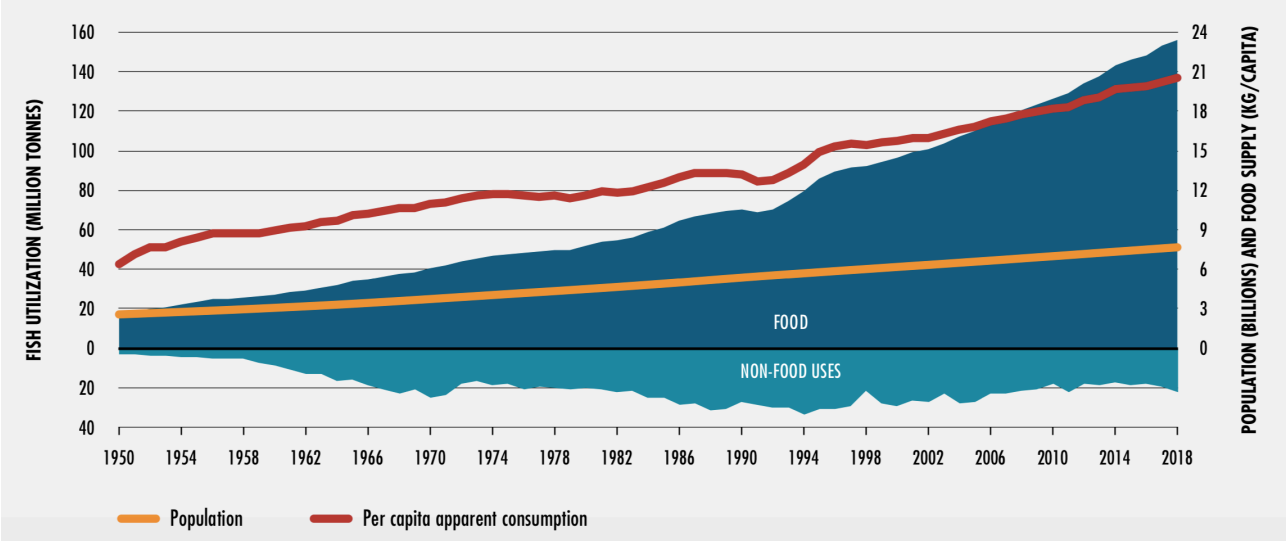
Fisheries:

Can the world face a growing demand for fish while stocks are being depleted and environmental degradation accelerates?

One of the fastest-growing sources of animal protein

Over the last six decades, consumption of fish[1] for food has increased extremely rapidly (3.1% per annum). According to FAO, the global amount of annual fish products consumption was multiplied by almost 8 since 1950, making it the fastest-growing source of animal protein, after poultry meat! [read] Most of the fish is used for food, the rest (around 12%) being employed to make fish oil and fishmeal for animals (Fig. 1).

Fig. 1: Evolution of global fish consumption (food and non-food uses) (1950-2018)



Source: FAO, 2020

Of course, population growth is an important explanatory factor of this increase, but consumption per person also rose remarkably, as it was multiplied more than 3 times between 1950 and 2018.

In East Asia and Pacific (including China), where fish consumption is the highest in the world, it reached just below 40 kg/person/year, almost twice the global average.

