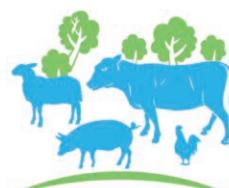




Fish Welfare

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**Conservative
Animal Welfare
Foundation**

Fish Welfare in the UK

Executive Summary

The UK was one of the first countries to enact animal welfare legislation,¹ and to this day stands as one of the strongest countries for protecting farmed animal wellbeing. However, fish have typically been left out of this progress. Today, the UK farms an estimated 28 to 77 million² fish and catches a further 1.5 to 2.7 billion³ every single year, with close to no regulation on the treatment of these animals.

The scientific community found evidence for fish sentience over two decades ago, and now this is broadly recognized by consumers. 76% of people in the UK believe the welfare of fish should be safeguarded to the same extent as other animals farmed for food.⁴ However, the current lack of legislation has created an animal welfare crisis that is as massive as it is inhumane.

Global competition and the depletion of wild fish stocks has forced producers to adopt rapid intensification, and, in the process, sacrifice long-term sustainability. In fisheries, trawlers level entire ecosystems to the ground and catch thousands of fish in crowded nets. The majority of the billions of fish caught in UK waters die from asphyxiation (oxygen depletion). During this cruel slaughter method, fish can remain conscious for up to 1-2 hours before being relieved from their suffering. In fish farming, an epidemic of sea lice

¹ Krawczyk, V. J., and Hamilton-Bruce, M. A. (2015). [The Origins of Compassion for Animals: Legal Privileging of Non-Wild Animals in Late Georgian Britain](#).

² Fiscount. (2018). [Estimated numbers of individuals in aquaculture production \(FAO\) of fish species \(2017\)](#).

³ Fishcount. (2017). [Estimated numbers of individuals in average annual fish capture \(FAO\) by country fishing fleets \(2007 - 2016\)](#).

⁴ ComRes. (2018). [Eurogroup for Animals/CIWF Fish Welfare Survey](#).



is costing the industry millions each year. Mortality rates that would be alarmingly high in other farmed animal sectors are accepted as routine. Production is unstable, and the industry is now habituating dangerous practices, pouring in money to keep this precarious situation viable (and leaving fish, the environment, and social welfare to absorb the cost).

However, there are viable alternatives. Across the globe, more and more consumers are searching for higher welfare products. There are effective ways to help improve fish welfare. Having left the EU, the UK has been presented with a unique opportunity to uplift entrepreneurial farmers and fishers, and pave the way for the rest of the world. This could benefit social welfare, the environment, and the billions of fish that are harvested each year. Below is a list of welfare improvements that we believe can help the UK to continue its legacy of innovation in the animal welfare space and legislating compassion.

1. Mandatory Labelling

- a. Educate consumers about what 'sustainable' and 'organic' labels truly mean for fish welfare.
- b. Introduce labels that correctly indicate the welfare implications of seafood products.

2. Improvement of Demersal and Beam Trawl Management

- a. Introduce seasonal restrictions.
- b. Build a timeline for ending demersal and beam trawling entirely and substitute with more welfare-friendly and sustainable capture methods.

3. Welfare Improvements in Marine Capture Fisheries

- a. Minimise time during capture and landing and decrease risk of injuries and pre-stunning death.
- b. Develop legislation for humane capture and slaughter for UK vessels and those fishing in UK waters.



4. Aquaculture Site Selection and Communication

- a. Establish stronger monitoring and site assessment systems to locate farms based on low sea lice levels.
- b. Create no-farming zones to break sea lice dispersal.⁵
- c. Enhance communication between farmers to:
 - i. Synchronize treatment among neighboring farms and avoid reinfection after successful treatment.⁶
 - ii. Communicate about treatments that succeeded or failed in similar areas.
 - iii. Synchronize fallow periods (the period of time between cycles of fish) to allow sea lice infestations to dissipate.

5. Funding of Fish Welfare-Oriented Research

- a. Advance the field of fish welfare research by earmarking funds.

⁵ This has been shown to be a promising way of reducing transmission. See Samsing, F. et al. (2019). [Identifying ‘firebreaks’ to fragment dispersal networks of a marine parasite](#).

⁶ Samsing, F., et al. (2017). [Network analysis reveals strong seasonality in the dispersal of a marine parasite and identifies areas for coordinated management](#).

Table of Contents

Executive Summary	2
Table of Contents	3
1. Introduction and Background	6
1.1 Do Fish Feel Pain?	7
1.2 The UK Fisheries and Aquaculture Sector	8
2. Fish Welfare in the UK	10
2.1 Capture Fisheries	10
2.2 Aquaculture	17
2.3 Hobbyist, Recreation, and Experimentation	24
3. Human Benefits of Fish Welfare	25
3.1 Producers, Consumers, and Fish Welfare	26
3.2 Fish Welfare and Environmental Sustainability	28
4. Fish Welfare and EU/UK Trade	29
4.1 Fisheries: Humane Capture and Slaughter Legislation	29
4.2 Improved Fish Welfare Law	30
5. Final Suggestions	31
5.1 Mandatory Labelling	31
5.2 Improvement of Demersal and Beam Trawl Management	32
5.3 Minimise Duration of and Injury From Capture and Landing	33
5.4 Introduce Humane Slaughter	34
5.5 Aquaculture Site Selection & Communication	36
5.6 Funding of Fish Welfare-Oriented Research	37
6. Conclusion	38
7. Highlighted Resources	39



1. Introduction and Background

Fish are typically neglected in considerations of animal welfare in the UK. This is likely due to the categorisation of fish as unintelligent and unfeeling animals. However, UK researchers such as Lynne Sneddon and Victoria Braithwaite devoted their careers to removing these assumptions and showcasing the broad capabilities of fish. There is now a scientific consensus that fish experience pain. This conclusion has been recognised by the World Organisation for Animal Health (OIE), who have established guidelines for fish welfare that the UK (as well as 181 other countries) has agreed to implement.

However, whilst this progress has been developing, the fisheries and aquaculture (fish farming) industries have continued to intensify, and fish welfare has remained mostly unchecked. As this disconnect deepens, the links between fish welfare, social wellbeing, and sustainability have become increasingly more obvious.

Improved fish welfare means fewer antibiotics, better growth, reduced feed waste, and the protection of wild fish populations. This is why fish welfare is an important stepping stone towards achieving the UN 2030 Sustainable Development Goals. Fish welfare is also a crucial part of implementing our duty of care to the animals we steward.

Fish farming is the fastest growing food sector in the world,⁷ and the UK faces a unique opportunity to shape that growth. The Fisheries Act 2020 is a strong example of positive change in the fisheries sector, and it helped solidify important sustainability measures into law. We believe that fish welfare should become an objective of the UK parliament, alongside the current objectives of sustainability and utilising scientific evidence.⁸

⁷ Subasinghe, R. and Soto, D. [Global aquaculture and its role in sustainable development](#).

⁸ Note that our focus in this report is on finfish welfare, but there also exists evidence for crustaceans experiencing pain, and their welfare should also be assessed and taken into account. See: Crustacean Compassion (n.d.). [Briefing on Crustacean Sentience and Welfare](#).

1.1 Do Fish Feel Pain?

Since 2003, the overwhelming consensus within the scientific community has been that fish can feel pain. Three key pieces of evidence point to this conclusion: first, they have the neurological capacity, namely nociceptors, to experience the sensation of pain from an injuring event.⁹ Second, fish react to painful stimuli.¹⁰ They recoil from painful stimuli and release cortisol as a hormonal response. Third, fish modify their behaviour in reaction to pain. For example, they guard wounded areas and learn to avoid painful events. According to Victoria Braithwaite, ‘there is as much evidence that fish feel pain as there is for birds and mammals’.¹¹

Recently, scientists discovered that fish trade off pain for other benefits (such as food).¹² Thus, fish not only react to negative stimuli, but also consciously experience said stimuli and use it to make informed decisions.

Apart from pain, fish have more capabilities that were previously only attributed to mammals and land animals. Fish can fall for optical illusions, implying that they go through a process of deliberation, which can be manipulated in a way similar to humans.¹³ Fish have emotive-like states, such as becoming pessimistic after a bad experience.¹⁴ Fish have showcased play behaviour, cooperate with others, and have complex social structures.¹⁵ In summary, fish are sentient, intelligent animals. As their stewards, we need to not only reduce physically painful experiences for fish, but also understand their psychological stresses and provide them with positive experiences.

⁹ Sneddon, I. U. et al. (2003). Do fishes have nociceptors?

¹⁰ Sneddon, L. U. (2013). Do painful sensations and fear exist in fish?

¹¹ Braithwaite, V. (2010). Do fish feel pain?. OUP Oxford.

¹² Balaban-Feld, J. (2019). Individual willingness to leave a safe refuge and the trade-off between food and safety: a test with social fish.

¹³ Brown, C. (2014). Fish intelligence, sentience and ethics.

¹⁴ Millot, S. et al. (2014). Use of conditioned place preference/avoidance tests to assess affective states in fish.

