



Gloucester Maritime Industry Symposium

Diversification of Fisheries - Aquaculture

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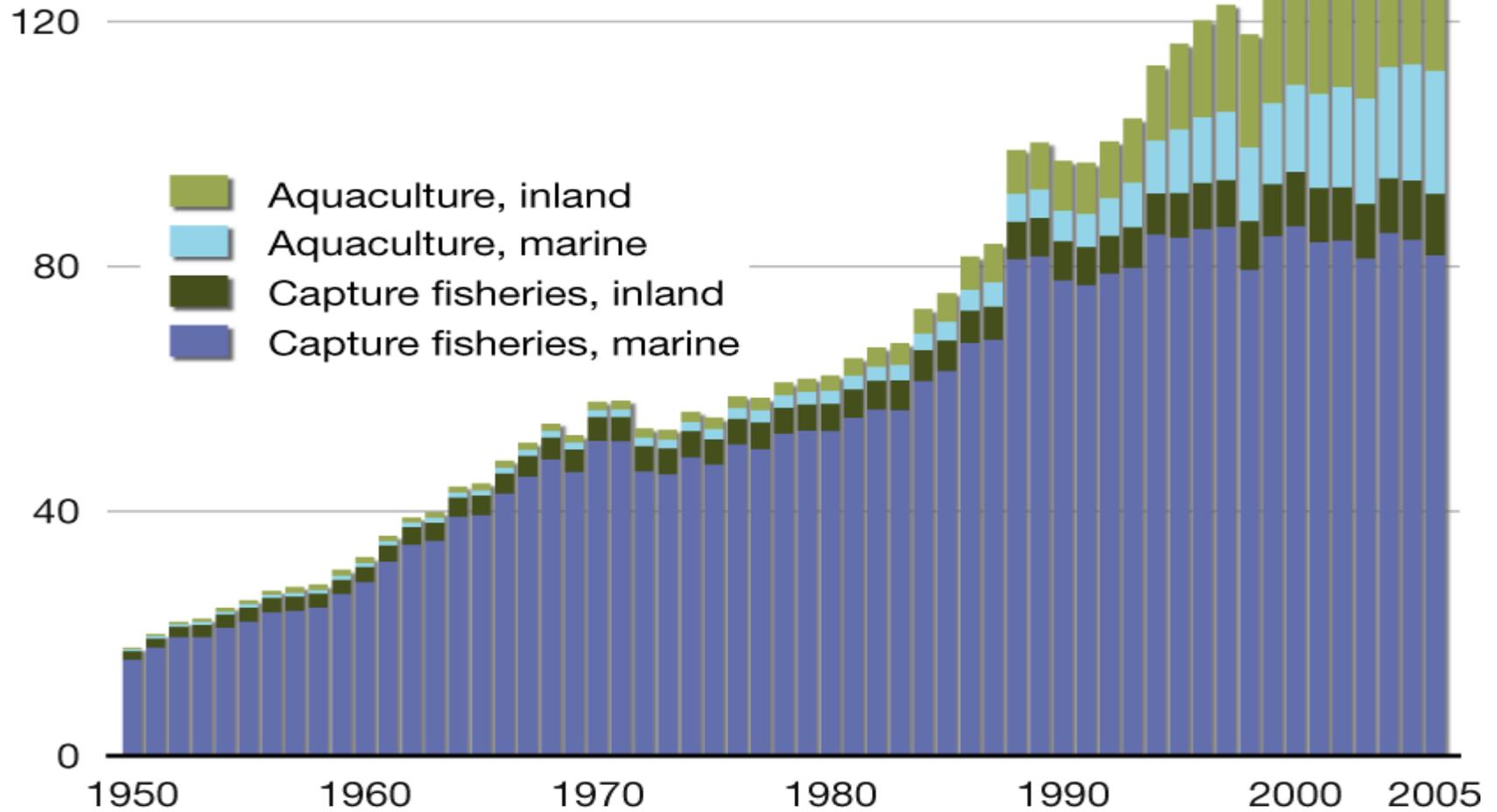


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Canada

World fisheries and aquaculture production (million tonnes)



Aquaculture Growth

World aquaculture output has increased substantially, from less than 1 million tonnes of annual production in 1950 to the 52.5 million tonnes reported for 2008, increasing at three times the rate of world meat production in the same period.

