

Global change, dynamics of exploited marine biodiversity, and fisheries viability (CHALOUPE): modelling approaches to explore some of the key drivers of changes in marine social-ecological systems

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& Olivier THEBAUD**

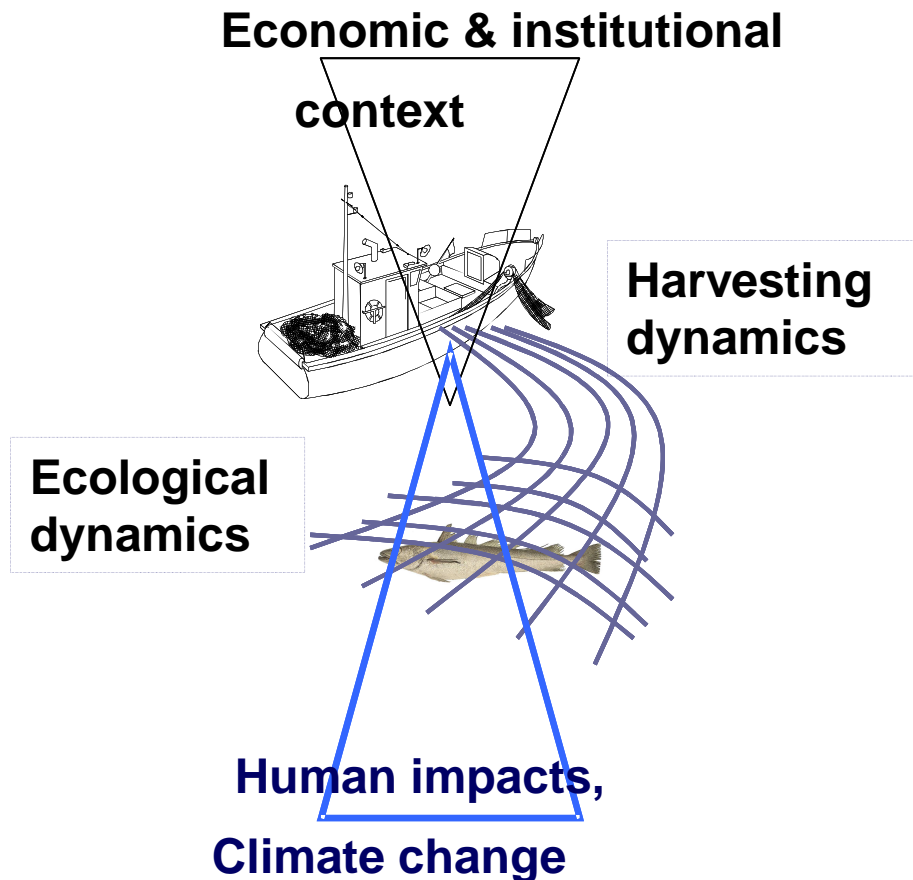
Ifremer



This research was funded by the French National Research Agency under the 2005 « Biodiversity » call for research proposals

Research object :

The evolution of exploited marine communities - fisheries systems



➤ Interfaces between ecological and socio-economic systems

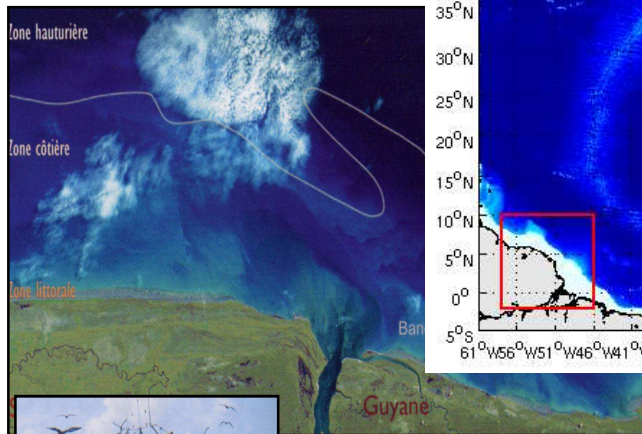
➤ Dynamics depend on interactions between ecological and economic processes

➤ Considering some forcing factors :