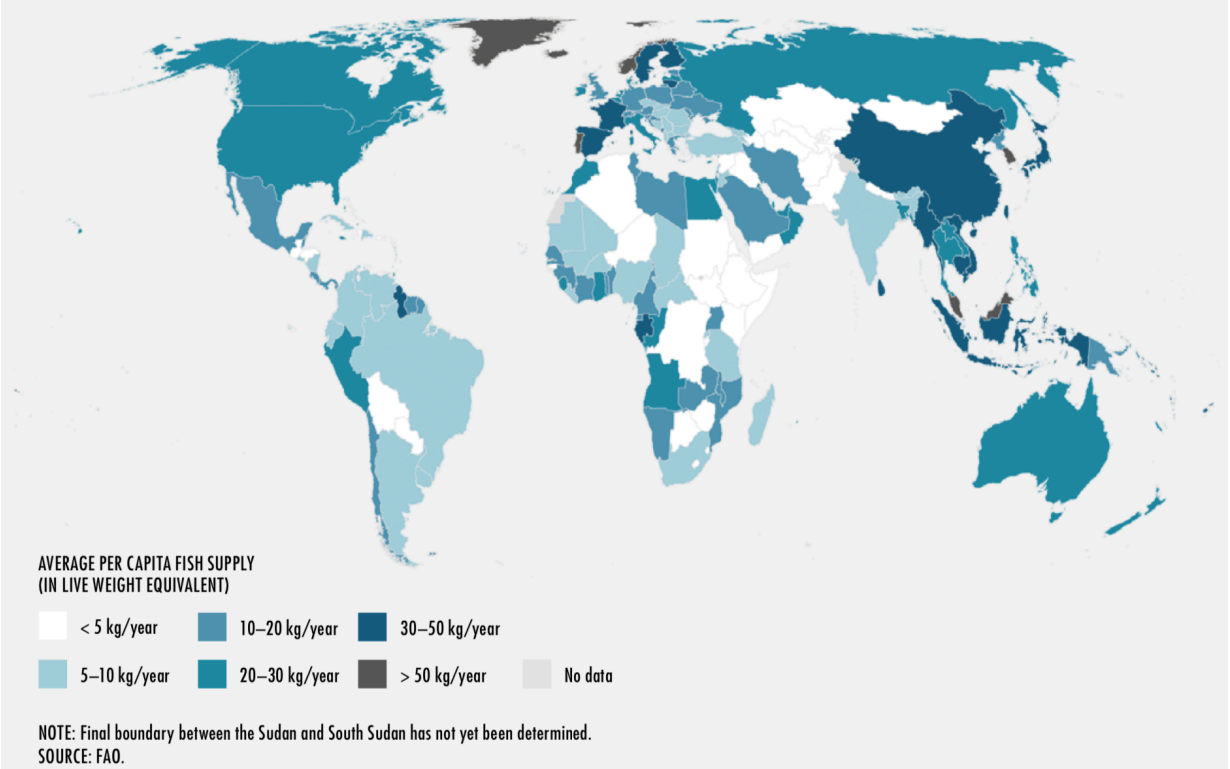
Meanwhile, it is in Africa and South Asia that fish is least consumed (around 8 kg/person/year) (Fig. 2).

[1] Including crustaceans, molluscs and other aquatic animals, but excluding aquatic mammals, reptiles and aquatic plants.

Dynamism of demand for fish can be explained by their very high nutritional quality. Many governments have advised their population to eat more fish [read] and considerable efforts have been made worldwide to boost supply through the development of aquaculture. This makes some say that if consumption increased so much, it is also basically because the availability of fish products improved greatly in recent decades. In addition, better incomes, particularly for the middle-class living in urban areas, have made it possible for a larger number of people to afford fish.

Nowadays, more than 3 billion people get more than 20% of their animal proteins from fish.

Fig. 2: Average annual fish consumption per person in different countries (1997 to 2017)