FAO Report , World Aquaculture 2010

But...

- Seafood production growth not keeping pace with population growth rate
- Markets for many seafood (esp. cultured) products are expanding
 - Growing middle-class in China, Russia, elsewhere
 - Greater awareness of health benefits
 - Increased acceptance of 'new' products (e.g. Basa, tilapia)

US Seafood trade deficit

Right now, the United States is a major consumer of aquaculture products – we import 84% of our seafood and half of that is from aquaculture – yet we are a minor producer. U.S. aquaculture (freshwater and marine) supplies about 5% of the U.S. seafood supply and U.S. marine aquaculture less than 1.5%. Driven by imports, the U.S. seafood trade deficit has grown to over \$9 billion annually – the highest it's ever been.

NOAA website (<http://aquaculture.noaa.gov/us/welcome.html>)

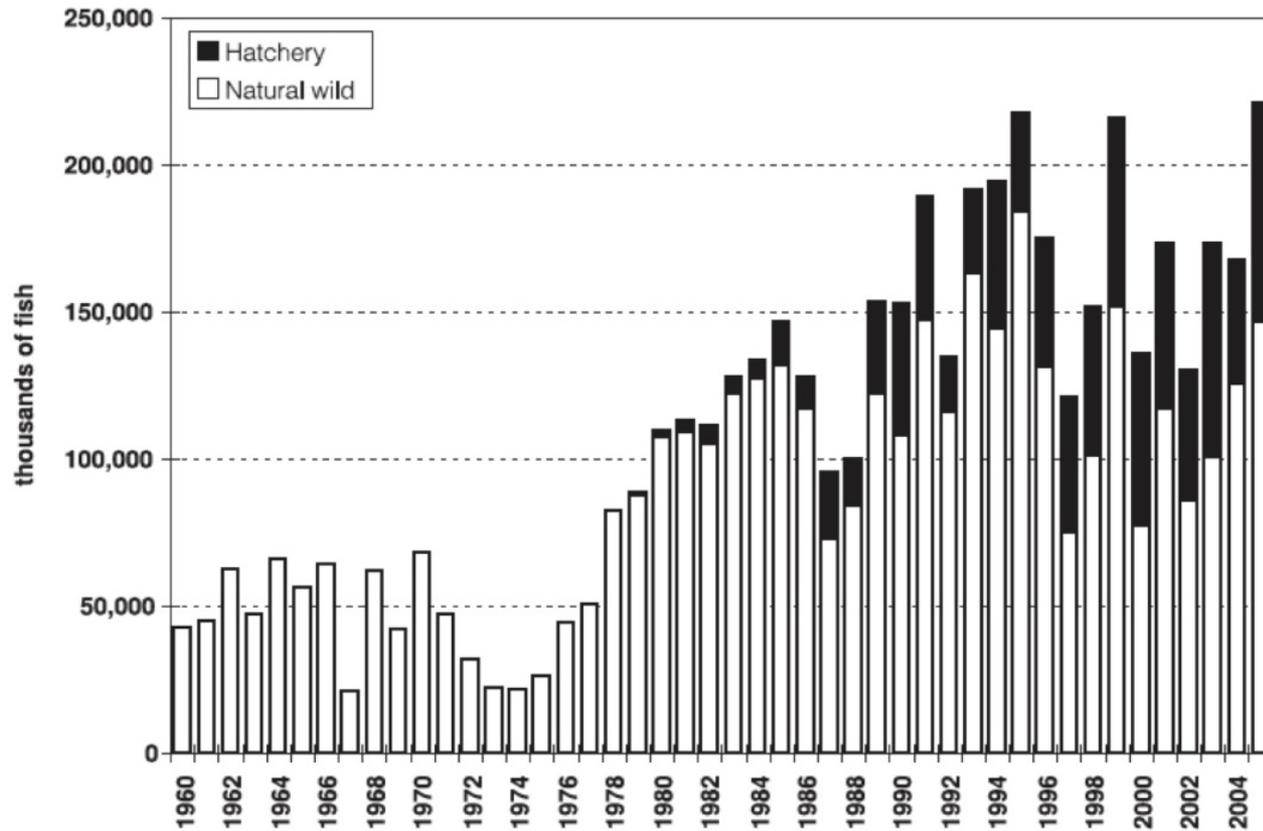


Stock enhancement (ranching)

