

Viabilité économique des flottilles de pêche et Etat de l'écosystème : vers une évaluation conjointe – Une application au Golfe de Gascogne

An integrated assessment of the ecological and economical status of French fisheries in the Bay of Biscay

Fabienne Daurès, Marie-Joëlle Rochet,
Verena Trenkel and Sylvie van Iseghem
(Ifremer, France)

Fabienne.Daures@ifremer.fr

Our contribution to the Chaloupe project:

An integrated (inter disciplinary) assessment of the status of fisheries

Questions

- What is the influence of stock status on the performance and dynamics of fishing fleets?
- What is the influence of fleet dynamics on the dynamics of fish stocks?

Linking ecology and economy

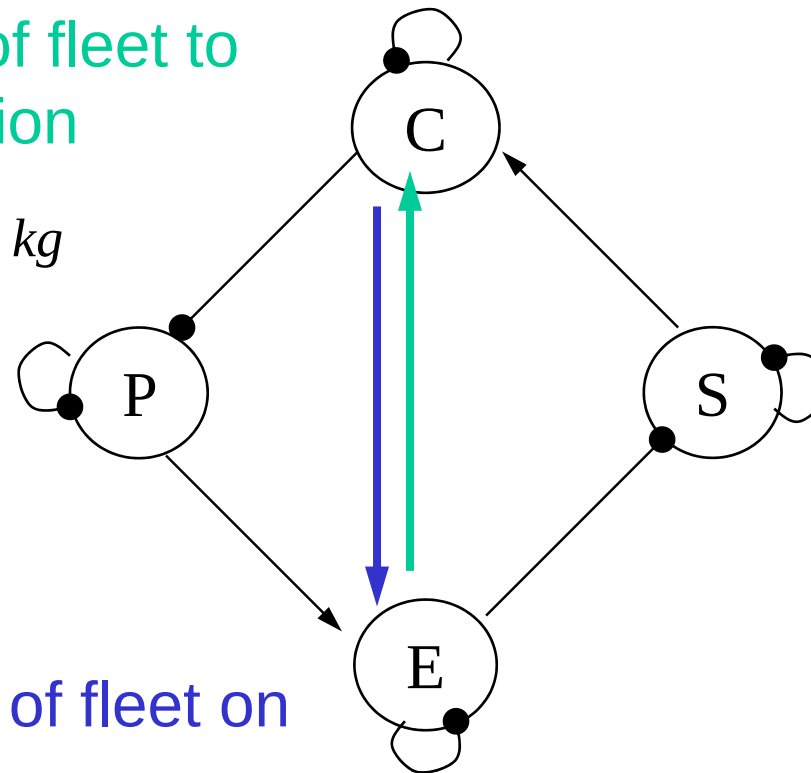
Conceptuel model for one stock and one fleet

