

Fishing the food web: a bio-economic analysis of changes and drivers of change in fisheries of the Bay of Biscay

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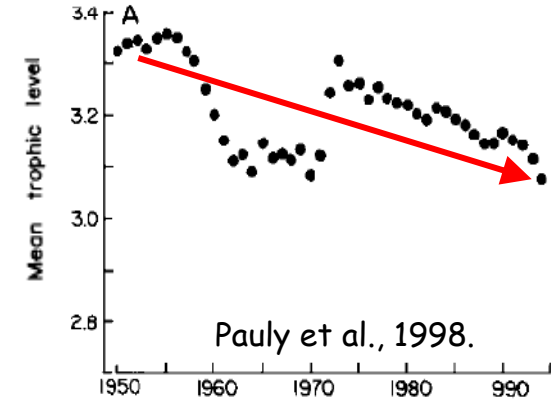


Outline

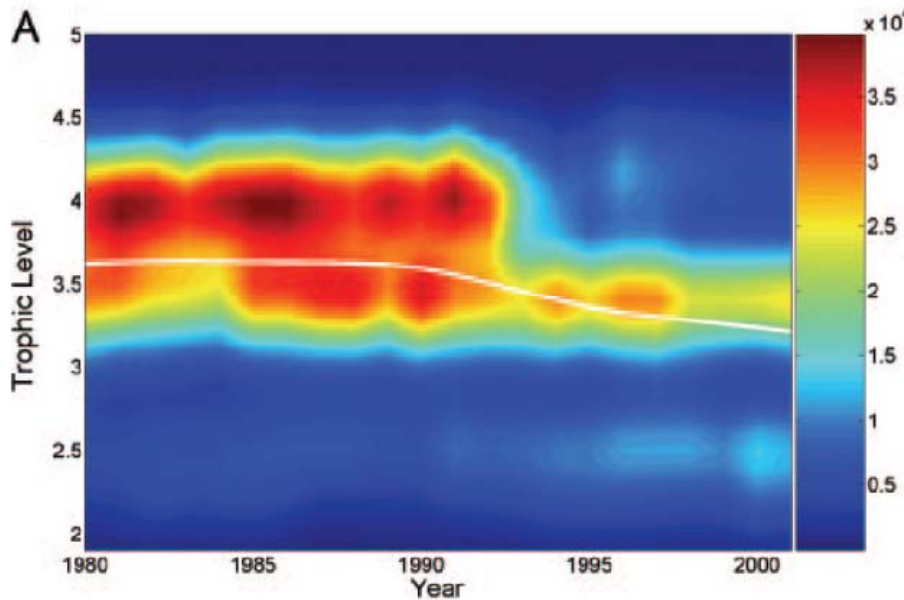
- I. Context - the "Fishing down the food web" debate
- II. A case study: changes in fisheries production by French Fleets in the North-East Atlantic / Bay of Biscay
- III. Key drivers
 - Internal: (deficient) access regulations
 - External:
 - Globalization of markets
 - Climate change
- IV. Perspectives

Context: the « fishing down marine food webs » debate

- Key role of economic drivers, at least in some cases (e.g. case B below) ?
- Environmental drivers ?
- Economic consequences ?

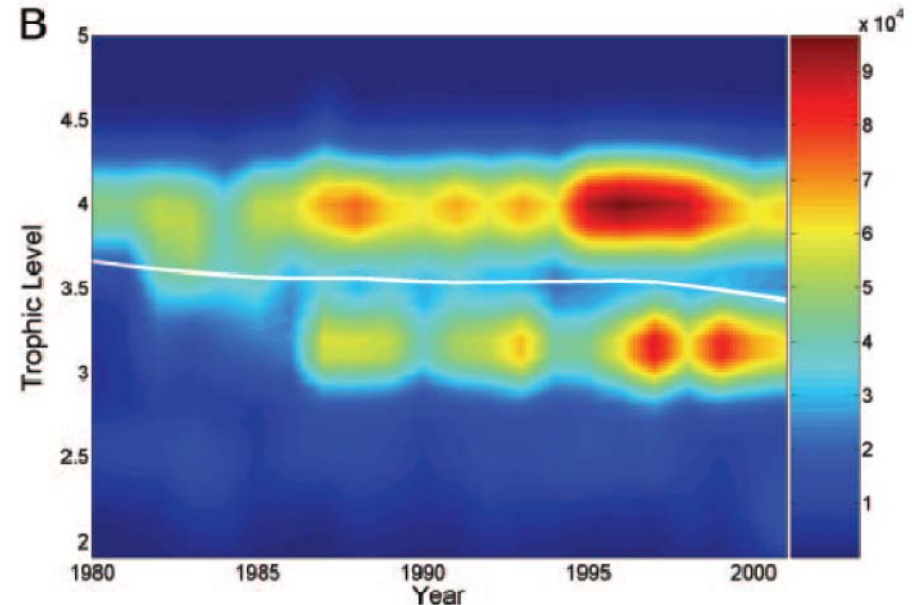


Total yearly catch for each 0.1 trophic-level increment indicated by the color bar on the right (10^4 kg yr^{-1})



A - sequential collapse / replacement

The Scotian Shelf ecosystem: collapse of the cod fishery → decline in the herring fishery → growth of the northern prawn fishery



B - sequential addition

Patagonian Shelf ecosystem: catches for upper-trophic-level species (Argentinean hake) grew substantially / new fisheries for short-fin squid developed



The case of fisheries production by French Fleets in the North-East Atlantic

Study period: 1973-2005

Two scales of analysis: landings by French fleets operating in (i) the North-East Atlantic & (ii) the Bay of Biscay

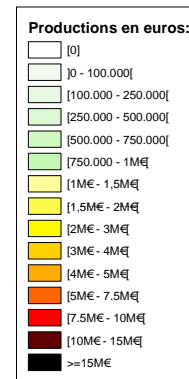
Data

1. Official French landings data published in paper reports
 2. Deflation of fish prices by consumption price index (base year 2005)
 3. Compilation of bio-geographical descriptors of species landed (literature based): trophic level; maximum length, age and weight; growth rate; mean latitude and depth of area of distribution; ...
- Focus on **57 fish species** (50 % of French landings from the Bay of Biscay & 78% of French landings from the North-East Atlantic, in volume)

