



TOWARDS SEABIRD-SAFE FISHERIES

GLOBAL EFFORTS & SOLUTIONS



Francisco Berned/ProDelphinus

TOWARDS SEABIRD-SAFE FISHERIES

Seabirds are one of the world's most threatened groups of animals, with many populations in decline due to incidental capture in fishing gears. Birds are caught and drowned on baited longline hooks and in nets, or are killed by collisions with trawl cables.

Simple and inexpensive measures can be highly effective in preventing these unintentional deaths. In fact, some fisheries have already reduced seabird bycatch by 90% or more, demonstrating the scale of potential success.

Here we present some of the remarkable efforts of fisheries large and small from almost every ocean, where fishers are finding solutions to prevent unnecessary seabird deaths. These stories demonstrate that collaboration – between fishers, scientists and decision makers – can lead to practical solutions that will ultimately turn the tide for many seabird species and improve the sustainability of global fisheries.



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Images by: Steph Prince, Leo Tamini, John Paterson, Bokamoso Lebepe, Luis Cabezas, Lisa Mansfield, Rory Crawford, Brocken Inaglory & Julius Morkunas

SEABIRDS IN DECLINE



Almost half of all seabird species are in decline and under threat – the albatross family is especially imperilled, with 15 of 22 species threatened with extinction. Albatrosses are long lived and slow breeding birds, so their numbers are particularly hard hit by deaths in fisheries. Most lay only one egg every two years, and some species do not breed until they are ten years old. It therefore takes many years to replace a breeding bird that is accidentally killed. Albatross naturally forage for squid and fish on the surface of the water, so to them foraging for bait from a fishing vessel mirrors their natural behaviour. For many it is their last meal. Since the 1990's some albatross populations have halved, mainly due to the impact of bycatch in fisheries.

The perilous decline of the majestic albatrosses has provided an important catalyst for action on seabird bycatch, but the scale of the threat to seabirds is broad. Three penguin species are thought to be threatened by fisheries, for example, and bycatch impacts seabirds small and large from coastal waters to the High Seas. Bycatch is of course not just limited to birds, and is an issue for a broad group of non-target species, from sea turtles to seahorses. Tailored solutions to bycatch are needed – the gear type and characteristics of fishing fleets, as well as affected species, need to be taken in to account.

The fishing gears largely responsible for seabird bycatch are:



Trawls

For many years, mortality in trawl fisheries went largely unobserved as most of the birds struck or dragged under by trawl cables are lost at sea. It was not until dedicated observers assessed the frequency of birds having serious interactions with the cables that the true death toll, particularly of albatrosses, came to light.



Longlines

It is estimated that between 160,000 and 320,000 seabirds are accidentally hooked and killed in longline fisheries globally each year. Concerted efforts have been made to tackle this major global threat to declining seabird populations, particularly albatrosses and petrels.



Purse Seines

Purse seine fishers encircle shoaling fish with a net and evidence is amassing of birds becoming entangled in this gear – research undertaken in Chile has shown that pursuit diving species like shearwaters are particularly at risk. Further investigation needs to be conducted to assess bycatch rates in fleets around the world.



Gillnets

Gillnet fisheries are globally widespread and have been implicated in high bycatch rates for sea turtles, marine mammals and seabirds. The first global review of seabird gillnet bycatch conservatively estimates that 400,000 birds are killed in this gear every year, with 148 seabird species considered susceptible to gillnet bycatch. Unlike longline and trawl fisheries, effective technical means of altering the gear to

reduce and eliminate bycatch from gillnets are still under development. In addition, many gillnet fisheries are low capital and small-scale, operating across broad areas – meaning there is often poor monitoring and regulation.

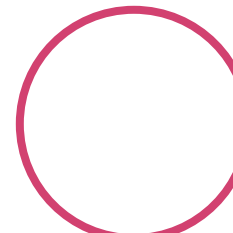
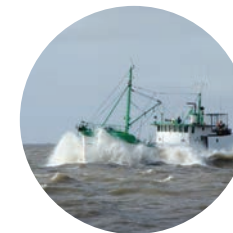
Tackling bycatch

The threat from pelagic longliners to seabirds is well established, as are the techniques to prevent unnecessary seabird bycatch in High Seas tuna fisheries. Recognised best practice solutions in tuna longline fisheries include the combined use of weighted branch lines, night setting and bird-scaring lines. All five tuna commissions have adopted Conservation and Management Measures that require tuna longline vessels to use mitigation in most areas overlapping with albatrosses.

Bycatch mitigation measures are usually either species or fishery specific, and their success varies greatly. Reliable mitigation measures for gillnets or purse seines do not yet exist and work is underway to design and test measures to halt bycatch in these fisheries. Progress is being made, and fishermen, NGOs and governments are working together to come up with effective solutions.

Although seabird bycatch is a complex problem that has varying causes and solutions for different gear types, experience from around the world shows that it is a surmountable issue – healthy seabird populations and fisheries can co-exist. This booklet explores some of the finest examples of this – and with the widest possible adoption of some of the measures showcased here, this vision can become a reality.

Anderson *et al.*, 2011, Žydelis *et al.*, 2013



SOURCES OF INSPIRATION



A few stand-out cases have helped pave the way to finding solutions that work for both fishers and seabirds. These cases raised the profile of the issue, demonstrated early successes, and showed what is possible in terms of bycatch reductions when both the practical solutions and political will are available. Many of the successes you'll read about in this booklet have been inspired by the early pioneers of seabird bycatch mitigation.

Early efforts

The incidental mortality of seabirds on longlines was first reported from bird band recoveries in the early 1980s. By the end of the decade work to assess the scale of the problem and to develop solutions had begun. Japanese tuna longline vessels were estimated to be killing at least 44,000 albatross per year across the Southern Ocean. In Australian waters some of these vessels already used bird-scaring lines to avoid bait loss to seabirds. Observations showed a 69% decrease in bait loss when using a bird-scaring line, and with some design modifications the potential was expected to be even greater. Suggestions were also made for line weighting and night setting as ways of reducing bycatch. This study raised awareness amongst the fishing community of methods to reduce bycatch whilst potentially improving catch, due to lower bait loss.

In Alaska bycatch regulations were adopted in the Gulf of Alaska and Bering Sea demersal longline fisheries in 1997. One vessel, the F/V Masonic, achieved zero bycatch just one year later by trialling various bycatch reduction methods, and eventually adopting a bird-scaring line coupled with line weighting. This showed how simple the solutions to bycatch can be if industry are willing to test the methods, and configure them for their vessels.

CCAMLR

One of the prominent examples of successful seabird bycatch reductions is from the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), an international commission designed to protect the Antarctic marine ecosystem. The Government of South Georgia and the South Sandwich Islands issues licenses for a demersal longline fishery within the CCAMLR convention area. To protect the nesting seabirds of the islands, the government enacted a seasonal closure during the seabird breeding season, and outside the breeding season required vessels to use a combination of measures including discard management, bird-scaring lines, line weighting and night setting. The result was a rapid drop in bycatch from over 6,000 albatross per year to practically zero.

Through CCAMLR, these measures were adopted across the Southern Ocean, reducing the estimated annual bycatch by around 67,000 birds per year. CCAMLR's decisive action on the issue catalysed efforts to address the issue on a global scale. Seabird tracking data was used to show that the non-breeding ranges of many albatross species overlap with tuna Regional Fisheries Management Organisations (RFMOs), which has lead to requirements for longline vessels to use mitigation measures in most areas overlapping with albatrosses on the High Seas.

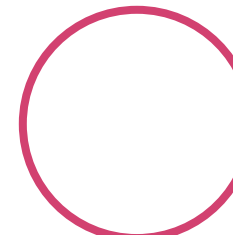
Hawaii

Inspiration also comes from the North Pacific where the Hawaiian swordfish and tuna pelagic fleet have reduced deaths by around 15,000 birds per year through the adoption of a National Plan of Action for Seabirds, which requires the use of seabird bycatch mitigation measures backed up by a robust observer programme. Important lessons have been derived from the work in the North Pacific, including that no single seabird avoidance measure is likely to be effective and practical for all longline fisheries, so testing of methods in individual fleets is needed to determine viability. Longline fishers must directly participate in trials as their in-depth knowledge is crucial to develop mitigation techniques. Efforts in Hawaii underscored how critical it is to identify solutions that are not only very effective, but are also economically viable and commercially practical.