Contribution of fleet to stock production

$$Co_{i,j} = \frac{C_{i,j}}{\sum_i C_{i,j}} \quad kg$$

Dependence of fleet on stock

$$De_{i,j} = \frac{C_{i,j}}{\sum_j C_{i,j}} \quad euros$$



S stock abundance

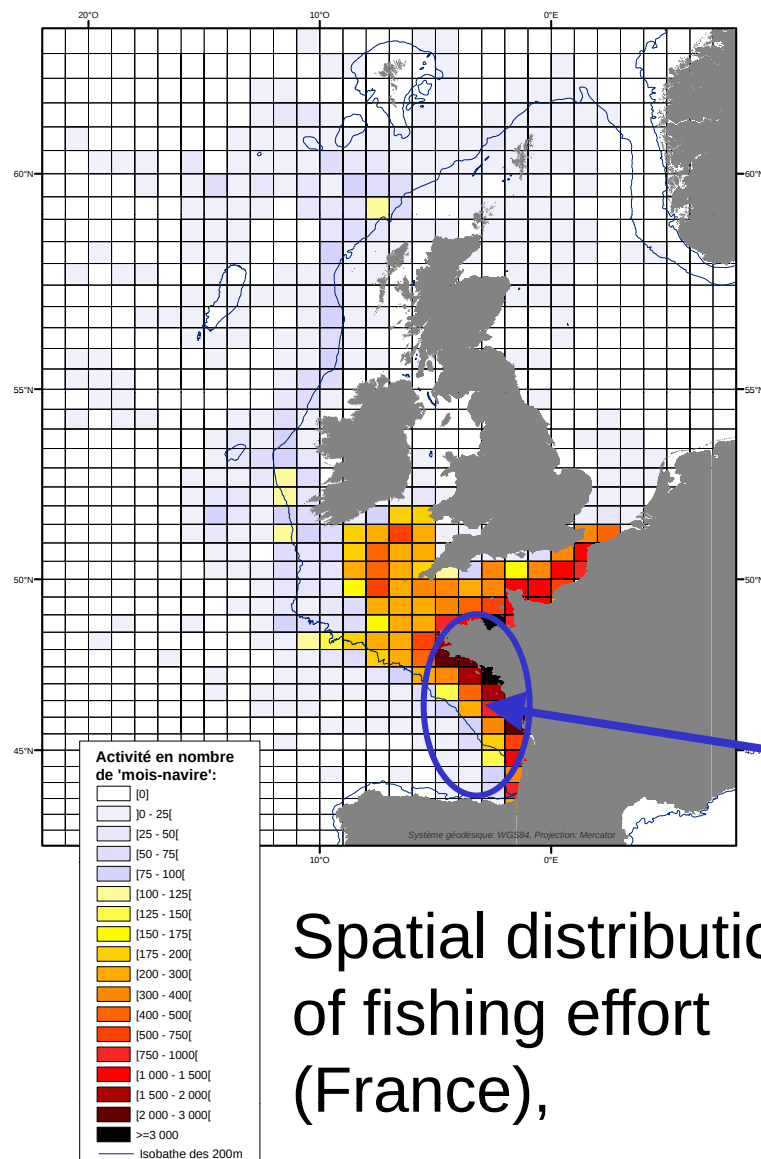
E fleet effort

C catch

P price

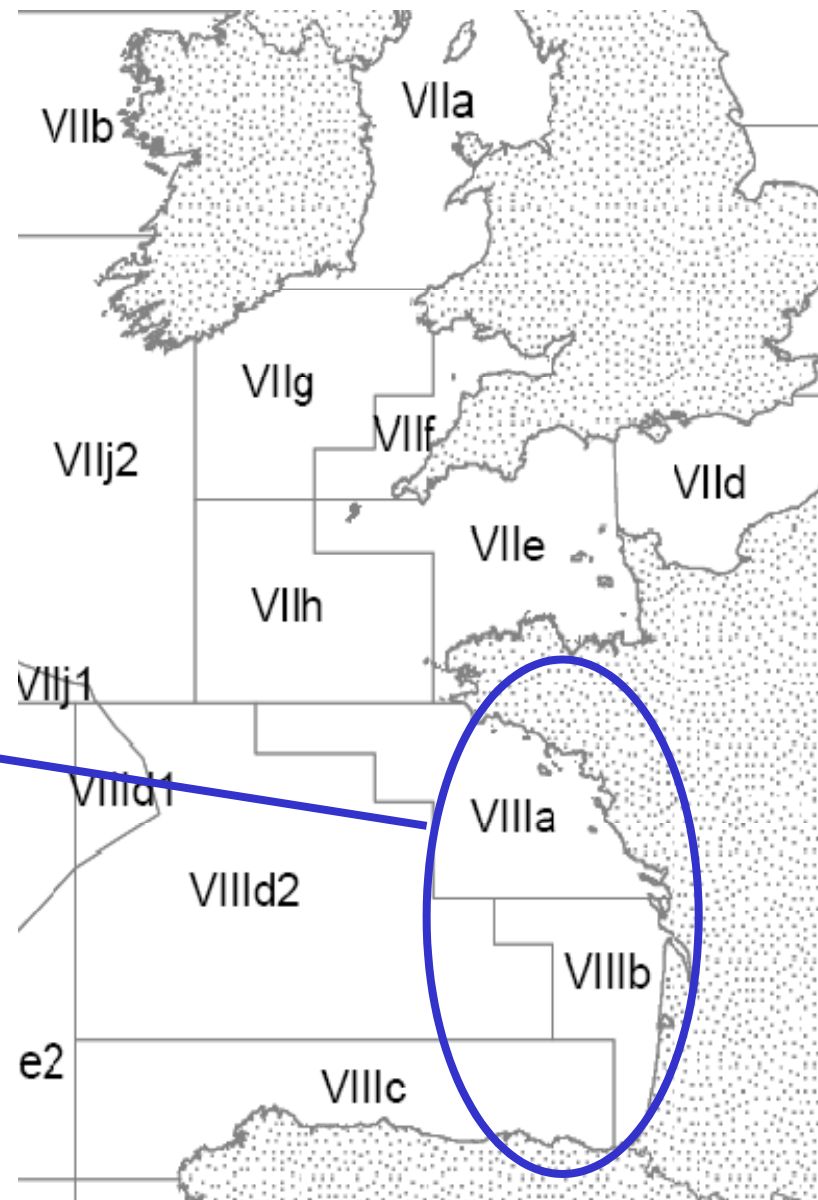
—● Negative impact
—→ Positive impact

Generalization to n stocks, p fleets
Application to the Bay of Biscay



Spatial distribution of fishing effort (France),

~1500 vessels, 200 species



The Bay of Biscay: ICES VIII a,b

French fisheries in the Bay of Biscay

Selecting stocks

- 9 species of both ecological and economic importance

anchovy, cuttlefishes (3), hake, Nephrops, monkfishes (2),
sardine, sea bass, sole, squids

