

Knowledge for Development Seminar, Center for International Development  
Kennedy School of Government, Harvard University, 18 March 2004

# **Trends in Fisheries and Aquaculture**

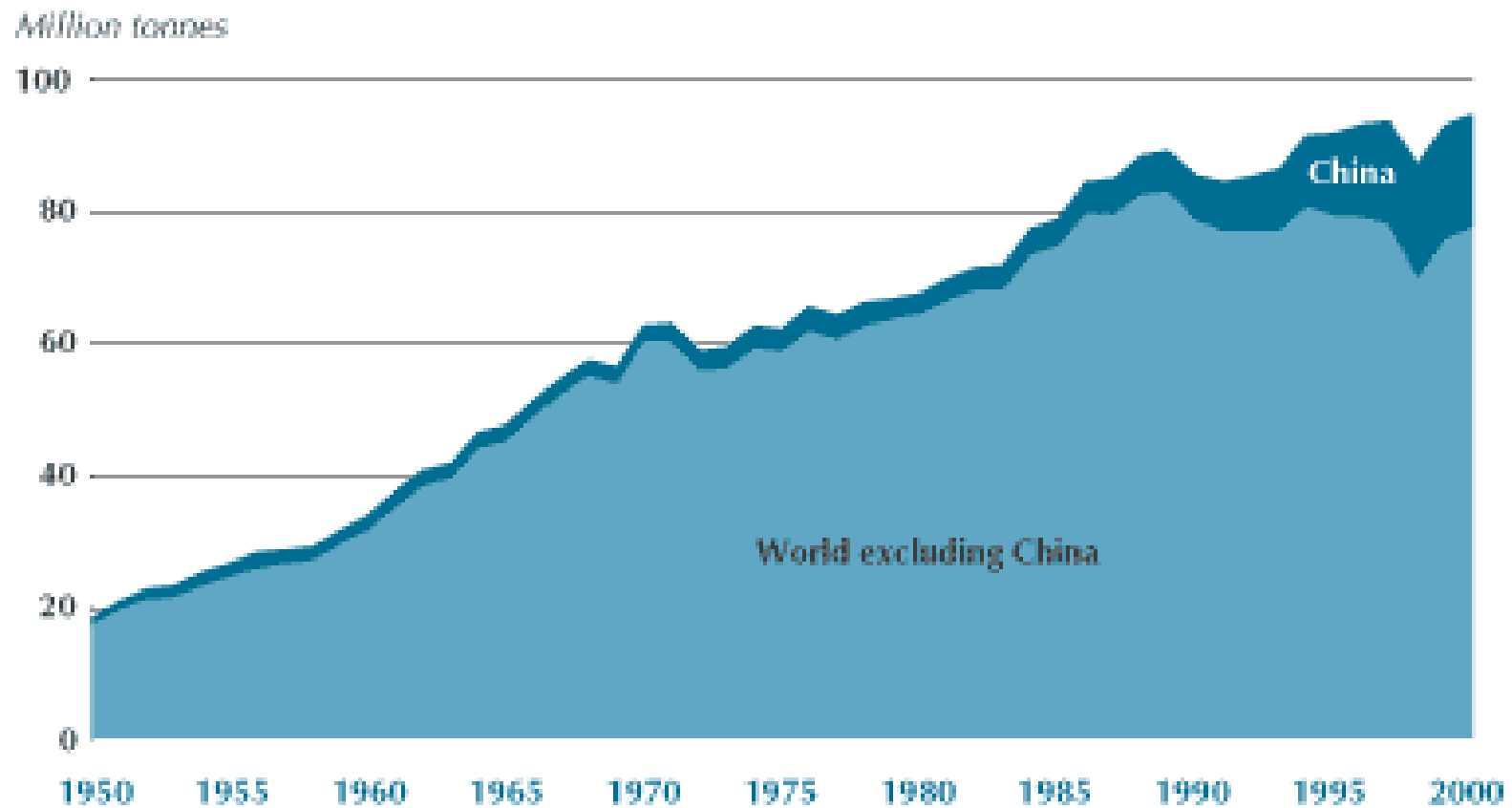
Hauke Kite-Powell  
Marine Policy Center  
Woods Hole Oceanographic Institution

