

# An Analysis of Solutions to Overfishing

Lillian Dick

September 2022

## Problem/Context

Our seas and the countless species which inhabit them are increasingly threatened by aquaculture: 70% of the 460 stocks managed by the National Oceanic and Atmospheric Association are being overfished, and 55% have been overfished.<sup>1</sup> Overfishing is detrimental both to the health of aquatic ecosystems, but also to many societies whose culture and economies are reliant on aquaculture and the oceans. The depletion of a certain species through overfishing can lead to the depletion or overpopulation of countless other species, and this shift can throw off the equilibrium of oceanic ecosystems. Therefore, overfishing not only affects a specific species, but also the entire food chain and the aquatic environment itself. In addition, when a species becomes depleted, people are no longer able to fish and eat those stocks, and this can be detrimental to economies and cultures.

The implications of overfishing are magnified in subsistence-fishing reliant communities, where the depletion of a certain species is no longer an inconvenience, but a matter of survival, as people may no longer have access to sufficient food. Certain communities are heavily reliant on the fishing economy and others may rely on seafood as their primary source of protein. I have chosen to focus my analysis on commercial fishing, because recreational fishing accounts for less than 1% of global seafood catch.<sup>2</sup> While recreational fishing may target endangered species, it occurs on such a small scale compared to commercial fishing that targeting it is less impactful. Additionally, commercial fishing often employs tactics that are harmful to the environment, such as trolling, that recreational fishing rarely employs.

## Solutions

Given the vast nature of the issue of overfishing, there are countless solutions at hand to address the problem.

## Nuances of Problem and Solutions

There are countless issues at stake in the current seafood industry. Commercial fishing vessels have been cited for countless human rights violations including having slaves.<sup>3</sup> Marine animals

---

<sup>1</sup> <https://www.fisheries.noaa.gov/national/sustainable-fisheries/status-stocks-2020>

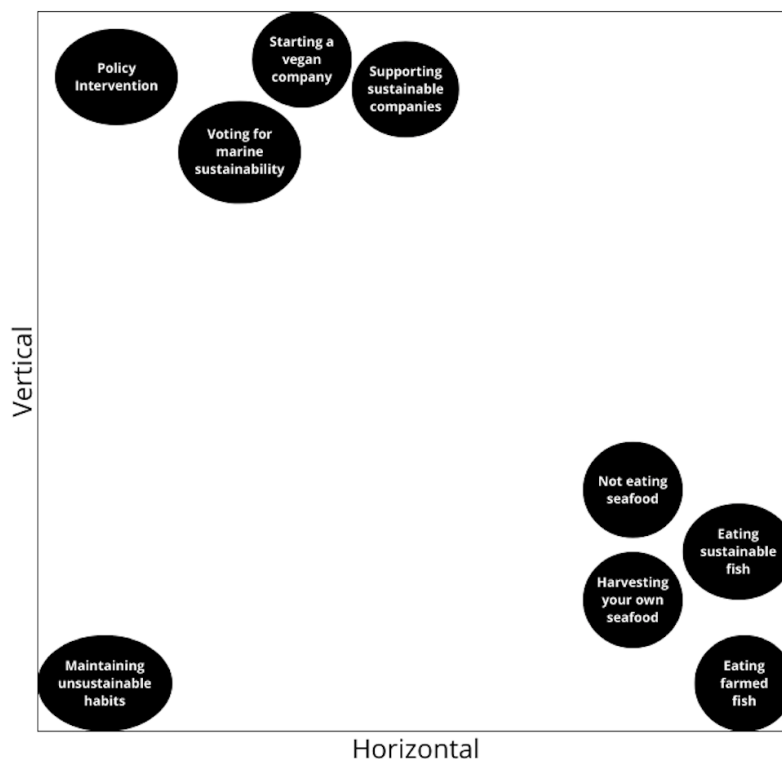
<sup>2</sup>

<https://www.frontiersin.org/articles/10.3389/fmars.2020.00012/full#:~:text=Marine%20recreational%20catches%20thus%20account.of%20total%20global%20marine%20catches.>

