Fisheries 101

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for Oceania, North America, Europe, and Latin America and the Caribbean were 24.6 kg, 24.1 kg, 22.0 kg and 9.9 kg, respectively. Although annual per capita consumption of fishery products has grown steadily in developing regions (from 5.2 kg in 1961 to 17.0 kg in 2009) and in low-income food-deficit countries (LIFDCs, from 4.9 kg in 1961 to 10.1 kg in 2009), it is still considerably lower than in more developed regions, although the gap is narrowing. A sizeable share of fish consumed in developed countries consists of imports, and, owing to steady demand and declining domestic fishery production (down 10 percent in the period 2000–2010), their dependence on imports, in particular from developing countries, is projected to grow in coming years.

China has been responsible for most of the increase in world per capita fish consumption, owing to the substantial increase in its fish production, particularly from aquaculture, despite a downward revision of China's production statistics for recent years (Box 1). China's share in world fish production grew from 7 percent in 1961 to 35 percent in 2010. Driven by growing domestic income and an increase in the diversity of fish available, per capita fish consumption in China has also increased dramatically, reaching about 20 kg in 2010.

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**Figure 2**

*World fish utilization and supply*

- **Fish utilization** (million tonnes)
- **Population (billions)**
- **Food supply (kg/capita)**

**Figure 1**

*World capture fisheries and aquaculture production*

- **Million tonnes**
- **Aquaculture production**
- **Capture production**

[http://www.fao.org/docrep/016/i2727e/i2727e00.htm](http://www.fao.org/docrep/016/i2727e/i2727e00.htm)
What do we value?

- Food?
- Money?
- Jobs and communities?
- Recreational opportunities?
- Ecosystem processes?
In 2009, fish = 16.6% world population’s animal protein

Provides 3 billion people with nearly 20% of animal protein
Fishery revenues in BC (2012)

GDP ($2002 million)

- Capture Fishery: 102
- Aquaculture: 62
- Fish Processing: 221
- Sport Fishing: 326

8400 jobs
Balancing a population’s biomass

Reproduction

Fishing mortality

Growth

Natural mortality

Year 1
Population biomass

Year 2
Population biomass
Logistic growth

\[ K = \text{“carrying capacity”} \]

![Graph showing logistic growth with K as carrying capacity, indicating low productivity at both high and low numbers, and high productivity at intermediate numbers.](image)
Maximum Sustainable Yield

Sustainable yield

Exploitation effort

High number in population, $N$

Low number in population, $N$

$K$

N

$MSY$
State of Fisheries (FAO 2012)

- Non-fully exploited
- Fully exploited
- Over exploited

Percent of fisheries
Issues: Decline of Target Species

Western bluefin tuna

Population size (thousands)

0  1970  1980  1990  250
Issues: Decline of Non-target Species

(Baum et al. 2003, Science 299: 389-391)
Issues: Marine extinctions

- Steller’s sea cow (1768)
- Caribbean monk seal (1952/1996)
- Great auk (1844)
- Sea mink (1894)
Issues: Wider ecosystems & processes
Good news

Pacific Northern Right Whale

1st sighting in Canadian waters in 63 years
June 2013
Basking Shark – off Haida Gwaii
Species at risk legislation to the rescue?

• COSEWIC (Committee on Status of Endangered Wildlife in Canada) determines status based only on science, reports to Minister of Env’t for possible listing under SARA (Species at Risk Act)
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• Minister communicates COSEWIC recommendations to cabinet

• Government has 9 months to reach a decision:
  - List
  - Do not list
  - Refer back to COSEWIC
Fisheries Minister rarely agrees to list threatened marine fishes for protection under SARA.
Fisheries management is people management

1. Decide what we value - e.g. commercial or recreational fisheries? Healthy ecosystems?

2. Set specific objectives - e.g. fishing while maintaining 60% biomass, protecting 33% reefs

3. Set measurable milestones to determine progress - e.g. regular surveys of fish and reefs

4. Have adaptive measures ready to fine-tune - e.g. close the fishery if needed

    Consult with stakeholders
    Communicate results

Formalizing the objectives is half the battle
Exploitation effort

Conservation vs sustainable use

Sustainable yield

MSY

no exploitation
efficient exploitation
MSY
open access break even
maximum exploitation

Conservation vs sustainable use

Preservation  Sustainable exploitation  Hit-and-run

Costs

Benefits