March 2004

# Outline

- Global fisheries status and trends
  - Catch, stocks, and utilization
- US fisheries
  - Economic scale
  - Rights-based vs. effort management
- Emergence of aquaculture
  - Implications for fisheries management
- Summary

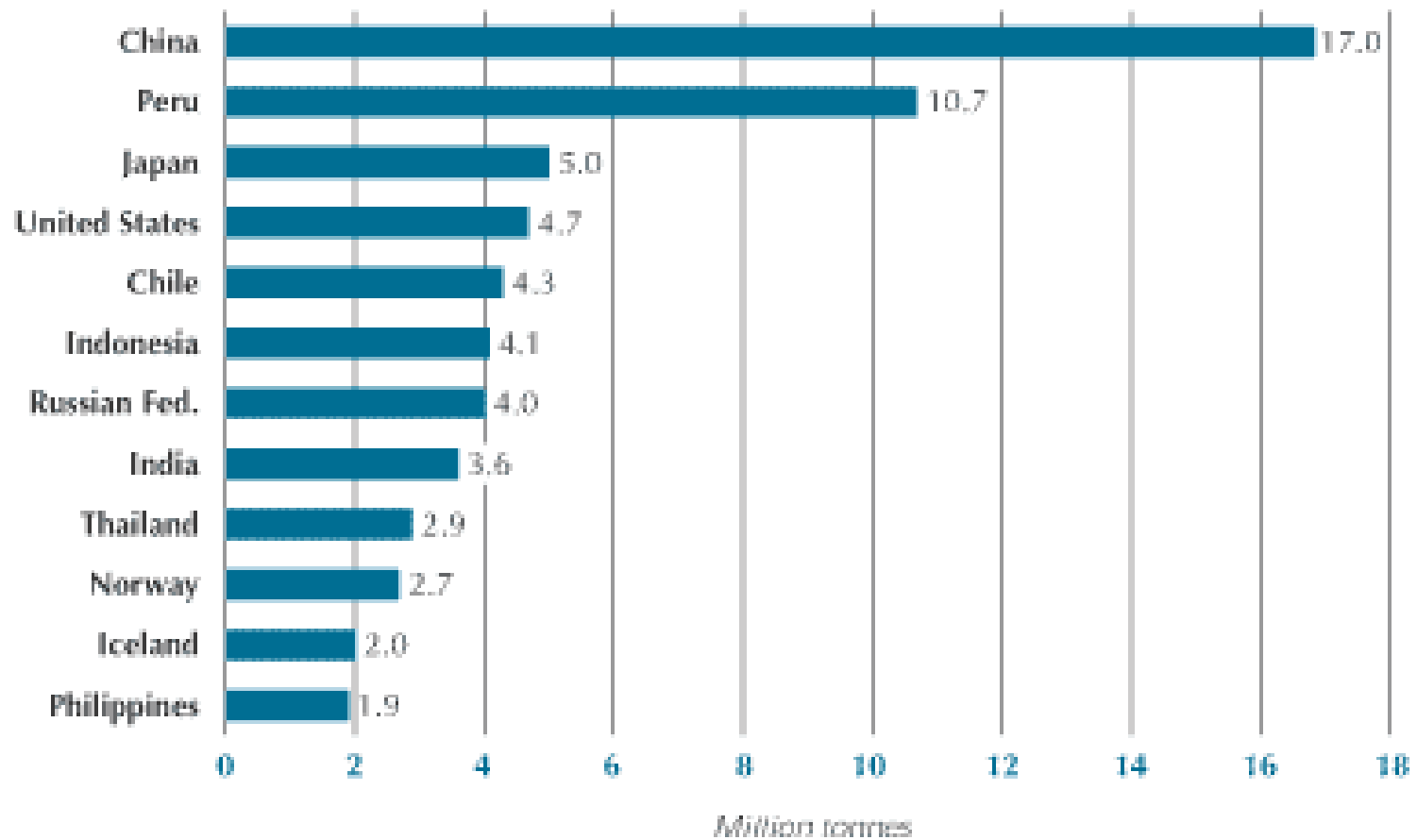
**FIGURE 3**  
**World capture fisheries production**



