

Getting Started

in


Aquaculture & Aquaponics

Alma Aquaculture Research Station
University of Guelph
December 6, 2018

Presenters

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Welcome & Introductions



Agenda

- 1. Aquaculture – The Wave of the Future**
 - Advantages of farming aquatic species
 - Global aquaculture output and future outlook
 - Consumer trends in seafood consumption
 - Aquaculture in Canada and Ontario
- 2. Production Requirements**
 - Production Systems
 - Aquaponics
 - Water supply - quality and quantity
 - Egg & Fingerling Supply
 - Nutrition and Growth
 - Fish Health Management
 - Necessary permits, licences, etc.
 - Nutrient Management

Agenda (continued)

- 3. Processing, Marketing & Economics**
 - Fish processing methods and requirements
 - Market factors
 - Product forms and pricing
 - Distribution channels to major markets
 - The Model Farm Design
 - Getting Started in Aquaculture / Next steps
- 4. Tour Alma Aquaculture Research Station**
 - History & Mandate
 - Facilities
 - Research Projects

Section 1

Aquaculture – The Wave of the Future

- Advantages of farming aquatic species
- Global aquaculture output & future outlook
- Consumer trends in seafood consumption
- Aquaculture in Canada & Ontario

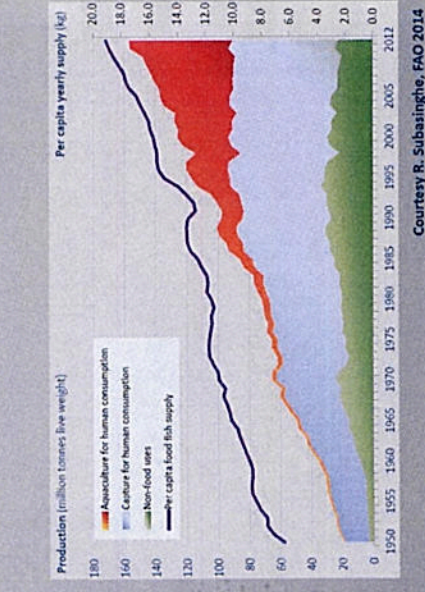
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Where Does Our Fish & Seafood Come From?

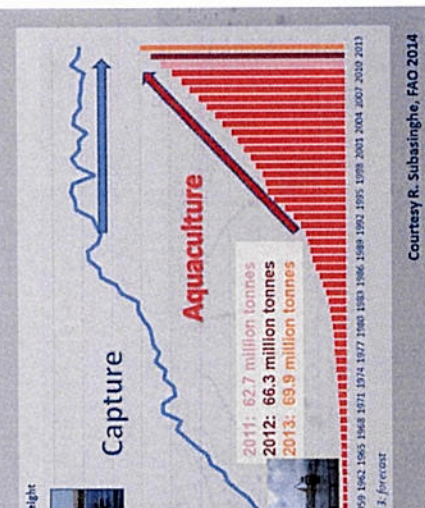


- Historically – our lakes and oceans
- When we needed more, we just fished
 - Harder,
 - Longer,
 - Deeper
- or Further Away

Seafood Production and Utilization



Seafood Production



Challenges – world population increase

- In 2011, the world consumed 125 million tonnes of fish, 62 million tonnes originated from aquaculture
- Ten years from now, aquaculture will need to produce 50 percent more per year than current annual production

ISSUES AT STAKE

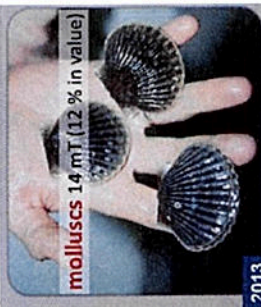
- Food security
- Food safety
- Western versus Asian industry approach
- Industry consolidation versus small farmers subsistence
- Legislation needs / Permits
- Level-playing field
- Fair business for small farmers in Asia
- Sustainability: economical, ecological, energy, resources



fish 42 mT (63% in value)



crustaceans 6 mT (21% in value)



molluscs 14 mT (12% in value)



seaweeds 21 mT (4% in value)



