Socio-economic modelling of coral reef health

by
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On behalf of
The Modelling & Decision Support Working Group
Coral Reef Targeted Research Project (World Bank / GEF)

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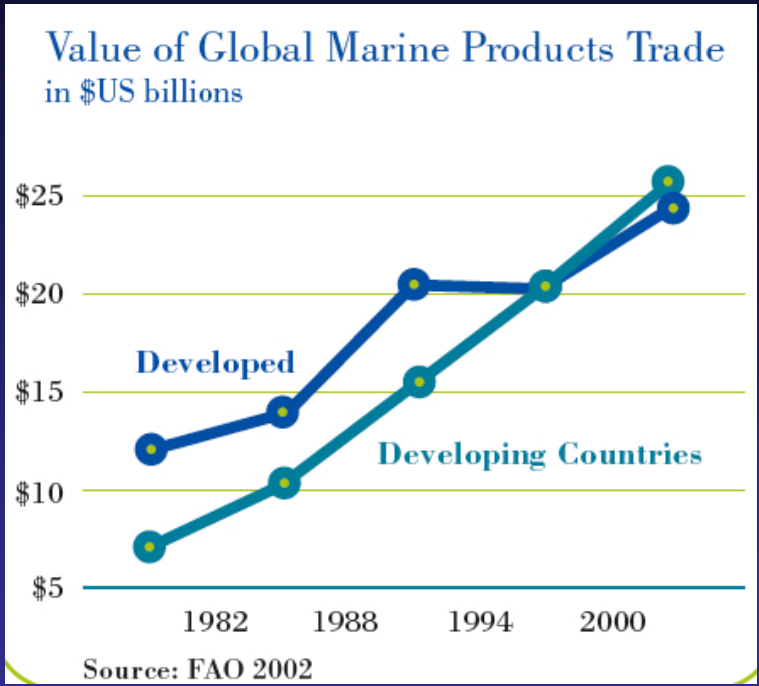
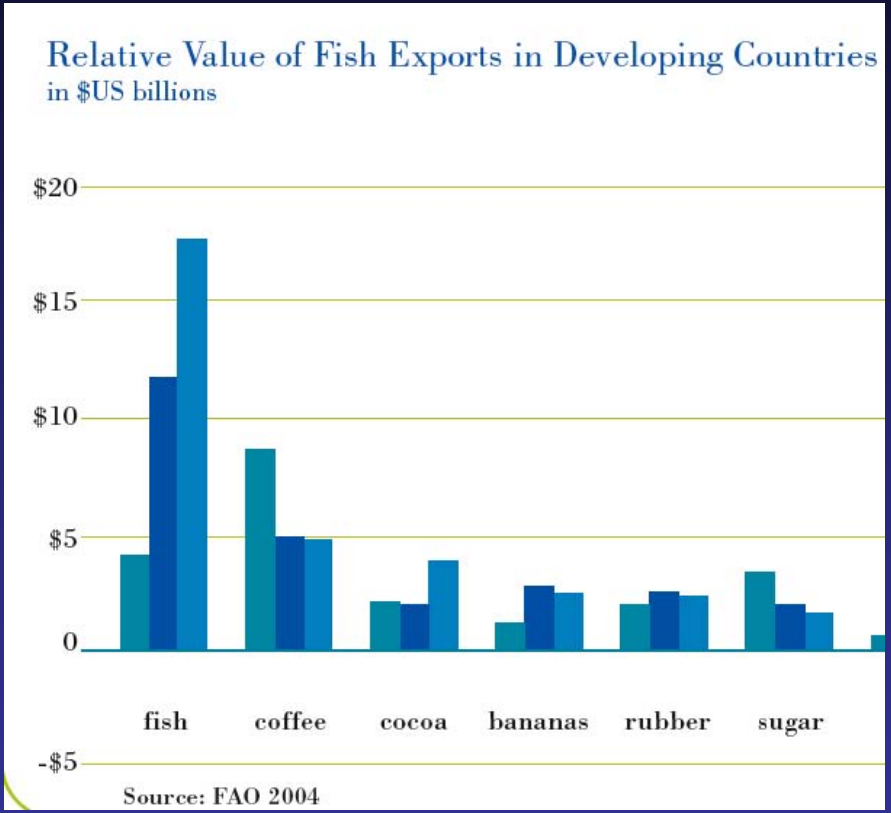
Coral Reef Targeted Research & Capacity Building for Management

Current threats on coral reefs

(credits: courtesy of R. Seymour)

A major social & economic issue





These figures include high seas fisheries, but coral reefs' contribution is significant (coastal fisheries, nurseries, fish tank trade).

(credits: courtesy of R. Seymour)

The Coral Reef Targeted Research Program
(Coordination: UQ, Australia ; Funding: WB/GEF)

The global Coral Reef Targeted Research (CRTR) program aims to shed light on key unknowns through coordinated research and to put this knowledge into the hands of decision-makers where it can make a difference. It describes the various themes and entities that have come together thus far to form this critical undertaking, and seeks support from new partners who share our global vision.

The CRTR Program has been established to address fundamental information gaps in our understanding of coral reef ecosystems, so that management options and policy interventions can be strengthened globally. For the first time in history, this Program will join the collective effort of many of the World's leading coral reef scientists to coordinate research and address key outstanding questions about the health of coral reefs

