The Chilean salmon Industry
Current status, future potential and some views over some short term challenges (2011 to 2013)

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Structure of the presentation

• Background information pre crisis, during the crisis and today:
  – Production figures
  – Licenses usage
  – Biological KPI
  – New regulations and trends

• Challenges
  – Structural
  – Economic
  – Sustainability
The Chilean Industry looking backwards:
Total fish harvested per year (thousand tons, gross weight)

- Maximum harvested biomass was reached in 2006
- In 2010, biomass production was equivalent to what it was produced in the year 2000
The Chilean Industry looking backwards: Licenses in use before and after ISA in Regions X and XI

- Unseen drop on licenses usage
- Most reduction in Atlantic salmon
The Chilean Industry looking backwards: Yield per smolt (kg harvested per smolt)

- Best ever performance Atlantic salmon and Coho
The Chilean Industry looking backwards:
Harvest weight (kg)

- Conditions between 2009 and 2012 (absence of virulent ISA) allowed completing growth cycles to optimal harvest weight
- Record high growth rates in the last 2 years
The Chilean Industry looking backwards: Monthly mortality (%)

- Mortality during the crisis peaked at 3 to 14% per month in 2H 2008
- After the crisis, monthly mortality have been maintained below pre-crisis levels
The Chilean Industry looking backwards: Lice, *Caligus* per fish

- Parasite pressure peaked in 2007 and it is believed played a key role on the ISA outbreak.
- After the crisis, parasite pressure is also below pre-crisis levels.
The Chilean Industry looking backwards: Production per species (tons GW/year)

- Atlantic salmon was the most affected in terms of biomass production
- Coho and trout production remain unaffected (interspecies interactions?)
The Chilean Industry: The Future
Egg origin and demand (millions eyed egg per year)

- Aiming for less risks of disease importation stricter egg importation rules were implemented
- Biomass production was reduced by one third while egg demand more than 5 times.
- Today’s better performance means only 1.6 eggs/smolt are required
- Only Denmark, Island and Australia are allowed to export eggs into Chile
- Larger share of the egg needs will be produced in Chile
The Chilean Salmon Industry: The Future
Technology and resources required for Smolt production

- New regulations are affecting the methods and environments used to produce smolts, aiming for better fish and reduced sanitary risks
- Today, smolts are mostly produced in lakes (2/3) and land based hatcheries (1/3)
The Chilean Salmon Industry: The Future
Technology and resources required for Smolt production by species

- Today, Atlantic salmon smolts are almost exclusively produced in land based hatcheries
- Coho and trout are mostly produced in lakes
- Predicted growth in Chile requires large investments in new land based hatcheries

**Chilean Salmon Industry: The Future**
Technology and resources required for Smolt production by species

- **Atlantic salmon**
  - Hatchery
  - Lake
  - Estuary

- **Trout**
  - Hatchery
  - Lake
  - Estuary

- **Coho salmon**
  - Hatchery
  - Lake
  - Estuary

**Aquabench**
Seeds of vitality and profitability
Farming in the sea is also much more regulated: neighborhoods, fallow periods, timing restrictions on smolt transfer from FW, fish movements between sea water farms are forbidden, among others, are some of these new rules.

Limitations over farm usage created scarcity of farms therefore investment in more exposed farms are now required.
Triggered by economies of scale and decreased availability of farms, the number of smolts per farm is increasing for all species. Atlantic salmon farms show the steepest growth on number of smolts per farm.
Standing biomass is increasing from its record low in Dic 2009.
During 2009 and 2010 the standing biomass fluctuates between 150 to 200 thousand tons.
Standing biomass in 2011 is growing fast but still at about 63% below its peak in 2008.
Harvested biomass in 2009 and 2010 reached the lowest since the last 10 years.
Economic and biological results were outstanding during 2H 2009 and 2010.
Fish transferred in 2010 will allow harvesting around 200 k tons extra in 2011, mostly Atlantic salmon.
Similar growth is expected in 2012 peaking at about 900 k tons in 2013.
The Chilean Salmon Industry: The Future Understanding the growth

Individual contribution on biomass growth based on estimates 2011 to 2013

• Harvested biomass: 5 to 6 companies explain 50% of the growth while the remaining 25 the other 50%.

• 76% of the growth will be based on Atlantic salmon only.

• Up until today, availability of concessions is one of the most important deciding factors to open the door for growth.

Estimate increase on harvested biomass 2010 to 2013

- 14% Coho
- 10% Trout
- 76% Atlantic

seeds of vitality and profitability
Challenges for the future
(a biologist view)

• Structural challenges
  – How to make rational and sustainable use of a common resource. Is it possible at all?

