AQUACULTURE ACCOUNTABILITY PROJECT

FARMFORWARD

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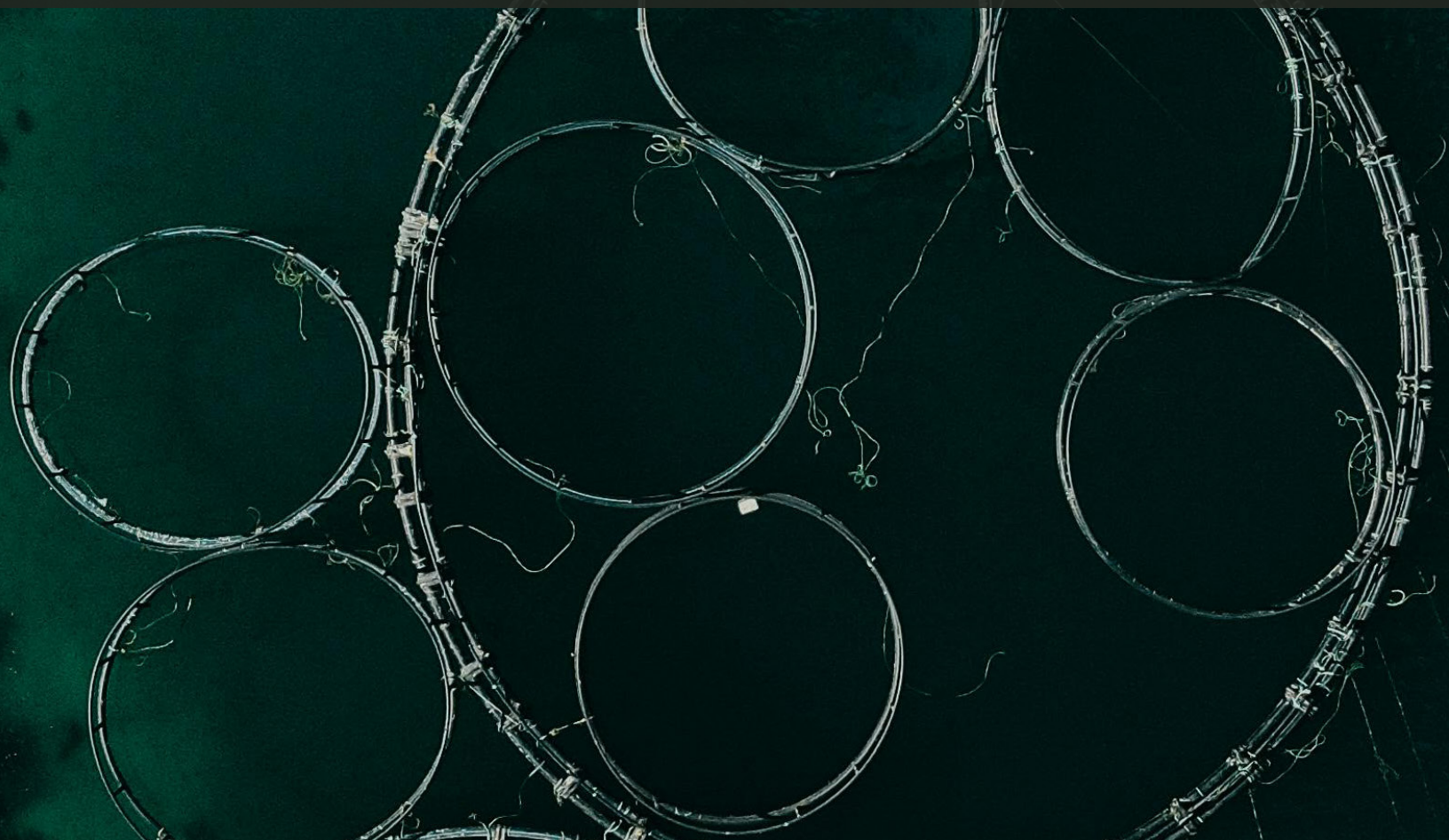
THE MYTH OF "SUSTAINABLE" AQUACULTURE

HOW THE FISH FARMING INDUSTRY SOLD A FALSE PROMISE OF SAVING THE OCEANS



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EXECUTIVE SUMMARY

As industrial fishing began to decimate wild fish populations in the latter half of the 20th century, a new industry promised a solution: that farming fish would save the oceans and deliver sustainable protein to the world. This eco-friendly image was carefully crafted by aggressive marketing and lobbying campaigns to win over the public, policymakers, and foodservice leaders, allowing the industry to grow exponentially and surpass wild-caught fisheries in tonnage sold. However, the industry has failed to deliver on its claims, instead quietly inflicting greater harms on the world's oceans.

This report dissects five of the most influential myths that the animal aquaculture industry has used to convince the world that it is sustainable and socially responsible:

- **Myth 1 | Fish Farming Reduces Pressure on Wild Fisheries**
  Reality: Using wild fish for feed exacerbates overfishing
  - The most popular farmed fish in the Global North are carnivorous species such as salmon. Farming these fish at an industrial scale relies on millions of tons of small wild-caught coastal fish, like anchovies. Small coastal species, many of which are relied upon by human communities in vulnerable Global South countries, are now being dangerously overfished to feed the industrial fish farming system.
  - Industrial fish farming has obscured this reality by enshrining outdated and unscientific metrics into international law, drastically underrepresenting its reliance on wild fish.

- **Myth 2 | Fish Farming Meets a Growing Demand for Seafood**
  Reality: The industry engineers unsustainable demand for seafood
  - Studies show that fish farming's growth does not displace wild-caught fishing—it is *additive*, driving overall fish consumption higher and compounding pressure on ocean ecosystems. This "demand" has been manufactured through deceptive marketing that recasts farmed fish as a clean, climate-friendly necessity, persuading consumers and foodservice to buy more fish.
  - To protect its unfettered growth, the industry has manipulated research and pressured policymakers. In Chile, for instance, salmon producers obtained long-term private property rights over coastal waters—effectively privatizing the ocean and minimizing oversight.

- **Myth 3 | Farmed Fish Is a Healthy Ocean Protein**
  Reality: Aquaculture spreads diseases and parasites that sicken fish and humans, and drives the global antibiotic resistance crisis
  - Crowded, waste-laden pens and ponds create ideal conditions for parasites and

diseases such as sea lice, infectious salmon anemia, and shrimp viruses, causing massive die-offs and spreading infections to wild fish. These same pathogens can persist through processing, putting human consumers at risk of illness.

- These rampant infections necessitate the use of antibiotics and chemicals—and since no aquaculture-specific antibiotics exist, the industry uses antibiotics that are classified as medically important for humans. This dependence fuels the antibiotic resistance crisis, with testing finding antibiotic-resistant bacteria in fish and shrimp on store shelves. Many antibiotics are banned in fish and shrimp in the U.S., but because of limited testing, aquaculture products containing these drug residues can and do reach consumers.

▸ Myth 4 | Farmed Fish Is a Climate-Smart Food
Reality: Fish farming exacerbates climate change

- Feed production, energy use, and high mortality make aquaculture highly carbon-intensive, with emissions often exceeding poultry and pork, and many times higher than plant-based proteins such as peas or soy.
- The industry also undermines natural carbon sinks by depleting forage fish who drive ocean carbon storage and by clearing mangroves for shrimp ponds, turning key carbon reservoirs into emissions sources.

▸ Myth 5 | Certifications and Labels Ensure Sustainability
Reality: Certifications and labels are marketing tools, not proof of sustainability

- Leading certification schemes are funded by the very companies they certify and rely on limited, sampling-based audits. This conflict of interest creates the appearance of oversight while masking pollution, disease, and high mortality across certified farms. Despite efforts by concerned environmental advocates to demand more meaningful oversight, the current system is an example of classic greenwashing built to preserve consumer confidence, not ecological integrity.
- Even widely trusted guides such as Seafood Watch lack farm-level data, rating fish and shellfish by species and region rather than by actual production conditions. These broad ratings are now used as powerful marketing tools to steer consumers and institutions toward certified products that perpetuate the harms inherent to industrial fish farming.

Industrial aquaculture has transferred the problems of factory farming from land to sea while masking them through sophisticated greenwashing campaigns. Behind its promise of "sustainable seafood," the industry perpetuates ecological collapse and public health risks to maintain profit and growth. Because these harms are inherent to fish farming, true ocean protection will require confronting the sheer scale of sea animal production and consumption, particularly by the Global North.

The Birth of the "Blue Revolution"

Industrial fish farming, the dominant sector of today's aquaculture industry, is the large-scale rearing of fish species seen as high-value, such as salmon, tilapia, carp, and bass, in tightly packed pens, tanks, or ponds. **Today's fish and shrimp farms operate much like land-based factory farms where hundreds of thousands of animals are confined in a single enclosure, allowing for the efficient and cheap production of sea animals on a massive scale.** This creates ideal conditions for disease and parasite outbreaks, especially sea lice, and often requires the use of antibiotics, chemical treatments, and pesticides.[1]

While fish farming has existed in various traditional forms for centuries, the industrialized version that dominates the market today only took shape in the late 20th century. At the time, as concerns about the decline in wild fish populations due to overfishing reached new heights, industrial aquaculture emerged as a "sustainable solution." Salmon companies in Norway, in particular—the birthplace of intensive salmon farming—launched what they called the "Blue Revolution," claiming that this new industry would save our oceans from overfishing while delivering high-quality, healthy ocean protein to consumers around the globe.

As the "Blue Revolution" took root, industrial fish farming proliferated globally, growing into a $300 billion sector. In 2022, animal-based aquaculture produced 94.4 million tons (live weight), exceeding the 91 million tons from wild-capture fisheries for the first time in history. Aquaculture now supplies 51 percent of aquatic animal products destined for human consumption.[2]

In this report, we use the term "aquaculture industry" to refer to the industrial farming of fish and shrimp, and we largely focus on carnivorous species, which are the most eaten in the Global North. Other forms of aquaculture include plants (e.g. seaweed) and mollusks. We recognize the sustainability benefits of the rapidly growing sea vegetable sector and its important role in reducing pressures on wild fish.[3]

Despite claims about saving our oceans, reducing pressure on wild fish populations, and feeding the world, the industry's massive growth has instead put *more* pressure on wild fish and threatened the health of ocean ecosystems worldwide.

1 Rosamond L. Naylor, Ronald W. Hardy, Alejandro H. Buschmann, et al. "A 20-Year Retrospective Review of Global Aquaculture." *Nature* 591, no. 7851 (2021): 551–563.
2 Food and Agriculture Organization of the United Nations (FAO). *The State of World Fisheries and Aquaculture 2024: Blue Transformation in Action*. Rome: FAO, 2024.
3 To learn more about the benefits of seaweed farming, see:
Carlos M. Duarte, Annette Bruhn, and Dorte Krause-Jensen. "A Seaweed Aquaculture Imperative to Meet Global Sustainability Targets." *Nature Sustainability* 5 (2022): 185–193.
Brijesh K. Tiwari and Declan J. Troy. "Seaweed Sustainability: Food and Nonfood Applications." In *Seaweed Sustainability: Food and Non-Food Applications*, 1–6. 2015.

Carnivorous farmed fish rely on wild-caught fish for feed, intensifying overfishing.[4] Further, farmed species actually result in a net loss of protein; for example, the largest salmon company in the world used nearly twice the amount of wild-caught fish as feed as the volume of salmon produced in 2019.[5]

The industry has only succeeded because of sophisticated and misleading marketing, lobbying, and campaigning strategies to uphold the industry's clean image. When a conscious consumer hears about "sustainable seafood," they picture clean, healthy oceans; protections for "bycatch" species like turtles; and safe, drug-free food, according to survey data.[6] Owing to the success of the industry's greenwashing, many now believe that farmed fish live up to this promise—naturally leading policymakers, NGOs, and foodservice professionals to integrate industrial aquaculture into their sustainability strategies.

In this report, we reveal how the current model of intensive fish farming not only replicates the very problems it claims to solve but also inflicts its own unique harms on ocean environments. We examine the five major myths upholding the industry's veneer of sustainability for the sake of profit and then, based on our systematic analysis of industry impact, we propose a new path forward for meaningful ocean protection.

Left: Norway-based Mowi, the world's largest salmon company, markets itself as the leader of the "Blue Revolution" (Source: Mowi advertisement as part of its gold sponsorship of the Sandnessjøen Idrettslag football team). Right: A salmon with an injured tail swims at a Mowi certified "sustainable" farm in Scotland (Source: Abolish Salmon Farming).

4 Pernille Kristiane Skavang and Andrea Viken Strand. "Conceptualization of the Norwegian Feed System of Farmed Atlantic Salmon." *Frontiers in Marine Science* 11 (April 3, 2024): Article 1378970.

5 Feedback Global. *The Hidden Cost of Farmed Salmon*. November 2020.

6 For example, a 2024 Aquaculture Stewardship Council survey found that 83 percent of respondents are motivated to some degree to choose seafood carrying a sustainability label. Consumers most often expected certified seafood to be free of antibiotics and chemicals (46 percent), come from healthy waters (35 percent), and be safe to eat (30 percent). (See Aquaculture Stewardship Council. "New ASC Research Reveals Shoppers Rely on Trusted Certification Labels," ASC North America, December 1, 2024.) Further, a 2019 Blue Circle Foods poll found that over 80 percent worry about mercury contamination, ocean pollution, extinction of wild fish species, and seafood mislabeling—yet most continue purchasing seafood and believe it is more sustainable than other animal proteins, indicating that labels reassure them these concerns are being addressed. (See Blue Circle Foods. "US Seafood Consumers Conflicted Over Sustainable Options," PR Newswire, October 3, 2019.)

MYTH 1: FISH FARMING REDUCES PRESSURE ON WILD FISHERIES

Reality: Using Wild Fish for Feed Exacerbates Overfishing

Photo: Resha Juhari / We Animals

Myth 1 | Fish Farming Reduces Pressure on Wild Fisheries

Reality: Using Wild Fish for Feed Exacerbates Overfishing

Even while the aquaculture industry positions itself as the silver-bullet solution to overfishing, fish farming entrenches industrial fishing and further imperils wild fisheries. This is because many of the most farmed species, like salmon and trout, are fed diets made from wild-caught fish. The small coastal fish used for feed are captured in vulnerable areas of the Global South, driving ecosystem disruption and destabilizing local subsistence food systems to produce more highly valued species for the Global North. Further, farming carnivorous fish is an inefficient way to produce protein: more protein from wild-caught fish is used than the resulting edible protein. By leveraging two flawed metrics—Maximum Sustainable Yield (MSY) and the Fish In:Fish Out (FIFO) ratio—the industry has sold the world a deceptive narrative about its role in ocean protection, simply to protect its own unfettered growth.

Fish Farming Exploits Vulnerable Coastal Fish Populations for Feed

Fish feed sits at the heart of aquaculture's paradox. Far from decoupling sea animal production from wild capture, the industry relies heavily on small coastal species—such as sardines, anchoveta, herring, and menhaden—from so-called "reduction fisheries," as they are "reduced" into fish meal and fish oil (FMFO). These forage fish are ecologically foundational, yet are increasingly diverted from vulnerable Global South waters into feed for salmon and other high-value species consumed in the Global North.[1] Both ecological disruption and social harm result as communities most affected by depletion see their resources extracted to fuel industrial growth elsewhere.