¹⁵ Braithwaite, V. (2010). Do fish feel pain?. OUP Oxford. And Brown, C. (2014). Fish intelligence, sentience and ethics.



1.2 The UK Fisheries and Aquaculture Sector

The United Kingdom is a major producer of fish within Europe, with a combined total of 897,845 tonnes produced through aquaculture (fish farming) and capture fisheries in 2018. This equates to a sector share of roughly 20% and 80%, respectively. Unfortunately, the UK does not track how many individual fish this equates to, and instead measures fish by weight. However, UK researchers estimated that 28 to 77 million individual fish were farmed in 2017,¹⁶ with a further 1.5 to 2.7 billion individual fish having been caught each year between 2007 and 2016.¹⁷ To put this into perspective, the UK farms and catches three times more fish than broiler chickens are slaughtered annually.¹⁸

Within the UK, Scotland catches the most fish, both by quantity and value (Fig. 1). Compared to Scotland, England has a remarkably higher value of fish relative to their quantity caught, as they target higher value species like shellfish.

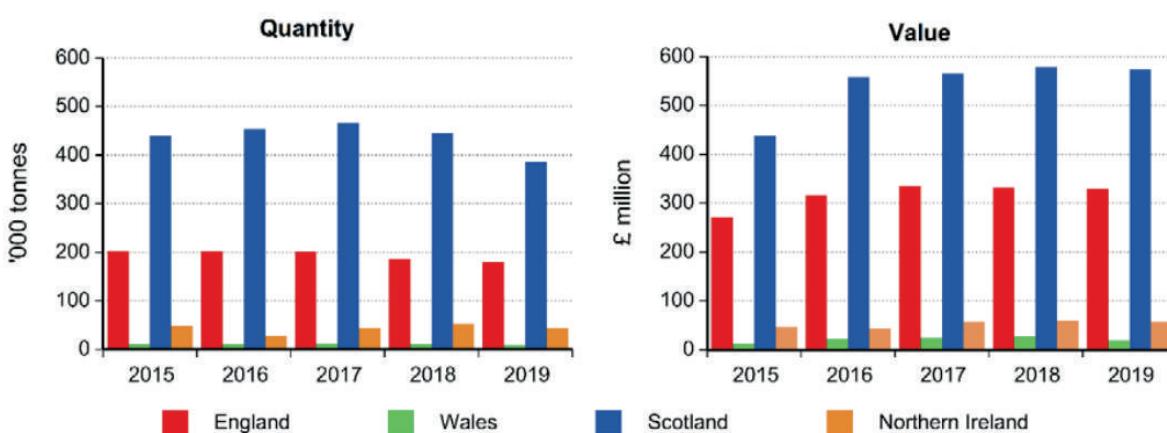


Figure 1. Fish landings in the four UK nations by quantity (left) and value (right). Source: UK Sea Fisheries Statistics 2019.

The most common species present in UK marine capture fisheries are Atlantic mackerel (*Scomber scombrus*), Atlantic herring (*Clupea harengus*), Blue whiting (*Micromesistius poutassou*), Atlantic cod (*Gadus morhua*), and shellfish (scallops, whelks, crabs, and

¹⁶ Fishcount. (2018). [Estimated numbers of individuals in aquaculture production \(FAO\) of fish species \(2017\)](#).

¹⁷ Fishcount. (2017). [Estimated numbers of individuals in average annual fish capture \(FAO\) by country fishing fleets \(2007 - 2016\)](#).

¹⁸ Between 2007 and 2016, 874 million broiler chickens were slaughtered annually in UK slaughterhouses. Numbers from [UK National Statistics 2020](#).

nephrops) (Fig. 2).¹⁹ Freshwater capture fisheries are largely for recreational fishing, and make up a negligible amount of annual capture fisheries.²⁰ We could not find numbers on freshwater capture in official statistical documents. A potential explanation for this lack of data is that the rather decentralised, recreational industry mostly practices catch-and-release.²¹

Wild-caught fish: 2018 production in tonnes

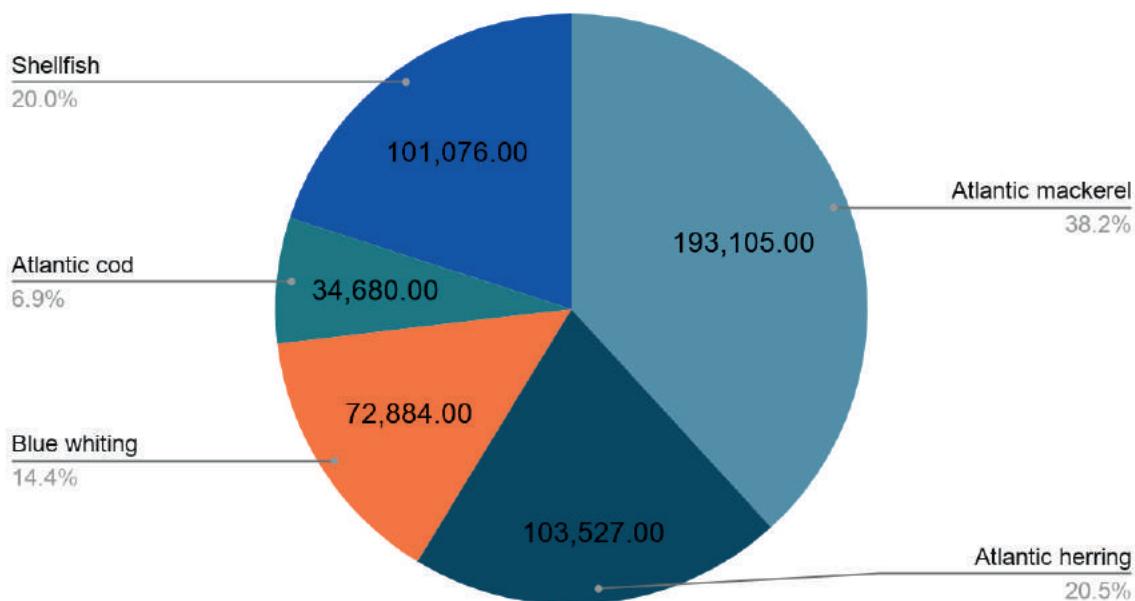


Figure 2. Amount of wild fish caught by UK vessels in 2018 (in tonnes). Source: FAO 2020.

Atlantic salmon (*Salmo salar*) dominates UK aquaculture, accounting for roughly 92% of production.²² Of this, the majority (about 94%) is within Scotland.²³ Usually, salmon are bred and raised in freshwater tanks on land for nine months before they are released into ocean sea cages.²⁴ The next largest group of finfish produced are rainbow trout (*Oncorhynchus mykiss*), at around 7% of production.²⁵ The most common production methods for rainbow trout are freshwater cages, ponds, and raceways.

¹⁹ Pilkington, J. and Wardlaw, M. (2018). [Statistics show where UK vessels fish and what is landed from our waters](#). and Marine Management Organisation. (2019). [UK Sea Fisheries Statistics 2019](#).

²⁰ FAO. (2017). [Fishery and Aquaculture Country Profiles: United Kingdom](#).

²¹ Winfield, I. J. (2016). [Recreational fisheries in the UK](#).

²² FAO. (2020). [Fishstat](#).

²³ Scottish Government. (2019). [Scottish fish farm production survey 2018](#).

²⁴ Borthwick, M. (2020). [Welfare Issues in Farmed Atlantic Salmon](#).

²⁵ FAO. (2020). [Fishstat](#).

Fish have limited protections under UK law. Farmed fish are included in the Animal Welfare Act 2006,²⁶ which affords them basic protections such as a duty of care. However, fish are explicitly excluded from the Welfare of Farmed Animals (England) Regulations 2007²⁷ which outlines more precise requirements such as inspections and record keeping. Fish are also sporadically covered by legislation, such as The Welfare of Animals (Transport) (England) Order 2006, but there is a significant lack of legislation that covers the broad and nuanced welfare requirements specific to fish.

The UK, as a member state of the World Organisation for Animal Health (OIE), has agreed to uphold Section 7 of the OIE's Aquatic Animal Health Code,²⁸ which concerns the welfare of farmed fish. This includes guidelines for transport, stunning, and disease. These are often more specific than UK legislation, but still lack species-specific details necessary to properly implement better welfare practices.

Wild-caught fish are not covered by the Animal Welfare Act 2006 and have no protection under UK law, unless they are classified as an endangered species.²⁹ This means that the largest group of vertebrate animals utilised for food in the UK have no legal protections concerning their treatment.

2. Fish Welfare in the UK

2.1 Capture Fisheries

Unlike farmed fish, wild fish lead a relatively natural life until they are caught by humans. Unfortunately, their last few hours or days can be particularly gruesome. Fish welfare has been largely neglected in industry, government, and scientific discourse. Past improvements in the capture fisheries sector have focused on ecosystem preservation

²⁶ [Animal Welfare Act 2006](#).