Benefits of Aquaculture

- Economic development in rural and coastal communities
- Year-round operations
- Capability to produce to meet market demand and consumer needs
- Expanding domestic and international markets
- Enhanced balance of trade (exports)
- Non-extractive, renewable resource industry
 - i.e. sustainable development
- Considerable un-developed potential
- Augments productivity of entire fishery sector

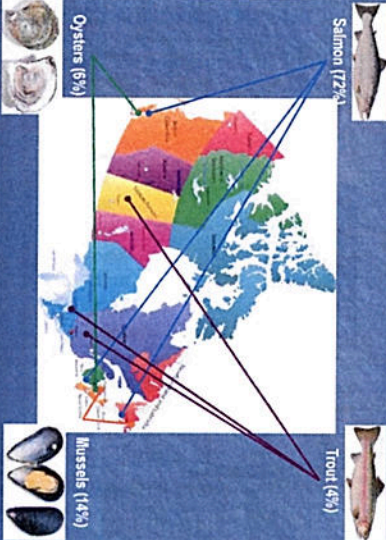


Common Challenges to Aquaculture Development

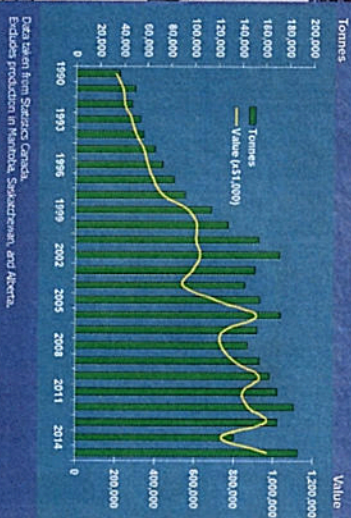
- Opportunities awareness
- Access to financing
- Training & skills development
- Availability of objective information
- Capacity to develop opportunities
- Infrastructure, transportation costs & economies of scale in often remote locations



Regional Distribution of Aquaculture



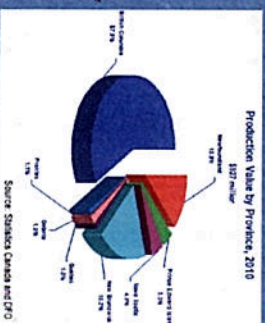
Canadian Aquaculture (farm-gate)



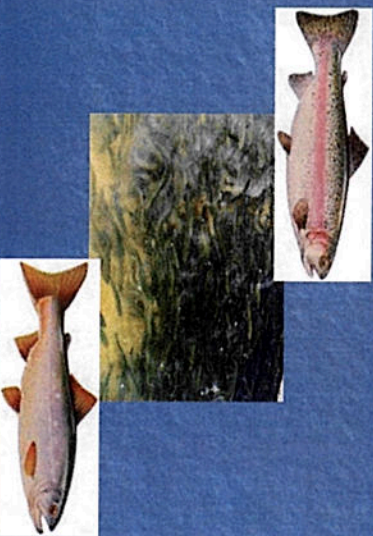
Data taken from Statistics Canada, Excludes production in Manitoba, Saskatchewan, and Alberta.

Output by Province

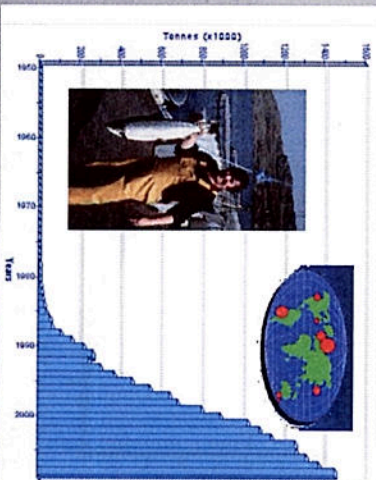
- BC leads provinces
- 54% of total output
- 95% salmon
- NB is second
- 25% of total output
- 98% salmon
- NL & NS also mainly salmon producers
- PEI mainly mussels
- ON, QC & Prairies produce mainly trout