<sup>3</sup> <https://www.nytimes.com/2015/07/27/world/outlaw-ocean-thailand-fishing-sea-slaves-pets.html>

are subject to cruel treatments and deaths. Aquatic environments are being destroyed, through over-fishing, harmful fishing methods, and poorly managed fish farms. I have chosen to structure this brief around methods of addressing the issue of overfishing and species depletion. Given the wide array of relationships that people have globally with seafood, there is no one right solution for dealing with overfishing. Certain solutions may be realistic for some and not possible for others. In addition, it is important that any legislation does not unfairly impact subsistence fishermen and force them to bear the consequences of the issue of overfishing, which has mostly been caused by large commercial fishing operations.

## Horizontal and Vertical Solutions



Given the vast nature of the problem at hand, there are countless ways of addressing the issue. People may proceed in a “horizontal” matter, in which they make changes to their own lifestyle which are lacking systemic impact. For example, choosing to go vegan would be a horizontal method to mitigate the effects of meat consumption. Going vegan is a personal decision and mostly affects the individual. People may also address the issue “vertically,” meaning that they strive to achieve systemic changes in order to have a greater impact.<sup>4</sup> Drafting legislation to ban industrial meat operations would be an example of a vertical method, because it directly attempts to reform a system, rather than make an alteration to a single person’s lifestyle.

---

<sup>4</sup> Pauly, D., and Jennifer Jacquet. *Vanishing Fish: Shifting Baselines and the Future of Global Fisheries*. Vancouver, David Suzuki Institute, 2019.

Horizontal methods are generally more accessible and easier to perform, but less impactful. However, when performed by many people, they can be very impactful and lead to vertical change.

Different people are able to address issues in many different ways. For example, a policy maker is in a very strong position to enact vertical change. They have the voice and the power to reform a system. However, a child is not in that position. A child may be best suited to perform a horizontal method, by going vegan or simply by discussing these issues with their parents.

Methods, however, often do not fit cleanly into either vertical or horizontal. For example, one could argue that while going vegan has the greatest impact on the individual, if enough people did it and meat operations shuttered, then that horizontal, personal change would have had vertical implications. Pauly's method of categorization is in no way meant to be perfect, it is simply a way to think about addressing an issue.

## Solution 1: Only eating farmed fish

Many studies have suggested that eating farmed fish, rather than wild caught fish, is a promising solution to the issue of overfishing. I would argue however, that reality very much depends on the fish being consumed. When carnivorous fish are farmed, they are fed a diet which consists of smaller, wild caught fish such as anchovies. Because of the laws of conversion, only 10% of the energy from that smaller wild caught fish is transferred to the farmed fish, meaning that a tremendous amount of wild caught fish must be harvested in order to feed a farmed fish. Therefore, the farming of carnivorous fish leads to the overfishing of other fish further down the food chain, and the depletion of these species may have detrimental ramifications for the wild caught populations of the farmed fish, which rely on them for food. Consuming farmed herbivorous fish may be a sustainable alternative to wild caught fish, if produced in a responsible manner, however herbivorous fish is generally less healthy for humans than carnivorous fish. Fish farming operations have been cited for allowing tremendous amounts of fish waste to seep into wild environments and allowing fish to escape into the wild environment, both of which threaten wild populations and ecology.

## Solution 2: Labels

A wide variety of seafood labels have been created in order to offer consumers more information on the sustainability and safety of the foods they are purchasing.

One of the most common labels is "dolphin safe," which was established in 1990 and codified into law by the US Congress, and which signifies that the harvest of tuna did not result in the chase, capture, injury, or death of dolphins. In order to obtain the label, captains must have attended a training course and they must certify in a written statement that they have complied with the procedures.<sup>5</sup> While enforcement of the certification is somewhat lacking, the implications of the label have been significant, as dolphin mortality as a result of tuna fishing has

---

<sup>5</sup> <https://www.fisheries.noaa.gov/national/marine-mammal-protection/dolphin-safe>

dropped from the hundreds of thousands to the hundreds since the establishment of the label. All in all, the “dolphin safe” label is not perfect, however it is a difficult issue to enforce and it is a step in the right direction.

