Clean Catch UK
Joint Action to Reduce Wildlife Bycatch

Hauling Up Solutions 2

Exploring new ways to expand the wildlife bycatch-reduction toolkit

Workshop Report
2022

REPORT CITATION

Ryan, K., Mynott, S., Lyons, C., Clare, T., Day, E., Bell, C., Wild, M., Engelhard, G., Hetherington, S.J. (Eds) (2022) Hauling Up Solutions 2: Exploring new ways to expand the wildlife bycatch-reduction toolkit. Final Workshop Report. 27 pp.
www.cleancatchuk.com/HUS2-Report

CHATHAM HOUSE RULE

This report gives a summary of a participatory workshop on the subject of wildlife bycatch reduction in UK fisheries, focusing particularly on the use of different fishing gears to reduce cetacean (whale, dolphin and porpoise) bycatch. The workshop was held at the National Marine Aquarium, Plymouth, on 22nd-24th March 2022 and was conducted under the Chatham House Rule. As a result, no comments are affiliated to any individual or organisation apart from direct quotes for which permission was sought.

WORKSHOP DELIVERY

The workshop was delivered as a collaboration between the Department for Environment, Food & Rural Affairs (Defra) and the Centre for Environment, Fisheries & Aquaculture Science (Cefas) under the umbrella of the Clean Catch UK programme. The workshop was delivered with support from a range of organisations and individual fishermen (see Acknowledgments on page 20).

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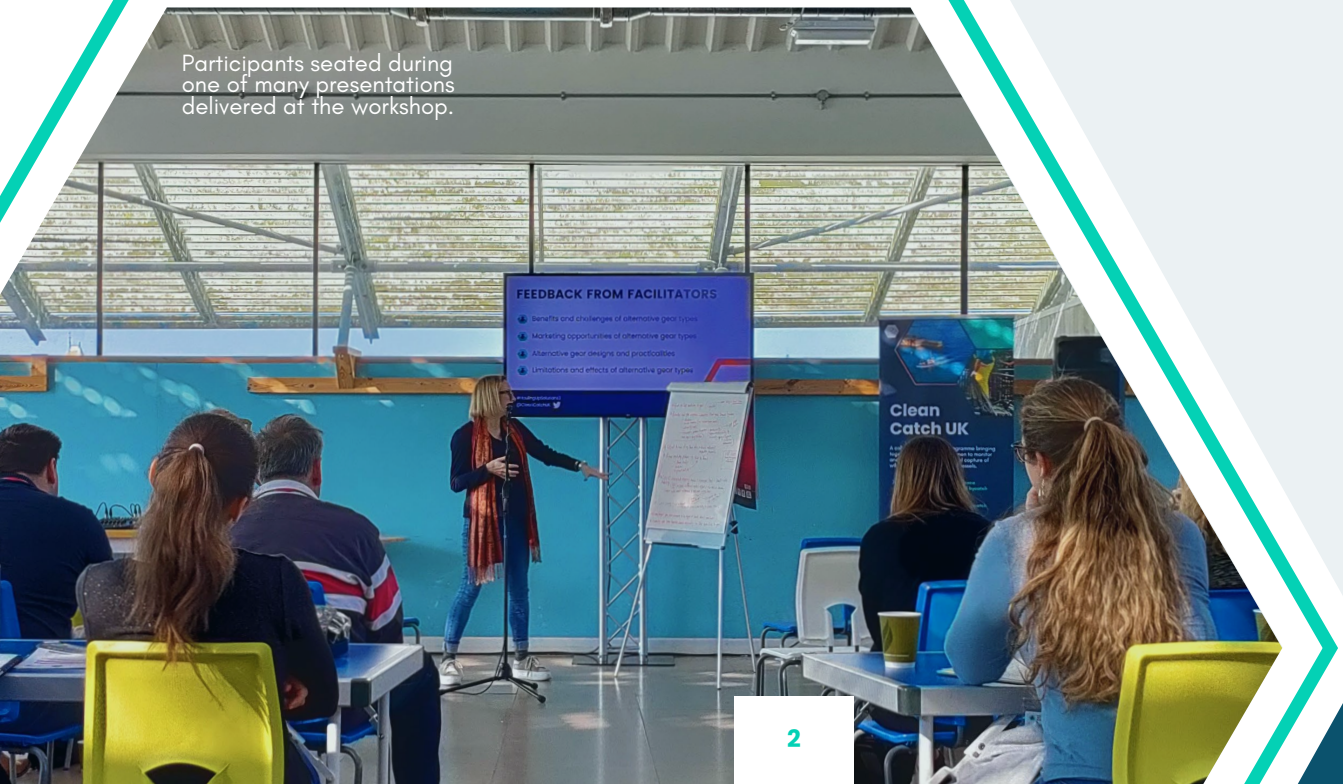


Participants seated during one of many presentations delivered at the workshop.

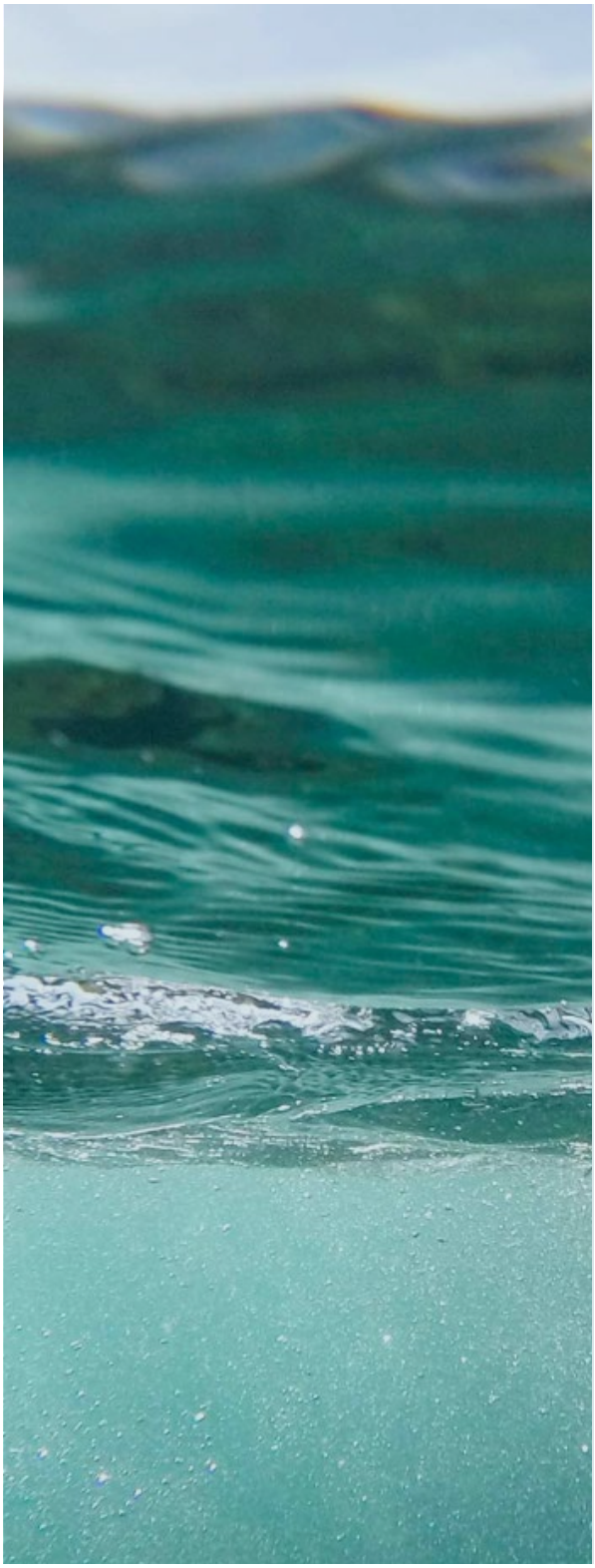
BACKGROUND AND SUMMARY

WHY ADDRESS BYCATCH AS AN ISSUE?

