

The Fish Farming Evolution

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Farming is a career that has continuously been revolutionized and industrialized. Companies have applied new technologies and factory-like methods to raising livestock. Recently these techniques have been applied to fishing as well. While farming fish is not a new idea, it is newly beginning to resemble the practices of raising beef and poultry. Fish farming involves raising fish commercially in tanks or enclosures, usually for food. There is an increasing demand for fish and fish protein, which has resulted in widespread overfishing of wild seafood. Fish farming offers fish marketers another source. The concerns associated with fish farming include the trouble of high concentrations, potential pollution issues and habitat destruction, diseases in the fish, and the effects of strong antibiotics and chemicals, to name a few. Another debate that has come up in the food industry is genetically modified organisms (GMO's) and this has recently been applied to fish, specifically salmon, as well. These new ways and innovations of farming fish have become a controversial issue in today's food industry. A practice that used to be a sustainable, food production method, has transformed into a method that has raised much concern between environmentalists, nutritionists, and consumers.

Research has shown how fish farming can be a benefit to both wealthy and poor countries because it provides a stable source of seafood year round. It is also inexpensive and able to feed many people. However, farming carnivorous fish, such as salmon, does not always reduce pressure on wild fisheries, since carnivorous farmed fish are usually fed fishmeal and fish oil extracted from wild forage fish. Studies of fish farming have revealed that there are many concerns associated with it, some that are similar to concerns of beef and poultry farming. The aquaculture industry needs to be reevaluated and changed so that the effect on the environment is minimal, the fish are still beneficial to consumers' health, and the fish are not subject to inhumane treatment or conditions.

There is evidence that fish farming has been practiced for thousands of years but in the last few decades methods have changed drastically. Fish farming has a long history and is estimated to have started in China around 2500 BC as a method to raise carp in artificially created ponds ("Fish Farming" 306). However, fish farming production has transformed in recent years, due to advanced technology and assembly line productions used widely throughout all kinds of industries. Monterey Bay Aquarium, a major organization dedicated to safe seafood, identifies this transition of farming technique and reports "half of the seafood eaten in the U.S. is farmed, and the practice is growing fast. Just as we raise cattle and chickens to eat, we're now raising seafood to meet the growing global demand" ("Aquaculture Ensuring"). These new methods and techniques have caused new issues in farming fish because of the unnatural lifestyles that the fish

must endure. If more measures were taken to ensure that the fish were raised humanely and not causing damage to the environment or wild fish populations many of the issues surrounding the new production approaches would be eliminated.

The demand for fish is rising rapidly at the same time supply is quickly declining, which is naturally unsustainable, leading to the rise of fish farming innovations that increase production and lower costs. Many nutritionists as well as environmentalists disagree with these new methods because of the conditions the fish get put in. Several health concerns arise from the increased production of farmed fish. Marion Nestle, author of the book *What to Eat*, expresses her concern about high levels of polychlorinated biphenyls (PCB's) in farmed fish. Nestle explains that "All fish have PCB's, but farmed fish – those fed fish meal and fish oils – have more" (Nestle 203). The issue with PCB's, as Nestle describes, is that they are toxic chemicals that cause severe problems with skin, reproduction, development, and behavior (Nestle 204). Farmedanddangerous.org, a campaign website run by the Coastal Alliance for Aquaculture Reform, also expresses their concerns of high PCB levels in farmed fish. A comparison chart on the website shows that farmed salmon contain 27 per billion PCB, while wild salmon have an average 5 parts billion ("PCB's and Contaminants"). This cancer-causing chemical gets passed into consumers when they eat fish containing high levels of it.

Nestle further contends that "Farmed salmon...are raised like cattle in feed lots" (Nestle 208). Thus, similar to those cattle, the fish are given large amounts of antibiotics to treat diseases. The website Farmedanddangerous.org explains:

The major cause of concern with the use of antibiotics in farmed salmon (and other livestock) is that many of these antibiotics are also used to treat human diseases. Frequent use of antibiotics in aquaculture and other industries poses a risk to human health by allowing disease microbes to become resistant to antibiotic treatments – making it more difficult to treat human disease. ("Excessive Antibiotics")

The Federal Drug Administration (FDA) even recognizes that almost all bacterial infections are becoming resistant to antibiotics. The FDA claims that "The misuse of antibiotics has contributed to one of the world's most pressing public health problems today -- antibiotic resistance" ("Antibiotics"). Many experts would agree that overuse of antibiotics is causing a resistance. As antibiotics are being used in every type of meat; beef, swine, poultry and now fish, it is no surprise that there is a concern with antibiotic resistance. With antibiotics being used everywhere daily, in food, medicine, and more, these experts cannot pinpoint one exact source of the increasing resistance, but nutrition analysts lay heavy blame on overuse in food production.