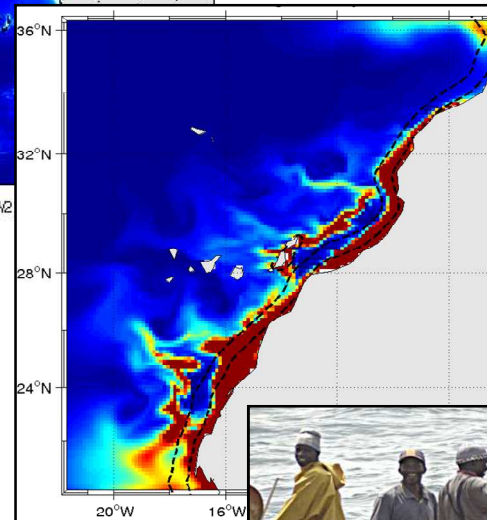
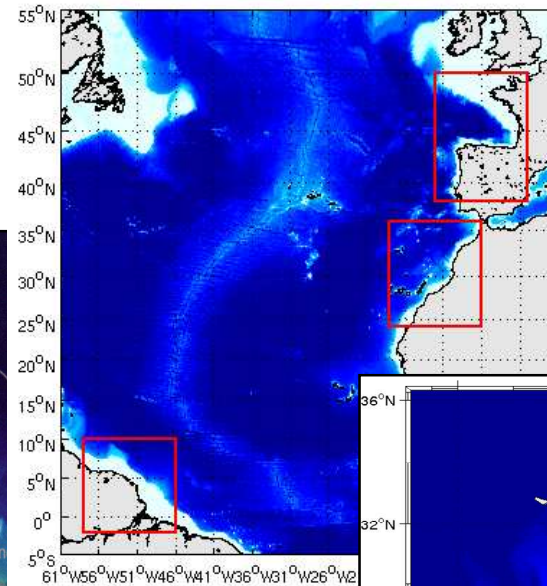
- climate
- institutional framework
- economic context

Objective

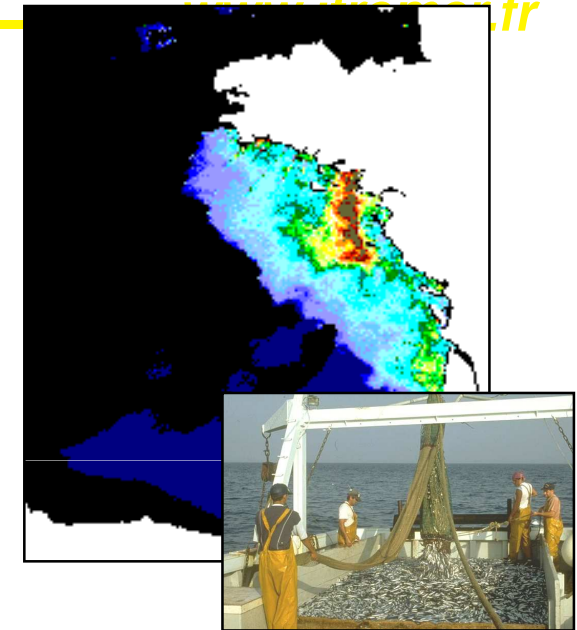
→ identify the main drivers of bio-economic changes in three systems over the past decades



Amazonian continental shelf of the French Guyana



Moroccan upwelling area



Temperate continental shelf of the Bay of Biscay

Important outcome : reinforce collaboration between fisheries scientists, marine ecologists, economists, mathematicians and computer scientists to progress towards integrated approach for marine ecosystem management, including fisheries resources

Ecological Dynamics

Ifremer (Fisheries Sciences, Ecology
And Modeling, tropical Fisheries
Sciences)

National Institute of Fisheries Science
Research (Morocco)

Economic Dynamics

Ifremer (Marine Economics)

Univ. Bretagne Occidentale (Law and
economics of the Sea)

CNRS-Museum

World Fish Center

Modelling

IRD (Upwelling Ecosystems)

