

SEABIRDS AND FISHERIES INTERACTIONS: HOW TO SOLVE THE BYCATCH PROBLEM



Figure 1. Seabirds following a trawler, attracted by discards. Photo: Pep Arcos.

01 Seabirds and fisheries

Seabirds are marine top predators, and as such share habitat and prey with fishers. The lives of seabirds and fishers are therefore closely intertwined, and this means that they interact in many different ways.

On the positive side, it should be remembered that, since time immemorial, fishers have used birds to find shoals of fish. Even today, birds complement the information on the location of catches that new technologies bring to fishing. Moreover, by studying the diet and movements of birds, we can obtain data on the abundance and distribution of their prey and help improve the management of fish stocks. Birds have also been able to benefit from fishing, especially from the discarded fish, as it can represent an extra food source that is easier to obtain. This resource has become very important for some species, to the extent that their ecology and behaviour is strongly influenced by fishing activity and the availability of discards, and their populations can fluctuate accordingly.

But it is not all plain sailing. When sharing prey, birds and fishers can also become competitors, and birds, with less extractive capacity, will always be more sensitive to change. The great flying ability of many seabird species means that they can compensate for local food shortages by moving to areas far from their breeding colonies. However, there might be severer effects if prey declines are widespread, either by environmental and/or overexploitation reasons. On the other hand, changes in the birds' diet can also alleviate these food shortages. In this respect, birds become good indicators for fisheries management, as they often warn of changes in prey abundance before we detect them more directly.

For example, the decline of the lesser sandeel, a member of the family Ammodytidae, in the North Sea has wreaked havoc on the many seabird colonies in Scotland and nearby areas, affecting iconic species such as the Atlantic Puffin and the Black-legged Kittiwake. In this situation, the Atlantic Puffin has partly compensated for the loss of the lesser sandeel by catching more herring, although in this case the



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change in diet could not halt the decline in their populations.

Another negative interaction between seabirds and fisheries, and probably the most serious one, is bycatch. Bycatch is unintentional, and often occasional, but can still pose a very high risk to some bird populations. It should be borne in mind that seabirds are usually long-lived animals with low reproductive rates. Some species may live for over fifty years, take years to breed for the first time and, when they do, lay only one egg per season, and may even take "sabbatical" years during which they do not breed. Thus, any factor that shortens life

expectancy can cause significant population declines, as the low reproductive rate cannot make up for the additional deaths.

But bycatch is also a problem for fishers, who want to catch fish. If birds are caught instead of fish, this causes problems, damage to gear and loss of fishing opportunities, and thus leads to economic losses.

02 Bycatch, who is affected, how and where?

Bycatch can occur in different fishing gear and affect various seabird species around the world. To understand how it occurs, it is important to analyse it on a gear-by-gear basis, and also to know the characteristics of the species affected. The gears most often involved are longlines, nets (both static and drift nets), trawls and purse seines.

02.01 Longlines

Longline (both surface and demersal) is the type of gear that has received most attention in relation to seabird bycatch. The crucial moment is when the lines are set, when the birds try to catch the baits and can either swallow them with the hook or get stuck superficially with the hook or tangled up with the line. They then sink with the gear and drown. This especially affects species that feed relatively close to the surface and often in groups, such as albatrosses and shearwaters.

The Southern Oceans were the first place where the link between catches with this gear and the sharp decline in many albatross populations could be demonstrated almost 30 years ago. It was also the area where the first firm measures were taken to solve the problem. But the phenomenon is much more widespread and affects many regions of the world, with a global estimate of between 160,000 and 320,000 seabirds killed annually as a result. However, there are still areas where much work needs to be done to document the problem properly and implement solutions, as is the case of the Mediterranean.

We can observe significant differences depending on the type of longline used. In the case of surface longlining, large fish species such as tuna and swordfish are often set in more pelagic waters and using larger hooks and baits, so large seabird species such as albatrosses, large petrels and gannets are those with higher risk of bycatch. Demersal



Figure 2. Atlantic Puffin (*Fratercula arctica*) have learned to exploit alternative prey, such as herring (pictured), in the face of the decline of their main prey, the Lesser Sandeel. Isle of May, Scotland. Photo: Pep Arcos.



Figure 3. Scopoli's shearwater (*Calonectris diomedea*) in its nest. Balearic Islands. Photo: Pep Arcos.

longlining (in its many variants) tends to be set in more coastal and more productive areas and uses smaller baits and hooks, and therefore may also affect smaller seabirds, especially shearwaters and some petrels, but also gulls and others.

02.02 Nets

Diving birds, such as cormorants, sea ducks and even shearwaters, can become entangled when attracted by the fish

caught or when swimming past the gear, as the birds are unable to detect it. In the case of bottom-set nets such as gillnets, these catches can be significant in coastal and/or shallow areas, especially seabird breeding colonies, or in areas where birds congregate to feed. This is a problem typical of temperate and cold areas, where diving species are usually more abundant. But it can also be observed in lower latitudes such as the Mediterranean, where locally it can affect the European shag and other



Figure 4. Great grebe (*Podiceps major*). Note the net around its body. Punta del Este, Uruguay. Photo: Pep Arcos.

species. Globally, an estimated 400,000 birds are killed each year as a result.

