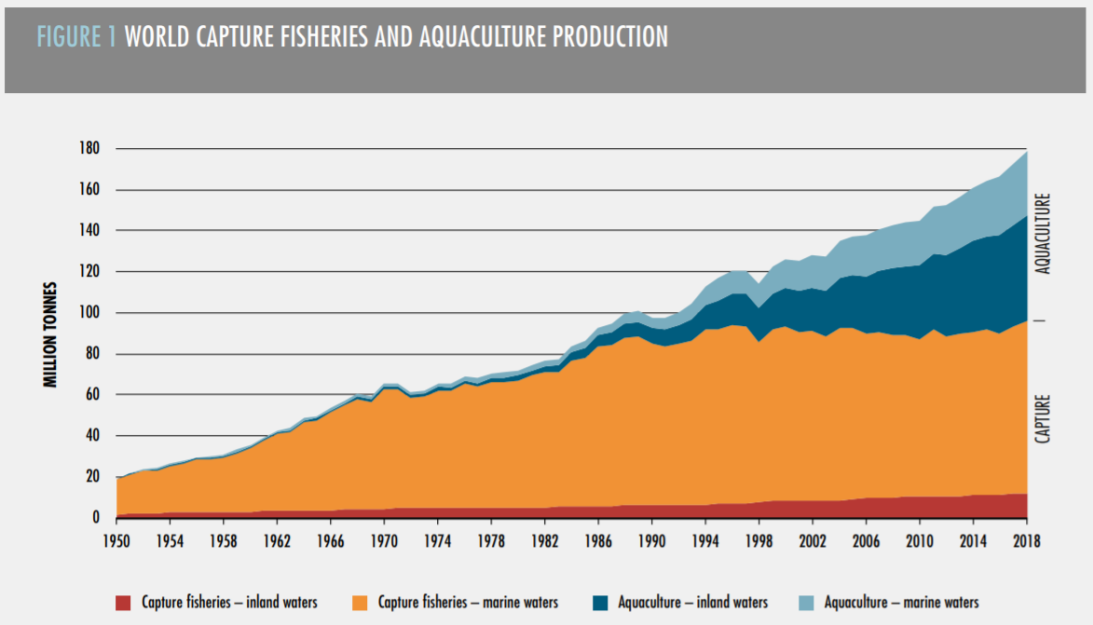
“We now know that fish are cognitively more competent than we thought before [with] some species having very sophisticated forms of cognition … There is as much evidence that fish feel pain and suffer as there is for birds and mammals - and more than for human neonates and preterm babies.”

Victoria Braithwaite, "Do Fish Feel Pain?" (2010) (1)

Introduction to the problem and scale

- Merging all aquaculture production (fish and other aquatic animal species), global production was 82.1 million tonnes in 2018. China alone produces about 40 million tonnes per year and Asia (excluding china) about 20 million tonnes (2).



Global growth of aquaculture and capture fisheries (1950 – 2018) (2).

- Fish aquaculture has been growing by an average 5.7% per year since 2000 (3). Surveys by the Global Aquaculture Alliance showed that aquaculture fish production increased by 73% between 2010-2019 (3).
- In 2017, global farmed fish production was 53.4 million tonnes, accounting for almost half (47.7%) of all aquaculture production with a value of US$ 139.7 billion (4). This has been estimated to include 51-167 billion fish (5).
- Whilst aquaculture reduces pressures on wild overexploited stocks, farming activities can have negative effects on biodiversity by releasing polluting effluents, consuming wild fish for feed, transmitting disease to wild stocks and releasing invasive escaped fish (6).
- The majority of fish farming is intensive, with fish kept in barren environments at high stocking densities to maximise profit and farm productivity. They experience a high risk of

injuries, diseases, and parasite infections, and are limited in their ability to express natural behaviours. Subsequently, their welfare is often deemed to be poor.