Source: FAO, 2020

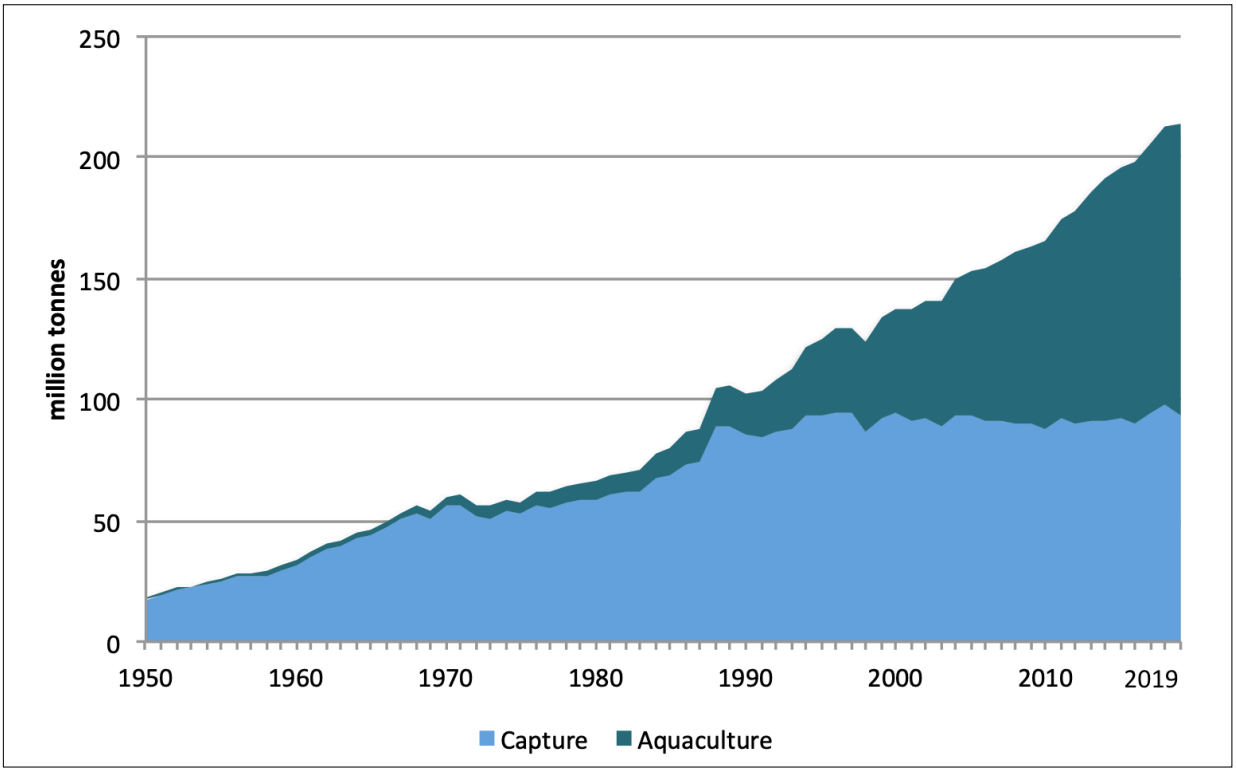
More than half of the fish produced in the world comes from aquaculture

Fish production has increased twelvefold since the 1950s. Until the 1970s, more than 90% of fish was coming from capture fisheries. In the decades that followed, aquaculture developed at a record speed, sometimes above 10% per annum. By 2019, aquaculture had become more important than capture fisheries and it supplied 56% of total fish production (120 million tonnes) (Fig. 3).

Between 1950 and 2019, the volume of fish from aquaculture had grown more than 200 times! Most of this boom (80%) took place in Asia, with China being top with 57% of world aquaculture output.

In fact, aquaculture became the main source of fish in China, as it provides more than 80% of fish consumed in the country. In contrast, it supplied only 7% of fish in Sub-Saharan Africa.

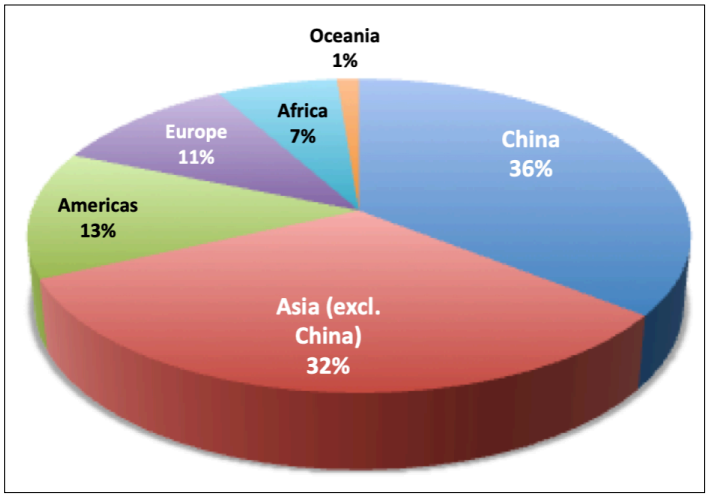
Fig. 3: Evolution of global capture and aquaculture production (1950 to 2019)



Source: FAO data

Fisheries production (marine and aquaculture), in its majority, originates from Asia (68%), with China alone producing more than one third of global fish (Fig. 4).