“MSC Certified” is another common label which is applied to wild-caught seafood which has been caught following the Marine Stewardship Council’s sustainable fishing practices. These practices include only fishing sustainable stocks and fishing them at a sustainable level, minimizing the environmental impacts, and ensuring that operations are well managed, meaning that they are adaptable and comply with laws.<sup>6</sup> The MSC certification is very widespread, as the organization claims to have certified 8% of global seafood catch, and it is very powerful, as it is worth more than \$3 billion. People view sustainable seafood as very important and they tend to be very confident in the MSC certification –possibly more confident than they should be. The MSC certification was created in part by Unilever, a major seafood provider, so that they do not deplete many more of their fish stocks. This seeming conflict of interest has been brought to light much more recently.

There are a few issues associated with the MSC certification process. First of all, MSC does not certify entities themselves. Instead, around a dozen commercial auditing companies must decide if the operation meets MSC’ standards. This certification process adds even more subjectivity to an already subjective set of standards. In addition, the certification process can cost firms \$150,000 or more, which makes it nearly impossible for smaller fishing entities.<sup>7</sup> Because said entities may not have the funds to obtain the MSC certification to which so many people have grown accustomed, people may believe that these vendors are unsustainable, when in actuality smaller suppliers tend to have a lesser environmental impact than large commercial trolling vessels. The MSC certification thereby may harm smaller fishing operations.

In addition, many experts have accused MSC of certifying fisheries that are not in fact sustainable, such as overfished fisheries. This may be in part because the MSC feels obligated to certify a large number of fisheries in order to keep up with the demand for their products.<sup>8</sup>

### Solution 3: Eating only sustainable fish

Some seafood stocks have been deemed sustainable by multiple entities, and eating these stocks may be a solution to overfishing. I will discuss the nuances of the blue mussel and tilapia fisheries, which are a farmed mollusk and a farmed fish respectively. There are countless other nuanced fisheries that I could have discussed. I chose to discuss Tilapia because of its affordability and prevalence as a highly farmed fish. I chose to discuss Blue Mussels because they are very prevalent along the eastern seaboard and they can be grown in NYC waters. Most oysters and mussels however are considered sustainable as they are filter feeders who actually clean the water.

---

<sup>6</sup> <https://www.msc.org/standards-and-certification/fisheries-standard>

<sup>7</sup> <https://www.npr.org/2013/02/11/171376509/is-sustainable-labeled-seafood-really-sustainable>

<sup>8</sup> <https://www.npr.org/2013/02/11/171376509/is-sustainable-labeled-seafood-really-sustainable>

## Tilapia

Tilapia is considered to be a somewhat sustainable farmed fish. Tilapia is not a particularly nutritious fish. The nutrient content of the fish is determined by what the fish are fed. In the wild, tilapia eat lake plants and algae, which give them omega-3 fatty acids, which are very beneficial for humans. Wild Tilapia however has less than a tenth the omega-3 content of wild salmon, and tilapia contains more omega-6, which is not considered the most healthy, than omega-3.<sup>9</sup> Farmed tilapia are fed corn and soy, which makes the fish even less nutritious.<sup>10</sup> Feeding tilapia corn and soy comes with its own environmental downsides, as the production of such crops requires a tremendous amount of water and requires deforestation in order to gain more farm-land. In addition, many Asian tilapia growers have been cited as using manure in order to stimulate algae growth for the fish to eat. The consumption of said crops, however, may be considered less harmful than consuming other fish stocks and thereby depleting those, as some carnivorous fish do. In certain cases, experts have suggested that the fish may have consumed some of the manure, however the facts surrounding this idea are not extremely credible.<sup>11</sup> Tilapia are very adaptable and considered easy to raise. They are raised in pens in lakes, rivers, oceans, or tanks.<sup>12</sup> Most of the tilapia consumed in the US is imported from Asia, where there are very few regulations ensuring the sustainability of the fishery. The waste from the farms is often not properly disposed of and it may contaminate waterways, and the fish may escape and invade an ecosystem.<sup>13</sup> Many tilapia are also treated with testosterone early in life in order to create an all male stock which will grow faster.<sup>14</sup> While farmed tilapia is preferable over the depletion of wild stocks through fishing, it may not be sustainable in the long-term without significant progress. If an increasing number of people rely on tilapia as a sustainable fish stock and the methods of production remain the same, then the amount of crops harvested to feed them, as well as contamination of water-ways from their waste will increase.

