

What the world should learn from Chinese fish farming

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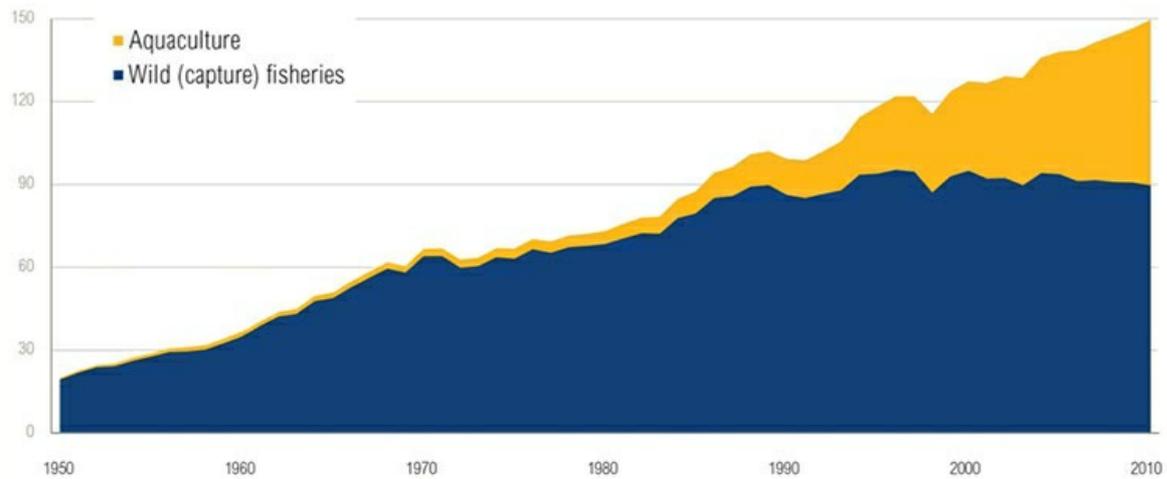
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By Karel Vereycken, June 2016

Fish is essential to feeding humanity. According to the 2014 United Nations Food and Agriculture Organization's SOFIA (State of World Fisheries and Aquaculture) report, in 2010, fish provided more than 3 billion people with almost 20 % of their intake of animal protein, and another 4.3 billion people with about 15 % of such protein. A portion of 150g of fish can provide up to 60 % of an adult's daily protein requirements as well as healthy fats like Omega3.

Both marine and inland capture of wild fish, thanks to more efficient fishing techniques, multiplied threefold between 1950 and 1969. However, it started stagnating at the end of the 1980s. For one simple reason: the technique outdid the resource.





In 2012, global fisheries and aquaculture production totaled 158 million tons. This is approximately 10 million tons more than in 2010. In the mid-1990s seafood production was around 75-85 million tons.