Fig. 4: Distribution of fish production by region (average over 2010-2018)



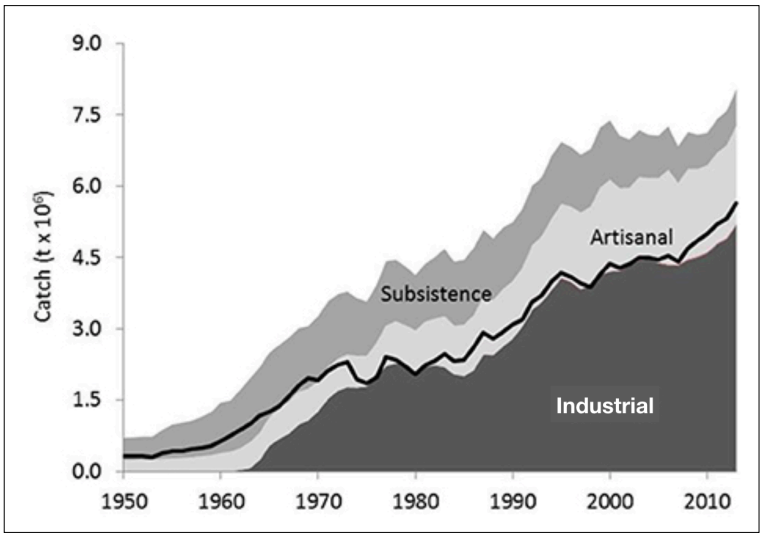
Source: FAO data

Fisheries is a source of livelihood for around 500 million people worldwide

FAO estimates that almost 60 million people earn their living from fisheries, two thirds from capture fisheries and one third from aquaculture, most of them (more than 80%) being in Asia [read]. It is believed that altogether about 180 million people work in fish-related value chains (production, processing, marketing, etc.) and provide a source of livelihood for a total of 500 million people. This is roughly comparable to the number of people relying on forests [read].

There is paucity in data and information on how fisheries production is shared between small-scale fisheries and large industrial fisheries, and there is some evidence that the contribution of small-scale fisheries is underestimated and neglected by national and regional policies. Some studies suggest that small-scale fisheries play a central role in food security of fisherfolk themselves as well as for their country. They also indicate that their part in the fish catch is decreasing as industrial fisheries gain importance. In South-East Asia, for example, the estimated share of industrial fisheries varied depending on the country, and grew considerably since the 1960s to reach almost two thirds of the total by 2013 [read] (Fig. 5).

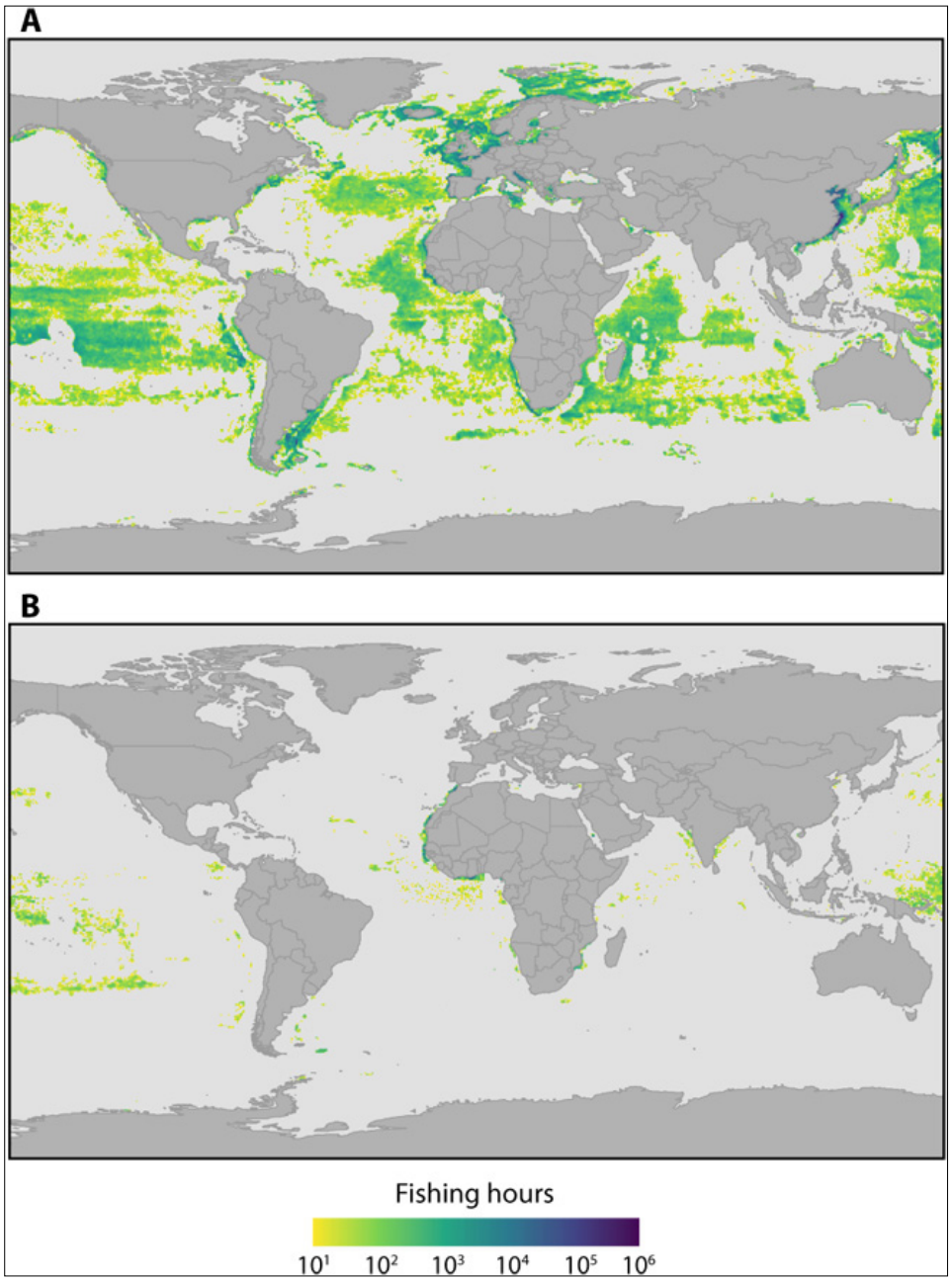
Fig. 5: Evolution of total reconstructed catch of Cambodia, Malaysia, Thailand, and Vietnam showing the contribution of different sectors (1950-2013)