Bleaching

Connectivity

Disease

Modeling

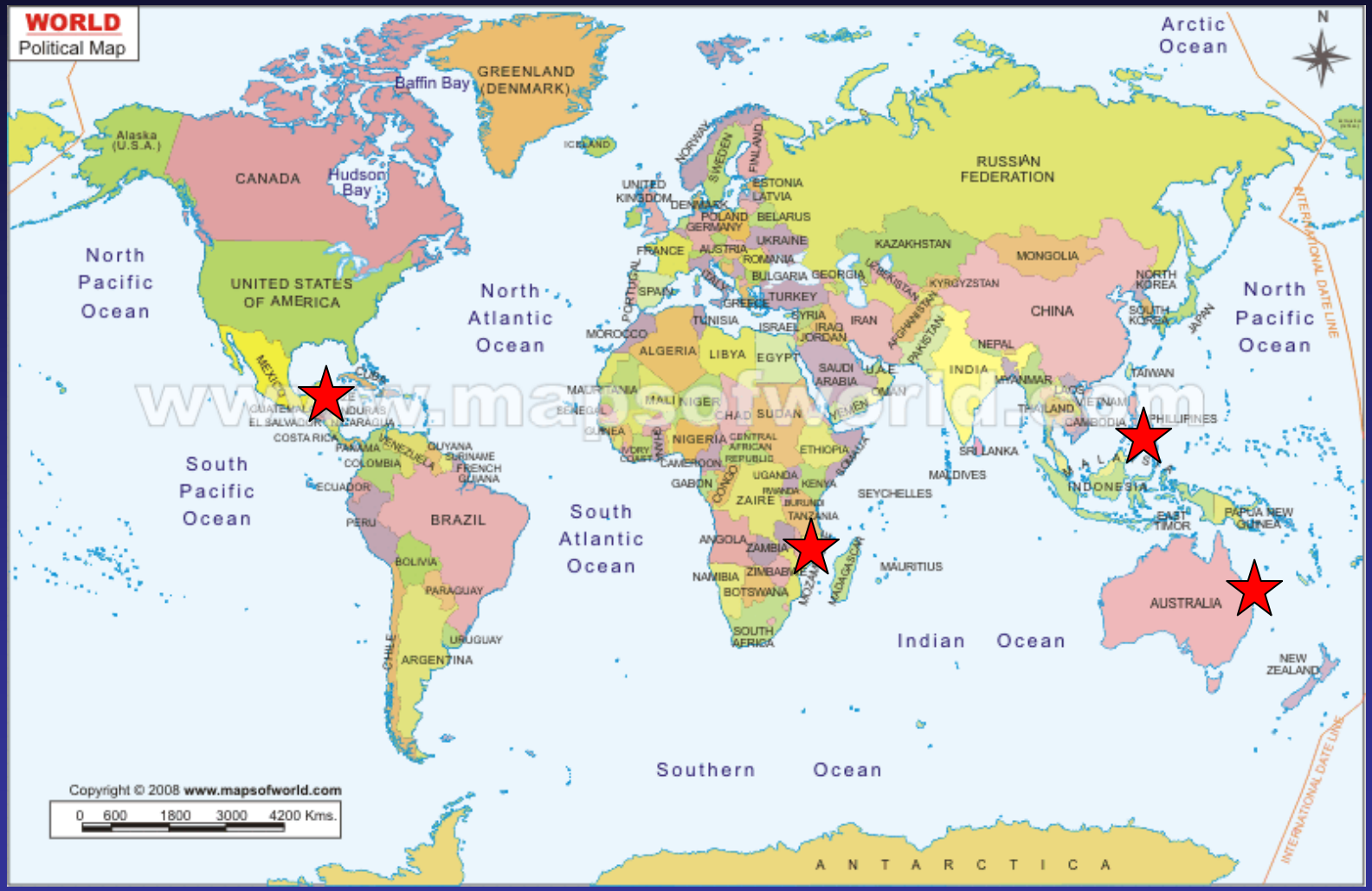
Remote Sensing

Restoration

Source: http://www.gefcoral.org

The Coral Reef Targeted Research Program

Centers of Excellence: Calibration, Integration & Implementation



The Modeling & Decision Support Working Group (MDS-WG)

The purpose of the MDS group is to create an integrated scientific understanding of the way in which people interact with coral reefs. We want to be able to help decision makers and reef users better understand and use reefs in a sustainable way. We want to do this by allowing them to see the dynamics of whole system that is, both the biophysical and socio-economic parts.