Aquaculture's reliance on these fish is pushing their populations into decline. Reduction

1 Species such as anchovies, sardines, and menhaden are considered ecologically foundational because they form dense schooling biomass that transfers energy from plankton to larger predators and support entire marine food webs. Their removal for fishmeal and fish oil disrupts nutrient flow, undermines the stability of coastal ecosystems, and reduces the availability of prey for seabirds, marine mammals, and predatory fish.

fisheries account for roughly 25 percent of the global ocean catch, with the vast majority of the resulting FMFO used to feed farmed fish.[2] In West Africa, intensive fishing for aquaculture feed has driven rapid industrialization of the coastline: a 2019 Greenpeace report mapped dozens of factories in West Africa, primarily in Mauritania, Senegal, and The Gambia, that process wild fish into FMFO for export to the European Union, China, and Vietnam.[3] The report revealed that fisheries sourcing these plants are now considered "overexploited," with scientists recommending significant reductions in catch.

Despite this, exports have grown, compounded by a lack of reporting and enforcement in the region. A similar story is unfolding in South America, where the Peruvian anchoveta fishery, the world's largest source of FMFO, has faced pressures from overfishing for decades. Over the past four years, Peru's anchoveta fishery has repeatedly faced early closures or outright season cancellations—including 2022's second season, both 2023 seasons, 2024's second season, and 2025's first season—due to low biomass and unusually high juvenile catch rates.[4,5,6,7,8] (Although these measures are framed as protecting juveniles, the need for such closures reflects intense fishing pressure and population depletion, since juvenile catch rates rise when adult populations are low.)

Overfishing small coastal fish sends ripple effects throughout ecosystems. As foundation species, these fish lie near the bottom of the food chain for the whole ecosystem, right above plankton, meaning they play a critical role in transferring energy up to high-level predators like sharks. In coastal West Africa, Peru, and Chile, intensive harvesting of anchovy, sardine, and similar small species for FMFO has been linked to declines in seabird populations, as these birds rely on forage fish for feeding chicks.[9] Exploitation of the Benguela sardine for FMFO in southern Africa is a contributor to the endangered status of African penguins and Cape cormorants.[10,11]

Human coastal communities also suffer from the decline of these fish populations.

2 Patricia Majluf, Kathryn Matthews, Daniel Pauly, Daniel J. Skerritt, and Maria Lourdes D. Palomares. "A Review of the Global Use of Fishmeal and Fish Oil and the Fish In: Fish Out Metric." *Science Advances* 10, no. 42 (October 16, 2024): eadn5650.

3 Greenpeace. *A Waste of Fish: Food Security Under Threat from the Fishmeal and Fish Oil Industry in West Africa*. June 2019.

4 Marta Negrete. "Peru Closes the 2nd Anchoveta Season 2022 without Reaching the Planned Quota," *We Are Aquaculture*, February 7, 2023.

5 Rachel Mutter. "Peru Cancels All-Important First Anchovy Fishing Season," *IntraFish*, June 9, 2023.

6 Louisa Gairn. "Peru Closes Anchovy Season with Unfulfilled Quota," *We Are Aquaculture*, January 15, 2024.

7 Christian Molinari. "Peru Closes Second 2024 Anchovy Fishery Season with 95 Percent of TAC Caught," *SeafoodSource*, January 2025.

8 John Evans. "Peru Closes Anchovy Fishing Season Early to Protect Spawning Stock," *IntraFish*, July 24, 2025.

9 Christopher M. Free, Olaf P. Jensen, and Ray Hilborn. "Evaluating Impacts of Forage Fish Abundance on Marine Predators." *Conservation Biology* 35, no. 6 (December 2021): 1717–29.

10 Richard B. Sherley, Robert Altwegg, Bruce J. Barham, Norman J. Barham, Les G. Underhill, Paul A. Whittington, and John C. Crawford. "Bottom-Up Effects of a No-Take Zone on Endangered Penguins." *Biology Letters* 11, no. 7 (2015): 20150237.

11 Robert J. M. Crawford, William J. Sydeman, Sarah Ann Thompson, Richard B. Sherley, and Azwianewi B. Makhado. "Food Habits of an Endangered Seabird Indicate Recent Poor Forage Fish Availability off Western South Africa." *ICES Journal of Marine Science* 76, no. 5 (October 2019): 1344–1352.

The FMFO used to feed species like salmon considered "high-value" in the Global North is heavily derived from fisheries in the Global South, destabilizing communities that have historically depended on them for sustenance. Norway's salmon industry in particular is a primary offender. A 2024 report by Feedback Global (now Foodrise) revealed that this industry extracts almost 2 million tonnes of fish for feed each year, much of it from Northwest Africa. This loss puts nearly 4 million people at risk of undernourishment.[12] In a second report, Foodrise spotlights Norway-based Mowi, the world's largest salmon producer, for a track record that sharply contradicts its marketing: in 2019, Mowi's operations relied on wild fish volumes nearly double its salmon harvest—about 880,000 tonnes of wild fish for 436,000 tonnes of salmon—highlighting a net drain of marine protein. This capture volume is greater than the entire volume of wild fish caught by Canada in 2018.[13] Under the guise of offering an efficient protein source that alleviates the pressures of industrial fishing, salmon companies like Mowi compound the very problems they claim to be solving.

According to Ivan Vindheim, Mowi CEO, "Food security and climate change are two of the most pressing challenges facing humanity. As a seafood producer, Mowi is unlocking the potential of the ocean to produce healthy and climate-friendly food for a growing world population."[14]

In 2019, by volume, Mowi used twice as much wild-caught fish as the edible salmon it produced.

This dependence on wild fish makes clear that aquaculture does not solve overfishing but drives it—transforming critical forage species into feed for luxury markets. Yet rather than confront this reality, the industry leans on selective measurements to create the illusion of sustainability and responsibility, masking the industry's true role in accelerating ocean depletion. Let's turn now to two of the industry's own metrics.

Fish Farming Leverages Faulty Metrics to Obscure Its Role in Overfishing

Facing growing scrutiny over its dependence on wild fish, the aquaculture industry has enlisted and popularized two metrics—Maximum Sustainable Yield (MSY) and the Fish In:Fish Out (FIFO) ratio—to reassure policymakers and consumers of its benefits to wild fish. In practice, though, both measures are deeply flawed and conceal aquaculture's continued reliance on, and amplification of, industrial fishing.

MSY is the seafood industry's cornerstone for defining "sustainable" fishing, born in the 1940s when governments sought to boost postwar food production and secure fishing rights. MSY defines "sustainability" as the maximum long-term catch that can be taken from a fish

12 Feedback Global. *Blue Empire: How the Norwegian Salmon Industry Extracts Nutrition and Undermines Livelihoods in West Africa*. January 2024.
13 Feedback Global. *The Hidden Cost of Farmed Salmon*. November 2020.
14 Mowi. "About Us." Accessed September 29, 2025.

population without causing it to collapse. Rather than emerging from ecological science, MSY was shaped by political and commercial ambitions to maximize harvests. U.S. diplomats and industry groups lobbied to make it the guiding principle of global fisheries management, including for the United Nations.[15] In 1955, the Food and Agriculture Organization (FAO) formally adopted MSY as the benchmark for "sustainable" fishing.[16]

The model assumes that fish populations produce the greatest yield for humans when they are kept at roughly half of their natural abundance—meaning populations are intentionally maintained in a depleted state. MSY is built on a simple idea: fish populations grow fastest at about half of their natural size. Fisheries management bodies therefore treat this mid-point as the "optimal" harvest level, assuming the upper half of the population is surplus production that can be removed without consequence—ignoring that this biomass plays essential roles in the broader ecosystem. Several fisheries management agencies have pushed this threshold even lower, allowing some fisheries to be considered "sustainable" with populations reduced by as much as 70 percent from their original size.[17] As fisheries scientist P.A. Larkin cautioned in *Transactions of the American Fisheries Society* in 1977, treating MSY as a fixed target risks legitimizing overfishing and pushing populations toward collapse.[18]

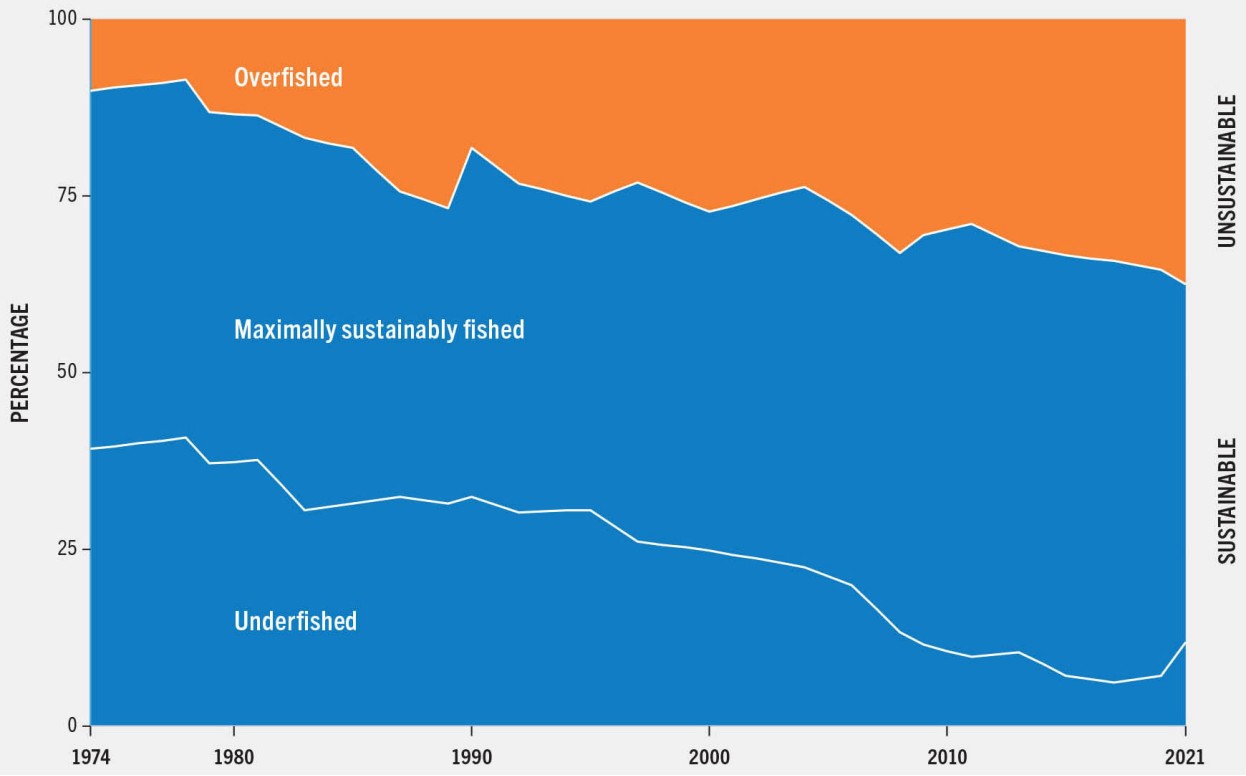
MSY ignores the ecological realities of marine systems, treating species in isolation and discounting how practices such as bottom trawling and high bycatch—and the habitat degradation they cause—alter food webs and predator-prey relationships, while removing the older, larger fish who play crucial ecological roles.

Decades of reliance on MSY has kept wild fish populations in decline. In the 1980s, industrial aquaculture began to expand rapidly, claiming to relieve pressure on wild fisheries. If aquaculture were relieving pressure on wild fisheries, MSY indicators would show broad recovery. That would not mean the oceans were healthy—MSY is defined around maximizing permissible catch, not protecting ecosystem function—but it would at least show, on the industry's own terms, that pressure was easing. Instead, these indicators have continued to worsen, in large part because aquaculture increases demand for wild-caught fish used in feed. According to FAO stock assessments, in 1980 roughly 34 percent of assessed stocks were "underfished," about 56 percent were "fully exploited," and around 10 percent were "overfished." Today those proportions have inverted: only about 7 percent of global stocks remain "underfished," roughly 35 percent are "overfished," and the majority fall into the "fully exploited" category—harvested at or near MSY thresholds with no room for increased catch.[19]

15 Jennifer Hubbard. "The Political and Economic Construction of Fisheries Management." *Isis* 105, no. 3 (September 2014): 546–573.
16 Carmel Finley. *All the Fish in the Sea: Maximum Sustainable Yield and the Failure of Fisheries Management*. Chicago: University of Chicago Press, 2011.
17 Daniel Pauly and Rainer Froese. "MSY Needs No Epitaph — but It Was Abused." *ICES Journal of Marine Science* 78, no. 6 (September 2021): 2204–2210.
18 P. A. Larkin. "An Epitaph for the Concept of Maximum Sustained Yield." *Transactions of the American Fisheries Society* 106, no. 1 (1977): 1–11.
19 Food and Agriculture Organization of the United Nations (FAO). *The State of World Fisheries and Aquaculture 2024: Blue Transformation in Action*. Rome: FAO, 2024.

This grim outlook should raise red flags—but the industry frames these numbers as positive, with the FAO itself claiming that "[n]early two-thirds of marine stocks are fished within biologically sustainable levels globally."[20] Such framing obscures the crisis and gives aquaculture cover to keep sourcing vast amounts of feed fish from vulnerable coastal areas, while assuring consumers that populations are stable.

Global Trends in the State of the World's Marine Fisheries, 1974–2021



This graph depicts the steady increase in overexploited fisheries since the early 1970s, when the "Blue Revolution" began. Simultaneously, the share of fisheries at or below their MSY, which the agency classifies as "sustainable" has continued to shrink. (Source: FAO, *The State of World Fisheries and Aquaculture 2024*)

The FIFO ratio has a similar backstory. Developed in the early 2000s by the International Fishmeal and Fish Oil Organisation (IFFO), a global trade group for the FMFO industry, FIFO measures the kilograms of wild fish required to produce one kilogram of farmed fish.[21] Where MSY obscures depletion through its narrow focus on catch limits, FIFO obscures it through feed accounting—yet both reveal the same underlying reality: aquaculture consumes more wild fish than it produces. The industry has reported a steadily shrinking FIFO ratio for all fed aquaculture over the last few decades, reaching a low of 0.27 in 2020, according to the IFFO.[22] This number is often cited as proof that aquaculture is becoming more efficient—sometimes even a net producer of animal protein.

20 Ibid.
21 Andrew Jackson. "Fish In–Fish Out Ratios Explained." *Aquaculture Europe* 34, no. 3 (2009): 5–10.
22 International Fishmeal and Fish Oil Organization (IFFO). "FIFO Data," Accessed September 29, 2025.

A groundbreaking 2024 study published in *Science Advances* challenges this narrative by recalculating FIFO ratios for the top 11 fed aquaculture species using a more comprehensive accounting method.[23] Roberts et al. found that conventional FIFO calculations make aquaculture look more efficient than it is by treating fish-processing trimmings and bycatch as "byproducts"—driving up incentives for trawl fisheries—and by averaging in herbivorous species like carp and tilapia that require little or no FMFO. When these factors were corrected, the researchers found that true FIFO ratios were 27 to 307 percent higher than industry estimates.