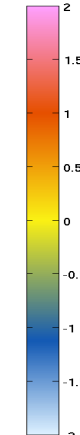
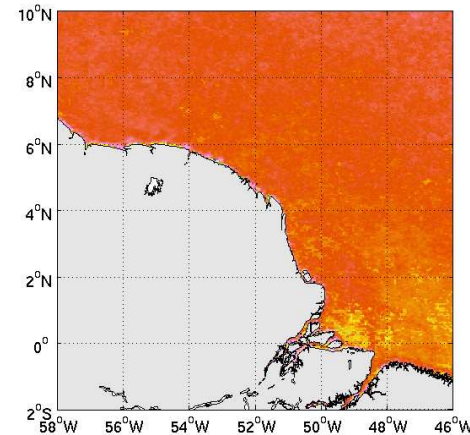
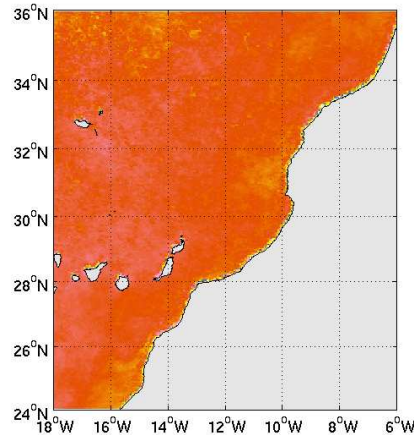
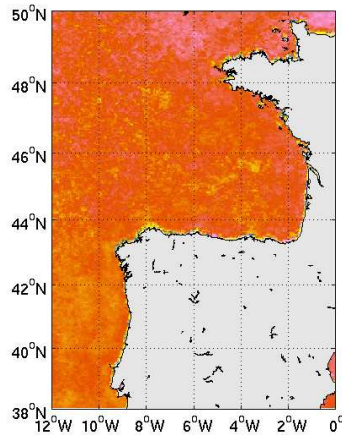
CNRS-Museum

World Fish Center

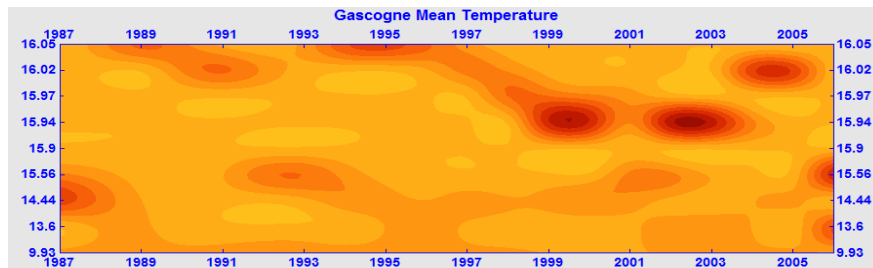
ENI-Brest (Virtual Reality)

Univ. Littoral (informatics)

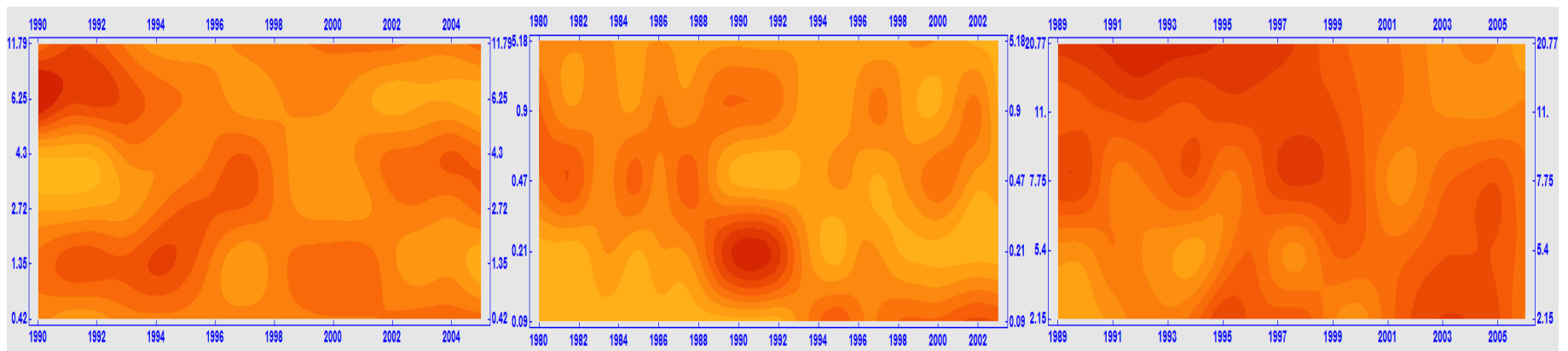
Some results...(not all!)



Increase of SST (1985-2006, from satellite data)



Biomass increase of species with affinity for warm waters in the Bay of Biscay (from bottom trawl surveys, 1987 to 2006)



Changes in the landings of species according to their value (€/kg) for the main species in the Bay of Biscay, Morocco. Same kind of results observed for a given fishery targeting one species : and for shrimp size class in F. Guyana. Combined impacts of environmental variations, overexploitation, changes in the markets, management....

