Climate Change, Science, and Mariculture Management in the United States and Brazil

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Overview

- Global aquaculture / mariculture management
  - Implications of climate change
- Climate science and mariculture in New England, USA
  - New England Sustainability Consortium
- Climate science and mariculture in Santa Catarina, Brazil
- Questions and discussion
Aquaculture as a Global Concern

Global harvest of aquatic organisms in million tonnes

(FAO 2012)
Mollusk Mariculture

Global bivalve production 2000 - 2010

World Aquaculture Production in 2012

(FAO 2012)
Climate and Mollusk Mariculture Management

- Environmental, social, economic, and health implications
  - Issues of changing ocean temperatures and salinity
- Production issues: Ocean acidification; Spread of shellfish diseases (e.g. MSX and Dermo)
- Impact issues: Pathogenic bacteria; (e.g. Vibrios); Marine biotoxins (e.g. Harmful algal blooms)

- Management challenges
  - Issues with siting and use of marine commons
  - Seed harvesting and mollusk productivity
  - Water quality
  - Sanitary controls and distribution
  - Overarching challenges related to regulatory vs. resource management roles
Investigating climate and mariculture science

Central research question:

- How do social and institutional factors affect..
  1) the development of different types of science related to mariculture
  2) the use of science by managers and industry
  3) perceptions of scientific validity, reliability, and certainty.
    - Compare “production” science to “impact” science

Data gathered from in-depth interviews with scientific community, managers, seafood industry, and growers
Mariculture Development and Management in New England
Mariculture management in the U.S.

- Key factors affecting use of production and impact science
  - Different types of growers and levels of knowledge
  - Asymmetrical investment in production vs. impact science
  - Institutional and policy context
    - Regulatory: Federal (EPA vs. FDA)
    - Marine resource: federal, state and local
Climate and Vibriosis in New England
Climate science and *vibrio* management

- Regulatory regimes different for HABs and *vibrios*
  - Regulatory action – open / closed
- Uncertainty related bacterial growth in ocean and during transport
  - Scientific community hesitant to engage in mgmt.
  - Competing interests promoting mariculture development vs. public health limits
- Economic rationalism dominates
  - Comparison acidification vs. *vibrio*
Mariculture Development and Management in Santa Catarina
Brazil and Santa Catarina (SC)

(www.worldatlas.com)

(DEINFRA-SC 2013)
Mollusk production in SC 1990-2012

Figura 1. Evolução da produção de moluscos comercializados em Santa Catarina entre 1990 e 2012 (t)

(Epagri 2012)
### Tabela 1. Estimativa econômica da comercialização de moluscos na concha, com base nos preços médios praticados diretamente pelo produtor (sem recompra), nos 12 municípios produtores do litoral catarinense, em 2012

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<th>Safra 2011</th>
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<td><strong>Ostras</strong></td>
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<td>Quant. (dz)</td>
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(Epagri 2012)
Mariculture in Santa Catarina
Science, Technology and Mariculture

(Epagri 2012)
Science, Technology, and Mariculture
Science and Mariculture in SC

- Reliance on production science to launch and sustain industry
  - Strong connection to universities and extension
  - Social-economic rationale dominates

- Legal and institutional ambiguity creates uncertainty

- Lack of capacity with public health sector to consider climate-related concerns
Cross National Issues

- Institutional challenges related to the marine commons
- Willingness to apply *production science* with uncertainty
- Hesitance to apply *impact science* with uncertainty
- Key cultural differences within the scientific and management communities
  - Agronomy/mariculture vs. microbiology
  - Marine resource mgmt. vs. public health
    - Efforts to manage vs. regulate
- Heterogeneity among growers
  - Scale of operation, access to capital, technical training
Key Future Social Science Questions

- Role of climate science in vulnerability assessments and resilience
  - Continuing challenges with uncertainty and skepticism
- Values and beliefs of producers and consumers
  - Production vs. public health concerns
- Differences between economic, health, and environmental risks
- Role of science and technology in advancing development and production vs. identifying and mitigating risks
  - Cultural differences within the scientific community
- Institutional capacity – govt., industry, community groups
Acknowledgments

- **Collaborators in U.S.**
  - New England Sustainability Consortium
    - [http://www.newenglandsustainabilityconsortium.org](http://www.newenglandsustainabilityconsortium.org)
  - Dr. Vaughn Cooper and Dr. Steve Jones

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  - Dr. Paulo Vieira – UFSC
  - Dr. Marcus Polette – Univali

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