In the UK, a wide range of sensitive species of wildlife can become accidentally caught and entangled in fishing gear, known as bycatch. This can include cetaceans (whales, dolphins, and porpoises), seabirds, seals and protected species of elasmobranchs (sharks, skates, and rays). This has not only ecological but also economic impacts, and generates safety concerns for members of the fishing industry – e.g. causing down-time from fishing due to disentanglement or net repairs, and safety issues when releasing live animals from nets or lines. Even in those fisheries where bycatch incidents are rare, many of the wildlife species affected may also be rare, or have highly sensitive populations – meaning bycatch can impact overall population numbers. There are also significant welfare implications for marine wildlife: bycaught animals are likely to suffer severe injury and stress, and may ultimately die. The charismatic nature of these wildlife species, and the welfare and conservation implications of bycatch, mean there are high levels of public concern about the issue, including concern from the supply chain and retailers.

- To read more about why the UK Government is tackling bycatch, see the **Cetacean bycatch workshop: Hauling Up Solutions** workshop report, which provides a summary at: **www.cefas.co.uk/media/ybqbhnmq/hauling_up_solutions-workshop-report-final_web.pdf**.

- To view current figures on sensitive species bycatch in the South-west UK and see information around the economic value of fishing, see the Clean Catch UK Risk of Bycatch Infographic at: **www.cleancatchuk.com/risk-of-wildlife-bycatch-in-the-south-west-of-the-uk/** and associated report at: **https://bit.ly/3U177bV**.



For more information about Clean Catch UK, a collaborative research programme that brings together scientists and fishermen, to monitor and help reduce the accidental capture of wildlife by commercial fishing vessels, **visit www.cleancatchuk.com**.

THIS REPORT

This report provides a condensed summary of detailed discussions held at the **Hauling Up Solutions 2: Exploring new ways to expand the bycatch-reduction toolkit** workshop, held at the National Marine Aquarium, Plymouth, on 22nd-24th March 2022.

Hauling Up Solutions 2 follows from the successful Hauling Up Solutions: Reducing Cetacean Bycatch in UK Fisheries workshop, held at the Zoological Society of London (ZSL) in March 2019. This highly participatory event sought to build on conversations around fishing gear design and use, as well as methods for reducing bycatch of sensitive species. These include cetaceans, seabirds, seals, turtles and elasmobranchs (sharks, skates, and rays).

Where the first Hauling Up Solutions workshop focused on existing methods of monitoring and bycatch mitigation in the UK and around the world, the Hauling Up Solutions 2 workshop broadened discussions to look at alternative gears or gear switching - where a different fishing method is used, targeting the same catch but with the aim of reducing wildlife bycatch. The workshop also explored new ideas for changes to fishing practice and modifications to fishing gears.

Central to all these discussions was the fishing industry: one third of attendees at the event were active fishermen and industry representatives, providing insight on practicality and applicability of the gears being discussed. Attendees from the worlds of science, policy, environmental campaigning, engineering, gear manufacture and fishery management also provided their perspectives - enabling a well-rounded view on the potential for use of gear modifications and alternative gears in UK fisheries.

> ***The text included in this report reflects the discussions held during the workshop only.***

THE WORKSHOP

The workshop reflects the Government's ambition that incidental catches of sensitive marine species are minimised and, where possible, eliminated, as set out in the ecosystem objective of the Fisheries Act 2020.

The three-day event sought to deliver against the following aims:

- **Celebrate and review existing bycatch reduction work underway in the UK.**
- **Better understand the state of play for the use of alternatives to static net fishing gears across the world - identifying the benefits, challenges and knowledge gaps.**
- **Encourage new thinking to push the boundaries of the current bycatch-reduction toolkit in UK fisheries - capturing both barriers and incentives.**
- **Develop clear, actionable recommendations for policy on the subject of alternative gears and gear modifications, together with realistic, practical options for UK fisheries.**

At the outset of the workshop, participants were asked to outline their key concerns or questions on the subject of wildlife bycatch and alternative gears, as well as to share their priorities for the event.

PRIORITIES

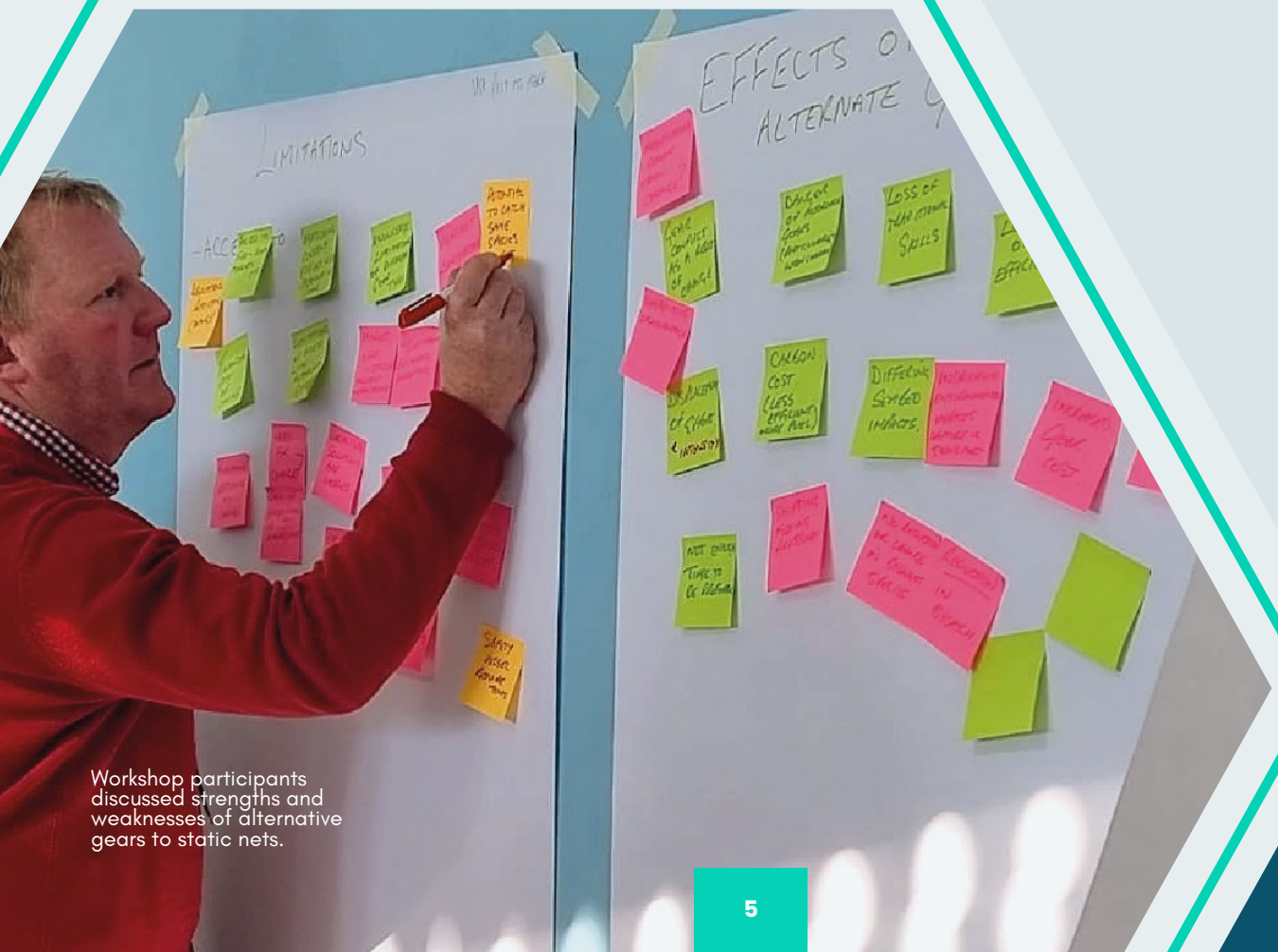
"Understand the barriers and incentives"

"Find something that is going to be effective and practical."