- e.g. Alaskan wild salmon fishery

Figure IV-1

Alaska Commercial Salmon Catches Since 1960:
Natural Wild Salmon and Hatchery Salmon



Source: Data for 1960-1978: ADFG Catch Data 1878-1981; Data for 1979-2005: ADFG Hatchery Data





Partial cycle

- Atlantic Canadian oyster industry



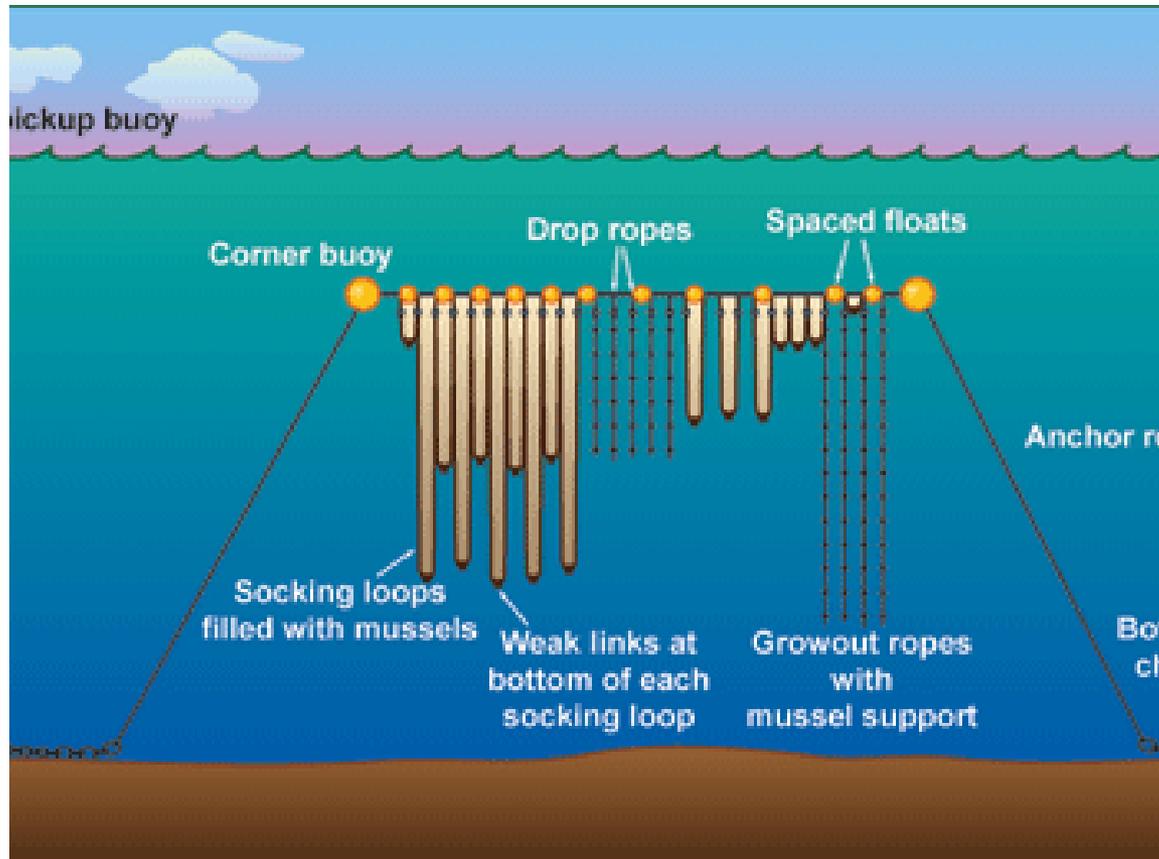
Full-cycle

Hatchery to grow-out to market

Location and Containment

- Net pen
- Land-based
- Closed-containment
- Offshore





Offshore submerged long-line

- Newfoundland, Rhode Island, New Hampshire, etc.



