

How Should the U.S. Control the Impact of Aquaculture on World Fish Supplies?

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Summary

In aquaculture establishments that farm carnivorous fish, wild fish are often used in feed, which raises many issues about bioethics, the dietary needs of humans and fish, and impacts to wild fish populations. Existing policy needs to change to protect wild fish stocks worldwide and to preserve the health of farmed fish and the people that eat them. I recommend that the EPA implements regulations that require every aquaculture establishment in the U.S. to convert their carnivorous farmed fish species to a strictly vegetarian diet.

Problem Description and Context

Global aquaculture has grown at a 6.6% annual rate since 1970, and is taking over both the world, as it represents 46% of global fish supply (Jolly 2011), and the U.S., where it represents 50% of supply (Live Science 2009). Aquaculture, if expanded successfully without harmful environmental consequences, can give wild fish populations around the world the opportunity to replenish and recover from overfishing and other human-induced environmental stressors. In aquaculture that involves herbivorous fish species, there are generally positive impacts on global fish stocks and ocean health, but for carnivorous species, the use of wild fish feed in the form of fish meal and fish oil impacts the health and recovery ability of natural ecosystems very far away from the actual farm at which the feed is used (Naylor et al. 2000). Fish meal, fish oil, and pharmaceuticals claim just under 20 percent of all wild species caught worldwide (Jolly 2011), and aquaculture uses a third of all fish meal produced worldwide. The remaining two-thirds of produced fish meal goes to feeding other animals such as pigs and chickens (Naylor et al. 2000).

Many common farmed species are carnivorous; for instance, salmon requires 3 pounds of wild fish for every pound of farmed fish gained (Monterey Bay Aquarium: Seafood Watch 2014). (For more statistics on the ratio of wild fish to fed farmed fish for common farmed species, see Figure 1 in the appendix.) Other consequences of use of wild species in fish feed are the issue of biological compatibility of feed with farmed fish diets, and human health risks in

possibly eating toxins from wild fish and eating fish that may not be healthy or biologically sound in a farmed environment (Naylor et al. 2001).

At the moment, there are no federal laws in the U.S. that regulate the composition or origin of the feed used in aquaculture. There are many local, state, and federal laws and regulations that apply to aquaculture in general, such as the Clean Water Act under which the Environmental Protection Agency has regulatory authority. The EPA needs to establish regulations to control where fish feed for aquaculture comes from and alleviate some stress on wild fish populations. This new policy should also promote the health of farmed fish in the United States and thereby protect the health of Americans that eat farmed fish.

Policy Options

1. Establish regulations to control what percentage of fish feed can be made up of wild species, and which wild populations can be used in fish feed.

PROS: This policy option would create tighter controls on the amounts of wild fish exploited for fish feed, what wild species can rebound from this exploitation, and what composition of fish feed is best for the farmed animals and the environment. This would also require a significant amount of research that would add to government, industry, and public knowledge of this topic.

CONS: Under this policy option, wild fish would still be exploited for use in feed for aquaculture. Establishing regulations also brings up the issue of enforcement, and it will cost the government lots of money to both implement the regulations as well as to deploy personnel and resources to make sure that every aquaculture establishment in the U.S. is complying with the regulations. Without strict enforcement, there is potential that many fish farms will not follow the regulations.

2. Convert all farmed carnivorous fish to a vegetarian diet, and establish regulations that require every aquaculture establishment in the U.S. to only feed their fish a vegetarian diet.

PROS: This policy option lays the groundwork for the discontinuation of use of wild fish in fish feed for aquaculture establishments in the U.S. Fish raised on a vegetarian diet also have the large potential to be healthier than fish on carnivorous diets, as shown by a Baltimore study. In this experiment, scientists changed the diet of cobia, which is a very

carnivorous fish species, to a vegetarian diet, and the fish grew larger and ingested fewer toxins such as mercury through their diet (Berko 2013). By discontinuing the purchase of fish meal and fish oil for feed, aquaculturists also reduce production costs as fish meal and fish oil are more expensive than alternative vegetarian options (Naylor et al. 2000).

CONS: If no more wild fish were exploited for use in feed for aquaculture, this could put some fishermen out of work and could impact the U.S. fish market by decreasing a small amount of GDP. There is also the problem of enforcement to ensure compliance of every aquaculture establishment of the U.S. Regulation and enforcement will both be expensive for the U.S. government. Implementation of this policy would also require a significant amount of additional food to be grown as ingredients in vegetarian feed for the fish.

3. Maintain the status quo in terms of laws and regulations, but fund education campaigns across the country to educate people about wild fish feed, its prevalence, and how they can make better and healthier food decisions.

PROS: As a result of this policy option, the American public will be more informed about aquaculture practices and can make better individual food choices. This advocates food democracy and awareness and promotes the EPA as an advocate for the American public and not just a politically involved government agency. An education campaign is also easier and much less costly than a full regulation and enforcement process. This policy might influence a significant number of people to decrease their consumption of farmed fish or of fish in general, which would decrease the demand on wild fish populations.

