PML | Plymouth Marine Laboratory

Projecting fish production in Bangladesh under climate and environmental change

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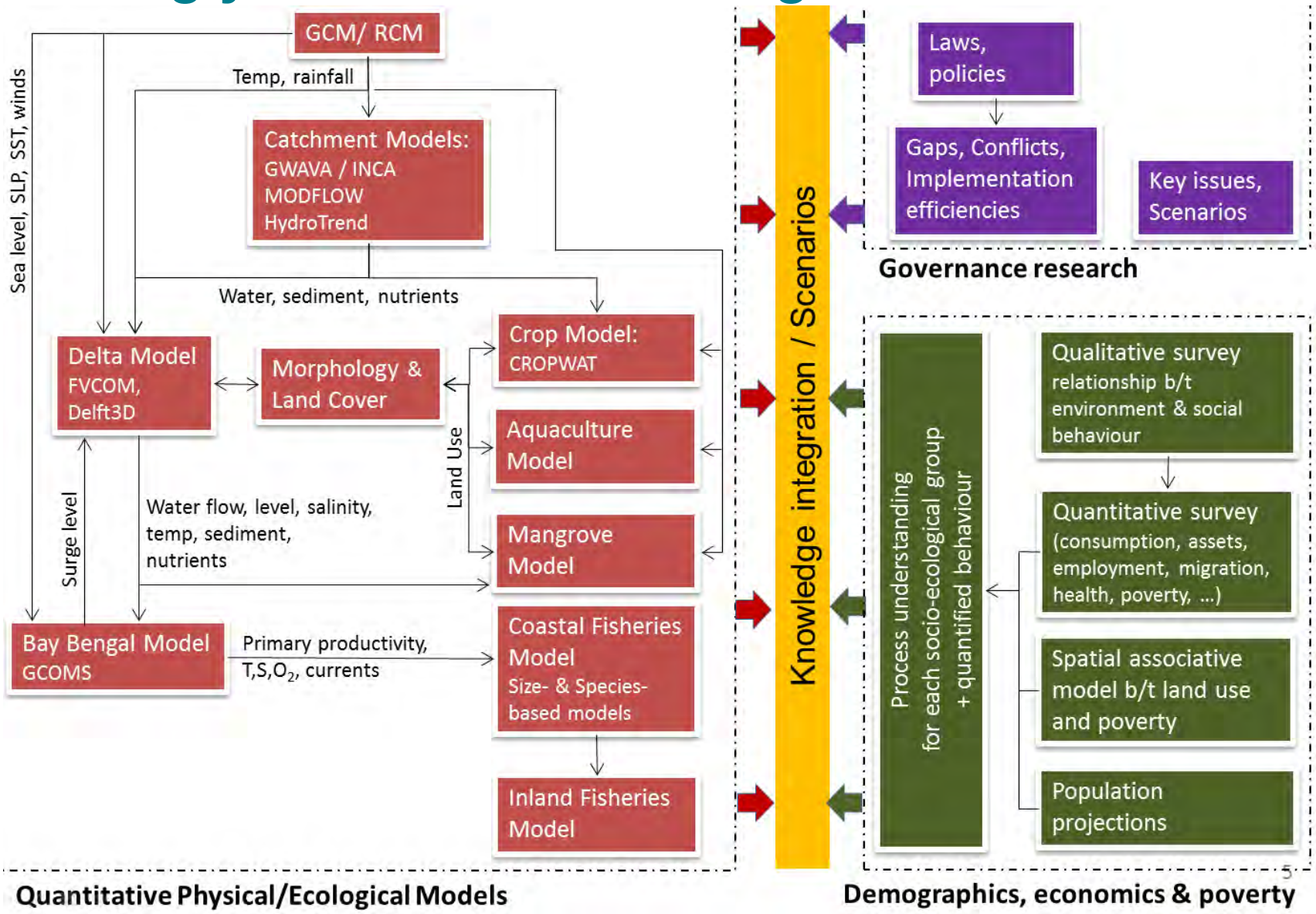
espa ecosystem services for poverty alleviation

ESPA Deltas project:

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

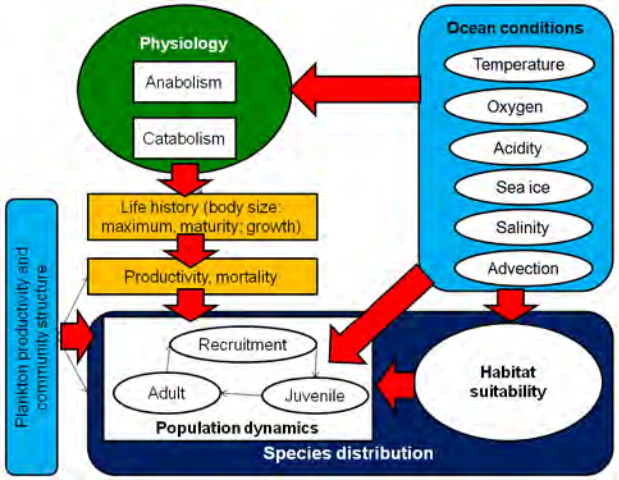
Consortium:
UK (7), Bangladesh (11), India (4)
Lead partner: University of Southampton; Fisheries and marine leader: PML

Strongly based on modelling and collaboration

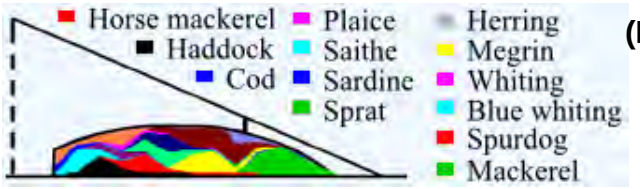


Modelling fish biomass and distribution

Species-based model

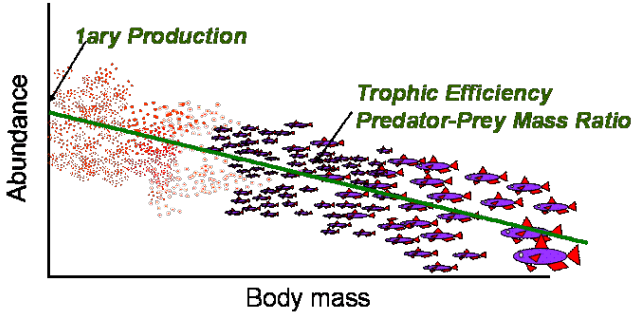


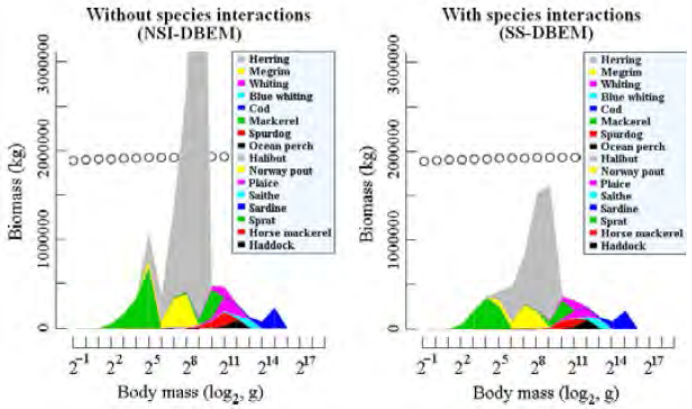
Latitudinal shifts 20% slower when considering species interactions



(Fernandes et al., 2013)

Size-spectrum model





Species-based + size-spectrum model = species interactions

Fernandes JA, Cheung WWL, Jennings S, Barange M, *et al.* (2013). Modelling the effects of climate change on the distribution and production of marine fishes: accounting for trophic interactions in a dynamic bioclimate envelope model. *Global change biology*, 19(8): 2596-2607.

Queirós A., **Fernandes JA**, …, Cheung WWL, Barange M, Widdicombe S. (2014). Scaling up experimental ocean acidification and warming research: from individuals to the ecosystem. *Global change biology*, DOI: 10.1111/gcb.12675.

