Viabilité économique des flottilles de pêche et état de l' écosystème: vers une évaluation conjointe

Une application au golfe de Gascogne

Marie-Joëlle Rochet, Fabienne Daurès, and Verena Trenkel

Ifremer Nantes et Brest

CHALOUPE
SUPPORTED BY ANR

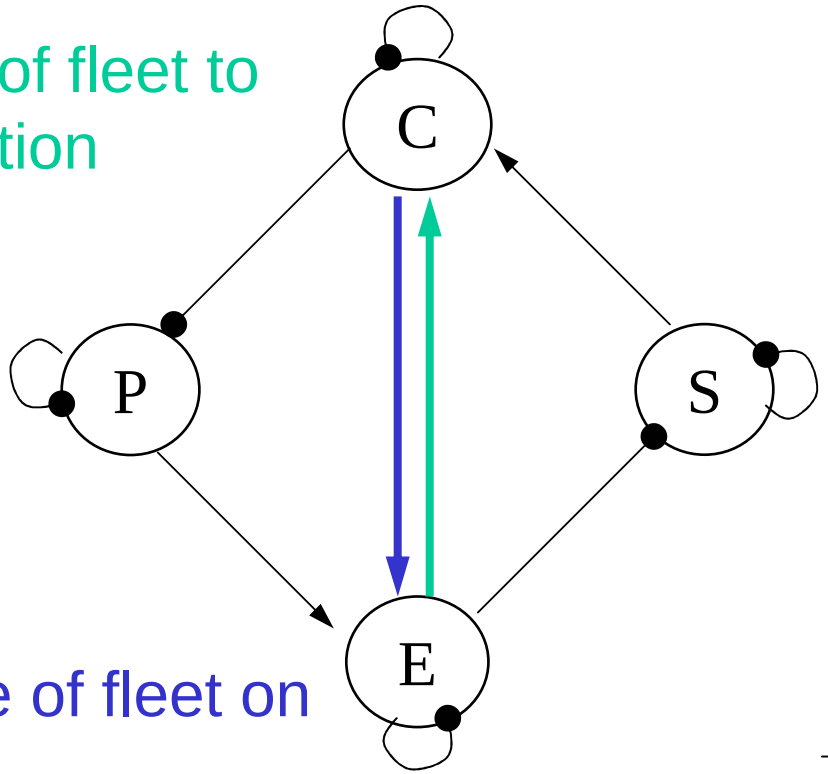
Questions

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

Linking ecology and economy

Conceptuel model for one stock and one fleet

Contribution of fleet to stock production



Dependence of fleet on stock

S stock abundance
E fleet effort
C catch
P price

Negative impact
Positive impact

French fisheries in the Bay of Biscay

Selecting stocks

- species of both ecological and economic importance

anchovy, cuttlefishes, hake, Nephrops, monkfishes, pilchard, sea bass, sole, squids

Defining fleets

- Economic input criteria: vessel activity radius & fishing gear

31 fleets

Steps of an integrated assessment

- **Single component assessments**
  - Changes in fish stocks
  - Status of fishing fleets
- **Analysis of links between components**
  - Fleet contributions to fish landings
  - Fleet dependencies on stocks
- **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 ↗ AND ($l_{bar} \cup l_{75\%}$) ↗
- Increased fishing impact N ↘ AND ($l_{bar} \cup l_{75\%}$) ↘
- No change in fishing impact in all other cases

Expected effect of stock changes on fisheries

- Favourable if N ↗ OR N ↔∩ ($l_{bar} \cup l_{75\%}$) ↗
- Detrimental if N ↘ OR N ↔∩ ($l_{bar} \cup l_{75\%}$) ↘
- Neutral in all other cases

Stock indicators

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

Changes in fish stocks 1992-2006

Time period	Impact of fishing	Effect 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

1. Single component assessments

Economic status of fishing fleets

Expected effect of economic status on fleet dynamics

- Increase of fleet capacity P > ref% AND R > ref salary
- Decrease of fleet capacity P < ref% AND R << ref salary
- 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

Economic status of fleets 2000 - 2006

Net profit rate

reference value 4% for mixte and offshore & 12% for coastal

Decrease in net profit →

Fleet	2000	2001	2002	2003	2004	2005	2006
Trawlers - Coastal							
Trawlers - Mixed							
Trawlers - Offshore							
Seiners - Coastal							
Dredgers - Coastal							
Netters - Coastal							
Other Passive - Coastal							
Netters - Mixed							
Glass eel - Coastal							

% of vessels above the reference value in the considered fleet and year						
<30%	30-40	40-50	50-60	60-70	70-80%	>80%
Bad situation						**Good situation**