Importantly, according to Roberts et al., even if FIFO ratios showed improvement, they should not be interpreted as gains in overall production efficiency. Lower reliance on wild fish is achieved largely by substituting crop-based ingredients, exacting a heavy toll on land ecosystems. This is the basis of the industry's "decoupling" narrative: the claim that aquaculture is becoming independent of wild fisheries by using fewer wild fish inputs, while ignoring the rapidly expanding crop inputs that now make up the majority of aquafeeds. For further discussion of the impacts of growing crops for feed, see Myth 4.

For carnivorous species groups such as trout, salmon, and eel, they found that wild-fish inputs exceeded twice the farmed biomass produced in *nearly every scenario*, with aggregate ratios ranging from 2.27 to 4.97. **For salmon, the number was particularly stark—up to 5.57—revealing that farmed salmon may consume nearly six times their weight in wild fish before harvest.** These results show that aquaculture remains a net drain on wild fish protein, with caloric and nutrient retention rates no better than in the 1990s, despite industry claims to the contrary.

Ultimately, metrics like MSY and FIFO function as tools of obfuscation, allowing aquaculture to present itself as ocean-friendly while in reality driving the depletion of small coastal fish, destabilizing ecosystems, and shifting the costs onto vulnerable coastal communities. These metrics distract from a basic reality: aquaculture returns very little of the nutrition it consumes—a point we detail further in the next section.

23 Spencer Roberts, Jennifer Jacquet, Patricia Majluf, and Matthew N. Hayek. "Feeding Global Aquaculture." *Science Advances* 10, no. 42 (October 16, 2024): eadn9698.

MYTH 2:
FISH FARMING MEETS A GROWING DEMAND FOR SEAFOOD

Reality: The Industry Engineers Unsustainable Demand for Seafood

Photo: Rontti Varjola / We Animals

Myth 2 | Fish Farming Meets a Growing Demand for Seafood

Reality: The Industry Engineers Unsustainable Demand for Seafood

Industrial aquaculture markets itself as a response to rising global demand for seafood—an environmentally responsible way to relieve pressure on wild fisheries while feeding a growing population. In reality, the industry has manufactured this "demand." Rather than stepping in to meet a pre-existing need, producers worked across scientific, policy, and cultural arenas to create the conditions for higher fish consumption, especially in wealthy markets. Consumption increased across the board, including wild-caught fish; thus, instead of substituting for wild fisheries, aquaculture has expanded the entire category.

To understand how this happened, we examine the mechanisms aquaculture companies used to inflate demand. First, salmon corporations and trade associations manipulated scientific narratives and policymaking processes to cast fish farming as an essential solution to overfishing and global food insecurity. By shaping global and national policy, the industry manufactured an aura of legitimacy that enabled unconstrained growth and shielded producers from regulations that would otherwise limit supply.

Second, once the path was cleared for expansion, the industry deployed aggressive marketing and PR campaigns to engineer consumer desire. These campaigns reframed farmed fish as modern, healthy, and sustainable—even when evidence showed the opposite—transforming occasional luxury products into routine staples.

These strategies illustrate that the industry does not passively respond to demand, but creates it—driving up consumption of farmed and wild fish alike, with severe ecological and social consequences.

Fish Farming Entrenches Demand for Wild-Caught Fish

Industrial aquaculture positions itself as a way to meet the world's growing hunger for seafood by replacing our dependence on wild-caught fish. This narrative not only obscures that aquaculture depends on wild fish for feed, as discussed, but also that **the industry's flooding**

of the market with cheap products from crowded, disease-ridden factory farms has fueled an overall surge in fish consumption that perpetuates, rather than substitutes for, wild-catch exploitation.

Longo and York expose this myth in a 2024 *Science Advances* study. In a profit-driven, globalized market, introducing a new form of production rarely displaces the old; instead, both coexist at high levels. Just as the rise of petroleum in the 19th century was expected to supplant whale oil but instead powered a whaling boom—steam-driven ships and industrial processing made whaling vastly more profitable, driving up catches until populations crashed—so too has fish farming expanded without reducing wild harvests.[1] Cross-national time-series analyses by Longo et al. tested statistical models controlling for population, GDP, and geography; the most reliable eight of nine total models showed no link between aquaculture growth and declines in wild-catch volumes.[2]

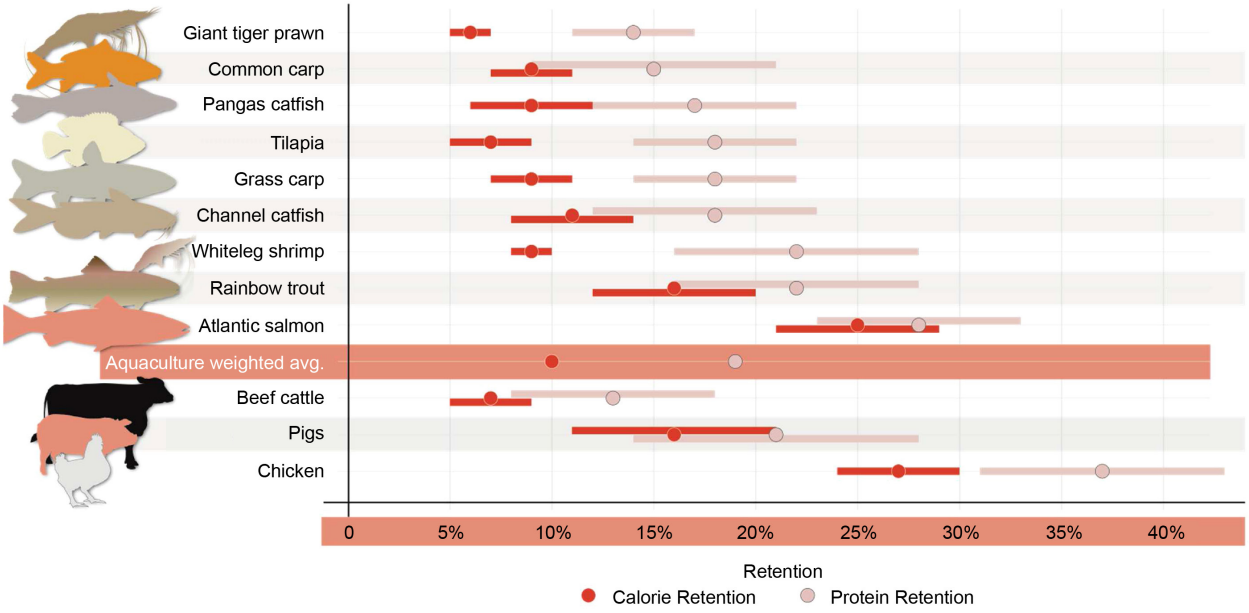
Moreover, classic market economics explain that making a resource cheaper and more efficient does not curb its use; it increases it. Instead of meeting a pre-existing need, confining hundreds of thousands or millions of fish in net pens to produce cheap seafood has created what economists call "supply-driven demand." In other words, according to Longo and York, the aquaculture industry has exponentially increased supply of affordable "premium" fish like salmon, leading to higher demand, the opposite of its claim to be meeting existing need.[3] Rather than improving access in regions facing food insecurity, much of this growth has occurred in high-income countries, reinforcing patterns of overconsumption. The abundance of farmed fish on supermarket shelves also sustains heavy reliance on wild-caught products, since most shoppers do not differentiate between farmed and wild at the point of purchase.[4] Since the 1960s, when industrial aquaculture first took root, global sea animal intake has grown significantly, nearly twice the rate of human population. Per-capita consumption has risen from about 9.1 kg/person/year in the 1980s to 20.7 kg in 2022—more than doubling.[5] Because the global population has also roughly doubled over this period, total sea animal consumption has increased nearly fourfold. In other words, animal aquaculture creates excess supply that encourages people to eat more fish, rather than simply filling unmet demand in a sustainable way.

Even if farmed fish *did* displace consumption of wild fish, it would still fail the food-security test. Farmed fish is widely promoted as a climate-smart alternative to not only wild fish, but also land-based meats like beef. However, there is no evidence that farmed fish is helping displace these meats; rather, as fish consumption has gone up, so has beef consumption.[6] Moreover, in wealthy countries, protein intake already often exceeds nutritional requirements, meaning additional animal protein does

1 Stefano B. Longo and Richard York. "Why Aquaculture May Not Conserve Wild Fish." *Science Advances* 10, no. 42 (October 16, 2024): eado3269.
2 Stefano B. Longo, Brett Clark, Richard York, and Andrew K. Jorgenson. "Aquaculture and the Displacement of Fisheries Captures." *Conservation Biology* 33, no. 4 (August 2019): 832–841.
3 Longo and York, "Why Aquaculture May Not Conserve Wild Fish."
4 Aquaculture Stewardship Council. "Two Thirds of Seafood Consumers Call for Radical or Significant Change to Feed Growing Population," Accessed September 29, 2025.
5 FAO, *The State of World Fisheries and Aquaculture 2024*.
6 OECD and FAO. *OECD-FAO Agricultural Outlook 2025-2034: Meat*. OECD Publishing, July 2025.

not address any real dietary gap.[7] Even in a hypothetical scenario where aquaculture *did* replace meat, it does not provide a significantly more efficient source of nutrition. Research from the Johns Hopkins Center for a Livable Future shows that across nine major farmed aquatic species, only about 19 percent of protein and 10 percent of feed calories are retained for human diets—losses on par with, and sometimes greater than, those seen in other forms of industrial animal production.[8] **In short, fish farming expands the overall supply of animal protein without delivering efficient nutrition, making it a net drain on global food resources rather than a solution to hunger.**

Protein and Calorie Retention for Selected Aquatic and Terrestrial Farmed Animal Species



Higher values indicate more efficient retention. Many of the most farmed species are less efficient than land animal products. (Source: Fry et al. 2018)

Next, we dive into a case study of salmon farming to illustrate the deceptive practices used by the industry to cement its unfettered growth: misleading both policymakers and consumers for the sake of profit.

7 Andreoli, Vania, Marco Bagliani, Alessandro Corsi, and Vito Frontuto. "Drivers of Protein Consumption: A Cross-Country Analysis." *Sustainability* 13, no. 13 (2021): 7399.
8 Jillian P. Fry, Nicholas A. Mailloux, David C. Love, Michael C. Milli, and Ling Cao. "Feed Conversion Efficiency in Aquaculture: Do We Measure It Correctly?" *Environmental Research Letters* 13, no. 2 (February 2018): 024017.

The Industry Misleads Policymakers with a False Sustainability Narrative to Resist Regulation

To engineer demand at scale, the industry first needed political legitimacy and freedom to expand production. That legitimacy was not earned through strong environmental performance but manufactured through strategic manipulation of science and policymaking bodies. By shaping policy to favor rapid expansion and by suppressing evidence of harm, producers created the kind of regulatory environment necessary for supply-driven demand to take hold. The salmon industry provides the clearest example.

From its earliest days, Norway's salmon industry invested heavily in research and promotion that framed aquaculture as the antidote to overfishing, both by funding reports and by channeling money into university and institute research, including through the government-run but industry-levy-financed Norwegian Seafood Research Fund (FHF).[9,10] Findings from this research were promoted by Norwegian industry and government representatives in international forums, including the FAO. Their influence is evident in landmark policy documents such as the 1995 FAO Code of Conduct for Responsible Fisheries and the 2000 Kyoto Declaration on Aquaculture, both of which enshrined aquaculture as a cornerstone of the global sustainable development agenda.[11,12] Today, major development lenders cite this framing directly, with the World Bank projecting nearly 100 million additional metric tons of aquaculture growth under the banner of "food security."[13]

Further, when independent scientists produced data that undermined the industry's claims, the industry mobilized to undermine their credibility. A striking example occurred after a 2004 *Science* paper revealed that farmed salmon—especially that from Scotland and the Faroe Islands—harbored elevated levels of contaminants like PCBs, dioxins, toxaphene, and dieldrin compared to wild fish.[14] (A subsequent risk assessment confirmed that eating farmed salmon at recommended rates could increase cancer risk.[15]) Within weeks, front organizations such as Salmon

9 Ola R. Valvåg. "Norwegian Seafood Research Fund (FHF)." In *Technology Transfer through Networks: Experiences from the Norwegian Seafood Industry*. FAO Fisheries Circular No. 1004. Rome: Food and Agriculture Organization of the United Nations, 2005.
10 Samson Afewerki, Frank Asche, Bård Misund, Trine Thorvaldsen, and Ragnar Tveteras. "Innovation in the Norwegian Aquaculture Industry." *Reviews in Aquaculture* 15, no. 2 (November 7, 2022).
11 Food and Agriculture Organization of the United Nations. *Code of Conduct for Responsible Fisheries*. Rome: FAO, 1995.
12 Food and Agriculture Organization of the United Nations. "Kyoto Declaration on Aquaculture." In *Aquaculture Development Beyond 2000: The Bangkok Declaration and Strategy*. Rome: FAO/NACA, 2000.
13 World Bank. *Harnessing the Waters: Sustainable Aquaculture*. Washington, DC: World Bank, June 22, 2025.
14 Ronald A. Hites, Jeffery A. Foran, David O. Carpenter, M. Coreen Hamilton, Barbara A. Knuth, and Steven J. Schwager. "Global Assessment of Organic Contaminants in Farmed Salmon." *Science* 303, no. 5655 (January 9, 2004): 226-229.
15 Jeffery A. Foran, David O. Carpenter, M. Coreen Hamilton, Barbara A. Knuth, and Steven J. Schwager. "Risk-Based Consumption Advice for Farmed Atlantic and Wild Pacific Salmon Contaminated with Dioxins and Dioxin-like Compounds." *Environmental Health Perspectives* 113, no. 5 (February 9, 2005): 552–556.

of the Americas (SOTA) and the Society for the Positive Awareness of Aquaculture (SPAA) launched coordinated attacks: they deployed industry propaganda websites, pressured the UK Food Standards Agency to dismiss the findings using irrelevant toxicology thresholds, and targeted the study's funders with ad hominem critiques.[16] The industry's push swiftly quelled any regulatory response: the UK Food Standards Agency maintained that contaminant levels were within legal limits and upheld its two-portions-per-week advice, while the European Commission likewise concluded no change in consumption guidance was warranted.[17]

Norwegian salmon firms also helped develop a booming industry in Chile, making the country the world's second-largest producer and the top supplier to the U.S.—but under far weaker regulations than in Norway.[18] Chile's lax regulatory framework reflects heavy industry influence: in Chile, salmon companies secured long-term aquaculture concessions, exclusive rights to farm specific coastal areas that are legally structured like private property. In practice, this gave firms de facto ownership of large stretches of coastal waters, allowing them to buy, sell, and mortgage concessions like real estate, with limited independent oversight.[19]

During the 2016 Chiloé red tide disaster—a massive harmful algal bloom that spread along southern Chile's coast, poisoning shellfish, devastating fisheries, and triggering weeks of protests by coastal communities—the government, under pressure from salmon producers, authorized the dumping of 4,700 tons of dead farmed fish offshore. Scientists later showed that this action likely fueled the bloom by adding a surge of organic material and nutrients, compounding an already severe ecological crisis.[20] Industry claims that salmon farming drives regional development have also helped entrench permissive policies. The 2016 crisis, though, revealed the other side: Indigenous and artisanal fishers, stripped of their livelihoods, led mass protests and blockades that exposed how industry influence shapes policy while local communities are left to bear the costs.[21]

These tactics illustrate how aquaculture interests have hijacked both science and policy to neutralize oversight and perpetuate unchecked growth. This paves the way for examining the misleading marketing the industry uses to shape

16 In response to the Hites et al. (2004) *Science* study, industry groups attempted to discredit the research through attacks on its authors and funders rather than its data. Scottish Quality Salmon and allies labeled the study "junk science" and "pseudo-science," while front groups such as SOTA and SPAA smeared the Pew Charitable Trusts as an "aggressively anti-industry" funder with a political agenda. These claims were amplified by industry-friendly toxicologists and PR outlets, reframing the scientists as biased activists instead of addressing their findings. See David Miller, "Spinning Farmed Salmon," in *Thinker, Faker, Spinner, Spy: Corporate PR and the Assault on Democracy*, ed. W. Dinanq and David Miller (London: Pluto Press, 2007).