Bleaching

Connectivity

Disease

Modeling

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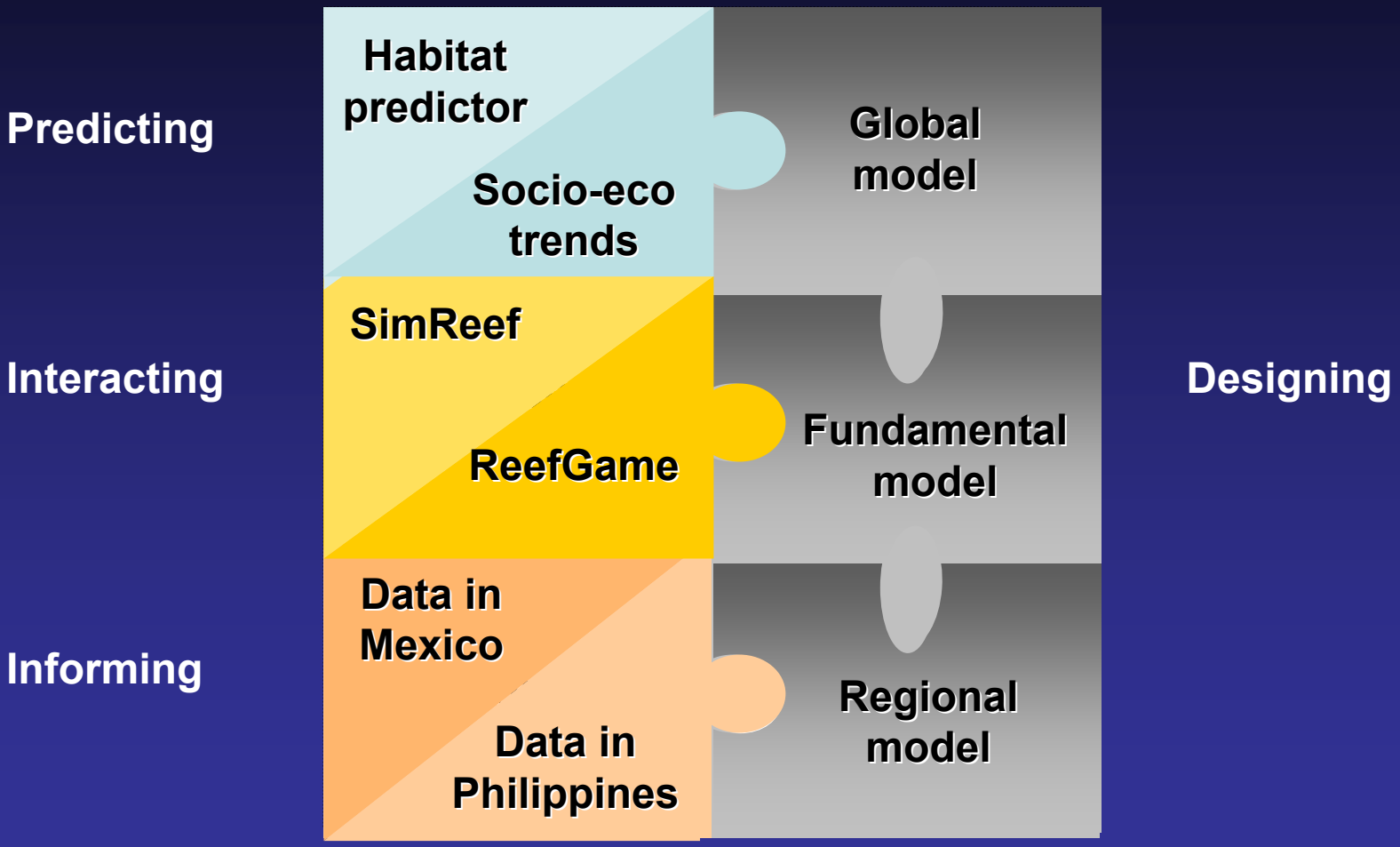
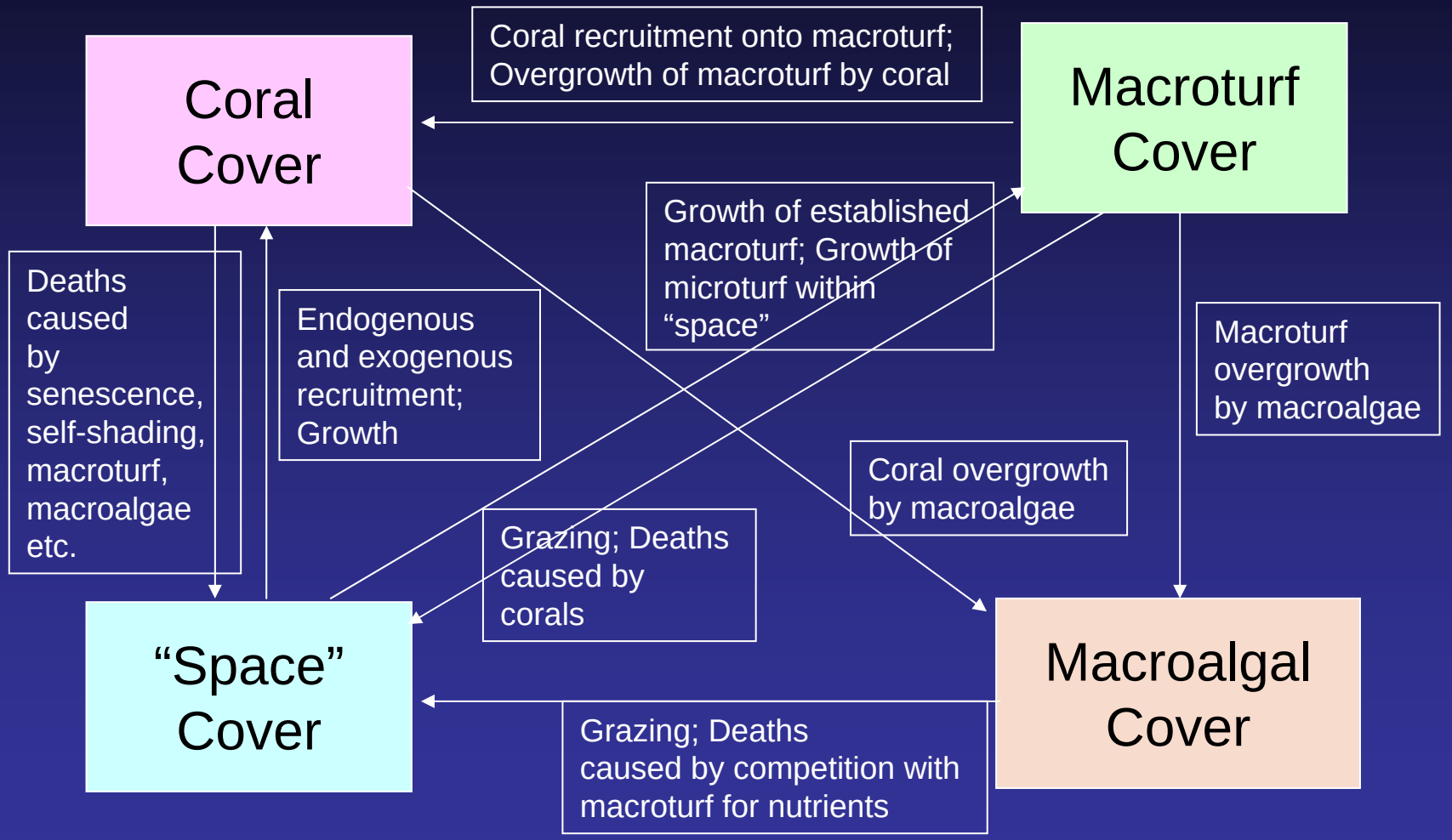
Restoration