Economic status of fleets 2000 - 2006

Net seaman salary

reference value depends of fleet

Slight increase or stability in salaries →

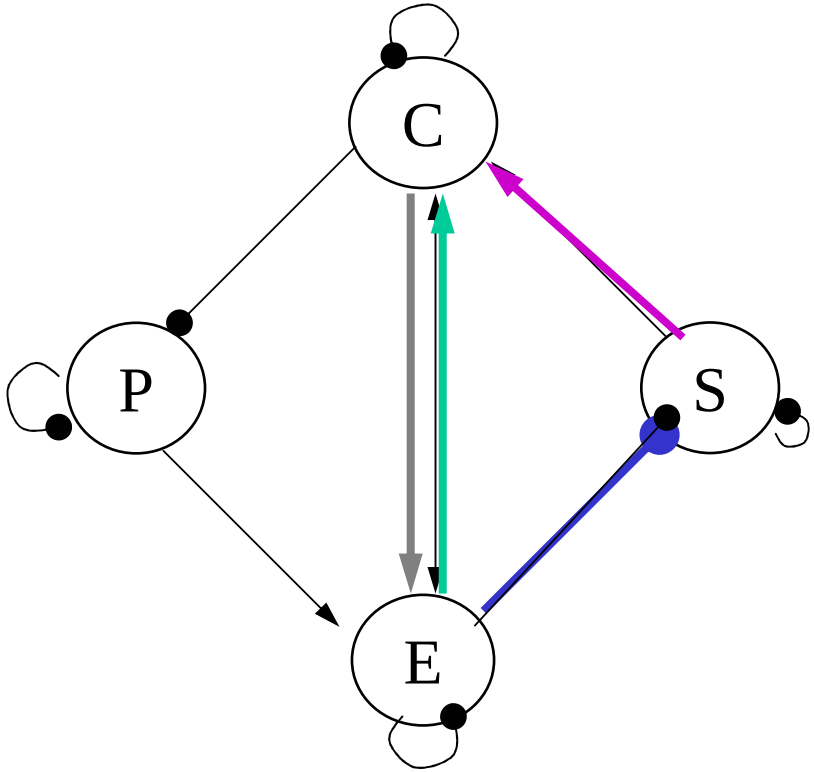
Fleet	2000	2001	2002	2003	2004	2005	2006
Trawlers - Coastal							
Trawlers - Mixed							
Trawlers - Offshore							
Seiners - Coastal							
Dredgers - Coastal							
Netters - Coastal							
Other Passive - Coastal							
Netters - Mixed							
Glass eel - Coastal							

% of vessels above the reference value in the considered fleet and year						
<30%	30-40	40-50	50-60	60-70	70-80%	>80%
Bad situation						Good situation

2. Mutual impacts of stock and fleet dynamics

Hypotheses tests

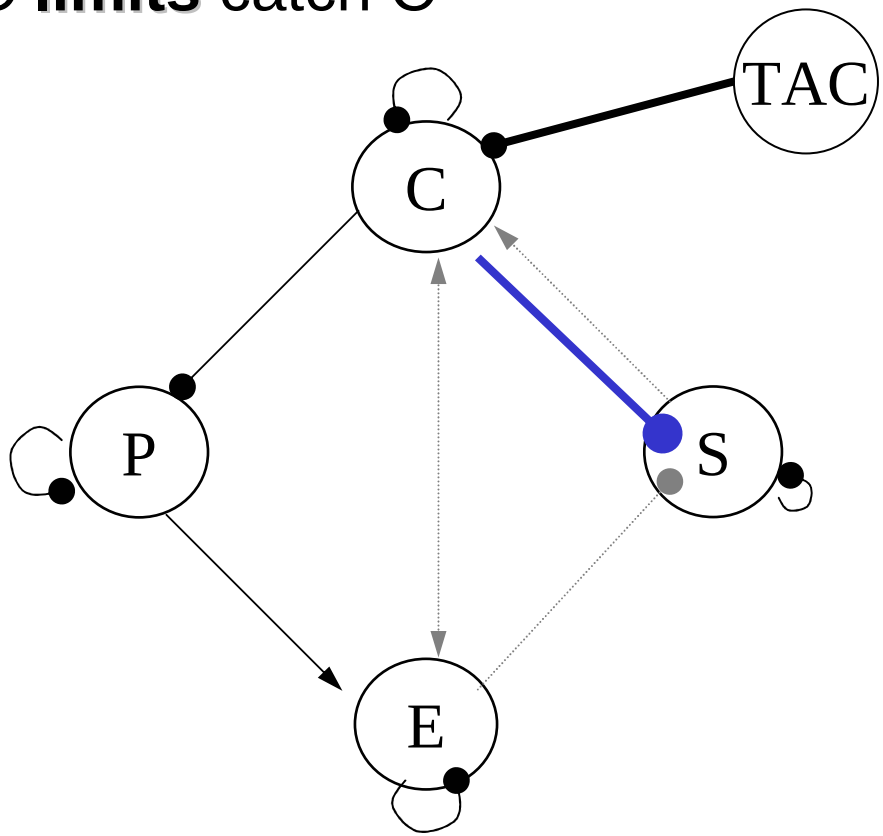
- H1) Changes in effort E drive stock changes S — No
- H2) Changes in effort E on stock S drive catch C — No
- H3) Changes in stock S determine catch C — No
- H4) Changes in catch C drive effort E — neg. corr.