17 Ibid.

18 Nina Bjørnstad. "12 Million to the History of Salmon Farming, Sustainability, and Norway's Role in Chile." *University of Bergen – Faculty of Humanities* (October 31, 2024).

19 Organization for Economic Co-operation and Development. *An Appraisal of the Chilean Fisheries Sector*. Paris: OECD, 2009.

20 Julien Armijo, Vera Oerder, Pierre-Amaël Auger, Angela Bravo, and Ernesto Molina. "The 2016 Red Tide Crisis in Southern Chile: Possible Influence of the Mass Oceanic Dumping of Dead Salmons." *Marine Pollution Bulletin* 150 (January 1, 2020): 110603.

21 Rodrigo Soberanes and Andrés Pérez. "The Salmon Crisis in Chile's Chiloé Island," *Mongabay*, October 5, 2016.

consumer perceptions and drive unsustainable demand.

The Industry Uses Misleading Marketing to Earn Consumer Trust

Once regulatory space for expansion was secured, the industry turned to manufacturing consumer demand. Marketing campaigns did not simply promote a product, but rather reshaped cultural norms, recasting farmed salmon as a necessity and embedding it in influential food traditions.

Much like tobacco companies once marketed "light" and "low-tar" cigarettes as a healthy alternative to regular smoking—despite knowing the health risks—salmon producers invested heavily in portraying farmed salmon as a healthy, eco-friendly choice. These claims—untethered from reality—functioned to create demand where none previously existed, ultimately driving overconsumption.

This shift in perception began in the 1980s, when the Norwegian Seafood Council (NSC) orchestrated a nationwide media blitz designed to recast salmon as a year-round necessity rather than an occasional indulgence. The campaign employed cheerful imagery in newspapers and broadcast channels to wrap salmon in the language of modernity and aspiration. A 1985 newspaper slogan urged, "Salmon on the table no matter the season. Salmon for sheriffs and for priests. Salmon for workdays and for feasts."[22] By framing salmon as wholesome, versatile, and modern, the industry could start selling its factory farmed products in every grocery store in the country.

A Seafood from Norway advertisement depicts a salmon feast against crystal-clear waters. (Source: Seafood from Norway Instagram)

Once Norway's appetite was secured, producers turned their sights outward. In the mid-1980s they launched Project Japan. Japanese consumers had never eaten raw salmon, associating it with disease risk, but industry leaders saw an opening: if they could normalize salmon in sushi, they could open a gateway to global demand. A delegation led by former fisheries minister Thor Listau arrived in Tokyo with "premium" fillets, staged high-profile tasting events, and saturated the public sphere with messaging about salmon's safety and quality. This was less a marketing campaign than a cultural intervention, designed to

22 Simen Saetre and Kjetil Østli. *The New Fish: The Truth about Farmed Salmon and the Consequences We Can No Longer Ignore*. Translated by Sian Mackie. Ventura, CA: Patagonia, 2023.

embed Norwegian salmon in one of the world's most influential food traditions. Within months, sushi chefs began offering salmon sushi, and as sushi culture went global, salmon's manufactured popularity spread with it—cementing a lucrative, worldwide market that hadn't existed before.[23]

Within the U.S., the salmon industry has also subversively targeted consumers. Under its Joint Marketing Program, the NSC covers up to half the cost of "Seafood from Norway" shelf tags and "Responsible Seafood" badges in U.S. grocery stores—labels shoppers may interpret as independent, rather than industry-funded, endorsements.[24]

This 2024 photo of a Mowi-owned farm reveals actual conditions on salmon farms—fish with injuries and covered in parasitic lice—sharply contrasting industry marketing.
(Source: Abolish Salmon Farming)

As a result of these tactics, farmed salmon has shifted from an occasional luxury to one of the most widely eaten sea animals in the U.S.—rising to second place at 3.22 pounds per person in 2022, from near zero just four decades earlier.[25,26] Beyond salmon, the industry has used the same playbook of greenwashed advertising and healthwashing to turn once-niche products into everyday staples across the globe. Rather than merely meeting consumer demand, these campaigns deliberately misled the public and manufactured the cultural and market conditions needed to drive up unsustainable fish consumption.

23 Ibid.
24 Norwegian Seafood Council. "The NSC's Joint Marketing Program," Last updated December 2, 2024. Accessed September 30, 2025.
25 National Fisheries Institute. *Top 10 Lists for Seafood Consumption*. 2022.
26 Gunnar Knapp, Cathy A. Roheim, and James L. Anderson. *The Great Salmon Run: Competition between Wild and Farmed Salmon*. March 2007. TRAFFIC.

MYTH 3:
FARMED FISH IS A HEALTHY OCEAN PROTEIN

Reality: Aquaculture Spreads Diseases and Parasites that Sicken Fish and Humans, and Drives the Global Antibiotic Resistance Crisis

Photo: Animal Equality UK

Myth 3 | Farmed Fish Is a Healthy Ocean Protein

Reality: Aquaculture Spreads Diseases and Parasites that Sicken Fish and Humans, and Drives the Global Antibiotic Resistance Crisis

Ads for farmed fish paint the picture of a vibrant, healthy protein produced in crystal-clear ocean seascapes. In reality, **industrial aquaculture operations function as water-based factory farms—with many of the same well-documented problems as their land-based equivalents. Most salmon, for instance, are raised in open-net pens—clusters of floating rings or square cages, each holding tens or hundreds of thousands of fish.**[1] From above, these operations look like a patchwork of giant nets stitched across the sea surface, but beneath the waterline they are cramped, waste-filled enclosures with no barrier to the surrounding ocean. Feces and uneaten feed create a nutrient-rich environment where bacteria, viruses, and parasites thrive, and waste, pathogens, and chemicals drift straight through the mesh into the surrounding ocean.[2,3]

Moreover, shrimp ponds form vast muddy grids carved into mangrove coastlines, where stagnant water quickly becomes a breeding ground for viral epidemics like white spot disease.[4] These pathogens not only devastate farmed populations but also pose two distinct risks to human health. Dangerous pathogens can make their way into the fish and shrimp products that end up on grocery shelves, putting consumers at risk of disease.

To keep their stocks from collapsing under these conditions, farms depend heavily on antibiotics, antiparasitics, and chemical bath treatments—all medically important to

1 To read more about problems plaguing the land animal farming industry, see, for example, these additional Farm Forward reports: "Is 'Antibiotic-Free' Meat Really Antibiotic-Free?" (April 2025), "Animal Agriculture and the Antibiotic Resistance Crisis" (May 2025), and "How the USDA & the US Poultry Industry Fail to Protect Americans from Foodborne Disease" (October 2025).

2 Martin Krkosek, Andrew W. Bateman, Arthur L. Bass, William S. Bugg, Brendan M. Connors, Christoph M. Deeg, Emiliano Di Cicco, Sean Godwin, Jaime Grimm, and Kristina M. Miller. "Pathogens from Salmon Aquaculture in Relation to Conservation of Wild Pacific Salmon in Canada." *Science Advances* 10, no. 42 (October 16, 2024): eadn7118.

3 Jillian Fry, David Love, and Gabriel Innes. *Ecosystem and Public Health Risks from Nearshore and Offshore Finfish Aquaculture*. Science Brief. Johns Hopkins Center for a Livable Future, revised August 2018.

4 Jorge Cuéllar-Anjel. "White Spot Disease," Center for Food Security and Public Health fact sheet, last updated October 2023.

humans—fueling the broader crisis of antimicrobial resistance. Some of these drugs are even banned in seafood produced in and imported to the U.S. but still enter the country because of poor oversight.

Left: Salmon producer Bakkafrost touts its "clean" salmon (Source: Bakkafrost Instagram). Right: Footage documented several salmon with bulging eyes, a sign of disease or stress, at a Bakkafrost farm in Scotland in 2024. Other fish were covered in sea lice or missing chunks of flesh (Source: Animal Rising).

Factory Farm Conditions Cause Rampant Disease and Parasites in Fish

The crowded, filthy conditions of intensive aquaculture facilities are breeding grounds for a cascade of diseases and parasites that devastate nearby aquatic species. From shrimp ponds to salmon pens, infections spread rapidly through dense populations, causing catastrophic mortality levels among farmed fish. These conditions, in turn, spill into the surrounding ecosystem, threatening wildlife.

In shrimp ponds, for instance, acute hepatopancreatic necrosis disease (AHPND)—which causes rapid organ necrosis in shrimp as toxin-producing Vibrio bacteria destroy tissue—can cause up to 100 percent mortality on farms within days of infection.[5] Other Vibrio species cause bacterial vibriosis, which leads to septicemia and muscle necrosis and can trigger significant die-offs.[6] Viral diseases add yet another layer of risk: white spot syndrome virus (WSSV), first identified in the 1990s, has since become the most serious shrimp pathogen globally. The virus is notorious for its speed and lethality, as outbreaks can wipe out an entire pond within

5 De Schryver, Peter, Tom Defoirdt, and Patrick Sorgeloos. "Early Mortality Syndrome Outbreaks: A Microbial Management Issue in Shrimp Farming?" *PLoS Pathogens* 10, no. 4 (April 24, 2014): e1003919.
6 Donald V. Lightner, Roger M. Redman, Carlos R. Pantoja, Kathy F. J. Tang, Bonnie L. Noble, Paul Schofield, Loren L. Mohney, L. M. Nunan, and Susan A. Navarro. "Historic Emergence, Impact and Current Status of Shrimp Pathogens in the Americas." *Journal of Invertebrate Pathology* 110, no. 2 (June 2012): 174–183.

In India, the top supplier of shrimp to the U.S., many shrimp ponds drain water that carries waste and potential pathogens into the ocean at harvest time. During this process, many shrimp and nearby fish are also trapped and killed in netting. (Source: Seb Alex / We Animals)

7–10 days.[7] These pathogens persist in pond water and sediments, making containment in intensive systems extremely difficult.

Farmed salmon also suffer from virulent pathogens. Infectious salmon anemia (ISA) causes severe internal bleeding, pale gills, fluid buildup, and organ failure in fish as the virus attacks red blood cells, often resulting in lethargy, loss of equilibrium, and sudden mass die-offs.[8] Outbreaks in Chile have destroyed entire farms within weeks.[9] Salmon with viral pancreas disease endure chronic inflammation and degeneration of the pancreas, heart, and skeletal muscles, with mortality rates up to 60 percent.[10] Such massive die-offs create dense mats of decomposing carcasses, multiplying opportunistic pathogens in surrounding waters.

Parasitic sea lice compound salmons' health

7 Timothy W. Flegel. "Historic Emergence, Impact and Current Status of Shrimp Pathogens in Asia." *Journal of Invertebrate Pathology* 110, no. 2 (June 2012): 166–173.
8 United States Department of Agriculture, Center for Epidemiology and Animal Health. *Hazard Identification: Infectious Salmon Anemia Virus (ISAV)*. April 2025.
9 Lars Qviller, Anja B. Kristoffersen, Trude M. Lyngstad, and Atle Lillehaug. "Infectious Salmon Anemia and Farm-Level Culling Strategies." *Frontiers in Veterinary Science* 6 (2020): 481. PMC6974534.
10 Victor H. S. Oliveira, Fernanda C. Dórea, Katharine R. Dean, and Britt Bang Jensen. "Exploring Options for Syndromic Surveillance in Aquaculture: Outbreak Detection of Salmon Pancreas Disease Using Production Data from Norwegian Farms." *Transboundary and Emerging Diseases* (April 30, 2024).

crisis. Salmon infested with sea lice suffer from open lesions, scale loss, and raw, eroded skin, leaving the fish vulnerable to secondary infections, organ stress, and death. Scottish regulations mandate reporting of adult female lice counts when they exceed 2 female lice per fish, with intervention required at 6 lice per fish.[11] **A 2023 WildFish report documented peaks of up to 8.2 lice per fish on Norwegian-owned Mowi farms in Scotland, exceeding legal limits, with farms releasing as many as 2 billion lice per week into surrounding waters.[12]** Further, a 2023 Scottish government report revealed a salmon mortality rate exceeding 30 percent nationally—largely driven by disease and parasites.[13]

Bins are placed around the edges of a Scottish salmon farm to collect high volumes of dead fish.

Ironically, the wild species the aquaculture industry claims to protect are also silent victims of these illnesses. For example:

- Outbreaks of WSSV in intensive shrimp ponds can release billions of viral particles into adjacent waters, where wild shrimp populations suffer elevated mortality.[14]
- Genetic analysis has confirmed transmission of piscine orthoreovirus (PRV)—which causes inflammation of the heart and skeletal muscles, jaundice, and anemia—from farmed to wild salmon populations in British Columbia.[15]
- Sea lice from salmon farms readily infect juvenile wild salmon as they migrate past cages, and Norwegian risk assessments estimate that lice from salmon farms can kill more than 30 percent of wild salmon smolts in heavily farmed areas—a level considered catastrophic for population survival.[16]

11 Scotland. Scottish Ministers. *The Fish Farming Businesses (Reporting) (Scotland) Order 2020*. S.S.I. 2020 No. 447. The salmon farming industry has actively resisted attempts to strengthen these reporting rules, lobbying the government to relax sea lice regulations and appealing new licenses that imposed stricter limits. See Rob Edwards, "Revealed: the Salmon Industry's 'Outrageous' Lobbying," *The Ferret*, April 2, 2024.

12 WildFish. *Breaching the Limits: How the Scottish Salmon Farming Industry Is Failing to Contain Sea Lice Parasites on Open-net Farms*. March 2023.

13 Scottish Government, Marine Directorate. *Scottish Fish Farm Production Survey 2023*. Publication – Statistics. October 30, 2024. ISBN 9781836019213.

14 K. K. Vijayan, P. S. Shyne Anand, C. P. Balasubramanian, Joseph Sahaya Rajan, P. Ezhil Praveena, R. Aravind, N. S. Sudheer, Biju Francis, A. Panigrahi, and S. K. Otta. "Vertical Transmission and Prevalence of White Spot Syndrome Virus (WSSV) in the Wild Spawning Population of the Indian White Shrimp, Penaeus indicus." *Journal of Invertebrate Pathology* 203 (March 2024): 108058.