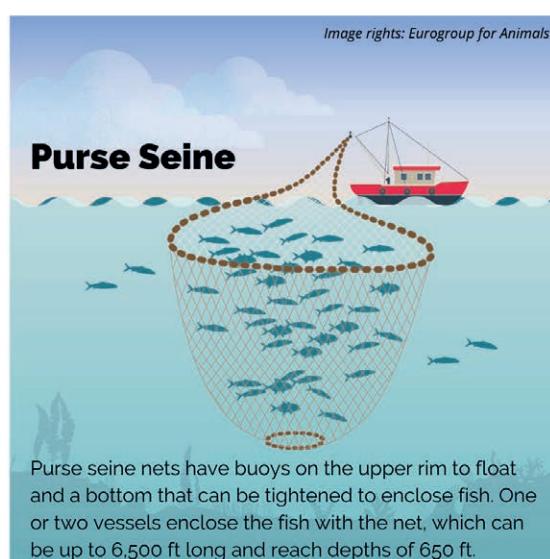
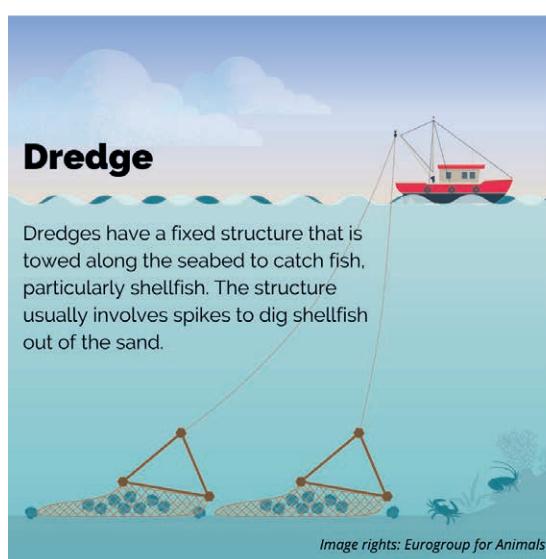
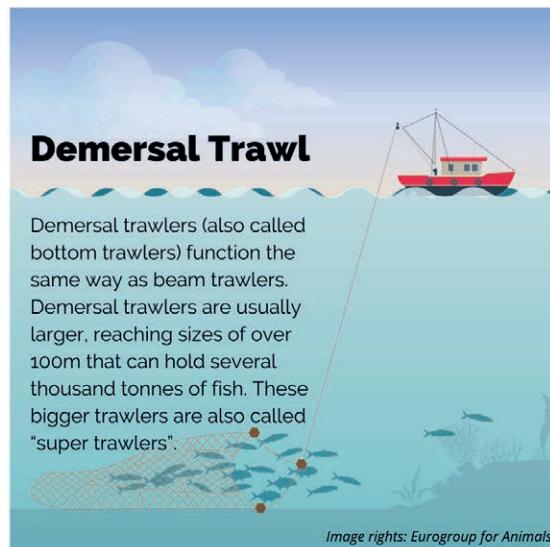
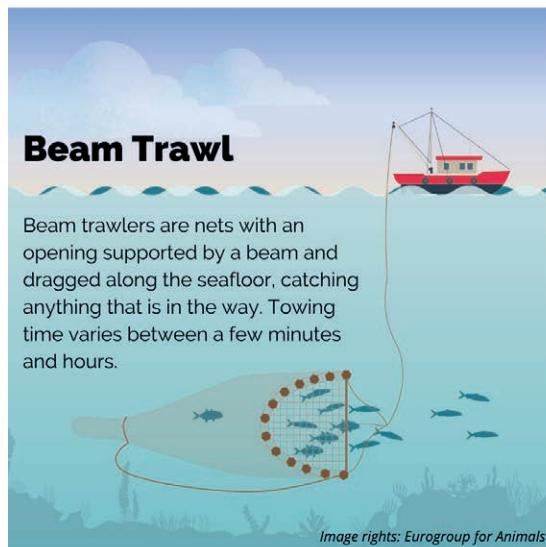
²⁷ [The Welfare of Farmed Animals \(England\) Regulations 2007](#).

²⁸ OIE. (2019). [Aquatic Animal Health Code](#).

²⁹ Marine Management Organisation. (2021). [Guidance Fish – including seahorses, sharks and skates](#).

and the control of illegal and overfishing. As a result, capture fisheries' equipment and procedures have not been designed with fish welfare in mind, and instead focus on increasing catch rates.³⁰ The well-being of fish is frequently compromised during capture, landing, and slaughter. With the increased industrialization of capture fisheries, many welfare issues have been exacerbated.

In 2019, 87% of fish captured in the UK were caught using active gear, namely, beam trawlers, demersal trawlers, dredges, and purse-seiners.³¹ Passive gear like drift and fixed nets, hooks, and traps are mainly used for shellfish. All of these methods are illustrated below:³²



³⁰ Waley, D., et al. (2021). [Catching Up - Fish Welfare in Wild Capture Fisheries](#).

³¹ Marine Management Organisation. (2019). [UK Sea Fisheries Statistics 2019](#).

³² For details on the impacts on fish, catch landed with the method, and recommendations see Waley, D., et al. (2021). [Catching Up - Fish Welfare in Wild Capture Fisheries](#).



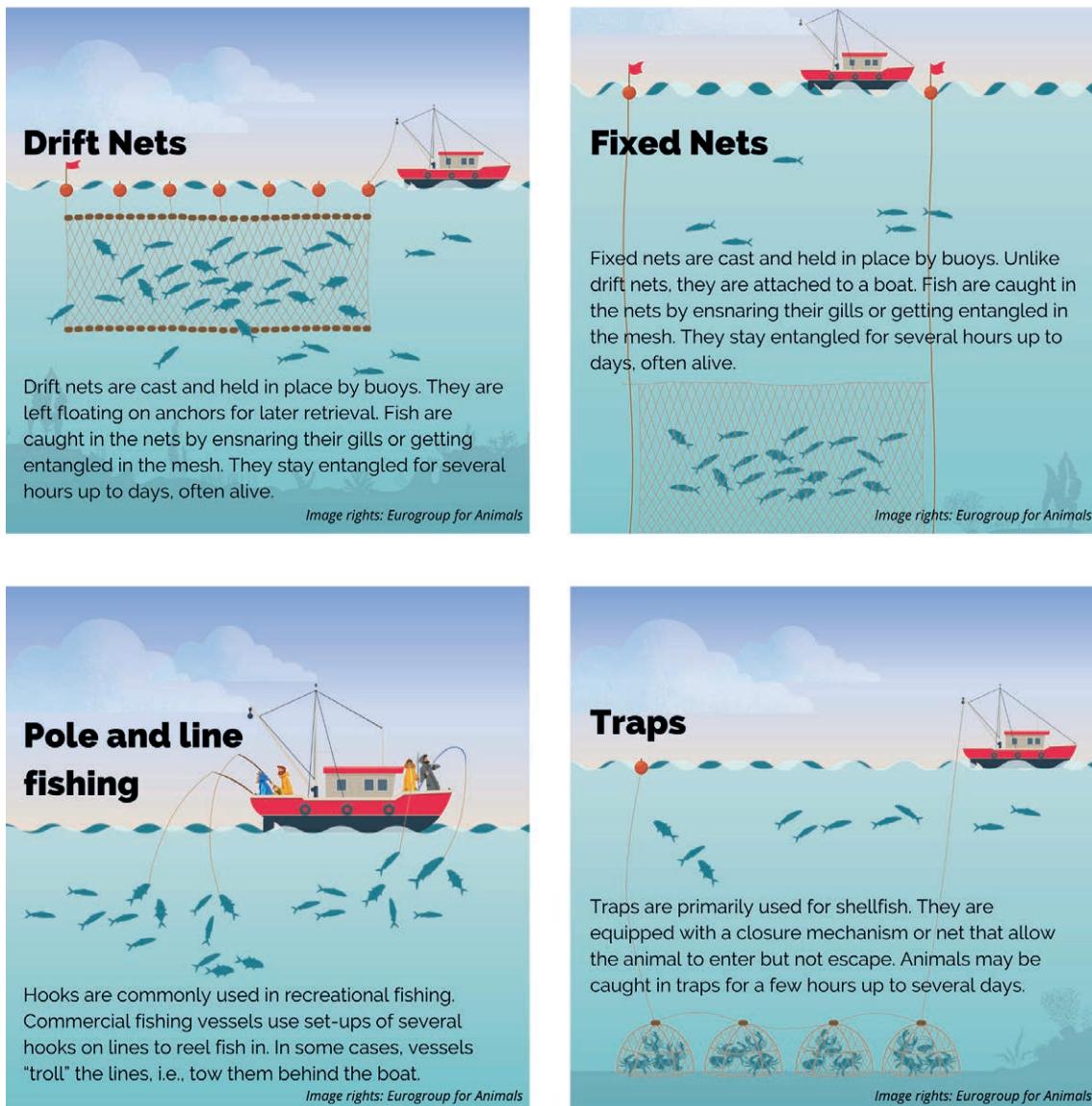


Figure 3. Common capture methods used by UK fishing fleets. Image rights: Eurogroup for Animals.