Additional hypotheses

- Ha) Changes in catch C **drive** stock changes S

- Hb) TAC **limits** catch C



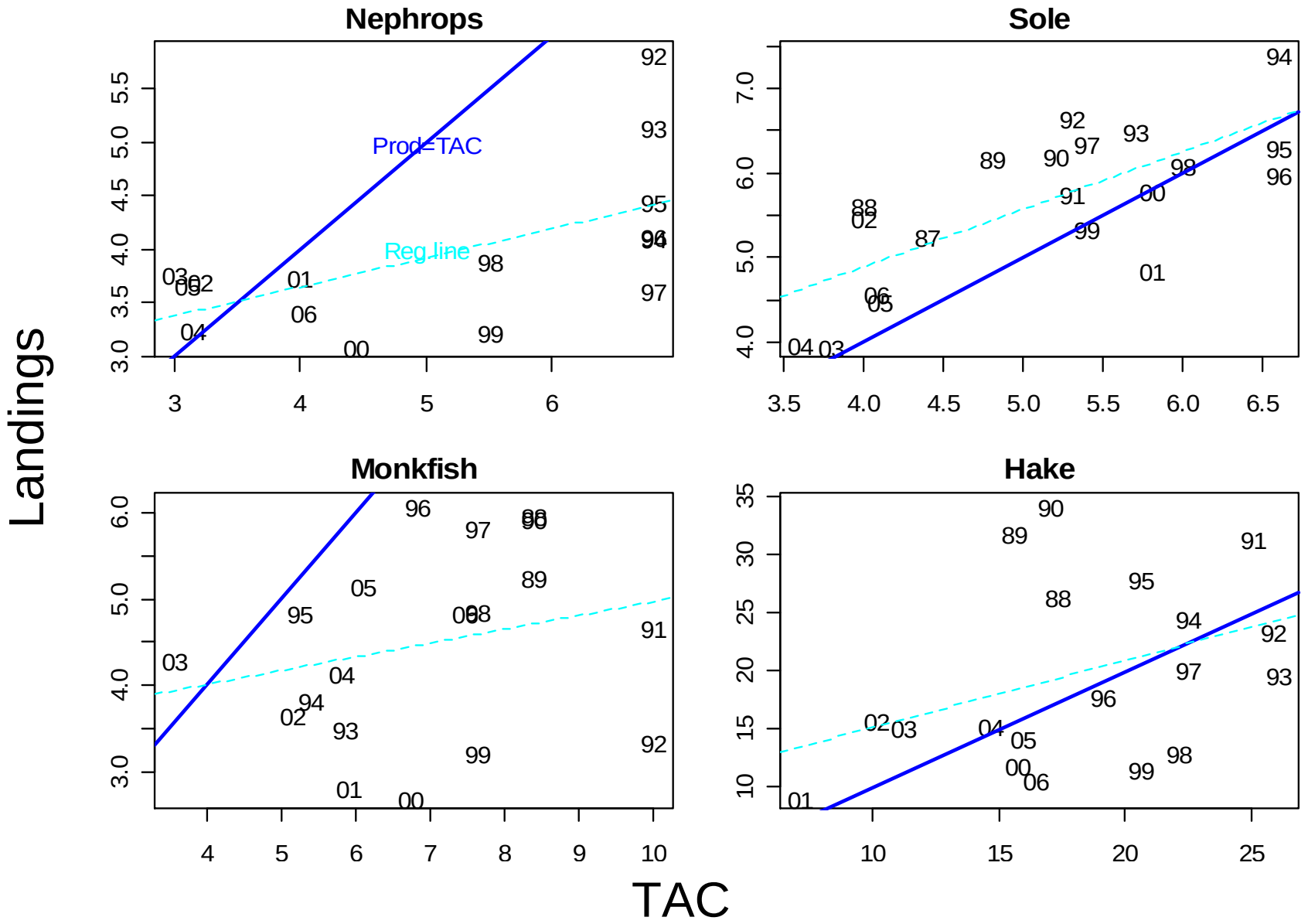
Ha) Changes in total fleet production between t-1 and t drive stock changes during same period

Some evidence

No species×year	Production ↘	Production ↗
Biomass ↘	10	17
Biomass ↗	17	11

- **Gtest: 3.031, P = 0.0817**

Hb) TAC is related to landings C (but does not limit C!)



