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

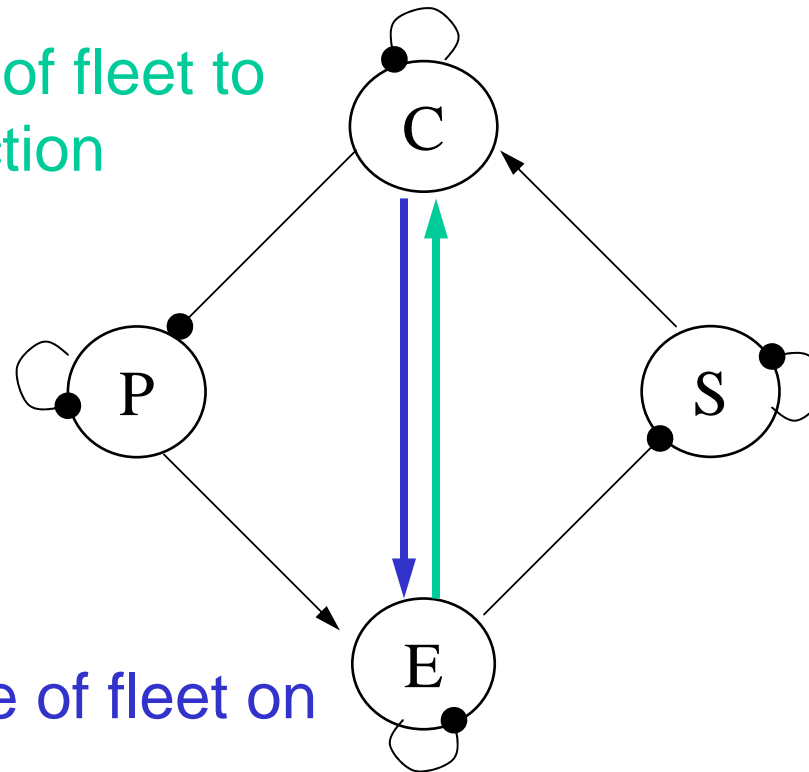**Fabienne Daurès,Marie-Joëlle Rochet and Verena Trenkel**

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CHALOUPE

SUPPORTED BY
ANR

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

C

P

S

E

Negative impact
Positive impact

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French fisheries in the Bay of Biscay

Selecting stocks
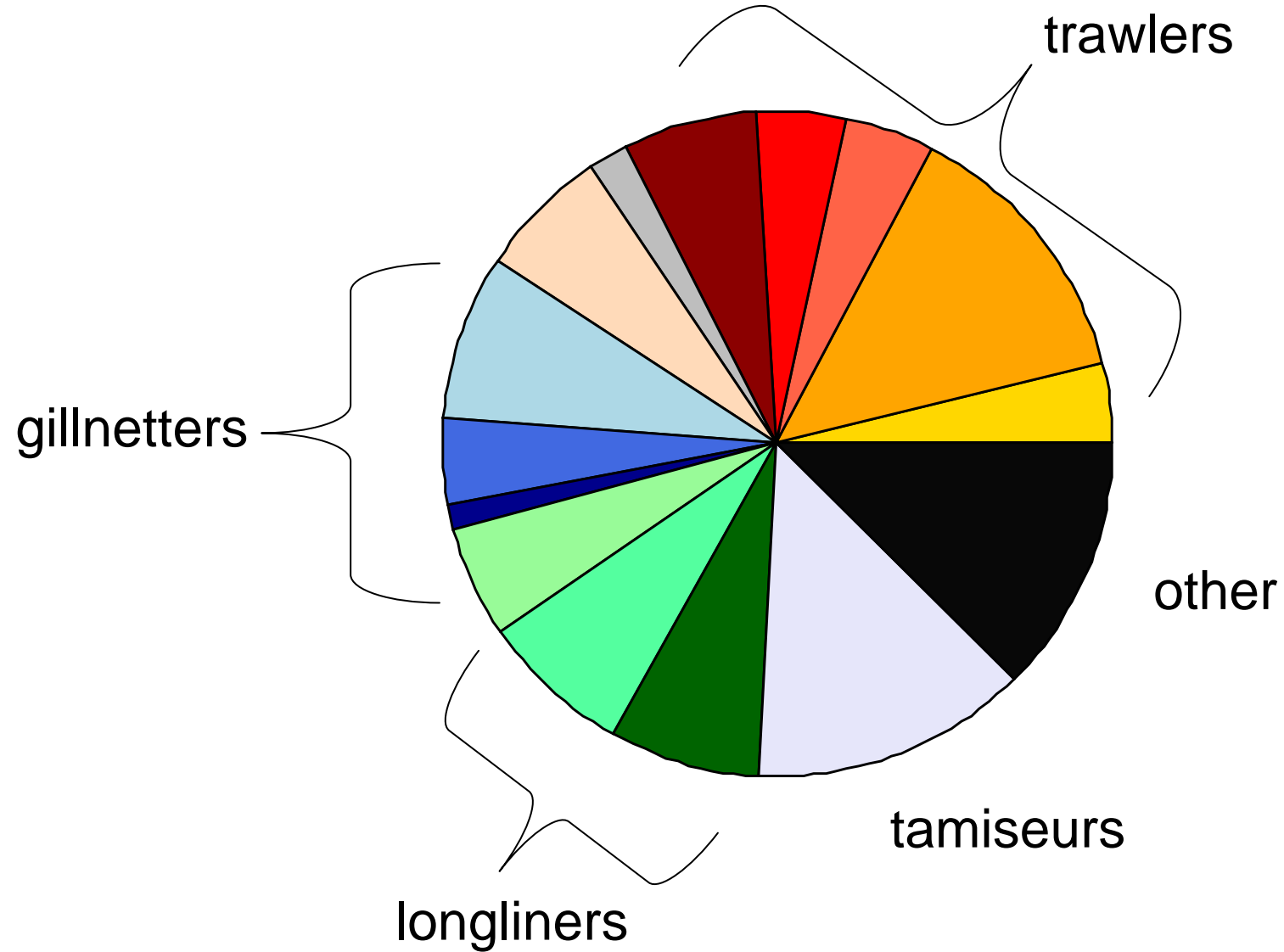
➢ species of both ecological and economic importance