NOAA NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

Commerce and NOAA release national aquaculture policies to increase domestic seafood production, create sustainable jobs, and restore marine habitats

June 9, 2011

The Department of Commerce and NOAA today released national sustainable marine aquaculture [policies](#) to meet the growing demand for healthy seafood, to create jobs in coastal communities, and restore vital ecosystems. Foreign aquaculture accounts for about half of the 84 percent of seafood imported by the U.S., contributing to the \$9 billion trade deficit in seafood.

"Our current trade deficit in seafood is approximately \$9 billion," Commerce Secretary Gary Locke said. "Encouraging and developing the U.S. aquaculture industry will result in economic growth and create jobs at home, support exports to global markets, and spur new innovations in technology to support the industry."

"Sustainable domestic aquaculture can help us meet the increasing demand for seafood and create jobs in our coastal communities," said Jane Lubchenco, Ph.D., under secretary of commerce for oceans and atmosphere and NOAA administrator. "Our vision is that domestic aquaculture will provide an additional source of healthy seafood to complement wild fisheries, while supporting healthy ecosystems and coastal economies."

The new aquaculture policies, which reflect the public comments received after draft policies were released on February 9, focus on:



Shellfish aquaculture currently makes up about two-third of U.S. marine aquaculture. Pictured here is oyster aquaculture.

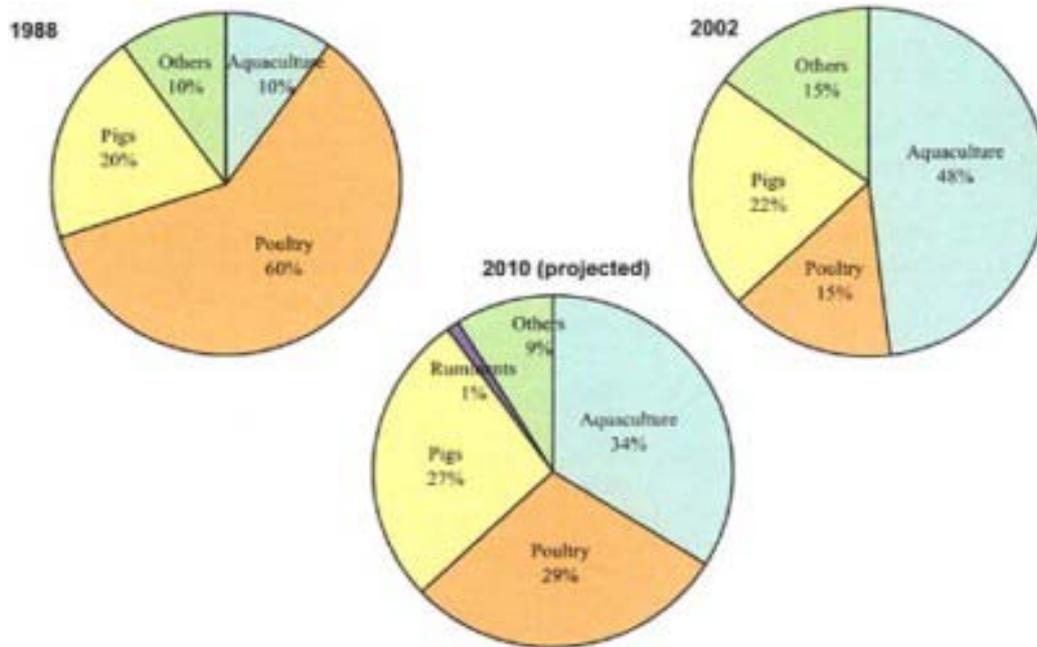
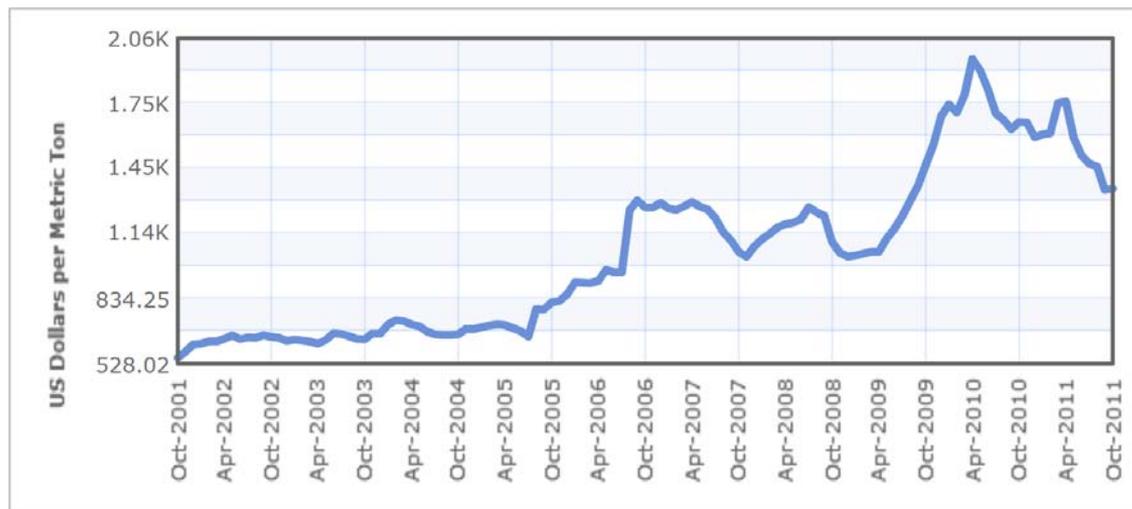
Nutrition / Feeding