Source: http://www.gefcoral.org/WorkingGroups/ModellingandDecisionSupport

Strategic framework

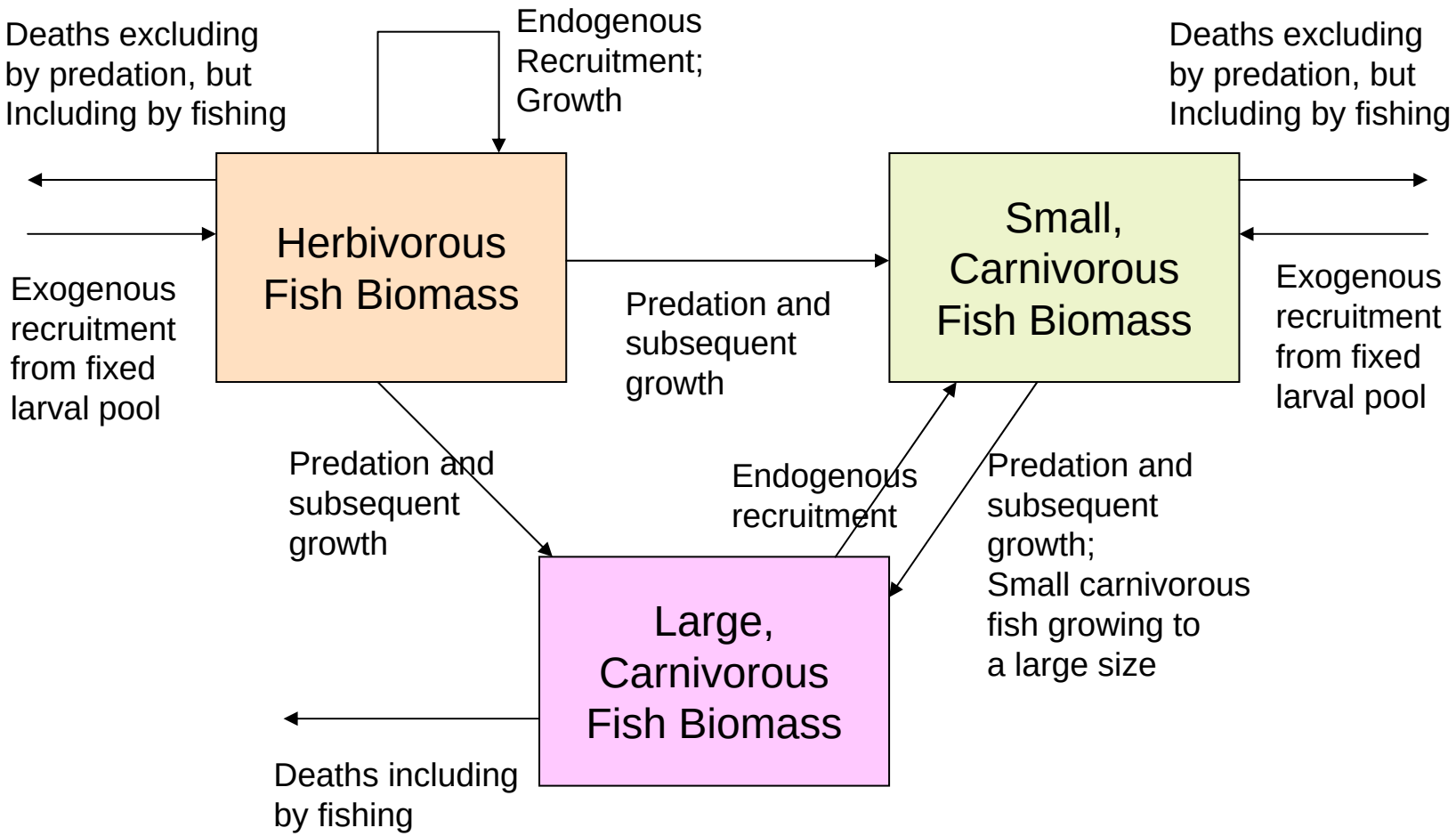


Benthic model: main interactions



(credits: courtesy of R. Seymour)

Fish model: main interactions



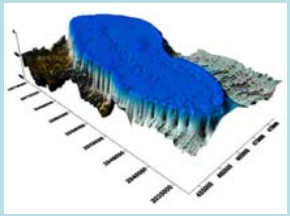
(credits: courtesy of R. Seymour)

Calibration in Mexico

Meso-American Reef System

Satellite imagery

Digital Bathymetric Models

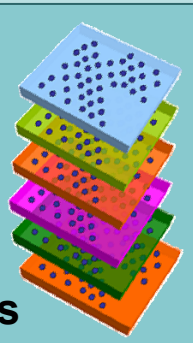


-Underwater Video-transects

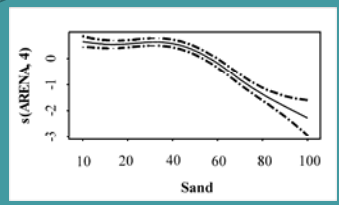
-Fish censuses

GIS

- **Satellite Bands**
- **Bathimetry**
- **Geomorphology**
- **Biotic components**