Driftnets pose a danger to many seabirds, and for many other marine species, and can affect more surface-bound species such as shearwaters and petrels. However, in 1992, the United Nations established an international moratorium on this type of gear in oceanic waters, so that today its legal use is limited to a few coastal areas.

02.03 Trawling

Accidental seabird deaths caused by trawlers went unnoticed for a long time. However, in some areas it appears that these deaths may be significant, particularly in the Southern Hemisphere where there is a high density of seabirds.

The main problem is collision with the wraocables, especially when large numbers of birds are associated with the boat, attracted by the discarding of fish. It mainly affects large species with long wings and poor manoeuvrability, such as albatrosses and some large shearwaters and petrels. Most collisions go unnoticed, as the bird is injured (usually with a broken wing) or sinks with the cable and drowns, but rarely comes aboard. On the other hand, some birds such as deep diving penguins or shearwaters can get caught in the net during fishing operation.

On a global scale, no estimate has been made of the number of seabirds affected by trawling, but the problem is known to be significant in areas such as southern Africa and the Patagonian Continental Shelf. In the Mediterranean, the available information suggests that this is an occasional phenomenon.

02.04 Purse seines

This practice can also cause bycatch, mainly when the target species are small pelagic fish such as sardines and anchovies, which are consumed by many seabirds. The moment of maximum danger is when the net is closing over a mass of fish and the birds are attracted by this abundance of prey near the surface. They are then in danger of getting caught in the net with the fish and suffering fractures or drowning. The problem mainly affects species that have some diving ability, especially shearwaters, as they may be underwater when the net has just closed, thus becoming unable to react and leave in time.

This is the least studied type to date, but it is known that the problem can be significant in areas such as the coasts of Chile and Peru. In the Mediterranean, documented cases are anecdotal.

03 How can the problem be solved?

Over the last three decades, great efforts have been made in some regions to minimise the bycatch problem, but much remains to be done. Existing experiences show that reducing bycatch is possible, often with small operational changes or simple technical measures that do not involve significant effort, and benefit both birds and fishers.

The Agreement on the Conservation of Albatrosses and Petrels (ACAP), with the support of the NGO *BirdLife International*, is constantly updating available information and developing recommendations on bycatch mitigation, promoting their implementation on a global scale. On its website (<https://acap.aq/>), we can find recommendations on how to act, and, in particular, it has factsheets with the most appropriate mitigation measures for each type of gear. According to their recommendations, for a seabird bycatch mitigation measure to be appropriate it must be simple and easy to implement, it must be proven to be effective in significantly reducing seabird bycatch and it must not increase the bycatch of other endangered species. Furthermore, it is also important to check that it does not adversely affect the capture of commercial species.

Beyond these recommendations, it should be remembered that minimising bycatch by fishing gear is a win-win objective and it is essential that all stakeholders work together to find solutions, and with fishers at the forefront. No one knows their gear and practice better than the fishers themselves, and they are therefore best placed to seek adjustments to improve the sustainability of their activity. On the other hand, scientists and conservationists know the behaviour and ecology of the birds well, and can help identify the factors that drive catches in order to find solutions. They can also bring experience from elsewhere. And public administrations are responsible for the resources and welfare of the marine environment, and for regulating any measures deemed appropriate to achieve these objectives.

When developing or adapting mitigation measures, the particularities of the area and the gear to be addressed must be well understood. As a starting point, however, it is useful to know what solutions have been found for similar gear in other regions. Let us look at some of them.



Figure 5. The decline of several species of albatross and petrel raised the alarm about bycatch in the early 1990s. In the photo, an Antipodean albatross (*Diomedea antipodensis*) and northern giant petrels (*Macronectes halli*) taking advantage of the discards from a fishing boat in New Zealand. Photo: Pep Arcos.

03.01 Longlines

Longline is the gear that has received most attention for developing and applying mitigation measures. There are two important factors to consider, and to work on: the vessel's likelihood of attracting seabirds and the sinking speed of the longline.

If we make sure that there are few birds associated, or that they cannot get very close, we significantly reduce the probability of catches. Thus, setting the gear at night (when most bird species are less active) can be a first approach, and often reduces the risk of capture significantly. Significant reductions can also be achieved by avoiding setting longlines during periods of peak interaction (usually

during the breeding season) and in areas close to breeding colonies. Another very effective method, as long as it does not affect fish catch, is to use bait that is unattractive to birds, such as crustaceans or octopus. Managing discards properly also helps: they should not be thrown out moments before or during the setting of the longline, so that birds do not follow the boat when the risk of catch is highest. On the other hand, mechanisms can be used to scare birds away or prevent them from approaching the area where the line is being set or retrieved, such as the so-called tori lines (a line stretched behind the boat from which brightly coloured strips are hung, which deters birds from approaching the area where the baited hooks are accessible to them). Finally, in the case of surface longlines, the use of encapsulated hooks, which do not open until they reach a certain depth, so that the bait remains inaccessible to the birds, is also very effective.