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

Defining fleets

➢ Economic criteria (input): vessel activity radius & gear

➢ Landings composition (output)

15 fleets

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Number of vessels: 1422 in 2006

trawlers

gillnetters

other

tamiseurs

longliners

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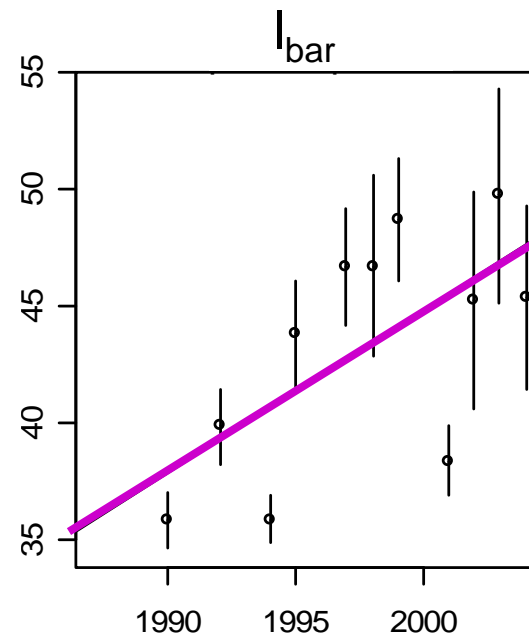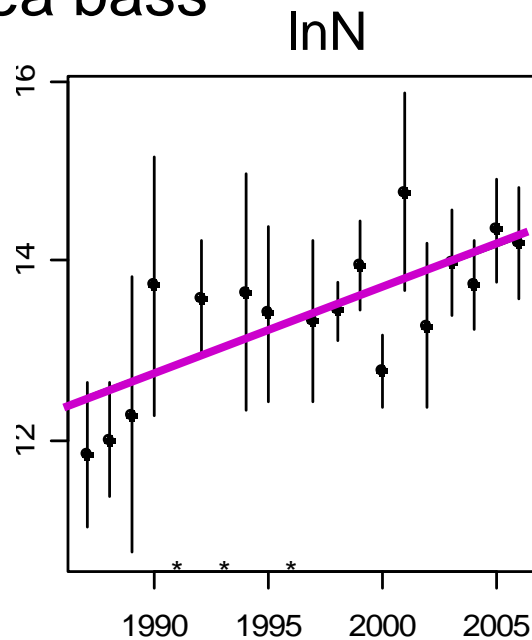- Neutral in all other cases

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

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Changes in fish stocks 1992-2006

Stock	LnN	Lbar	L75%	Stock effect on fleets	Fleet impact on stock
sea bass	↗	↗	↗	favourable	decreased
pilchard	↗	⇔	⇔	favourable	stable

sea bass

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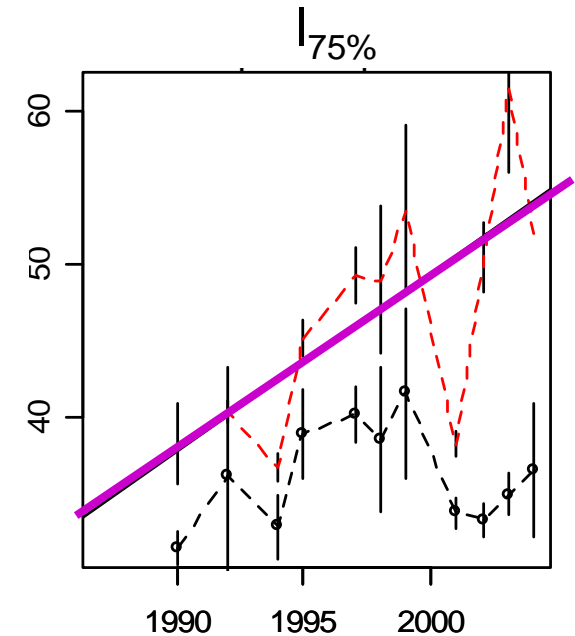
1. Single component assessments
Economic status of fishing fleets

Expected effect of economic status on fleet dynamics

➢ Increase of fleet capacity P > 8% AND R > ref salary

➢ Decrease of fleet capacity P < 4% AND R << ref salary

➢ No change in fleet composition in all other cases

Fleet indicators
P net profit rate; *R* revenue of seaman

Economic status of fleets in 2000 and 2006

		2000		2006	
Gear	**Radius**	**Net profit**	**Seaman salary**	**Net profit**	**Seaman salary**
Trawlers	coastal		🟩		
	mixte				🟥
	offshore	🟥			
Seiners	coastal				🟥
Dredgers	coastal				
Gillnetters	coastal				
	mixte				
	offshore				
Dor???	coastal				
Tamisseurs	coastal		🟩	🟥	