Fisheries in WP5: a modelling effort

Inland fisheries linked statistically to marine

Fisheries Modelling

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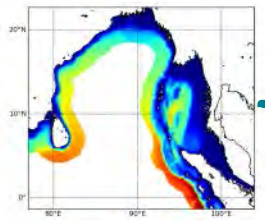
Scenarios



GCOMS (Bay of Bengal) Modelling

Susan Kay

Consistent scenarios definition

	BOBLME, 2010							Haldar & Amin 2005	Amin et al., 2008	Ahmed et al., 2006	Rahman et al., 2012		
Year	92	95	96	97	98	99	00	02	03	06	02	03	09
FM	1.25	1.43	1.78	2.01	2.18	2.49	1.62	2.16	1.92	1.39	2.15	1.94	1.87

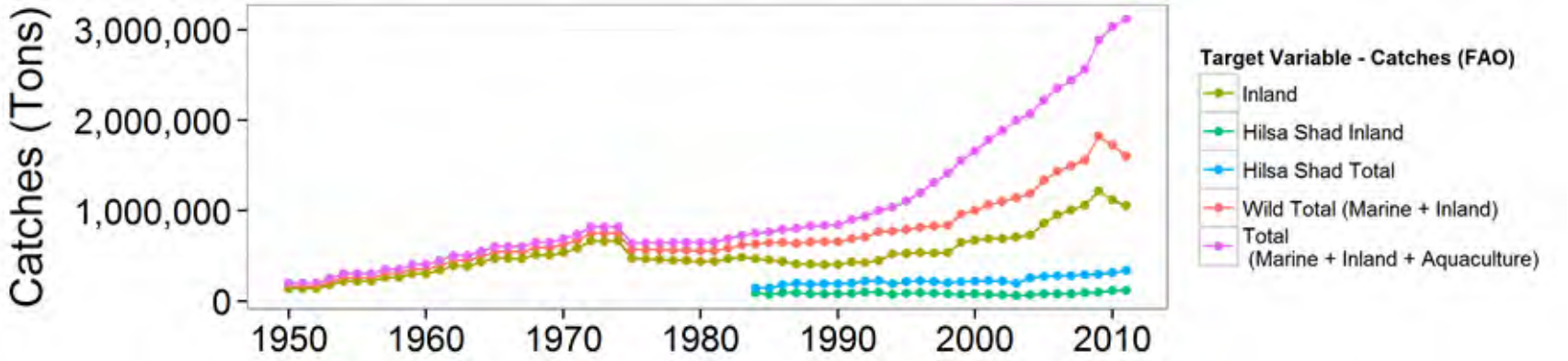
- **More Sustainable scenario (MSus):** MSY level fishing (0.6 for Hilsa Shad), fisheries management is effectively enforced, no undersize fisheries, more profitable fisheries with more commercial fisheries and new recreational fisheries business, international fisheries agreements and no piracy.
- **Business 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.

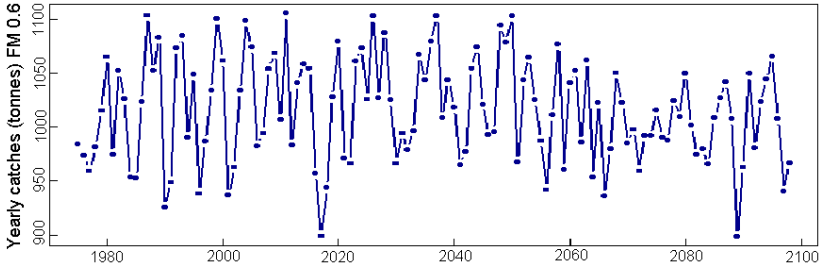
What we know about fisheries in Bangladesh?