Trout & Char Aquaculture

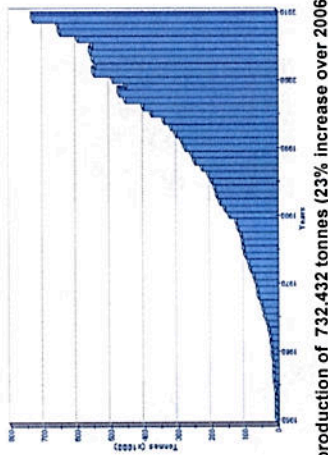


WORLD SALMON PRODUCTION



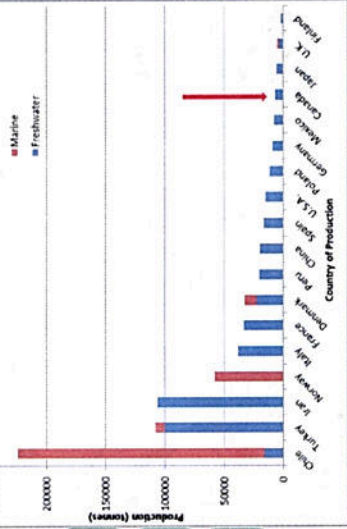
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World Production of Rainbow Trout



2009 production of 732,432 tonnes (23% increase over 2006)
 2011 production of 770,385 tonnes (31% increase over 2006)

Global Farmed Rainbow Trout Production 2011



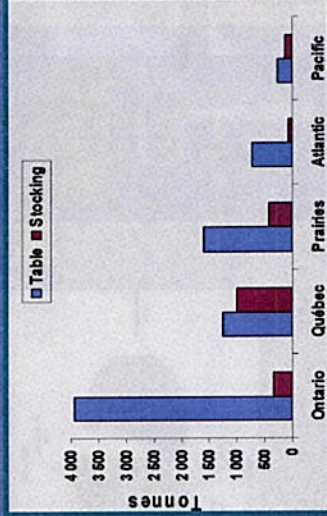
Why Rainbow Trout?

- Culture techniques, based on more than 100 years of research and practice, are well established;
- Domesticated strains of trout have been bred to improve performance and yield;
- Nutritional requirements are well defined and efficient commercial feeds are available from several suppliers;
- Water temperatures and the biophysical resource base throughout much of Canada are near ideal for the species;
- An established market exists for rainbow trout; and
- Naturalized species in most parts of the country and thus poses little to no genetic threat to feral populations.

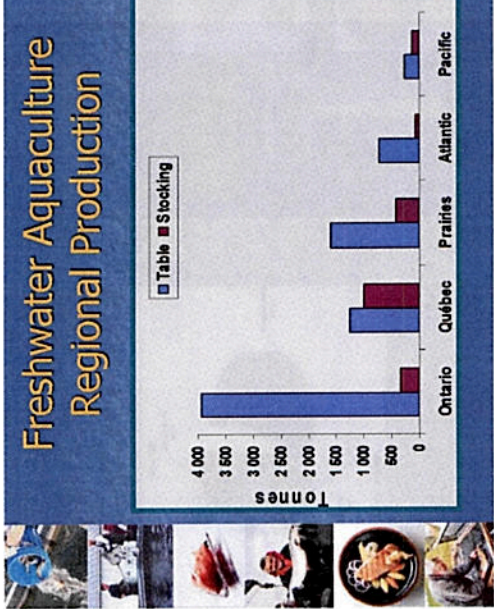
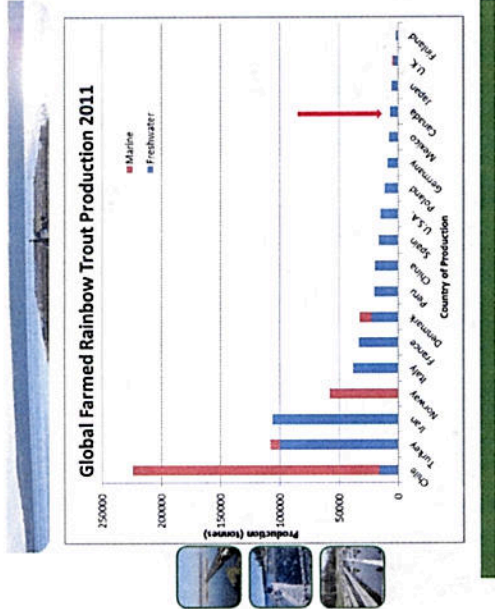
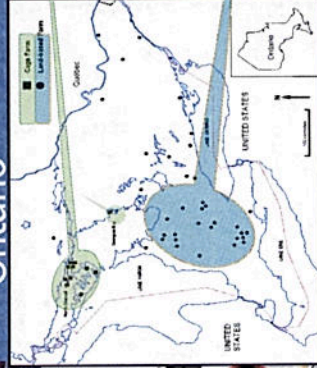
The abundant potential...