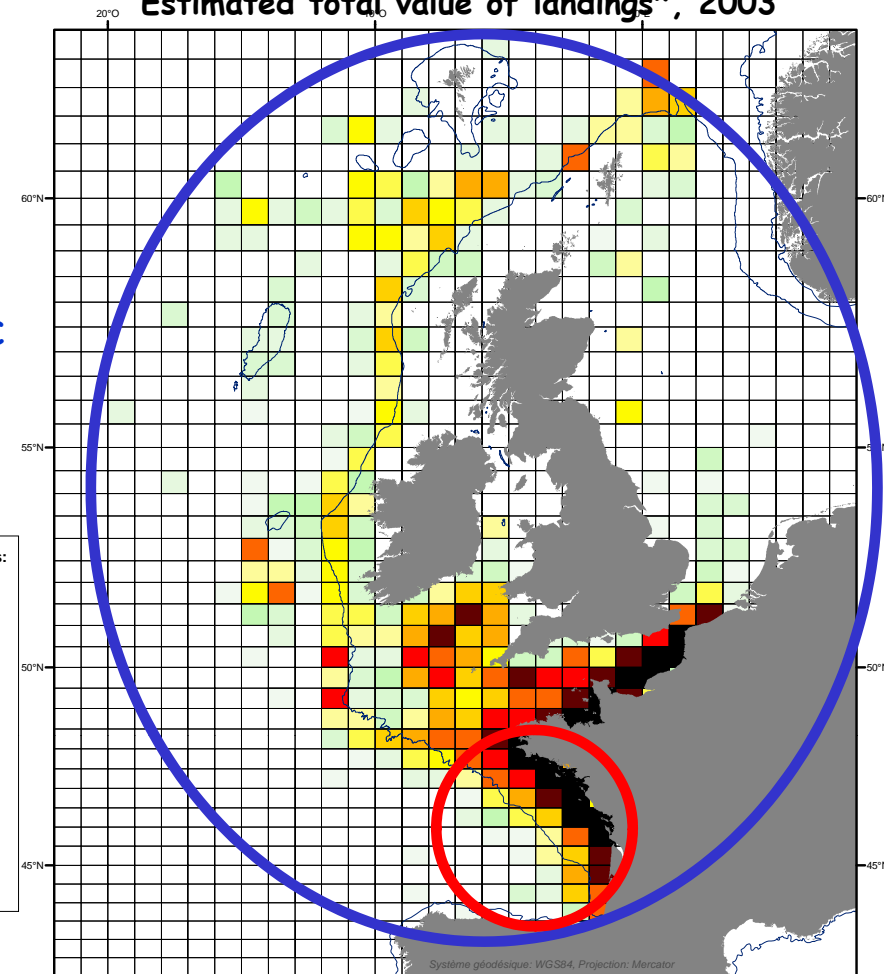
Steinmetz F., Thébaud O. et al., forthcoming. ALR

N-E
Atlantic

Bay of
Biscay



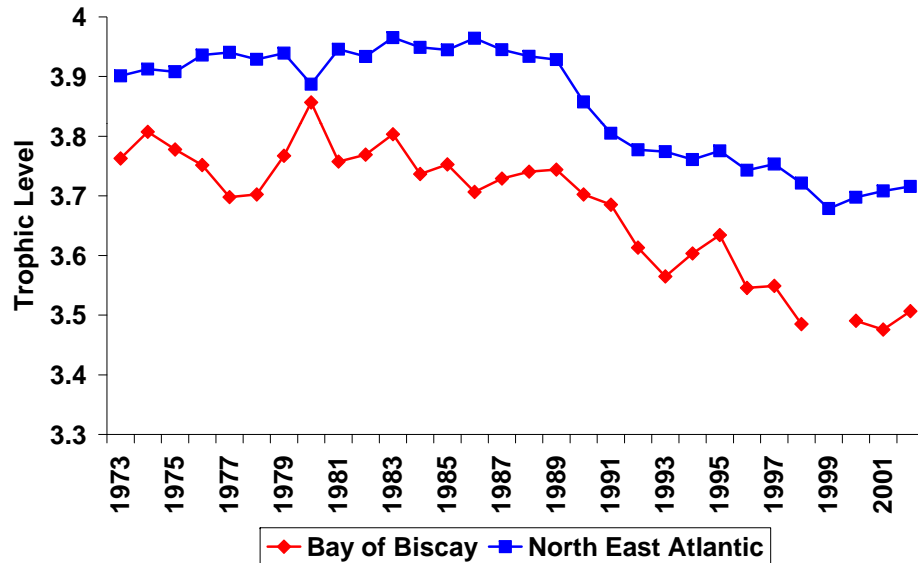
Estimated total value of landings*, 2003



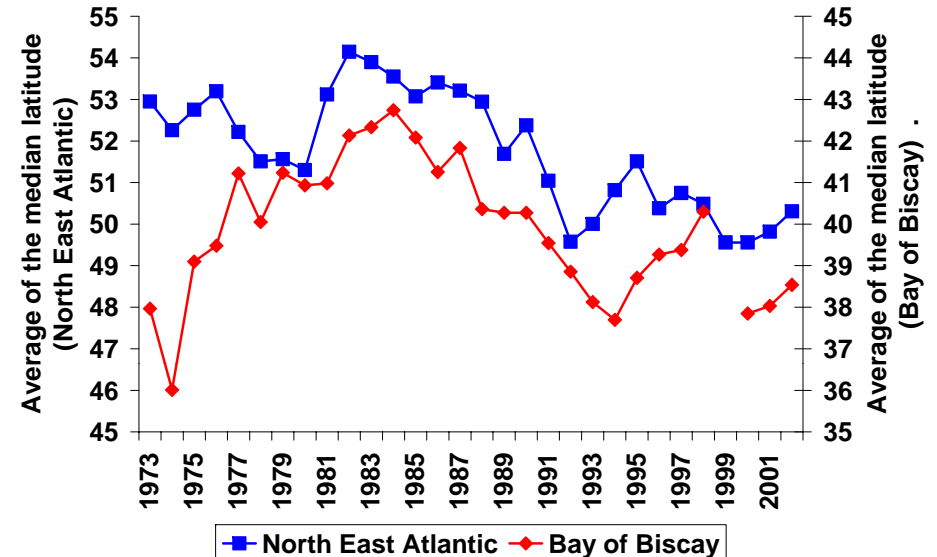
*Source : DPMA-BCS; estimation by Ifremer