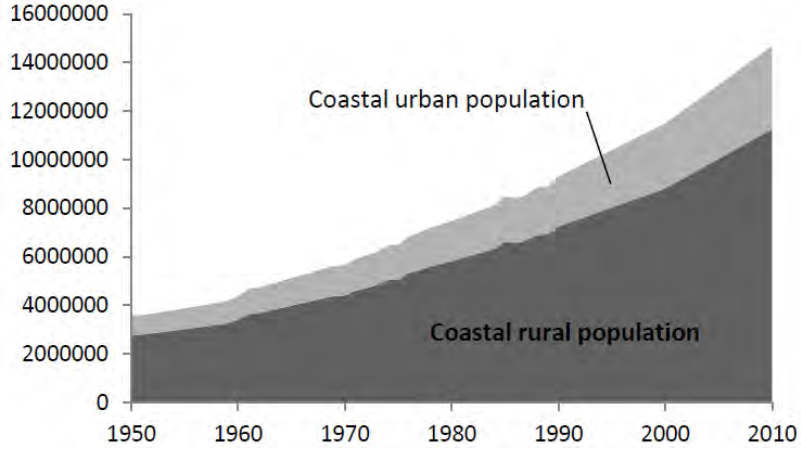
Data source	1971	1981	1991	2001	2011
DoF marine	---	---	---	415 420	546 333
DoF inland open water	---	---	---	688 435	1 054 585
DoF inland close water	---	---	---	786 604	1 460 769
DoF total	---	---	---	1 890 459	3 061 687
FAO marine	87 920	118 200	258 884	379 497	607 492
FAO total	162 325	554 476	689 727	1 068 417	1 726 586
FAO marine Hilsa	---	---	114 681	154 654	198 574
FAO total Hilsa	---	---	099 487	229 714	313753

- 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)



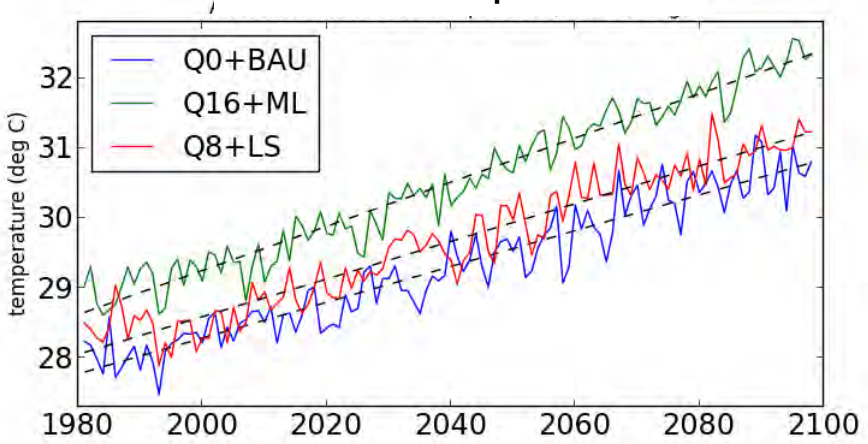




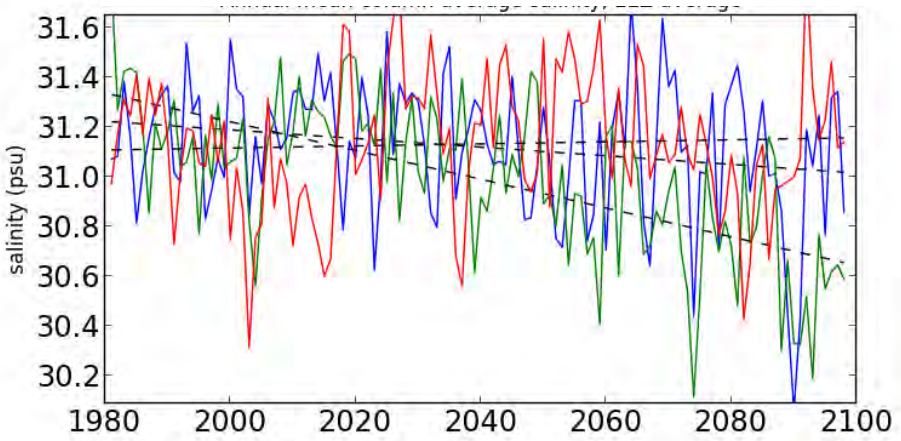
- Marine catches from models
- Wild inland catches from:
  - models
  - + scenarios cultured
  - + scenarios river usage
- Inland cultured from land usage + scenarios cultured