- 20% of the world's freshwater,
- Plentiful biophysical resources,
- Developed culture technology,
- Still not meeting domestic demand,
- Substantial export potential with proximity to the U.S. market,
- The industry has the experience, expertise and desire to support development.

Freshwater Aquaculture Regional Production

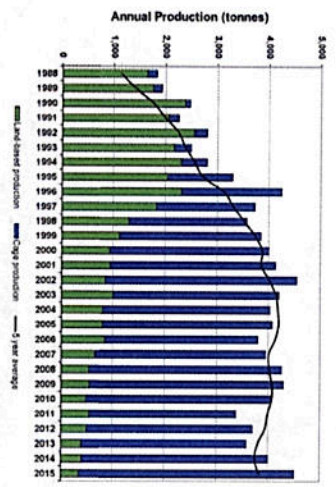


Distribution of Trout Farms in Ontario



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Ontario Farmed Trout Production



Ontario Aquaculture Production

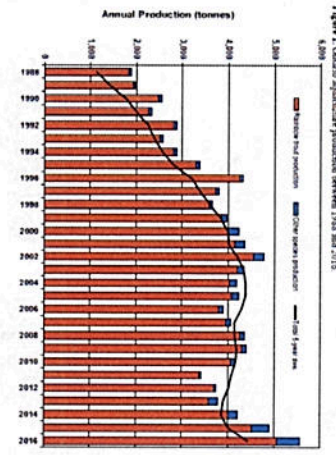
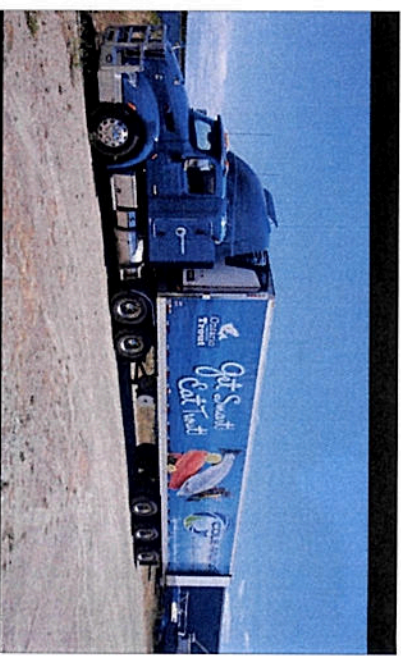


Figure 1. Ontario aquaculture production between 1988 and 2015.