2.1.1 Welfare Concerns During Capture

Fishing gear was not designed with fish welfare in mind, and frequently stresses, injures, and kills fish before slaughter. Table 1 depicts the most common fish welfare issues during capture and landing.

Gear type	Welfare concerns
Beam and demersal trawl	<ul style="list-style-type: none"> Exhaustion, injury, asphyxiation, and crushing during tow and haul. These stages sometimes involve fish death. Decompression injuries and thermal shock when coming from greater depths (swim bladder may burst, see Fig. 4). Large amount of by-catch that may be injured or suffocated. These concerns become exacerbated with the trawlers' sizes, escalating with super trawlers.
Dredge	<ul style="list-style-type: none"> Large amounts of by-catch that may be injured or suffocated. Crowding and crushing during capture.
Purse-seine	<ul style="list-style-type: none"> Crowding and crushing during enclosure and haul. Bigger fish may be gaffed,³³ leading to serious injuries. Decompression injuries and thermal shock when coming from greater depths (swim bladder may burst, see Fig. 4).
Drift and fixed nets	<ul style="list-style-type: none"> Suffocation, injuries, and exhaustion. Predation by larger predators while immobile. Decompression injuries and thermal shock when coming from greater depths (swim bladder may burst, see Fig. 4).
Hooks (e.g., long line or angling)	<ul style="list-style-type: none"> Injuries from the hook itself (especially with J-shaped, barbed hooks). May swallow the bait and get deep-hooked. This causes serious injuries to the gut and throat when being unhooked. May remain hooked for hours or days at a time. Serious injuries from gaff hooks when brought on board.

Table 1. Fish welfare concerns of commercial marine fishing gear commonly used in the UK.

Information based on: [Waley et al. 2021](#) and [Mood and Brooke 2019](#).

³³ Gaffing refers to the practice of spearing fish with a gaff, or handled hook, to lift them on board and/or maneuver them.



Figure 4. Barotrauma (burst swim bladder) in adult snapper. Image rights: [Boys and Navarro 2014](#).

In addition to the welfare issues outlined above, a recent review of capture fisheries suggests the **following issues increased injury and/or mortality during capture**.³⁴

- Design of fishing gear (e.g., shape of hooks)
- Longer fishing duration
- Higher density in trawl nets (longer trawl duration leads to higher density)
- Capture at greater depths (due to changes in pressure or temperature and may take longer to land)
- Large changes in water temperature during capture (i.e., if surface water is warmer than the depths)
- Longer air exposure
- Use of trawls and seines (as opposed to hooks, gillnets, and traps)

Typically, by-catch is left to asphyxiate on deck or is thrown back into the ocean. Studies suggest a survival rate of only 1-2% for released fish and up to 50% for crustaceans.³⁵ Survival rates for throwback fish are low because they have often already suffered physical injuries, or because they simply do not recover from the inflicted stress. For sharks, there may be a solution to prevent them from ending up as bycatch in using their unique sensors for electrical fields. Fishers can attach metal to hooks or cover hooks with a magnetic metal layer

³⁴ Veldhuizen, L.J.L., et al. (2018). [Fish welfare in capture fisheries: A review of injuries and mortality](#).

³⁵ Cook, R. (2003). [The Magnitude and Impact of By-catch Mortality by Fishing Gear](#).

to evoke a repelling effect on sharks without affecting their intended catch.³⁶ While this research is still debated and requires further species-specific research,³⁷ it could offer a solution to unintended bycatch of sharks.

Equipment used to haul and process fish on board, such as nets and conveyor belts, can increase suffering and even cause fatal injuries.³⁸ Fish are lifted through the water at an unnaturally fast pace, causing decompression injuries. Extreme crowding before and during hauling can lead to fish being crushed under the weight of others. This process of crowding and hauling fish often takes several minutes to hours - a time period during which many fish die from asphyxiation. If this process is not done quickly, fish suffer from asphyxiation and frequently die long, painful deaths. Arguably the most horrific hauling practice is gaffing. A gaff is a handled hook that is commonly used to heave heavy fish such as tuna onto the fishing vessel. On board, fishermen have been observed hooking fish with gaffs several times to inflict injuries and, finally, let them bleed out.³⁹ This is not a humane method for killing fish, and involves intense, prolonged suffering.

Baitfish are also affected by fishing activities. These fish are caught or farmed in order to be used as bait for the target species. Baitfish often spend days or weeks in crowded confinement before being hooked or thrown into the water.⁴⁰ Either of these outcomes involves prolonged fear, stress, and physical injury.

³⁶ Swimmer, Y. J. H., et al. (2008). [Shark deterrent and incidental capture workshop](#).

³⁷ Grant, S. M., et al. (2018). [Greenland shark \(*Somniosus microcephalus*\) feeding behavior on static fishing gear, effect of SMART \(Selective Magnetic and Repellent-Treated\) hook deterrent technology, and factors influencing entanglement in bottom longlines](#). and Swimmer, Y. J. H., et al. (2008). [Shark deterrent and incidental capture workshop](#).

³⁸ Waley, D., et al. (2021). [Catching Up - Fish Welfare in Wild Capture Fisheries](#).

³⁹ For an example, see Animal Equality's [undercover video](#).

⁴⁰ Mood, A. & Brooke, P. (2019). [Towards a strategy for humane fishing in the UK](#). and Fishcount. (2019). [Avoiding live fish as bait](#).

2.1.2 Welfare Concerns During Slaughter

In commercial capture fisheries, capture often already involves fishes' deaths. If they do make it on board alive, the most common causes of death are asphyxiation and live gutting.⁴¹ Fish are frequently put on ice to be made immobile. This immobilisation (muscle paralysis) can be misinterpreted as unconsciousness. Ultimately, these fish suffer from cold, stress, fear, and oxygen deprivation for up to 250 minutes.⁴² When gutted alive, fish are conscious and sensible for 26 to 65 minutes.⁴³ Slaughter via asphyxiation is comparable to slaughtering chickens by throwing them into tanks of water and letting them drown – with the difference being that fish struggle for a longer period of time.

As a signatory of the OIE Aquatic Animal Health Code, the UK pledged to follow humane slaughter methods for farmed fish.⁴⁴ Considering that wild fish are equally sentient, these commitments to humane slaughter should also be applicable to wild-caught fish. The OIE guidelines prohibit the use of asphyxiation, chilling with ice, and exsanguination without stunning as slaughter methods because these have been shown to result in poor welfare. It is questionable, then, why slaughtering fish at sea allows for practices that are intolerable for farmed fish and farmed land animals.

In the last decade, stunning equipment for the capture fisheries sector has entered the market.⁴⁵ Fishing fleets can choose from automated electrical or percussive stunning systems. If used appropriately, these methods render fish unconscious by means of an electric shock or blow to the head. For an in-depth overview of the different types of stunning, please see [Mood & Brooke, 2019](#) (p.6) and [Waley et al., 2021](#) (p.27). With this new

⁴¹ Waley, D., et al. (2021). [Catching Up - Fish Welfare in Wild Capture Fisheries](#). and Mood, A. & Brooke, P. (2019). [Towards a strategy for humane fishing in the UK](#).

⁴² Mood, A. (2010). [Worse things happen at sea - the welfare of wild-caught fish](#).

⁴³ Mood, A. and Brooke, P. (2019). [Towards a strategy for humane fishing in the UK](#).

⁴⁴ OIE. (2019). [Aquatic Animal Health Code](#).

⁴⁵ For examples see [Blue North](#), [Optimar](#), [Ace Aquatec](#), and automated percussive stunning by [Wild Salmon Direct](#).



equipment, fish can be rendered unconscious within seconds of capture, thus significantly reducing their suffering.⁴⁶ As many of these technologies are relatively new, the UK now stands at an opportunity to promote further research and early adoption.

For an overview of the welfare concerns for wild-caught fish from initial encounter to final slaughter, we highly recommend reviewing the illustration on page 33 of this report: Waley, D. et al. (2021). [Catching Up - Fish Welfare in Wild Capture Fisheries](#).

2.2 Aquaculture

Fish welfare within aquaculture is a complex and multifaceted issue. Fish farmers have control over all aspects of fish life within farm systems and, as such, have a responsibility to provide for their needs across their entire lives. Within the UK, salmon farming makes up roughly 92% of production.⁴⁷ Salmon are raised in inland tanks for about nine months before they are released into sea cages.⁴⁸ These sea cages have a buoyant, circular structure from which nets extend into the water, comparable to a submerged cage (Fig. 5).



Figure 5. Sea Cages holding 200,000 Atlantic salmon each. Image rights: personal photo.

⁴⁶ Companies providing on-board stunning equipment include [Blue North](#) and [Ekofish](#) (electric dry stunning project).

⁴⁷ FAO. (2020). [FishstatJ](#).