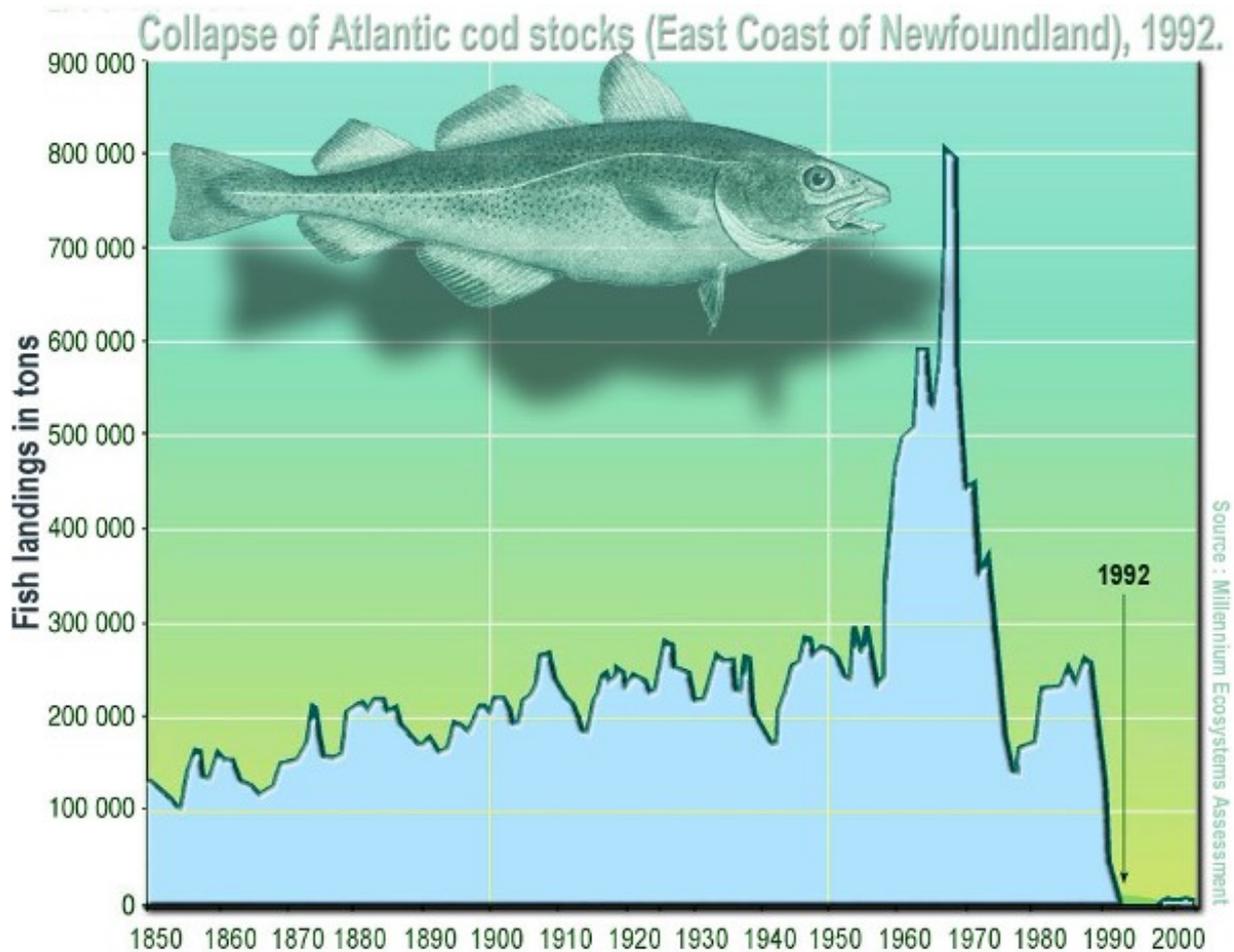
Only the fast growing practice of fish farming (aquaculture) which dominates in Asia and China, allowed a net increase of the world's fish consumption, today at 19.2 kg per year per capita. Asia has the highest consumptions of seafood as a continent, combining high per-person consumptions with large populations. In France, consumption increased from 23 kg in 1990 to 35 kg today, i.e. twice the amount of 1960.

Exit pre-history

The reality of wild fish, is that it is about to go extinct. So far, in terms of fishing, humanity, instead of creating new and larger resources, maintains a policy of looting the oceans, pretty much identical to that of pre-historical man living in a hunting and gathering society. Indeed, before domesticating animals and developing agriculture around 10,000 BC, man barely survived by looting policies. Today, as long as mankind refuses for various reasons to change his prehistoric behavior of looting, the risk of disappearing remains dead real.

Today, FAO statistics of 2015 indicate that 50 % of world fish stocks are "fully" exploited and 30 % of them are exploited "beyond renewal capacities". It means several species, as herring, considered as being "naturally" available, if nothing is done, are threatened to disappear! Today, worldwide, with modern fishing techniques using sonar to identify targets, fishing capacities are estimated three times larger than the available fish resources to be captured! 50 % of all fish is captured by only 1% of the worlds fishing fleet, mainly in the hands of giant multinational sea food corporations.

The lesson of the great cod disaster



Did it happen before? Yes, it did, but few people know about it. The world has hidden and seems quite reluctant to learn the lessons of the dramatic collapse of the Atlantic northwest cod fishery (kabeljouw, stockfish).

