Global Seafood Markets in 2030: Dominated by Aquaculture, with Wild Fish as Niche Market Products?

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The world’s oceans covers 2/3 of the planet...
...and the world’s waterways and oceans is a great underutilized resource

- Increasingly, land-based technologies are adopted to use this resource
  - Offshore drilling
  - Minerals

- Aquaculture is the “food production” arm of this development
  - Aquaculture is farming while fisheries is our last large hunting industry

- Aquaculture is an old technology, but a revolution took place in the 1970s as one started to use knowledge from agro-sciences to domesticate, breed and feed fish
Demand for seafood is expected to increase strongly

- Depending on assumptions, projected global demand for seafood is between 138 and 159 Million Tons (MT) by 2025.
- Aquaculture production would then need to be between 74 and 100 MT by 2025, an increase of 22 or 42 MT from 2008 levels.

Source: Geoff Allan, Port Stephens Fisheries Institute
My basic premise for the discussion of how the seafood market will develop is that demand for food (including seafood) will increase and that the world’s oceans and waterways are an under-utilized resource.
Fisheries has traditionally been the main aquatic food production technology: Production has peaked.
Fisheries production has peaked

- Better management can improve predictability and create more value

- There is very limited scope for known fisheries resources and thereby fisheries to increase the role of the oceans and waterways as a source of food
Growth in seafood trade

• Adjusted for inflation, trade value has increased threefold from 1976 to 2009 from 29.5 billion USD to 95.7.4 billion USD

• During the same period the volume has increased from 7.9 million tones to 32.1 million tonnes, or fourfold

• Hence, the unit value of the seafood has decreased, increasing seafood’s competitiveness as a food source

• Aquaculture
Global seafood exports
Global seafood exports

Bill USD

Developing
Developed

Real unit prices, 1976-2009

[Graph showing real unit prices for 1976-2009, with lines for Ex developed, Ex developing, Im developed, and Im developing.]
The seafood market is changing: Whitefish

- The whitefish market is one of the largest seafood market segments
  - Ca 6 million tonnes if only the main wild species are included
  - Ca 13 million tonnes if all species including aquaculture are included

- From 1980 the market has changed from a regional north Atlantic market to a global market

- The size of the market and a large number of processed product forms makes it an easy market to enter for new species
New species in the whitefish market

- **Until 1985**: Cod, haddock, saithe, etc.
- **1990**: Alaska Pollock, Catfish
- **1995**: Hake, Hoki
- **2000**: New warm water species like tilapia and Nile Perch
- **2005**: Pangasius
US imports of frozen whitefish, 1990-2008 (tonnes product weight)
Seafood retail is changing:
Market share by value of fish retail in the UK, 1988-2003

Source: Sea Fisheries Industry Authority (SFIA)
The supply chain

• It is the total cost of a product that matter for the competitiveness of a product, and landing prices are only a part of that
  – Innovations in the supply chain is as important as innovations in production

• Salmon in Europe is in a shop less then 3 days after it came out of the sea, and is freighted by truck
  – First species with reliable delivery of good quality fresh fish independent of distance
  – Air freight (USA, Japan)
  – Icelandic cod
  – Pangasius
The value of attributes and information are increasingly important.

The product is not only the physical seafood product...
...but also a set of services related to:

- Volume
- Timing and frequency
- Flexibility
- Cost efficiency in distribution
- Food safety
- Harvesting technology
- Ecolabel
- etc.
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- etc.