Generalized Additive Models



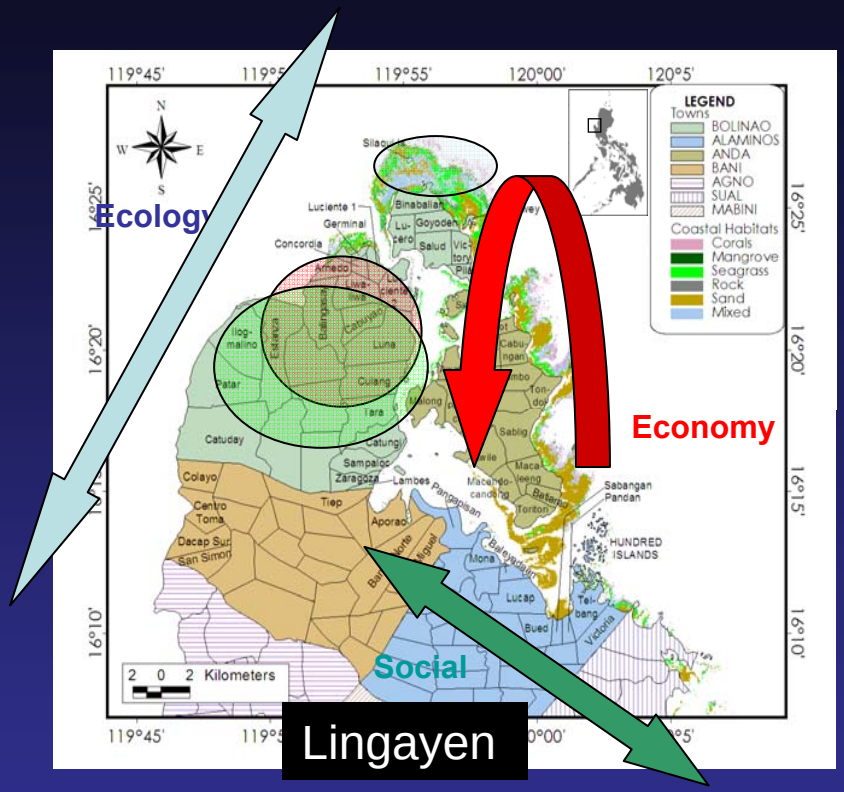
Spatial prediction

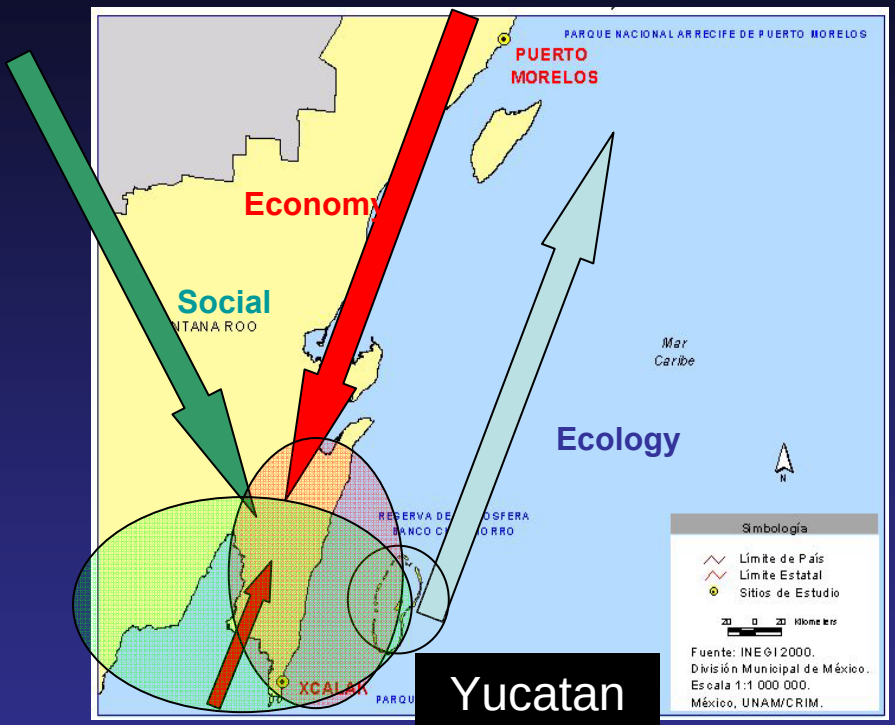
(credits: courtesy of R. Garza)

Local-regional coupling

(credits: courtesy of J. Melbourne)

Social & Economic Factors





- Scales differ between social, economic and ecological dynamics
- Socio-economic models need to be contextual
- More information is needed on decision-making processes

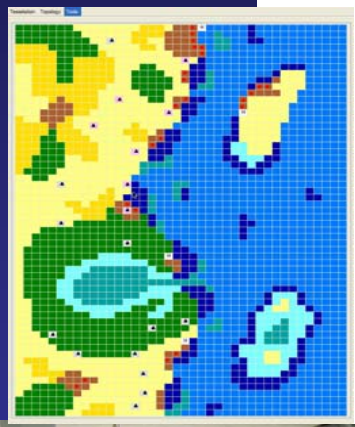
Participatory modelling
SimReef in Mexico