15 Gideon J. Mordecai, Kristina M. Miller, Arthur L. Bass, Andrew W. Bateman, Amy K. Teffer, Jessica M. Caleta, Emiliano Di Cicco, Angela D. Schulze, Karia H. Kaukinen, and Jeffrey B. Joy. "Aquaculture Mediates Global Transmission of a Viral Pathogen to Wild Salmon." *Science Advances* 7, no. 22 (May 26, 2021): eabe2592.

16 Geir L. Taranger, Ørjan Karlsen, Rasmus J. Bannister, Knut A. Glover, Vidar Husa, Torbjørn Svåsand, Karl A. Bjørn, Bjørn Finstad, Per A. Bjørn, Håkon A. Samuelsen, and Øyvind T. Skilbrei. "Risk Assessment of the Environmental Impact of Norwegian Atlantic Salmon Farming." *ICES Journal of Marine Science* 72, no. 3 (April 2015): 997–1021.

Farmed Fish Diseases Pose Risks to Human Health

The damage does not stop at the water's edge. In the U.S., ~260,000 people are sickened from sea animal products each year.[17] A large share of the species most frequently implicated—such as shrimp, tilapia, and salmon—are now farmed, underscoring how pathogens circulating on fish and shrimp farms can persist through harvest and processing and enter the human food chain. These infections are most dangerous when fish and shrimp are eaten raw or undercooked.

Salmonella from crustaceans is the most frequently reported cause of aquaculture-linked outbreaks in humans, with shrimp ponds—often contaminated by fecal runoff—serving as reservoirs for bacteria that cause gastroenteritis and, in severe cases, systemic infection.[18] In 2021, a U.S. outbreak of *Salmonella Weltevreden* sickened people in four states and was traced to frozen cooked shrimp imported from India.[19] Between 2020 and mid-2025, the U.S. Food and Drug Administration (FDA) rejected 469 aquaculture imports—mostly shrimp—because of the presence of *Salmonella*.[20] But only 2.2 percent of incoming shipments are inspected for food safety issues—a figure lagging behind other countries.[21] **Such limited oversight suggests that the total number of contaminated imports could approach 25,000, meaning the vast majority would not be detected.**

Vibrio bacteria, also common in shrimp ponds, can cause gastroenteritis, septicemia, or wound infections in humans through handling or consumption of contaminated shrimp.[22] A 2023 investigation of retail shrimp in the Greater Sacramento, California, area found *Vibrio spp.* in 60 percent of shrimp samples collected from grocery stores.[23]

Farmed fish pose their own risks. *Listeria monocytogenes*—able to survive cold storage and smoking—has caused multiple outbreaks linked to smoked and ready-to-eat salmon products, with one genomic cluster causing 10 fatalities across Europe between 2019 and 2023. In addition, Streptococcus iniae, a pathogen endemic to tilapia and other cultured fish, has infected people handling farmed fish, causing

17 Mina Ziarati, Mohammad Jalil Zorriehzahra, Fatemeh Hassantabar, Zibandeh Mehrabi, Manish Dhawan, Khan Sharun, Talha Bin Emran, Kuldeep Dhama, Wanpen Chaicumpa, and Shokoofeh Shamsi. "Zoonotic Diseases of Fish and Their Prevention and Control." *The Veterinary Quarterly* 42, no. 1 (June 19, 2022): 95–118.
18 Kerry A. Hamilton, Arlene Chen, Emmanuel de-Graft Johnson, Anna Gitter, Sonya Kozak, Celma Niquice, Amity G. Zimmer-Faust, Mark H. Weir, Jade Mitchell, and Patrick L. Gurian. "Salmonella Risks Due to Consumption of Aquaculture-Produced Shrimp." *Microbial Risk Analysis* 9 (August 2018): 22–32.
19 U.S. Food and Drug Administration. "Outbreak Investigation of Salmonella Weltevreden: Frozen Cooked Shrimp (April 2021)," Updated August 2021.
20 U.S. Food and Drug Administration. *Import Refusals Dashboard*. FDA Office of Regulatory Affairs, January 1, 2020–June 15, 2025, accessed October 15, 2025.
21 United States Government Accountability Office. *Imported Seafood Safety: FDA and USDA Could Strengthen Efforts to Prevent Unsafe Drug Residues*. Report to the Chairman, Committee on Appropriations, U.S. Senate. GAO-17-443. September 2017.
22 Centers for Disease Control and Prevention. "About Vibrio Infection," Last updated May 14, 2024. Accessed October 15, 2025.
23 Brady Hirshfeld, Kurtis Lavelle, Katie Y. Lee, Edward Robert Atwill, David Kiang, Bakytzhan Bolkenov, Megan Gaa, Zhirong Li, Alice Yu, Xunde Li, and Xiang Yang. "Prevalence and Antimicrobial Resistance Profiles of Vibrio spp. and Enterococcus spp. in Retail Shrimp in Northern California." *Frontiers in Microbiology* 14 (June 2023).

cellulitis and endocarditis.[24]

Parasitic flukes are also widespread in crustaceans and fish in parts of Asia, which are also suppliers of aquaculture products to the U.S. These trematodes, which can cause serious liver and biliary diseases and lung infections in humans, are already a major cause of death in Southeast Asia.[25]

Like industrial meat production on land, modern aquaculture concentrates huge numbers of animals in crowded, stressful conditions that foster infections both in those animals and in humans. To keep production viable under these pressures, farms must use antibiotics, parasiticides, and chemical bath treatments—setting the stage for the antimicrobial risks detailed below.

Drug Use in Aquaculture Exacerbates the Global Crisis of Antibiotic Resistance

The aquaculture industry's main defense against the rampant disease on crowded fish farms is antibiotics. Their overapplication has consequences far beyond aquaculture itself: it feeds directly into the global crisis of antimicrobial resistance (AMR), the process by which bacteria, viruses, fungi, and parasites evolve to withstand the drugs designed to kill them. Because many of the antibiotics used to treat animals are also used to treat humans, this poses a direct threat to human health. The World Health Organization (WHO) identifies AMR as "one of the top ten global public health threats facing humanity."[26] Resistant infections are already linked to nearly 5 million deaths worldwide each year, with the U.S. Centers for Disease Control and Prevention warning that antimicrobial resistance is "an urgent global public health threat."[27]

> *Aquaculture plays an outsized role in the larger AMR crisis. By 2030, aquaculture is projected to have the highest antimicrobial use intensity of any food animal sector, with more antibiotics administered per kilogram of production than in terrestrial livestock industries.*[28]

The industry's antibiotic use is so high because approximately 75 percent of these drugs are not metabolized and are, instead, excreted directly into surrounding waters or sediments, where they can persist for months, creating conditions for aquatic bacteria to develop resistance.[29] As a result,

24 Michael R. Weinstein, M. Litt, D. A. Kertesz, P. Wyper, D. Rose, M. Coulter, A. McGeer, R. Facklam, C. Ostach, B. M. Willey, A. Borczyk, and D. E. Low, for the S. iniae Study Group. "Invasive Infections Due to a Fish Pathogen, Streptococcus iniae." *New England Journal of Medicine* 337, no. 9 (August 28, 1997): 589-594.
25 Mina Ziarati et al., "Zoonotic Diseases of Fish and Their Prevention and Control."
26 World Health Organization. *Antimicrobial Resistance: Key Facts*. Geneva: World Health Organization, 2021.
27 U.S. Centers for Disease Control and Prevention. "About Antimicrobial Resistance," Last reviewed July 11, 2024.
28 Daniel Schar, Eili Y. Klein, Ramanan Laxminarayan, Marius Gilbert, and Thomas P. Van Boeckel. "Global Trends in Antimicrobial Use in Aquaculture." *Scientific Reports* 10 (2020): 21878.
29 Milan Milijasevic, Slavica Veskovic-Moracanin, Jelena Babic Milijasevic, Jelena Petrovic, and Ivan Nastasijevic. "Antimicrobial Resistance in Aquaculture: Risk Mitigation within the One Health Context." *Foods* 13, no. 15 (August 2, 2024): 2448.

aquatic bacteria surrounding fish farms are becoming resistant to antibiotics, with one study reporting that more than 70 percent of bacteria isolated from fish, water, and sediments in Turkish trout farms carried at least one resistance gene, and two-thirds carried multiple resistance genes.[30] Because there are no drug classes developed specifically for fish, aquaculture depends entirely on antibiotics that are also used in human medicine. **An estimated 96 percent of antibiotics approved for use in aquaculture fall into classes the WHO designates as critically or highly important for treating human disease.**[31] Aquatic bacteria developing resistance to these drugs pose direct threats to human health, through two pathways.

First, the resistance genes from bacteria in aquatic environments can spread into the bacteria that infect humans. Take, for example, Chile—the world's second-largest salmon producer and the leading supplier to the U.S.—which used more than 338 tons of antibiotics in 2023, more than 300 times the antibiotics used by the world's leading salmon producer, Norway.[32,33] Unsurprisingly, studies have found widespread antimicrobial resistance around Chilean farms, including high loads of resistant Vibrio, Aeromonas, and other bacteria in farm effluents and nearby waterways. Molecular studies have found the resistance genes from local aquaculture environments present in human pathogens in the local population.[34,35]

Second, antibiotic-resistant bacteria that remain in sea animal products create a direct pathway for resistance genes to enter humans, potentially undermining antibiotic efficacy. Because of this AMR risk, as well as their direct health risks, including carcinogenicity and other toxic effects, many drugs have been banned in sea animals both produced in and imported to the U.S.[36] Sampling of fish and shrimp sold in the U.S., however, has repeatedly found antibiotic-resistant bacteria, including strains resistant to banned drugs. A 2021 study of retail shrimp from Florida and Georgia, for example, detected bacterial resistance to chloramphenicol, a prohibited antibiotic linked to aplastic anemia in humans, in nearly one-fifth of samples.[37] National surveying has also found bacteria resistant to medically important drugs in

30 Erol Capkin, Ertugrul Terzi, and Ilhan Altinok. "Occurrence of Antibiotic Resistance Genes in Culturable Bacteria Isolated from Turkish Trout Farms and Their Local Aquatic Environment." *Diseases of Aquatic Organisms* 114, no. 2 (May 21, 2015): 127-137.

31 Schar et al., "Global Trends in Antimicrobial Use in Aquaculture."

32 Sernapesca. *Uso de Antimicrobianos en la Salmonicultura Nacional, Informe 2023*. Valparaíso: Servicio Nacional de Pesca y Acuicultura, 2024.

33 Norwegian Veterinary Institute. *NORM-VET Report 2023: Usage of Antimicrobial Agents and Occurrence of Antimicrobial Resistance in Norway*. Oslo: Norwegian Veterinary Institute, 2024.

34 Javiera Ortiz-Severín, Christian Hodar, Camila Stuardo, Constanza Aguado-Norese, Felipe Maza, Mauricio González, and Verónica Cambiazo. "Impact of Salmon Farming in the Antibiotic Resistance and Structure of Marine Bacterial Communities from Surface Seawater of a Northern Patagonian Area of Chile." *Biological Research* 57 (November 10, 2024): Article 84.

35 Aleksandra Tomova, Larisa Ivanova, Alejandro H. Buschmann, María Luisa Rioseco, Rajinder K. Kalsi, Henry P. Godfrey, and Felipe Cabello. "Antimicrobial Resistance Genes in Marine Bacteria and Human Uropathogenic Escherichia coli from a Region of Intensive Aquaculture." *Environmental Microbiology Reports* 7, no. 5 (August 2015): 727-735.

36 United States Government Accountability Office. *Imported Seafood Safety*.

37 Laxmi Sharma, Ravinder Nagpal, Charlene R. Jackson, Dhruv Patel, and Prashant Singh. "Antibiotic-Resistant Bacteria and Gut Microbiome Communities Associated with Wild-Caught Shrimp from the United States versus Imported Farm-Raised Retail Shrimp." *Scientific Reports* 11 (February 8, 2021): Article 3356.

both farmed and wild sea animal products. These drug-resistant strains circulating in human populations contribute to the growing AMR crisis.

Food safety controls lag far behind these risks. The FDA maintains a list of more than a dozen prohibited drug classes, yet only tests approximately 0.1 percent of imports.[38] Even with such a small sample size, agency testing routinely produces positive results of illegal drugs, such as chloramphenicol and nitrofurans, in incoming aquaculture products.[39] The limited testing paired with the ubiquity of antibiotic use in aquaculture suggests that large quantities of fish and shrimp containing illegal residues may be entering the U.S. undetected.

Supporting this conclusion, a study out of Baton Rouge, Louisiana, found that 70 percent of retail samples of farmed shrimp tested positive for residues of nitrofurantoin, an illegal antibiotic.[40] Moreover, a 2022 review of 95 national antimicrobial resistance (AMR) action plans globally found that 37 percent made no mention of aquaculture at all, and most that did lacked meaningful detail. Additionally, among the world's 15 largest aquaculture-producing countries, six had not implemented an aquaculture component in their AMR plan, including major producers such as Chile, Egypt, and Brazil.[41]

Contrasting its promise of a clean, healthy ocean protein, aquaculture's crowded and unsanitary conditions drive routine reliance on antibiotics critical for human medicine. This dependence fuels the antimicrobial resistance crisis, undermining both ecosystem integrity and human health.

A 2024 investigation across 12 Finnish trout farms discovered rampant disease, decomposing fish left in pens, and polluted waters. (Source: Rontti Varjola / We Animals)

38 United States Government Accountability Office. *Imported Seafood Safety: FDA and USDA Could Strengthen Efforts to Prevent Unsafe Drug Residues*. Report to the Chairman, Committee on Appropriations, U.S. Senate. September 2017. GAO-17-443.
39 U.S. Food and Drug Administration. "Import Refusals Dashboard," Accessed October 1, 2025.
40 Murshida Khan and Julie A. Lively. "Determination of Sulfite and Antimicrobial Residue in Imported Shrimp to the USA." *Aquaculture Reports* 18 (November 2020): 100529.
41 Andrea Caputo, Melba G. Bondad-Reantaso, Iddya Karunasagar, Bin Hao, Patricia Gaunt, David Verner-Jeffreys, Sophie Fridman, and Alejandro Dorado-Garcia. "Antimicrobial Resistance in Aquaculture: A Global Analysis of Literature and National Action Plans." *Reviews in Aquaculture*, first published October 24, 2022.

