

FISH WELFARE and sustainable food production

The Animal Welfare Act covers all animals kept by humans, including fish. Yet, fish welfare is frequently overlooked due to the lack of species-specific regulations, and because they were previously thought to have poorly developed senses. However, recent studies have repeatedly demonstrated the opposite, and there is now a push to safeguard fish to the same extent as other animals. Consequently, we require fresh insights into how to care for fish, we need to rely less on wild-caught fish for fish feed, and we need to start recognizing fish as individual beings.

Approximately three billion people currently consume a significant part of their daily protein intake from fish. Global fish consumption has increased by more than sixfold in the last 70 years, even as 90 percent of commercially important fish stocks have been depleted. This rise in demand has been made possible by the increased captive production of food fish.

Today, about half of the fish we eat has been bred in captivity, and it is projected that nearly two-thirds of the world's fish supply will come from aquaculture by 2030 (1). As a result, between 48–160 billion fish are currently slaughtered on an annual basis in aquaculture (2), with 5–10 millions of those fish slaughtered in Sweden alone.

Aquaculture is viewed by many as a solution to future food production challenges. Indeed, the Swedish government recognizes the potential of aquaculture in the national food strategy, with government investigators estimating that investing in aquaculture could create 1,100 new full-time jobs and bolster growth in rural areas. However, sustainable aquaculture demands new regulations to protect fish welfare. To ensure the success of this initiative, fish producers must be able to guarantee that fish are shielded from unnecessary stress and suffering, particularly as consumer demand for good animal welfare increases.

RECOMMENDATIONS

1. Treat fish as good as other animals

Since the Animal Welfare Act applies to individuals, fish should be considered as individuals rather than counted in kilograms.

2. Develop species-specific regulations for fish

Species specific regulations for fish are necessary and requires new knowledge.

3. Protect wild fish

Develop animal welfare legislation that covers wild-caught fish.

4. Reduce wild-caught fish as feed

Develop sustainable aquaculture that does not rely on wild fish as feed.

5. Stunning and killing equipment for fish should be verified

Equipment for the stunning and killing of fish should be properly tested and verified before it is put on the market.

6. Consumer label for fish welfare

Introduce a product label for the welfare of fish to enable an active choice by consumers.



1. Treat fish as good as other animal

Since the Animal Welfare Act applies to individuals, fish should be considered as individuals rather than counted in kilograms.

Throughout history, humans have considered fish to be animals with poorly developed senses. Numerous national and international investigations have revealed that farmed fish are often subjected to poor welfare conditions. This is largely due to the difficulty in assessing stress, suffering and welfare of fish since they lack many of the behaviors that signal negative stress, pain, and discomfort in other animal species (3). Despite the challenges associated with assessing stress in fish, modern research has demonstrated that fish can possess advanced cognitive abilities. For instance, a blue cleaner fish was able to pass the 'mirror test', a test often used to determine whether an animal is self-aware (4).

The low regard for fish is clearly reflected in the neglect of animal protection and welfare. As previously stated, 48–160 billion fish are slaughtered annually in aquaculture worldwide (2), yet these figures are only estimates since fish are counted in kilograms and not in numbers of individuals. This is paradoxical, as the Animal Welfare Act applies specifically to individuals. To protect the welfare of fish in the future and comply with animal welfare legislation, new regulations should be established where fish are counted and treated as individuals.

2. Develop species-specific regulations for fish

Species specific regulations for fish are necessary and requires new knowledge.

With over 35,000 described species, fish make up for more than half of the world's vertebrates. Due to this high diversity, fish can be found in almost any environment where there is water, consequently resulting in a wide range of unique needs and requirements across the various species.

Despite fish being covered by the Animal Welfare Act, there is still a lack of evidence-based, species-specific information that can serve as a basis for

guidelines on the ethical handling and killing of fish on a large scale. Furthermore, views on fish welfare can vary considerably between different countries, creating problems when practices used in the countries of origin are not acceptable from an animal welfare perspective in countries such as Sweden.

Unfortunately, as new aquaculture species are introduced, knowledge gaps also arise. Generally, the biology and needs of newly introduced 'warm water' fish species differ from the 'cold-water' fish species that are traditionally kept in Sweden (e.g. salmonids). A recent report to the Swedish Board of Agriculture highlighted the lack of available information and knowledge on stress and animal welfare with regards to the stunning and killing of 'warm water' fish species. Although 167 species were covered in the report (that is, species that constitute 65–90 percent of the world's aquaculture production of food fish), relevant information was only available for 11 percent of these species, and there was not enough scientific evidence available to make a firm recommendation for any of them (5). Thus, targeted research efforts for new species are clearly needed to further develop sustainable aquaculture in Sweden.

3. Protect wild fish

Develop animal welfare legislation that covers wild-caught fish.

Approximately 50 percent of the fish we eat today (globally) is estimated to be captive bred. However, this estimate is based on counting fish in kilograms rather than as individual beings. On an individual basis, captive bred fish only represent 2–15 percent of the total number of fish consumed, with wild caught fish accounting for the rest with a total of 790–2,300 billion individuals consumed each year (6). This discrepancy is largely since individual captive bred fish are generally much larger.

Worryingly, wild-caught fish are rarely subject to either animal welfare or hunting legislation and are usually not actively killed but die due to the fishing method or are left to suffocate on the boat. This is of course not a sustainable way to treat animals.