Source: FAO

**FIGURE 4**

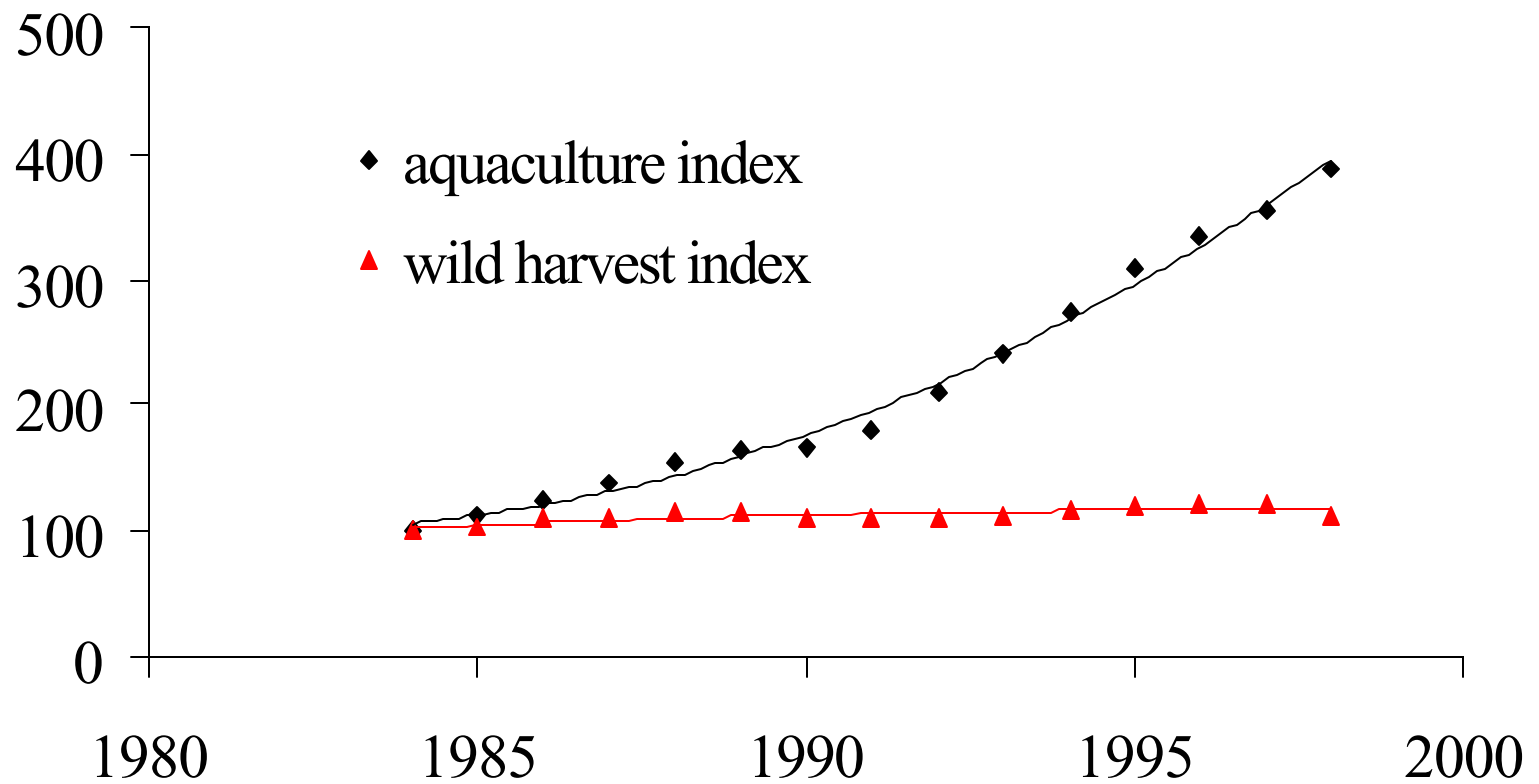
**Marine and inland capture fisheries: top producer countries in 2000**