Moscona and Beaman, 2017



Ontario Aquaculture Association
Ontario Fishery Enhancement and Aquaculture Association

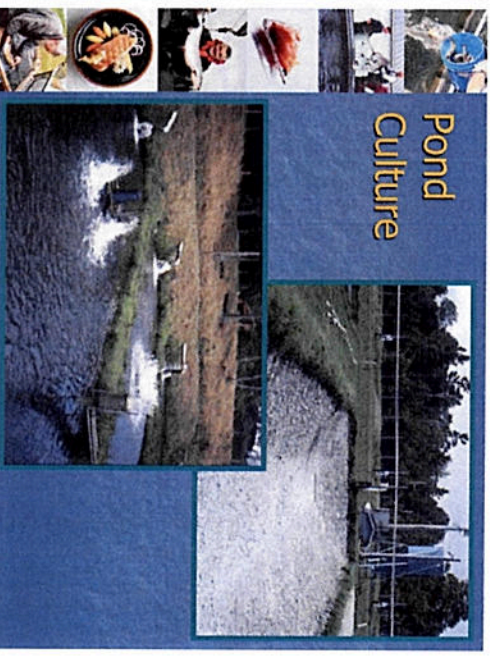
ontarioseafoodfarmers.ca
ontarioaquaculture.net



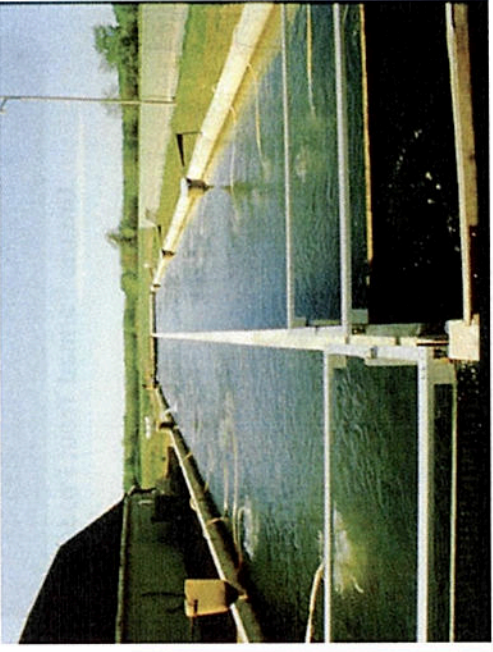
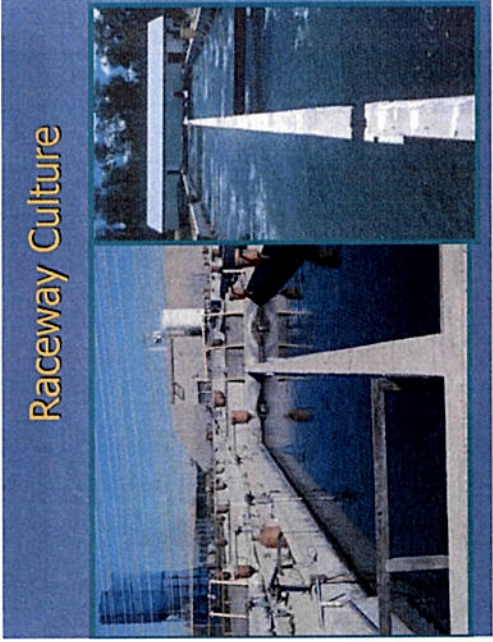
Rainbow Trout / Arctic Char Production Cycle

- OVA**
 - Commercial hatcheries
 - Selected brood stock / strains
 - Hatch in 30-100 days
- Sac Fry**
 - Absorb nutrients from yolk
 - <60 days
- Fingerlings**
 - Moved to large tanks or cages at $\sim 10-20$ grams
- Harvest**
 - On-growing for 12-16 months
 - 0.9 - 1.5 kgs
 - Two 8-12 oz filets per fish