- There is evidence that fish are sentient and feel pain (7,8) and as such deserve a good quality of life.
    - Findings from an EU survey: "the majority of EU citizens agree that fish are sentient being (65%), and that they feel both positive (55%) and negative emotions (65%), and that not allowing fish to exhibit natural behaviours has a negative impact on their welfare" (9)
    - South America: a survey of people with higher education showed that 71.8% of participants in Brazil perceived fish as sentient and 79.7% participants in Colombia (10).
- The World Organization for Animal Health (OIE) Aquatic Animal Code, has published recommendations on the welfare of farmed fish during transport, stunning and slaughter (11). In the EU, these guidelines are used as a measure of compliance with EU legislation, but they are rarely followed around the rest of the world.
    - In many countries, fish are not included in animal welfare and humane slaughter legislation.
    - Fish welfare is considered in some certification schemes (e.g. RSPCA and Soil Association), however, many fish-specific schemes focus largely on sustainability issues and omit key welfare issues (12).
    - Fish welfare is, however, being increasingly considered by companies throughout the supply chain in their corporate animal welfare policies (as demonstrated in the Business Benchmark for Farm Animal Welfare (BBFAW) (https://www.bbfaw.com/).
    - South America: in the same survey mentioned above, 72% of participants in Brazil and 76% participants in Colombia believed that fish should be included in humane slaughter regulations (10).
- Although farmed fish tend to have a low food conversion ratio (FCR) (1-2.4), only 14-28% of the protein and 6-25% of the calories used in fish feed is turned into human edible fish (13). Moreover, it takes 3 – 4 tonnes of raw fish to make one tonne of fishmeal and fish oil for fish feed (14).

Link to intensive fish farming

- As of 2016, there were 369 recorded species of farmed finfish (15). However, the most farmed species is carp accounting for 61% of total farmed fish production (16). Each species of farmed fish has a its own characteristics and requirements for maintaining positive welfare.
- In intensive systems, fish are farmed either in nets, ponds or cages, inland or offshore, and are kept at too high a stocking density to obtain sufficient feed from their environment. As well as high stocking densities, intensive fish farms are often characterised by barren environments, high levels of disease and parasites and poor water quality.
- **Welfare Issues are related to:**
- ***Confinement****:* The high stocking densities of fish within a net/pond/cage results in physical injuries such as fin damage from aggressive conspecifics and poor body condition resulting from food competition and stress. High stocking densities can also cause poor water quality and increased risk of disease and parasite infections (17). Fish should be provided with the opportunity to express natural behaviours and access favourable environmental conditions, which is not possible at high stocking densities.

