SPATIO-TEMPORAL PATTERNS AND ENVIRONMENTAL CONTROLS OF SMALL PELAGIC FISH BODY CONDITION FROM CONTRASTED MEDITERRANEAN AREAS

Pablo Brosset, Jean-Marc Fromentin, Claire Saraux

Ifremer

Drivers of dynamics of small pelagic fish resources, Victoria, March 2017

Sardine

Sardina pilchardus

Anchovy

Engraulis encrasicolus

Interests

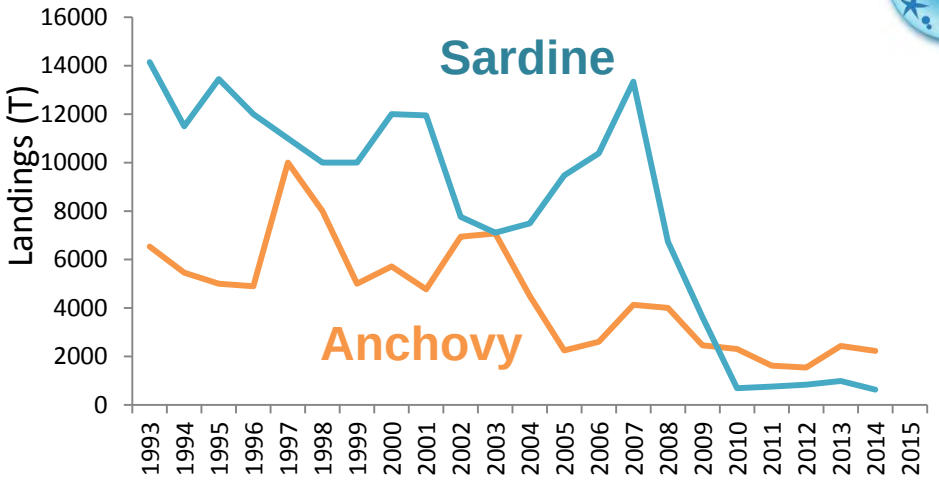
Ecological

(energy transfer from low to high trophic levels)

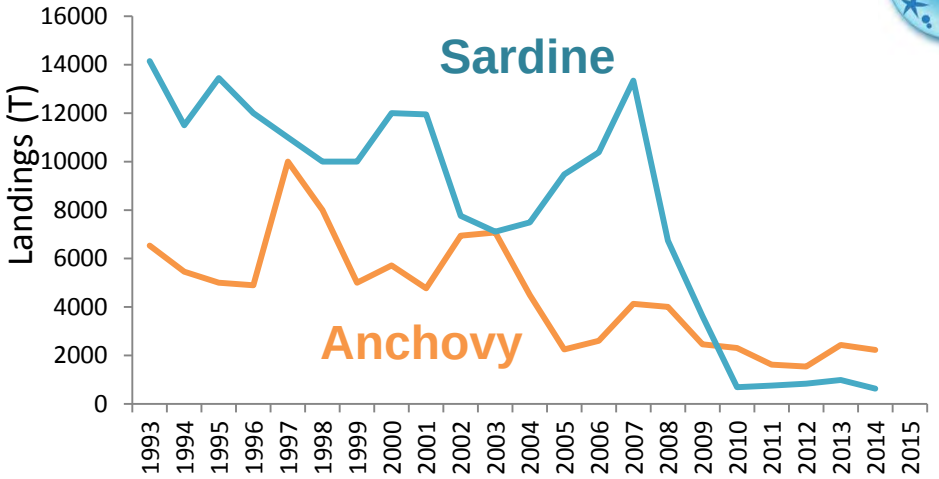
Economical

(intensely exploited in the Mediterranean)