Conclusions

In the Bay of Biscay during 2000-2006

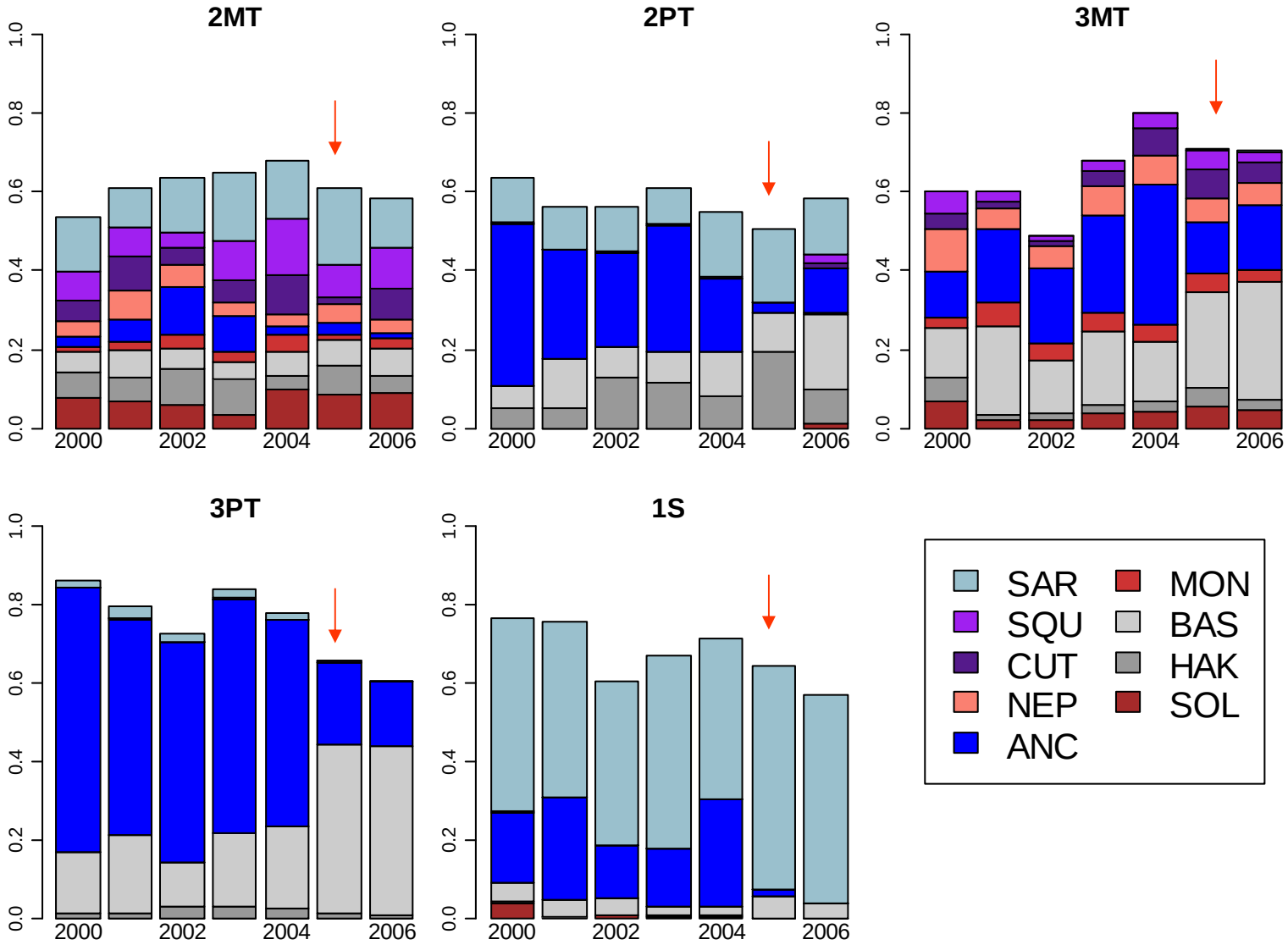
- The impact of fishing on 9 important stocks remained stable or decreased slightly, due to decreased (French) fleet size and perhaps TAC being limiting
- Stock dynamics seemed to have had little direct impact on fleet dynamics