A modern sea pen can be up to 120 meters in perimeter and contain more than 200,000 animals. Assessing the welfare of individuals in this type of system is practically impossible, yet the Animal Welfare Act requires it. Photo: Eugene Sergeev / Mostphotos.

Cleaner fish

Many were surprised when a fish joined the exclusive group of animals that have passed the mirror test used to assess whether an animal is self-aware. The test involves placing a colored dot on the animal and then allowing it to observe itself in a mirror. If the animal examines the dot on itself rather than the dot in the mirror, it is seen as an understanding that it is the animal itself that is being reflected. Like a few primates, elephants, killer whales, dolphins and magpies, this is exactly what a small blue cleaner fish did (4).

Instead of highlighting the blue cleaner fish as a species with cognitive abilities, the result of the study led to a debate about the reliability of the test. This shows that many people relate to fish in a different way, and this is also reflected in the fact that animal protection and welfare for fish is largely neglected.



The blue cleaner fish made world news when it passed the mirror test, which is used to assess whether an animal is self-aware. Photo: Brian Gratwicke, Flickr cc.

4. Reduce wild-caught fish as feed

Develop sustainable aquaculture that does not rely on wild fish as feed.

Many farmed fish are currently being fed with fish meal and oil sourced from wild-caught fish. This practice is unsustainable, with an estimated 450–1000 billion wild-caught fish being used as fish feed each year. Approximately 40 percent of these fish are used to raise salmon (this number increases to 60 percent when including all salmonids) (6). Since salmon only contribute towards 0.3–0.5 percent of the total number of individuals raised in captivity, anywhere between 250–3000 wild-caught fish are required to feed a single salmon.

This puts tremendous pressure on already vulnerable natural fish stocks and thus continuing to feed farmed fish with such large numbers of wild-caught fish cannot be seen as sustainable. The current unsustainability of this system is further highlighted by the fact that 90 percent of the fish used for fish feed is also fit for human consumption (7).

While it is essential that we reduce the use of wild-caught fish in fish feed from a sustainability perspective, it has been demonstrated that captive bred piscivores will not thrive if fish are completely excluded from their diet. Thus, alternative fat and protein sources are required to solve this issue. Indeed, large proportions of fishmeal and fish oil are already being successfully replaced by substitutes such as soy protein, sunflower oil, flaxseed, rapeseed, peas and beans. There are also several promising research projects that are investigating the potential of mussel meal, microorganism and insect substitutes.

Another approach is to focus on fish species that are less dependent on fish in their diet. By adopting sustainable practices and alternative feed sources, aquaculture can reduce its reliance on wild-caught fish and ensure the long-term viability of both farmed and wild fish populations.

5. Stunning and killing equipment for fish should be verified

Equipment for the stunning and killing of fish should be properly tested and verified before it is put on the market.

Currently, there is a pressing issue of finding a way to kill fish in a safe and effective way. The prevalent practices worldwide to kill fish are through suffocation in air and/or evisceration. However, in Europe, regulations stipulate that all fish kept by humans must be stunned before they are killed.

In Sweden, stunning with CO₂ is still permitted despite being associated with several welfare problems and described as being unacceptable from a welfare perspective by both the World Organization for Animal Health (WOAH) and the European Food Safety Authority (EFSA). A ban on CO₂ stunning has been implemented in Norway, a world leader in salmon farming, and they have switched to stunning via percussion or electricity instead. Since it was clear more research was urgently required, the Swedish Board of Agriculture tasked SLU's scientific council for animal welfare in April 2019 to "compile current research and provide a clear picture of the scientific situation in the field of stunning in the slaughter of fish." The council concluded that there was insufficient scientific evidence to support the acceptability of any commercial stunning method currently used for fish.

Insufficient knowledge regarding the acceptability of stunning methods for fish is largely related to the difficulty with determining whether a fish is unconscious or not. Currently, visual behavioral measures are mostly used, even though these measures have proven to be unreliable and can lead to fish being judged as being unconscious up to several minutes prior to actually losing consciousness (5). This represents a serious welfare issue, as throat cutting, bleeding and gutting may be performed on immobile, yet fully conscious animals. A more reliable method for determining whether a fish is unconscious or not is to record brain activity

through electroencephalography (EEG). However, technical difficulties associated with these types of measurements have hindered its use during the development of new stunning equipment.

If there is no requirement for stunning equipment to undergo proper verification (for example via the use of brain activity measurements), then there is a risk that the stunning methods used may not effectively render the fish unconscious and may instead only serve to ease the conscience of human observers.

6. Consumer label for fish welfare

Introduce a product label for the welfare of fish to enable an active choice by consumers.

There seems to be a growing awareness of fish welfare among consumers in Europe and a demand on fisheries to take animal welfare seriously. In a 2018 report, more than 9,000 consumers in nine different European countries (including Sweden) were asked about fish and their welfare (8). As many as 79 percent of respondents said that the welfare of fish should be protected to the same extent as other animals we eat. 57 percent said that they thought the term 'sustainable' should also mean that fish were killed quickly and painlessly, and 79 percent of respondents said they would like to see a product label providing information on fish welfare.

The provision of product labeling that offers information on fish welfare can facilitate informed consumer decision-making and act as a guiding light for the transformation of the fish industry towards sustainability.

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Version 2, April 2023



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