🟥 Decrease of fleet capacity expected

🟩 Increase of fleet capacity expected

1. Single component assessments
Fishing fleet dynamics

gillnetters mixte
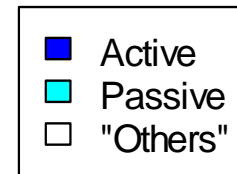
beach seines
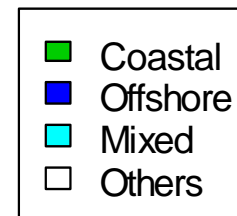
General
decrease in
number of
vessels
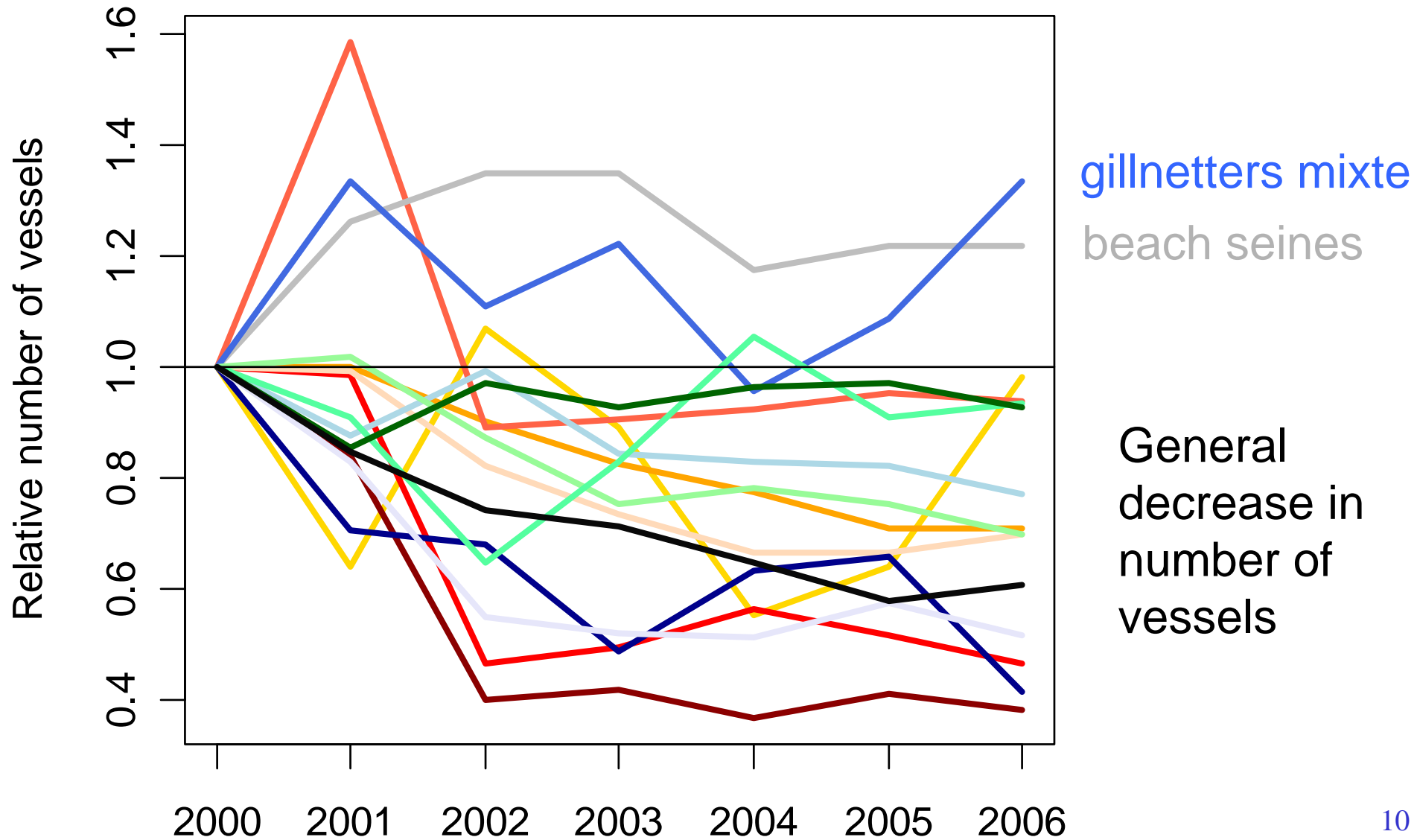
2. Analysis of links between components
Contribution of fleets to landings

