

IN TERMS OF population, the human race is a victim of its own success; according to UN estimates, there will be 9.7 billion human mouths to feed by 2050, further increasing to 11.2 billion by 2100. Producing sufficient sustenance to our ever-burgeoning population, while being responsible stewards of our environment, is undoubtedly one of the greatest challenges humanity has ever faced.

The FAO predicts that in 2025 global aquaculture will produce 52% of the world's seafood (102 million tonnes) and wild-capture will contribute the balance of 48% (94 million tonnes). By comparison, the USDA's most recent report on world trade in livestock and poultry projected that meat production in 2017 was on target to be greater than any other year's output, topping out at 262.6 million tonnes; double the quantity 30 years ago.

So, given humanity's escalating demand for protein and increasing reliance upon aquaculture, why are some critics so acutely opposed to the industry? And more importantly, is it warranted?

For the last two decades, one of aquaculture's most vocal detractors has been Don Staniford, director of The Global Alliance Against Industrial Aquaculture (GAAIA). He is a particularly vociferous opponent of salmon farming but also rails against shrimp farming, tuna ranching and the future possibility of transgenic salmon - which he refers to as 'Frankenfish' - hitting supermarket shelves.

Staniford describes his lightbulb moment, the event that propelled him toward activism, as occurring when he was attending the World Aquaculture Society meeting in Seattle, in 1997.

"It was when I was listening to a panel discussion led by NGOs on the environmental impacts of aquaculture. I thought, wow, this is something to get involved with. That was the moment - when I met with other activists from around the world and our common link was the destruction of nature by aquaculture."

Staniford points out that he, like many other anti-salmon farming activists, is not against all aquaculture.

"I gave a paper in 2000 or 2001 to the European Parliament Fisheries Commission and it was called 'The five fundamental flaws of sea-cage farming' and that looked at what I saw as the five main impacts of carnivorous sea-cage farming, which were waste, chemical use, escapes, diseases and the feed/fish issue - the fact that we are robbing Peter to pay Paul."

One or other of Staniford's 'fatal flaws' are potentially applicable to all forms of aquaculture, and agriculture, and most cultured fish, even herbivores and omnivores, commonly rely on some forage fish in their diet. Even so, the fishmeal (FM) and fish oil (FO) argument is a compelling one; recent global market statistics show that, in 2015, aquaculture used 70% FM and 73% FO (the share of this used by salmonids, one quarter of which are trout, was 22% FM and 58% FO). However, this is a tricky number to take at face value for numerous reasons and a great deal has been written on the topic, which is indicative of the subject matter's complexities.

Much attention has been focussed on improving the management of targeted reduction fisheries and increasing the quantity of fisheries by-products used in FM and FO production. The FAO's 2009 "Fish as feed

# Aquaculture: Meeting the Critics

The wealthier a nation is, the greater its abundance of food and diversity of opinion on which food choices are best. When it comes to seafood, be it wild or farmed, there are a chorus of opinions vying to be heard. In 2014, for the first time in history, the amount of our seafood which was farmed surpassed that which was wild-caught. Aquaculture patently has an increasingly significant role to play in feeding our future selves but, despite this, the sector also has its critics, reports **Owen Stevens**.



**DON STANIFORD**, DIRECTOR of The Global Alliance Against Industrial Aquaculture (GAAIA), has been one of aquaculture's most vocal critics

inputs for aquaculture" suggests that this 'recycled' portion of FM and FO may eventually constitute 50% of the final product. At present it constitutes about 25%. The FAO report concludes: "Globally, evidence is weak, if any, that expanding aquaculture has significantly contributed to increased fishing pressure on reduction fish species. The primary reason for over-exploitation is the absence of effective fisheries management and increase in the demand and price of food fish."

On the topic of his own preferred proteins, Staniford comments, "At home we eat a lot of organic produce and wild Alaskan salmon. It seems counterintuitive, but to support wild fish we need to eat wild salmon in order to support the fishermen who catch wild salmon - we don't want to support a farmed salmon economy because that is effectively destroying wild salmon with the spread of infectious diseases and sea lice and parasites and waste and the whole catalogue of issues associated with open-net-cage salmon farming."