"Hear fishermen's on-the-water perspectives of implementing modifications and alternative gears." / "Input from fishermen to find out what fishing gears they would be willing to trial or switch to."

"Encouraging industry-wide use of mitigation methods."

"Concrete action plan for next steps, to progress to alternative gears."



Workshop participants discussed strengths and weaknesses of alternative gears to static nets.

PARTICIPANT KEY QUESTIONS AND CONCERNS:

Asked multiple times

ALTERNATIVE GEARS

"What are the most realistic alternative gear types in terms of effectiveness in reducing bycatch, and practical and affordable implementation?"

TRIALS AND ACTION

"How do we move from trials to fleet-wide implementation of measures?"

FISHERMEN INVOLVEMENT

"What are the incentives and barriers to monitoring or reducing bycatch?"

FISHERMEN INVOLVEMENT

"Can we hear from fishermen on how to best incentivise alternative gear /gear modification uptake?"

SENSITIVE SPECIES

"Will climate change impact change in species and seasonality?"

SENSITIVE SPECIES

"How can we adapt locally, given that bycatch rates are different in different areas?"

TRIALS AND ACTION

"How can action happen fast enough?"

A breakout group of participants in discussion on market incentives for alternative gears.

SETTING THE SCENE: EXISTING BYCATCH MITIGATION UNDERWAY IN THE UK

Setting the scene and providing context for discussions on the use of alternative gears, the workshop started with an exploration of existing bycatch mitigation work underway in the UK. A number of industry-led or participatory trials and programmes were detailed: showcasing the existing 'toolbox' that the workshop aimed to build upon [Table 1].

PROGRESS SINCE HAULING UP SOLUTIONS 1

Five key actions have been taken since the first **Hauling Up Solutions workshop: Reducing cetacean bycatch in UK fisheries**. These focus on the following key recommendations, determined by workshop participants:

Table 1: Progress against the recommendations identified in the first Hauling Up Solutions workshop.

RECOMMENDATION	ACTION
Local solutions to local challenges	Implemented via the creation of multi-stakeholder Clean Catch UK Local Focus Groups – designing and trialling bycatch mitigation at a local scale. Meeting reports are shared openly online. See more at **www.cleancatchuk.com/groups/local**.
Integrate and balance monitoring and mitigation	Development and rollout of the Clean Catch UK app – for fishermen to self-report their wildlife bycatch, whilst cetacean bycatch studies, trialling pingers and lights are underway, and another study is in development, trialling a Passive Acoustic Reflector.
Prioritise mitigation in bycatch hotspots	Cetacean bycatch mitigation studies are underway in the Cornish static net fishery, whilst the Clean Catch UK Regional Working Group is established – a technical, science-focused body, determining data needs, analysing data, and identifying high risk fishing gear, areas and bycatch species, from which to prioritise where to focus effort and resource.
Combine and share data on existing mitigation options	Development and publication of the Clean Catch UK Bycatch Mitigation Hub – an interactive tool bringing together knowledge on mitigation techniques for all species and fishery types: **www.cleancatchuk.com/hub/**.
Measure and report on success	Results of all cetacean bycatch mitigation studies being captured across Local Focus Groups, presented to a National Steering Group (**www.cleancatchuk.com/groups/national/**) and passed to Defra.

CLEAN CATCH UK BYCATCH MITIGATION

Within the Clean Catch UK programme, two Local Focus Groups (LFGs), comprising fishermen and their representatives, scientists, NGO representatives, policy-makers, and fishery managers, are working within Cornwall to reduce bycatch of cetaceans and spurdog (*Squalus acanthias*). Outputs of the Local Focus Groups, including the Spurdog Bycatch Management Programme Three Year Review, can be found at **www.cleancatchuk.com/groups/local/lfg-resources/**.

PINGERS IN THE CORNISH OFFSHORE GILLNET FLEET

In the offshore gillnet fleet in Cornwall, several vessel-members of the Cornish Fish Producers Organisation (CFPO) have been using Acoustic Deterrent Devices (ADDs) known as pingers since 2004 to reduce bycatch of common dolphins (*Delphinus delphis*) and harbour porpoise (*Phocoena phocoena*). Due to industry concerns with the practicality and effectiveness of the pingers being used, in 2008 a new trial was carried out involving the fleet, Seafish, and the Sea Mammal Research Unit. This used a pinger found to be successful in reducing cetacean bycatch in the Mediterranean. This device had a longer range, of up to one kilometre, requiring far fewer pingers to be attached to the net, and a longer battery life, contributing to ease of use. In the trial, porpoise bycatch was reduced by 95%, reassuring fishermen as to their effectiveness. However, pingers remain expensive, at around £3,000–£4,000 for this particular device. A limited amount of research has been conducted on any impacts of pingers on the wider ecosystem, although these are assumed to be relatively low given that the fishing episodes during which the pingers are deployed are short in duration. [WP2]

PASSIVE ACOUSTIC REFLECTORS

Working as part of the Clean Catch UK Cetacean Local Focus Group, an innovative wildlife conservation technology enterprise – Arribada Initiative – has recently been co-developing a new Passive Acoustic Reflector (PAR) device, designed to replace standard headline floats on static nets. The PAR uses a dense, hard-wearing foam material and has a specifically engineered shape to reflect echolocation clicks and calls from cetaceans, with a particular focus on the sound-range of the common dolphin. The design is such that it is hoped to make the fishing net more acoustically visible to cetaceans, helping to prevent entanglement. In addition to ensuring the PAR is effective for cetaceans, it is intended to be both affordable and practical for fishermen. [WP3]

A Passive Acoustic Reflector (PAR) device being presented to workshop attendees.

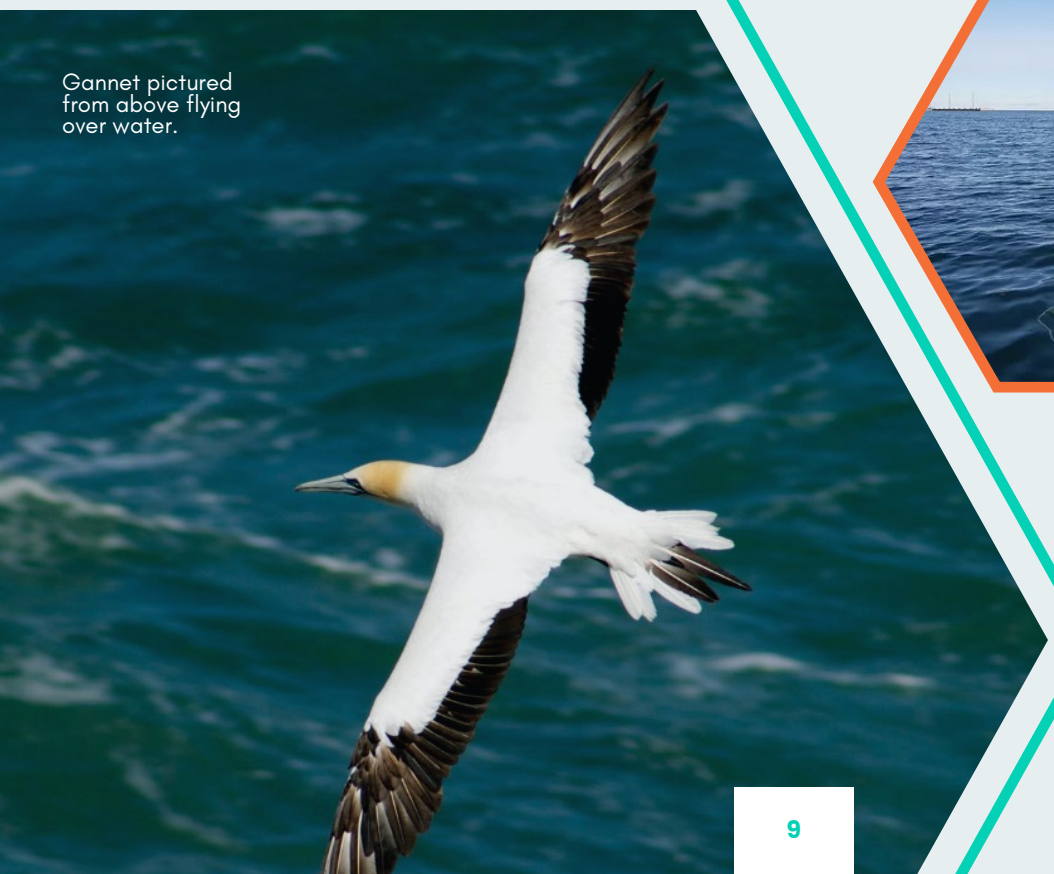
A pinger, an Acoustic Deterrent Device (ADD).