Gear type
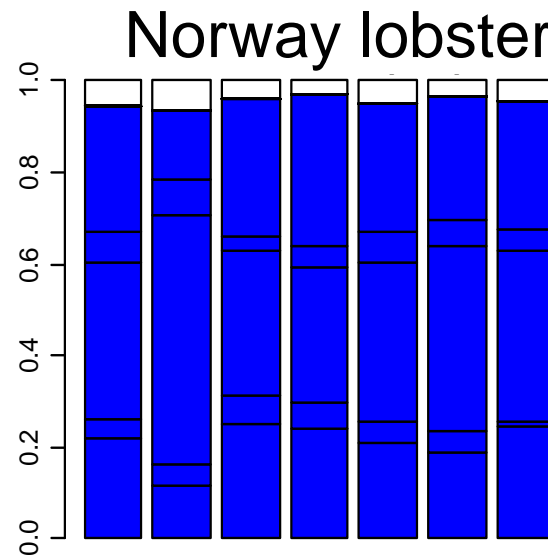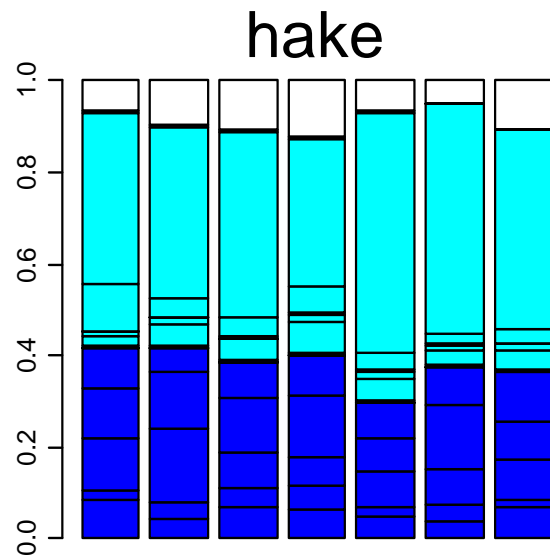
- ■ Active
- ■ Passive
- □ "Others"
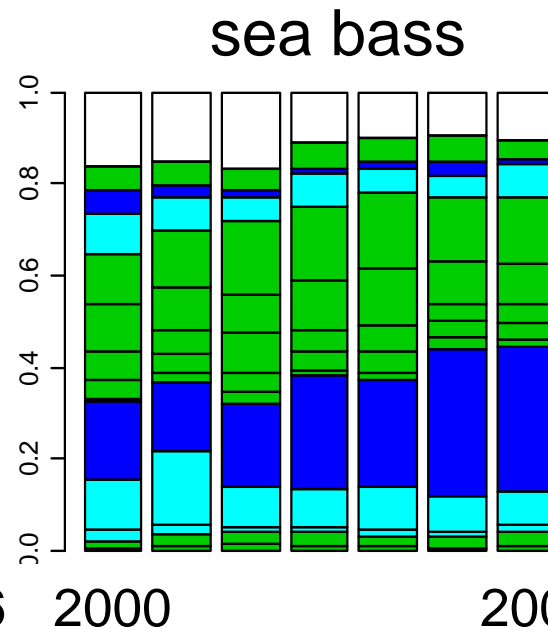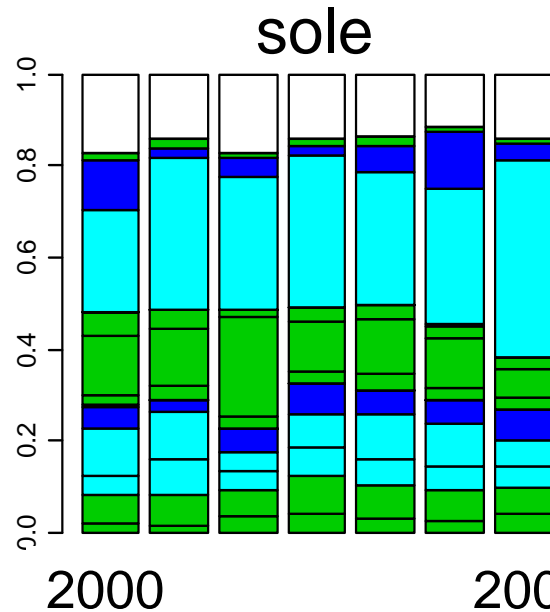
Activity radius
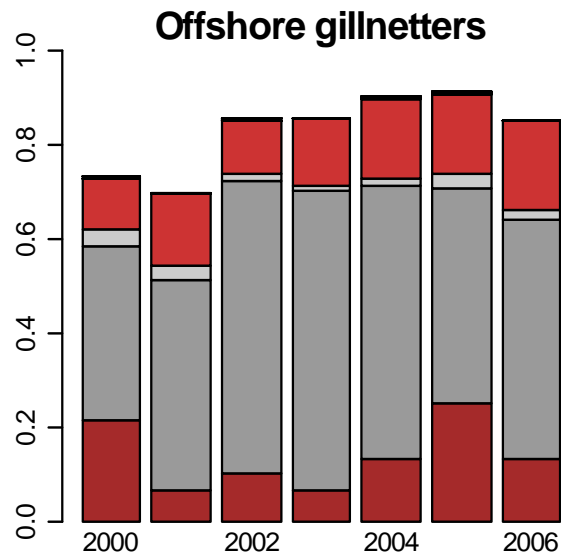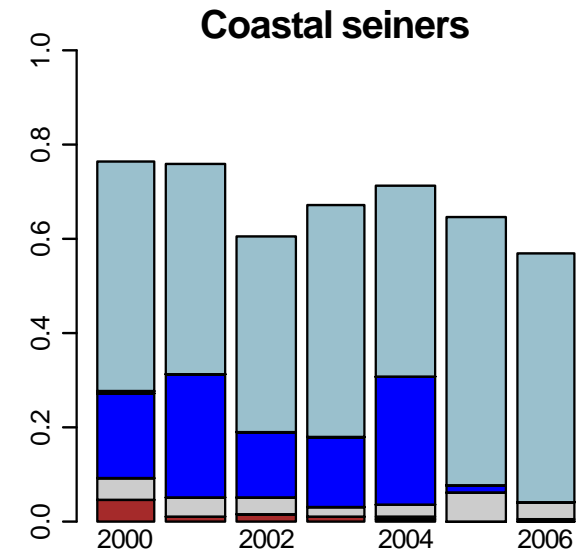
- ■ Coastal
- ■ Offshore
- ■ Mixed
- □ Others

coastal < 12 nm

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2. Analysis of links between components
Dependence of fleets on stocks