Projections for Bangladesh exclusive economic zone

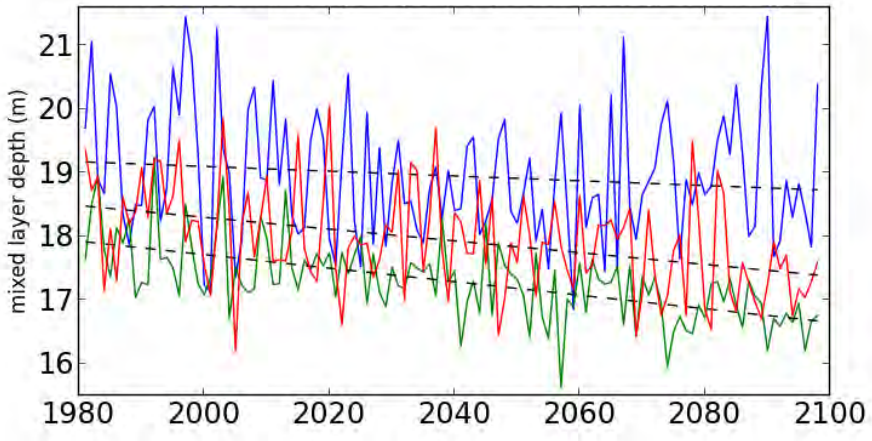
Surface temperature



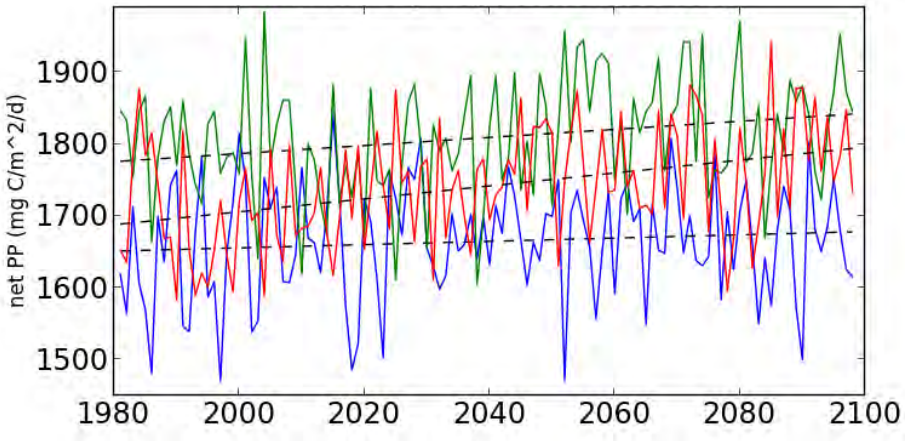
Salinity (average for water column)