The modelling approach to represent these changes, at various scales...some debates

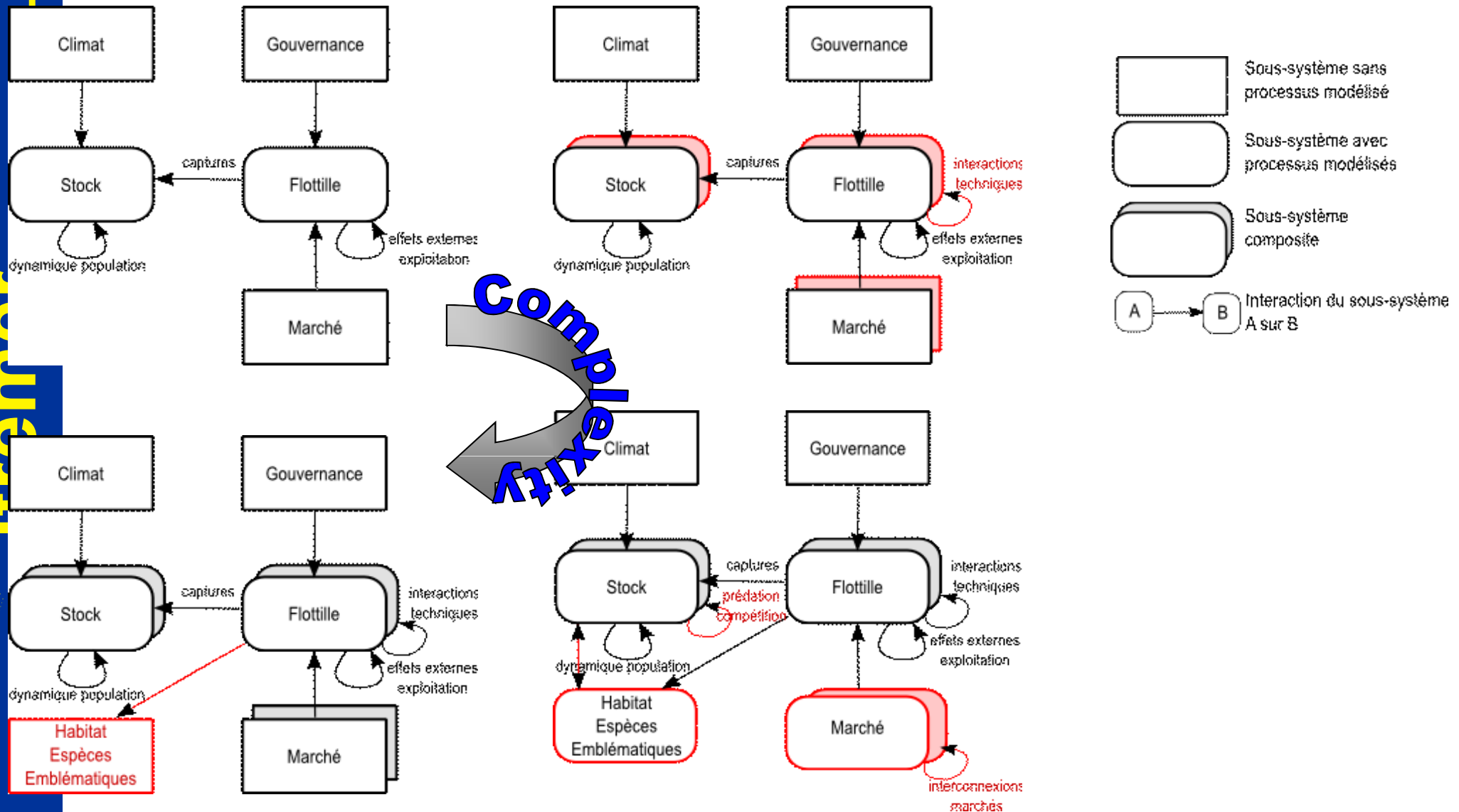
Universalism vs culturalism : can we address the question with one generic model (bio-economic, ecosystemic...) or do we need a new model for each case study and each question?

Complexity vs simplicity : do we need theoretical comprehensive models to better understand the system functioning or only increasing step by step some existing models operational for management?