Source: FAO

## World Production of Seafood: 1984-98

(1984 = 100)



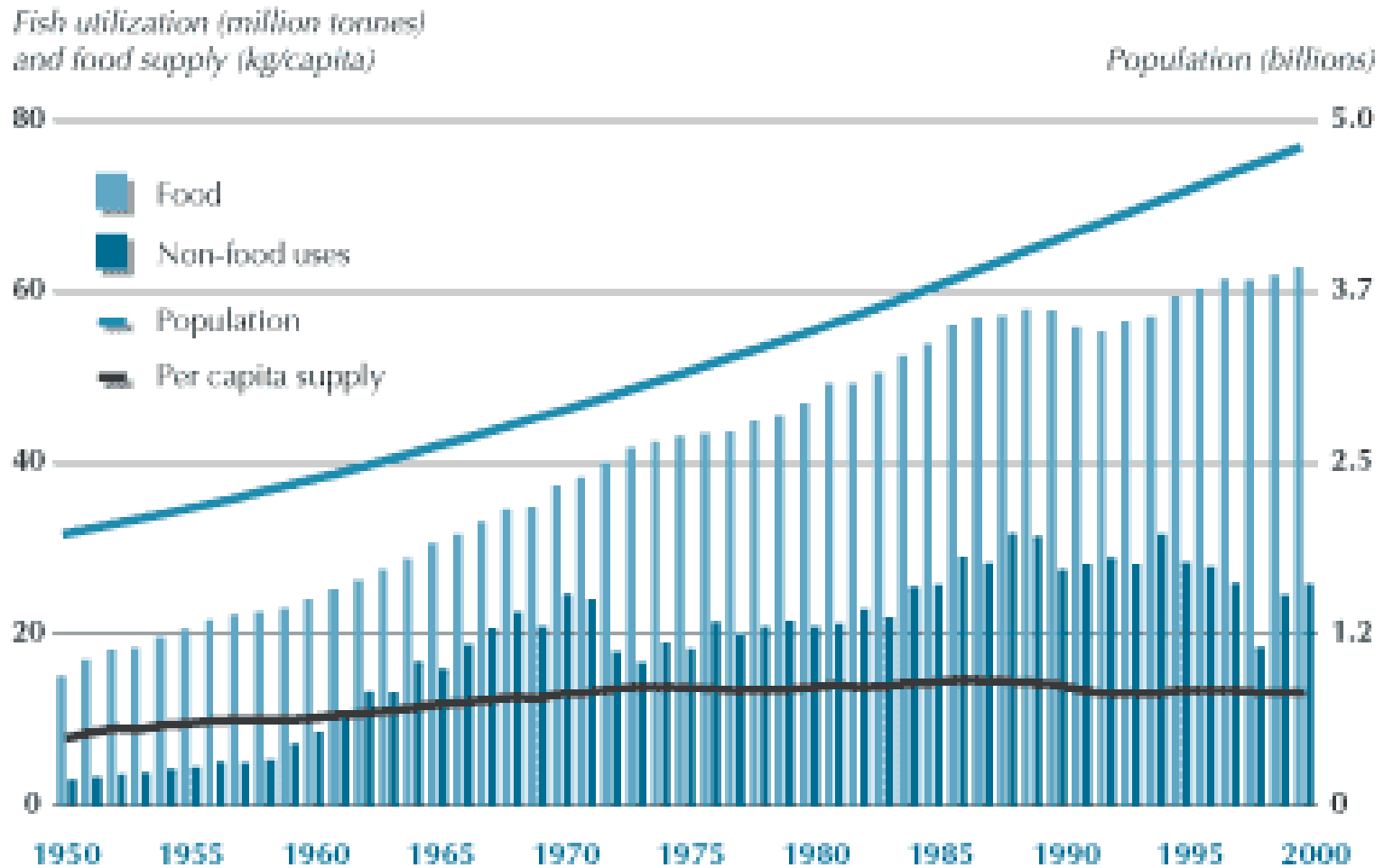
# World Fish Production

- Capture fisheries
  - 6% growth per year 1950s, 60s
  - 2% growth per year 1970s, 80s
  - No growth in 1990s
  - 85 million tons/year marine, 10 mt fresh water
  - \$81 billion; 28 million employed
- Aquaculture
  - Dramatic growth in 1980s, 90s
  - 20 million tons/year fresh, 15 mt marine
  - Approx. \$50 billion; 7 million employed

## Utilization (2000)

- 95 million tons for human consumption
- 35 million tons for fishmeal and oil
- World per capita food fish supply: 13 kg per year and decreasing
- Animal protein contribution in human diet: 15%
- Global trade: \$55 billion