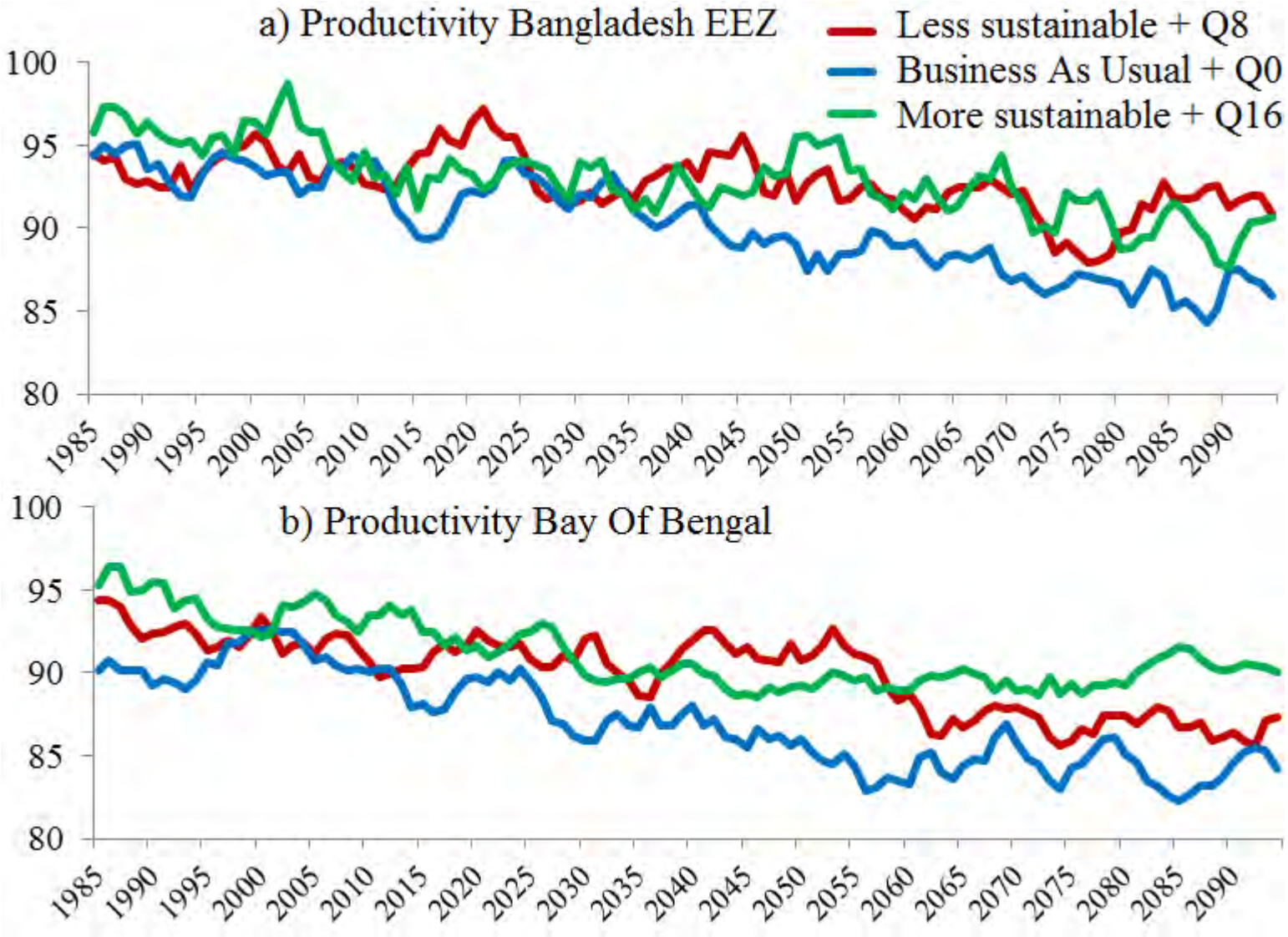
Depth of mixed layer



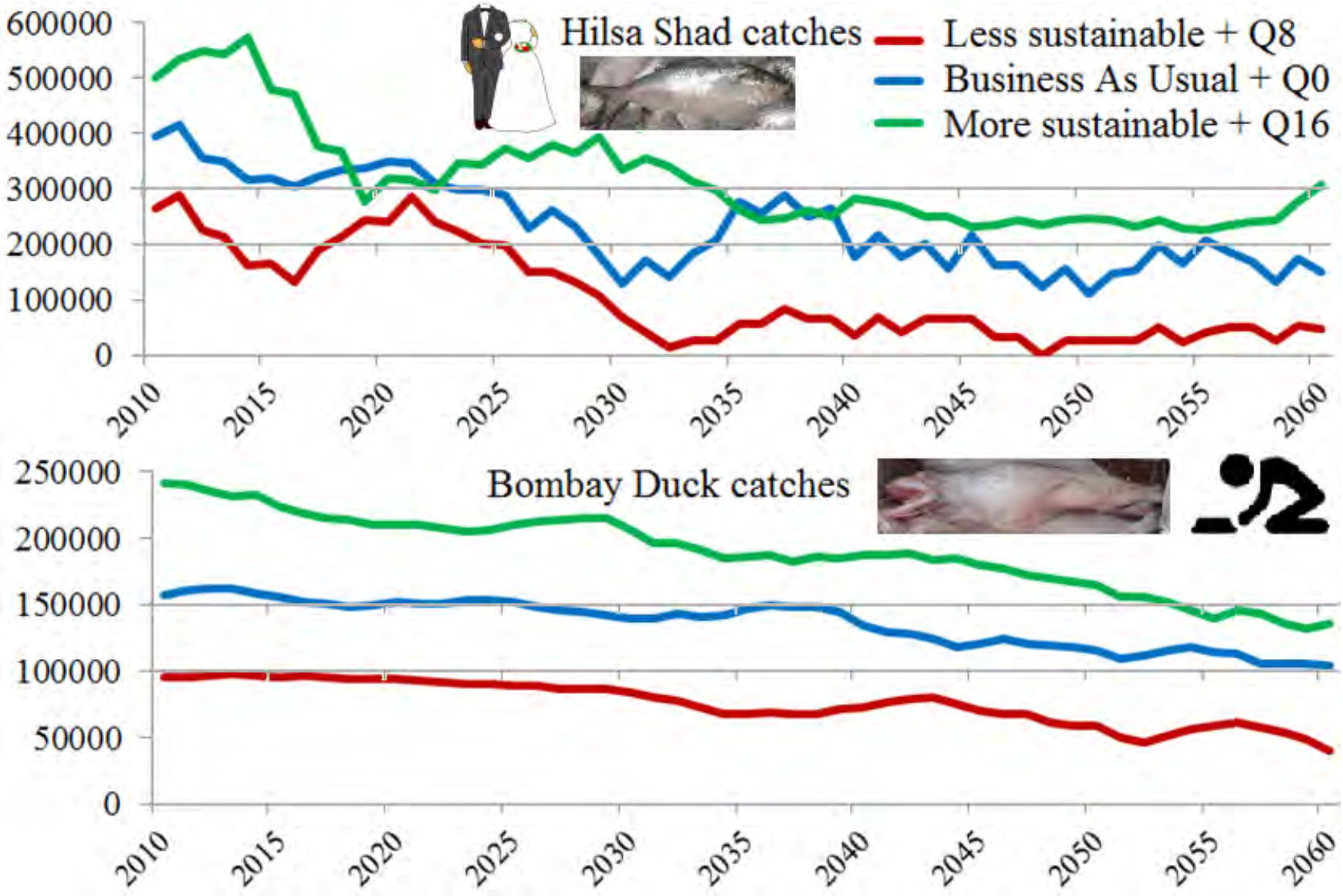
Net primary production



Total productivity of the system



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?