Achieving fast sinking rates also helps to minimise the risk of bird catches. When little (or no) weight is attached to the line, baited hooks take a long time to sink, and can be accessible to birds even hundreds of metres from the boat, at least for species that have a certain ability to dive (such as shearwaters). The more weights we add,

and the heavier they are, the faster the line will sink and the lower the risk of catching birds. An extreme case is the Chilean system, where vertical lines are used with a weight at the end that makes them sink quickly. In addition, with this system, as the gear is lowered vertically and with the boat stationary, the line stays close to the deck, which makes it more difficult for the birds to approach the bait.

03.02 Nets

The bycatch of birds in nets usually occurs when the gear is set, making it more difficult to find solutions. The aim is to prevent birds from approaching the net once it is set, and various deterrent or signalling systems have been tested for this purpose. The most widespread are acoustic deterrent systems, which emit high-frequency sounds. These devices often work well for preventing the capture of marine mammals, but for birds they are not always as efficient. Visual systems that signal the presence of the net, such as flashing lights or panels with colouring patterns that are particularly conspicuous to birds, are also being experimented with.

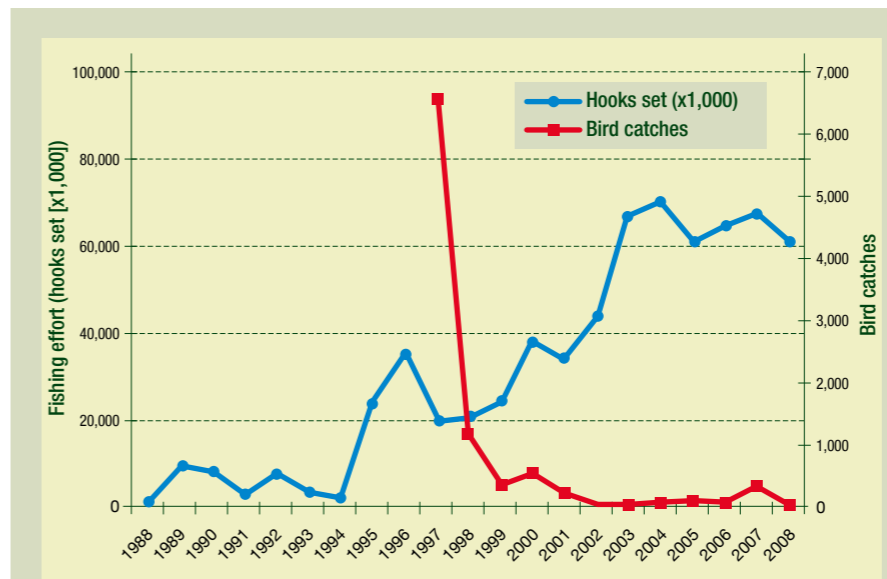


Figure 6. Comparative graph between fishing effort and bird catches, from data recorded by CCAMLR.

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) is an international convention established in 1982 to manage fisheries in Antarctic marine ecosystems. This convention has been a model to follow in the management of fishing activity, taking into account its impact on the marine ecosystem as a whole, and birds have not been left out. Thus, seabird bycatch mortality has gone from affecting thousands of birds annually to almost zero within the area managed by the convention, thanks

to the development and implementation of a combination of measures including seasonal closures, night setting, the use of bird-scaring lines and the use of weights to ensure the rapid sinking of longlines. This reduction in bycatch has been accompanied by an increase in fishing effort, and shows that minimising bycatch has nothing to do with to place obstacles in the way of fishing obstacles in the way of fishing.



Figure 7. Purse seine fishing and Balearic shearwaters. Photo: Pep Arcos.



The reduction in bycatch in the CCAMLR area has been accompanied by an increase in fishing effort, and shows that minimising bycatch has nothing to do with placing obstacles in the way of fishing.

03.03 Trawling

One of the most commonly used systems to minimise bird mortality on trawlers is bird-scaring lines, similar to those used on longliners, to prevent birds from getting too close to risk areas (stern and wrap cables). This, combined with good discards management, which in this case is very important (as this type of fishing generates large amounts and attracts many birds), can significantly reduce bycatch.

03.04 Purse seines

This type of fishing has received the least attention in developing mitigation measures for seabird bycatch. However, recent studies in Chile show how slight improvements in gear, which avoid making unnecessary "bags", significantly reduce shearwater catches. Another way of minimising catches is to fish at night and to avoid the net closing manoeuvre extending into the early hours of the morning, when the birds are most active.

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It is essential to work together to find solutions collaboratively and led by the fishers.