Legend:
- Sardine
- Squid
- Cuttlefish
- Nephrops
- Anchovy
- Monkfish
- Bass
- Hake
- Sole
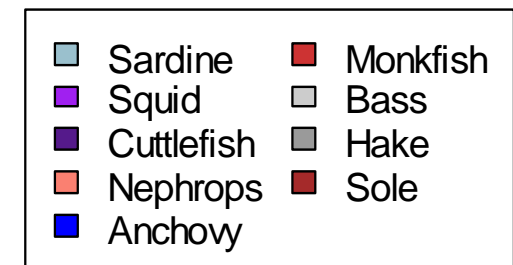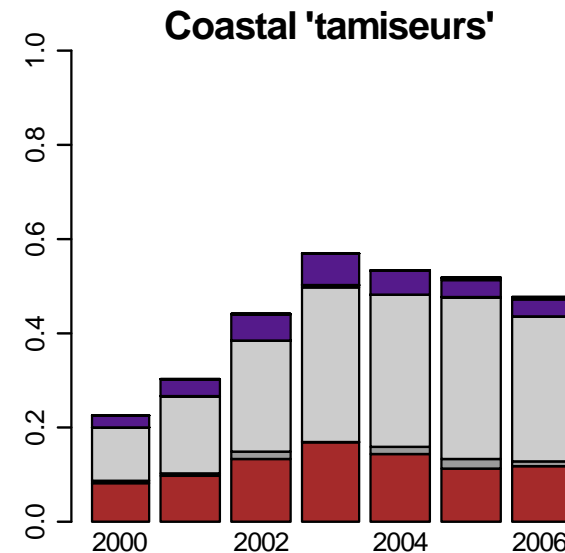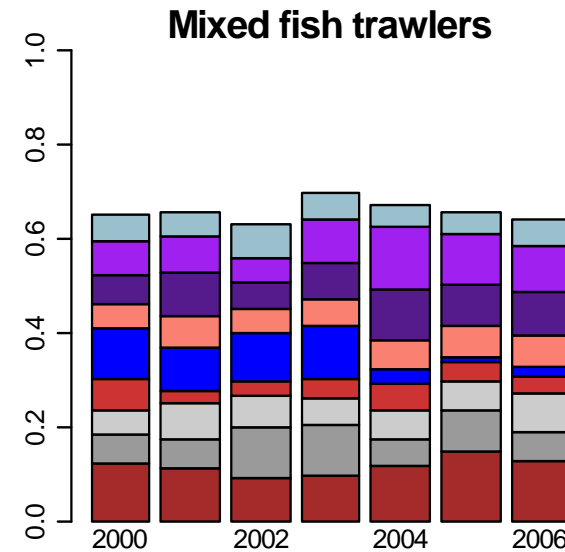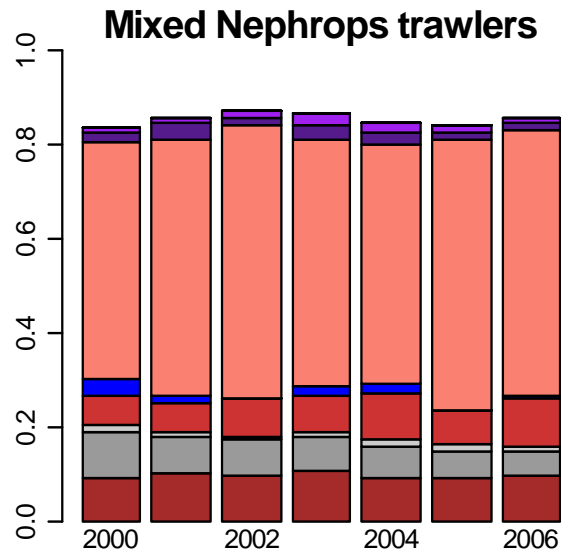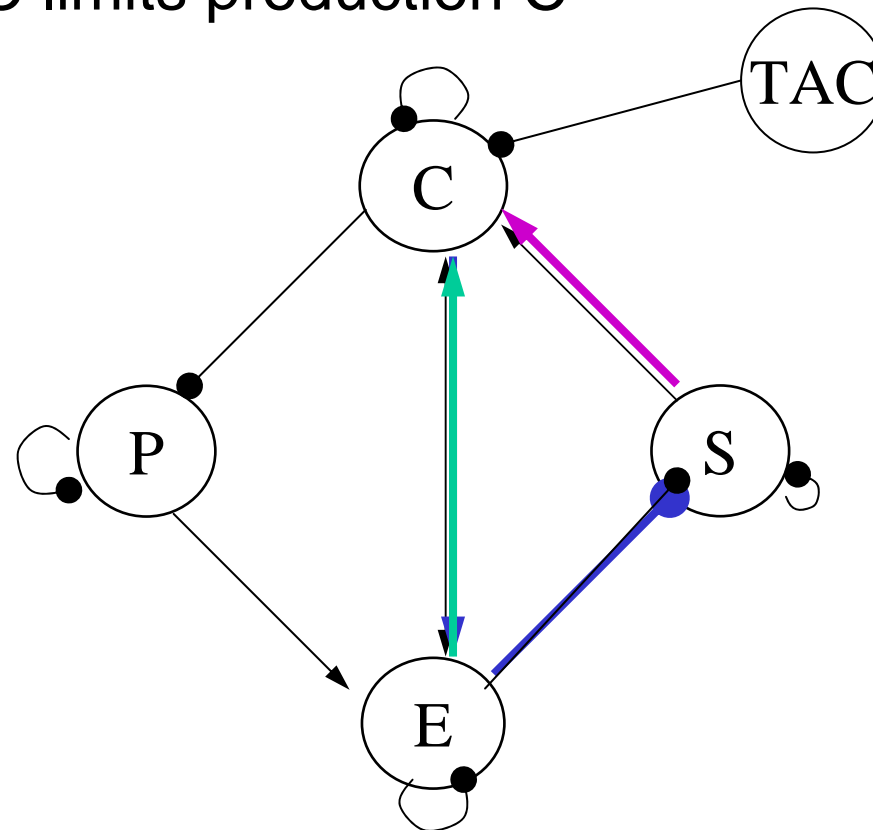
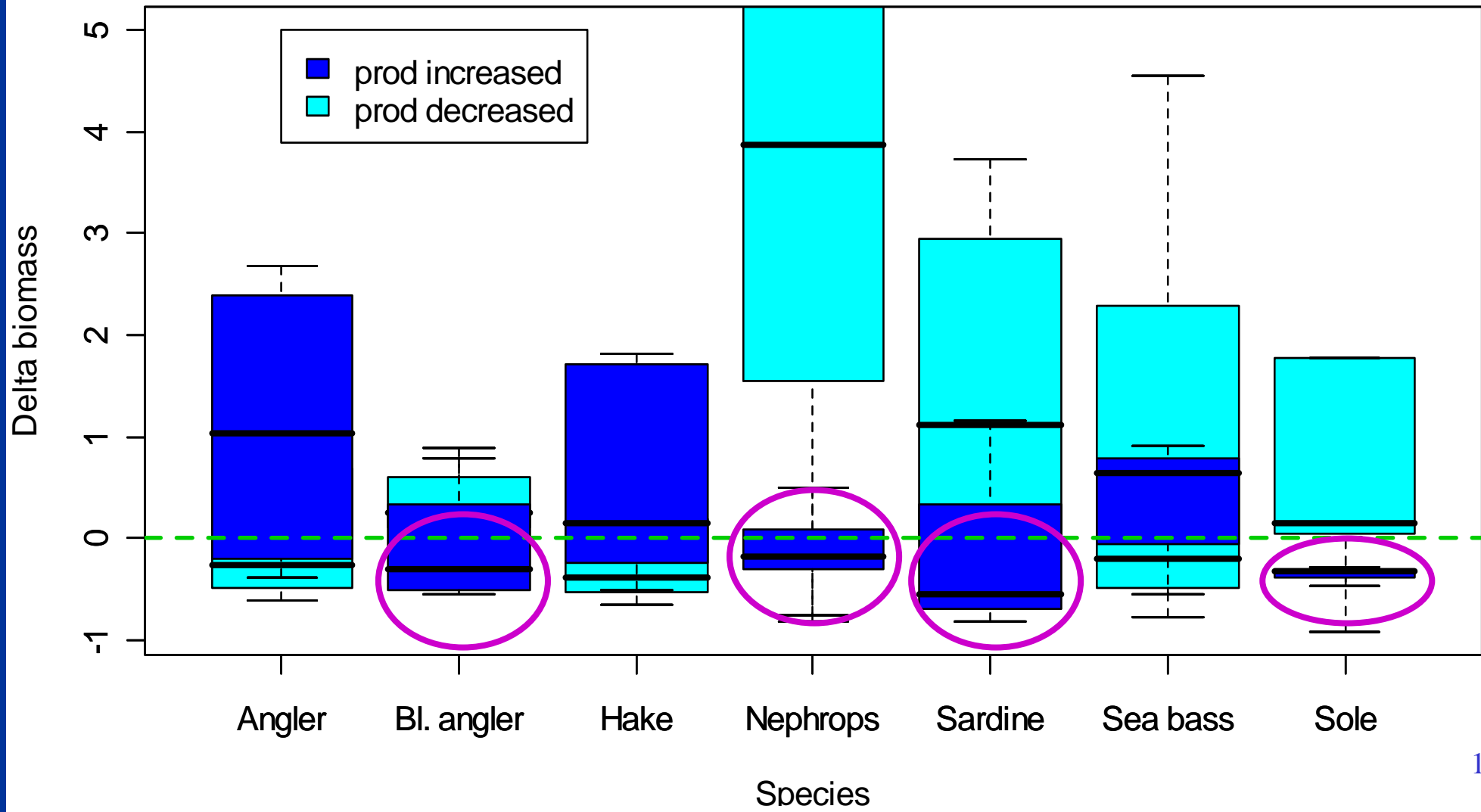# 3. Mutual impacts of stock and fleet dynamics
Hypotheses tests