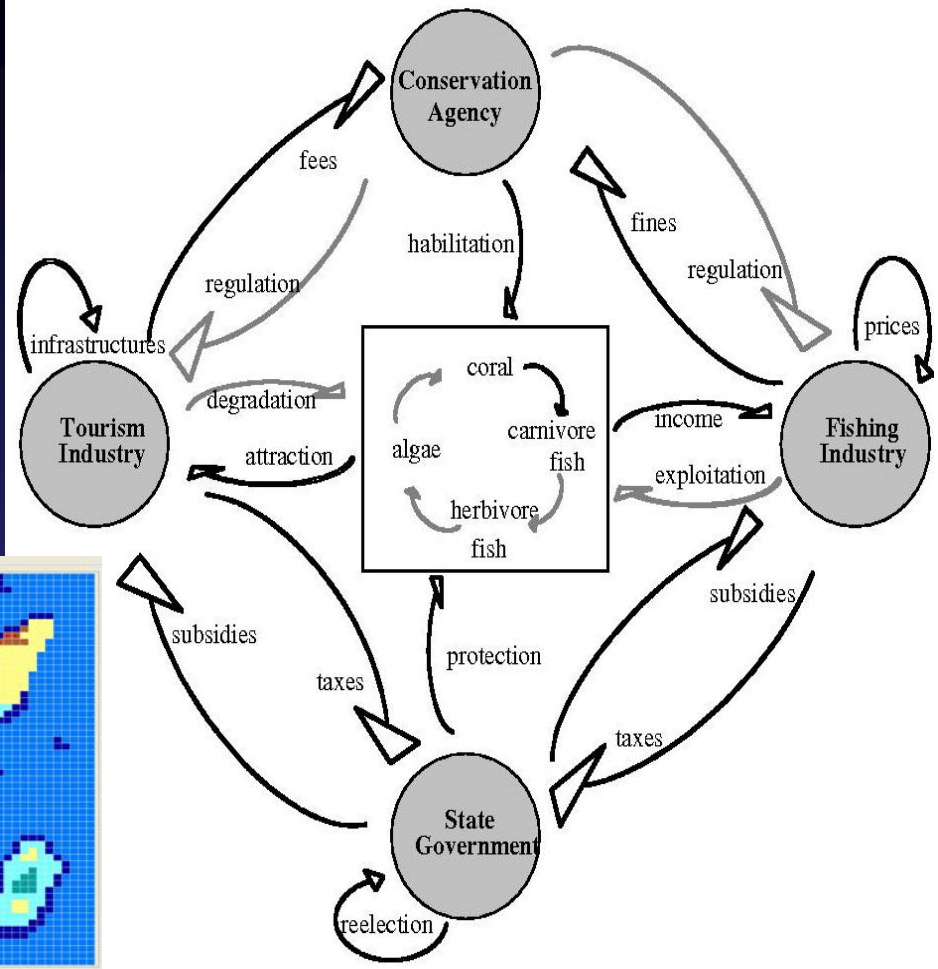
Objectives

- Understand regional economic drivers
- Validating model's assumptions

Participants

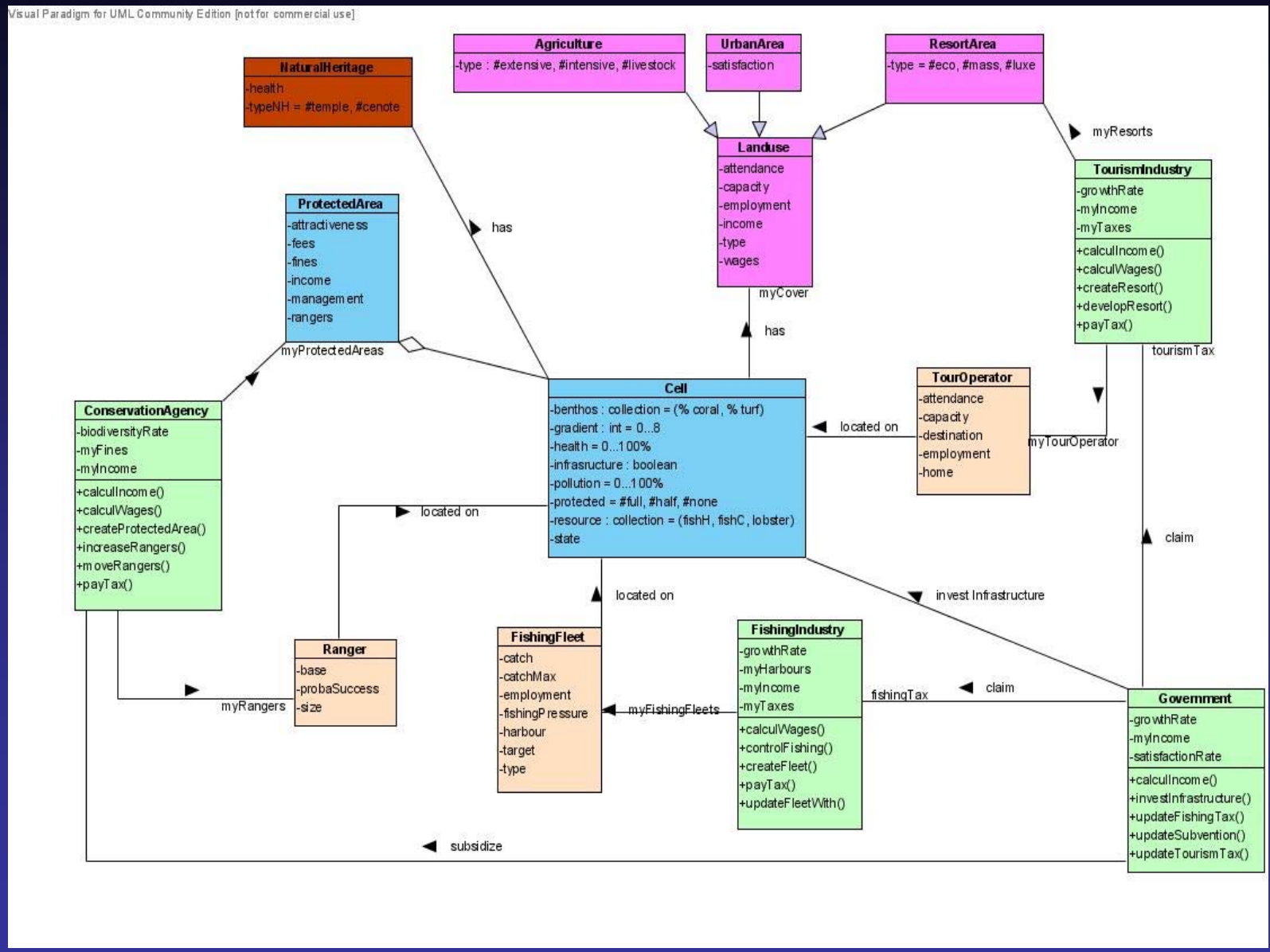
- Regional managers





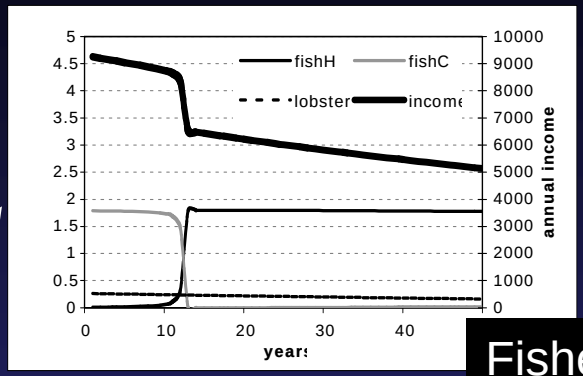
(credits: courtesy of A. Dray)

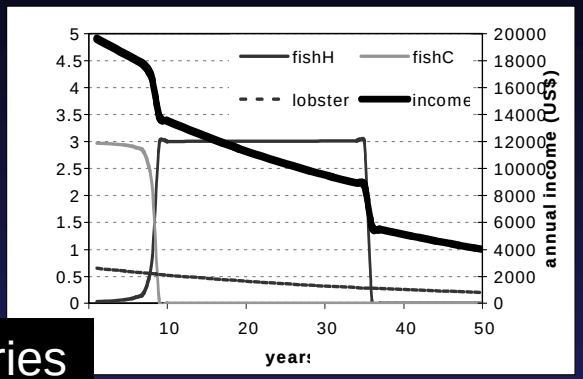
SimReef: an interactive agent-based model



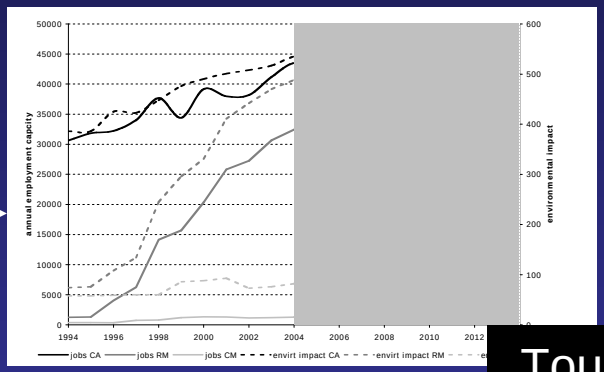
(credits: courtesy of A. Dray)