Solving bycatch today

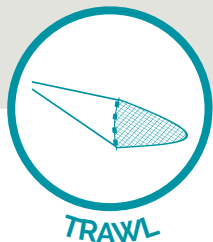
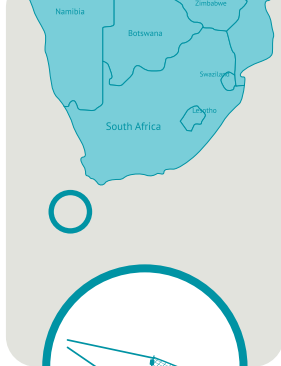
Efforts to reduce seabird bycatch continue today across the world, and in many fisheries the reductions have been significant. For some gear types, including longline and trawl, the solutions are well established and the challenge is to ensure fishers are using them where required. For others, mitigation methods are still being trialled. In this booklet we detail both proven methods and those still at experimental stage (which are clearly marked in the next section) that have shown promising results.

Brothers *et al.*, 1991; Croxall., 2008; Gilman *et al.*, 2005; Lundsten., 2001



BYCATCH SUCCESS STORIES





Target species:
Hake (*Merluccius paradoxus* & *M. capensis*)



Bycaught species:
Albatrosses & petrel species, mainly; black-browed albatross (*Thalassarche melanophris*) & Cape petrel (*Daption capense*)



Fleet:
46 vessels



Oceans:
Atlantic & Indian



Albatross deaths reduced by 99% in the South African hake trawl fishery.

Situation

Hake is a key species for the South African fishing industry, accounting for half of the country's annual catch. Forty six vessels land up to 160,000 tonnes every year. In 2004 the fishery was certified by the Marine Stewardship Council (MSC) and part of the criteria of the certification was that the fishery must assess impact on bycatch species and work to quantify and reduce seabird bycatch.

In 2004/2005 the South African Deep Sea Trawl Industry Association (SADSTIA) investigated the scale of bycatch and found that black-browed albatross, which was classified as Endangered at the time, and shy-type albatross, which are Near Threatened, were the species' most impacted.

Through onboard observations and the use of video cameras they estimated that 15,000 seabirds were killed by cable strikes every year. Later re-analysis with more accurate fishing effort data estimated a more conservative 9,300 killed, but 7,200 of these were albatrosses. These were still vastly higher losses than the populations could sustain.

The majority of fatalities occur when the vessels are discarding offal, as albatross can detect the smell of fish from over 20 kilometres away, so are drawn to vessels in large numbers. It is therefore imperative to use mitigation methods if discarding while trawling.

Solutions

The South African government introduced bycatch regulations in 2006, and in the same year BirdLife's Albatross Task Force (ATF) was launched and the trawl vessels began working with the ATF to mitigate seabird bycatch. Bird-scaring lines (BSL's) were tested in the fishery to see the effect they had on the numbers of birds killed. By 2010 seabird mortality had been reduced by 73-95% due to the use of BSL's compared with 2004-2005 mortality (pre-mitigation) on the observed vessels. Combined with the halving in fishing effort over the period, albatross deaths were reduced by >95%.

Seabirds are at highest risk of collisions with cables when the net is being set, so in 2011 SADSTIA decided voluntarily to deploy BSL's during setting to mitigate this risk, and a year later this was made a condition of the fishing permits. In 2013 the results of a multi-year study by the ATF was published, and it showed that albatross deaths had been reduced by an astounding 99% across the demersal trawl fishery. This amazing improvement was all down to a simple mitigation method being adopted by all vessels in the fleet.

A BSL following best practice specification costs less than US\$200 to build in South Africa. This is a trivial amount compared to the huge impact it can have on reducing bycatch of threatened seabird.

Each vessel in the fleet has now developed its own Bird Mitigation Plan, which fine tunes the mitigation method design to suit its unique needs. Tailoring the methods to meet the requirements of each vessel was key in the success of the measures.



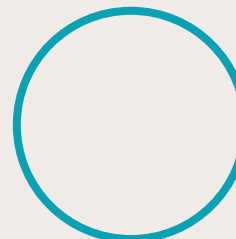
"The use of bird-scaring lines is very important, and it's something that all trawl fishing vessels should do. Before using them, we used to catch a lot of birds in the nets and cables. Seeing that was very unpleasant, we fishermen don't like hurting animals. At the beginning, using the bird-scaring lines was difficult and time consuming but now the guys are used to it, and we don't mind. It's more important that we don't hurt the birds"

Achmat Sadie, 2nd Mate I&J trawl fleet

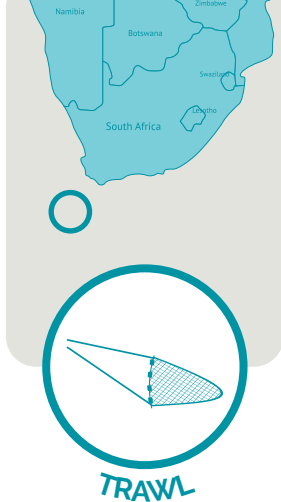
Future

The fleet has had great success in reducing albatross deaths. It is a shining example of what is possible. The focus for the future is to maintain these massive bycatch reductions through ongoing monitoring of mitigation use and updating of Bird Mitigation Plans.

Maree *et al.*, 2014



Bronwyn Maree, Bokamoso Lembepe.



TRAWL



Target species:
Hake (*Merluccius paradoxus* & *M. capensis*)



Bycaught species:
Albatross (*Thalassarche* spp.),
petrels (various spp.) & Cape
gannet (*Morus capensis*)



Fleet:
46 vessels



Oceans:
Atlantic & Indian



The Rory Line offers a neat solution to prevent smaller seabirds drifting towards the 'danger zone' around trawl cables. Trials found that they are a useful compliment to bird-scaring lines, and can dramatically reduce cable collision with white-chinned petrels.

Situation

In trawl fisheries, high seabird mortalities have been recorded as a result of seabirds being struck by the trawl cables (which tow the trawl net) or becoming entangled on the cable and dragged under by the force of the water moving past the cable. Bird-scaring lines (BSL's) have been used to decrease seabird mortality significantly in South Africa, particularly for albatrosses (see p12), but on some vessels the trawl cables are attached outboard of the vessel side, which creates a

narrow channel between the vessel and the BSL's down which smaller seabirds can drift while they feed on offal discards.

This was found to be an issue for trawlers in the demersal trawl fleet for hake in South African waters, and was impacting globally Vulnerable species such as white-chinned petrel and Cape gannet.

Solutions

Fishermen are best placed to design viable solutions for their fleets, and to deal with this particular problem of birds drifting aft to the trawl cable area the Rory Line – a horizontal side boom with vertical streamers that block small birds from entering the channel between the vessel and the bird-scaring lines – was thought up by a skipper in the demersal trawl fleet. The Rory Line is designed to be used in conjunction with BSL's, and reduces cable strikes by placing a physical barrier between the scupper (where factory discards are released) and the danger zone (where the trawl cables enter the water) at the stern of the vessel.

At-sea trials of the Rory Line conducted in 2011-2012 found that cable collision rates were dramatically diminished for white-chinned petrels and great shearwaters, by 68% and 84% respectively. Use of the lines also significantly reduced the numbers of albatrosses, white-chinned petrels and Cape gannets that drifted alongside the vessel and into the danger zone around the trawl cables.

“Safeguarding our heritage for future generations is my foremost motivation for innovations. I introduced Rory Lines to deter seabirds from drifting toward the trawl cable from the side of the vessel, and it's working remarkably well” said Roy Diedricks, Skipper of the African Queen, who came up with the idea for the Rory Line and further developed it with BirdLife International's Albatross Task Force.