Average characteristics of landings

Av. trophic level

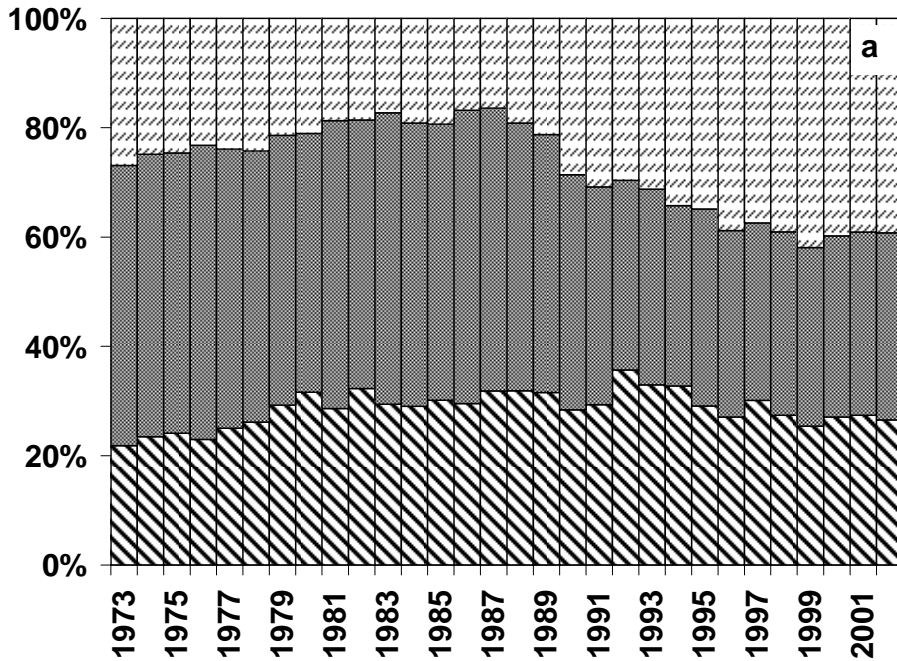


Mean latitude of area over which landed species are known to be distributed

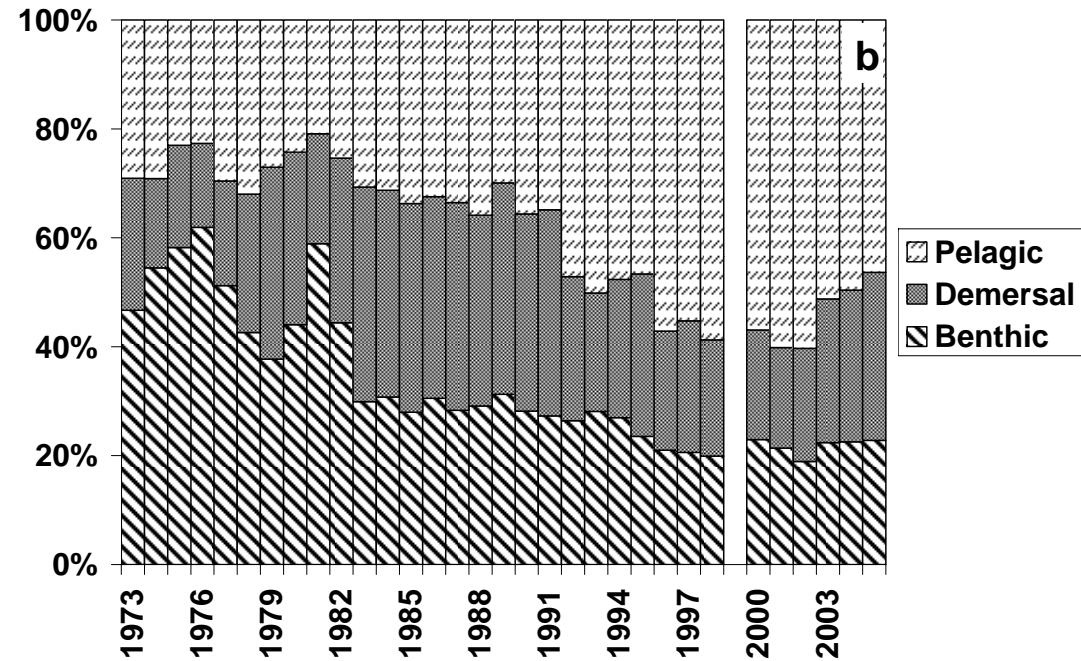


Structure of landings

North-East Atlantic



Bay of Biscay



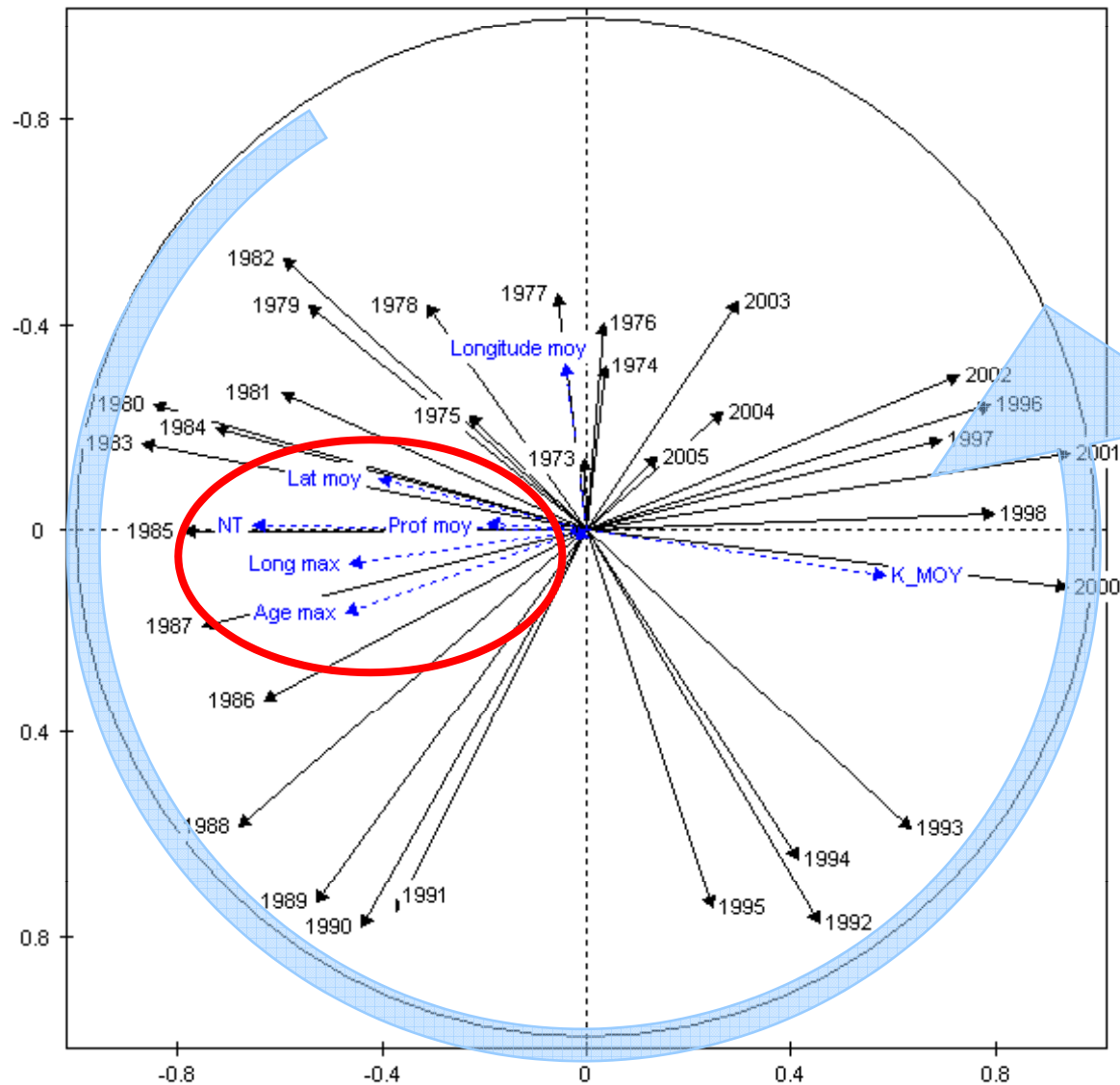
Trends in French landings of the three groups of species

	Bay of Biscay	North-East Atlantic
Benthic fishes	↘ ** (-842 tons per year)	→
Demersal fishes	→	↘ ** (-3363 tons per year)