➢ H1) Changes in catch C drive stock changes S

➢ H2) Changes in effort E drive catch C

➢ H3) Changes in stock S determine production C

➢ H4) TAC limits production C

Test results
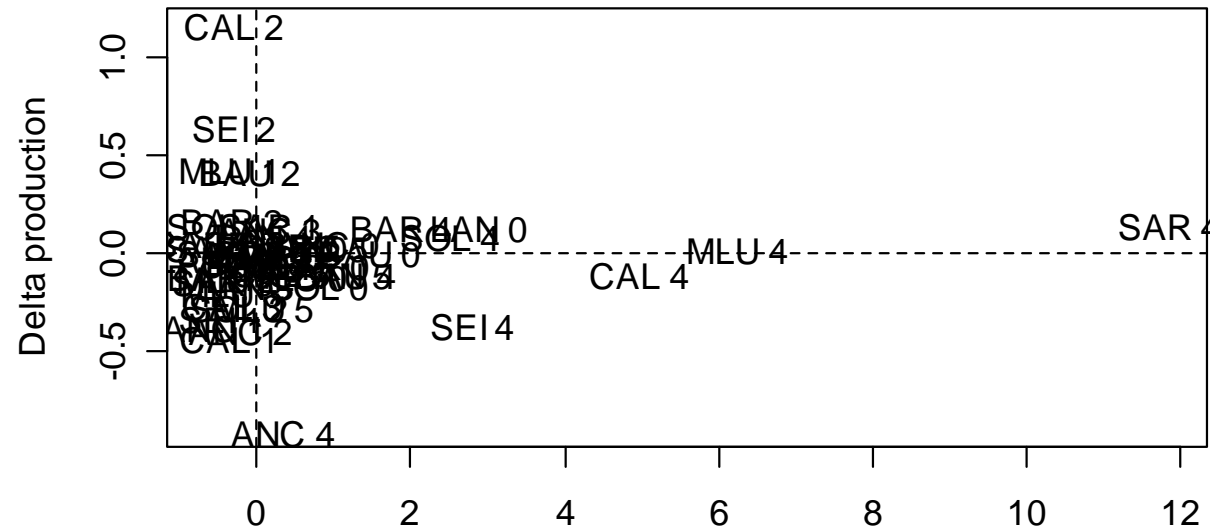## H1) Changes in fleet production between t-1 and t drive stock changes during same period