Additional health concerns that are present in farmed seafood result from the increased use of chemicals and the diets of the fish. In aquaculture, specifically salmon farming, chemicals are used as colorants, disinfectants, and to control sea lice and fungus levels, amongst other things. Farmedanddangerous.org describes that regulations are set to limit the risks of these chemicals to humans, but little is being done to protect the introduction of these chemicals to marine environment. This could still impact seafood that humans eat and most consumers are not aware

of the possible exposure to these chemicals or the unintended consequences (“Chemical Dependence”). Wild salmon eat krill and occasionally other small fish. This diet gives them their healthy, pink color. In farming habitats chemicals are used to change the color of the salmon to that same pink color as opposed to an unappealing grayish color that results from the fish meal they are fed (“Chemical Dependence”). These farming companies are lying to consumers when they sell pink salmon that has been artificially colored with chemicals.

Still, chemical concerns are not the only issues experts have with the food that farmed fish are fed. Nestle expresses her extreme dissatisfaction with the diets of farmed salmon. Nestle makes the claim that farm-raised salmon “eat the equivalent of dog food” (Nestle 209). The fish are fed man-made pellets that contain fish oil, wheat, vitamins and minerals. However, as Nestle describes, “The pellets also contain meat-and-bone meal made from the rendered leftover meat, blood and bones of cows, pigs, and other animals....The several billion chickens that get killed for food each year produce tons of feathers, many of which end up as feather meal in fish pellets” (Nestle 209). Not all farmed fish are fed fish meal however. Many operations catch smaller wild fish to feed to the farmed fish. While to some experts like Marion Nestle, this seems like the best choice, keeping the farm environment as natural as possible, but to other experts this method needs to end. The Monterey Bay Aquarium recognizes this method as an issue and argues that “When we farm these carnivores, we need lots of wild fish to feed them. On average it takes over three pounds of wild fish to grow a pound of farmed salmon. Alternative feeds are being developed to reduce this dependence on wild fish. But the best solution may be farming shellfish and non-fish eaters like tilapia and catfish” (“Aquaculture Ensuring”). Some nutritionists and conscientious consumers are concerned about the fish meal and the adverse effects that get passed on to humans when these farm raised fish are eaten but environmentalists are worried about the wild fish population, causing much controversy on the issue. If farmers changed the type of fish they farmed to ones lower on the food chain, and pellets were not made with unnatural, unhealthy ingredients, they could most likely find a happy medium for nutritionist and environmentalists.

Since most fish farming occurs in enclosed sections of the ocean, environmental issues have become a major concern amongst specialists associated with aquaculture. Some researchers contend that upsetting the marine ecology by the accidental release of farmed fish into the wild is one concern, and another concern is the overcrowding of fish. Overcrowding can make the fish more susceptible to disease and also causes high levels of waste, making the fish less comfortable and inviting algae which can use up the oxygen in the water and kill the fish (“Fish Farming” 308). Another problem with high concentrations of farmed fish is that the fish will frequently run into each other, which causes cuts and scrapes that lead to infections and diseases (“Fish Farming” 308). Sea lice are the major concern here because they “attach to the fish and feed on tissue, which creates lesions and causes fluid loss from the affected fish.... In addition, the sea lice can spread to wild salmon in the seas around fish farms when farmed salmon escape from the confinement, and also when the lice are washed away from the fish farm into the surrounding water” (“Fish Farming” 308). Brian Halweil identifies similar concern in a Worldwatch Institute report, “Farming Fish for the Future.” Halweil alleges that “There are no widely accepted standards for what constitutes ‘good’ fish farming” but he believes good fish

farming would be farms that minimize pollution, improve nearby habitats and limit food safety risks (Halweil 32). The Center for Food Safety explains in depth:

The environmental problems arising from the industry are altering the biodiversity of entire ecosystems. Some of the impacts include the introduction of non-native farmed fish species that diminish or replace indigenous fish populations; the propagation of deadly fish diseases; and the over-fishing of vast quantities of non-commercial fish to feed carnivorous farmed fish, such as salmon. Yet fish are not the only organisms affected—federally protected marine mammals and birds are continually harmed by entanglement in net pens and by the concentration of harmful wastes and industrial drugs and chemicals escaping into open waters. (“What’s Wrong with Fish Farming?”)

