SUSTAINABLE AQUACULTURE ON ISLANDS – THE EXAMPLE FROM THE FAROE ISLANDS

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Introduction

• Operating in islands has some disadvantages
  – Distance from marked
  – Harsh weather conditions

• and advantages
  – Isolation from disease and pollution
  – Good dispersion of effluents
  – Stable water quality
  – Often few operators
Faroe Islands
Faroe Islands

- 18 islands
- 113 km north-south
- 75 km east-west
- Land area 1393 km²
- Pop: 48,660 (Jan. 2010)
- Farmed trout and salmon: 48,662 tonnes (2009, gutted weight)
Large fjord system vs islands

One fjord has a larger production than all the Faroe Islands

Hardangerfjord, Norway

Faroe Islands
Water quality

- Stable water temperatures. Mean is around 8 °C and min and max are 2-3 °C lower and higher respectively.

- Well mixed water column.

- Only harmful algal blooms at the most sheltered sites

Larsen et al., 2008
Harsh farming conditions

• The Faroe Islands are exposed to ocean waves from all directions
• Tidal currents are strong on the shelf
• Fish farming sites are located in bays and fjords
Currents

- Most farms located in bays or fjords with slow currents
- Outside the fjords, the tidal currents are strong
- The strong currents disperse whatever is spread into these currents very fast around the entire shelf
- Concentrations are thinned out equally fast

Knud Simonsen, www.setur.fo
Waves

- Require strong equipment
- Better conditions on the bottom under fish farms
- Therefore the sites support quite high biomasses
Production

• Production has been quite variable (max of 52,000 tonnes in 2003)
• The largest drop in production (16,000 tonnes in 2006) followed a series of ISA outbreaks
• Regulation became much stricter after this
• Now production is back up to 49,000 tonnes in 2009

2000 – 1  ISA outbreak
2001 – 5  ISA outbreaks
2002 – 5  ISA outbreaks
2003 – 10 ISA outbreaks
2004 – 11 ISA outbreaks
2005 – 1  ISA outbreak
The Faroese farming industry

• Eggs
  – Mostly local production (Aquaculture Research Station of the Faroes) and some import since 2005

• Smolts
  – Local production
  – Development is from many small flow through stations to few large stations using recirculation

• Ongrowing
  – Sea sites
  – Number of sites had a maximum of 63 with the same number of operators
  – Number of sites down to 40, organized in 23 management areas and operated by 5 operators
  – Cages have grown to 128m circumference and exposed sites are favoured in front of the most sheltered.
Management areas

The colors show approximately the management areas.
A new start

Ready for a new start in 2005
• Almost no salmon at sea
• New regulations in place
• All smolts are ISA vaccinated (except for small control groups)

Numbers of smolt put to sea

Dam, R., 2010
New regulations

- Management areas
  - Most are single fjords facing the open ocean or areas with strong tidal currents
- All-in-all-out
- Fallowing periods
- Approved production and contingency plans
- Landbases with dead fish handling
- Stocking densities and oxygen monitoring
- Approved safe movement of all aquaculture material
- Closed valve well-boat transport
- Desinfection of wellboat water and all effluents from the slaughter process.
ISA-vaccination program

- Test with ISA-vaccine
- All smolts are vaccinated for 3 production cycles
- A small test group is held at each site
- All farms sampled monthly
Additional improvements

• Important to have high quality smolts
• Ongrowing in sea cages is vulnerable to the surrounding environment and has a large impact on the environment
  – Using exposed sites offers better flushing of the sites, e.g. for removal of parasites, but puts strain on the equipment
  – And offers better bottom environment, cage environment and water quality
Results

• No significant disease outbreaks

• Healthier farming

• Better economics
Shortening production time

Smolt size

- Since 2003 a larger smolt size has been used

- Shortened production time starting with the 2003 yearclass of smolt
- Reducing the risk of disease in sea cages

Dam, R., 2010
Fish welfare

Feed conversion rate (FCR)

Mortalities (%)

- FCR has been reduced since 2004
- The clearest advantage of this new system are the reduced mortality numbers
Harvest weight and yield

- Low harvest weight in 2001 and 2002
- Gradual increase to quite high weight

- By now the farmers in the Faroe Islands produce more salmon per smolt than their competitors
Discussion

• This new structure has had a large impact on the farming result with no disease problems, and highly improved biological and economical results.

• For an optimal production, each operator should have sites in at least 3 areas

• Since the regulation came in place after the farms were developed, some of the management areas are not optimal.
Flexibility

- Salmon louse problems in especially four neighboring areas
- Agreement within the industrial partners to run these areas (and one fjord not in use) as one management area with common all-in-all-out cycle and fallowing period

The colors show approximately the management areas.
Further development

Research based further development of the industry

• Research projects
  – Wave and current regime in faroese fish farming areas (modeling and measurements)
    • Equipment requirements
    • Transport between sites and farming areas (using i.e. salmon louse as indicator)
  – Water quality within fish farming cages
  – Open ocean fish farming
Thank you for your attention!

Questions??