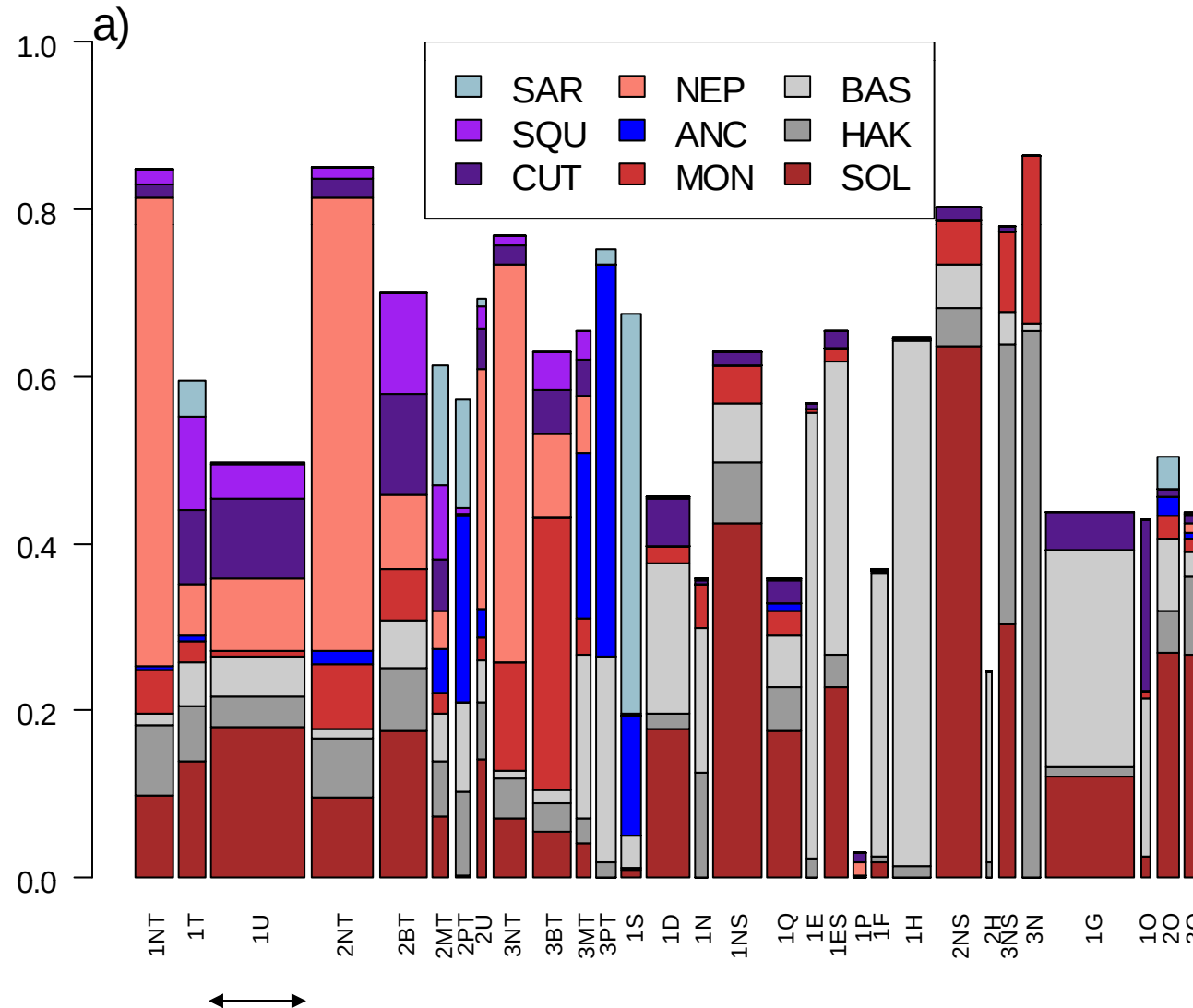
13 stocks, submitted to annual TAC

Defining fleets

- Technico-Economic criteria (input): vessel activity radius & gear
- Landings composition (output)

30 fleets + 1 group of inactive vessels

Fleet dependency to major species of the Bay of Biscay (2000-2006)