H1) Changes in total fleet production between t-1 and t drive stock changes during same period

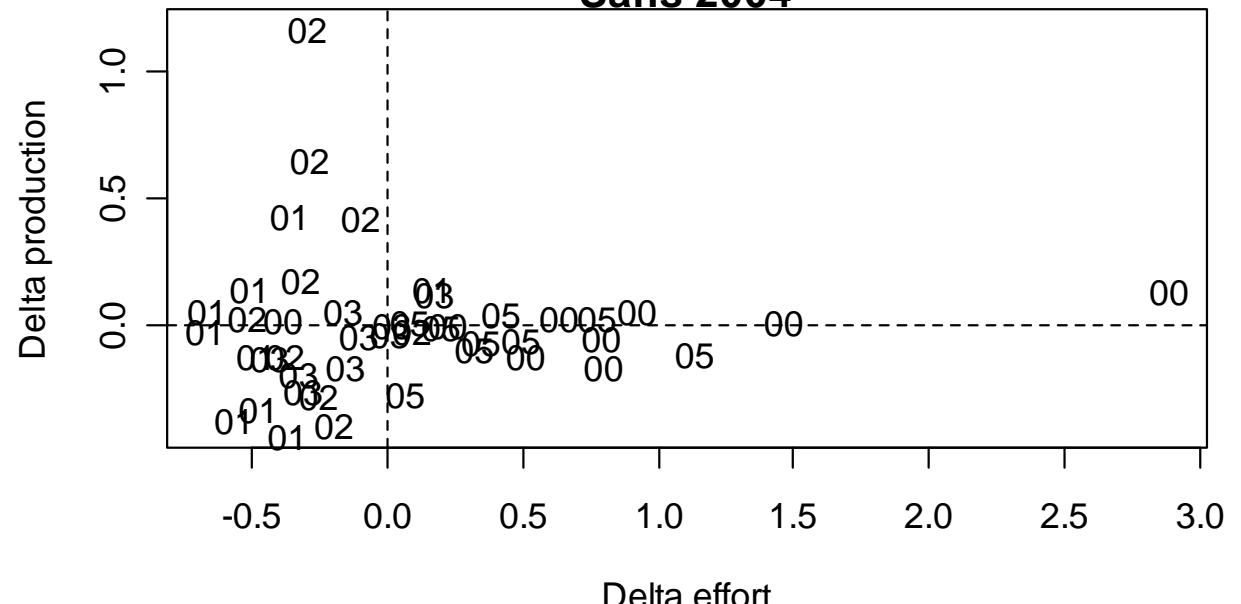| No species×year	Production ↘	Production ↗
Biomass ↘	10	17
Biomass ↗	17	11

