Projecting fish production in Bangladesh under climate and environmental change

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Overarching aim: the knowledge and tools to evaluate the effects of policy decisions on people's livelihoods

Consortium:
UK (7), Bangladesh (11), India (4)
Lead partner: University of Southampton; Fisheries and marine leader: PML
Strongly based on modelling and collaboration

- GCM/ RCM
  - Temp, rainfall
  - Catchment Models: GWAVA / INCA MODFLOW HydroTrend
    - Water, sediment, nutrients
    - Delta Model FVCOM, Delft3D
    - Morphology & Land Cover
      - Water flow, level, salinity, temp, sediment, nutrients
    - Crop Model: CROPWAT
    - Aquaculture Model
    - Mangrove Model
    - Coastal Fisheries Model
      - Size- & Species-based models
    - Inland Fisheries Model
      - Primary productivity, T, S, O, currents

- Surge level
- Sea level, SLP, SST, winds

Governance research
- Laws, policies
- Gaps, Conflicts, Implementation efficiencies
- Key issues, Scenarios

Knowledge integration / Scenarios
- Qualitative survey relationship b/t environment & social behaviour
- Quantitative survey (consumption, assets, employment, migration, health, poverty, ...)
- Spatial associative model b/t land use and poverty
- Population projections

Quantitative Physical/Ecological Models

Demographics, economics & poverty
Modelling fish biomass and distribution

Species-based model + size-spectrum model = species interactions

Latitudinal shifts 20% slower when considering species interactions
(Fernandes et al., 2013)


Fisheries in WP5: a modelling effort

GCOMS (Bay of Bengal) Modelling
Susan Kay

Inland fisheries linked statistically to marine

Fisheries Modelling

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Scenarios
Consistent scenarios definition

<table>
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<th>Year</th>
<th>BOBLME, 2010</th>
<th>Haldar &amp; Amin 2005</th>
<th>Amin et al., 2008</th>
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- **More Sustainable scenario (MSus):** MSY level fishing (0.6 for Hilsa Shad), fisheries management is effectively enforced, no undersize fisheries, more profitable fisheries with more commercial fisheries and new recreational fisheries business, international fisheries agreements and no piracy.

- **Business As Usual scenario (BaU):** 3 times MSY fishing, management is partially enforced aiming to protect species spawning areas and period, fishing effort is not limited, some migration to cities, high interest loans and piracy reduces.

- **Less Sustainable scenario (LSus):** 4 times MSY level, no fishing management effectively enforced, piracy increase, no loans available, migration to large cities and stock collapses of high value species.
What we know about fisheries in Bangladesh?

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<td>114 681</td>
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<td>FAO total Hilsa</td>
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<td>099 487</td>
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- Subsistence sector 46% of the catches.
- Artisanal fisheries 44% of the catches.
- Industrial fisheries 10% of the catches.
- Hilsa Shad 18% and Bombay Duck 9% of the catches.
Productivity vs fishing pressure (marine vs inland)

- Marine catches from models
- Wild inland catches from: models + scenarios cultured + scenarios river usage
- Inland cultured from land usage + scenarios cultured
Projections for Bangladesh exclusive economic zone

Surface temperature

Salinity (average for water column)

Depth of mixed layer

Net primary production
Total productivity of the system

a) Productivity Bangladesh EEZ
- Less sustainable + Q8
- Business As Usual + Q0
- More sustainable + Q16

b) Productivity Bay Of Bengal
Hilsa Shad and Bombay Duck projections (ES approach)
Interviewing stakeholders (Cox’s Bazar 2014)

13-15 June 2014 (Prof. Munsur on 04-05-14. Jose 17-06-14 BAU, BFDC, DoF SUFO), BFRI, MM Enterprise Bharchara

Or the other way around? Fish Packing, Dry Fish, Fish Landing

Interview with SA TV & Newspaper on 15-06-14 Just before the flight
Conclusions

• All models projects decreases on potential catches comparing present and future within the same scenario. However, higher catches on average in the more sustainable future scenario in comparison with a present less sustainable.

• Therefore, environmental and climate change would impact negatively in Bangladesh fisheries. But, good management can mitigate those catches losses.
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