Pelagic fishes	↗ ** (+982 tons per year)	↗ ** (+2027 tons per year)

* (resp. **) : Indicates the significance to 5 % (resp. 1%) of the Mann-Kendall trend test; the Sen slope is indicated in the brackets.

Changes in the composition of landings - A synthetic representation

Facteur 2 - 18.76 %



Facteur 1 - 34.01 %

Bay of Biscay

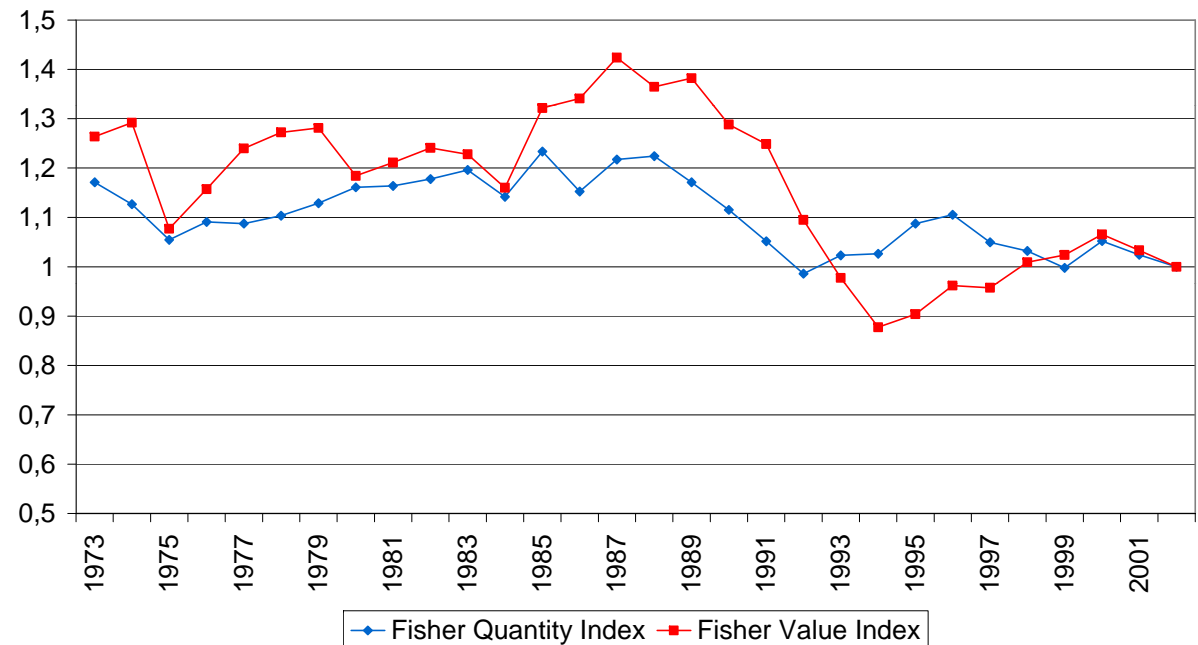
First plane of a principal component analysis with landings_years as active variables, and species as observations.

