Socioeconomic Benefits of LME valuation in context of Climate Change

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Key messages/outline of talk

• LMEs provide crucial ecosystems services, e.g., fisheries, that are important to people;
• Even without climate change, LME fisheries, in general, are in trouble;
• Climate change will affect the biophysics of the ocean;
• It would therefore impact the socioeconomics and governance of LMEs.
LME Fish as base for many activities

- Capture fisheries
- Aquaculture
- Seafood processing
- Management cost
- Recreational fisheries & tourism
- Marine manufacturing & services, boat building
- Fishing ports and jetties
- Marine research
Importance of LME fish to food security

- Annual ocean fish catch is ~80 million t;
- Fish is a good source of protein, micro-nutrients, minerals and essential fatty acids;
- Provides 3 billion people up to 15% of dietary animal protein;
- For low-income food-deficit countries, the contribution of fish to total animal intake is nearly 20%.

FAO, State of World Fisheries and Aquaculture (2009)
Fisheries values from LMEs worldwide

Total annual catch = 80 million t

Gross revenues from marine capture fisheries worldwide are estimated at between US$ 80 and 85 billion annually (FAO, 2009);

Total impact throughout the global economy is between US$ 220 and 235 billion in 2003 (Dyck & Sumaila, 2010).
Contribution of LMEs to employment

260 million people worldwide involved in marine fisheries, including direct and indirect sector

Top 10 countries providing marine employment

Teh and Sumaila (2011): Fish and Fisheries
Global LME catch and effort

FAO Fisheries Statistics

*Effective effort indexed on 2000 based on average 2.42% increase annually
Global LME catch and effort

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Watson et al. (2012)
Human impacts on marine ecosystems
Climate change biophysical impacts

Physical change in the ocean

- ↑ SST;
- Retreat of sea ice;
- ↑ acidification;
- ↑ coastal hypoxic & oxygen min. zone;
- ↑ sea surface level.

Biological / ecological change in the ocean

INDIVIDUAL
- Physiology;
- Growth;
- Body size.

POPULATION
- Distribution;
- Abundance;
- Recruitment.

COMMUNITY
- Species composition;
- Invasion/extinction.

ECOSYSTEM
- Productivity;
- Species interaction.

Cheung et al. (2010); Hoegh-Guldberg and Bruno (2010); Brander (2010)
Climate change implications

It will result in changes in the following:

- Catches and food security;
- The economics of fishing
  - Catch (landed) values;
  - Cost of fishing;
  - Profits to fishing companies;
  - LME-based fisheries job.
- The governance and management of human-coastal environments.

Global climate change projections

Predicted future species distribution

Species composition in each LME

Catch potential & landings (t)

Gear type composition

Ex-vessel price of each species ($/tonne)

Total variable fishing cost ($)

Landed Values ($)

Economic rents in each EEZ

Unit variable cost ($/tonne)
Latitudinal average changes in potential catch

Global LMEs
Distribution of fish protein under climate change

Dyck & Sumaila (in prep.)
Management implication of climate change and ocean acidification

Latitude

Invasion

Climate-shifted distribution

Change in mortality/growth/body size/life history traits

Country A

Country B

Depth

Local extinction

Original distribution

Warming

Acidification

Hypoxia

Habitat changes
Distribution of fish protein under climate change

Dyck & Sumaila (in prep.)
Example: Change in landed values in Mexican EEZ

**SEVERE** climate change scenario

**MILD** climate change scenario

Sumaila, Lam & Cheung (2015)
Implications for resource sharing/allocations

Why is Britain braced for a mackerel war?

By Andrew McFarlane
BBC News Magazine

24 August 2010 Last updated at 11:56 GMT

Mackerel stocks had recovered well during the past decade.

Britain is said to be bracing itself for a re-run of Iceland - except this time the fish being fought for, until recently, few were interested in a fish unclean.

EU warns Iceland, Faroes over 'mackerel war'

(EU) - Ireland and the Faroe Islands are
ýoverfishing mackerelý, thereby depriving a level of income
ýfor the survival of the fish, the European Union's executive arm said Wednesday.

Iceland's fishing policies, notably its refusal to share its cod fishing waters, has been identified as a thorny issue to resolve with the EU in the North Atlantic's bid to join the 27-nation club.

Clive Drewett, the European Commission's spokesman for maritime affairs, said the dispute over mackerel would be discussed with Iceland and the Faroe Islands at a technical meeting in September.

"They are overfishing more than which is justifiable on the basis of scientific evidence," Drewett said at a news briefing.
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• Thanks very much for your attention!