Stock/fishery local point of view of fisheries biologists vs ecosystem/global point of view of marine ecologists

Modelling approach within the "Chaloupe" project

Implementing and/or developing models with increasing complexity levels,



Trade-offs between recovery time and cost for a given fishery

Economic consequences of bad recruitments (environmental extreme events or trends)

Economic impacts of mitigation measures for emblematic species

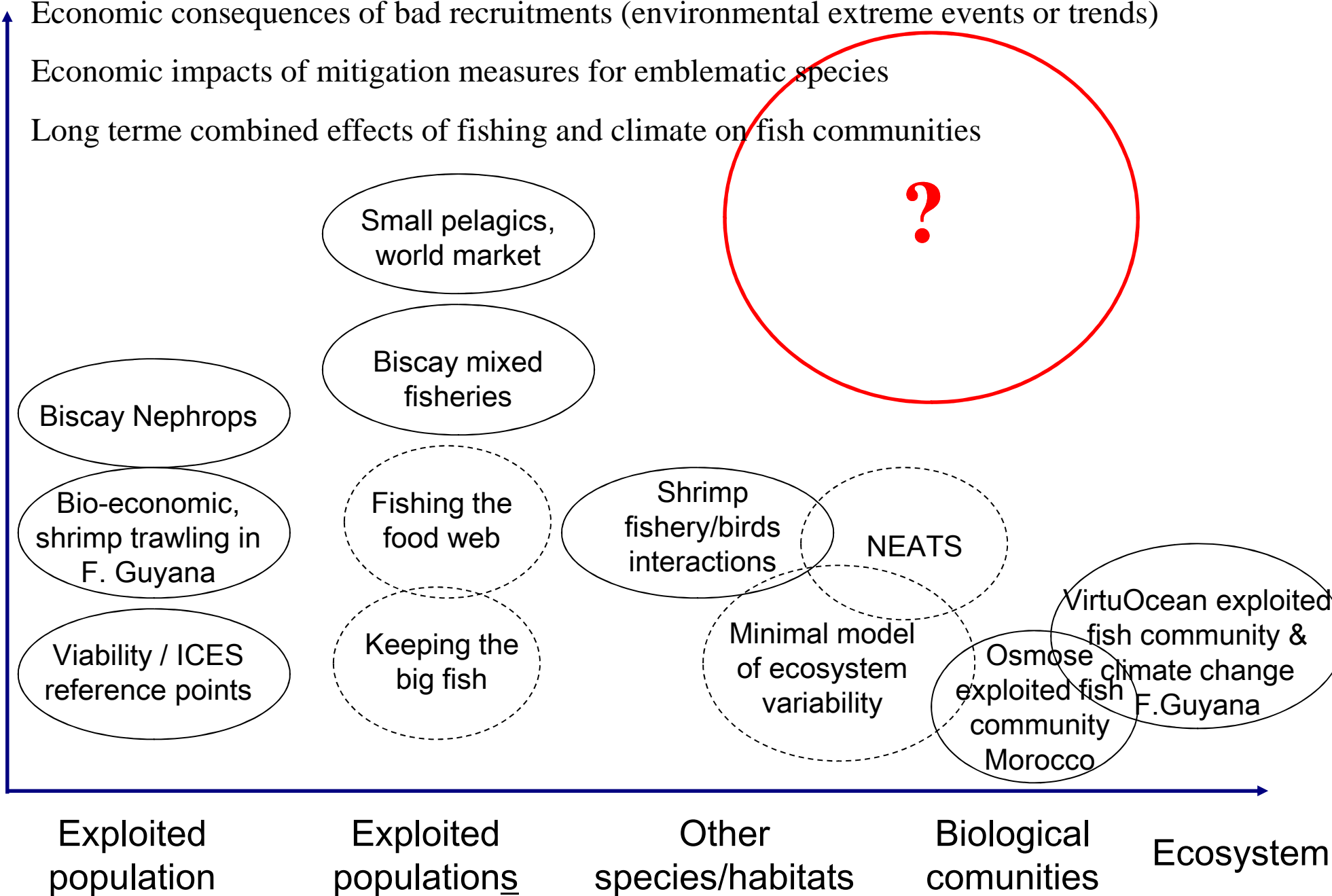
Long term combined effects of fishing and climate on fish communities

Markets/...