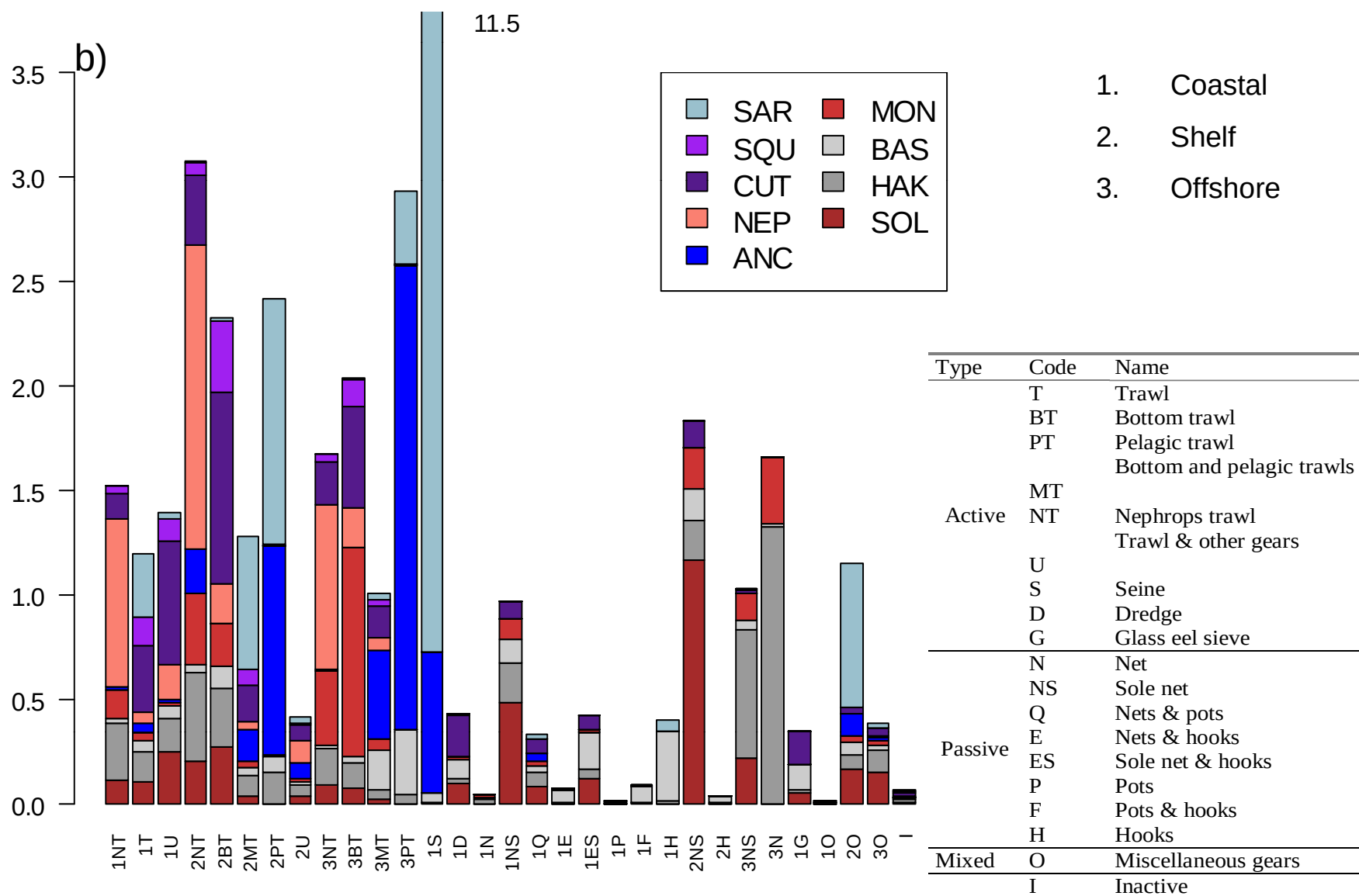


Type	Code	Name
Active	T	Trawl
	BT	Bottom trawl
	PT	Pelagic trawl
		Bottom and pelagic trawls
	MT	
	NT	Nephrops trawl
		Trawl & other gears
	U	Seine
	D	Dredge
	G	Glass eel sieve
Passive	N	Net
	NS	Sole net
	Q	Nets & pots
	E	Nets & hooks
	ES	Sole net & hooks
	P	Pots
	F	Pots & hooks
	H	Hooks
Mixed	O	Miscellaneous gears
	I	Inactive

1. Coastal
2. Shelf
3. Offshore

The bar widths are proportional to the total power of the fleets concerned (in kW).

Fleet contribution to the French landings of major species of the Bay of Biscay (1000t, 2000-2006)



Steps of an integrated assessment

- **Single component assessments**
 - Changes in fish stocks
 - Economic status of fishing fleets
- **Hypotheses tests of mutual impacts of stocks and fleets**

1. Single component assessments

Interpreting changes in fish stocks

Expected **impact** of fisheries on **stocks**

- Reduced fishing impact $N \nearrow$ AND $(l_{bar} \cup l_{75\%}) \nearrow$
- Increased fishing impact $N \searrow$ AND $(l_{bar} \cup l_{75\%}) \searrow$
- No change in fishing impact in all other cases

Expected **effect** of stock changes on **fisheries**

- Favourable if $N \nearrow$ OR $N \leftrightarrow \cap (l_{bar} \cup l_{75\%}) \nearrow$
- Detrimental if $N \searrow$ OR $N \leftrightarrow \cap (l_{bar} \cup l_{75\%}) \searrow$
- Neutral in all other cases

Stock indicators derived from survey data

N abundance; l_{bar} mean length; $l_{75\%}$ upper length quartile

Changes in fish stocks 1992-2006

Time period	Impact of fisheries on stocks	Effect of stock changes on fisheries
1992-2006	1 reduced 12 no change	1 detrimental 9 favourable 3 neutral
2004-2006	3 reduced 10 no change	4 favourable 6 neutral