➢ **Gtest: 3.031, P = 0.0817**

H2) Changes in effort E drive catch C

➢ **No evidence**
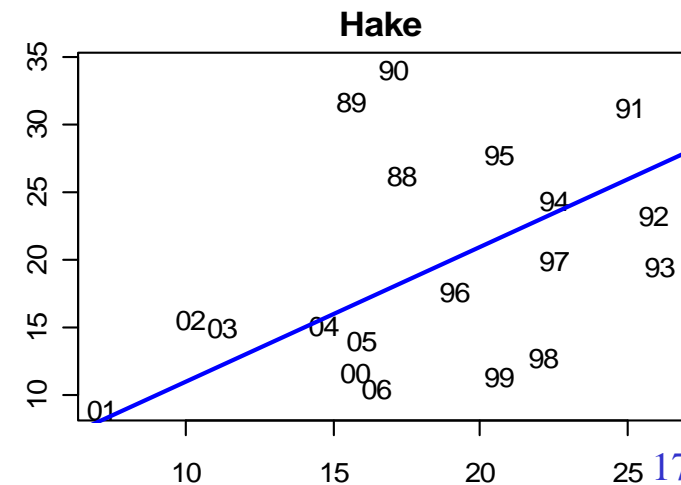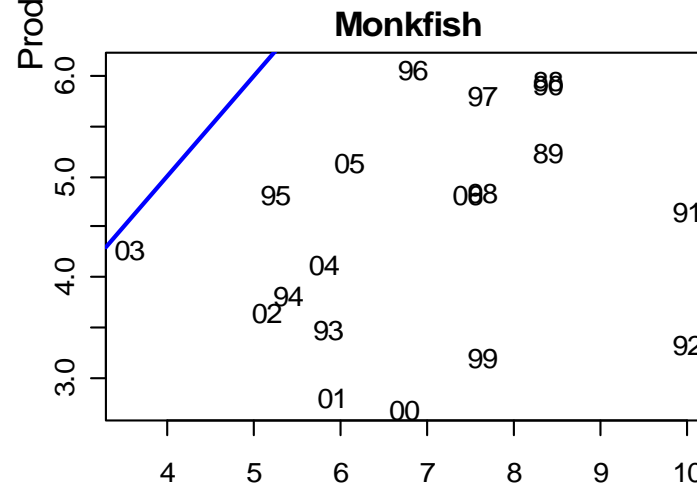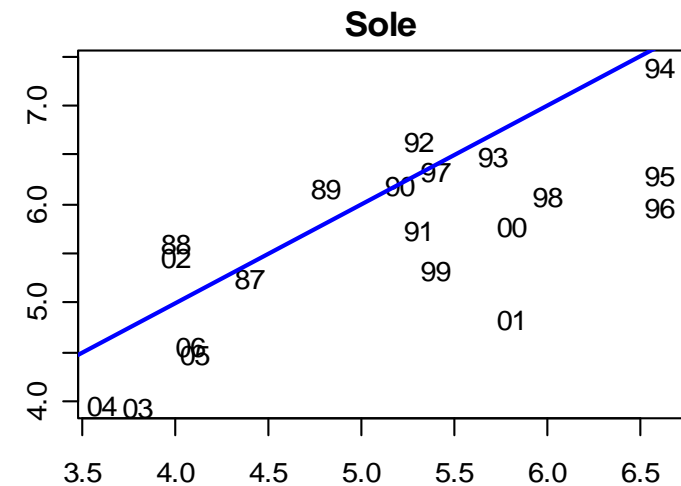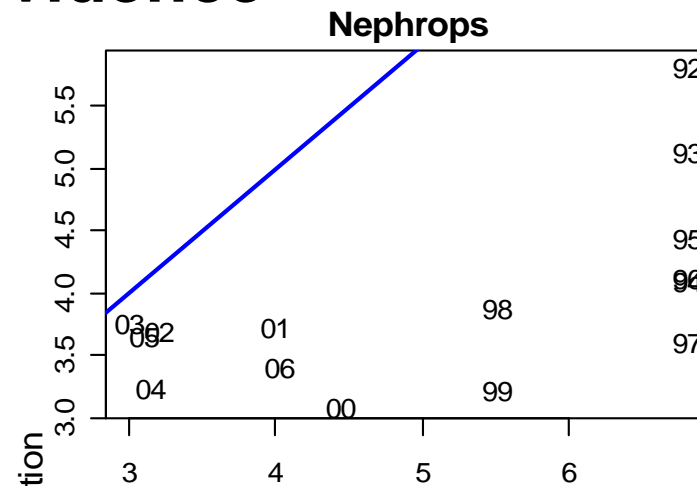
Effort = number of vessels

Sans 2004

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H3) Changes in stock S determine production C
H4) TAC limits production C

➢ **H3) No evidence**

➢ **H4)**

Conclusions

➢ **Stock results**

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

➢ **Fleet results**

General decrease in fleet size

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Conclusion

- ➤ H1) Changes in catch C **drive** stock changes S
- ➤ H2) Changes in effort E do **not** drive catch C
- ➤ H3) Changes in stock do **not** determine production
- ➤ H4) TAC **limits** production C
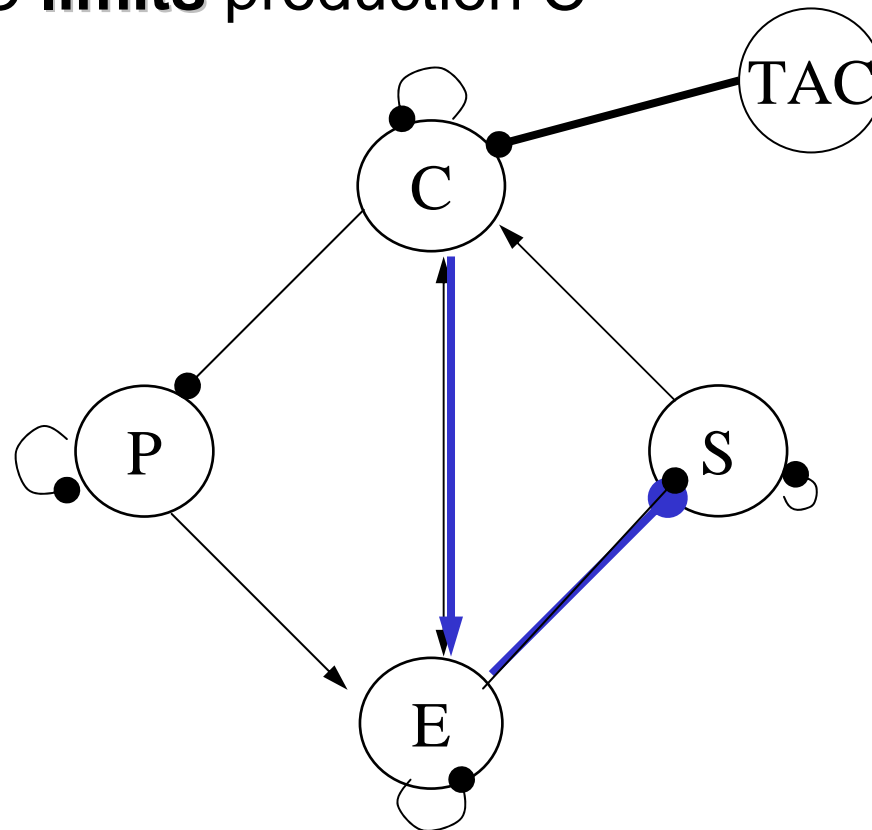
Conclusion (provisoire)

Dans le golfe de Gascogne, sur la période d'analyse:

➢ **L'impact de la pêche est resté stable ou a légèrement décru, grâce à une décroissance de la taille des flottilles et aux TAC qui limitent la production**

➢ **La dynamique des stocks a eu peu d'impact sur la dynamique des flottilles**