**FIGURE 2**  
**World fish utilization and supply, excluding China**

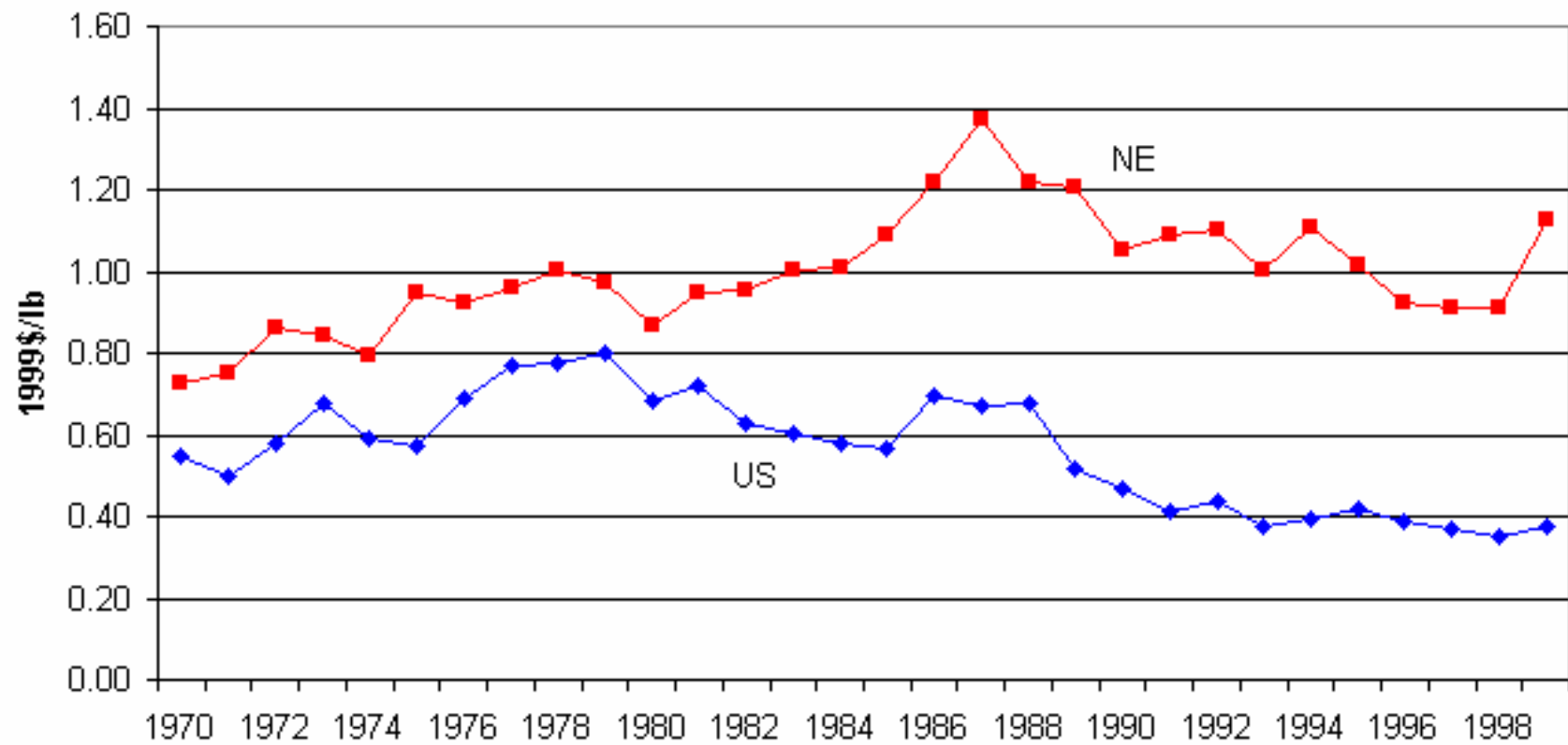


Source: FAO

# US Fisheries: Economic Scale

- Marine capture fisheries: 4.5 million mt, \$3.5 billion/year; imports are about 60% of consumption
  - Consumers don't notice stock declines
- Recreational fisheries: over \$1 billion in expenditures/year in Massachusetts alone
  - Commercial fishing "irrelevant" to national economy
- Aquaculture: less than \$1 billion/year:
  - Catfish, salmon, oysters, ...

**Figure 2: Average Price of Commercial Fish Landings,  
US and New England**



# Rights-based vs. Effort Management

- Efficiency losses
  - US Gulf of Maine groundfish \$150 million/year
  - US Gulf of Maine scallops \$500 million/year
- Incentives
  - Landings data
  - Technological progress and productivity
- Safety
  - Most hazardous US line of work (16 deaths/10,000)
  - Derbys: Alaskan halibut
  - Vessel design and target species
- Success stories
  - Gulf of Maine scallops
  - Alaskan halibut
  - Atlantic surf clam

# Outside the EEZ

- 5 to 10% of global catch
- Transboundary (straddling) stocks
- Highly migratory species
  - Tuna
- Flags of convenience