Conversely, the organization Salmon of the Americas, a company that speaks on behalf of multiple fish farming companies, claims that ocean farming salmon is a safe and eco-friendly answer to worldwide demand (“Benefits of Aquaculture”). Yet, the website also says that, “like any food production industry...aquaculture poses a certain level of risk to the environment” (“Benefits of Aquaculture”). Some environmentalists are worried that aquaculture is one of the fastest growing threats to water environments and marine culture. However, Monterey Bay Aquarium makes note that environmental destruction is not always the case when it comes to fish farming. On their website they identify that there are some adverse effects, “But the environmental impact of fish farming varies widely, depending on the species being farmed, the methods used and where the farm is located. When the environment is considered and good practices are used, it's possible to create sustainably farmed seafood. Such operations limit habitat damage, disease, escapes of non-native fish, and the use of wild fish as feed” (“Aquaculture Ensuring”). Monterey Bay Aquarium does extensive research on all kinds of fish and how they are caught or farmed. The organization has compiled multiple lists according to regions of the United States that identifies the type of fish consumed in that area and if it is the best choice, a good alternative, or a fish to avoid, based on the health of the fish as well as the methods used to catch the fish and the abundance of that specific species. Consumers should take a look at the list which is on their website, and explore what types of seafood is the best choice to eat, as well as how they categorize what is good or not. While there may be many fish farms that are harmful to the environment, Monterey Bay Aquarium claims that there are some safe, healthy farms out there as well.

As with other food productions such as corn and soybeans, specialized scientist are modifying the DNA of salmon to create fish that may grow bigger and faster, as well as have a higher resistance to disease. Many experts agree that genetically modified (GM) salmon is dangerous to the health of the fish and consumers. The GM fish, made by Aqua Bounty Technologies Inc., is manipulated to grow twice as fast as traditional Atlantic salmon. According to Ethan Huff, “If approved, the GM salmon -- known as AquAdvantage -- will be the first GM animal officially authorized for human consumption in the U.S” (Huff). There are several issues that are associated with an approval of GM salmon. Huff explains that “In 1999, researchers from Purdue University found that transgenic fish are more attractive to other fish because of their abnormally large size. So more often than not, they beat out real fish in attracting breeding mates, which can

cause serious problems if introduced into the wild” (Huff). Studies have shown that offspring of GM fish live very short lives. If these fish were to be introduced into the wild, the species could become extinct in less than 20 years. Just as with other fish farms, escapes into the surrounding habitats are quite common so there is no way to prevent the GM salmon’s exposure to the wild (Huff). Emily Sohn shares the same concerns and explains that all salmon species are already listed as endangered, so a new potential threat could ultimately destroy the fish altogether (Sohn). The FDA has not revealed the safety data about GM salmon, so researches are uncertain on the health effects, however, “concerned groups say that, like other GM foods, AquAdvantage fish may cause allergies, digestive problems and other serious illness” (Huff). Due to generally unknown health consequences of genetically modified fish, consumers and experts are skeptical of the approval of the AquAdvantage.

The practice of farming fish has evolved from carp raised in ponds to large indoor water tanks and ocean net enclosures. For centuries humans have been raising cattle, pigs, and chickens for food. Now the food industry has added fish to this list. Some fish are farmed in open net pens in the ocean while others are farmed in large tanks on land. Either way, the production of these fish is following in the footsteps of most animal farming with the use of chemicals and antibiotics, high populations in small areas, pollution and habitat destruction. Consumers should be conscientious of the food they are eating. Everyday people eat food and do not take the time to consider where it came from or what it took to get it on their plate. If more consumers were aware of the concerns in what they eat, there could be a shift to a healthier, more natural diet for everyone. Consumers can get on Facebook and like various pages such as Say NO to GMO to show their support for change. Advocating to people on social media is the fastest and easiest way to make a step towards a healthy and sustainable world of food production. Additionally, Monterey Bay Aquarium has a free mobile app available for iPhone and Droid called Seafood Watch. The app allows users to enter in what type of seafood they are going to eat or want to know about and the app will show them a list of matching results and what that species may be labeled as, and whether it is the best choice, a good alternative, or something to avoid, as well as how it is caught/farmed and where. This app is a simple and easy way to make better food choices and support better farming techniques.

If consumers want to know more about fish farming or healthy food choices, Marion Nestle’s book *What to Eat* discusses food in all areas from dairy to poultry to fish and what to look for and avoid when making decisions on food. The most important thing that consumers can do is be aware of the issues surrounding food production and realize that it affects them daily. When people go out to restaurants and get fish or seafood, they can ask what type of fish they are serving and use the Seafood Watch app to identify whether it is a good choice or not. The app also has a tool called Project FishMap which identifies the user’s location and shows nearby places to get best choice seafood. If more people are aware of these issues in fish farming and advocate for a change or support better alternatives, a movement of change can happen in time. With increased population and increased demand, the old ideas of small family farms, and fishing ponds have virtually disappeared, and food supply has become just another large scale production industry. With this, the industry is continuously changing and innovating to increase speed and quantity of production while simultaneously lowering costs. This is where the

controversy arises in the fish farming industry and knowledge of the issues is vitally important in moving to create a healthy, sustainable lifestyle.

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