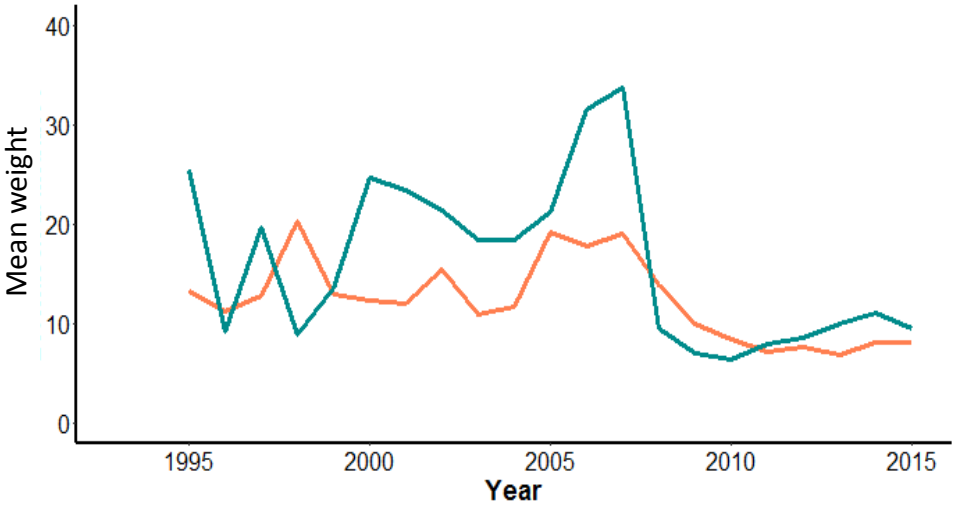

Atlantic Ocean
EUROPE
Black Sea
ASIA
Mediterranean Sea
AFRICA



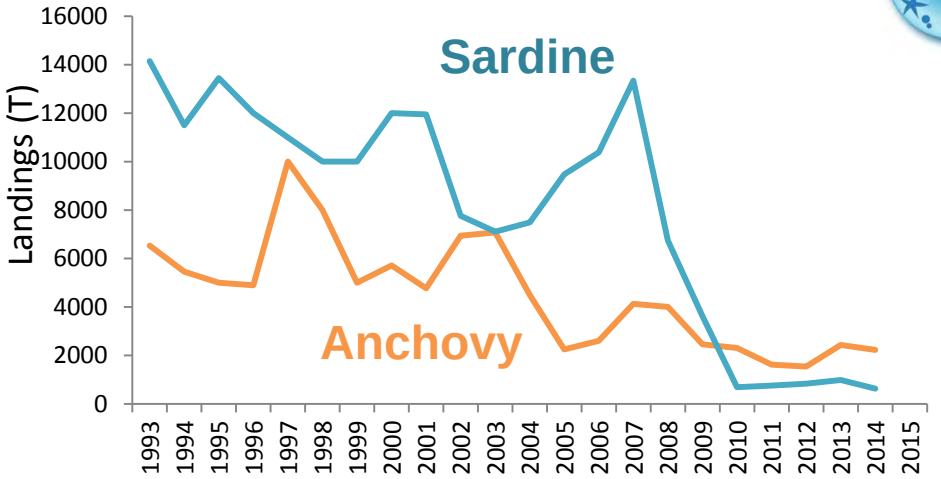
Sharp decline in landings



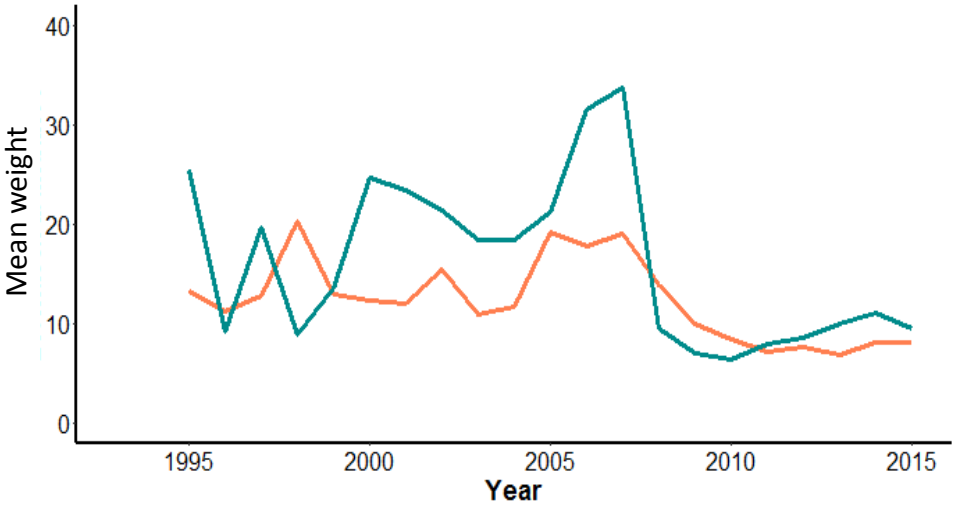