SCOTTISH ENTANGLEMENT ALLIANCE

In Scotland, entanglement of sensitive species – particularly humpback whales *(Megaptera novaeangliae)* and basking sharks *(Cetorhinus maximus)* – has been recognised as a significant issue in creel fisheries. In response, the Scottish Entanglement Alliance (SEA) was formed, bringing together NatureScot, charities including Whale and Dolphin Conservation (WDC), and the Scottish Creel Fishermen's Federation (SCFF). Representing small-scale under-12 metre vessels, the role of SCFF in SEA is to seek the input of fishermen and keep them engaged and involved. For example, disentanglement training was held for fishermen from across Scotland, to reduce the risks to themselves and entangled animals. The SCFF hopes to produce written guidance for fishermen on managing entanglements, requiring future funding. A next step to reduce the likelihood of entanglements is to collaborate with WDC to conduct small-scale trials including the use of negatively buoyant creel ropes. [WP4]

LOOMING EYES BUOYS TO PREVENT SEABIRD BYCATCH

In 2019, the BirdLife International Marine Programme team – hosted by the RSPB – reviewed the success of existing mitigation measures in tackling seabird bycatch from gillnet fisheries. Following the review, new measures based on a scare-crow approach were suggested, inspired both by how some species use eyespot mimicry to deceive and keep predators such as birds away, and research carried out to prevent bird collisions in airports. In collaboration with Fishtek Marine, the team developed a new mitigation device called the Looming eyes buoy. They also adapted a predator kite design, which has been used in agriculture. Following promising trials in 2020, in 2021 the devices were deployed in the Cornwall Bycatch Mitigation Project, a collaboration between the RSPB and Cornwall Inshore Fisheries and Conservation Authority (CIFCA). Results for the trials are expected within 2022, and funding is being sought for further trials. Fishermen engagement and input has been essential to the Cornwall Bycatch Mitigation Project. [WP5]



Gannet pictured from above flying over water.

Looming eyes buoy from the Birdlife International Estonia project.

Photo by Andres Kalamees/RSPB/ PA.

GATHERING KNOWLEDGE: ALTERNATIVE GEARS PRESENTATIONS

A review by Clean Catch UK [Table 2] identified a range of alternative gears, with a focus on switching from gillnets to reduce cetacean bycatch, as well as other species. The main criteria for a viable alternative gear type, other than its wildlife bycatch reduction potential, are that it:

- **Can be readily switched to or adopted**
- **Is easy to use**
- **Can target the species fished for in the UK**

Table 2: Alternative gears to reduce bycatch of cetaceans (with a focus on switching from gillnets to other fishing gear).

GEAR	STRENGTHS	WEAKNESSES
Pots Used to target many species worldwide	- Very low wildlife bycatch rate - Higher quality of catch (likely leading to increased value of catch) - Discards can be returned alive	- Lower commercial catch rate, or more varied catch rate - Some instances of seal bycatch in larger pots - Potential for gear conflict between static (e.g. pots) and mobile gears
Longlines Used to target species including hake, cod, haddock, bass, halibut, skates, rays, and ling	- May increase commercial catch - Higher quality of catch (likely leading to increased value of catch)	- May increase bycatch of seabirds, sharks, skates, and rays - Does not eliminate depredation by seals and/or cetaceans
Jigging Currently used as an alternative gear in fisheries in the South-west of the UK, when fishing conditions are not favourable for gillnets	- Higher quality of commercial catch (likely leading to increased value of catch) - No bycatch of cetaceans or elasmobranchs	- Relies on fish behaviour, so is only possible at certain times of year, requiring predominately clear water - Does not eliminate seal depredation
Small-scale Danish seining ("mini seine") Used for demersal fish in Denmark and Norway, with testing underway in Germany [WP13]	- Similar level of commercial catch - Higher quality of catch (likely leading to increased value of catch) - Low wildlife bycatch - Very low seal depredation - Low impact on seabed - Low fuel use	- Limited to soft ground
Additional gears Other alternative gears have been less well explored, or have much more limited use, including: - Traps / Fyke nets: Not suitable for open sea conditions - 'Virtual nets' and trawl fish selectors: High cost and the technology is in its infancy		

Examples of alternative gears or fishing methods that could be applied as an alternative to static nets, exist in fisheries in the UK and across the world. A wide range of examples were explored during the workshop, building on the evidence from the Clean Catch UK review. A full breakdown of the case studies presented can be found in **Annex 1** and **Annex 2**.

CHALLENGES AND OPPORTUNITIES OF ALTERNATIVE GEARS

Information from the case studies – including scientific, regulatory and industry perspectives – was considered through group discussion on the following topics:

- **Benefits and challenges of alternative gears**
- **Limitations and effects of alternative gears**
- **Alternative gear designs and practicalities**

The key challenges and opportunities relating to alternative gears – highlighted by workshop participants – are synthesised below, together with a summary of each of the breakout discussions held during the workshop.

KEY CHALLENGES

- **Cost:** The cost of switching gears was seen as a potential barrier. Alongside the cost of purchasing new gear, there is the potential cost of licencing changes and modifications to vessels to accommodate new gears.
- **Skills acquisition:** Fishermen often have years of experience fishing with specific gears. Changing gear type will also mean learning a new skillset, requiring time. In addition, there may not be the necessary knowledge amongst UK gear-makers and manufacturers to produce all alternatives under discussion.
- **Market limitations:** Alternative gears may catch different amounts of different species – the market would need to flex to accommodate this, ensuring catches are still economically viable.
- **Complexity of UK fisheries:** Fishermen often use multiple gear types in any one year, and change according to environmental factors, season or market pressures. It may not be possible to identify one alternative gear – the approach needs to be adaptive, and nuanced.
- **Avoiding spatial conflict:** Switching from gillnets to potting and trapping, for example, comes with a risk of overcrowding gear-specific fishing grounds, and possible spatial conflict.
- **Health and safety concerns:** Alternative gears such as long-lining were seen to be more dangerous for fishermen to deploy than static gillnets.

Supportive and agile fisheries management was seen as an underlying key factor to ensure successful gear switching, addressing and accounting for the complexity of fisheries, spatial pressures, and helping to create incentives for lower-impact operators. This was identified as a key challenge, but may also be viewed as an opportunity to make change at-scale.