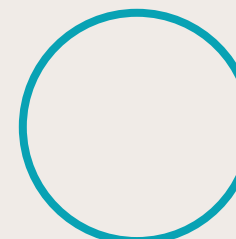


Future

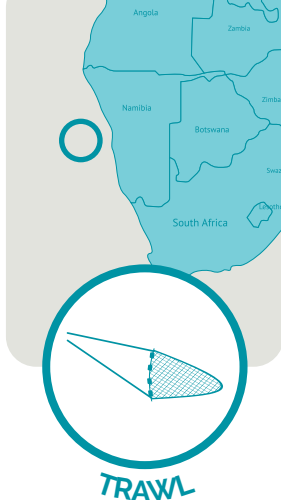
Rory Lines have been found to have good potential to further reduce seabird bycatch in the hake trawl fishery, particularly when used in combination with BSL's. The efficacy of Rory Lines at reducing trawl cable strikes appears to be linked to the feeding behaviour of each seabird species. Whilst the Rory Lines halved the numbers of Cape gannets that drifted into the danger zone, cable strike rates for this plunge-diving species were not reduced as they tend to enter the water behind the Rory Line. Further tests would be useful with adjusted positions to maximise the benefit of the mitigation measure to the broadest group of seabird species possible.

In the absence of offal discharge, birds do not approach the danger area where the trawl cables enter the water. While there may be practical constraints for older vessels (e.g. to retrofit a fishmeal plant), ultimately the best solution to limit cable strikes is to manage the release of discards and a number of studies have shown that halting discharge can eliminate seabird mortality.

Rice., 2012; Watkins *et al.*, 2008; WWF., 2012



Steph Wymard, Dimas Granuca, Lisa Mansfield



Once dubbed 'the world's worst fishery for bycatch', Namibia has turned seabird safe through regulation and industry uptake of mitigation measures.

Situation

The hake fishery is Namibia's most important. The majority of hake is caught by trawl, but in 1991 demersal longlining began, reaching a peak of 25 vessels by 2007, subsequently reducing with 14 vessels currently fishing in Namibian waters.

Namibia had historically topped the global list of longline fisheries in terms of numbers of seabirds killed as bycatch. The Benguela Current is a nutrient rich upwelling that supports large numbers of seabirds as well as fish, and is therefore a hotspot for both fishing activity and seabird foraging. In 2010 it was estimated that

around 20,567 (6,328-37,935) birds were killed in the hake demersal longline fishery alone. The species most affected by this fishery is the white-chinned petrel (~85% of all birds killed), which is classified as Vulnerable to extinction. The Endangered Atlantic yellow-nosed albatross also patrol Namibia's Exclusive Economic Zone and are caught in smaller numbers in the fishery.

Solutions

Over four years BirdLife International's Albatross Task Force (ATF) worked alongside the Namibian Nature Foundation to monitor numbers of birds being killed and to test mitigation methods. Between 2009 and 2012, 126 sets were observed during 14 trips (1,800,800 hooks). During 11 of these trips the effectiveness of bird-scaring lines (BSL's, both single and paired) were tested against a control of no mitigation, and three trips compared modified main line weighting (5kg steel) with standard line weighting (3.7. ± 1.1 kg concrete).

The use of BSL's reduced bycatch from 0.57 birds/1000 hooks to 0.04. No albatrosses were caught when BSL's were used. The use of steel weights also showed significantly lower bycatch rates than when no mitigation methods were used, and sank faster than when using concrete weights. Crucially there was no significant difference in hake catch rate when using the heavier steel weights. A combination of mitigation measures is the most effective way of reducing bycatch, especially in fisheries that impact on species that are proficient nocturnal foragers and divers, such as the white-chinned petrel.

In November 2015, the Ministry of Fisheries and Marine Resources (MFMR) went further and introduced mandatory regulations requiring the use of BSL's. These regulations led to improved mitigation uptake by the industry. Since 2016 the Fisheries Observer Agency (FOA) has been collecting seabird bycatch and compliance data to complement data collected by the ATF instructors. This data has shown a 98.4% reduction in seabird bycatch mortality on longline vessels, while trawl vessels recorded 54% less potentially deadly interactions.

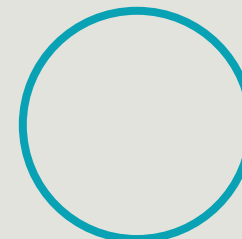
These results show an overwhelming success on longline vessels, but they also clearly show that there is room for improvement on the trawl fleet, particularly around the technicalities of when the BSL is deployed. The ATF team is working alongside the Namibian Hake Association (NHA) to advise the trawl fleet on the installation of extension arms to attach BSL's, which reduce the chance of BSL's entangling with warp cables.

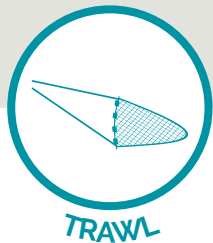
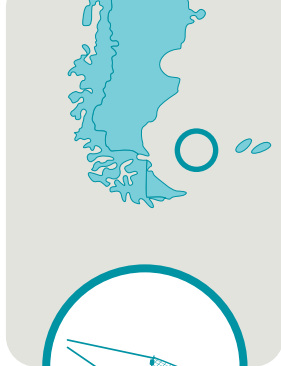
"Namibia is indeed a world leader and trend-setter with the enactment of seabird mitigation conservation measures. The FOA will continue to ensure that laws related to seabird mortality is adhered to. In the next five years, we anticipate to see almost no incidences of seabird mortality in Namibian waters and that we continue on the same trajectory for the trawl fishery." – Stanley Ndara, CEO of the Fisheries Observer Agency (FOA)

Future

100% of vessels adopted BSL's after regulations were passed. Namibia has almost 100% fisheries observer coverage on its vessels, which provides an ability to monitor implementation. Suitably trained observers collect valuable information on the effectiveness of mitigation measures, and compliance with regulations. The next steps involve updating the regulations to include mandatory night setting and line weighting for the demersal longline fleet, as well as implementing adequate systems to ensure there is sustainable monitoring, reporting and enforcement of seabird bycatch mitigation measures.

Da Rocha et al., 2021 (Da Rocha, N., Oppel, S., Prince, S., Matjila, S., Shaanika, T.M., Naomab, C., et al. (2021) Reduction in seabird mortality in Namibian fisheries following the introduction of bycatch regulation. Biological Conservation, 253, 108915)





Target species:

Argentine hake (*Merluccius hubbsi*), hoki (*Macrurus magellanicus*), grenadier (*Coelorhynchus fasciatus*), kingklip (*Genypterus blacodes*), red cod (*Squalius australis*), southern blue whiting (*Micromesistius australis*) & patagonian toothfish (*Dissostichus eleginoides*)



Bycaught species:

Black-browed albatross (*Thalassarche melanophrys*), southern giant petrel (*Macronectes giganteus*), northern giant petrel (*M. halli*), Cape petrel (*Daption capense*) & white-chinned petrel (*Procellaria aequinoctialis*)



Fleet:

24 stern factory trawlers



Oceans:
Atlantic



Bird-scaring lines (BSL's) on Argentine factory trawlers have drastically reduced seabird collisions with trawl cables. Binding regulations for mitigation devices came into force in 2018 and half of vessels have now implemented BSL's..

Situation

The Patagonian shelf Large Marine Ecosystem extends over 2.7 million square kilometres, and is an area of high productivity. Seabirds and seals thrive there, and the area supports numerous fishing fleets. The trawl fishery operates between 41°S and 54°S, and Argentine hake accounts for a quarter of landings, with an average catch of 278,000 t/year.

Thousands of seabirds are attracted to vessels to feed on discards during trawl operations. The

attractiveness of obtaining a free meal puts them at risk of being struck by cables, or becoming entangled in the net.

Between 2008 and 2010, in response to this threat, BirdLife's Albatross Task Force (ATF) instructors spent 141 days onboard trawlers recording seabird interactions with the fishing gear. The results of these observations, combined with analysis of fishery effort data, found that approximately 13,548 black-browed albatross,

2,463 southern giant petrels, 1,847 northern giant petrels and 1,232 Cape petrels are injured or killed in this fishery every year. These numbers are unsustainable, particularly for black-browed albatross, which in some parts of its range is undergoing rapid population declines.