Historically, since the beginning of the XVIth century, generations of European fishers from Spain, Portugal, Britain, France, etc.) went fishing and captured millions of tons of cod in New Foundland (Terre Neuve) before the coast of Canada, Groenland and Iceland. There, the availability of cod seemed infinite. A good breeder, this big and tasty fish could be dried and easily conserved with salt.

But when fishing techniques became more performing and fleets increased, after an initial explosion of captures, the stocks of cod collapsed entirely.

As a result, since 1993, year after year, the interdiction to fish cod in this area has been renewed and stocks are slowly regenerating. Of course, without fish, the fishing industry specialized in cod went bankrupt. Today, cod eaten in Europe comes mainly from the North East Atlantic, especially the Barents Sea north of Norway where stocks are managed with care. While before, one cod could weigh up to 35 kg, today 5 kg is the average. Elsewhere in the world, the species is in a precarious situation.

Overfishing

Today, overfishing, i.e. looting for pure short term financial profits remains the overall rule and nothing really serious is done to implement policy decisions aimed to reverse such suicidal tendencies. Fishing companies, to increase profits, are increasingly practicing "trawling", a method of fishing that involves pulling a giant fishing net through the water

behind one or more boats. Midwater trawling catches pelagic fish such as anchovies, shrimp, tuna and mackerel, whereas the very destructive and largely unproductive practice of bottom trawling targets cod, squid, halibud and rockfish.

In short, the same practice which provoked the great cod disaster of 1993 is still used in the Atlantic today. So far, despite many resolutions and campaigns, nothing has been done to outlaw this practice.

And since there isn't too much to steal any more in the Atlantic, how about steeling elsewhere? Since large fish is extinct, fishing multinationals are increasingly looting Africa and Latin America. With the small fish and the shrimps they catch (37% of all captures), they produce fish oil and fishmeal (mainly for high-protein feed) and fish oil (as a feed additive in aquaculture). The small fish, rather than feeding the bigger fish, are used both as fertilizer as well as food for pet animals, poultry, pigs and cows in the rich countries...

On top, per year up to 30 million tons of fish (30 % of total) are stolen in Africa, Asia and Latin America by non regulated "pirate fishing"! Poor countries, dramatically lacking navies to protect their fishermen are of course the primary targets.

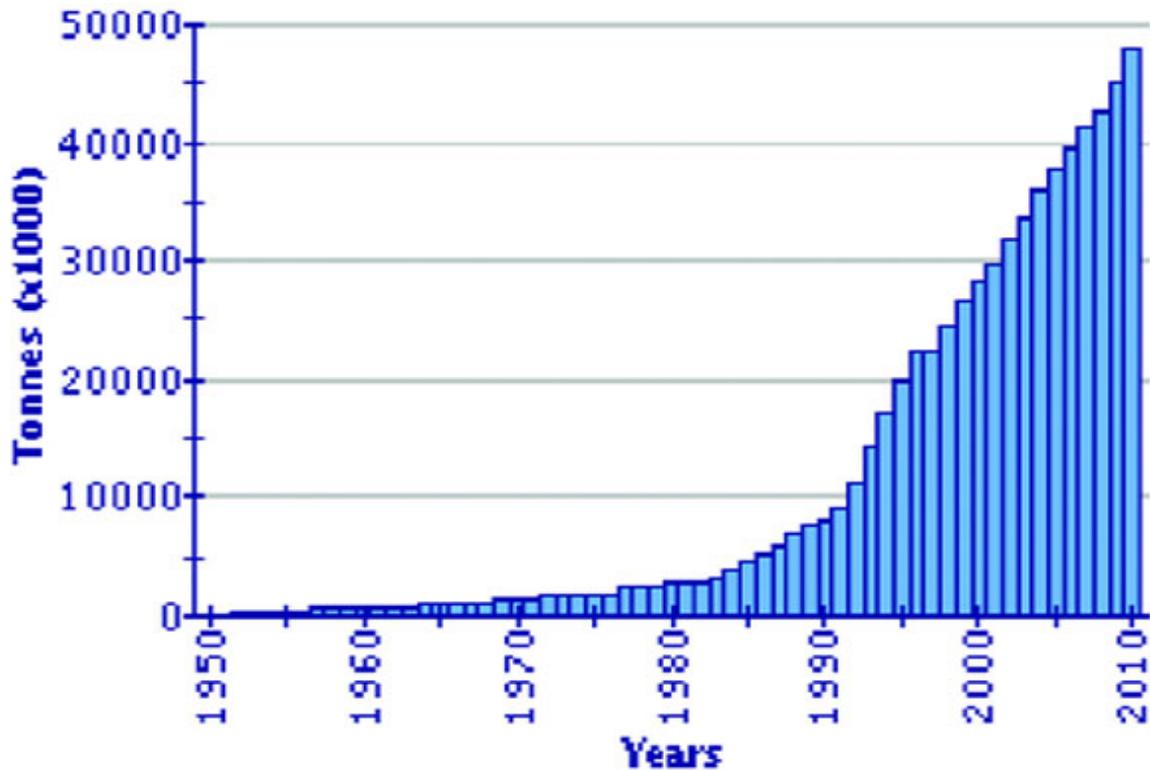
The EU, once so abundant in fish, is already importing 40 % of its consumption. At best, officials talk about "managing" stock, while the creation of new stock should be the issue.