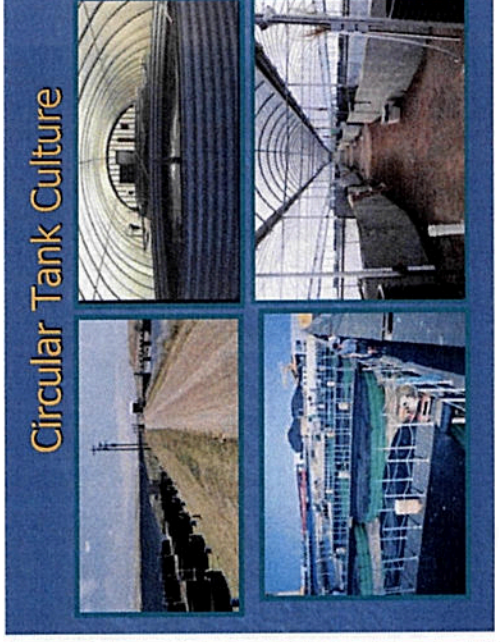
Pond Culture



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Raceway Culture

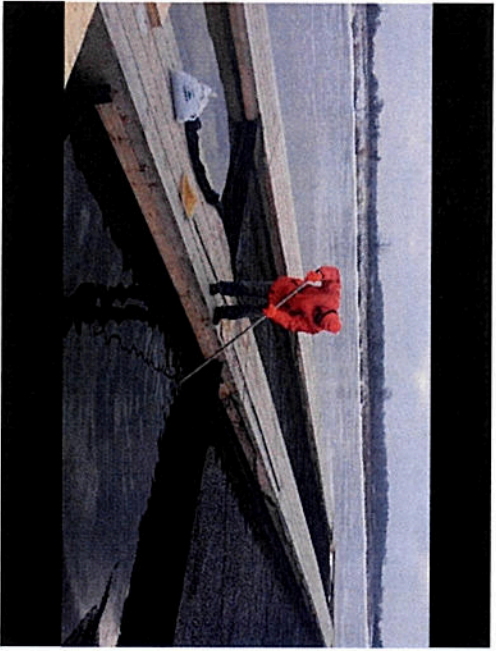
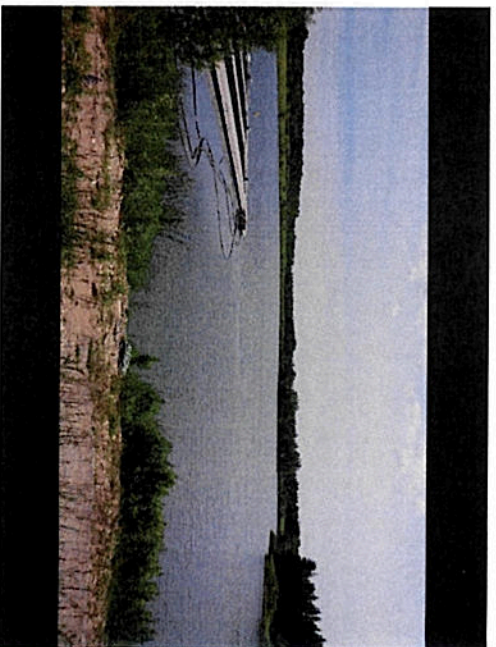
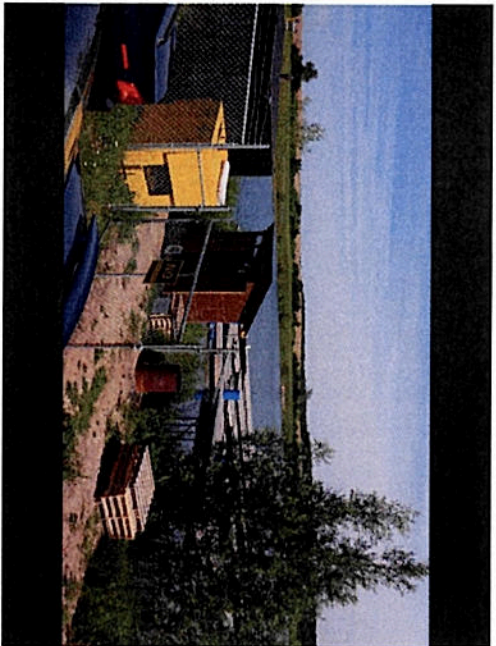
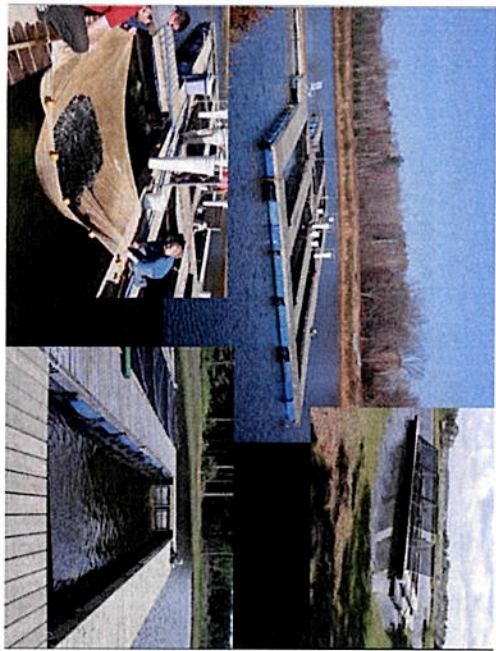