## Blue mussels

Blue mussels are considered to be a highly sustainable fishery. They are not known to have any environmental downsides, and in fact they benefit the environment by removing excess nutrients and improving water quality. They can also be grown in tidal zones or in the open

---

9

<https://www.healthline.com/nutrition/tilapia-fish#:~:text=The%20bad%20news%20for%20tilapia,thn%20it%20does%20omega%2D3.>

10

<https://www.nytimes.com/2011/05/02/science/earth/02tilapia.html#:~:text=%E2%80%9CThey%20are%20what%20they%20eat.decently%20with%20little%20or%20none.>

11

[https://www.washingtonpost.com/lifestyle/food/tilapia-has-a-terrible-reputation-does-it-deserve-it/2016/10/24/4537dc96-96e6-11e6-bc79-af1cd3d2984b\\_story.html](https://www.washingtonpost.com/lifestyle/food/tilapia-has-a-terrible-reputation-does-it-deserve-it/2016/10/24/4537dc96-96e6-11e6-bc79-af1cd3d2984b_story.html)

12

<https://www.healthline.com/nutrition/tilapia-fish#:~:text=Wild%2DCaught%20vs%20Farm%2DRaised&text=%E2%80%9CThis%20means%20the%20fish%20are.%2C%20rivers%2C%20oceans%20or%20tanks.>

13

<https://www.nytimes.com/2011/05/02/science/earth/02tilapia.html#:~:text=%E2%80%9CThey%20are%20what%20they%20eat.decently%20with%20little%20or%20none.>

<sup>14</sup> <https://moa.gov.jm/sites/default/files/pdfs/Testosterone%20in%20Tilapia.pdf>

ocean and they do not require any food, as they filter phytoplankton directly from the water.<sup>15</sup> Because blue mussels are not fed anything besides phytoplankton, issues of conversion are not present in this fishery. In addition, there are no animal ethics concerns in this fishery as research has shown that mussels do not feel pain.<sup>16</sup>

#### Solution 4: Fish-free diet (industrialized vs. non-industrialized)

For some, a fish-free diet may seem like an obvious solution to the issue of overfishing. However, people's circumstances play a tremendous role in whether this is even an option for them.

In an industrialized setting, fish consumption tends not to be a necessary part of one's diet. There are far fewer instances of protein deficiency in these countries, so people are rarely reliant on fish as a primary source of protein. Also, people in these countries rarely rely on fish for essential nutrients like iodine because, often as a result of government regulation, these nutrients are included in other foods. Also, because of large-scale commercial fishing, fish is seemingly unlimited in these countries and over consumption means that industrialized countries are having the largest impact on overfishing. In industrialized countries seafood is often a luxury and people are easily able to switch to other, less expensive sources of nutrition. Removing seafood from one's diet will lessen the impact of overfishing.