Fishing boats moored in harbour.

KEY OPPORTUNITIES OF ALTERNATIVE GEARS:

- **Reduction in wildlife bycatch:** Central to the proposition under discussion, reducing wildlife bycatch was universally seen as important.
- **An opportunity to regain fishing cultural heritage:** Through reclaiming some older methods of fishing as alternatives to gillnets, an opportunity was seen for the reinvigoration of some more traditional fishing crafts and practices.
- **Possibility of access to new markets:** Different types of catch, and potentially higher quality catch, could lead to better market access for those switching from gillnets to alternative gear types.
- **Possibility for increases in fuel efficiency:** Opportunities to reduce fuel use, and lower carbon impacts of fishing, were seen as appealing.

Fisherman working at sea.
Photo by Jacek Dylag on Unsplash

SUMMARY OF DISCUSSION

Table 3: Summary of the discussion on the benefits and challenges associated with alternative gear types facilitated by the Zoological Socieity of London (ZSL).

BENEFITS AND CHALLENGES OF ALTERNATIVE GEARS	
+ Reduced wildlife bycatch	– Lack of incentive to switch gears
+ Improved reputation of the industry	– Difficult to get everyone working together to implement and manage a trial / an alternative gear
+ Potential reduction in gear conflict if there is a diversification away from static nets, depending on gear type	– Risk that a better price for catch is not directly felt by fishermen – economic benefits only further up the supply chain
+ Maintain cultural heritage	– Potential increase in spatial conflict
+ Improved catch quality, leading to a better market price	– Need to re-allocate fishing grounds and opportunities
+ Less predation and fish wastage	– Loss of traditional knowledge
+ Improved fishing selectivity	

Table 4: Summary of the discussion on the limitations and possible unintended effects of alternative gears facilitated by Seafish.

LIMITATIONS AND POSSIBLE UNINTENDED EFFECTS OF ALTERNATIVES GEARS	
+ Safety and welfare – may, in some instances, mean a move to a safer type of fishery and / or more time at home with family due to shorter fishing spells	– Increased time in upskilling to a new fishing practice and loss of earnings while fishing less efficiently whilst upskilling
	– Currently, there is a lot of pressure on fishermen relating to other issues – i.e. introduction of Vessel Monitoring Systems into the inshore fleet
	– Financial support to switch gears – Sometimes the initial injection of finance required from grants needs to be paid back on rapid timescales, which can be challenging

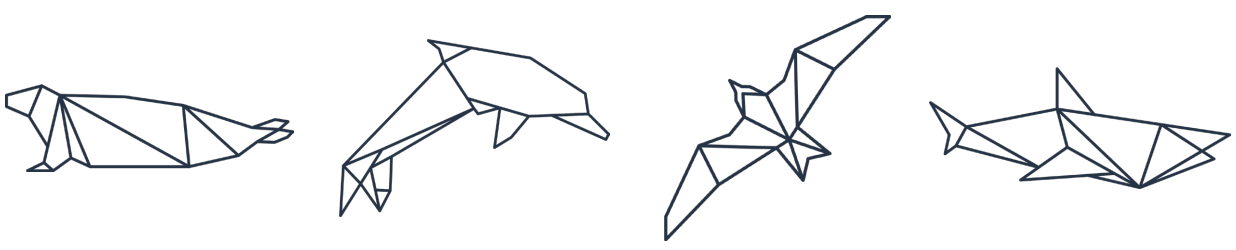


Table 5: Summary of the discussion on alternative gear designs and practicalities facilitated by Seafish.

ALTERNATIVE GEAR DESIGNS AND PRACTICALITIES	
+ Opportunities to use fishermen's in-depth knowledge of existing gears and adapt these to reduce wildlife bycatch rather than fully switch gear type	– Lack of appetite to move to alternative gears, when gear modifications could be trialled in the first instance
+ Use of seal-scarers is popular with fishermen to reduce seal bycatch	– Lack of storage space on quaysides to hold switched gears e.g. pots
+ Peer support for use of new technologies or approaches to fishing	– Switching to an alternative gear could bring a financial burden
+ Innovation creates opportunities to identify and apply tailored solutions	– Challenging to provide solutions at the appropriate scale, given complexity of UK fisheries

ALTERNATIVE GEARS / GEAR MODIFICATIONS & SPECIFIC DESIGN POINTS RAISED
> Reducing the amount of time that gear is left in the water (soak time) can result in higher quality of catch, reduced opportunity for interactions with marine wildlife, and reduces the amount of time that fishermen must spend out on the water
> Many species of fish cannot be caught with longlines
> Vessel sizes and crew expertise limit gear-switching possibilities
> Devices such as Hookpods can be expensive and require more work to deploy
> Depredation of catch by seals remains a significant concern for many fishermen, with potential for new research and development in this area

EVENT FEEDBACK

FISHERMEN'S COMMENT:

'It used to just be me at these meetings... It's nice to see so many other fishermen getting involved now'.

– BARRY PRESTON, FISHERMAN, CORNWALL

The workshop brought together a wide range of stakeholders.

Table 6: Summary of the discussion on marketing opportunities for alternative gears facilitated by the Marine Stewardship Council (MSC).

MARKETING OPPORTUNITIES FOR ALTERNATIVE GEARS	
+ Marketing about local identity, telling a local story to promote local catch – an example given was the Isle of Skye, where locally-caught seafood was said to be preferentially selected by visitors and promoted by restaurants	– Linking specific gear types into consumer marketing is challenging (as it requires an understanding of the gear's benefits and limitations) – there were concerns that this is not necessarily effective. An example given was around FAD-free tuna products; participants felt FAD was not a commonly understood term amongst consumers. Different markets with varying regulations may require gear to be detailed in different ways – some suggested that sufficient space on product packaging isn't provided to cover detail on gear type
+ Opportunities to use social media directly from the boat, grassroots campaigns, celebrity chefs, restaurants and other methods to broaden consumer education. Marketing opportunities can be linked into local tourism	– Broader need for education around fisheries and seafood that goes beyond bycatch
+ Opportunities for supportive partner organisations in gear trials (e.g. non-government organisations) to support with holding the role of promotion/marketing	– Difficult for fishermen to hold the role of marketing and promotion – requires a specialist skill set and available time

Fishing vessels moored at a harbour.

Photo by Craige McConigle on Unsplash

NECROPSY SESSIONS - CETACEAN STRANDINGS INVESTIGATION PROGRAMME (CSIP)

A unique opportunity was provided for attendees to witness the necropsy (dissection) of two bycaught dolphins. Collecting stranded cetaceans and conducting necropsies in order to establish the cause of death is part of the routine work of the Cetacean Strandings Investigation Programme, led by the Zoological Society of London.

Signs that a specimen has been a victim of bycatch include:

- Net marks or other external evidence of interactions with fishing gear on the body of the animal
- The animal otherwise appearing to be in good nutritional condition, usually with evidence of recent feeding
- Occasionally evidence of some internal injury or trauma
- Eliminating any other significant factors in relation to the cause of death

One of the specimens dissected during the workshop was a juvenile bottlenose dolphin, retrieved from a beach in Sussex. The necropsy showed that the dolphin was very young and had pathology consistent with gillnet bycatch. The other was a short-beaked common dolphin found dead stranded on a beach in south Devon, with pathology consistent with trawl gear bycatch.

The demonstration allowed participants to learn more about the impacts of bycatch, ask questions, and provided a chance for fishing industry attendees to understand more about the signs of cause of death that can help with reporting bycatch.

During the session, the Clean Catch UK self-reporting bycatch Smartphone Application was presented and promoted as a tool for fishermen to report wildlife bycatch.

Find out more about the CCUK app **here**.