Solutions

ATF instructors conducted trials using paired BSL's to assess if they could significantly reduce seabird bycatch when compared to observations of seabird collisions in the absence of mitigation measures. This area of the world is known for its adverse weather conditions, and so to combat the potential for entanglement of BSL's with trawl gear a towed device (the Tamini Tabla) was designed to create directional drag to maintain the BSL's parallel with the trawl cables.

The use of BSL's dramatically reduced the number of collisions with the trawl cables for all species affected. The number of black-browed albatross collisions were reduced from 16.97/hour to 2.63/hour, southern giant petrel collisions from 5.07 hour to 0.17/hour and Cape petrel collisions from 18.63/hour to 1.49/hour.

The fishermen involved in the trial were very positive about the experience, and once aware of the issue of seabird bycatch, were keen to work to solve the problem.

"I think it is important to use bird-scaring lines so that there are fewer dead albatrosses. In fishing there are very few people who are aware of the harm that can be done to birds and other species, but I believe that if we keep educating fishermen about this issue, the use of bird-scaring lines will become a habit." said Roberto Galarza, F/V Centurión del Atlántico.



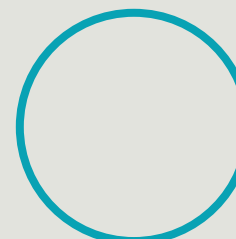
In 2018 a regulation was introduced which makes the use of BSL's mandatory for trawl fisheries in Argentina.

Future

More than half of the fleet has adopted the regulation to use BSL's. The ATF team are working with fishers, fishery managers, and the Ministry of Fisheries to improve compliance among the rest of the fleet.

Claudio García, is one such fisherman who has taken up measures voluntarily. He said ***"Many years ago there were many more albatrosses than there are today. I use bird-scaring lines to reduce mortality of these birds because they also have the right to live"***.

Tamini et al., 2015



Nahuel Chavez, Leo Tamini

200,000
seabirds are killed
in longline and
gillnet fisheries
across Europe
every year



400,000
seabirds die in gillnets
across the globe each year



The CR
endangered
Balearic
Shearwater is
caught in
bottom
longlines in Spain,
France and Portugal-
driving it to extinction



Diving seabirds
such as
Guillemots,
Razorbills,
Long-tailed Duck
& Velvet Scoter are most
at risk of bycatch with
gillnets



reduction in
albatross
killed in
South African
hake trawl
fishery



22,000
less
seabirds
killed by
Namibian
longliners after
regulations require use
of bird scaring lines



5/5 
tuna commissions now
requiring seabird
bycatch mitigation
measures

9 out of 10 
hotspot fisheries for
seabird bycatch
introduced new
regulations to protect
seabirds in the
last decade



LONGLINE



Target species:

Yellowfin tuna (*Thunnus albacares*), bigeye tuna (*T. obesus*), Pacific & Southern bluefin tuna (*T. orientalis* & *T. maccoyii*) & swordfish (*Xiphias gladius*)



Bycaught species:

Albatross & petrel species including; Buller's albatross (*Thalassarche bulleri*), white-capped albatross (*T. steadi*), Antipodean albatross (*Diomedea antipodensis*), Campbell's albatross (*D. impavida*), grey petrel (*Procellaria cinerea*), & black petrel (*P. parkinsoni*)



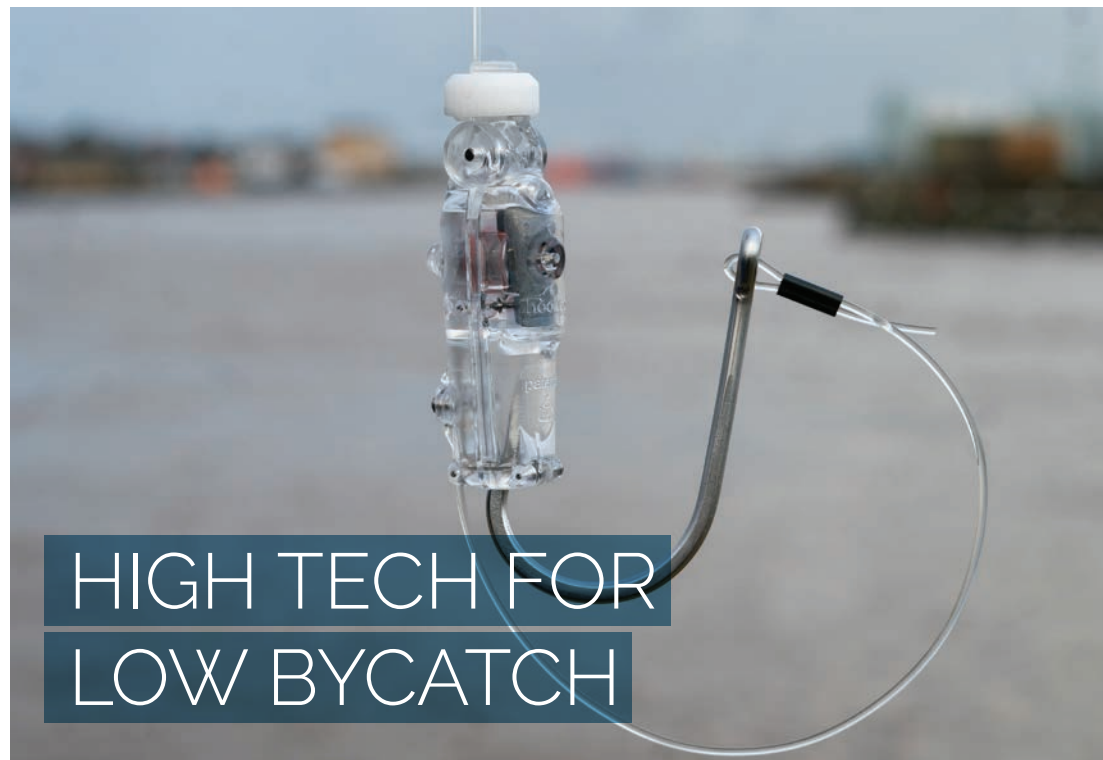
Fleet:

~170 vessels



Oceans:

Pacific



One stop solutions to seabird bycatch are being used. In New Zealand - the seabird capital of the world.

Situation

The New Zealand surface longline fishery comprises of around 170 domestic vessels fishing primarily off the east coast of the North Island and west coast of the South Island. New Zealand is an extremely important place for breeding seabirds and has more seabird species than any other country. In 2010-11 it was estimated there were 740 seabirds accidentally caught in the surface longline fishery. The Endangered Antipodean albatross, which is currently classified as Vulnerable to extinction, are particularly susceptible to being caught on longlines, with one vessel capturing 58 birds on a single trip in 2006.

A combination of line weighting, night setting and bird-scaring lines is the best practice solution to seabird bycatch in longline fisheries, but there can be challenges with the implementation of these three measures. The nature of surface longline fishing gear, means bird-scaring lines can become entangled with the buoys and slow sinking hook lines during setting operations, for example, which can make fishing masters reluctant to use this mitigation measure. Line weighting has also raised safety concerns for crew.

Solutions

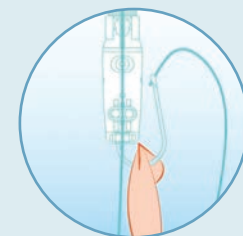
As an alternative to the traditional combination of mitigation methods, a single mitigation measure designed to be a one stop solution to seabird bycatch; the Hookpod* has now been proven to effectively prevent seabird bycatch in pelagic longline fleets. Since January 2020 New Zealand surface longliners have been using Hookpod Minis in the commercial tuna fishery. This has resulted in zero seabird bycatch reported from vessels using it.



During setting the baited hook is loaded

into the Hookpod to encase the point and barb of the hook.

A pressure release system opens the Hookpod and releases the baited hook at a predetermined depth.



"These Hookpods are a great invention and they are working well for us. It has taken away the dangers of using lead weights on our gear" said –Mike Te Pou

"Not one single bird has been caught on the pods so far from the tests we have run, and yes, we have caught the odd bird on our regular gear!"