The blue arrow follows the sequence according to which the composition of landings changed with time.

Indices of total volume / value of landings

North-East Atlantic:

- Decrease in landings since late 80ies
- Maximum value achieved in 1987;
- Drop in value by 40%+ since then; lower value today than in the 70ies

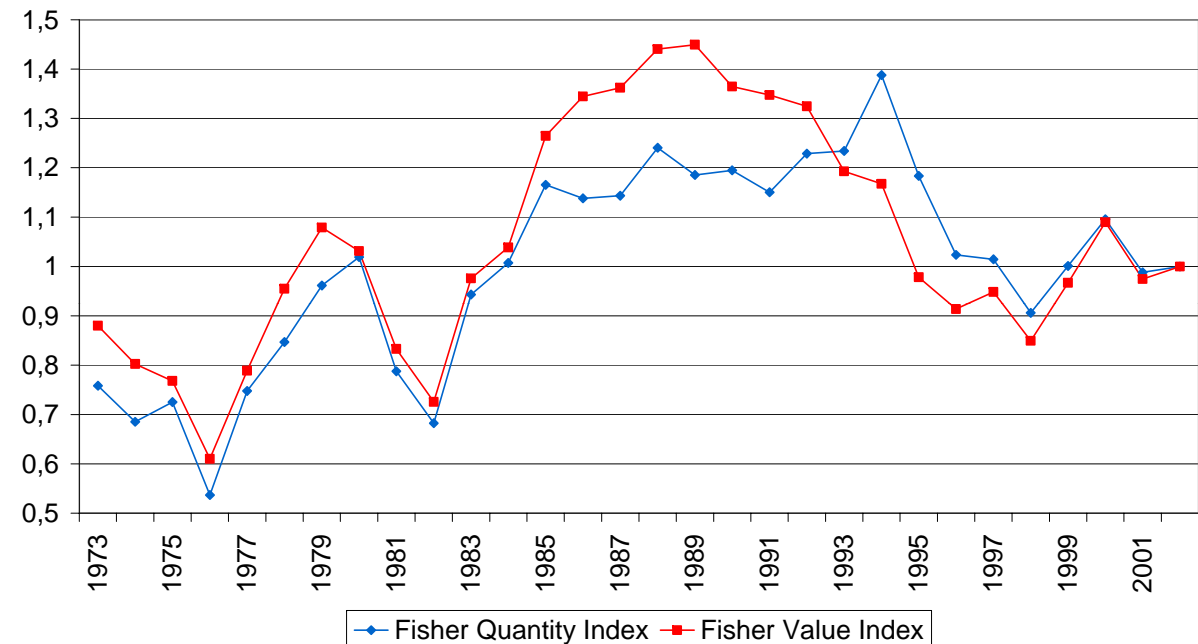


Bay of Biscay:

Increase in landings until 1994

Maximum value achieved in late 80ies

Drop in value by 45%+ in the last decade



Role of catch composition in value changes

→ 2002/1989 evolution of French fish landings from the Bay of Biscay:

~ 40% drop in value

Based on index number calculations:

Reduction in volumes of fish landed explains 58% of drop in total value

→ Drop in price of fish landed explains the rest

But 62% of the drop in average price of fish is due to increased proportion of low-priced species in landings