⁴⁸ Borthwick, M. (2020). [Welfare Issues in Farmed Atlantic Salmon](#).

There have been numerous reports, books, and articles written on salmon welfare,^{49, 50, 51} and the RSPCA has established guidelines for Atlantic salmon farming⁵² (which roughly 50 to 60% of salmon sites in the UK have committed to).⁵³ However, fish welfare science is still a very young field, and many welfare issues remain prevalent within aquaculture systems in the UK.

Perhaps the easiest indicator of welfare to understand is mortality rates. Mortality rates average 12 to 18% for 'adult' salmon in Scotland.⁵⁴ To put this in perspective, typical mortality rates in the UK poultry sector are 2 to 3%.⁵⁵ Mortality rates are typically dramatically higher for juvenile salmon. Unfortunately, juvenile deaths are not tracked in the UK. These death rates present an animal welfare crisis that is not seen as disastrous solely due to its ubiquity across UK aquaculture.

However, mortality rates are not a standalone welfare issue, but rather the final product of severe and often chronic welfare issues. Below is an explanation of some of the most prevalent welfare issues that farmed fish in the UK regularly face:

⁴⁹ Noble, C., et al. (Eds.) (2018). [Welfare Indicators for farmed Atlantic salmon: tools for assessing fish welfare.](#)

⁵⁰ Rey S, Little D.C and Ellis, M.A. (2019). [Farmed fish welfare practices: salmon farming as a case study.](#) GAA publications.

⁵¹ Stein, L. H., et al. (2013). [Salmon Welfare Index Model \(SWIM 1.0\): a semantic model for overall welfare assessment of caged Atlantic salmon: review of the selected welfare indicators and model presentation.](#)

⁵² RSPCA (2018). [RSPCA welfare standards for Farmed Atlantic Salmon.](#)

⁵³ This estimated range is based on conversations with RSPCA (who disclosed that they work with a little over 130 farms) and the 221 salmon sites noted in Scotland's 2018 fish farm production survey (Scotland containing about 97% of salmon sites in the UK): Munro, L. A. (2019). [Scottish Fish Farm Production Survey 2018.](#)

⁵⁴ This is based on monthly mortality rates as released by The Fish Health Inspectorate: Scottish Salmon Producers Organisation (2020). [Monthly mortality rate: December 2019.](#)

⁵⁵ Levitt, T. (2020). [KFC admits a third of its chickens suffer painful inflammation.](#)



2.2.1 Disease and Parasites

There are many issues with diseases and parasites in fish farming, which can pose a threat to both fish and human wellbeing. However, the predominant welfare issue that the UK aquaculture sector faces is sea lice. Sea lice are visible parasites that eat the mucus layer, flesh, and blood of fish. In particularly bad cases, this can lead to what is colloquially called a 'death crown', where large areas of the fish's skull is exposed (Fig. 6).



Figure 6. Salmon covered in sea lice that exposed its skull, creating a 'death crown'. Photo credit: Corin Smith.

Sea lice is a £30 million issue within the aquaculture industry, and ravages through salt-water aquaculture facilities.⁵⁶ In 2019, roughly a third of all salt-water aquaculture sites in Scotland had numbers of sea lice high enough to require being reported to the Fish Health Inspectorate.⁵⁷ The issue is significant enough for the Salmon and Trout Conservation Scotland (S&TCS) Director Andrew Graham-Stewart to claim that 'sea lice numbers on farmed fish across much of the industry are of epidemic proportions'.⁵⁸

⁵⁶ Fraser, D. (2017). [Scottish salmon farming's sea lice 'crisis'](#).

⁵⁷ This estimate is based on the number of salt water aquaculture sites accounted for in the 2019 Scottish Fish Farm Production Survey (250) and the number of sites that registered sea lice levels above the reporting level to the Fish Health Inspectorate in 2019 (81); Munro, L. A. (2019). [Scottish Fish Farm Production Survey 2018](#). and Fish Health Inspectorate (2021). [Fish Health Inspectorate: sea lice information](#).

⁵⁸ TheFishSite. (2017, October 31). [Scottish sea lice levels "can be overcome"](#).

Unfortunately, no treatment has been found that can both effectively remove sea lice and ensure the welfare of the fish involved. Hydrolicers blast fish with jets of water, which remove attached sea lice, but have also been shown to be extremely stressful and even damaging to fish. Thermalicers use heat treatment to kill sea lice, but again, this comes at the cost of harming the fish. In essence, what kills sea lice tends to also injure the fish.

Currently, the only clear route to decreasing the numbers of sea lice is prevention. A government-funded research project by Scotland's Rural College (SRUC) suggests that sea lice skirts (a thin material that prevents sea lice from entering) are the most cost-effective method of sea lice management.⁵⁹ Another prevention method that was not considered by SRUC research is to select geographical sites based on their existing levels of sea lice. Norway has implemented site selection rules with the intent to minimise the effect of sea lice on wild salmon populations.⁶⁰ The UK currently includes site selection within its farm registration process, but does not have any rules based on sea lice levels.

2.2.2 Cleaner Fish

One solution often used for sea lice is cleaner fish, or species of fish that naturally prey on sea lice. This is beneficial to the salmon, who can be treated relatively painlessly by the cleaner fish, but it poses serious welfare issues for the cleaner fish themselves. Although no official numbers have been published, an estimated 10 million cleaner fish were used in the UK in 2020.⁶¹ Though there are multiple species used as cleaner fish, all of which have their own complex welfare requirements, they are typically neglected when considering fish welfare issues. The UK animal welfare committee recognised cleaner fish welfare in 2014, claiming it to be 'no less important' than the welfare of fish reared for human consumption.⁶²

⁵⁹ Toma, L., et al. (2020). [Understanding the Relative Cost-Effectiveness of Sea Lice Management Measures for Farmed Salmon Production in Scotland](#).

⁶⁰ Myklevoll, M. S. (2017). [Norwegian researchers develop sea lice tracking model](#).

⁶¹ Marine Conservation Society (2018). [Use of cleaner fish in salmon farming: Current use, concerns and recommendations](#).

⁶² Farmed Animal Welfare Committee (2014). [Opinion on the Welfare of Farmed Fish](#).



*Figure 7. Picture of a juvenile lumpsucker (*Cyclopterus lumpus*; left) and Ballan wrasse (*Labrus bergylta*; right) in a Norwegian aquaculture facility. These two species are the most commonly used cleaner fish on farms. Photo credit: Rudolf Svensen/ www.uwphoto.no*

There are many welfare issues that cleaner fish face.^{63,64} Cleaner fish require supplementary food, and without it they are susceptible to malnutrition. Some species of cleaner fish are preyed upon by salmon. Cleaner fish are susceptible to diseases, and can be affected by sea lice themselves. These issues can all lead to extremely poor welfare conditions, and some reviews have claimed that cleaner fish mortalities are often close to 100%.⁶⁵

2.2.4 Natural Behaviour

The lives of wild fish are dramatically different from those of farmed fish. Salmon are migratory species, typically travelling great distances at sea. This is a natural compulsion that is completely frustrated within an enclosed sea cage, where fish often have space roughly equivalent to a bathtub each.⁶⁶ Salmon are also solitary animals for much of their lives and,

⁶³ OneKind (2018). [Cleaner Fish Welfare On Scotland's Salmon Farms](#).

⁶⁴ To read more around welfare issues for cleaner fish in Scotland, see: OneKind (2018). [Cleaner Fish Welfare On Scotland's Salmon Farms](#).

⁶⁵ ibid.

⁶⁶ Compassion in World Farming (n.d.). [Farm Animals: Fish Welfare](#).

therefore, unnaturally high stocking densities often lead to aggression (especially when fish are already stressed, which is inevitable in intensive production systems).⁶⁷

New research has been conducted on the possibilities of incorporating environmental enrichment into fish farms (which are typically barren tanks or cages), with promising results for species-specific improvements.⁶⁸

2.2.5 Recirculating Aquaculture Systems

Recirculating aquaculture systems (RASs) are a type of aquaculture that is entirely land-based, where fish are kept within tanks (Fig. 8). Water is pumped through the tanks, treated, and then recirculated. Many companies are looking to RASs as an alternative to sea cages and pens, as they allow farmers full control over the environmental conditions. This could be beneficial to fish welfare, removing the risk of parasites like sea lice and allowing for a more optimal environment. However, RASs also come with some major drawbacks that need to be properly addressed before the system is introduced on a larger scale.



Figure 8. A Recirculating Aquaculture System. Picture Credit: Pan Xunbin

⁶⁷ Borthwick, M. (2020). [Welfare Issues in Farmed Atlantic Salmon](#).

⁶⁸ Näslund, J., and Johnsson, J. I. (2014). [Environmental enrichment for fish in captive environments: effects of physical structures and substrates](#).

Farms using RASs often use higher stocking densities than those without.⁶⁹ As expressed above, high stocking densities can have serious negative effects on fishes' mental wellbeing as well as physical health. For example, high stocking densities result in lesions, both through aggression and due to fish constantly rubbing against each other.