However, as he acknowledges, the wild Alaskan salmon fishery is itself dependent on aquaculture, since around one third of 'wild' juveniles have been hatchery-raised. The term 'wild Alaskan salmon' refers to any of five species of Pacific salmon. These salmonids are also targeted commercially in Russia, Japan, British Columbia, and the Pacific Northwest. In 2015, global catch of these species was 1.02 million tonnes, comprised of 44% pink (aka humpback), 34% chum (aka keta or dog), 18% sockeye (aka red), 3% coho (aka silver), and 1% Chinook (aka spring or king). Of the total catch, 47% came from US waters. This compares to a global production of 2.38 million tonnes of farmed Atlantic salmon in the same year.

According to WWF's 2007 report, *The Great Salmon Run: Competition Between Wild and Farmed Salmon*, "Hatcheries were first established in North America in the second half of the nineteenth century, motivated by the recognition that natural stocks of salmonids were in decline." The report states that: "In recent years, hatchery fish have accounted for about 38% of total Alaskan 'wild' salmon catches."

Similar historical declines, within the same time-frame, also affected the Pacific salmon's cousin, the Atlantic salmon. The website of Iceland's North Atlantic Salmon Fund comments that declines in the species were noted there in the 1970's. Wild Atlantic salmon also used to be found in Germany, Switzerland, the Netherlands, Belgium, the Czech Republic and Slovakia - but alas, no more.

It is evident that these population collapses and declines occurred before the advent of open-net-cage salmon farming. Indeed, had wild stocks been healthy, there would not have been any incentive to start farming them. This logic also applies to the economic viability of cod farming; as wild stocks have recovered, interest in development of cod farming has been curtailed. FAO data show that farmed Atlantic salmon was first produced in Norway in 1964, when one tonne was reported. By 1980, global production of farmed Atlantic salmon was still very small,

amounting to just 5288 tonnes. While there are certainly sound, science-based reasons to question the environmental impact of salmon farming on wild salmon, there are undeniably a multiplicity of factors that have brought about the increasingly critical status of wild Atlantic salmon - such as overfishing, agricultural runoff and dam building. Which brings us back to the issue of population pressure.

It is estimated that our planet was home to a mere 500 million humans in 1500 BC. By 1927 our species had grown to 2 billion and arable land availability was becoming an issue. However, the Haber-Bosch process, a discovery which facilitated the manufacture of synthetic nitrogen fertilisers, was about to change everything: the stage was set for a population explosion.

With the arrival of the 1960's, the population reached 3 billion. Technological developments in agriculture paved the way for dramatic increases in crop yields. Dr. Norman Borlaug became known as the father of this 'Green Revolution'. His efforts were credited with averting famine, which otherwise could have caused one billion deaths. In 1970, Borlaug won the Nobel Peace Prize for his contribution toward the prevention of world hunger. However, as we now know, there were hidden, ecological costs attached to these agricultural innovations.

In 1995, recognising that aquatic resources were not limitless and stewardship was needed, the FAO formulated the voluntary *Code of Conduct for*



A **VOCIFEROUS OPPONENT** of salmon farming, he is also against shrimp farming, tuna ranching and the future possibility of transgenic salmon

*Responsible Fisheries*. These were later followed up with further guidelines for the ecolabelling of fishery products (2009) and aquaculture certification (2011). These documents underpin the standards of fishery certification schemes such as ASC, GAA and MSC.

But for Don Staniford, a self-proclaimed idealist, there can be no compromise. He claims that financial motivation is behind any scheme which potentially endorses the forms of aquaculture he opposes or the forage fisheries that support it - and this criticism extends to WWF and RSPCA also.

Future development in the aquaculture sector will

see new feeds formulated and feeding practices refined, sterilisation will likely be introduced to mitigate against escapes, and while some farms will move on-shore others will move off-shore. New technologies will continually strive to improve the sustainability of the industry and as this innovation continues, as it will in all food production sectors, criticisms will follow. In this process, pressure groups and NGOs will continue to play a vital role, helping to prioritise the areas of food production that need attention. Hopefully, as we continue on this journey, the choices we make along the way will be the right ones.

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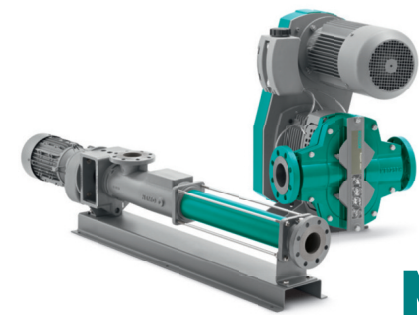
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