Circular Tank Culture

Floating Containment

- Relatively low operating costs compared to land-based
- Very energy efficient –low pumping costs
- Low environmental impact due to manure recovery and removal
- Ease of operation and management, depending on technology can allow for a greater degree of stock management than net pens
- Flexible design - units can be added and moved around as needed
- Depending on the site it is possible to manage water temperatures by dual draws pulling from different depths

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Net Pen Systems

Steel Cages



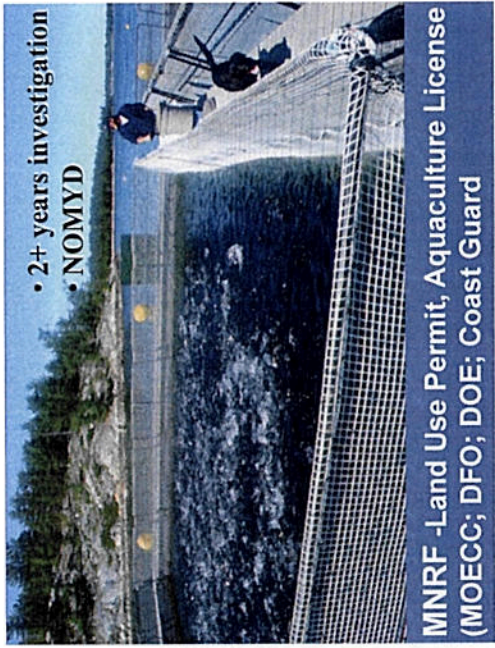
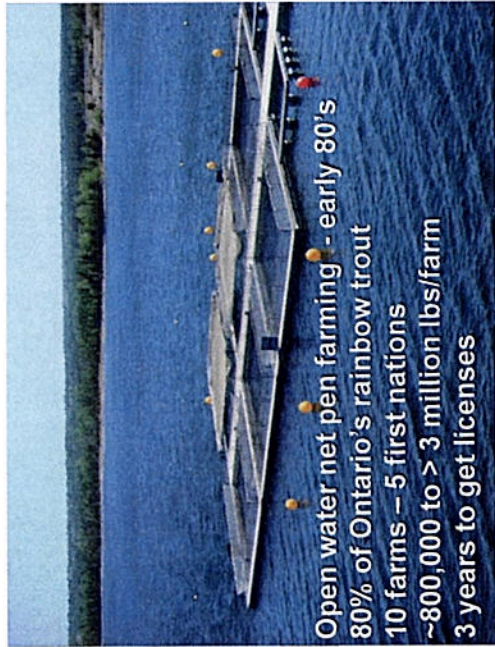
HDPE Plastic Cages