Fleets

Fleet

« F »

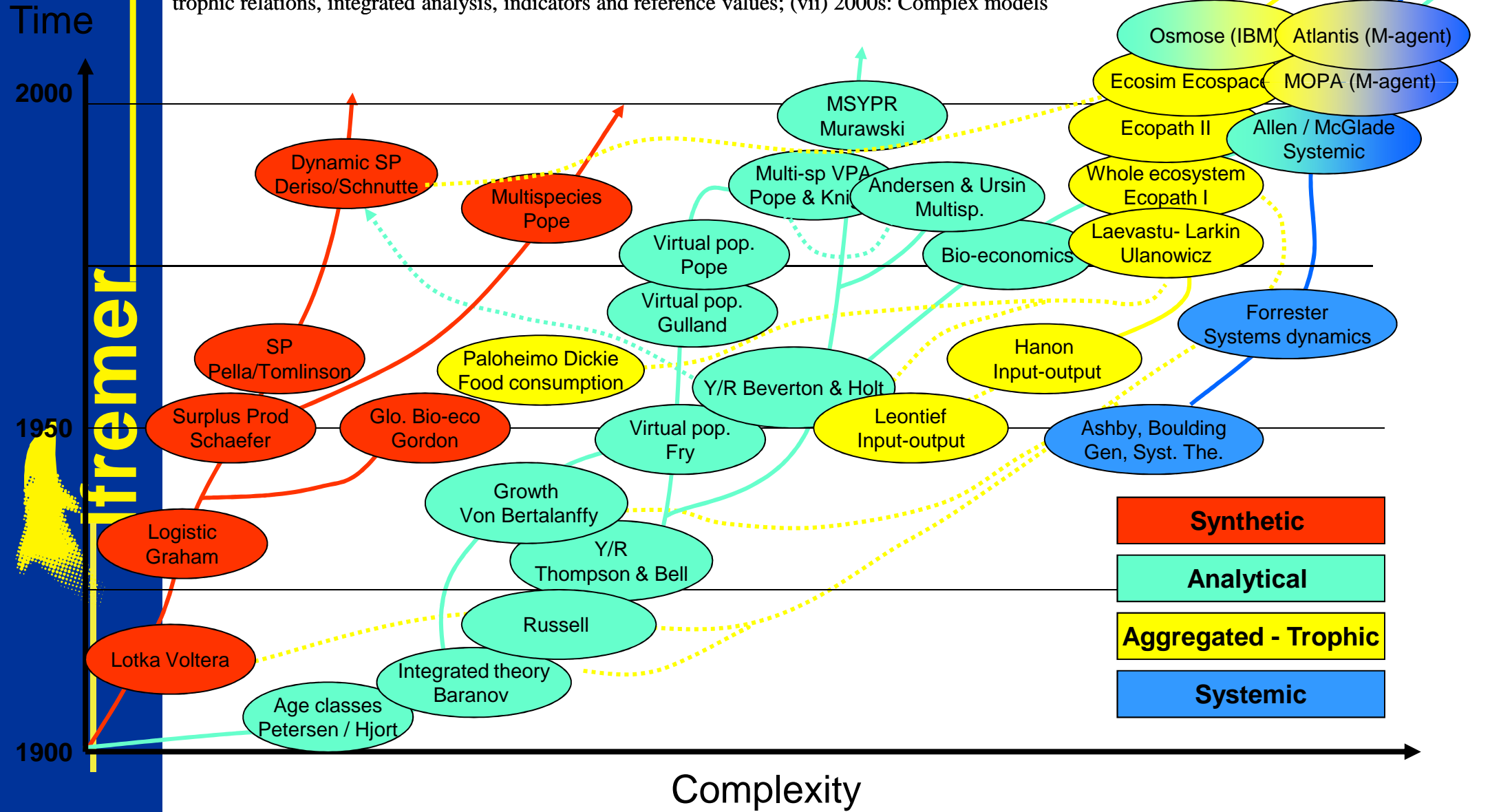


Fishery science response to societal demand

S.M. GARCIA and A.T. CHARLES

ICES International Symposium on Fisheries Management Strategies, Galway, Ireland, 27-30 June 2006.

Synthesis of the evolution of modelling: (i) 1940s-50s: Beverton, Holt, Schaefer, Gordon; (ii) 1970s: Biological & technological interactions; (iii) Stochastic effects, uncertainty; (iv) 1980s: Bioeconomic interactions; (v) 1980s: Climate oscillations; (vi) 1990s-00: trophic relations, integrated analysis, indicators and reference values; (vii) 2000s: Complex models



Thank you for attention



Projection of individual species - Bay of Biscay

size of marks = f(share in total landings)

« high price » species / « medium price » species / « low price species »

Facteur 2 - 18.76 %