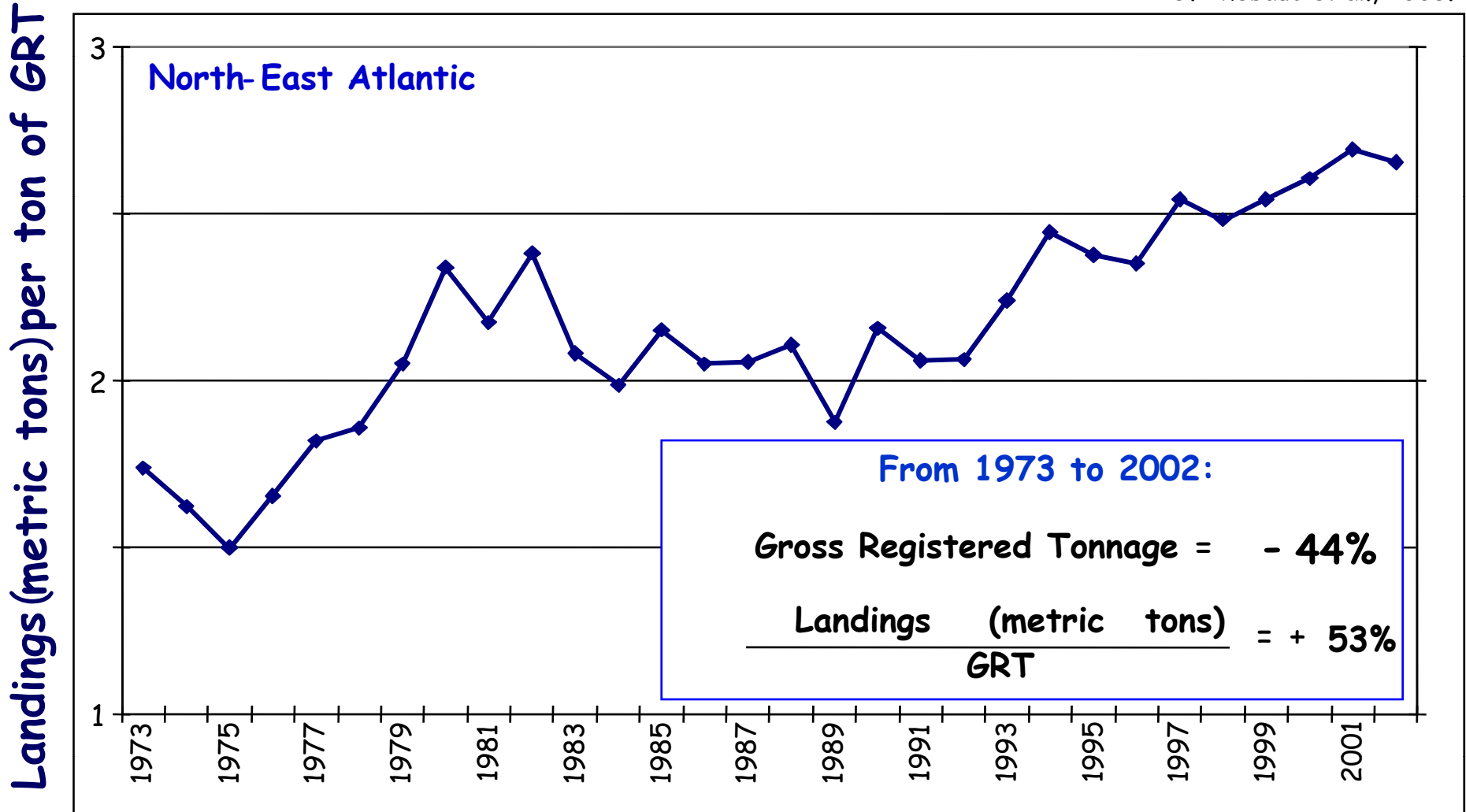
III

ifremer

Three key drivers

Key driver 1 - A case of de facto open access:
 → incentives towards the increase of fishing capacity

O. Thébaud et al., 2005.

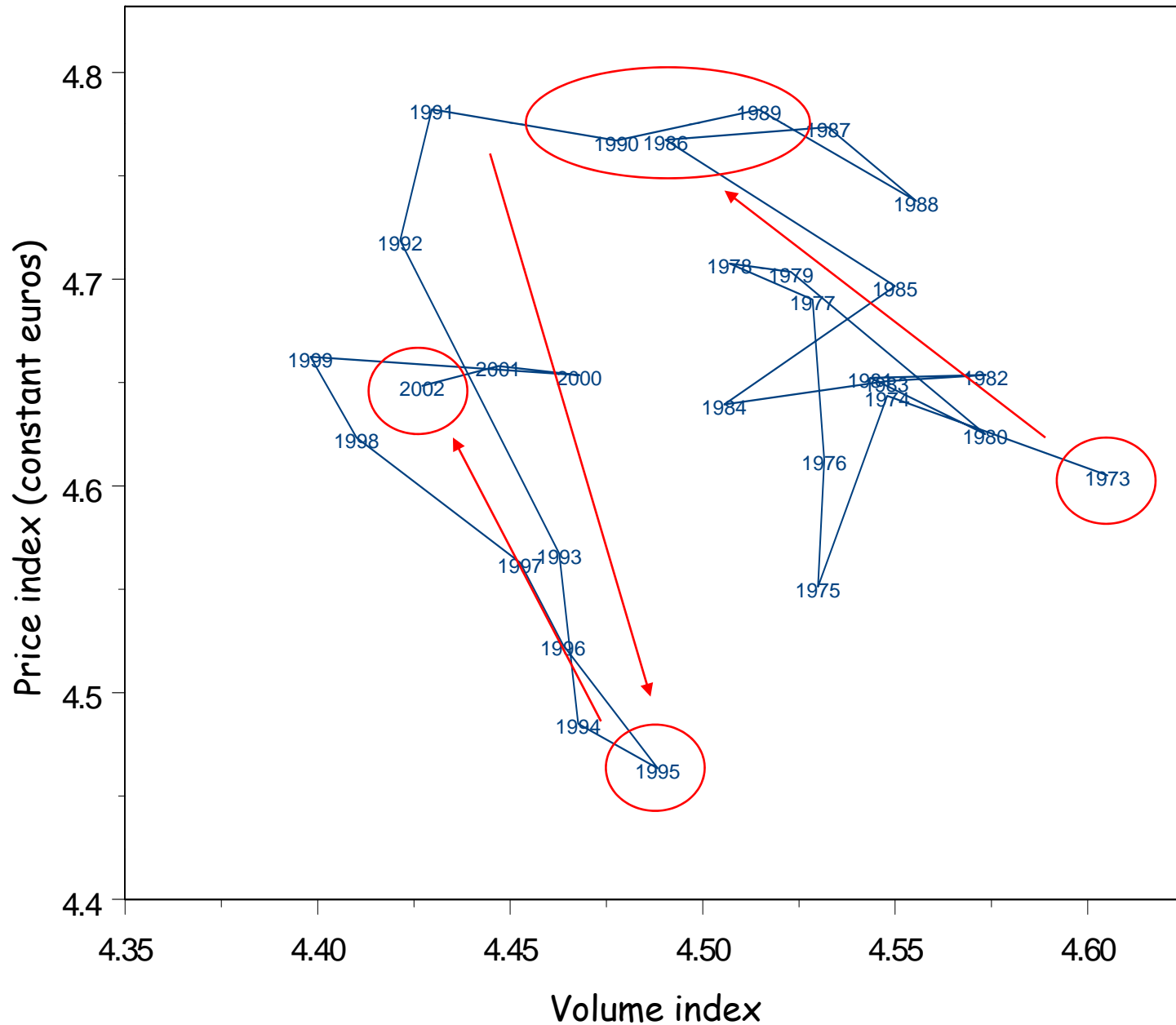


1973
1.7 ton / ton of GRT

1989
1.9 ton / ton of GRT

2002
2.7 ton / ton of GRT

Key driver 2: Impacts of increased competition on markets for fish (all species)