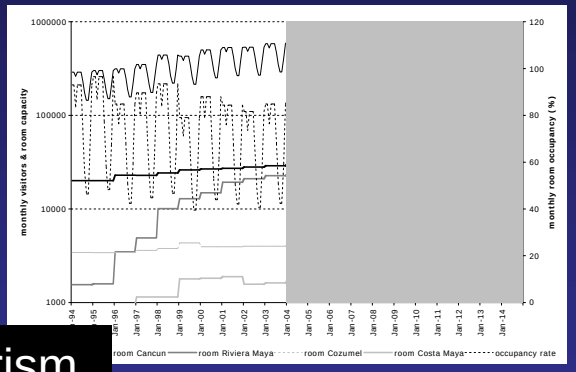
SimReef: outcomes



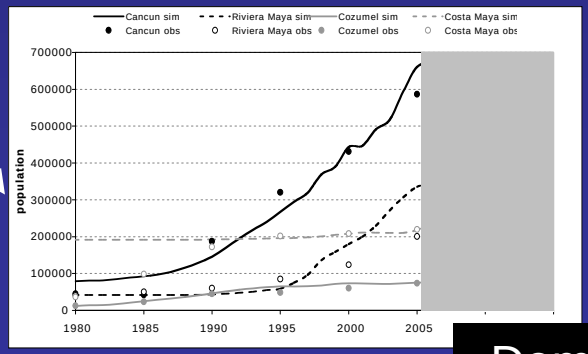


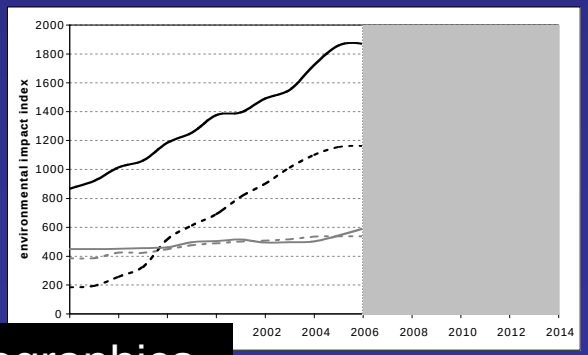
Fisheries





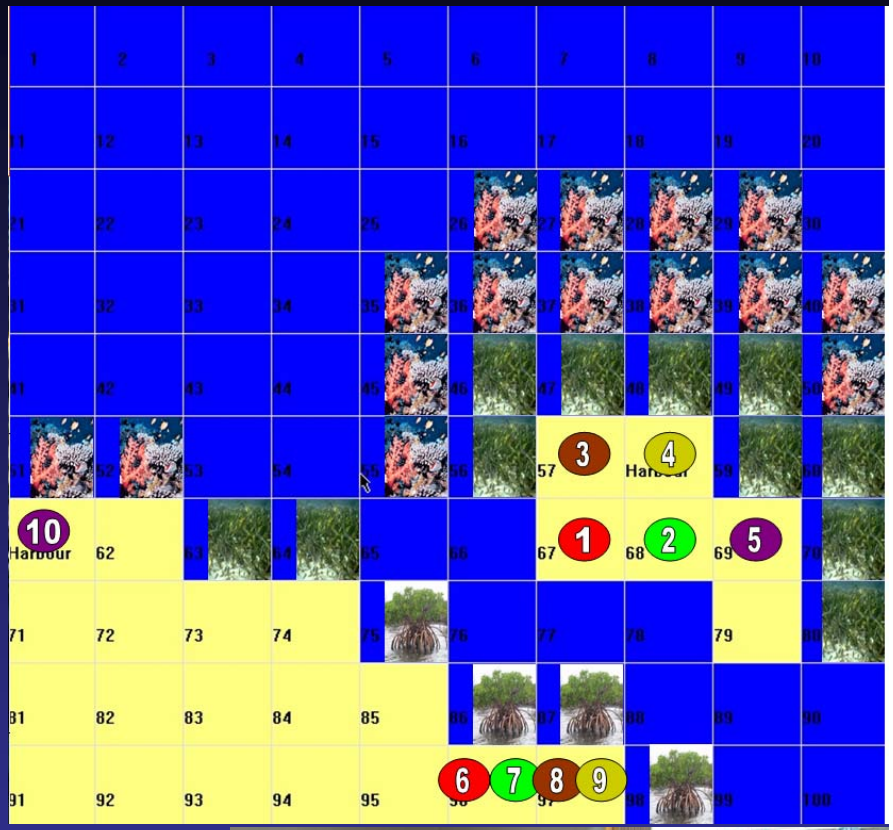
Tourism





Demographics

Participatory modelling
ReefGame in Philippines



Objectives

- Exploring alternative livelihoods
- Understanding fishing behaviours

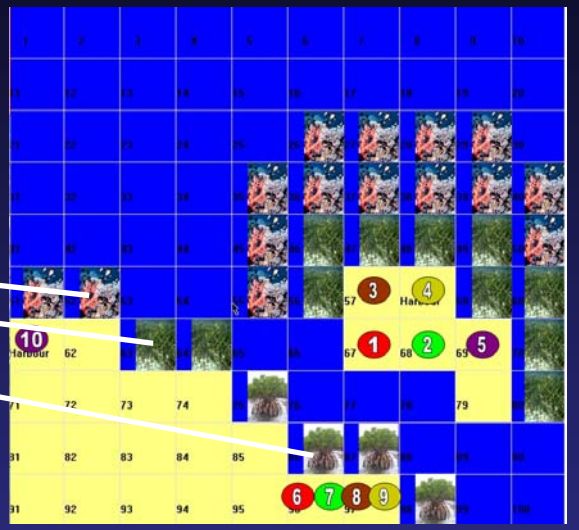
Participants

- Local fishermen

(credits: courtesy of A. Dray)

ReefGame: design

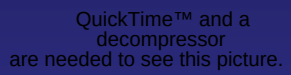
- 3 natural marine habitats:



- Maximum fish biomass /cell: 50
- 2 fish types (ft): Big Fish (BF) and Small Fish (SF)
- Initial biomass$_{(ft)}$ = Ω . ß$_{(ft)}$. 50 with: (ft) = BF or SF
- Fish growth$_{(ft)}$ = ß$_{(ft)}$. Biomass$_{total}$. (1+ ∂ $_{(ft)}$)