Farming the oceans

For J.F. Kennedy, which decided in 1963 to invest 2 million dollars, oceanic exploration was not just getting out oil, gas and raw materials. In 1962 he said that the US *"intensified effort to expand knowledge and understanding of the vast resources held by the oceans through basic research and surveys of geologic and living resources will surely result in extending our known resource base, with encouraging prospects for improving our standard of living and adding protein-rich marine products to the diets of the hungry people of the world."* And in 1962 he declared that *"In addition, we can make the most extraordinary gains in getting food from the ocean depths in the next 10 or 20 years. This question of oceanography has also occupied the attention of the Congress and this administration, how we can double the amount of protein which is available to people around the world. This is a whole new area of conservation, unknown to those who preceded us but which is now coming into public understanding as a result of your efforts and the efforts of others, and which can make the most profound difference to the lives of people who live rather listlessly because of inadequate proteins."*

China and the invention of aquaculture

While in 1980, only 9 % of seafood came from fish farming, its share rose to 47 % in 2010. Today, 88 % of all fish farming takes place in Asia. China alone, with one-fifth of the world's population, represents 62 % of the world's fish farming capacity. China's fish production has tripled in the past 20 years and employs millions of people. The principal aquaculture-producing regions are close to urban markets of the middle and lower Yangtze valley and the Zhu Jiang delta.



In the great classical handbook *Aquaculture science*, Rick Parker says that China is, of course, “the cradle of fish farming” and fish farming was and remains crucial to its rise. *“Aquaculture began in China about 3500 BC in China with the culture of the common carp. These carp were grown in ponds on silkworm farms. The silkworm pupae and feces provided supplemental food for the fish. (...) In Chinese, the word for fish means surplus. Indeed, fish were equated with a bountiful harvest. (...) In 475 BC, (politician) Fan-Li wrote the oldest document on fish farming (Yang Yu Ching, or Treatise on fish breeding. Original document is in the British Museum.). (...) Fan-Li’s document described methods for pond construction, broodstock selection, stocking, and managing ponds”.*



Carp are native to China. They are good to eat, and they are easy to farm since they are prolific breeders, do not eat their young, and grow fast. The common carp was the number one fish of aquaculture in antiquity, and today, worldwide, is still extensively cultured. Carp represents 46 % of today's Chinese aquaculture.

The Confucian tradition allowed the Chinese to understand the harmony of nature's "intelligence". Two things which most of us consider self-evident, in reality do not exist in nature: waste and unemployment. Vernadsky understood this principle. A leaf falling from a tree will become the breeding ground for other forms of life. Therefore, in China, fish farming was not considered something separate but a key element in the chain of an integrated aqua-agricultural economy.