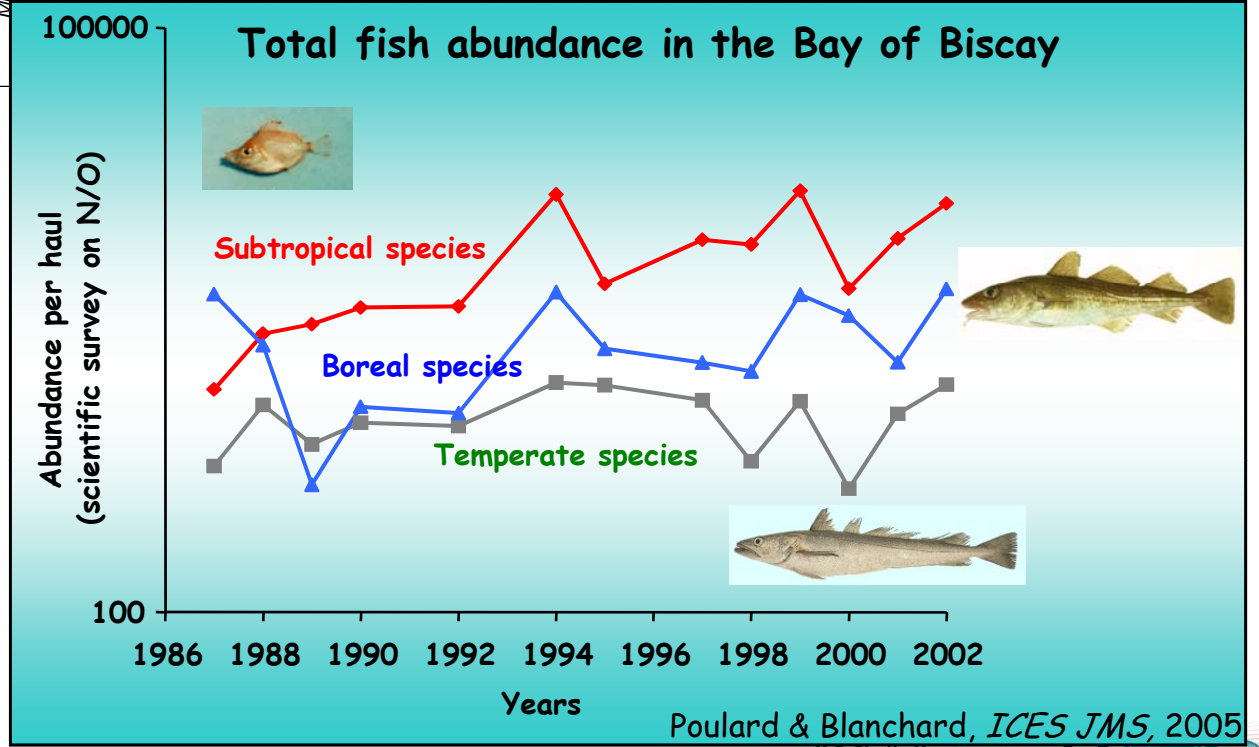
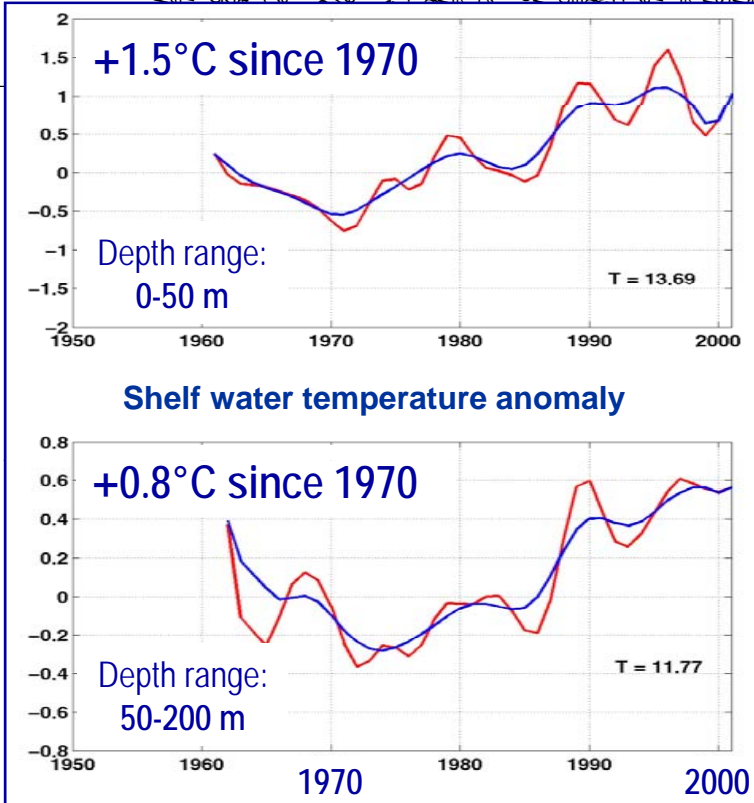
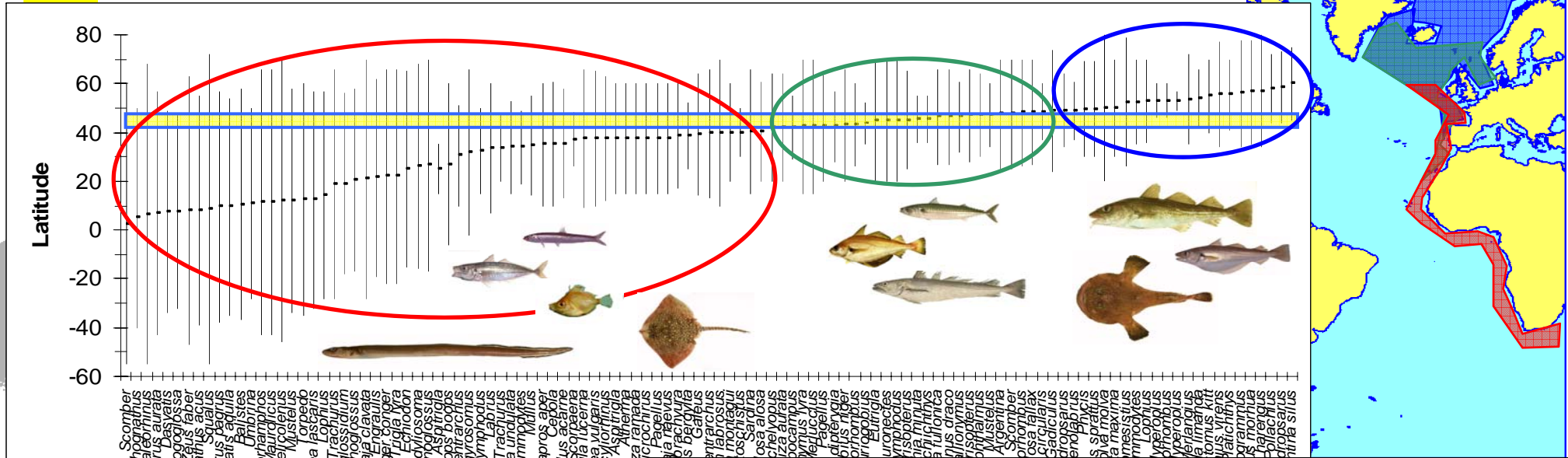