Workshop attendees witnessed a dolphin necropsy.

GEAR MODIFICATIONS

Following discussions of the challenges and opportunities presented by alternative gears, there was a clear preference from the fishermen present to further develop conversations around potential for modifications to existing gear (static nets), alongside discussions around alternative gears.

As a result, further discussion sessions were held on the following topics:

- Potential / desirable **modifications to static nets** in order to reduce bycatch;
- Potential / desirable **modifications to fishing practice** in order to reduce bycatch.

Many of the discussion points covered in these sessions fed into recommendations (see the following section).

The Clean Catch UK self-reporting bycatch app can be used at sea to record wildlife bycatch.

Key reflections included:

- **Options to explore when modifying static nets include using Passive Acoustic Reflectors (PAR) currently in development, or a float-line consisting of the same material as in the PAR, to make the head-line (and, potentially) the entire net more acoustically visible to cetaceans.**
- **There was interest in exploring the use of a dark filament material in static nets, such as in the Filey Bay case study presented, to explore impacts on bycatch. Some fishermen were sceptical about the broad applicability of this measure.**
- **Modifications to the tautness of static net gear was seen as an option to help 'bounce' bycatch off a net. A disadvantage was seen as increased risk of the net tearing. Fishermen noted that in some deep-set gillnet fisheries, taut-rigging is a requirement to help prevent shark bycatch.**
- **Changes to soak time were discussed - generally shorter soak times were seen as a good bycatch mitigation option, but some noted that longer soak times are needed for targeting some fish species.**
- **Management changes around fishing practice were seen as important - the development of more co-management, where fishing perspectives are built-in to management decision-making, as well as higher-resolution spatial and species management were called for.**

EXAMINING NEXT STEPS

Having considered the challenges and opportunities of alternative gears and gear modifications, participants were invited to consider a further set of questions before moving towards working on concrete recommendations from the workshop.

- **Easy wins:** are there any easy, immediately applicable options amongst the alternative gears and gear modifications discussed, that could be trialled in UK fisheries in the short-term?
- **Support:** what kind of additional support does the fishing industry need in order to trial alternative gear / gear modification options?
- **Developing trials:** how do we develop trials over time? What are the key ingredients / drivers for this?

From the detailed discussions in these breakout groups, a set of recommendations was developed.

Static fishing gear (pots) aboard a fishing vessel.

HEADLINE RECOMMENDATIONS

The recommendations below will be prioritised and taken forward in England by Clean Catch UK, and other projects and funding initiatives from 2023.

QUANTIFY RISK

- **Further work should be undertaken to identify key areas and fisheries at risk of wildlife bycatch, and support monitoring,** building on the actions taken following the first Hauling Up Solutions workshop (Table 1).

INDUSTRY CODES OF CONDUCT

- **Once high-risk bycatch areas have been identified in collaboration with the fishing industry, bespoke codes of conduct should be co-developed,** ensuring feedback from the fishing industry is incorporated throughout the process. These should be tailored to the specific conditions of the fishery, and include advice on any actions that could be taken to monitor and reduce wildlife bycatch – including bycatch reporting, temporal and spatial measures, gear deployment techniques, bycatch reduction technologies and gear switching and modification.

BUILD COLLABORATION

- **Build and strengthen collaboration around local trials of alternative gears, or other methods to reduce wildlife bycatch.** Key ingredients of this were identified as: clearly outlining roles and responsibilities of all partners engaged in any research or trial activity; transparently feeding back results from trials, including when they are not favourable; and support to ensure trials are locally-led, and efforts are made to promote good work being done at the local level.

OPTIONS TO TRIAL

- **Eight options to trial to address wildlife bycatch - including alternative gears, modifications to gear and modifications to fishing practice - were identified, with strong agreement from members of the fishing industry present.** Some of these options are aimed at reducing bycatch of specific groups of wildlife – while there is no single solution for all bycatch challenges, some measures can be used in tandem.
- Ongoing and evolving trials include:
  - Passive Acoustic Reflectors on the headline of static nets to mitigate cetacean bycatch
  - Scaring devices to mitigate seabird and seal bycatch
- Gear and fishing practice modifications that could be trialled from 2023 include:
  - Buoyant and reflective headline ropes in static nets to mitigate cetacean bycatch.
  - Negatively buoyant ropes (creels) to mitigate cetacean entanglement.
  - Multi-coloured static net filaments, primarily to mitigate seabird bycatch, but other animal groups too.
  - Use of sensors to monitor static net height with the tide, to understand the relationship between tidal state, net height and bycatch rates.
  - Reduction of static net soak time, where feasible, with improved compliance monitoring.
- Of the alternative gears discussed, the most promising alternative to trial in the replacement of static nets was mini-seines, which should be explored at the earliest opportunity.

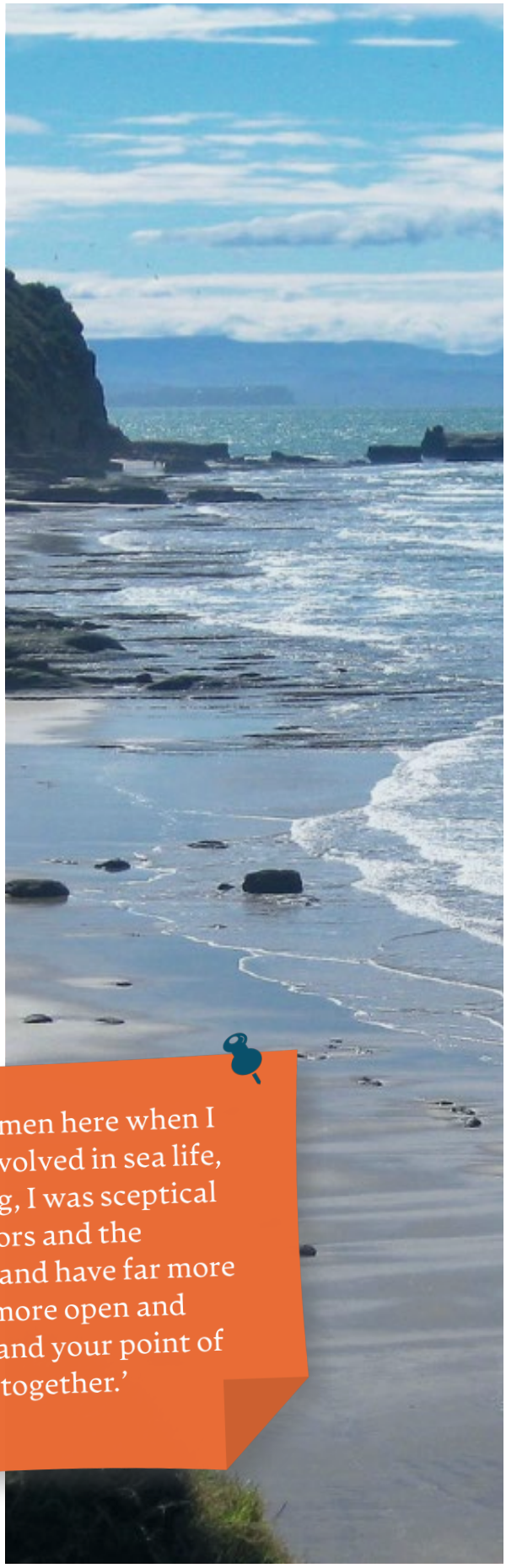
CONTINUED KNOWLEDGE EXCHANGE

LONG-TERM BUY-IN

- **The need for early buy-in and long-term Government support for bycatch mitigation trials was highlighted.** This includes long-term funding support, but also commitments to ensure appropriate incentives for trial participants are developed. Suggestions included an ambition to deliver much more rapid, responsive management of fisheries, and providing preferential access to quota for fishermen participating.