Rick Parker: *"In the Zhujiang Delta of South China, a dike-pond system of agriculture still exists after more than 500 years. Mulberry, sugarcane, fruit, forage crops, vegetables, silkworm breeding, and pig raising integrate with fish rearing. Crops and crop residues are fed directly to various species of carp, bream and tilapia".*

During the Tang dynasty (618–907 AD), the farming of common carp was banned because the Chinese word for common carp sounded like the emperor's family name. Anything that sounded like the emperor's name could not be kept or killed. The ban had a productive outcome, because it resulted in the development of polyculture, the growing multiple species in the same ponds. Different species feed on different foods and occupy different niches in the ponds. In this way, the Chinese were able to simultaneously breed four different species of carp, the mud carp, which are bottom feeders, silver carp and bighead carp, which are midwater feeders, and grass carp which are top feeders. Another development during the Tang dynasty was a fortunate genetic mutation of the domesticated carp, which led to the development of goldfish.

From 1368 AD, the Ming Dynasty encouraged fish farmers to supply the live fish trade live, which dominates Chinese fish sales to this day. From 1500 AD, methods of collecting carp fry from rivers and then rearing them in ponds were developed.

In the past, fish culture in China has been a family business, with traditional techniques passed from generation to generation. Then, in the late 1960s the Chinese government began a move to the modern induced breeding technologies, which resulted in a rapid expansion of freshwater aquaculture in China.

China key to the future of seafood

Today, the choices made by the Chinese government for the future of China's aquaculture will fix world trends.

Ancient China was full of wisdom. In terms of fishing it made three excellent choices which should guide us, including China, today.

- 1) The first choice was to start **creating its own resources** by the development of aquaculture.
- 2) The second was to select a species of fish, such as carp, that was **not carnivore but omnivore**. Why is this important you will understand in a moment.
- 3) The third choice was to feed the fish it was farming with **herbs, insects and waste**, and not with fresh animal protein.

To understand the wisdom of these three decisions seen as a totality, one has to know some of the basics of aquaculture. While aquaculture is generally presented as more environmental friendly, the reality can be the opposite.

The difference comes in the first place from the eating habits of species produced: carnivore, herbivore or omnivore. Today, in the West, the main species farmed in fish farms are carnivore species such as salmon, trout, etc. However, these carnivore species can only be fed with some form of animal protein: to obtain 1 kg of carnivore fish, between 1.5 to 4 kg of other fish are required!

Therefore, fish farmers farming carnivore depend on fishmeal and fish oil made from wild-caught species, as said before, a practice depleting wild fish stocks and destroying the ocean's ecosystems. Chile, Peru and Iceland are the main producers of fishmeal and fish oil mainly used for fish farming. Some unregulated Chinese fishers are fishing so-called "trash fish", i.e. species unfit for human consumption that end up in animal feeds, including fishmeal. What the fishers don't realize is that they are taking away the food of the fish they will not be able to fish any longer tomorrow!

Therefore, the world has to go back to ancient Chinese wisdom:

- 1) Fish producers should emphasis on farming omnivore and herbivore fish species;
- 2) Fishmeal should be produced exclusively from the waste by-products from seafood processing plants and not from wild fish. A team of researchers from Stanford University observed that in China, this waste, which can be 30 to 70 percent of the incoming volume of fish, is often discarded or discharged into nearby waters. They also said that even if the waste is lower in protein than wild-caught fish, this can be overcome by adding plant-based protein sources to the fishmeal, like algae or ethanol yeast;
- 3) The mass production of insects can and should be organized, not to feed humans, but to replace fishmeal as food for fish;
- 4) New techniques of fish farming, not in ponds but in the open ocean, can and should be developed without delay.
- 5) In the West, the promotion of herbivore fish species in our daily food habits will also be required.
- 6) Vaccination of fish stocks, as done with great success in Norway, rather than saturation with anti-biotics is also the way to go.
- 7) Silk production should not be considered something of the past but of the future. Many other insects, besides "silkworms" can produce interesting treads. Scientists are convinced that silk can become the basis of replacement for our current plastics which, while falling into nano-particles, are a huge source of pollution in the oceans (giant garbage patches in the main oceans). If one extrapolates current trends, in 2050, the weight of the garbage floating on the oceans will bypass the weight of seafood ! Tomorrows "bio-plastics" made from silk can become a substitute for current plastics, replace titanium in razors and play a key role in medical prosthesis.