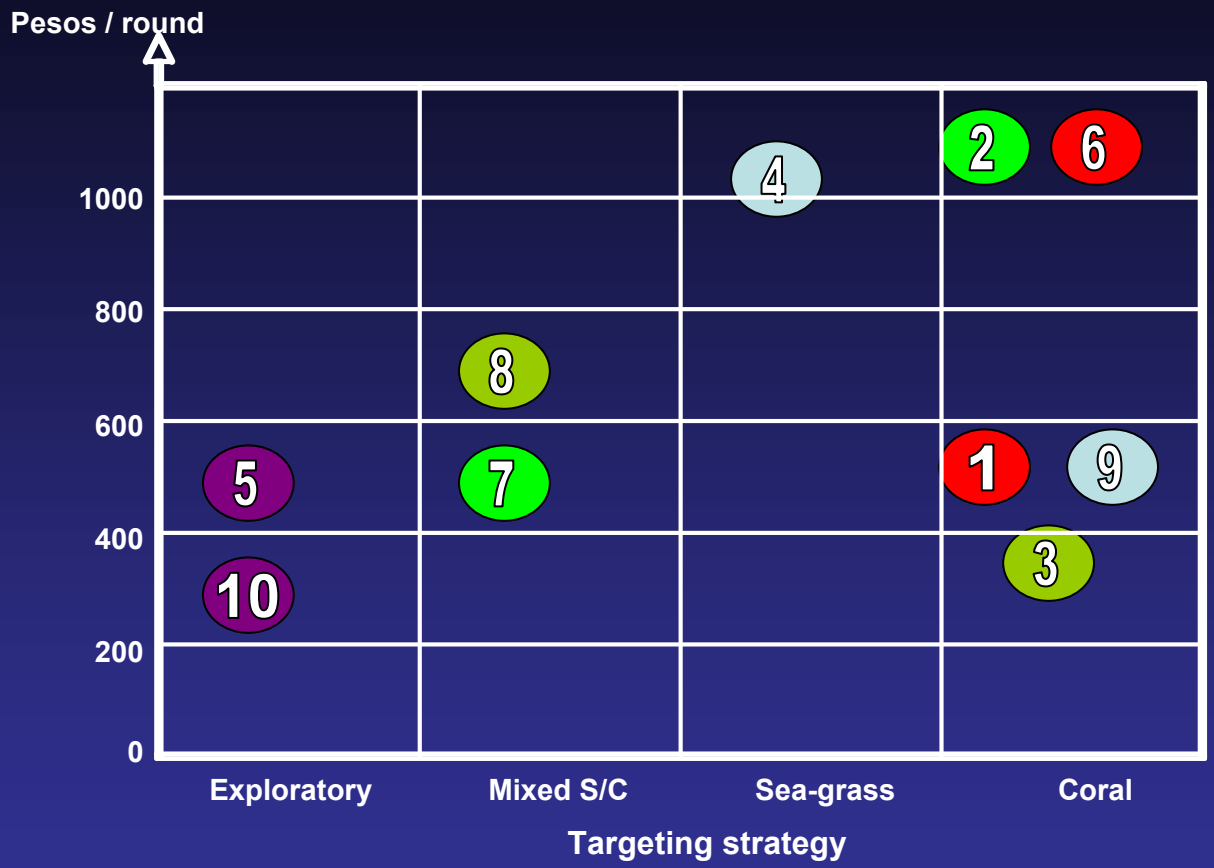
	coral	sea-grass	mangrove	degraded coral
Ω	1	0.5	0.4	0.6
ß$_{BF}$	0.4	0.2	0.1	0.2
ß$_{SF}$	0.6	0.8	0.9	0.8
∂	0.12	0.07	0.07	0.05

ReefGame: playing the game



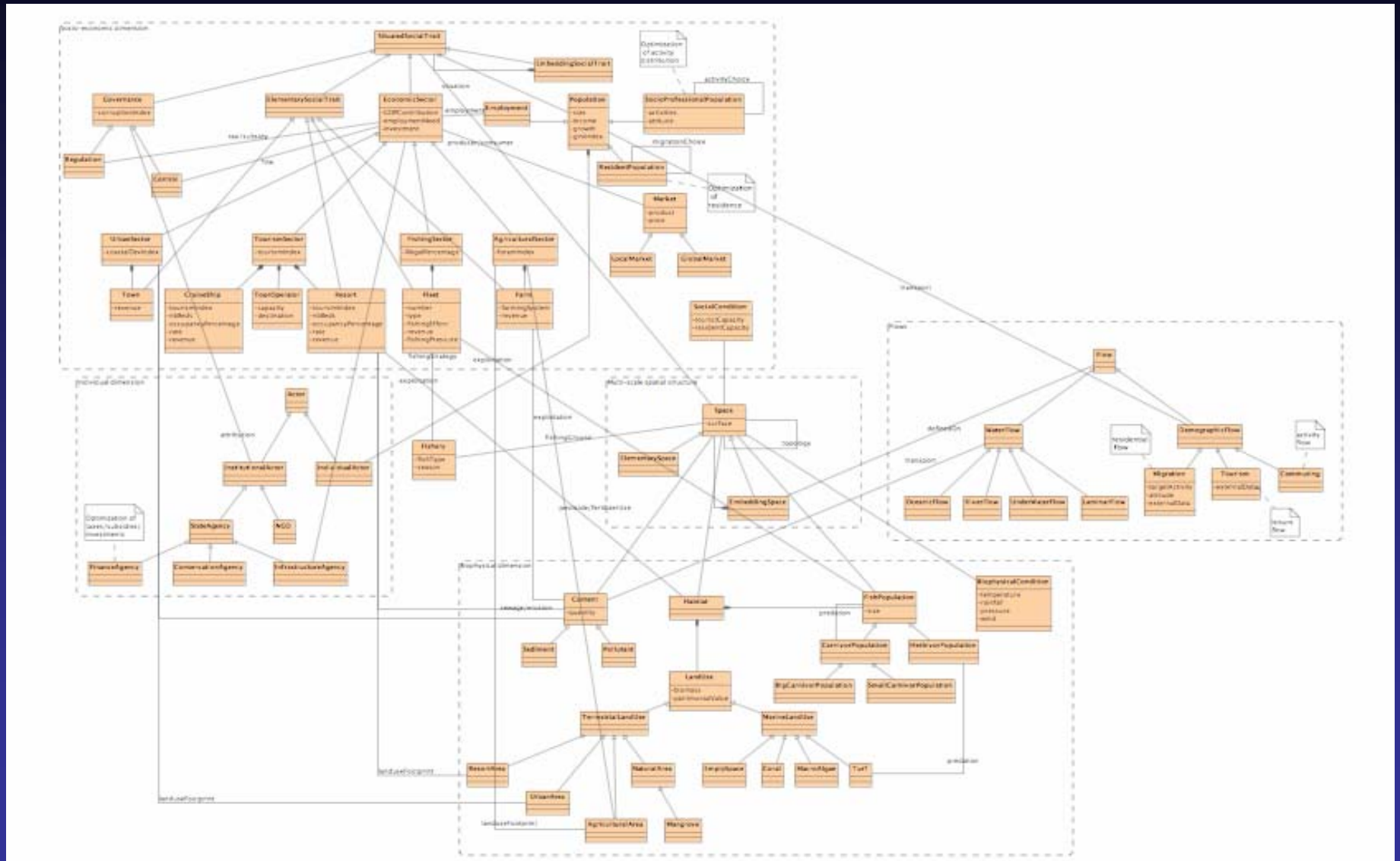
ReefGame: analysing results

Rounds 1 to 4



Average income:	670 P$ / round / player
Total catch:	90 kg / round
% degraded coral:	20% of initial cover
% fish biomass:	85% of initial biomass

Socio-eco model: towards a generic ontology



More information…

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