CONTINUED KNOWLEDGE

- **Knowledge exchange was seen as a key underpinning factor to future success in trialling or developing new gears, gear modifications, or approaches to fishing practice.** Participants highlighted that marketing and consumer engagement knowledge from NGOs could contribute meaningfully to creating local incentives for trials. This recommendation also includes identifying and using methods to promote increased knowledge exchange between the fishing industry, gear manufacturers and engineers. This also includes future workshops to check-in on progress against aims from Hauling Up Solutions 1 & 2, and continue sharing information and experiences around bycatch reduction.
- **Capacity-building for existing tools:** Fishing industry participants acknowledged the value of the Clean Catch UK bycatch monitoring app, but requested additional capacity-building in its use and application – in order to promote and support its use amongst those less familiar with the technology.
- **Communicating progress:** Industry participants proposed ongoing communication on progress, following the workshop, via a newsletter or WhatsApp.



ACKNOWLEDGEMENTS

Clean Catch UK would like to express its gratitude to all attendees and speakers for their invaluable input to the Hauling Up Solutions 2 workshop and this subsequent report, with special thanks to the Cetacean Strandings Investigation Programme for delivering a series of cetacean necropsies, and to the National Marine Aquarium for hosting.

For the workshop organisation and facilitation, a special thank you to **Mindfully Wired Communications** and the workshop **Steering Group**, comprised of **Defra**, **Cefas**, **National Federation of Fishermen Organisations**, **Marine Stewardship Council**, **Zoological Society of London** and **Cetacean Strandings Investigation Programme**.

EVENT FEEDBACK

FISHERMEN'S COMMENTS:

'I think I speak on behalf of the fishermen here when I say this - I'd like to thank all of you involved in sea life, for listening to us. At the first meeting, I was sceptical about interacting with the eco-warriors and the greens... but you've all listened to us, and have far more awareness of our job! I've come here more open and willing to listen, and I better understand your point of view, and I think we all have a future together.'

– MALCOLM SAUNDERS, FISHERMAN, CORNWALL

PARTICIPATING ORGANISATIONS

FISHING & FISHERIES ORGANISATIONS

- Brixham Trawler Makers
- Cornish Fish Producers Organisation
- Eastern England Fish Producers Organisation
- Fishermen: with representation from Cornwall, Suffolk, North Yorkshire, and Scotland.
- Fishmongers' Company
- Fishing into the Future
- New Under Ten Fishermen's Association
- Seafish
- Scottish Creel Fishermen's Federation
- Western Fish Producers Organisation

POLICY ADVISORS & GOVERNMENTAL ORGANISATIONS

- Centre for Environment, Fisheries and Aquaculture Science
- Comisión Nacional de Áreas Naturales Protegidas
- Department for Environment, Food & Rural Affairs
- Joint Nature Conservation Committee
- Natural England
- Seafish

ENVIRONMENTAL NGOS

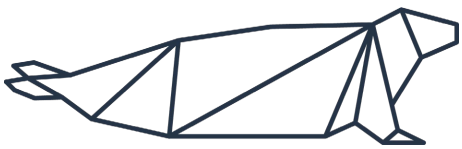
- BirdLife International
- British Divers Marine Life Rescue
- Cetacean Strandings Investigation Programm
- Cornwall Wildlife Trust
- Marine Conservation Society
- Marine Stewardship Council
- Royal Society for the Protection of Birds
- Scottish Entanglement Alliance
- Seal Research Trust
- Shark Trust
- Sussex Dolphin Project
- Whale and Dolphin Conservation
- World Wide Fund for Nature – UK
- Zoological Society of London

TECHNOLOGY

- Arribada Initiative
- Chelonia Limited
- Fishy Filaments Ltd
- Fishtek Marine
- Gannet Nets
- Hooktone
- SafetyNet Technologies Ltd
- Tiaki Precision Seafood Harvesting

SCIENCE

- Centre for Environment, Fisheries and Aquaculture Science
- Johann Heinrich von Thünen Institute
- Ocean Associates
- University of Massachusetts Boston



GLOSSARY

- **Acoustic deterrent device:** A device that is attached to fishing nets which emits noises to deter cetaceans.
- **Barotrauma:** When a fish is brought up from deep water, the rapid change in pressure causes the gases in the fish's body to expand, resulting in a range of injuries that will most likely be fatal.
- **Bycatch:** Unintended capture of a non-target species; or the proportion of a commercial fishing catch that consists of marine animals caught unintentionally.
- **Bycatch Reduction Technology:** Devices developed and used to reduce bycatch.
- **Cetaceans:** Whales, dolphins, porpoises.
- **Depredation:** Marine mammals that actively seek out fishing gear to feed on bait or target catch.
- **Elasmobranchs:** Sharks, skates and rays.
- **Gear:** Fishing equipment.
- **Gill nets:** Often used as a general term referring to gill nets, trammel nets, wreck nets and tangle nets.
- **Mitigation:** Techniques or methods that fishers or fishery managers can use to reduce catch of non-target species.
- **Necropsy:** Post-mortem examination of animals.
- **Non-target species:** Species not specifically targeted as a component of the catch; may be incidentally captured as part of the overall catch.
- **Pinger:** An acoustic deterrent device.
- **Static gear:** Fishing gear not moved in the water (except when deployed or recovered) but set at a particular location, with or without bait and left for a period of time for finfish or shellfish to get caught in or on. Includes pots, creels, gill nets.
- **Target species:** Those species primarily sought by fishermen in a particular fishery.
- **Towed gear:** Fishing gear that is towed through the water, either on or off the seabed, to catch the target species in a net or dredge. Also known as mobile gear. Includes trawls, seines, dredges.

REFERENCES: LIST OF PRESENTATIONS

- **WP1.** Hetherington, S (2022) Achievements of Hauling Up Solutions 1
- **WP2.** Wheeler, A (2022) Pinger use in the offshore net fishery
- **WP3.** Davies, A (2022) Passive Acoustic Reflector research and development
- **WP4.** Philip, B (2022) Scottish Entanglement Alliance work
- **WP5.** Rouxel, Y (2022) Developing and testing a novel bycatch mitigation measure: Looming eyes buoy
- **WP6.** Wild, M (2022) Cefas' review on alternative gears to static nets to reduce cetacean bycatch
- **WP7.** Werner, T (2022) Gillnet alternatives: Lessons from Argentina and beyond
- **WP8.** Stepputtis, D, Schartmann, H. & Berzosa, S (2022) Using acrylic spheres to reduce bycatch of odontocetes species in gillnet fisheries
- **WP9.** Rouxel, Y (2022) Comparative study of alternative gears
- **WP10.** Percy, J (2022) Real-life experiences of longlining in the UK
- **WP11.** Anderson, D (2022) Hooktone and seabird bycatch
- **WP12.** Harrison, R (2022) The Filey Bay fishery in Yorkshire and reef-nets in the Pacific Northwest
- **WP13.** Stepputtis, D & Noac, T (2022) The mini seine: Tackling current problems using old knowledge
- **WP14.** Rojas-Bracho, L (2022) International case study: Alternative fishing gear and the vaquita
- **WP15.** de Beer, M (2022) Tiaki Precision Seafood Harvesting in New Zealand

Annex 1: ALTERNATIVE GEARS & BYCATCH REDUCTION – UK CASE STUDY PRESENTATIONS

Alternative gear examples – or fishing methods that could be applied as alternative gears to static nets, and that currently exist in UK fisheries. The case studies in Table 7 (below) detail UK-based examples from which lessons could be learned and applied in other fisheries, with a view to reducing wildlife bycatch.

Table 7: Synthesis of alternative gear & bycatch reduction case studies from the UK.