• Economic challenges
  – New measures are not for free
  – Supply and demand (plus others) are still ruling pricing

• Sustainability
  – Within current constraints, what are limits for the Chilean salmon industry. A comparison to Norway.
• Structural Challenges
  – Neighbourhoods structure
  – Industry structure
The Chilean Salmon Industry: Challenges

Industry structure

- Over 1174 licenses in Region X and XI and 57 in Region XII
- No limitations on growth
- No legal framework to control biomass production (so far)
The Chilean Salmon Industry: Challenges
Industry structure, neighborhoods

Licenses per neighborhood
The Chilean Salmon Industry: Challenges
Industry structure, neighbourhoods

- Neighbourhoods: 58 (X Region 24; XI Region 34)
- Mean Licenses per neighbourhood: 21
- Mean Companies per neighbourhood: 7.9
- Licences per company: 2.7 per neighbourhood

The industry fragmented structure makes self regulation implementation very difficult.
The Chilean Salmon Industry: Challenges

Industry structure: De-consolidation

- Compared to the salmon farming industries in other countries, the Chilean industry the only that has deconsolidated in recent years
- 18 companies explain 80% of the overall production
- The more the players, the lower the chance for agreements
• Economic Challenges
  – New rules: benefits and costs
  – Pricing: Supply/demand plus other factors
Economic performance in the last 4 years has shifted from record lows to record highs. All companies are showing positive EBITDA for the last 18 months. IPOs and good operational performance has allowed most companies to escape from bankruptcy and prepare them for future growth.
The Chilean Salmon Industry: Economic Challenges

The scenario in Nov 2010.

- EBITDA results in the last 2 years were obtained on above the average price. *Everybody could make money.*
- The new regulations in Chile have and will have an impact on cost
  - *Breakeven prices have increased*
## The Chilean Salmon Industry: Economic Challenges

The scenario in July 2011.

### Average

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### Profit Analysis

- Only best farmers are making money on current prices.
- Price dropped despite supply increase is not even realized.
- Other “external” factors affecting salmon prices?

![Graph showing FOB Miami C-trim 2-3 pounds USD](Image)
• Sustainability
  – What is the potential?
  – What are the limits?
The Chilean Salmon Industry: Sustainability Farming “area” in Norway and Chile
X Region licenses
- 24 neighbourhoods
- 250 km long
- 8,600 km²
- Mean area: 357 ha per neighbourhood
The Chilean Salmon Industry: Sustainability

Farming area in XI Region

- XI Region licenses
  - 34 neighbourhoods
  - 300 km long
  - 14,500 km²
  - Mean area: 426 ha per neighbourhood
The Chilean Salmon Industry: Sustainability
Farming resources in Norway and Chile

• Chile (X-XI Reg.)
  ✓ 58 neighbourhoods
  ✓ 550 km long
  ✓ 23,074 km²
  ✓ 1174 licences

• Norway
  ✓ 10 counties
  ✓ 2200 km long
  ✓ 76420 km²
  ✓ 982 licences

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Geographic allocation of aquaculture sites

Norwegian Ministry of Fisheries and Coastal Affairs
Biomass concentration in Chile could easily surpass Norwegian densities (mean and maximum) depending on the intensity currently available licences are used.
Adding new farming areas in Region XII (estimated to be about 400 km long) will reduce pressure on Regions X and XI.

Control over the farm numbers and sizes (biomass) remains to be addressed.
Conclusions

• The industry has recovery from its most serious crisis

• The post crisis results have shown Chile offers exceptional conditions so fish can be grown at world class biological KPI

• The industry has re-gain financial support and motivation for a new start. The industry leaders today are more open for mutual collaboration and collective efforts than ever before.

• Debt levels and promises made at IPO are still pushing growth, perhaps beyond the limits

• Financial resources are required in new infrastructure but there are too many incentives to spend them on the generation of more biomass.
Conclusions

• A new regulatory framework that facilitate and encourage licences trade could contribute to a more organized industry and prevent “the tragedy of the commons”.

• Licenses in Region X and XI are too many and too close compared to Norwegian standards.

• The industry needs to spend some more R&D resources to understand the causes for the crisis and also for the amazingly fast “biological” recovery. We suggest standing biomass and biomass density is one of the most relevant causative factor.

• For now it seems wise establishing limits to the use of existing licenses avoiding another potentially very expensive experiment as a result of producing fish at much higher densities than the rest of the world.