Source: Teh et al., 2018.

Industrial high sea fisheries are overwhelmingly in the hands of rich countries, as results from the use machine learning technologies applied to big data analysed by the Global Fishing Watch platform (Fig. 6) [read].

Fig. 6: Geographic distribution of industrial fishing
(A: flagged in rich countries; B: flagged in poor countries)



Source: McCauley et al., 2018.

The development of industrial fisheries has been tarnished by violations of human rights and labour regulations, and cases have been reported of abuse of vulnerability, deception, restriction of movement, isolation, physical or sexual violence, child labour, intimidation or threats, retention of identity documents, withholding of wages, debt bondage, abusive working or living conditions and assigning excessive overtime to workers [read].

In addition, contractual arrangements between coastal countries and large fishing corporations have often been characterised by a lack of transparency and participation in the decision-making and implementation process by key stakeholders from the sector, i.e. local fishermen, fish processors, scientists and NGOs. In several cases, opacity in the granting of fishing permits created controversies [read]. More efforts are needed to ensure that money collected supports public good and that the environmental, social and economic impact of industrial fishing practices are properly conducted [read], particularly as it is known that industrial vessels interact more profoundly with the habitat (operating on or close to the seafloor), including with vulnerable ecosystems [read].

Fisheries and health - benefits and risks

The nutritional benefit of fish

Fish provides high-quality animal protein and polyunsaturated fatty acids that are healthy fats which can help reduce 'bad' cholesterol levels in blood [read]. Fish products also contain a large array of micronutrients critical for nutrition security (e.g. essential amino acids, vitamins A, B and D, iron, calcium, zinc and selenium). They have other beneficial metabolic effects [read] and are particularly good for the physical and cognitive development of children [read].

Health risks associated to fish consumption

Water (both freshwater and seawater) is increasingly contaminated by various pollutants such as plastic, nitrogen, phosphorous, mercury and other heavy metals, pesticides, organic matter such as pharmaceuticals and antimicrobial, as well as acids [read pp. 5-7]. These elements are now being found frequently in fish products [read] and can be progressively accumulated in the bodies of those who consume large amounts of contaminated food. When present in quantity in human organs, they may cause inflammation and are associated to serious health impacts, particularly in women [read].

Moreover, fish may also be contaminated by mycotoxins synthesized by fungi that have been found to cause cancer. Such contamination is quite common in aquaculture where the fungi originate from the feed employed to raise fish [read].