MYTH 4: FARMED FISH IS A CLIMATE-SMART FOOD

Reality: Fish Farming Exacerbates Climate Change

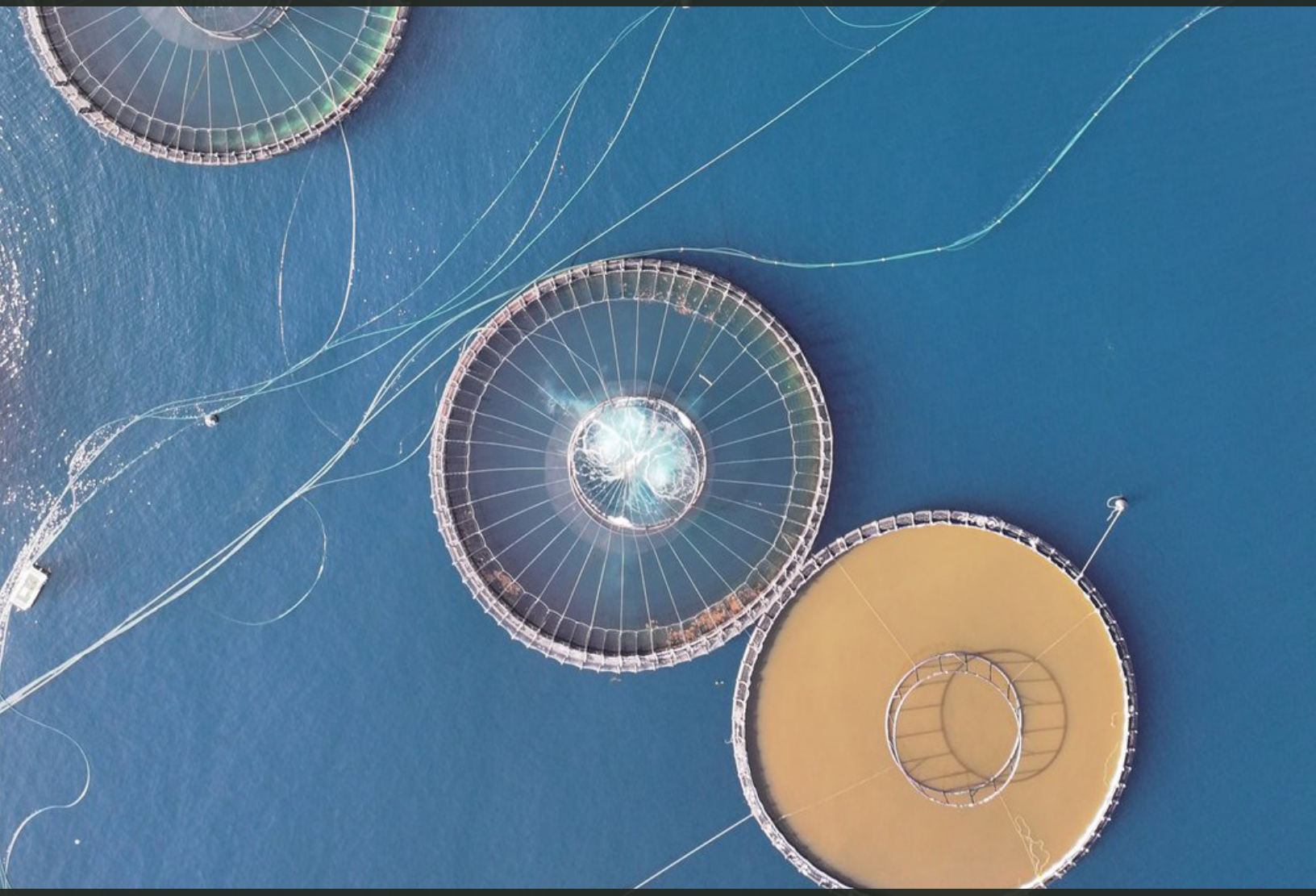
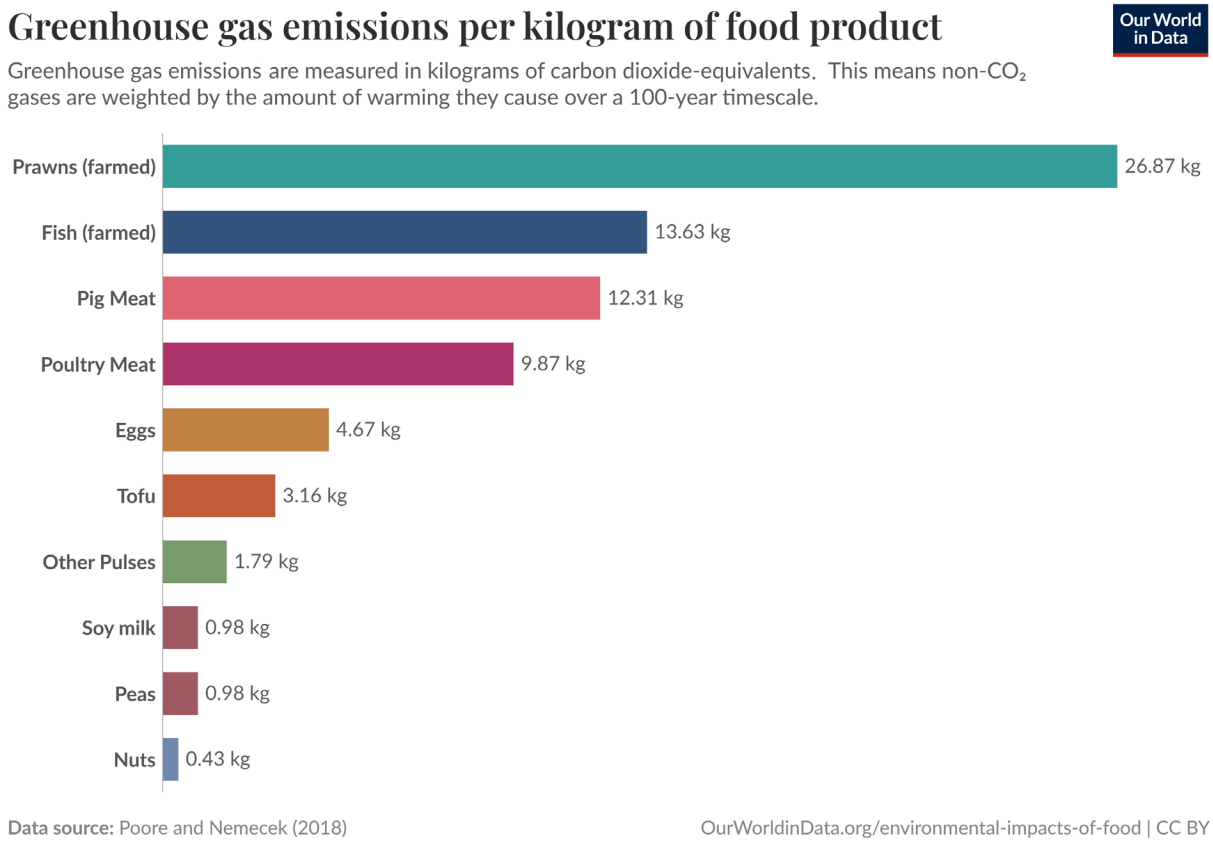


Photo: Wilderness Witness

Myth 4 | Farmed Fish Is a Climate-Smart Food

Reality: Fish Farming Exacerbates Climate Change

Despite its framing as a "climate-smart" source of protein, industrial aquaculture carries a heavy carbon burden. Life-cycle analyses place farmed fish at an average of 13.63 kg CO_2-eq per kilogram of food product—exceeding both poultry and pork, and 13 times higher than peas.[1] Farmed fish are also far more resource-hungry, requiring roughly 10 times more freshwater than plant proteins like beans, peas, and soy.[2]



1 Joseph Poore and Thomas Nemecek. "Reducing Food's Environmental Impacts through Producers and Consumers." *Science* 360, no. 6392 (June 2018): 987–92.

2 This water calculation compares the water usage of farmed fish against the average water usage of peas, beans, and tofu. See Poore and Nemecek, "Reducing Food's Environmental Impacts."

Beyond the impact of its direct emissions, fish farming also undermines the planet's carbon sinks. By diverting small fish from the ocean's natural carbon pump and converting wild forests and grasslands to agricultural lands to grow soy and other feed crops, the industry weakens two of the Earth's most important climate buffers.

The Emissions and Energy Burdens from Farming Fish Deepen the Climate Crisis

Claims that aquaculture offers a low-carbon alternative to wild-caught fish and other animal proteins obscure the industry's high climate toll. Across farmed species, three factors dominate the emissions profile: the energy- and land-intensive production of feed, the operational energy required to keep fish alive in crowded systems, and the chronic mortalities that squander those inputs.

Feed alone can comprise up to 94 percent of the emissions profile of farmed salmon.[3] For carnivorous species, the full carbon costs of industrial fishing fleets and processing of fish meal and fish oil (FMFO) roll into the emissions of the final product.[4] Growing public pressure on the industry to reduce its reliance on FMFO has contributed to a shift to more plant-based feed ingredients—but this merely shifts the emissions burden to land-based ecosystems. In a study of Icelandic open net pen aquaculture, soybean meal and rapeseed oil together were found to drive nearly half of salmon feed-related greenhouse gases because of heavy fertilizer use and land-use changes such as deforestation needed to grow these crops.[5]

Under pressure for their dependence on wild-caught fish for feed, fish farming companies have begun promoting their use of more "sustainable" plant-based alternatives, primarily soy, corn, and vegetable oils. While the shift is largely inevitable for continued industry growth (as reduction fisheries are already at their ecological limits), it conveniently boosts the industry's eco-friendly narrative. However, not only has this strategy failed to reduce pressure on coastal fish species, but it has extended the feed industry's environmental degradation from sea to land, intensifying deforestation, pollution, and greenhouse gas emissions.[6]

Emissions from farmed salmon are estimated to be about 5.1 kg CO_2-eq per

3 Nathan Pelletier, Peter Tyedmers, Ulf Sonesson, Astrid Scholz, Friederike Ziegler, Anna Flysjo, Sarah Kruse, Beatriz Cancino, and Howard Silverman. "Not All Salmon Are Created Equal: Life Cycle Assessment (LCA) of Global Salmon Farming Systems." *Environmental Science & Technology* 43, no. 23 (December 2009): 8730–36.

4 Ibid.

5 Clara M. Vásquez-Mejía, Heiðdís Smáradóttir, María Gudjónsdóttir, Guðrún S. Hilmarsdóttir, Hildur Inga Sveinsdóttir, Alessandro Manzardo, and Ólafur Ögmundarson. "Water Scarcity- and Carbon Footprints of Aquafeed: The Case of Land-Based and Ocean-Based Atlantic Salmon (Salmo salar) Farming in Iceland." *Agricultural Water Management* 314 (January 2025): 109528.

6 Jillian P. Fry, David C. Love, Graham K. MacDonald, Paul C. West, Peder M. Engstrom, Keeve E. Nachman, and Robert S. Lawrence. "Environmental Health Impacts of Feeding Crops to Farmed Fish." *Environment International* 91 (May 2016): 201–14.

kilogram of edible product—five times those of peas (at just 0.98 kg CO_2-eq/kg).[7,8] Worse, indoor recirculating aquaculture systems (RAS), which filter and reuse water in tanks to reduce effluent discharge and are promoted as a greener method of salmon farming, actually carry a heavier carbon toll than open net pens, estimated at 7 kg CO_2-eq/kg, since extruding high-protein pellets, pumping oxygen, and chilling harvests impart significant emissions.[9]

This problem is not limited to salmon. Non-carnivorous species like tilapia and catfish are often marketed as lower-trophic or "efficient" fish because of their reliance on land-based feed, but life-cycle analyses show emissions actually exceeding those of salmon: tilapia emit 10.68 kg CO_2-eq/kg, more than poultry (9.87 kg CO_2-eq/kg), while catfish emit 7.77 kg CO_2-eq/kg.[10,11]

Tilapia farms carry a heavy carbon toll. Like salmon farming, tilapia farming confines fish in crowded conditions, leading to nutrient pollution of rivers and mortality from fungal and bacterial diseases. (Source: Lilly Agustina / Act For Farmed Animals / We Animals)

Farmed shrimp, comprising 90 percent of shrimp eaten in the U.S., are also highly carbon-intensive, primarily due to feed production and on-farm energy use. Life cycle analyses estimate that, depending on farming method, shrimp can emit upwards of 26 kg CO_2-eq/

7 Gephart, Jessica A., Patrik J. G. Henriksson, Robert W. R. Parker, Alon Shepon, Kelvin D. Gorospe, Kristina Bergman, Gidon Eshel, Christopher D. Golden, Benjamin S. Halpern, Sara Hornborg, Malin Jonell, Marc Metian, Kathleen Mifflin, Richard Newton, Peter Tyedmers, Wenbo Zhang, Friederike Ziegler, and Max Troell. "Environmental Performance of Blue Foods." *Nature* 597 (September 15, 2021): 360–65.

8 Poore and Nemecek, "Reducing Food's Environmental Impacts."

9 Zhang, Zhimin, Haokun Liu, Junyan Jin, Xiaoming Zhu, Dong Han, and Shouqi Xie. "Towards a Low-Carbon Footprint: Current Status and Prospects for Aquaculture." *Water Biology and Security* 3, no. 4 (October 2024): 100290.

10 Gephart et al., "Environmental Performance of Blue Foods."

11 Poore and Nemecek, "Reducing Food's Environmental Impacts."

kg. This suggests that **farmed shrimp is among the most GHG-intensive sea animal products on the market, and its emissions often exceed those of pork, poultry, and even bottom-trawled wild shrimp.**[12,13]

High on-farm mortality further worsens aquaculture's carbon ledger by consuming resources that never reach the food supply. In Norway alone, 62.8 million farmed salmon died in 2023—16.7 percent of the total stock—due to disease, parasites, and poor conditions.[14] Fish who die before harvest still eat feed—the largest source of aquaculture's greenhouse gas emissions—and require electricity, oxygenation, and chemical treatments, all of which generate carbon regardless of whether the fish survive. Industry metrics such as feed conversion ratios (FCRs) and carbon footprints are almost always expressed per kilogram of harvested fish. This means all of the resources spent on fish who died are simply folded into the averages for the survivors. While a farm with higher mortality will report a somewhat worse FCR or carbon figure, those metrics cannot show how much additional feed, other resources, and climate impact were wasted on fish who never became food.[15] The result is an efficiency profile that obscures the full environmental burden of mortality.

Some readers may assume the answer is to simply switch back to wild fish, but the climate math does not support this. While some wild-caught fish register lower carbon intensity than farmed fish (wild fisheries' emissions vary wildly, from between 2 and 20 kg CO_2-eq/kg), they still rarely approach the low-emissions profile of plant proteins.[16] Further, these numbers ignore other ecological costs of industrial fishing: bycatch of non-target species, habitat destruction from trawling, and additional pressure on already depleted populations. In other words, whether farmed in cages or hauled up in industrial nets, industrial fish protein carries a heavier environmental burden than plant-based alternatives.

When feed production, operational energy, and uncounted fish losses are tallied, aquaculture is highly carbon-intensive—particularly when compared with plant protein sources like beans and other pulses—directly contradicting the narrative of industrial aquaculture as a climate-smart seafood solution.

Industrial Aquaculture Disrupts Critical Carbon Sinks

Industrial aquaculture exacts a double burden on Earth's climate system: its energy use and emissions dump carbon into the atmosphere while simultaneously destroying Earth's capacity to absorb this carbon in the form of carbon sinks. Carbon sinks are ecosystems that absorb and store more carbon than they release, buffering

12 Ibid.
13 Gephart et al., "Environmental Performance of Blue Foods."
14 Ingunn Sommerset, Jannicke Wiik-Nielsen, Torfinn Moldal, Victor Henrique Silva De Oliveira, Julie Svendsen, Asle Haukaas, and Edgar Brun. *Fiskehelserapporten 2023*. Oslo: Veterinærinstituttet, 2024.
15 Pierre Jouannais, Pier Paolo Gibertoni, Marco Bartoli, and Massimo Pizzol. "LCA to Evaluate the Environmental Opportunity Cost of Biological Performances in Finfish Farming." *International Journal of Life Cycle Assessment* 28 (2023): 1286–1301.
16 Gephart et al., "Environmental Performance of Blue Foods."

the planet against rising greenhouse gases. Together, the oceans, forests, and wetlands absorb more than half of all human-caused CO_2 emissions each year, making them indispensable for climate stability.[17] Weakening these systems not only releases stored carbon but also diminishes their ongoing ability to draw carbon from the atmosphere.

