Challenges and Opportunities of Environmental Issues Faced by Coastal Aquaculture in China

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Fish is an important protein supply in Asia

- Protein supplies by continent and major food group (2003-05)

FAO 2008
China is an important fish producer

- China’s aquaculture produces the largest volume and number of species in world
- World aquaculture in 2006 (excl. aquatic plants)

FAO 2008
China is an important fish trader

- China’s imports and exports of fish and fishery products (US$ billions)

FAO 2008
Fish consumption is high in China

- Fish as food: per capita supply (average 2003-05)
Aquaculture provides more food than capture fisheries in China

- Relative contribution of aquaculture and capture fisheries to food fish consumption

FAO 2008
Mariculture in the Yellow Sea region is important in China

- % Contribution of mariculture volume in the YS to China

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<tr>
<th>Category</th>
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<tr>
<td>Total</td>
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<td>Others</td>
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<td>Seaweeds</td>
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<td>Crustaceans</td>
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<td>Finfish</td>
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% Contribution: 0% 20% 40% 60% 80% 100%

Map of China, Yellow Sea, Bohai Sea, East China Sea, Yellow Sea region, map of China's provinces: Liaoning, Shandong, Jiangsu, Bohai Bay, Yellow Sea, Pacific Ocean.
Some important species cultured in the Yellow Sea region of China

- Longline – kelps (*Laminaria japonica*, *Porphyra yezoensis*, *Undaria pinnatifida*)
- Longline – shellfish (*Crassostrea gigas*, *Chlamys farreri*, *Patiniopecten yessoensis*, *Haliotis discus hannii*)
- Bottom propagation – clams (*Ruditapes philippinarum*, *Bullacta exarata*, *Arca granosa*)
- Pond – sea cucumber (*Stichopus japonicus*) and shrimps (*Litopenaeus vannamei*, *Penaeus japonicus*)
- Cage – finfish (*Lateolabrax japonicus*, *Sebastes schlegeli*, *Hexagrammos otakii*)
- On land – finfish (*Scophthalmus maximus*, *Paralichthys olivaceus*)
Major challenges (1)

- Available coastal area is limited for aquaculture
- Other sector may demand to use the same sites of mariculture
- This requires increasing “production efficiency”
  - Higher volume of marketable food within unit area and time
- For most of the traditional aquaculture, technique already “fully” developed
- This requires **intensified uses of area and time**
- The market also stimulates **more culture for finfish**
- Risk – more environmental problems foreseen

![Mariculture in a Yellow Sea coast](image)

![Unit mariculture production (t/ha) in the Yellow Sea region of China](chart)

- Price (US$/kg)
- Unit mariculture production (t/ha)
- (Chung IK 2007)
Major challenge (2)

- Diseases in aquaculture
  - Population/species is more vulnerable to disease infections after generations of cultivation
  - Many diseases emerging, as aquaculture intensified, seed sources diversified, along with environmental degradation and climate change
  - The last century has witnessed disastrous diseases in shrimp and scallop culture
  - What/will next?

Zhang XL et al. 2006
Opportunity (1)

- Integrated multi-trophic aquaculture (polyculture)
- The wishes:
  - Better usage of the resources (space, nutrients)
  - Less environmental problems (waste internalized)
  - Higher production efficiency (volume & value)
- Other stimuli:
  CO₂ emission quota trade
  New energy demand

Integrated mariculture

Chung IK 2007 after Neori et al. 2004
Opportunity (2)

- Marine ranching and offshore (deepwater) culture
- Successful experience (MR) in Korea
  - Health and quality food
  - Little environmental problems (waste minimized)
  - High production (volume & value) than capture fishery
- Constraint:
  - Heavy load of management
  - Technology
  - Environment requirement
  - Huge investment
Opportunity (3)

• Shifting from the mode production of large quantity of low quality (cheap) to smaller quantity of higher quality (higher value) food

• Drivers:
  – Consumers’ attitude (as a result of living standard shift-up)
  – Producer side: constraint due to increasingly shared resources (materials, inputs, labor) with other sectors
Conclusion

FAO 2008:
• Little doubt that aquaculture growth will slow, albeit with growth spurts for particular species and regions
• The success of the industry is bringing out constraints that were only potential when it started to grow
• However, it is evident that aquaculture will continue to grow in response to demand for fish and seafood generally
Thank you