→ Highest prices achieved in the late 1980ies

→ Market crisis in early 1990ies (due to external factors)

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Key driver 3: Effects of the sea warming on the fish community structure

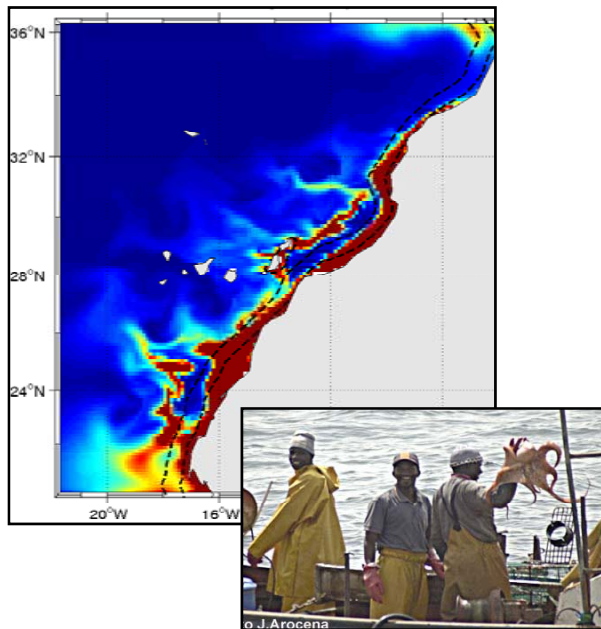


Blanchard & Vandermeirsch, 2005.

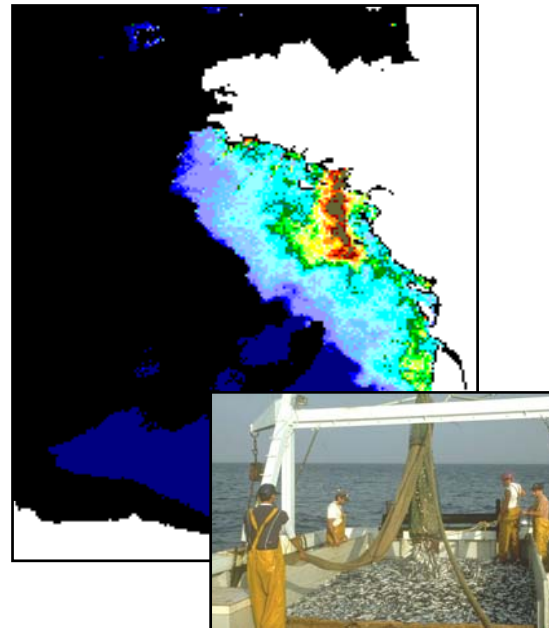
Poulard & Blanchard, ICES JMS, 2005

Perspectives → Compare trends across ecological-economic systems: the Chaloupe project

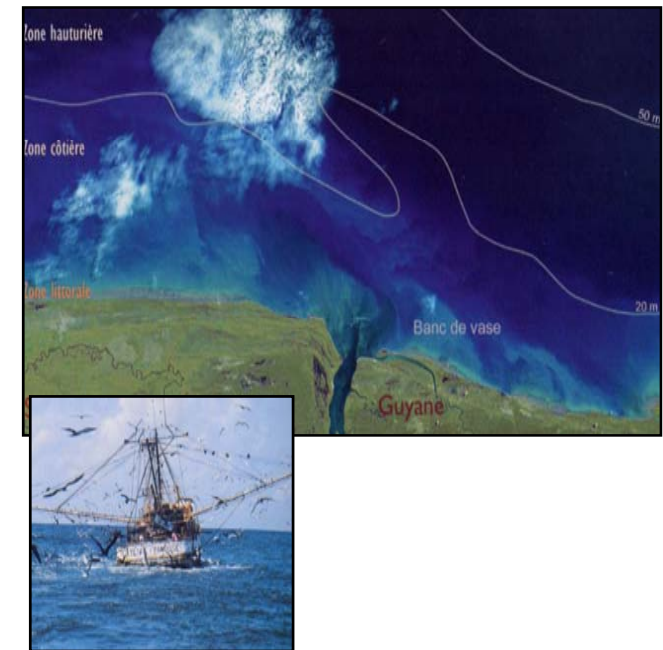
- identify the main drivers of bio-economic changes in three systems over the past decades
- develop integrated models of key processes
- assess the viability of fisheries



Moroccan upwelling area



Temperate continental shelf of the Bay of Biscay



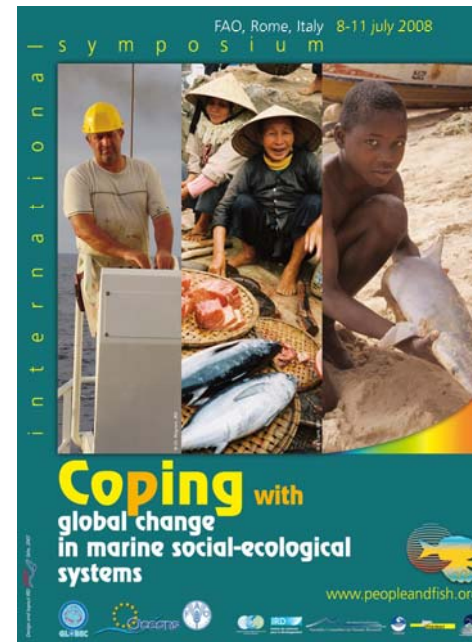
Amazonian continental shelf of the French Guyana

<http://www.projet-chaloupe.fr>

Thank you for your attention !

PROJET CHALOUPE

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marine exploitée et viabilité
des PEcheries**



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