Sea Bass

(+Benthos increase)

Anchovy

1. Single component assessments

Economic status of fishing fleets

Expected effect of economic status on fleet dynamics

- Increase of fleet capacity if $P \nearrow$ and $P > \text{ref}\%$
- Decrease of fleet capacity $P \searrow$ and $P < \text{ref}\%$
- No change in fleet composition in all other cases

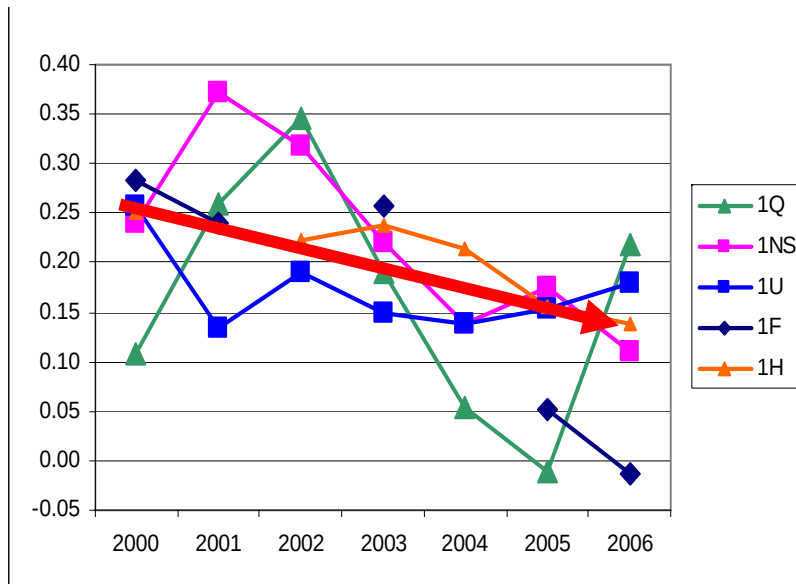
Fleet indicators derived from economic surveys

P net profit rate = net profit/capital invested

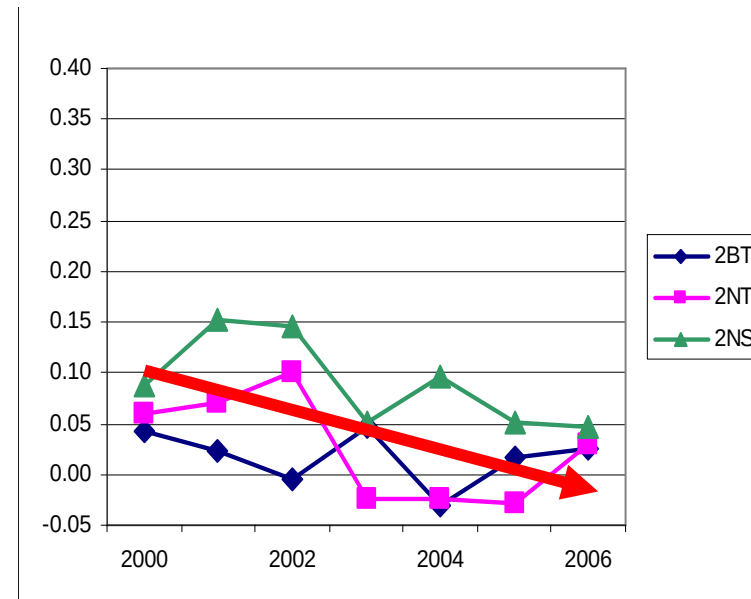
R net seaman salary (*recently introduced*)