However, if someone were to replace seafood with something like beef, there may be more harmful environmental impacts. A tremendous amount of land must be cleared on which cattle must live. Land must also be cleared in order to grow crops for the cattle to eat. A tremendous amount of water is used to grow these crops and to feed the cows. Methane, a greenhouse gas many times more heat trapping than carbon dioxide, is released from the cow's digestion. Beef production results in land destruction, greenhouse gas emissions, and resource depletion, all of which contribute to climate change. The production of any livestock higher up on the food chain requires a larger number of resources to be used, most of which are wasted as only 10% of the energy from something is transferred to the cow.<sup>17</sup> Therefore, if someone were to replace seafood with something very low on the food chain, such as vegetables, fewer resources would be used in its production, and the environmental impact would be smaller. There would still be an environmental impact however, as plants require farm land, water, and nutrients in order to grow. Therefore, the environmental benefits of removing seafood from one's diet depend on the foods with which seafood is replaced.

In a non-industrialized setting, or a coastal setting which is reliant on seafood, removing seafood from one's diet often may not be possible. In certain locations, farming may be for subsistence, meaning that people are fishing in order to feed their families. In this case, people may not have access to alternate foods and therefore are unable to remove seafood from their

---

<sup>15</sup> <https://www.fisheries.noaa.gov/species/blue-mussel>

<sup>16</sup>

[https://www.washingtonpost.com/lifestyle/food/why-i-eat-oysters-and-mussels-even-though-im-otherwise-vegetarian/2016/02/04/d284fd4e-c9c4-11e5-88ff-e2d1b4289c2f\\_story.html](https://www.washingtonpost.com/lifestyle/food/why-i-eat-oysters-and-mussels-even-though-im-otherwise-vegetarian/2016/02/04/d284fd4e-c9c4-11e5-88ff-e2d1b4289c2f_story.html)

<sup>17</sup> Schlottmann, Christopher, and Jeff Sebo. *Food, Animals, and the Environment: An Ethical Approach*. Abingdon, Routledge, 2019.

diets. Because these people are typically not using tremendously destructive fishing techniques like trolling on a large scale and because they are not catching vast amounts of fish, they are not the main contributors to over-fishing. In fact, they are often the ones most impacted by overfishing, because they are no longer able to catch the fish on which they rely. In addition, these people rely on fishing for their jobs and for the stability of their local economy, so they are unable to simply stop fishing.

## Solution 5: Eating smaller fish

Renowned marine scientist Daniel Pauly suggests that consumers simply eat smaller fish as a tactic to mitigate overfishing. Because of the 10% law of conversion, animals higher up in the food chain consume a larger number of organisms in order to reach maturity. Smaller fish therefore consume fewer resources, so eating them has a smaller footprint. Because smaller fish consume less, there is far less bioaccumulation of heavy metals in their bodies –this makes them healthier for humans than larger fish. In addition, smaller fish tend to reproduce earlier in life and have shorter lifespans, meaning that their population is able to remain more stable when dealing with overfishing. While eating these smaller fish may be more sustainable than eating large fish like tuna, there might still be negative environmental impacts associated with their overfishing. Because these small fish play a crucial role in so many species' diets, if they were to be depleted, countless other species higher up in the food chain may suffer. Also, even these small fish like herring, sardines, and anchovies are omnivores, and small animals like plankton play a key role in their diet.<sup>18</sup> Consequently, farming them is still not the most sustainable practice as it would require plankton to be harvested from the wild.

## Conclusion

There is no perfect solution to the issue of overfishing because people have tremendously different relationships with seafood. Solutions that mitigate overfishing may not be the most effective at addressing other issues with aquaculture, such as human-rights violations and seafloor destruction. I believe that whatever change someone can make in order to take care of the sea and of their community is the best solution. The issue of overfishing is very significant and people will need to take significant steps in order to address it. For example, people may have to make sacrifices to their own practices, whether it be eating new foods or practicing a different method of harvesting. Whether someone becomes a vegan or simply catches a few less fish or a different species of fish, that is impactful. In order for meaningful change to occur at a large scale, however, we must consider vertical interventions such as passing legislation to curb overfishing. People and governments across countries must come together to address the pressing issue of overfishing.

---

<sup>18</sup> <https://education.nationalgeographic.org/resource/marine-food-chain>