"At first I was a bit suspect about using them but I have noticed that our fishing has not been affected in any way. On a few occasions the Hookpods actually out-fished our regular gear and caught more fish! Not one single bird has been caught on the pods so far. Shooting and hauling is no different ...It just takes the crew a few sets to get used to them" Mike Te Pou, NZ Skipper

Results from more extensive trials conducted in Australia, Brazil and South Africa have demonstrated that the larger 68g Hookpod LED is also highly effective at reducing seabird bycatch, and additionally contains a fishing light which negates the requirement for chemical plastic lightsticks. During 19 at-sea trips (over 62,000 experimental hooks) only one seabird mortality was recorded on the Hookpods compared to 24 on the branchlines of standard gear (without Hookpods), a bycatch rate of 0.034 birds/1000 hooks and 0.77 birds/1000 hooks, respectively. Importantly no significant differences were found in catch rates of target species. The Hookpods were well received by the crew

The use of Hookpods could enable fishing operations to be conducted using a single mitigation method, or could be used in combination.

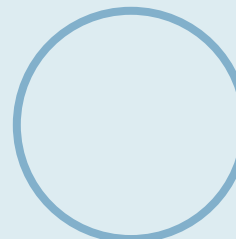
"Let us hope it its only a matter of time before Hookpods become universal"
Sir David Attenborough.

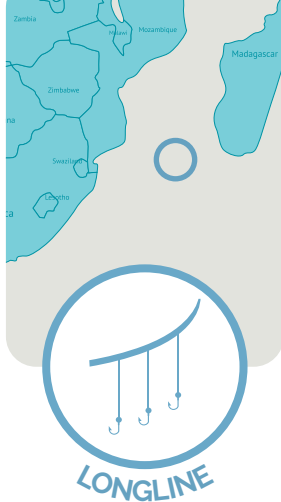
Future

The Hookpod has been recognised since 2016 as a stand-alone mitigation measure by the Agreement on the Conservation of Albatrosses and Petrels. 'Hook- shielding devices' were also added to the seabird regulations of the Western and Central Pacific Fisheries Commission in 2018 and also permitted as a standalone measure in New Zealand in early 2020. This provides another proven option for fishers to reduce bycatch.

Sullivan & Potts., 2016; Brouwer & Griggs., 2009; MPI National Plan of Action-2020.

*Hookpod is patented in the EU and New Zealand





Collaborative trials with Korean pelagic longliners found that sliding weights did not compromise fish catch, fishing operations or safety when targeting high value tunas.

Situation

The Korean tuna longline fishery in the Indian Ocean commenced in 1957, targeting yellowfin tuna, bigeye tuna and albacore tuna, with the addition of southern bluefin tuna in the early 1990s due to its high market value. The fleet fishes in the south eastern Indian Ocean, particularly for southern bluefin tuna, and the south western Indian Ocean for various tuna species. In these areas fishing effort overlaps with several vulnerable seabird species.

The increasing recognition of the risk posed to albatrosses and petrels by pelagic longliners has led to Regional Fisheries Management Organisations (RFMOs) adopting measures to reduce bycatch in High Seas fleets. At the point when the regulations were coming in to force in the Indian and Atlantic Oceans (2011, 2012), BirdLife International and the National Fisheries Research and Development Institute, now the National Institute for Fisheries Science (NIF'S) embarked on a research and training programme to assist Korean longline fishermen to apply the incoming regulations.

Solutions

Recognised best practice solutions in pelagic longline fisheries include the combined use of weighted branch lines, night setting and bird-scaring lines. Use of two of these three mitigation measures is required by the Indian Ocean Tuna Commission when fishing south of 25° South.

While adding weight to branchlines has been demonstrated as an effective method of reducing bycatch, concerns over crew safety are often raised. Fishing masters have suggested weights might have negative effects on fishing operations by causing bait loss, increasing branch line entanglements, or that weights placed at, or close to, the hook could reduce tuna catches. BirdLife and NIFS adopted a scientific approach to addressing these questions, undertaking collaborative, tests of various line-weighting configurations during production fishing.



Safety at sea

If a shark bite-off occurs during hauling, the weight can fire back towards crew on the hauling deck when the monofilament line recoils. Sliding weight technology has been developed as a safer alternative. Lumo Leads, are a type of sliding weight attached to branchlines via a mechanism which grips the monofilament, permitting the weights to move up and down the line when the line is under tension, unlike traditional leaded swivels. If the line snaps during a bite-off, the line passes through the Lumo Lead, often resulting in the lead falling off the end of the line, rather than shooting back dangerously towards the vessel.

Trials in 2013 (8,430 paired experimental hooks) and 2014/15 (217,000 hooks) were conducted onboard pelagic longline vessels off western Australia and southern Africa. Dominic Rollinson, who conducted the 2014/15 trials with NIFS, summarised the results:

“We found that at specific distances from the hook Lumo Leads had no measurable effect on fish catch or fisherman safety.”

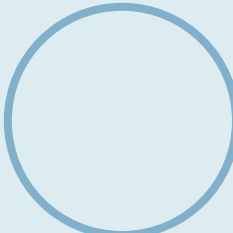
The results demonstrate that Korean-style branch lines can be optimised for a fast sink rate with a weighting regime that appears to have a very low risk of negatively impacting catch rates of target species. Neither 45g nor 60g Lumo Leads had a significant impact on catch rates of southern bluefin tuna when placed at 5cm from the hook, and catches were very similar for yellowfin tuna and bigeye tuna when Lumo leads were placed at 1m from the hook compared with unweighted branchlines. Incidences of flybacks and entanglements were few. ***“Our collaborative research shows that it is possible to develop line-weighting techniques for seabirds that do not compromise fish catch, fishing operations efficiency or crew safety”***, report NIFS.

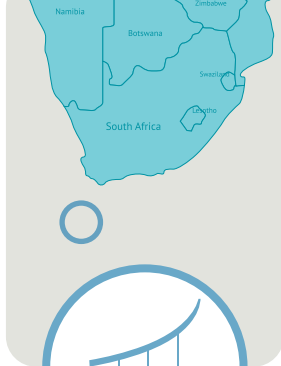
Future

The effect of Lumo Lead colour on fish catch requires investigation, and further trials are needed in areas of high seabird bycatch.

NIFS report that Lumo Leads have now been rolled out in the Korean fleet. ***“All of our tuna longline vessels operating in the Southern Indian and Southern Atlantic oceans have been supplied with Lumo Leads, helping Korea comply with RFMO regulations that are in place to protect seabirds.”***

Rollinson *et al.*, 2016 (a); Sullivan *et al.*, 2012; Tamini *et al.*, 2013





Target species:

Yellowfin tuna (*Thunnus albacores*), bigeye tuna (*T. obesus*), albacore tuna (*T. alalunga*) & swordfish (*Xiphias gladius*)



Bycaught species:

Shy albatross (*Thalassarche cauta*), black-browed albatross (*T. melanophris*) white-chinned petrel (*Procellaria aequinoctialis*) & cape petrel (*Daption capense*)



Fleet:

3 vessels
(1 million hooks/year)



Oceans:

Atlantic & Indian



Japanese joint venture tuna fleet reduces bycatch in South African waters using best practice mitigation measures and 100% observer coverage.

Situation

Japanese vessels have been fishing for tuna in South African waters since the 1960's. In 1995 a joint venture agreement was reached between a South African and Japanese vessel, which showed that tuna and swordfish could be profitably exploited in South African waters. The resulting fleet is known as the Japanese joint venture tuna fleet. It currently consists of three vessels, but has historically been as high as 29 vessels, and targets swordfish and tuna species.

Bycatch observations were conducted between 2002 and 2006 and found the fleet to have a bycatch rate of 0.45 birds/1000 hooks. This is almost an order of magnitude greater than the recommended acceptable maximum of 0.05 birds /1000 hooks. At this time Japanese vessels were not using any mitigation methods, and their fishing style did not utilise any line weighting, which was likely a critical factor, as hooks would be accessible to birds for a long period.



Solutions

In 2007 the South African Department of Agriculture, Forestry and Fisheries (DAFF) began to introduce a number of measures to reduce seabird bycatch. These measures are approved as best practice by the Agreement on the Conservation of Albatrosses and Petrels (ACAP).