Net profit rate

Coastal fleets



Shelf fleets



Type	Code	Name
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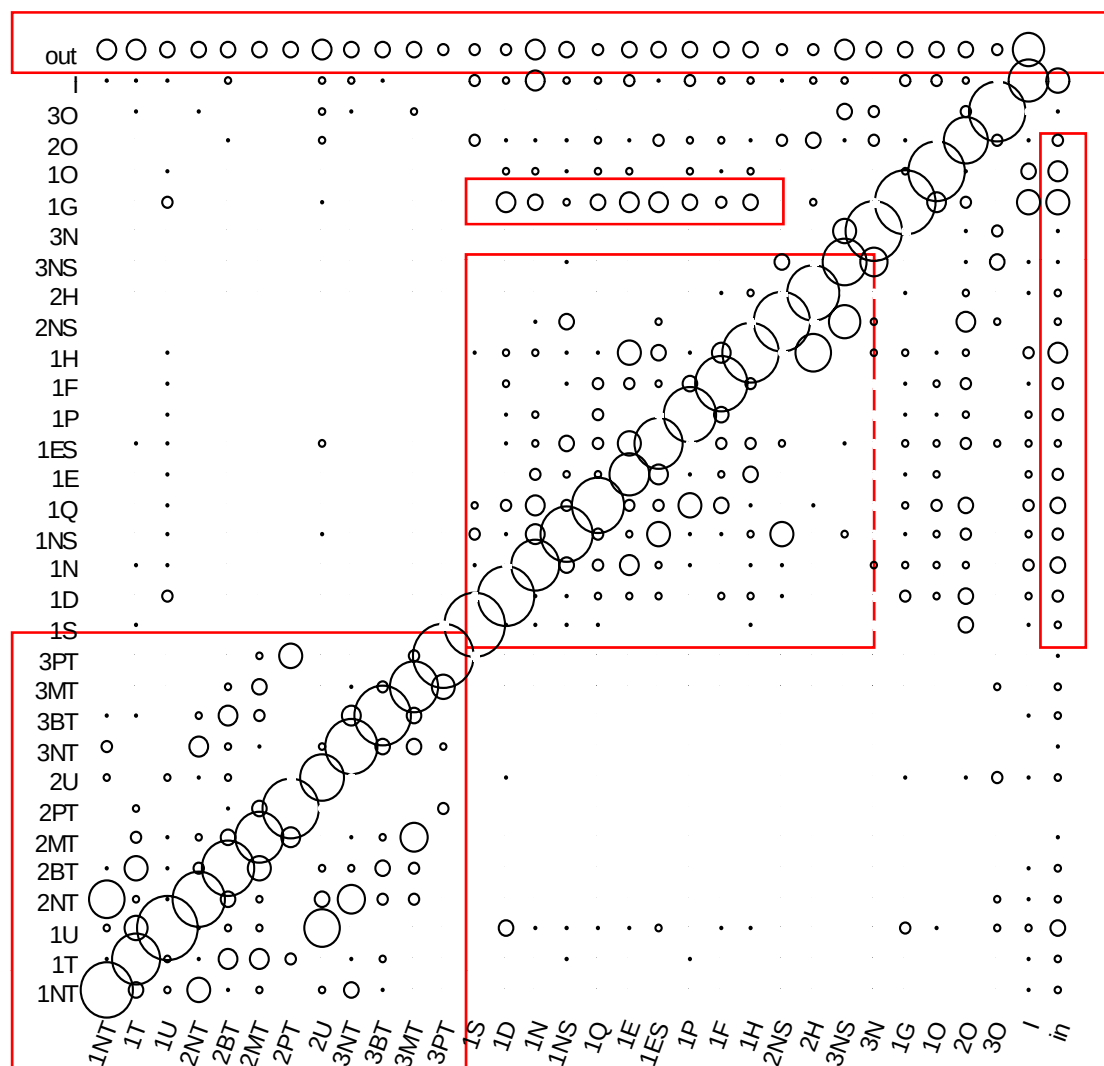
Assessment of economic status if :

- Fleet population ≥ 15 vessels (In average 2000-2006)
- Sample > 4 vessels (for each year)
- Sampling rate $\geq 10\%$ (In average over the period)