- And each attribute create a new potential opportunity/challenge at the market place, in the supply chain and in the production of harvesting process
Conditions favouring increased aquaculture production

- Population growth and economic growth lead to increased aggregate demand for food
- Stagnating global catches of fish reduce the competitiveness of wild fish
- Globalization has reduced the cost of shipping products and increased trade
- The growth of retail chains favour supply chains with sufficient control to enable efficient logistics
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- To exploit these conditions, one must be competitive
Aquaculture is competitive

- Aquaculture is the result of systematic R&D and innovation in water based food production systems.
- Expansion of aquaculture production is profitable because of lower production cost due to technical innovations:
  - Productivity growth
  - Demand growth
- This is a necessary development if the world’s oceans and waterways are to be significant sources of food.
Innovations are leading to rapid technological progress

Specialized suppliers increase productivity with their own R&D work
Innovations increase scale – a salmon pen from 1980 and one from 2010
Improved logistics

Truck carries chilled fish

Air freight

Distribution terminals
Product innovation increase demand

- Branded salmon
- Pre-prepared meals
- Better cuts
... but aquaculture also lead to new environmental challenges

- Aquaculture is also a new way of using the environment, and creates a set of environmental challenges

- Feed (the fish meal trap)
  - Which is a good story that does not hold

- Local externalities
  - Emissions
  - Escapes

- In principle, the control with the production process that allow systematic R&D can also be used to address environmental externalities
  - In practice, it depends on governance
Norwegian export price and production cost for salmon 1985-2011 (2011=1)
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Shrimp production and real US import price (2008=1)
Environmental challenges can be solved:

Use of antibiotics in the Norwegian salmon farming industry
World aquaculture production

Million tonnes


0 10 20 30 40 50 60
World seafood production

Million tonnes

- Aquaculture
- Capture
Per capita seafood consumption, USA
Seafood is a part of the larger food market

The food price crisis can be interpreted as evidence that we are not producing enough and that the potential of the oceans are very important.

In the long run competitiveness is the key factor for all food products (and production is of course sustainable).
Innovation is driving the food market and enable us to feed more humans: The long run real price trends
Real U.S. broiler prices


Real 2011 USD/lb

$0.00 $0.50 $1.00 $1.50 $2.00 $2.50 $3.00 $3.50 $4.00
Annual growth rate
Aquaculture vs agriculture

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<th>Animal Meat</th>
<th>Milk</th>
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<th>Cereals</th>
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Global per capita food fish supply: Aquaculture is already as important as wild fish
New aquaculture species are expected to dominate the whitefish market...
... as they already dominate the salmon market

Source: NSEC, FAO, own estimates
Conclusions

• Aquaculture production will continue to increase
  – Because one have just started to adopt technology from agriculture, and there is a tremendous scope for further productivity growth

• As for all biological production processes, this creates environmental challenges
  – Can be solved
  – North-America and EU lags behind
Conclusions

- Aquaculture will be the clearly most important seafood production technology in 2030
  - And the only reason why seafood continues to be an important source for animal protein

- Fisheries is not likely to feed more people
  - The real issues is largely how to protect stocks and how to maximize value
  - And poor management is likely to continue to be a problem in many parts of the world
Conclusions

• But 2030 is too early to make all wild fish markets niche markets.
  – But one are likely to see a segmentations into high value niche products and low price protein
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• Will Alaska by then start to manage the wonderful resource that its coast line constitutes?
The fishmeal trap hypothesis (Wijkstrøm, Naylor et al)

• Growth in aquaculture production increase demand for forage fish to produce feed
  1. This makes aquaculture inherently unsustainable and environmentally degrading
     • Requires that forage fisheries are poorly managed, that forage fish has no substitutes, and that cost is not important for aquaculture production
  2. This will eventually also put a limit on aquaculture production
     • Requires that aquaculture feed must contain marine ingredients
Global aquaculture and fishmeal production

Mill. tonnes

- Fish Meal
- Aquaculture

Global production by source for fishmeal
Growth in global aquaculture production does not lead to increased use of marine ingredients.
Inclusion levels of fish meal and oil in salmon feed

Inclusion levels of marine ingredients in Salmonid diets

% Dietary Inclusion

Fishmeal %
Fish Oil %

The fishmeal trap is a good story, but does not hold up against the data
For potential consumers of small pelagics, it comes down to what you want to eat

This fish …

or maybe consume no fish at all

…or have it converted to this one