CONS: Under this policy option, wild fish still appears in fish feed for aquaculture, and no efforts are made on the supply end to reduce the proportion in fish feed or change the types of wild fish that appear in feed. An education campaign also may not be enough for a significant portion of the American public to change their behavior and cast dollar votes toward more sustainable food. Since the EPA would be initiating this education campaign, the public may not be very responsive since the information would be coming from a politically-affiliated government agency and the public might not trust it as an information source as much as they would trust an NGO, business, or nonprofit organization.

Policy Recommendation

I recommend implementing policy option #2, in which the EPA establishes regulations that require fish farmers to only feed their fish vegetarian diets. Although this will be complicated, difficult, and expensive to enforce and maintain, so will policy option #1, and my chosen policy recommendation will provide greater benefits to the environment, the health of the fish, and the health of Americans. Our current overexploitation of wild fish stocks worldwide is extremely unsustainable and we are creating damage on marine ecosystems that is often irreversible. We need policies that will significantly reduce our demand for and impact on wild fish populations in any way possible so that these ecosystems can be given the chance to rebound and recover from human impact. I believe that policy option #2 is the best because it lessens the impact of aquaculture on the environment, keeps farmed fish healthy, keeps farmers at work, and reduces aquaculture production costs. In addition, I recommend that the EPA does launch an education campaign to accompany these new regulations to raise awareness about how individuals can make smart and healthy food choices.

Suggested Further Studies

The impact of wild fish feed on farmed fish populations, human health, and the environment has been relatively under-examined compared to other environmental impacts of aquaculture. There are knowledge gaps in the genetic make-up of farmed fish compared to wild fish of the same species, the biological effects to farmed fish of eating wild fish and other foods and the further impacts on human health and the environment, and the ideal, biologically safe diet for farmed fish. Although my policy recommendation involves completely eliminating the use of wild species in fish feed, these further studies are still critical for knowing how to best feed and maintain farmed fish, how to optimize aquaculture health and the health of the humans who eat that fish, and how to further expand aquaculture while taking care of human health and the environment. These answers would help direct a future decision-making process in developing policy and creating regulations surrounding this issue.

Appendix

Figure Five

Estimated 2000 Fish-meal and Fish-oil Use in World Aquaculture

Fish	Production (million pounds)	Production Using Compound Feeds (million pounds)	Wild Fish Used in Compound Feeds (million pounds)	Ratio of Wild Fish to Fed Farmed Fish*
Marine Finfish	2,083	1,250	5,157	4.13
Eel	492	392	1,843	4.69
Salmon	1,953	1,953	4,762	2.44
Marine Shrimp	2,707	2,220	4,996	2.25
Trout	1,168	1,168	1,709	1.46
Tilapia	2,363	970	545	0.56
Milkfish	829	331	311	0.94
Catfish	1,060	913	273	0.30
Fed Carp	22,167	8,201	3,075	0.38
Filter-feeding Carp	12,169	0	0	0
Mollusks	20,150	0	0	0

*This column represents the ratio of wild fish used in fish meal to farmed fish produced using compound feeds, or pelleted fish food. For example, it takes an average of four pounds of wild fish to produce one pound of marine finfish fed with compound feeds.

Source: Naylor et al., 2000 (methodology); Tacon and Forster, 2000 (data).

Figure 1. Estimated 2000 fish-meal and fish-oil use in World Aquaculture (Naylor et al. 2001)

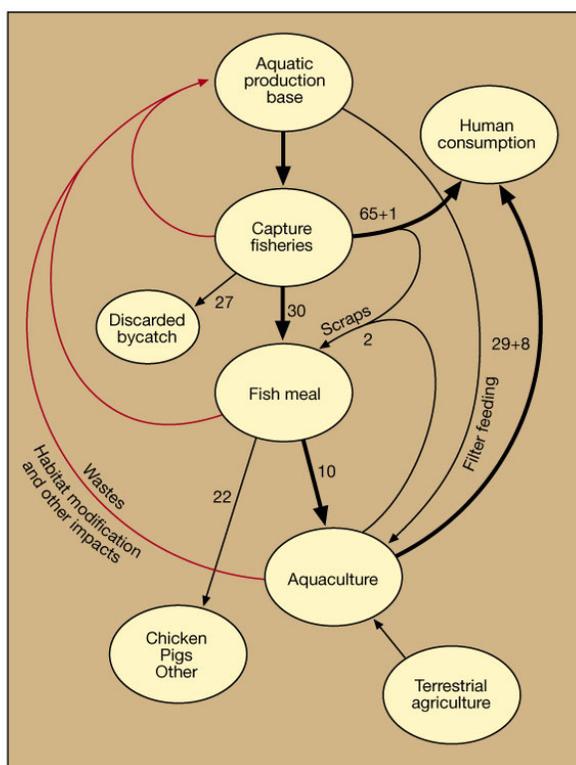


Figure 2. Flow chart of capture and farmed fisheries products from aquatic primary production (Naylor et. al 2000)

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