Source : SIH Ifremer, Economic surveys

Fishing fleet dynamics

mean



Flottilles chalutières

Flottilles Arts
dormants

Tamiseurs et Autres

➤ High fidelity to the belonging fleet (right hand diagonal)

➤ **Out** : all fleets are concerned
In: Coastal Passive gears

➤ Transitions between fleets occurred within the same gear class, changing the distance class (distance from the coast)

➤ Passive gears move to Glass sieves fleet

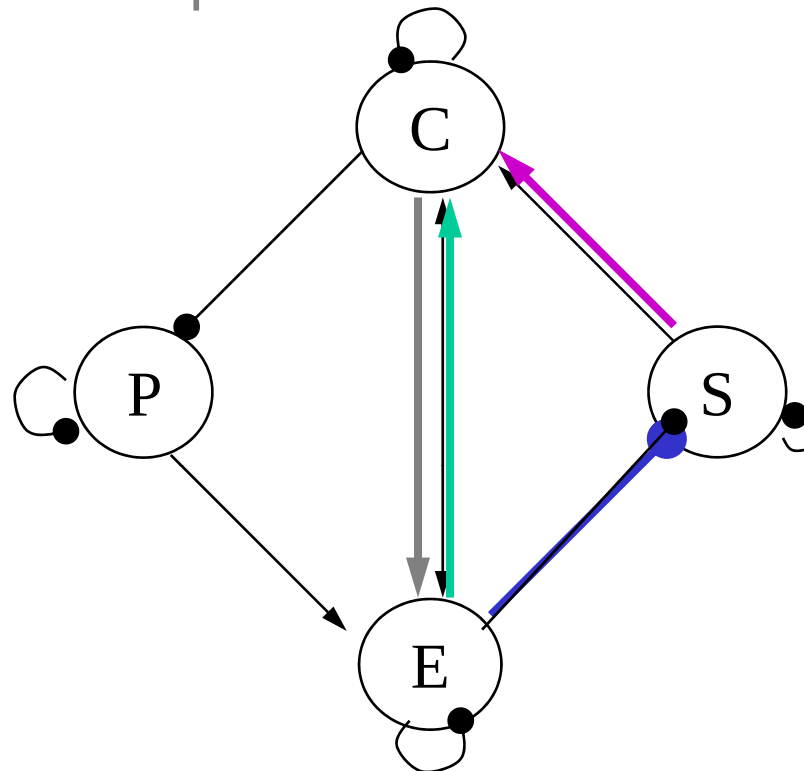
General decrease
in number of
vessels

2. Mutual impacts of stock and fleet dynamics

Hypotheses tests (in progress)

- H1) Increase in effort will negatively impact stocks
- H2) Increase effort will also increase catch
- H3) Stocks changes favourable to fishing will increase catch
- H4) Increased profit will increase effort...

Improvement
of the model
(Catch –
Effort –
Earnings –
Profit ...) –
*Multi stocks /
Multi fleets*



Regarding the
fleets and stocks
dynamics and the
relative changes in
contribution and
dependencies
during the period

3. Publications

- Daurès, F., M.-J. Rochet, S. Van Iseghem and V. Trenkel Fishing fleet typology, economic dependance, and species landing profiles of the French fleets in the Bay of Biscay, 2000-2006. Submitted.
- Rochet, M.-J., V. Trenkel, F. Daurès and S. Van Iseghem Qualitative modelling of fleet resource interactions. In preparation for submission.
- Daurès, F., S. Van Iseghem, E. Leblond and C. Brigaudeau Assessing the economic viability of the French fishing fleets in the Bay of Biscay from 2000-2007 In preparation.
- Daurès, F., M.-J. Rochet, V. Trenkel and S. Van Iseghem 2009. La pêche et les communautés démersales dans le Golfe de Gascogne - Prototype d'un tableau de bord. IFREMER. 7p.

Conferences : 2008 (IIFET, ASP), 2009 (ICES, AFH)

Merci de votre attention