Another issue for RASs is that they are complex, and require a deep technical understanding to properly operate. RASs work through a process of biofiltration, where harmful substances such as ammonia are removed from the water. Technical failure, such as a broken filter, can lead to mass fish mortalities, as progressively more toxic water is recirculated through the tanks.⁷⁰ As such, RASs require attentive, trained operators to function safely, and have a high potential for human error. As such, producers must be adequately trained before moving from more traditional farming systems to RASs.

2.2.6 Slaughter

There are currently no specific provisions in the UK concerning the welfare of farmed fish at the time of slaughter. We support The Animal Welfare Committee's opinions on farmed fish welfare at the time of killing,⁷¹ and believe that the UK should mandate ethical slaughter practices for fish in addition to ensuring welfare at all key stages in the slaughter process.

Of course, there are many other welfare issues that fish experience in aquaculture. Routine procedures such as handling and transportation can induce severe stress. Issues with the quality of the water are prevalent in all aquaculture systems. Fish can escape into natural habitats, where they die of hunger or predation. Each welfare issue presents its own challenges, and all need to be addressed to ensure optimal welfare conditions.

⁶⁹ EUMOFA (2020). [Recirculating Aquaculture Systems](#).

⁷⁰ Ibid.

⁷¹ Farmed Animal Welfare Council (2014). [Opinion on the Welfare of Farmed Fish at the Time of Killing](#).

2.3 Hobbyist, Recreation, and Experimentation

It is also worth noting that fish welfare issues are not confined to the food sector. There are also considerations to be made as to fishes used in other sectors, as well as for recreational purposes. In recreational fishing, fish suffer from hook injuries, stress, and crowding when stored in buckets. Although no official statistics have been obtained, it is unlikely that every angler properly stuns the fish they catch to eat, meaning that fish may still be conscious while asphyxiating or being gutted. Catch and release activities are also stressful for the fish and even when released back into the wild survival rates can be dramatically low. Some researchers suggest a survival rate of only 1-2% for released fish and up to 50% for crustaceans,⁷² while others suggest a mean survival of 18%.⁷³ Regardless of what the exact survival rate is, from a welfare perspective catch and release remains a highly stressful event for fish from which they recover only slowly if they recover at all.

Other fish groups with welfare concerns include fish used for restocking, ornamental fish, and laboratory fish. Fish used for restocking experience many of the same welfare issues as [farmed fish](#), as do ornamental fish when not caught from the wild. For ornamental fish, import and transport cause serious harm as they are deprived of food and oxygen while being stored and handled roughly in small plastic containers for days at a time.

Due to the nature of experiments, laboratory fish suffer painful procedures. Zebrafish (*Danio rerio*) are an increasingly popular experiment ‘alternative’ to rodents. In 2017, 308,000 fish were used in experiments in the UK, an 8% increase from 2016.⁷⁴ While there are some

⁷² Cook, R. (2003). [The Magnitude and Impact of By-catch Mortality by Fishing Gear](#).

⁷³ Bartholomew, A. Bohnsack, J. A. (2005). [A Review of Catch-and-Release Angling Mortality with Implications for No-take Reserves](#).

⁷⁴ Home Office. (2017). [Annual Statistics of Scientific Procedures on Living Animals Great Britain 2017](#).

guidelines to protect laboratory fishes' welfare in the UK,⁷⁵ unnecessarily cruel⁷⁶ experiments such as the LD50 are still allowed on fish, as well as mice and rats.⁷⁷

3. Human Benefits of Fish Welfare

Many welfare improvements for fish also benefit producers, society, and the environment and contribute to the UN's Sustainable Development Goals (Fig. 9). This is especially true within aquaculture, where humane treatment contributes to a decrease in disease and mortality rates, thereby boosting sustainability, animal health, and farmers' income.



Figure 9. Maintaining high fish welfare is essential for achieving the Sustainable Development Goals.

⁷⁵ Animal (Scientific Procedures) Act 1986.

⁷⁶ Rowan, A. (1983). Shortcomings of LD50-values and acute toxicity testing in animals. and IAAPEA. (2021). LD 50 Toxicity Test on Animals.

⁷⁷ Home Office. (2017). Annual Statistics of Scientific Procedures on Living Animals Great Britain 2017. (p.46)

3.1 Producers, Consumers, and Fish Welfare

Diseases in farmed fish affect consumers in instances where they ingest pathogens or when antibiotic-resistant agents are present in fish meat. We know from terrestrial animal farms that intensive farming can lead to the rapid spread and mutation of pathogens. In aquaculture, 'intensive fish farming will lead to the evolution of more virulent pathogens'.⁷⁸ Today, farmers treat diseases with antibiotics, and they continue to increase doses to treat these fast-spreading pathogens.⁷⁹ However, the overuse of antibiotics makes fish immune to antibiotic treatment, and can ultimately create antibiotic-resistant superbugs.⁸⁰ If these antibiotic-resistant agents are then ingested by humans, we face a serious public health issue: antibiotic resistance in humans. The single best solution to avert such a crisis is to halt the intensification of farming practices and improve the welfare of fish on farms. Welfare improvements reduce stress and thus improve fishes' immunity to disease. With simple interventions, farmers can decrease disease rates, reduce their need for antibiotics, and ensure the survival of their fish.⁸¹ Therefore, protecting human social wellbeing from the adverse impacts of the fish farming industry requires policymakers to improve the welfare of fish, as well as slow down the sector's rapid intensification.

Improving fishes' wellbeing also benefits producers. In both aquaculture and fisheries, fish are frequently injured from rough handling, sharp edges on equipment, and aggression among equally stressed conspecifics. Consumers see these injuries when buying fish fillets and classify them as imperfections, which can ultimately drop the sales price. Producers and industry thus have an interest in minimising injuries in capture fisheries and aquaculture in order to fetch higher prices for their products. Furthermore, reducing fish stress has been

⁷⁸ Pulkkinen, K. et al. (2010). [Intensive fish farming and the evolution of pathogen virulence](#).

⁷⁹ Cabello, F. C. (2006). [Heavy use of prophylactic antibiotics in aquaculture](#).

⁸⁰ Pulkkinen, K. et al. (2010). [Intensive fish farming and the evolution of pathogen virulence](#).

⁸¹ For examples, see Zahedi et al. 2019, Rosburg and Barnes 2019, and Näslund and Johnsson 2016.

shown to delay rigor mortis,⁸² and ultimately makes for a more juicy, colorful, and firm meat.⁸³ Reducing injuries also leaves fewer pathways for bacteria to enter fish meat and thereby make their way to consumers.⁸⁴ Thus, ‘what is least traumatic to the animals is best for meat quality’.⁸⁵

What is least traumatic to the fish is also safer for workers, especially when it comes to slaughter. For example, introducing stunning can lower injury events among workers by creating a more efficient and less hazardous slaughter process.⁸⁶ Workers in fish slaughter facilities and on board fishing vessels have to deal with wet and slippery fish that move extensively when not stunned in an attempt to escape the slaughter process. If fish are rendered unconscious immediately after capture, workers can more easily handle them and are less prone to injuring themselves with sharp equipment.

Beyond wanting an unscathed product, consumers care about fish and their well-being. In a recent survey, 76% of UK respondents think that the welfare of fish should be safeguarded to the same extent as the welfare of other animals farmed for food.⁸⁷ Some UK consumers (52%) also say that the label ‘sustainable’ should demand that fish are killed quickly and painlessly, and 64% of respondents believe that ‘sustainable’ should indicate that fish can express their natural behaviour in captivity. Unfortunately, there seems to be a misconception between what consumers expect from a label and which practices those labels actually promote (see [Section 5.1.](#)). Consumers care about how the animals they

⁸² Poli, B. M., et al. (2005). [Fish welfare quality as affected by pre-slaughter and slaughter management](#).

⁸³ Mood, A. (2010). [Worse things happen at sea - the welfare of wild-caught fish](#). (p.83)

⁸⁴ EFSA. (2009). [Food Safety considerations concerning the species-specific welfare aspects of the main systems of stunning and killing of farmed fish](#).

⁸⁵ Flick, G. J., et al. (2013). [Killing methods, post-slaughter quality, part 1](#).

⁸⁶ SINTEF. (n.d.). [Better fish welfare means better quality](#).

⁸⁷ ComRes. (2018). [Eurogroup for Animals/CIWF Fish Welfare Survey](#).



consume were treated, and this concern should be reflected on farms and fishing vessels through implementing high welfare practices.

3.2 Fish Welfare and Environmental Sustainability

Commercial fishing methods not only compromise fish welfare, but also decimate other marine populations and deteriorate the environment. Demersal trawling flattens benthic structures and anything else in the nets' way. In a single day, large fishing vessels catch as many fish as an artisan fisher would catch per year. Additionally, most fishing methods result in as much as 40% bycatch.⁸⁸ Therefore, minimising capture and avoiding the most harmful practices not only benefits the fish, but also the environment.