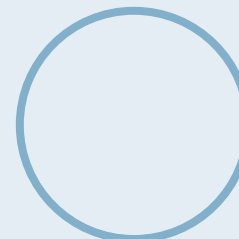
Whilst fishing in South African waters vessels must set at night, add weights to their lines (this has typically been 60g within 2.8m of the hook) and fly bird-scaring lines (BSL's) at all times. Vessels in the joint venture fleet have 100% observer coverage to ensure compliance. Further to these measures, vessels report bycatch every five days, and if this exceeds 50 birds, and there has been non-compliance with the prescribed measures, it can lead to the revocation of the fishing permit for the season. Extra assistance is given to vessels catching more than 25 birds to try to reduce their bycatch rates.

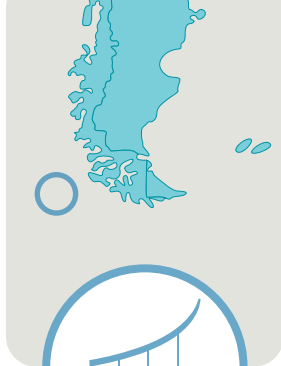
Following the introduction of these measures bycatch rates have been dramatically reduced. In 2016 the bycatch rate was 0.047 birds/1000 hooks, showing that the measures do work very well when used correctly and consistently. Compliance rates have been high in this fleet with 100% of observed sets (n=8498) using BSL's by 2013.

Future

This fishery has been hugely successful in reducing its seabird bycatch, and improvements are continuously being made. Recently regulations on line weighting in South Africa were changed to align them with revised ACAP recommendations of at least 40g within 0.5m of the hook; at least 60g within 1m of the hook; or at least 80g within 2m of the hook. These changes should reduce bycatch even further.

Rollinson *et al.*, 2016 (b); Ryan *et al.*, 2002





LONGLINE



Target species:
Patagonian toothfish
(*Dissostichus eleginoides*)



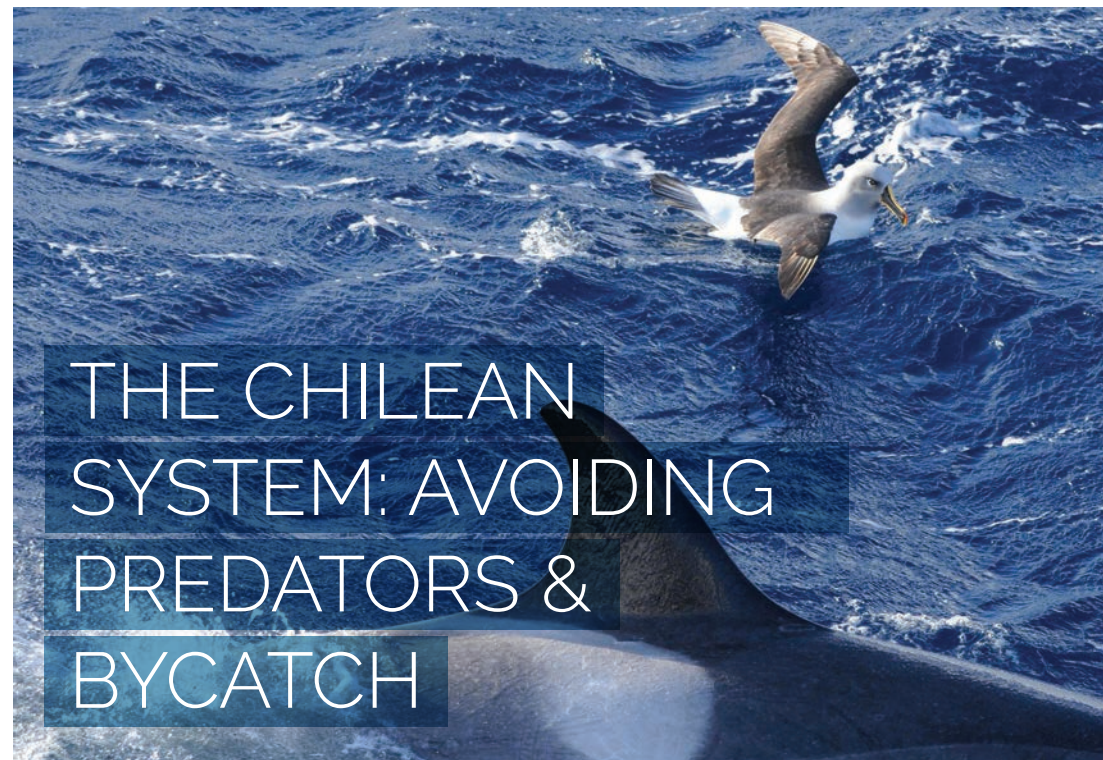
Bycaught species:
White-chinned petrel (*Procellaria
aequinoctialis*), black-browed
albatross (*Thalassarche
melanophris*), grey-headed
albatross (*T. chrysostoma*)



Fleet:
19.5 million hooks per year
(artisanal fleet) & 14.5 million
hooks per year
(industrial fleet)



Oceans:
Pacific



Adapting an artisanal fishing technique to industrial longline vessels reduced bycatch, halved depredation by whales and eliminated entanglements, all while maintaining toothfish catch.

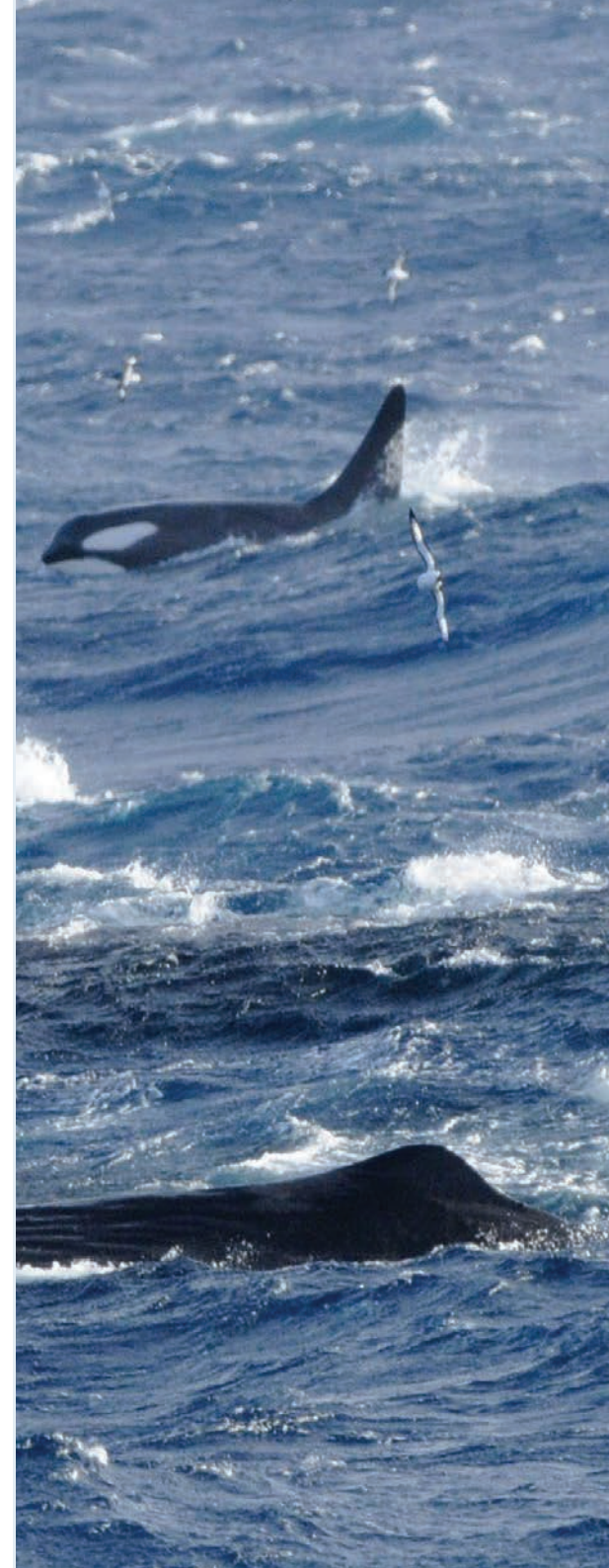
Situation

Some longline fisheries, such as for Patagonian toothfish, have recorded issues with depredation of target catch by killer and sperm whales, sometimes taking up to 50% of the catch. In the Chilean fishery there have also been instances of sperm whales becoming entangled in longline gear. Whales are not the only issue – these fisheries often suffer from seabird bycatch.