Aquaculture contributes to this erosion on multiple fronts. In the ocean—by far the world's largest carbon sink, storing 38,000 gigatons of carbon—feed production relies heavily on small fish who drive the natural carbon "pump": their excrement aggregates into "marine snow," sinking carbon into the deep sea and locking it away for centuries. By harvesting large volumes of these species to produce FMFO, industrial fishing interrupts this key sequestration pathway. A 2022 mapping of intensive fishing zones against upper-ocean carbon-export hotspots found that just 9 percent of the ocean's surface—where 39 percent of global fishing effort is concentrated—accounts for 21 percent of the ocean's carbon sink, and the small species used for FMFO dominate catches in these high-impact areas.[18] As the study's authors warn, overfishing these fish weakens one of the planet's most vital climate-stabilizing systems, which has been largely ignored.

Shrimp aquaculture has also driven the destruction of mangrove forests, among the most carbon-dense ecosystems on Earth. Since the 1980s, shrimp ponds carved into coastal wetlands have accounted for 38 percent of all mangrove deforestation worldwide and 54 percent of the mangrove loss recorded in Southeast

Large swaths of Indonesia's mangrove forests have been cleared for shrimp farms.

17 United Nations Environment Programme. "Five Ecosystems Where Nature-Based Solutions Can Deliver Huge Benefits," UNEP, November 9, 2021.
18 Emma Cavan and Simeon Hill. "Commercial Fishery Disturbance of the Global Ocean Biological Carbon Sink." *Global Change Biology* 28 (April 2022): 1212–1221.

Asia.[19] Mangroves store up to five times more carbon per hectare than most tropical forests, particularly in their deep organic soils. Their destruction for shrimp farming permanently removes one of the planet's most efficient carbon sinks.[20] The expansion of shrimp ponds in Southeast Asia and Latin America has therefore transformed a climate buffer into a major emissions source, compounding aquaculture's already significant feed and energy footprint.

On land, the aquaculture industry has shifted pressure to terrestrial ecosystems by replacing marine ingredients with crops like soy and rapeseed. Growing these feed crops requires clearing large swaths of forest, particularly in countries already struggling with food insecurity and biodiversity loss—following in the footsteps of the beef industry, which has driven Amazon deforestation through cattle ranching and growing soy for feed.[21] Forests, which lock carbon in living biomass and deep soils, are one of Earth's largest terrestrial carbon sinks, storing an estimated 861 gigatons of carbon and absorbing nearly 16 billion tons of CO_2 each year.[22] Supply-chain mapping by Trase in 2020 shows that major salmon feed companies, including Cargill, Biomar, and Skretting, were sourcing soybeans from Brazilian regions experiencing ongoing deforestation. [23]

As Dr. Spencer Roberts of the University of Miami observes, "What we're talking about is not so much increasing efficiency as much as a shift in pressure from ecosystems like the Humboldt Current [in Peru], where the anchovies come from, to ecosystems like the Amazon rainforest where the soy comes from."[24]

Rather than reducing pressure on the planet, aquaculture compounds the climate crisis twice over: first through its heavy greenhouse gas emissions, and again by weakening the ocean and land-based carbon sinks that should be absorbing them. The result is an industry whose climate impacts run counter to the story it tells about sustainability.

19 Hai Nguyen, Long Chu, Richard J. Harper, Bernard Dell, and Hanh Hoang. "Mangrove-Shrimp Farming: A Triple-Win Approach for Communities in the Mekong River Delta." *Ocean & Coastal Management* 221 (15 April 2022): 106082.

20 Mark Chatting, Ibrahim Al-Maslamani, Mark Walton, Martin W. Skov, Hilary Kennedy, Y. Sinan Husrevoglu, and Lewis Le Vay. "Future Mangrove Carbon Storage Under Climate Change and Deforestation." *Frontiers in Marine Science* 9 (February 2022).

21 Beef production is widely recognized as the leading driver of Amazon deforestation, with cattle ranching and clearing for soy production responsible for up to 80 percent of forest loss. See Daniel C. Nepstad, Claudia M. Stickler, Britaldo Soares-Filho, and Frank Merry. "Interactions among Amazon Land Use, Forests and Climate: Prospects for a Near-Term Forest Tipping Point." *Philosophical Transactions of the Royal Society B: Biological Sciences* 363 (February 11, 2008): 1737–1746.

22 Sarah Ruiz. "Global Forest Carbon Storage, Explained," Woodwell Climate Research Center, April 17, 2024.

23 Trase. *Brazil Soy Supply Chain Dataset, 2004–2022*. Updated January 28, 2025.

24 Kenny Torrella. "Fish Farming Was Supposed to Be Sustainable. But There's a Giant Catch." *Vox* (Future Perfect), October 24, 2024.

MYTH 5: CERTIFICATIONS AND LABELS ENSURE SUSTAINABILITY

Reality: Certifications and Labels Are Marketing Tools, Not Proof of Sustainability

Myth 5 | Certifications and Labels Ensure Sustainability

Reality: Certifications and Labels Are Marketing Tools, Not Proof of Sustainability

Concerns over ocean health are at an all-time high, with survey data showing overwhelming public anxiety about overfishing and ecosystem decline.[1] The seafood industry has responded by promoting "sustainability" labels and certifications, which now appear across supermarket shelves and menus. These assurances have proven lucrative: products marketed with sustainability attributes grow faster than conventional goods,[2] and certifications increasingly guide procurement policies for hospitals, universities, and retailers. While some certifications have driven modest improvements, the system as a whole remains deeply compromised. Because there are no global standards to verify what counts as sustainable seafood, the industry creates its own terms—and heavily influences the certifiers that should, in theory, regulate *it*. Therefore, what appears as credible oversight has become a greenwashing tool—one that, despite the well-intentioned efforts of reformers, legitimizes industrial seafood practices and sustains profitability. Across the spectrum, from vague, self-declared eco-labels to major certification programs and consumer guides, standards and accountability remain weak, conflicts of interest abound, and industry influence is pervasive—fostering a false sense of progress in consumers and food buyers.

The Industry Uses Misleading Labels to Sell Sustainability to Consumers

At the most basic level, seafood labels often consist of company-defined claims such as

1 In a 2024 Marine Stewardship Council-commissioned survey, for example, 91 percent of seafood buyers expressed concern for the health of the world's oceans, with 47 percent listing overfishing among their top concerns. (See Marine Stewardship Council. *Rising Recognition in the US: The MSC Label and Sustainable Seafood in 2024*. January–February 2024 survey. Marine Stewardship Council / GlobeScan.) Further, a 2020 Kantar survey found that across six countries, between 75 percent and 93 percent of people felt that ocean health was important to their families. (See Kantar. *Perceptions of the Ocean and Environment: Public Opinion Survey Conducted in Chile, China, Indonesia, Mexico, Japan, and the U.S.* March 2020. Conducted for the David and Lucile Packard Foundation.)

2 Bar Am, Jordan, Vinit Doshi, Anandi Malik, Steve Noble, and Sherry Frey. "Consumers Care about Sustainability — and Back It Up with Their Wallets," McKinsey Insights, February 6, 2023.

"responsibly farmed" or "sustainably sourced." These terms operate in a regulatory vacuum: there is no standardized definition or federal oversight in either the U.S. or Canada, leaving producers free to set their own benchmarks. A study of Canadian retailers found such unregulated claims to be the most common type of label, yet 60 percent could not be verified, and nearly 10 percent were actively misleading, such as wild salmon labeled "no antibiotics" (a claim irrelevant to wild fish).[3]

The absence of oversight extends even to mandatory disclosures. U.S. law requires that fish and shrimp be labeled by country of origin and production method (wild versus farmed), yet enforcement has proven so weak that misrepresentation is widespread. An Oceana DNA study found that 43 percent of salmon sold in U.S. groceries and restaurants was mislabeled—most often farmed Atlantic salmon marketed as wild-caught.[4]

Together, these examples illustrate how seafood labeling—whether voluntary sustainability claims or mandatory farming-method disclosures—remains highly vulnerable to industry manipulation. In practice, basic labels function as frontline greenwashing, instilling consumer trust without corresponding action or accountability.

These labels—"Responsibly Sourced" on the left and "Quality & Trust Guarantee"—on the right offer no description or verification that the products meet specific standards. Rather, they are greenwashing tools to win consumers' trust and increase profits.

Top Aquaculture Certifications Facilitate Industry Greenwashing

Third-party certifications are marketed as rigorous safeguards against the failures of self-declared eco-labels. In theory, they are meant to set science-based standards, verify

3 Kelly Roebuck, Sarah Foster, Liane Veitch, and Scott Wallace. *Certification, Verification or Fabrication? An Investigation of Seafood Environmental Claims in Canadian Retailers*. SeaChoice, September 2020.
4 Kimberly Warner and Beth Lowell. *Oceana Reveals Mislabeling of America's Favorite Fish: Salmon*. Oceana, October 2015.

compliance through independent audits, and revoke certification when violations occur. In practice, most third-party certifications, including the most commonly used aquaculture schemes—Best Aquaculture Practices (BAP) and the Aquaculture Stewardship Council (ASC)—remain structurally aligned with industry interests. While some individuals within these systems are working earnestly to strengthen standards and reduce serious harms, the underlying frameworks were built to serve the needs of producers rather than to regulate them.[5] Their financial models depend on industry fees, their standards are written to accommodate rather than constrain harmful practices, and their enforcement mechanisms rarely function as advertised. This means that, despite efforts by concerned environmental advocates to reform them, the result is a system that projects the appearance of accountability while enabling business as usual to continue. In this context, certifications function less as independent safeguards than as instruments of greenwashing—misleading conscientious consumers, organizations, and foodservice leaders into believing they are supporting genuine sustainability.

Industry Ties and Financial Dependence

Many certification programs are financed and even governed by the very companies they are meant to oversee. BAP, for example, is administered by the Global Seafood Alliance, an industry group founded by seafood and agribusiness corporations such as Cargill and Monsanto.[6] As of 2025, 42 percent of its Board of Directors represent companies that produce, process, distribute, or sell sea animals or aquafeed, and another 27 percent are major buyers or distributors of seafood.[7] Further, the program is sustained largely through membership dues and licensing fees from companies seeking certification, creating a direct conflict of interest.[8] ASC presents itself as independent, yet it is similarly dependent on licensing fees from producers and retailers.[9] **This financial structure creates a ceiling on standards: the certification bodies can only raise requirements as far as their paying members are willing to accept.** If a company becomes unable to meet these standards and is removed from a certification program, the certification itself loses funds, disincentivizing more rigorous standards. Both programs are thus structurally designed to maintain industry participation and profitability rather than to impose rigorous ecological safeguards.

5 The co-author of this report, Farm Forward, experienced this failure firsthand as a member of the board of the Global Animal Partnership (GAP), a leading land animal certification program heavily influenced and funded by the animal agriculture industry. After years of working with GAP to raise animal welfare standards, Farm Forward exited the board in 2020—followed by the remaining animal welfare organizations in 2025—as progress stalled and the label evolved into a humanewashing tool for factory farming practices. Read more: Aaron S. Gross "Why We Resigned from the Board of the Nation's Largest Animal Welfare Certification," Farm Forward, October 2, 2020.

6 Global Seafood Alliance. "A Brief History of the Global Seafood Alliance," Accessed October 8, 2025.

7 Global Seafood Alliance. "The People Behind GSA / Our Team," Accessed October 8, 2025.

8 Global Seafood Alliance. *Form 990: Return of Organization Exempt from Income Tax, Fiscal Year 2023*. Part VIII, "Statement of Revenue." Accessed via ProPublica Nonprofit Explorer, EIN 54-1853030.

9 Aquaculture Stewardship Council. "Funding and Finances," Accessed October 8, 2025.

Weak Standards and Permissive Thresholds

Because of these conflicts of interest between oversight bodies and the industry they regulate, both BAP and ASC have set standards not to restrict harmful practices but to sanitize them under the guise of "best practice." **Most fundamentally, by certifying farmed salmon—carnivorous fish who, by their nature, consume more wild fish than their own weight—both certifications greenwash a highly inefficient protein.** Under ASC's current standard, farms may use enough fish oil that producing one kilogram of ASC-certified salmon can still require catching up to 2.52 kilograms of wild fish—even as ASC proclaims on its website that it is "easing pressure on natural resources."[10,11] (ASC sets *two* separate limits on wild-fish inputs in salmon feed: one for fishmeal and one for fish oil. Modern salmon feed uses far less fishmeal than oil because it can be replaced with plant and animal proteins. Fish oil is different: while farms can substitute some vegetable oils, these oils do not contain the long-chain omega-3 fats that salmon require—making fish oil the true bottleneck in salmon feed.[12] The two ASC ratios cannot simply be added together to show total wild-fish use because they are calculated with different formulas and different conversion factors and are not designed to produce a single combined number. As a result, ASC's system prevents consumers from seeing the full amount of wild fish required to raise a kilogram of salmon—as would be reflected in the FIFO ratio—which would typically be higher than each of the two figures reported.)

Standards related to disease and parasite control—particularly sea lice—are also weak under certification schemes. For example, in 2022, SeaChoice reported that ASC had increased sea lice limits for salmon by 1,550 percent in British Columbia, from 0.1 to 3 adult sea lice per fish—a threshold critics warn can be dangerous for juvenile

Industry ties, low standards, and weak accountability make BAP (left) and ASC (right) act more as greenwashing tools than guarantees of sustainability.

10 Aquaculture Stewardship Council. *ASC Farm Standard, Version 1.0.1 (August 1, 2025)*. ASC Programme Centre.
11 Aquaculture Stewardship Council. "Aquaculture Stewardship Council," Accessed October 9, 2025.
12 Patricia Majluf, Kathryn Matthews, Daniel Pauly, Daniel J. Skerritt, and Maria Lourdes D. Palomares. "A Review of the Global Use of Fishmeal and Fish Oil and the Fish In: Fish Out Metric." *Science Advances* 10, no. 42 (October 16, 2024): eadn5650.

wild salmon. Although farms exceeding allowable levels are technically required to self-report and reduce lice within 21 days, enforcement is lax.[13] Even worse, BAP sets no quantitative limits at all, and environmental organizations have documented BAP-certified farms with sea lice levels as high as 51 per fish.[14]

Standards concerning chemical and antibiotic use also remain lax. BAP's salmon standard requires only vague veterinary oversight without clear limits on amounts or frequency of use.[15] ASC allows up to six antibiotic treatments (three for smolts and three for the "grow-out" phase), a cap set in 2012 and still unmodified in recent revisions, despite growing concerns about antimicrobial resistance.[16]

Ultimately, both BAP and ASC standards are designed far less to protect ecosystem and fish health than to provide the veneer of sustainability, allowing industrial aquaculture to continue unchecked while maintaining consumer and corporate confidence.