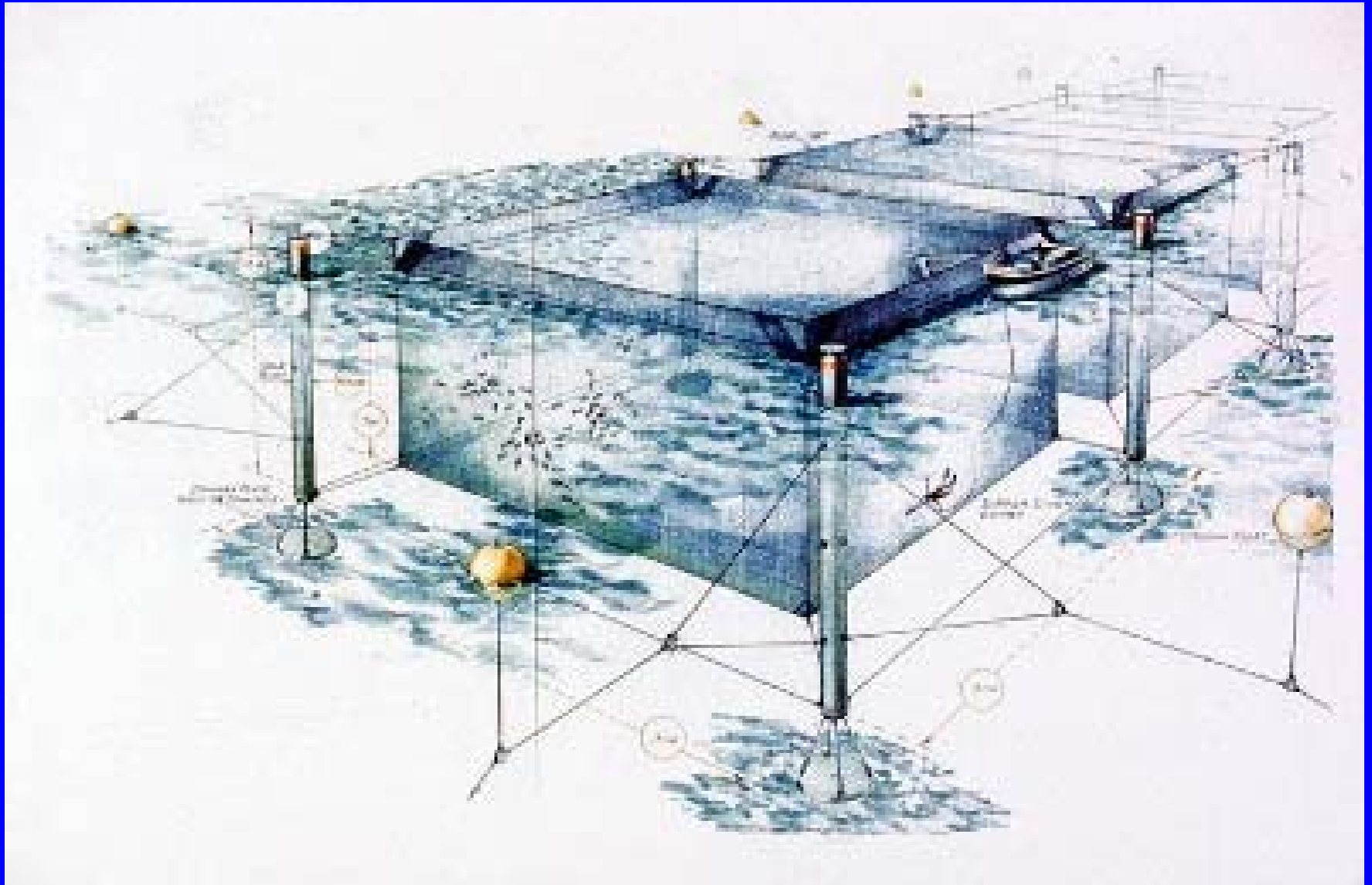
# World Aquaculture Today

- Freshwater: finfish (carp)
- Brackish water: shrimp (tiger prawn)
- Marine: seaweeds and molluscs (oysters); salmon; cod (emerging)
  
- China accounts for more than half of all aquaculture production
  - Questionable numbers?