In Chile there are two toothfish fisheries, one artisanal and one industrial. The later operates south of 47° South, in the vicinity of Cape Horn,

an area that holds up to 20% of the world's black-browed albatross and 23% of grey-headed albatross.

The artisanal fishery has historically had a relatively low bycatch rate of ~0.047 birds/1000 hooks, even with the absence of mitigation measures. This is likely due to the gear configuration, which is considerably different with vertical secondary lines attached to the mother line. Each secondary line has snoods (thin monofilament line from the secondary line to the



hook) attached, and a small weight at the end (200-600g), which causes the secondary line to sink comparatively quickly. The industrial longline fleet had a considerably higher bycatch rate, and in 2002 1,588 seabirds were killed, including a staggering 1,555 black-browed albatross.

Solutions

In 2006 the industrial Patagonian toothfish fishery adopted an adapted version of the gear configuration used by the artisanal fishery, including a buoyant net sleeve placed on secondary vertical lines. During fishing the sleeve remains at the top of the line, but once hauling begins the sleeve slides down the line, due to the movement of the water, and covers the catch and hooks. They used secondary lines of 15-20m in length, placed every 30-40m with a weight (4-10kg) on the end. They called this the Chilean system or 'cachalotera'.

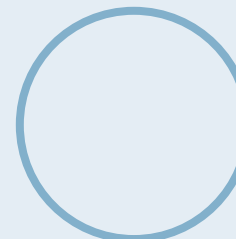
The sink rate of this gear configuration was rapid at 0.80 m/sec until the secondary line was fully extended (over twice as fast as in the artisanal fishery). The rapid sinking rate doesn't allow foraging seabirds time to reach the baited hooks, and no seabirds were killed in 2006, despite a huge fishing effort of ~4 million hooks.

The new system also yielded substantial benefits for fishermen including a two-fold decrease in the depredation of their catch by whales, no impact on catch per unit effort, and it also eliminated entanglements of gear on the seabed.

Future

The Chilean system has proven to be a very successful solution to both seabird bycatch and whale depredation in the Chilean Patagonian toothfish fishery. This system has great potential for use in other fisheries with similar depredation issues and seabird bycatch, and is already being adopted in other longline fisheries in the South Atlantic.

Moreno *et al.*, 2006; Moreno *et al.*, 2007



Jared Tower, Katie Bridgen, Steph Winnard



Target species:

Anchovy (*Engraulis ringens*) and sardine (*Strangomera bentincki*)



Bycaught species:

Pink-footed shearwater (*Ardenna creatopus*), sooty shearwater (*A. grisea*), Peruvian booby (*Sula variegata*) & Peruvian pelican (*Pelecanus thagus*)



Fleet:

~Around 300 small-scale vessels (length 18m)



Oceans:
Pacific

TIGHTENING THE NET ON SEABIRD BYCATCH



Slimming down nets is a possible solution to bycatch in Chilean purse seine fisheries. In trials modified nets resulted in zero seabird mortality, easier net handling and more fish catch for less effort.

Situation

Purse seine fisheries are very common across the world. In Chile alone there are estimated to be >3,400 registered vessels, yet little attention has been given to their impact on seabirds.

Productive areas such as the Humboldt Current System concentrate large amounts of forage fish such as anchovy and sardine. This productivity attracts breeding seabirds, bringing them into conflict with the fishing industry. In 2013 BirdLife's Albatross Task Force began working with two fleets which number around 300 vessels, in

north and south-central Chile, to assess if these fisheries were involved in significant seabird bycatch.

After observing fishing effort over two years (72 complete sets) it was found that birds were being killed during fishing operations, due to excessive floating net that form a mesh ceiling in which diving birds become entangled and drown. An early analysis of bycatch rates indicated that 3.58 birds/set were killed in the fishery, mainly pink-footed and sooty

shearwaters, but included a total of 12 seabird species. With the large number of purse seine vessels fishing, these results imply that the industry as a whole are capturing large numbers of seabirds, including endangered species.

Solutions

In 2014 BirdLife began a collaborative initiative with local fishermen and local net manufacturers to come up with solutions to reduce bycatch. The key was to modify net designs to reduce the excessive net without impacting fishing efficiency. Experimental trials of a modified net design (removing ~800kg of net) were conducted. When the modified nets were tested and compared with simultaneous sets with unmodified nets, the modified net resulted in zero mortality versus 0.55 birds/set in unmodified nets.

Differences in fishing performance were recorded between the two net types. In the 11 sets monitored, the modified net caught on average 2.4x more fish biomass than the unmodified net. In practical terms this means the vessel with the modified net had to do one less trip to complete their quota catch, than the vessel with the unmodified net.

With this kind of project, today we can see how the new net is working better than the former. We feel that the modified gear is faster to set, catches more fish in less time, and is easier to handle during hauling said David Valdebenito, Purse seine boatswain.

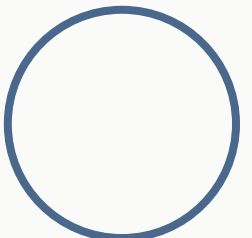
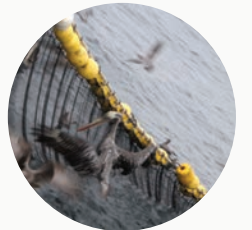
Future

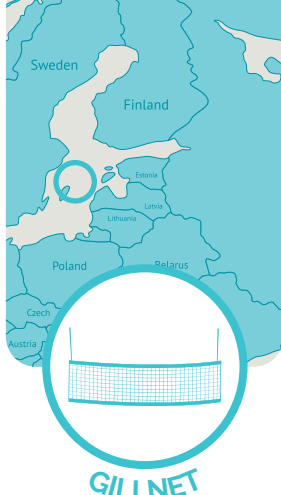
The modified net design has so far proven to be a win-win solution for both fishers and seabirds, with more fish caught for less fishing effort. It has even received prestigious recognition from the Latin American Green Awards. Further trials are underway in Chile to test the modified nets on more vessels, and future work is required to assess the effectiveness of the modified net design in other fleets.



"The world of fishing is changing and everyone in the sector must learn to adapt to those changes ...I'm part of this project as a new way of fishing, towards saving seabirds" said Patricio Krause, former Purse Seine Captain and director of net company Kranet Ltd.

Suazo et al., 2014; Suazo et al., 2016; Debski et al., 2016





EXPLORING ABOVE-WATER MEASURES TO TACKLE GILLNET BYCATCH



By tapping into knowledge of seabird behaviour and cognition, new solutions are being developed to tackle seabird bycatch in gillnet fisheries.

Situation

Modern gillnets made of monofilament nylon are ubiquitous in fisheries around the world, and are particularly popular among small-scale fishers owing to their low cost. However, being practically invisible underwater, even under good visibility conditions, these nets also pose a high risk of entanglement to marine organisms, including to diving seabirds when foraging nearby. Bycatch of seabirds in gillnet fisheries is a global conservation issue with an estimated 400,000 seabirds killed each year and nearly 150 different seabird species thought to be susceptible. While preventative measures are available to address

this threat in long-line and trawl fisheries, no such technical solutions have so far been proven effective in gillnet fisheries.

Technical mitigation measures utilising ‘underwater’ strategies (through modifications or addition of devices to nets), such as coloured nets, high-contrast panels or lights, have had - to date – limited or condition-specific success in preventing bird captures. This may be, in part, due to the challenging nature of the underwater environment, in which even marine-adapted birds have reduced visual capacity.

“Gillnets present a unique challenge compared to other fishing methods when trying to solve the problem of seabird bycatch: birds are caught well out of sight, so the behavioural aspects of interactions are poorly understood. In the urgent need to start reducing the collateral damage from gillnetting, we need to bring a better understanding of interactions so that we can develop a toolbox to start saving seabirds from this needless death” Rory Crawford, Bycatch Programme Manager for the Albatross Task Force, RSPB/BirdLife International.