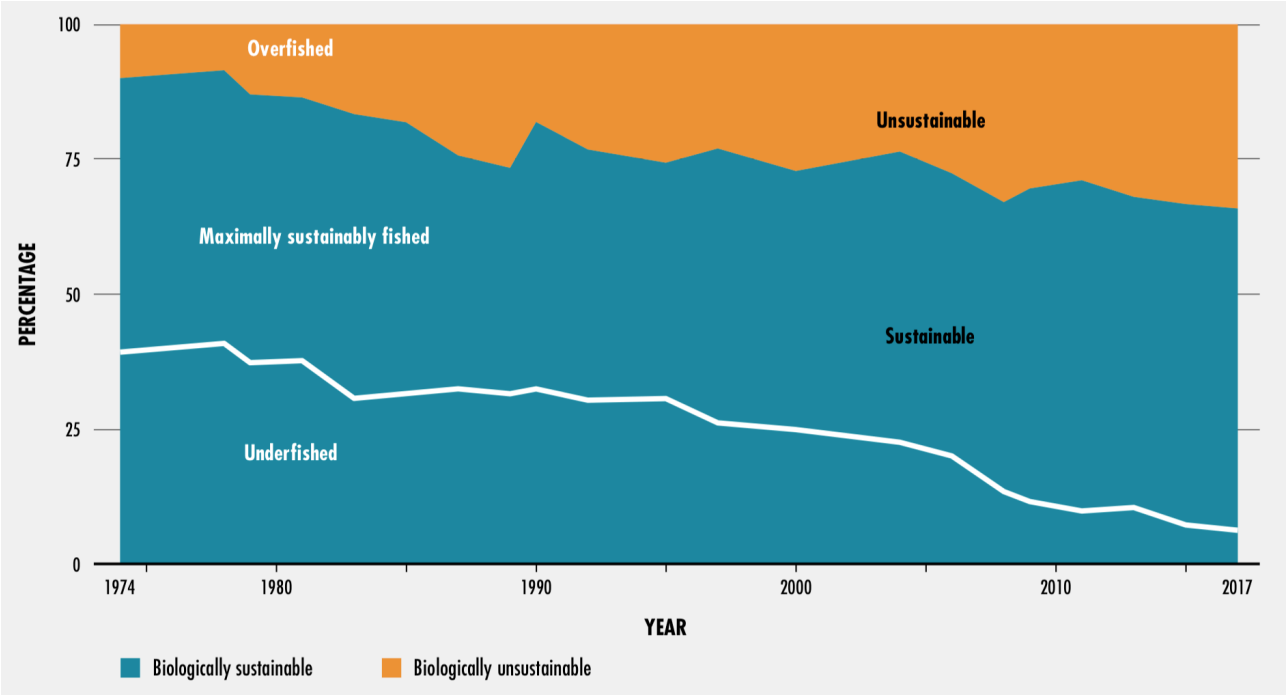
Also very frequent in aquaculture is the presence of antimicrobials used for growth performance enhancement, disease prevention, treatment and control. These substances that are often applied systematically and in large quantities both in fish and livestock production, are known to induce antimicrobial resistance. In 2019, almost 5 million people who died suffered from at least one infection resisting to antibiotics and antimicrobial resistance cause directly the death of more than one million people. This figure is projected to reach 10 million annually by 2050 [read here and here].

Overfishing depletes fish stocks and threatens future fisheries

According to FAO, world marine fish stocks are being progressively depleted. Whereas in 1974, only 10% of fish stocks were overexploited, this proportion was more than one third in 2017. Meanwhile underexploited stocks have fallen to less than 10% of total [read] (Fig. 7).

Overfishing is particularly important in the Mediterranean and Black Sea (almost two thirds), followed by the South-East Pacific and South-West Atlantic [read].

Fig. 7: Evolution of global marine fish stocks (1974–2017)



Source: FAO, 2020

More generally, there are signs that marine ecosystems and their resources are degrading: for instance, around half the live coral cover on coral reefs has been lost since the 1870s, with an accelerating trend in recent decades, as climate change exacerbates the effects of other factors such as overfishing and pollution [read].

This evolution clearly is a threat for the future of fisheries.

Fisheries and climate change

Fisheries are an important emitter of greenhouse gases (GHGs)

Fisheries weigh 2.6% of food-related emissions, generating annually around 180 million tonnes of CO_2 equivalent (more than the total GHG emissions of The Netherlands) [read].