Explanation: larger management context and shorter (within year) and longer time frames determine fleet dynamics

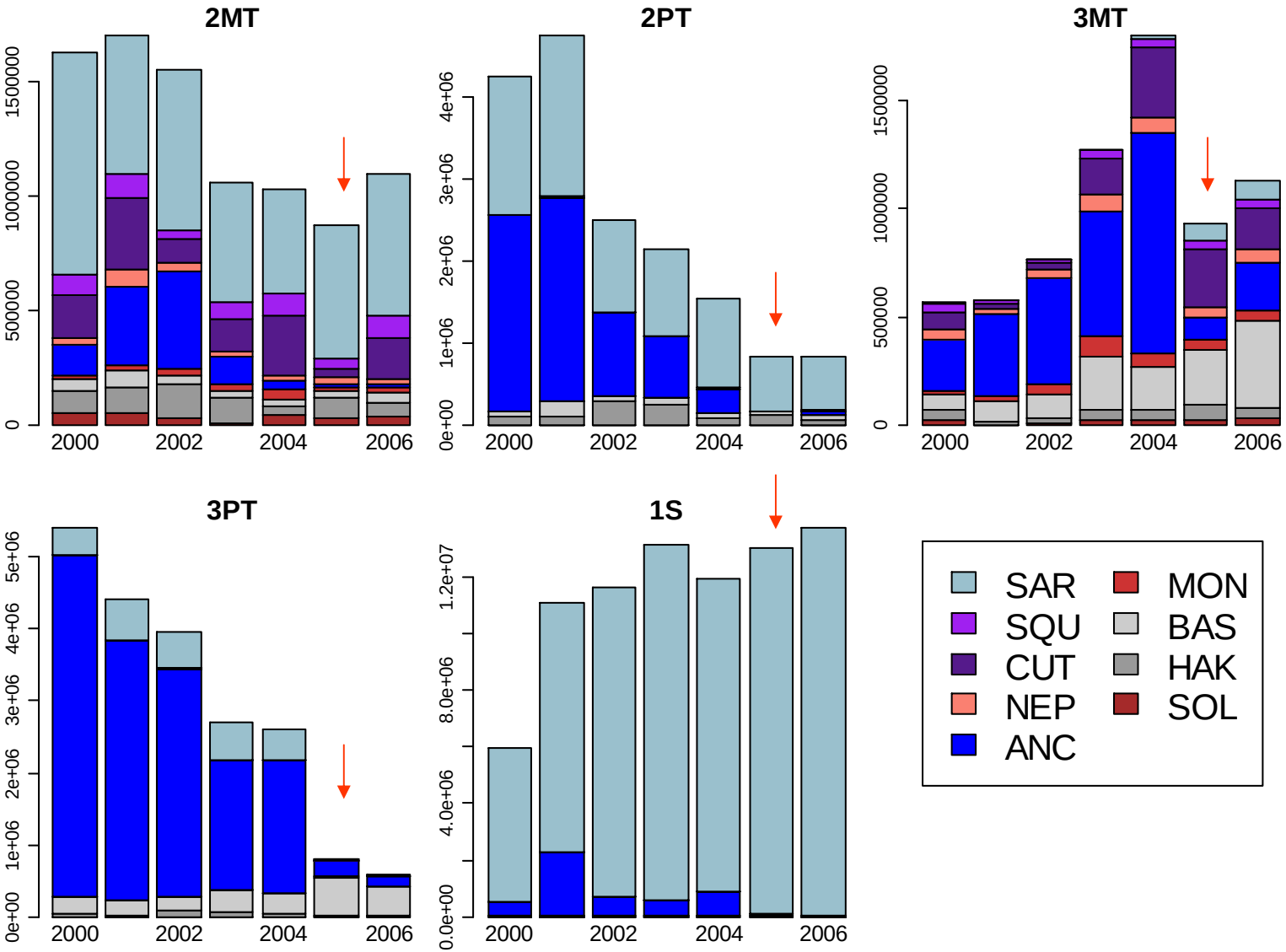
Example closure of anchovy fishery

Economic effect of anchovy closure from 2005

Proportion of revenue derived from different species by fleet



Fleet production changes



Fleet dynamics effect of anchovy closure

leaving Bay of Biscay

moving offshore (>12 nm)

adding bottom trawl