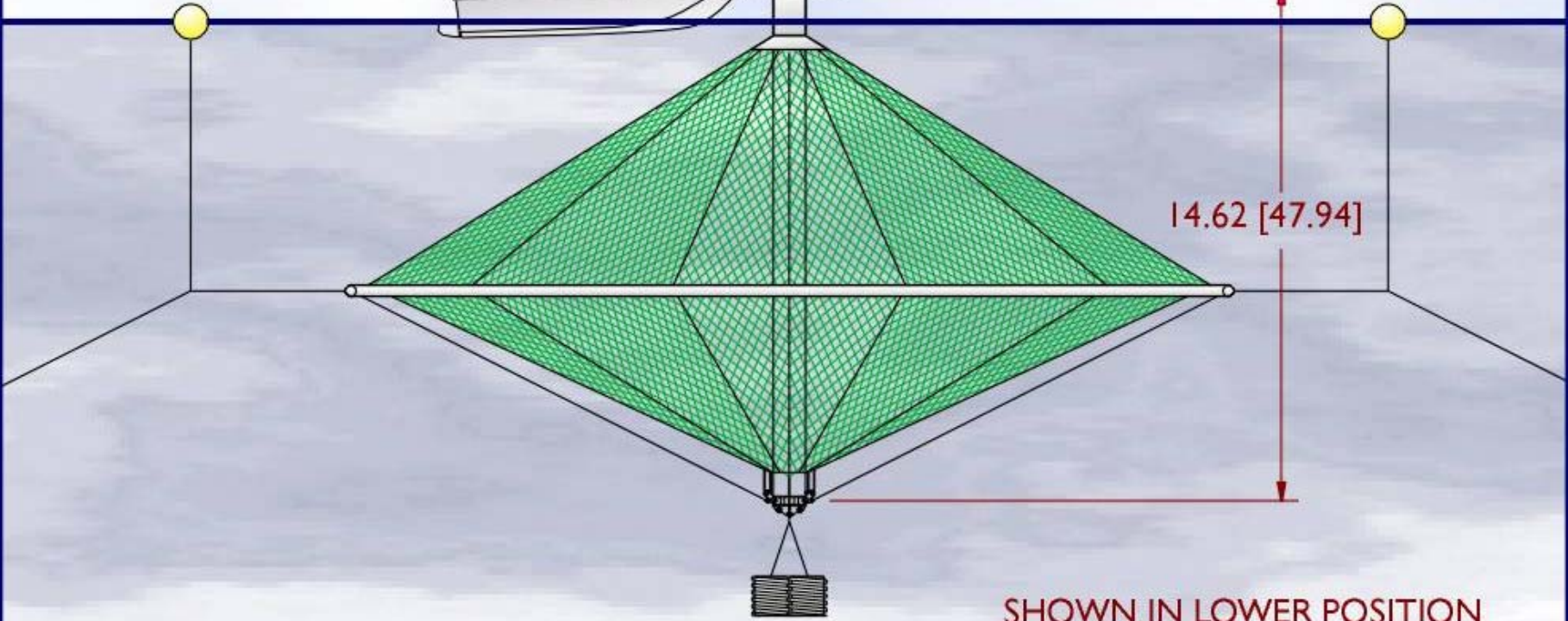
# Aquaculture Techniques

- Extensive ponds (carp, tilapia)
- Semi-intensive ponds (shrimp)
- Cage culture (mariculture; salmon)
- Intensive onshore systems (finfish)
  
- Others: seaweed, shellfish beds, tuna...





8M TENDER



14.62 [47.94]

SHOWN IN LOWER POSITION

PATENT PENDING



# Challenges: US Aquaculture

- Onshore intensive systems or open ocean?
  - Need for an ocean leasing process
- Environmental and ecological issues
  - Nutrient loading (ponds, open water)
  - Genetics
  - Disease management: antibiotics
  - Feed constituents (fisheries!)
  - Reproduction

# New England

- Gulf of Maine: commercial fish landings \$700 million/year; aquaculture \$90 million
- Salmon (ME), quahogs and oysters (MA), lots of oysters (CT)
- Challenges to growth:
  - Labor costs
  - Space (MA coastal tourism expenditures: \$5 billion/year)



# Developing World

- Similar problems, but a very different context
- Seafood protein is more important – few substitutes available
- Severe overfishing
- Limited infrastructure and economic resources







# Summary

- Fisheries management: transition to rights- or tax-based management
  - Management role in stock assessment, modeling
  - Provide incentives for fishers to cooperate
- Aquaculture is the future of seafood production
  - Capture fisheries potential is limited even with proper management
  - Environmental and ecological challenges