GHG emissions from the fishing industry increased by 28% between 1990 and 2011, while emissions by tonne of fish jumped by 12% [read].

Marine fisheries are a particularly energy-intensive activity (40 billion litres of fuel per year). The more fish stocks degrade, the more there will be a need for fuel to produce the same amount of fish.

Primary aquaculture generates less GHG per kilogramme of food than terrestrial animals or fish from capture fisheries. However it has negative environmental consequences, affects water quality and reduces marine biodiversity [read].

Fisheries also suffer from climate change

The warming of seas and oceans caused by climate change creates heat stress, affects biological processes in time and reduces productivity of marine systems. At the same time, higher acidity of waters impacts on calciferous marine life (e.g. foraminifera, algae, coral, crustaceans and shells) and its productivity. Researchers have estimated that ocean warming, acidification, deoxygenation and sea-level rise could lower maximum catch potential of tropical fish stocks in some tropical zones by up to 40% by 2050, compared to the beginning of the century, if there are no serious efforts to cut GHG emissions [read].

More violent storms and high wave actions make fishing at sea more dangerous and disrupt coastal fisheries activities, causing loss of output, as the sea level rises. Theses consequences are felt more in small equatorial and northern islands. Warming and acidification of oceans impact more fish catch at higher latitudes, while flooding, cyclones and high waves affect more equatorial countries [read].

Climate change also impacts the distribution of fish stocks, alters their species composition and their productivity. Movements of fish populations could create conflict about fishing zones [read].

Conclusion

Demand of fish has followed an impressive trend in recent decades. This great success was possible because of an extraordinary development of aquaculture, particularly during the last 30 years, while capture fisheries stagnated due to a fall of global fish stocks.

The success of fish is to a large extent the result of information campaigns directed at consumers regarding the advantages this food has in terms of health (high-quality animal protein, polyunsaturated fatty acids and various micronutrients). Unfortunately, the pollution of waters (freshwater and oceans) dampens the sanitary pros of fish, as its flesh contains more and more frequently non-negligible amounts of toxic substances. This is likely to seriously threaten consumer enthusiasm (and demand) for fish.

The environmental impact of the development of fish consumption is not negligible either. Aquaculture, although efficient from the point of view of GHG emissions, contributes to the degradation of water quality, harms biodiversity and participates in the worrying progress of antimicrobial resistance.

Marine fisheries too, is less and less sustainable: declining fish stocks, high GHG emissions and outrageous violations of human rights and labour regulations, particularly in the case of industrial fisheries. Moreover, this sector is especially vulnerable to climate change.

The answer to the question raised in the title of this document will depend on what will be done to address the issues described here. These issues require thorough measures and the adoption of sustainable practices from the economic, social and environmental perspective, in order to avoid a fading out of the popularity of fish that would then remain in our memory as a flash in the pan that lasted only a few decades.

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(March 2022)

To know more:

- FAO, Sustainable Development Goals, Indicator 14.4.1 - Proportion of fish stocks within biologically sustainable levels, (online).
- UNEP, From Pollution to Solution: A global assessment of marine litter and plastic pollution, United Nations Environment Programme, Nairobi, 2021.
- FDA/EPA, Advice About Eating Fish - For Those Who Might Become or Are Pregnant or Breastfeeding and Children Ages 1 – 11 Years, US Food & Drug Administration and US Environmental Protection Agency, 2021.
- FAO, The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome, 2020.
- Teh L. C. L. and D. Pauly, Who Brings in the Fish? The Relative Contribution of Small-Scale and Industrial Fisheries to Food Security in Southeast Asia, Sea Around Us, Institute for the Oceans and Fisheries, The University of British Columbia, Vancouver, Canada, 2018.
- McCauley, D.J., et al., Wealthy countries dominate industrial fishing, Science Advances Vol 4, Issue 8, 2018.

Selection of past articles on hungerexplained.org related to the topic:

- Water resources: water stress and pollution, 2022.
- Pervasive plastic (Season 2) : in the Mediterranean Sea and in our food, 2019.
- Pervasive plastic: from food in plastic to plastic in food, 2018.
- Fisheries and aquaculture in troubled waters, 2018.
- Seafood and tobacco blamed for being responsible for the high level of metal contamination of pregnant women in France, 2017.
- Opinion: Catastrophic Antibiotic Threat from Food, 2017.