On land, fish welfare can contribute to cleaner rivers and groundwater. Most land-based fish farms discharge their wastewater, which contains pathogens, antibiotics, and uneaten feed that may leak into water bodies. This practice can provoke diseases and antibiotic resistance in wild animals and humans. Furthermore, uneaten feed holds excessive nutrients that accumulate in wastewater. This accumulation of nutrients depletes local rivers, lakes, and oceans of oxygen, ultimately creating dead zones (i.e., zones with extremely low oxygen saturation). Welfare improvements can help restore the ecological balance and reduce the amount of harmful agents in farms' wastewater. Humanely raised fish eat more efficiently, thus reducing the amount of suspended feed in the water that is ultimately discharged. Higher welfare also increases immunity, and thus fewer antibiotics are used and fewer diseases are transmitted to wild animals.⁸⁹

⁸⁸ Davis, R. W. D., et al. (2009). [Defining and estimating global marine fisheries bycatch](#).

⁸⁹ Barrett, L. T., et al. (2018). [Impacts of marine and freshwater aquaculture on wildlife: a global meta-analysis](#).

4. Fish Welfare and EU/UK Trade

As per the recent trade agreements, EU member countries can continue fishing in UK waters at a 75% capacity for the next 5 ½ years, while UK fishers will also increasingly fish in local waters. These changes offer the UK the opportunity to continue its pioneering role in animal welfare legislation, this time for fish.

4.1 Fisheries: Humane Capture and Slaughter Legislation

Many European countries depend on UK waters for their fisheries. Particularly as new trade deals are negotiated and the UK fisheries policy is revisited, politicians can incorporate welfare into these documents and thus make welfare improvements in capture fisheries and aquaculture legally binding. The UK government could impose restrictions and welfare legislation that affects all vessels in the UK exclusive economic zone (EEZ). When renegotiating the deal in 2026, EU vessels could be required to meet this higher welfare standard. If they failed to comply, the UK could then restrict EU producers from fishing in the UK, and from there, the country's resources would be awarded back to local producers. Specific recommendations for legislation include humane capture and slaughter and ending demersal and beam trawling.

In late January 2021, the EU adopted progressive measures to better protect the welfare of wild-caught fish.⁹⁰ With the international community pushing for such legislation, the UK must pass their own wild fish welfare legislation, ideally progressing beyond the improvements made by the EU. Ultimately, and regardless of any legislation passed, UK politicians need to keep an attentive eye on quotas and ensure that fishing quotas in UK waters do not increase in order to avoid adverse impacts on precious local ecosystems.

⁹⁰ Eurogroup for Animals. (2021). [European Parliament takes a strong stance to protect the welfare of wild-caught fish](#).

Considering the complexity of enforcing laws on the high seas, monitoring activities and issuing fines is essential.

4.2 Improved Fish Welfare Law

It is important that the manifesto commitment for animal sentience is enshrined in UK law as soon as possible. [The Animal Welfare \(Sentencing and Recognition of Sentience\) Draft Bill](#) (2017) defines animals as all organisms 'endowed with life, sensation and voluntary motion'. Fish are included under this definition, and we should not exclude them from any final bill. In June 2020, the EU improved their fish welfare guidelines.⁹¹ Leaving the EU should not mean that UK waters and farms become a space absent of effective law. Instead, new trade agreements strengthen the UK's power and put the UK in a unique position to improve fish welfare beyond the efforts of the EU. From a trade perspective, including fish in animal welfare considerations is important, because the EU is the UK's biggest export market for seafood.⁹² While negotiating new deals, the EU could potentially require higher welfare standards for seafood, and the UK should be able to provide these in order to avoid losing this market.

⁹¹ N.d. (2020, June 24). [Fish Welfare Guidelines promise higher welfare for millions of fish](#).

⁹² Office for National Statistics. (2021). [Trade in goods: country-by-commodity exports](#).

5. Final Suggestions

5.1 Mandatory Labelling

Labelling products allows customers to make informed decisions. As such, they can reward morally-aligned producers by purchasing their products and potentially even paying more. For this market-driven impetus to improve welfare to be effective, labels need to display the truth and live up to what they claim. Unfortunately, present labels appear to deceive UK consumers. According to a 2018 study, 48% of UK respondents think that the label 'sustainable' means that fish are able to express their natural behaviour when in captivity.⁹⁴ For fisheries, 55% of respondents thought that 'sustainable' indicates an avoidance of bycatch, and 35% believe that fish are killed quickly and painlessly. None of these assumptions are reality. When asking respondents about whether the label 'sustainable' *should* mean these things, percentages increased to 64%, 66%, and 52% respectively. Summarising their ethical stance, 75% of the survey participants believe that the welfare of fish should be better protected than it is now.⁹⁵

It seems imperative, then, that consumers are educated about existing labels and their actual meanings. Introducing a label that clearly indicates the welfare issues associated with their purchase could give consumers the choice that they already believe they have. For industry, this could mean that those implementing higher welfare practices are rewarded by more purchases and/or a price premium.⁹⁶ Only educated consumers can successfully drive the market, and they need to be given honest labels in order to act on their ethical beliefs.

⁹⁴ ComRes. (2018). [Eurogroup for Animals/CIWF Fish Welfare Survey](#).

⁹⁵ Ibid.

⁹⁶ In the [study](#) 52% of UK respondents were willing to pay for higher welfare-labelled fish

For more details on mandatory labelling and the logistics of implementing it, see the [Mandatory Labelling Report](#) by the Conservative Animal Welfare Foundation.⁹⁷

5.2 Improvement of Demersal and Beam Trawl Management

Demersal and beam trawling are among the most destructive fishing practices in the sector.⁹⁸ Trawling seafloors affects individual fish by prolonging their suffering during capture, and affects wild populations by significantly contributing to overfishing and the destruction of local habitats. In the past few years, super trawlers have gained particular attention, because many of those that fish in UK waters come from outside the UK.⁹⁹ However, as the UK regains sovereignty over its waters, foreign trawlers should not be replaced by national trawlers. For trawling, it is simply impossible to comply with the OIE standards that the UK undersigned. Certification schemes acknowledge this problem and, as a result, the dredge trawling industry around Isle of Man is not MSC certified, unlike the remaining local fisheries.¹⁰⁰ Furthermore, in February 2021, the Marine Management Organisation announced that they plan to end demersal trawling in Dogger Bank and South Dorset to safeguard the sustainability of important fishing areas.¹⁰¹

In their extensive report, Waley et al. recommend ending demersal and beam trawling.¹⁰² Fishers can instead use other methods that are more humane for the individual and more sustainable on an ecosystem level.¹⁰³ Appropriate methods need to be assessed locally and

⁹⁷ Shann, A. (2020). [Mandatory Labelling - CAWF Research Report](#).

⁹⁸ Kaiser, M. J., et al. (2002). [Modification of marine habitats by trawling activities: prognosis and solutions](#).

⁹⁹ Bosoti, A. (2020, December 26). [EU super trawlers threat trashed as public to lead 'crusade' against plundering vessels](#).

¹⁰⁰ Dignan, S. P., et al. (2014). [Environmental impacts of demersal otter trawls targeting queen scallops \(*Aequipecten opercularis*\) in the Isle of Man territorial sea](#).

¹⁰¹ Harrabin, R. (2021, February 1). [Bottom trawling ban for key UK fishing sites](#).

¹⁰² Waley, D. et al. (2021). [Catching Up - Fish Welfare in Wild Capture Fisheries](#).

¹⁰³ Ibid.

in accordance with marine biologists' recommendations. In areas where trawling continues, the industry should be heavily regulated. Trawlers could, for example, only be allowed to fish seasonally, and in areas where destruction is comparatively low. This compromise may somewhat protect ecosystems; however, the welfare aspect is not covered unless the method is ended entirely.

A seasonal or full end of trawling will affect fishers if they do not transition to other capture methods. Phasing in any changes gradually gives fishers the time to adjust to these new circumstances and change their fishing practices. Currently, trawling vessels land the majority of fish, and are thus likely operated by larger companies.¹⁰⁴ Therefore, large-scale producers would likely bear the impacts of ending trawling the most. On the flipside, smaller-scale fisheries and local fishing communities could become competitive again if trawling was ended, as it would help restore local ecosystems and fish stocks.

5.3 Minimise Duration of and Injury From Capture and Landing

Having left the EU, the UK has the unique opportunity to revise and advance their fisheries legislation. EU legislation does not protect wild fish during capture and landing, even though studies show that consumers misinterpret existing labels as indicative of being humane.¹⁰⁵ While appropriate methods are still understudied, we recommend the implementation of existing findings¹⁰⁶ and the funding of species-specific research into humane capture and landing. There are numerous improvements that decision-makers can already build into legislation:

¹⁰⁴ Eurogroup for Animals (2020). [Handle with Care - Policy Briefing and Recommendations](#).

¹⁰⁵ ComRes. (2018). [Eurogroup for Animals/CIWF Fish Welfare Survey](#).

¹⁰⁶ For instance recent findings about plaice, see [Hürlmann, R., et al. 2014](#).