Solutions

Minimising seabird bycatch in gillnets through above-water measures have not been extensively explored to date, but given the challenges below the surface, a mitigation approach which prevents birds diving close to gillnets in the first place could potentially have greater success. After exploring the diving behaviour of several seabird species at risk from bycatch and informed by cognitive ecology, we concluded that such approach was worth exploring.

As a result, we developed a prototype that uses a ‘looming eyes’ deterrent, combining large eyespots and looming movement to create a super visual stimulus that has proven to be effective in evoking avoidance behaviour in avian species near airports. Based on a very simple design and fitted on a buoy, we called this device a “Looming-eyes buoy” or LEB.

With the support of the National Geographic Society and our colleagues at the Estonian Ornithological Society, LEBs were deployed in early 2020 in an important wintering area for seabirds in the Baltic Sea. Designed as a pilot behaviour study, thus not involving fishing nets to ensure seabirds’ safety, we collected nearly

250 hours of observation across 62 days and recorded a total of 11,118 seabirds of 18 different species. Results showed a significant reduction in Long-tailed Ducks numbers (which accounted for more than 90% of our observations) within a 50m radius from the device.

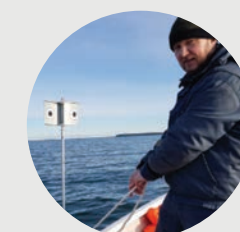
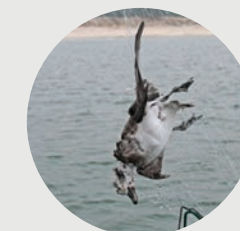
Other ideas have included exploring the potential of “predator-shaped” kites to deter birds from fishing gear. In Portugal, colleagues from the Portuguese Society for the Study of Birds (SPEA) have deployed such kites from purse-seiners, showing promising results with gull species. Similar work was done for gillnets in Lithuania by the Lithuanian Ornithological Society.

“Many questions remain on the effectiveness of these new devices to tackle seabird bycatch, across species and fishing conditions, and to ensure any serious drawbacks are avoided. Our aim is to ensure seabirds have access to safer foraging and resting grounds, not driving them out from them. To respond to those unanswered questions, further research is absolutely needed” Yann Rouxel, Bycatch Project Officer for the RSPB and the BirdLife International Marine Programme.

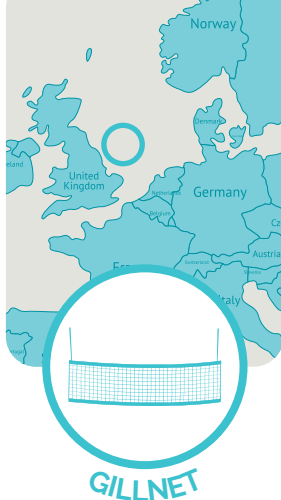
Future

The demonstration of an effective and easy-to-use technical solution to gillnet bycatch would be a significant breakthrough in resolving the global seabird bycatch issue in gillnets. This would offer the industry and fishery managers a less economically damaging alternative to fishery closures.

Zydelis et al. 2013, Hausberger et al. 2018, Field et al. 2019, Oliveira et al. 2020, Rouxel et al. in prep



Julius Morkunas



FISHING FOR SOLUTIONS TO GILLNET BYCATCH

Collaboration between netsmen, fishery managers and conservationists has overcome mistrust and innovated to reduce bycatch in a small-scale salmon fishery.

Situation

On the east coast of Yorkshire, UK, Filey Bay has been home to a sea trout and salmon fishery for over 100 years. The fishery operates using small boats and J-shaped gillnets extending from the water's surface down to the seabed, placed at right angles to the shore to trap fish passing along the bay. Filey Bay is also used by feeding seabirds, particularly razorbills and guillemots, which breed in their thousands along Flamborough and Filey's cliffs, either side of the bay. When foraging, the birds are vulnerable to being caught in the static nets, and in 2008

very high levels of bycatch were reported. Rex Harrison, a Filey Bay netsman who has fished the area for decades, describes the situation:

“In the early days, bird bycatch led to a lot of hostility and suspicion between the fishermen and conservationists. But the fact that we’ve come through that difficult time and work together shows how committed and open-minded everyone has been.”

Solutions

Modifications to the fishing gear and net deployment were developed by the netsmen to reduce seabird bycatch, including switching parts of the net from monofilament to a thicker black nylon ‘corline’ net, which in some cases has been found to increase fish catch. In 2010 the Environment Agency (EA), the fishery managers, introduced a byelaw which requires netsmen to take reasonable steps to ensure the net does not kill seabirds, including the quick release of live birds, recording all bycatch and – during the peak of bycatch in June – fishing only in daylight hours using the high visibility corline in the leader of the net. It also restricts the monofilament section to 70m and requires net attendance at all times. A voluntary code of conduct also operates for the rest of the fishing season.

Since the introduction of these mitigation measures, seabird bycatch has fallen dramatically; the corline is thought to have greater visibility underwater, alerting birds to the presence of the net, whilst net attendance ensures that any caught birds can be removed swiftly, reducing mortality. All netsmen have received training in bird handling and in recent years the number of birds released alive exceeds the number of fatalities.

The success followed a concerted effort by the EA, Natural England (NE), the Royal Society for the Protection of Birds and the Filey Bay netsmen. The reduction in bycatch can be put down to a number of factors in addition to the net modifications, including regular monitoring (funded by the EA and NE) and the positive uptake and involvement of the netsmen.

“Filey shows us the art of the possible in gillnet fisheries. For sure, not everything done there will work elsewhere, but the mixture of measures has helped to bring bird bycatch down. There is much to be learnt from the collaboration and ingenuity found in this beautiful corner of England” said Rory Crawford, Bycatch Programme Manager at BirdLife International.

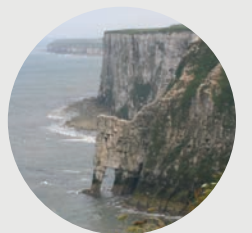
Future

Gillnet fisheries are widespread and particularly prevalent in coastal areas worldwide, affecting a whole host of birds including threatened species such as the marbled murrelet, velvet scoter and yellow-eyed penguin. While we are still some way from finding a definitive answer to the gillnet bycatch problem, building blocks are being established and Filey Bay provides a concrete example where action by fishermen, working with government and wildlife organisations, can tackle this issue in small-scale fisheries.

“I’ve been fishing salmon all my life’, says Rex ‘these amazing cliffs and bays have been my office for decades. When you see the wildlife here, it makes you look after it as best you can, so future generations can benefit and see what I’m seeing today.”

“Rex’s insight, and that of the other netsmen, has been invaluable in transforming this fishery into a flagship for bycatch mitigation” said Helen Quayle, RSPB Marine Conservation Officer. ***“The positive experience from Filey required time and trust but demonstrates what can be achieved when all parties work openly and innovatively.”***

Žydelis et al., 2013; Quayle, 2015



Rory Crawford, Helen Quayle

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“In Namibia we have come a long way since it was found that our seabird bycatch mortalities were amongst the highest in the world. The Namibian Government put in place regulations making it mandatory for the hake trawl and demersal longline fleets to use bird scaring devices. We hope to gazette similar regulations for the surface longline fleet, which will no doubt further reduce Namibia’s seabird bycatch.”

Dr Hannes Holtzhausen, Namibian ex-Minister of Fisheries and Marine Resources



“The fishing industry has played a crucial role in developing techniques to reduce bycatch. We should celebrate these positive steps, while recognising that there is still a long road ahead to tackle the accidental capture of non-target species. The long-term viability and sustainability of fishing depends on us rising to the challenge and rolling out practical bycatch solutions across fleets and entire ocean basins, and industry needs to continue collaborating to achieve this.”

Javier Garat Pérez, Secretary General, Spanish Fishing Confederation (CEPESCA).



“Collaboration with fishermen has taught me that their knowledge must be considered and applied for seabird conservation to succeed...experiences working with fishermen continue to teach me new dimensions about the sea...”

Cristián G. Suazo, Albatross Task Force Instructor, Chile.



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