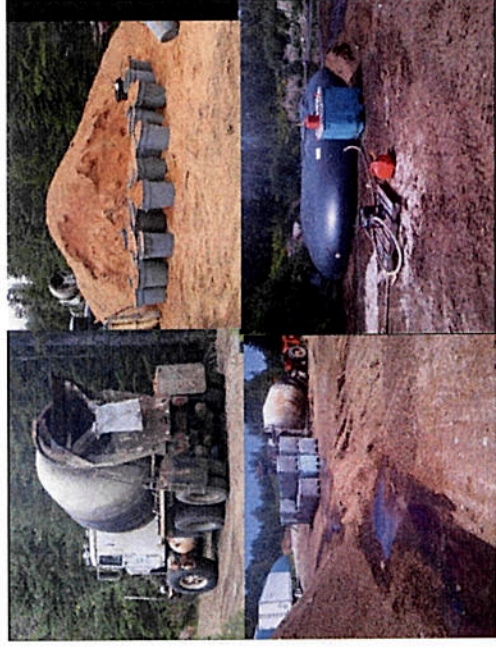
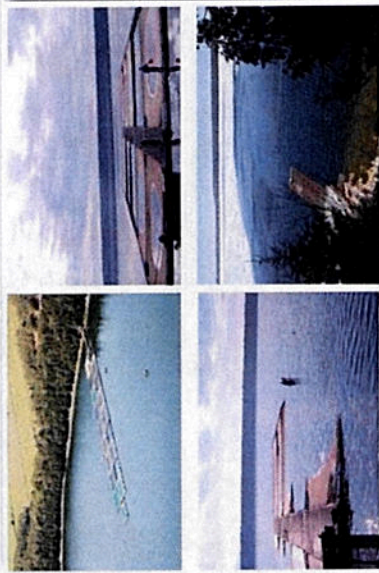
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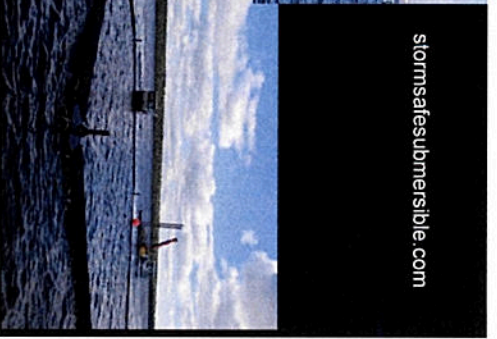
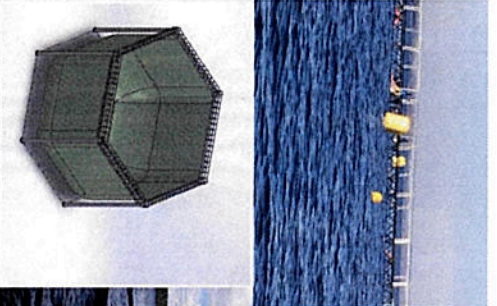
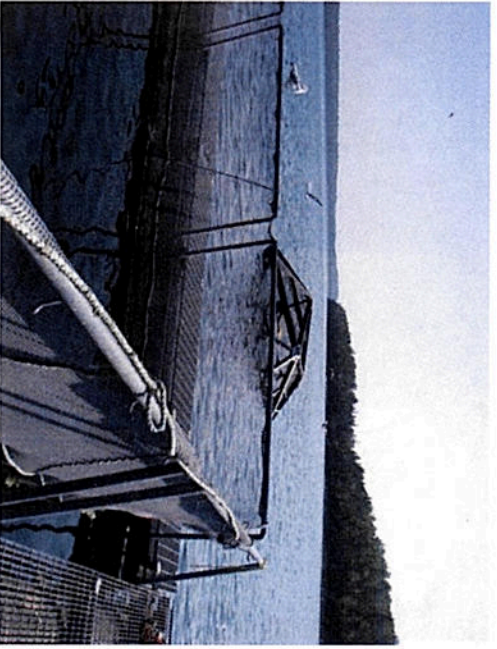
Open Net Pens (Cage Culture)

- Manitoulin Island and Parry Sound
- Lower unit costs for capital and operation than land-based
- Need to be located in more remote areas to avoid potential user conflicts
- Site selection vital as many sites have high surface temperatures during the summer months
- Need to be sufficiently large to be economical (at least 400 tonnes per year)
- Location, location, location – not in a small confined hypolimnion area and location to minimize risk of ice movement and severe weather



Submersible Cages





Recirculating Aquaculture Systems

Source: ProQuest.com

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