CASE STUDY	GEAR SWITCH & KEY FINDINGS	TAKEAWAY MESSAGES
East Anglian longline fishery [WP10]	**Longlines:** - Negligible to no cetacean bycatch - High catch quality - Unwanted fish can be easily returned to the sea alive - The fleet is able to work with the seasons and geography of the coastline - Very little impact on the seabed - Operating longlines is highly skilled work	- Very few longliners currently operate in the UK. Financial incentives would likely be needed to encourage new uptake of the gear and could be explored as one means of implementing the objectives in the Fisheries Act 2020 - Due to low catch rates, longlining depends on healthy fish stocks
Reducing seabird bycatch by Hooktone fleet in UK and Spanish waters [WP11]	**Bottom-set longlines:** - Bird scaring lines, also known as tori lines, reduce seabird bycatch - Changes in fishing practice can also reduce seabird bycatch, including better offal management, dimmer boat lights, and relocating vessels using Automated Identification System (AIS) buoys	- Modifications to alternative gears and changes in practice should continue to be explored
Filey Bay fishery, North Yorkshire [WP12]	**Modifying gillnets to significantly reduce seabird bycatch:** - Switched the majority of the netting from monofilament to a darker netting and changed the floats to 'old fashioned' grey cork, as conventional white floats mimic resting seabirds on the water, drawing in other seabirds to the fishing area - Nets are attended at all times, allowing immediate handling and careful removal of any bycaught birds	- Low-cost alternative materials to standard gear had a significant impact - bird fatalities reduced from over 1,000 per year to 15 per year in the fishery - Fleet has been engaged in bycatch reduction for a decade, with all the innovations coming directly from the fishermen

Annex 2: ALTERNATIVE GEARS & BYCATCH REDUCTION – INTERNATIONAL CASE STUDIES

Alternative gears have been trialled and deployed in fisheries across the world. In the case studies in Table 8 (below) the selected alternative gears uniformly resulted in lower bycatch. Researchers and fishermen also focused on optimising the efficiency of the gears in terms of fish catches, and the conditions that may help or hinder switching to these gears.

Table 8: Synthesis of international case studies relating to alternative gear & bycatch reduction.

CASE STUDY	GEAR SWITCH & KEY FINDINGS	TAKEAWAY MESSAGES
Franciscana dolphin in Northeast Argentina [WP7]	**From gillnets to longlines:** - Some fishermen fear getting themselves caught on the longline hooks **Handlines:** - Slightly lower fish catch than gillnets, although higher catch quality could minimise the economic loss **Pots:** - Higher quality of catch - Caught much smaller individuals, in the case of one commercial species - Switching from gillnets to pots was operationally and economically feasible **General findings:** - All alternative gears to gillnets in this case study led to significantly lower dolphin bycatch, including zero turtle and dolphin bycatch in the case of pots	- It is not inevitable that alternative gears will be adopted even when there is an economic incentive to do so - Partnering with local fishing leaders helps to advance the uptake of changes in fisheries, and progress will likely be limited without this - Many existing studies on bycatch mitigation do not include an economic component
Marine mammals and seabirds in the Baltic Sea [WP8, WP13]	**From gillnets to pots:** - Aspects of the study included bait preference, fish attractants, colour and structure of pot entrances, and triggers to prevent fish escape, all improving fish catch rates without affecting effectiveness at reducing bycatch **From gillnets to traps:** - High quality of catch. There is need to improve fish catch rates and handling of the gear by fishermen **Static net modification** **Small, sound-reflecting beads which are attached to gillnets to make nets more visible to porpoises:** - Easy to deploy - Reduced bycatch of porpoises, with no impact on fish catch rates - Difficult to manufacture	- Where it is established that an alternative gear is highly effective in reducing bycatch, modifications may be required to improve fish catch rates, and training and upskilling for fishermen in handling the gear - Unwanted fish can be returned to the sea alive if the gear is fished at relatively shallow depth - A fisherman at the workshop highlighted that when fishing at depth, most fish when brought to the surface will suffer barotrauma which will reduce both the number of non-target fish released alive and the quality of the target catch. Gear in this case study was tested to maximum depths of 40 metres

Table 8 continued

CASE STUDY	GEAR SWITCH & KEY FINDINGS	TAKEAWAY MESSAGES
Marine mammals and seabirds in the California Halibut fishery [WP9]	**From gillnet to otter trawls:** - Significantly reduced wildlife bycatch - Higher fish catch rate	- With catch rates being equivalent or even higher than those of gillnets, uptake of these gears could lead to overfishing if they are not correctly managed
Marine mammals and seabirds in the Baltic Cod fishery [WP9]	**From gillnets to longlines:** - Significantly reduced wildlife bycatch - Similar fish catch rate	
Māui dolphin in the New Zealand gillnet and trawl fisheries [WP9]	**From gillnets and trawls to longlines:** - Significantly reduced bycatch - Estimates of costs to transition to longline gear were significant and posed a key challenge	- Financial support from the Government may be needed to enable fishermen to meet the significant costs of both gear-switching and fishing displacement - Even with financial support, for each individual fisherman there may be cultural barriers to switching from traditionally-used gears that are "embedded" in their industry or society
Newfoundland Stewardship Cod fishery, Atlantic Northwest, Canada [WP9]	**From gillnets to fish-pots and hand-lines:** - Nearly eliminated seabird and marine mammal bycatch - Higher quality catch and higher price per fish - Need to improve catch-efficiency to compete with gillnets	- To achieve gear-switching, a holistic approach that includes socio-economic and ecological realities is essential - Efforts to improve catch efficiency of alternative gears should be supported by government and industry
Lummi Island sea trout and salmon fishery, Pacific Northwest, USA [WP12]	**Reef-net (static fishing pontoons, with winch-operated nets rigged in between, uses camera or observer to identify incoming fish and close the net):** - Zero wildlife bycatch - Solar-powered - High quality catch for premium price	- Filey Bay fishermen explored the potential to trial the reef-net, but management barriers currently prevent testing and adoption - Relies on migratory fish and highly specific conditions

Table 8 continued

CASE STUDY	GEAR SWITCH & KEY FINDINGS	TAKEAWAY MESSAGES
The vaquita in the Gulf of California, Mexico [WP14]	**From gillnet to small trawl:** - Similar economic return to gillnets - Training and skills needed to optimise use of the gear - Catches and thus economic return were lower if fishermen did not use the gear optimally **In addition to designing and testing the alternative gear, the team also sought to increase support for vaquita bycatch mitigation through market influence, by:** - Persuading seafood industry leaders in the USA to write to the Government of Mexico to express support for action - Running an 'Ocean Awards' to engage chefs and consumers	- Socio-political context plays a key role in determining whether alternative gears are adopted or not. In this case study, some fishermen physically blocked operation of the alternative gear, there is a lack of regulatory enforcement, and the fishing industry is affected by corruption and organised crime
Reducing bycatch and discards in New Zealand with the Modular Harvesting System (HMS) [WP15] NB: for reduction of commercial fish bycatch, rather than wildlife bycatch. However, the company behind this gear is now developing technology to allow the MHS to be opened at depth, to allow the release of protected species or other wildlife bycatch from the net	**'Modular Harvesting System'(replaces the traditional mesh lengthener and cod-end of a trawl, to create a low-turbulence environment within the net):** - Improved escape rate of non-target fish - Improved rate of non-target fish being returned to the sea live - Improved quality of the catch from greatly reduced fish-on-fish and fish-on-gear contact - Increased efficiency, as soak times can be extended and the gear can be reset faster - Improved health and safety for fishermen - No increase in fuel consumption	- The regulatory and policy context can prevent or slow down innovation in alternative gears. In this case study, it took over a year for the gear to be approved for commercial use in New Zealand's fisheries

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