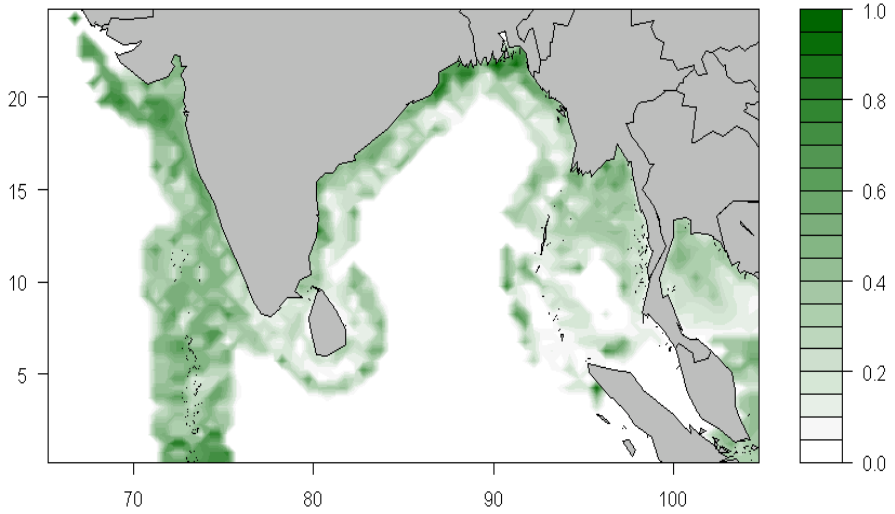
Fish Packing, Dry Fish, Fish Landing

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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