1. Minimise crowding.
2. Design gear to minimise injuries and incorporate fast release mechanisms.¹⁰⁷
3. Minimise time in air. Use pumps to move fish without injuring them.
4. Do not capture at great depths to avoid injuries from pressure and temperature changes.
5. Prefer barbless hooks and circle hooks to minimise injuries.¹⁰⁸
6. For manual handling, staff should have wet hands or use gloves.
7. Bring fish on board with pumps instead of nets.

Many of these suggestions are relatively simple and cheap for fisheries to implement. For example, barbless circle hooks are not significantly more expensive than barbed J-shaped hooks, and pumps are becoming increasingly affordable. In the end, producers will benefit from fish that have minimal injuries and are less scathed - a product that may sell better than severely crushed fish with missing body parts. Furthermore, higher welfare standards in fisheries can set the UK apart from the EU and prevent the overexploitation of UK waters by EU fleets with lower welfare standards.

Recommendations specific to fishing methods can be found in the following report: Waley, D. et al. (2021). [Catching Up - Fish Welfare in Wild Capture Fisheries](#).

5.4 Introduce Humane Slaughter

Another opportunity for the UK to lead welfare legislation is the introduction of humane slaughter. The slaughter of wild-caught fish is unimaginably cruel compared to standard methods used for farmed fish in the UK, and unthinkable for farmed land animals. While more research is needed, some companies have already introduced stunning equipment for

¹⁰⁷ As soon as fish are lifted out of the water, the weight of fish above them will crush many. Thus, fishers should ideally use pumps to avoid lifting fish in nets. However, if they do lift them with nets, it is essential to minimize this lifting time and ensure that a big part of the net can open quickly to release the fish on deck.

¹⁰⁸ Serafy, J. E. (2012). [Circle Hooks in Commercial, Recreational, and Artisanal Fisheries](#).

commercial fishing vessels.¹⁰⁹ The UK could be a forerunner in making effective stunning mandatory and thereby pioneer wild fish welfare. To be effective, stunning needs to occur immediately after landing and must render the animal unconscious within one second by a scientifically-validated method. To make the most out of stunning equipment, staff need to be trained accordingly.

While we need more research, several groups have explored or are in the process of researching onboard stunning and species-specific methods.¹¹⁰ There are already onboard stunning recommendations for many species commonly caught in the UK:

- Cod and haddock ([Lambooij, E. et al., 2012](#))
- Dab and plaice (see research with individual recommendations [here](#))
- Turbot and sole ([Daskalova et al, 2016](#))
- Atlantic mackerel ([Anders et al, 2019](#))
- For general recommendations, see the Aquatic Animal Alliance's [recommended standards for fisheries](#)

Humane slaughter in fisheries is a relatively young practice. Producers that want to introduce humane slaughter on their vessels face the often high cost of onboard stunning equipment. At the same time, they will benefit from a better product and a later onset of rigor mortis that may get them a price premium on the market. To encourage fishers to make this initial investment, the government should reward early adopters and then pave the way for future legislation.

¹⁰⁹ For examples, see [Blue North](#), [Optimar](#), [Ace Aquatec](#), and automated percussive stunning by [Wild Salmon Direct](#).

¹¹⁰ For example, the Humane Slaughter Association ([project link](#)) and researchers from Harper Adams University ([project link](#)).

5.5 Aquaculture Site Selection & Communication

A welfare issue that stands out in UK aquaculture is that of sea lice. While these parasites cause great suffering for the fish, they also cost the Scottish salmon industry £30 million per year.¹¹¹ Presently, there are no direct interventions that control sea lice without harming either the farmed or cleaner fish. The UK should support research in the field of treatment and, for now, consider preventative measures such as site selection to reduce sea lice numbers.¹¹² Intelligent site selection can take advantage of natural marine conditions to reduce the number of sea lice on farms. For example, in previous reviews, Orkney was found to have considerably fewer sea lice than East and West Shetland.¹¹³ Site selection can also minimise contact between farms to help reduce the spread of sea lice.¹¹⁴ The [Scottish salmon farm registration](#) process has a section on site selection, but does not explicitly include sea lice considerations.

The following management practices for site selection could help reduce sea lice numbers:

1. Establish stronger monitoring and site assessment systems to locate farms based on low sea lice levels.
2. Create no-farming zones to break sea lice dispersal.¹¹⁵
3. Enhance communication between farmers to:
 - a. Synchronize treatment among neighboring farms and avoid reinfection after successful treatment.¹¹⁶

¹¹¹ Fraser, D. (2017, February 14). [Scottish salmon farming's sea lice 'crisis'](#).

¹¹² Samsing, F., et al. (2017). [Network analysis reveals strong seasonality in the dispersal of a marine parasite and identifies areas for coordinated management](#).

¹¹³ Carrell, S. (2012). [Scottish fish farmers use record amounts of parasite pesticides](#).

¹¹⁴ Barrett, L. T., et al. (2020). [Prevention not cure: a review of methods to avoid sea lice infestations in salmon aquaculture](#).

¹¹⁵ This has been shown to be a promising way of reducing transmission. See Samsing, F. et al. (2019). [Identifying 'firebreaks' to fragment dispersal networks of a marine parasite](#).

¹¹⁶ Samsing, F., et al. (2017). [Network analysis reveals strong seasonality in the dispersal of a marine parasite and identifies areas for coordinated management](#).



- b. Communicate about treatments that succeeded or failed in similar areas.
- c. Synchronize fallow periods (the period of time between cycles of fish) to allow sea lice infestations to dissipate.

We recommend that these practices be made mandatory for new farms. Already established farms may want to relocate their cages where possible. While relocating may come with a financial investment, farmers are likely to be rewarded with fewer sea lice, thus increasing the number of fish they can sell and minimising treatment costs. New regulations will be able to strike a balance between increased fish welfare and practicality for future farmers.

Many of these suggestions involve technological developments that could be funded and pioneered by the UK.¹¹⁷ One local project that is currently being designed is the Sea Lice Management Decision Support System.¹¹⁸ Similar programs have already been successful in the US,¹¹⁹ and could be further developed by the UK to help the industry fight this fish welfare crisis. Even without these novel programs, existing communication and monitoring systems could be modified to allow for improved monitoring, risk assessment, and communication between farmers.

5.6 Funding of Fish Welfare-Oriented Research

Although many important and actionable strides have already been made towards understanding the needs of fish, the field of fish welfare research is still nascent. The question of whether fish feel pain has, in effect, been answered, but many of the practical steps towards alleviating pain and increasing fish welfare need more research. For example, we do not know the ideal surfacing speed to minimise mortalities from decompression

¹¹⁷ Hatch. (2018). [Manolin - Using Big Data As A Tool For Disease-control In The Aquaculture Industry](#).

¹¹⁸ UK Seafood Innovation Fund. (n.d.). [Sea Lice Management Decision Support System \(FS065\)](#).

¹¹⁹ Harris, W. (2005). [Sea Lice Decision Support System being tested in Newfoundland](#).

injuries and crowding when catching wild fish. We also have not found methods for the effective treatment of sea lice that do not harm the fish involved.

Unfortunately, it can often be difficult for researchers to access funding for fish welfare-related projects (this is true of all animal welfare research). The few welfare-focused granters, such as The Universities Federation for Animal Welfare, are regularly inundated with proposals. However, this has not stopped many UK researchers from obtaining international recognition for their fish welfare research. Government grants earmarked for effective animal welfare research would help support these researchers and push forward the future standards of the aquaculture and fisheries sectors.

6. Conclusion

The UK has been progressive when it comes to animal welfare, but as of now, fish have been excluded from most of these welfare reforms. At a time when production continues to intensify, it is more important than ever that fish welfare be seriously considered. Moving forward, fish welfare must be recognised as a necessary part of building a sustainable, socially-conscious, and ethical food sector. At its best, fish welfare is not only an innately valuable pursuit, but also acts as a guide towards a better food sector overall.

We believe that the suggestions outlined above stand as ambitious but important steps towards properly engaging with the OIE standards that the UK has committed to. They will help put the UK at the forefront of fish welfare and stimulate world-wide change. However, these suggestions are not enough, and continued, incremental efforts toward higher animal welfare standards seem to be the best model for the UK to follow. The aquaculture and fisheries sectors have to reassess their practices to avoid continuous economic loss from diseases and mortalities. With rising temperatures and more severe weather, farming carnivorous and highly migratory species such as Atlantic salmon does not appear to be a

future-proof undertaking. Decision-makers should provide incentives to promote forward-thinking and ethically conscious industry practices.

Ultimately, we believe that fish deserve a seat at the table, and their interests should be included as a factor within any decision that affects them. Stereotypes of fish as unintelligent and unsophisticated have prevented this from happening before now. It is time the question is shifted from whether fish can suffer, to how we are going to protect their interests given that they can.

7. Highlighted Resources

World Organisation for Animal Health. (2019). [Aquatic Animal Health Code](#).

Fisheries

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