Ingredient replacement

- Cost and “sustainability”
- Fish meal / oil
- Vegetable meals / fats
- Protein
- Antioxidants/astaxanthin

Custom feeds

- Species specific diets
- Early rearing diets
- Broodstock diets





Feeding technology

- Improving feed efficiency
 - Decreased loss, optimized regimen, fewer lost feeding days, etc.

Breeding and Species

- Adaptation
- Production
- Early Maturity
- Genomics and breeding
 - Sterility
 - Hard to select traits
- Institutional support



Figure 1. A market-sized Atlantic cod.

Species selection

- Environmental adaptation
- Native species
- Market



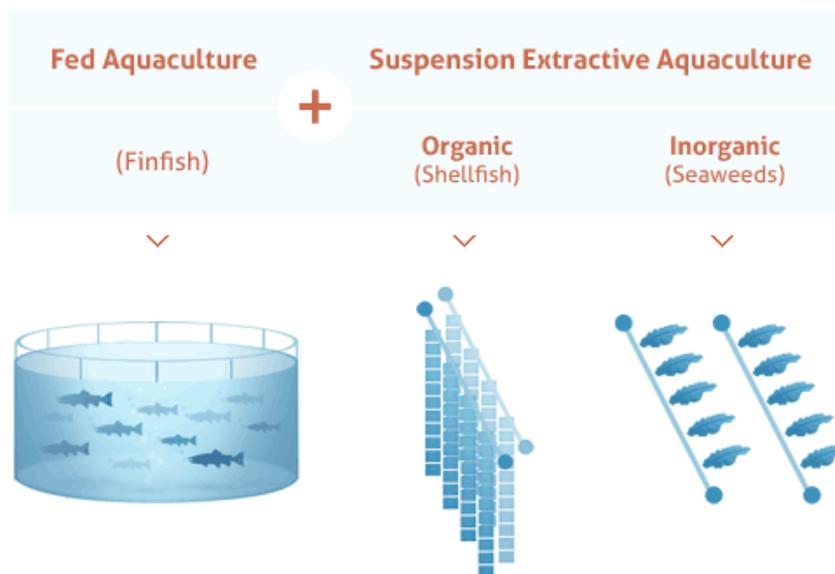
Fish Health

- Vaccines
- Immune boosters
- Breeding
- Nutrition – health linkage
- Treatment technologies



Next generation?

- Integrated Multi-Trophic Aquaculture (IMTA)
- Aquaponics





Discussion

Thank-you



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