Lack of Accountability

In theory, when a certified farm violates standards, it should face sanctions: suspension of certification, mandatory corrective actions, and in severe cases, permanent removal from the program. In practice, this almost never happens.

Both BAP and ASC rely on sampling-based audits, meaning that after initial audit, only a fraction of farms within a company group must be visited by auditors in each annual cycle.[17,18] BAP does not make its audit results public, making it impossible to know whether farms that have violated even the bare-bones standards have been allowed to remain in the program.[19]

With ASC, investigations reveal that enforcement is weak even when violations are found. For example, in 2022, **WildFish revealed that five out of six ASC-certified Scottish salmon farms supplying a major UK retailer averaged sea lice counts eight times higher than ASC's own limit, with some exceeding the threshold by thirty-fold.[20] All kept their certification status.** A 2018 SeaChoice review of 456 ASC audit reports found widespread inconsistencies and lenient enforcement, with many farms certified despite failing to meet several core requirements—raising serious questions about the credibility and rigor of the scheme.[21]

13 SeaChoice. "ASC's New Sea Lice Limits Protects Industry, Not Wild Salmon," Press release, September 7, 2022.
14 Living Oceans Society, Greenpeace, SeaChoice, et al. *Open Letter to the Global Seafood Alliance*. May 2024.
15 Global Seafood Alliance. *Best Aquaculture Practices: Salmon Farm Standard, Issue 3.0*. August 4, 2025.
16 Aquaculture Stewardship Council, *ASC Farm Standard*.
17 Global Seafood Alliance. *Best Aquaculture Practices: Farm and Hatchery Group Program Policy and Control Document, Issue 1.0*. December 13, 2018.
18 Aquaculture Stewardship Council. *ASC Group Requirements for Farms, Version 1.0 (CAR-005)*. May 2025.
19 SeaChoice. "Accountability in Aquaculture Sustainability," April 2021. [PDF assessment: *Best Aquaculture Practices (BAP) Certification Scheme*].
20 Andrew Graham-Stewart. "Aquaculture Stewardship Council's Accreditation Standards Worthless for Salmon Farms," WildFish, April 27, 2022.
21 Kelly Roebuck and Karen Wristen. *Global Review of the Aquaculture Stewardship Council's Salmon Standard: Summary Report*. SeaChoice, 2018.

Rather than holding producers accountable, BAP and ASC normalize harmful practices and shield them from scrutiny. By codifying weak standards and failing to enforce what standards they do set, these schemes function less as watchdogs than as greenwashing tools, legitimizing industrial aquaculture under the guise of sustainability.

Feed Certifications Enable Fishery Exploitation

Aquaculture certifications claim to ensure responsible feed sourcing by relying on secondary certifications for the fisheries that supply fishmeal and fish oil. In practice, this outsourcing passes the accountability problem down the chain to schemes with the same flaws: the Marine Stewardship Council (MSC) and MarinTrust.

MSC was created explicitly to protect the long term profitability of industrial seafood companies and today depends on licensing fees from the fisheries it certifies.[22] MSC allows companies that fail to meet their standards to use the MSC logo under a "conditional certification." In effect, **producers with "conditional certifications" are allowed to market themselves as certified well before they meet MSC's standards, and consumers have no way of determining which products even meet the low bar MSC sets.** A 2024 assessment revealed that more than 90 percent of fisheries certified by MSC start out with a "conditional certification" and do not meet all standards.[23] In addition, MSC's standards themselves permit bottom-trawling—among the most destructive forms of fishing—with a 2023 review identifying 83 MSC-approved trawl fisheries.[24] Researchers have estimated that over 80 percent of MSC-labeled sea animal products come from destructive gear types.[25] At the foundational level, the program heavily relies on MSY to define sustainability, making its standards more geared toward production than ecosystem integrity.[26]

MarinTrust is even more compromised: it was created by, and remains tightly bound to, the Marine Ingredients Organization (IFFO), the trade association representing more than half of the world's FMFO producers and 80 percent of global trade. IFFO's explicit mission is to expand the industry's growth and profitability, making MarinTrust less a regulator than a vehicle for industry self-certification.[27] A Changing Markets Foundation investigation found

22 Daniel Zwerdling and Margot Williams. "Is Sustainable-Labeled Seafood Really Sustainable?" *NPR*, February 11, 2013.
23 On The Hook. *Research Brief: Conditional Certification and Associated Sustainability Claims Are a High Risk for Businesses*. November 2024.
24 Rainer Hilborn, R. Amoroso, J. Collie, J. G. Hiddink, M. J. Kaiser, T. Mazor, R. A. McConnaughey, A. M. Parma, C. R. Pitcher, M. Sciberras, et al. "Evaluating the Sustainability and Environmental Impacts of Trawling Compared to Other Food Production Systems." *ICES Journal of Marine Science* 80, no. 6 (August 2023): 1567–1579.
25 Frédéric Le Manach, Jennifer L. Jacquet, Megan Bailey, Charlène Jouanneau, and Claire Nouvian. "Small Is Beautiful, but Large Is Certified: A Comparison between Fisheries the Marine Stewardship Council (MSC) Features in Its Promotional Materials and MSC-Certified Fisheries." *PLoS ONE* 15, no. 5 (May 4, 2020).
26 Marine Stewardship Council. *MSC Fisheries Standard and Guidance Version 3.1*. London: MSC, July 22, 2024.
27 Brigitte Wear, Hazel Healy, and Michaela Herrmann. "Revealed: Industry-Led West Africa Fishery Protection Measures Marred by 'Massive Conflicts of Interest,'" *DeSmog*, July 4, 2024.

that IFFO- and MarinTrust-linked plants were sourcing from overfished and poorly managed fisheries in West Africa, where weak oversight and limited traceability make illegal and unreported catches commonplace.[28] Because MarinTrust's "Responsible Supply" standard applies only to processing plants—not to the fisheries supplying them—facilities can be certified even when relying on depleted populations. The scheme also accepts MSC certification as a proxy for fishery sustainability, further obscuring the environmental toll of reduction fisheries.[29]

Rather than curbing overfishing, MSC and MarinTrust allow reduction fisheries to present themselves as sustainable, channeling wild fish into salmon and shrimp feed under a green seal of approval. By outsourcing oversight to these bodies, aquaculture certifications like BAP and ASC import the same conflicts of interest and permissive standards, embedding fishery exploitation into the very definition of "responsible" aquaculture.

Consumer Purchasing Guides Lack Accountability: The Failures of Seafood Watch

Consumer guides appear to offer independent sustainability advice but often reinforce industry narratives. Seafood Watch, one of the most trusted consumer guides, rates fish at the species and regional level rather than auditing individual farms. In conversation with the authors, **Seafood Watch staff confirmed that their scope is limited to region, species, and farm type, and that individual farms are never assessed or audited.** As a result, farms with serious issues can be hidden within a "Good Alternative" or "Best Choice" regional rating if the overall management system scores well.[30] Chronic issues such as high mortality, disease outbreaks, and pollution are masked by broad averages, and there are no mortality thresholds at all—despite routine losses of 15–20 percent of salmon on farms. Moreover, poor performance in one area, such as feed sourcing or efficiency, can be offset by stronger scores elsewhere, producing favorable ratings that obscure significant ecological harms.[31]

The credibility gap is compounded by Seafood Watch's reliance on certification schemes. In 2017, Seafood Watch benchmarked ASC's salmon standard, directly applying ASC thresholds to its own aquaculture criteria.[32] This means ASC-certified farms are automatically awarded a higher rating—typically a "Good Alternative"—even in regions where Seafood Watch's own assessments acknowledge major ecological concerns, such as in British Columbia.[33] Seafood Watch framed this alignment as a means of reducing duplication, but in practice it

28 Changing Markets Foundation. *Fishing for Catastrophe*. October 2019.
29 Ibid.
30 Monterey Bay Aquarium. *Seafood Watch® Standard for Aquaculture, Version A4.0 (April 1, 2020–Present)*. Monterey Bay Aquarium, April 1, 2020.
31 Ibid.
32 Global Salmon Initiative. "Seafood Watch Upgrades Recommendation of ASC-Certified Farmed Salmon to 'Good Alternative'," Press release, June 5, 2017. Seattle, WA.
33 As confirmed by staff in conversation with the authors of this report.

entangled Seafood Watch with an industry-funded certification scheme whose conflicts of interest undermine the credibility of its ratings.

Once secured, these ratings are not just consumer-facing—they are leveraged in business-to-business marketing. Seafood Watch's own staff confirmed that the program now operates as much as a supply-chain tool as a consumer guide, with a dedicated business team working directly with major foodservice companies to shape sourcing policies. In this way, Seafood Watch's ratings transform industry certification into institutional legitimacy, amplifying the sustainability myth of aquaculture rather than serving as an independent check on it.

Aquaculture "Sustainability" Labels vs. Consumer Expectations

Label/Program	Independent from industry funding?	All farms audited yearly by 3rd party?	Antibiotics banned?	Strong limits on disease, parasites, and mortality?	Farms consistently removed for violations?	Reduces pressure on wild fish stocks?
Aquaculture Stewardship Council (ASC)	X	X	X	X	X	X
Best Aquaculture Practices (BAP)	X	X	X	X	X	X
Seafood Watch	✓	X	X	X	X	X

Legend: ✓ = Meets expectation X = Does not meet expectation

Sources in footnotes: column 2,[34] column 3,[35] columns 4-5,[36] column 6,[37] column 7[38]

34 Aquaculture Stewardship Council. "Funding and Finances."
Global Seafood Alliance. *Form 990*.
Monterey Bay Aquarium Foundation. *Form 990: Return of Organization Exempt from Income Tax (2023)*.
35 Aquaculture Stewardship Council. *ASC Group Requirements for Farms*.
Global Seafood Alliance. *BAP Farm and Hatchery Group Program Policy and Control Document*.
Monterey Bay Aquarium. *Seafood Watch® Standard for Aquaculture*.
36 Aquaculture Stewardship Council, *ASC Farm Standard*.
Global Seafood Alliance. *BAP Farm and Hatchery Group Program Policy and Control Document*.
Monterey Bay Aquarium. *Seafood Watch® Standard for Aquaculture*.
37 Kelly Roebuck and Karen Wristen. *Global Review of the Aquaculture Stewardship Council's Salmon Standard*.
SeaChoice. "Accountability in Aquaculture Sustainability."
Monterey Bay Aquarium. *Seafood Watch® Standard for Aquaculture*.
38 Aquaculture Stewardship Council, *ASC Farm Standard*.
Global Seafood Alliance. *BAP Farm and Hatchery Group Program Policy and Control Document*.
Monterey Bay Aquarium. *Seafood Watch® Standard for Aquaculture*.

WHERE DO WE GO FROM HERE?

Where Do We Go from Here?

It is natural to assume that the problems with aquaculture could be solved through reforms, such as tighter standards, stronger oversight, or efforts to reduce climate impacts. However, industrial aquaculture's harms are systemic, not incidental. **The scale at which we farm fish requires high densities that spawn disease, necessitating antibiotic use, and uses enormous quantities of wild-caught fish and deforestation-linked crops, destroying both land and aquatic ecosystems and undermining food security for vulnerable communities around the globe.** Even so-called "best practice" farms cannot meet a basic threshold of sustainability.

For decades, many conservationists, scientists, and philanthropic leaders have championed sustainable aquaculture in good faith, driven by a genuine desire to protect the oceans. The industry has spent just as long shaping a narrative that downplays its impacts and presents fish farming as a climate solution. This story has misled even the most well-intentioned among us—but recognizing this will allow the conservation community to realign around strategies that genuinely safeguard marine ecosystems.

Charting a new path will require rethinking how much seafood we eat. Consumers can play a meaningful role in this transition by reducing sea animal consumption, choosing more plant-forward meals, and expressing demand for lower-impact foods in their communities and workplaces. Individual action becomes most effective when paired with institutional leadership that can embed these choices at scale. Already, foodservice leaders in the U.S. are recognizing the ecological burden of animal-based foods and are responding by rebalancing their menus. For example, Aramark pledged to make 44 percent of its residential dining menu offerings plant-based by 2025 and reduce its food-related emissions by 25 percent by 2030.[1] Compass Group, the world's largest foodservice provider, has committed to a 40 percent shift to plant-based proteins by 2030 as part of its climate strategy.[2] For its campus program, Sodexo pledged to offer 50 percent plant-based planned menus by 2025 and, after a successful trial that saw a 23.6 percent reduction in food-related emissions, expanded its plant-based behavioral nudge program to its nearly 400 U.S. campuses, reaching roughly a million students daily.[3] Sodexo has also committed to implementing plant-based default menus at 400 hospitals after a successful rollout in New York City cut carbon emissions by a third.[4] These commitments signal a growing recognition that reducing animal protein—including sea animals—is key in building a more sustainable food system.

1 Aramark. "Aramark to Increase Plant-Based Menu Offerings on College Campuses," Press release, October 9, 2022. Philadelphia, PA.
2 Compass Group. "Compass Group: How Compass Group Is Creating a Sustainable Future for All," Vision 2045, December 13, 2021.
3 Sodexo. "Sodexo Launches Massive Expansion of DefaultVeg Pilot, Making Plant-Based Meal Service a Norm at Campus Eateries Across USA," Press release, March 17, 2024.
4 Sodexo. "Greener by Default Announces Expanded Partnership with Sodexo to Offer Plant-Based Meals at 400 U.S. Hospitals," Press release, April 4, 2025.

This direction aligns with the evidence summarized in this report: plant proteins such as beans, soy, and other pulses carry a fraction of the greenhouse-gas, land, and water burdens of farmed fish or shrimp, and shifting demand toward these foods delivers outsized ecological benefits. A move away from high-impact animal proteins also reduces exposure to contaminants and antibiotic-resistance risks associated with industrial aquaculture.

This report calls for a course correction across the food system in the Global North: reduce reliance on sea animal products overall; phase out the highest-impact farmed products, especially salmon and shrimp; and stop treating certification logos as stand-ins for sustainability. Real progress comes from shifting our meals toward plant-based staples—legumes, soy, and grains—that carry far lower climate, land, and water burdens while easing pressure on forage fish and coastal habitats. By centering these priorities, we move beyond the illusion of "sustainable seafood" and build a food system that genuinely advances climate goals and protects oceans.

These savory plant-based "crab" cakes and spicy "fishless" tacos are just two of the many creative dishes that can replace animal-based seafood, making menus more sustainable and accessible.

Author & Acknowledgements

The **Aquaculture Accountability Project** seeks to challenge the myths of "sustainable seafood" that are perpetuating its growth. Industrial fish farming—the fastest-growing form of factory farming—markets itself as the answer to overfishing, yet fuels the very crises it claims to solve. By holding this industry accountable and engaging food and climate leaders, we aim to slow its growth, reduce unsustainable sea animal consumption, and advance a truly ocean-friendly food system. More information is available at aquacultureaccountability.org.

AAP is a partnership with **Farm Forward**. Farm Forward was founded in 2007 as the nation's first nonprofit devoted exclusively to end factory farming. We are a team of strategists, campaigners, and thought leaders guiding the movement to change the way our world eats and farms. More information about Farm Forward's work and additional publications can be found at farmforward.com.

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