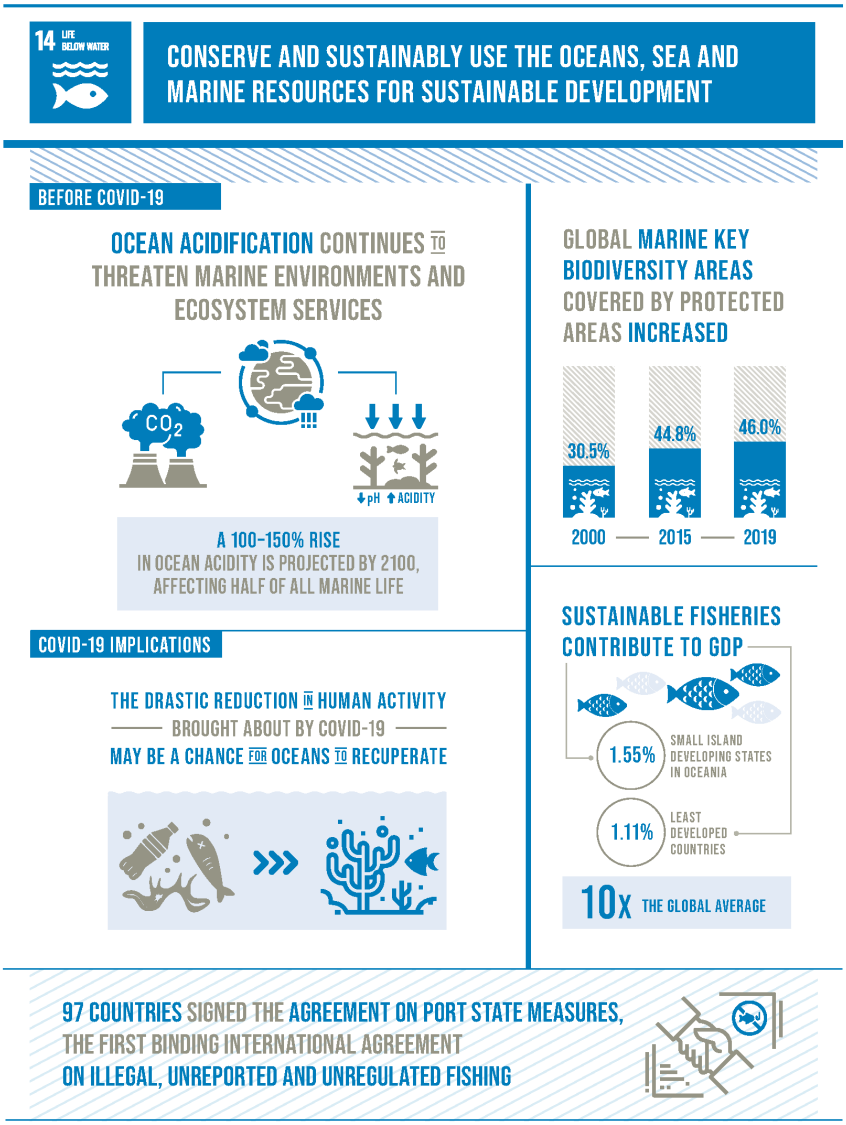
- ***Disease and parasites*:** Diseases and parasites can spread through the water to other farms because of the close proximity between farms in many areas (18), as well as spreading to wild fish (19).
    - In farmed salmon, sea lice are a widespread problem. Sea lice cause open wounds, injuries to the gills and mouth and can result in the infected fish dying. Most sea lice treatments can also cause injury and death for the fish. As the salmon farming industry expands, the number of salmon infected with sea lice is likely to increase.
- ***Transport:*** Fish are transported as juveniles to on-growing facilities (e.g. to sea cages) or from rearing pens to slaughter facilities. Common methods are via well boat (boats with a well in which to keep fish alive), towing of cages by tugs (where the fish must swim to keep up with the speed of the boat), or by road (20, 21). Capture, loading, transport and unloading of the fish for transport, as well as high stocking densities and poor water quality during transport, can cause exhaustion, physical injury and severe physiological stress (22). There are currently no maximum transport times written into legislation for fish and transport is not considered by most certification schemes.
- ***Inhumane slaughter:*** Fish are slaughtered without stunning in many areas. This causes prolonged suffering as death can be slow to occur depending on the killing methods used. This means that millions of fish suffer unnecessarily every year (22). Inhumane slaughter methods (without stunning) involve cutting the gills to sever the blood vessels so that the fish remains conscious while it bleeds out. The use of carbon dioxide to slaughter fish is also still used in some countries, where the fish exhibits head shaking and vigorous tail shaking for up to two minutes before losing consciousness (23). Exposure to air results in fish taking over an hour to lose consciousness, depending on the species (24). Live chilling in ice slurry without an effective stun, traditionally used for bass and bream, can result in the fish struggling for up to 40 minutes (25) and it can take over 3 hours for death to supervene (24). This means that fish slaughtered using air or live chilling may be gutted alive.
- ***Fasting:*** Prior to transport or slaughter, fish are fasted to reduce oxygen demand and physical activity and empty the digestive system to reduce water fouling. In salmonids, for example, 2-3 days is a sufficient fasting period to reduce metabolic rate (11). Some certification schemes, however, allow farms to withhold food for up to two weeks (26).
- ***Crowding:*** In addition to fasting, fish are crowded prior to slaughter at extremely high stocking densities while they wait to be pumped or netted out to be killed. This is a stressful procedure which can lead to reduced water quality and physical injuries from the net or other fish. Fish will often be seen air gasping, attempting to escape (jumping) and burrowing into the net.
- ***Physical health:*** In fish farming, mortality rates during rearing accepted by the industry can be high (up to 20% in pangasius (27)). In addition, occasional disease preventative culls (28) or mass mortality events (29) occur during which tens of thousands of fish die. High stocking densities during rearing and crowding events also cause physical injuries such as fin damage, skeletal deformities, snout and eye damage, and skin/scale damage. Physical health is also impaired as a result of disease and parasites.
- **Environmental and Sustainability Issues are related to:**
- ***Damage to the natural environment:***
    - By weight, almost a fifth of the world's total catch of wild fish is processed into Fishmeal and Fish Oil (FMFO), of which 69% of fishmeal and 75% of fish-oil production are used to feed farmed fish (30). This accounts to 0.5-1 trillion fish being processed into fish feed every year (31).

- Aquaculture can cause environmental pollution and habitat/wildlife destruction because of an excess of nutrients (faeces and uneaten food) and chemical run off from treatments entering the surrounding area (32, 32).
- Approximately 84% of farmed fish are freshwater fish (2) which can put a strain on limited water resources (18).

- ***Damage to wild animals:***
  - Escaped farmed fish can be a threat to wild fish populations. Fish farmed in proximity of wild populations can sully the genetic diversity of wild fish populations and transfer pathogens from farmed fish to wild populations (18). Escaped fish farmed in non-native area can replace endemic species (18).

Link to the relevant SDG(S)

- **SDG 14: Life below water.** Conserve and sustainably use the oceans, seas and marine resources for sustainable development.(34)



Source: https://unstats.un.org/sdgs/report/2020/

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