Sharp decline in landings



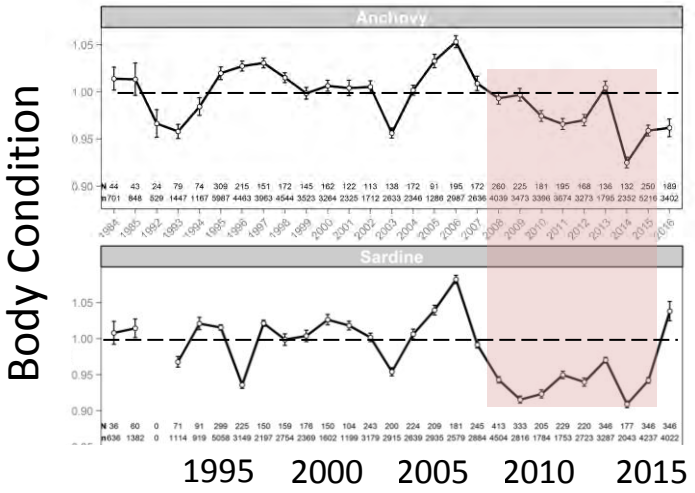
Lowest prolonged values of mean weight



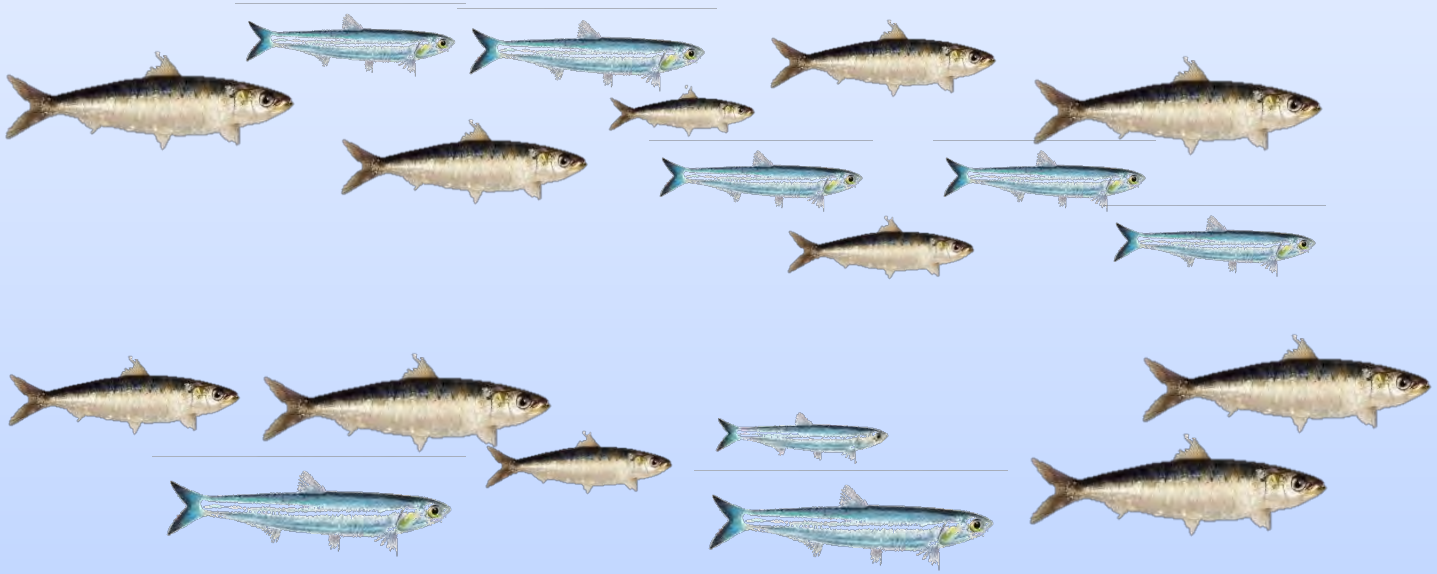
Sharp decline in landings

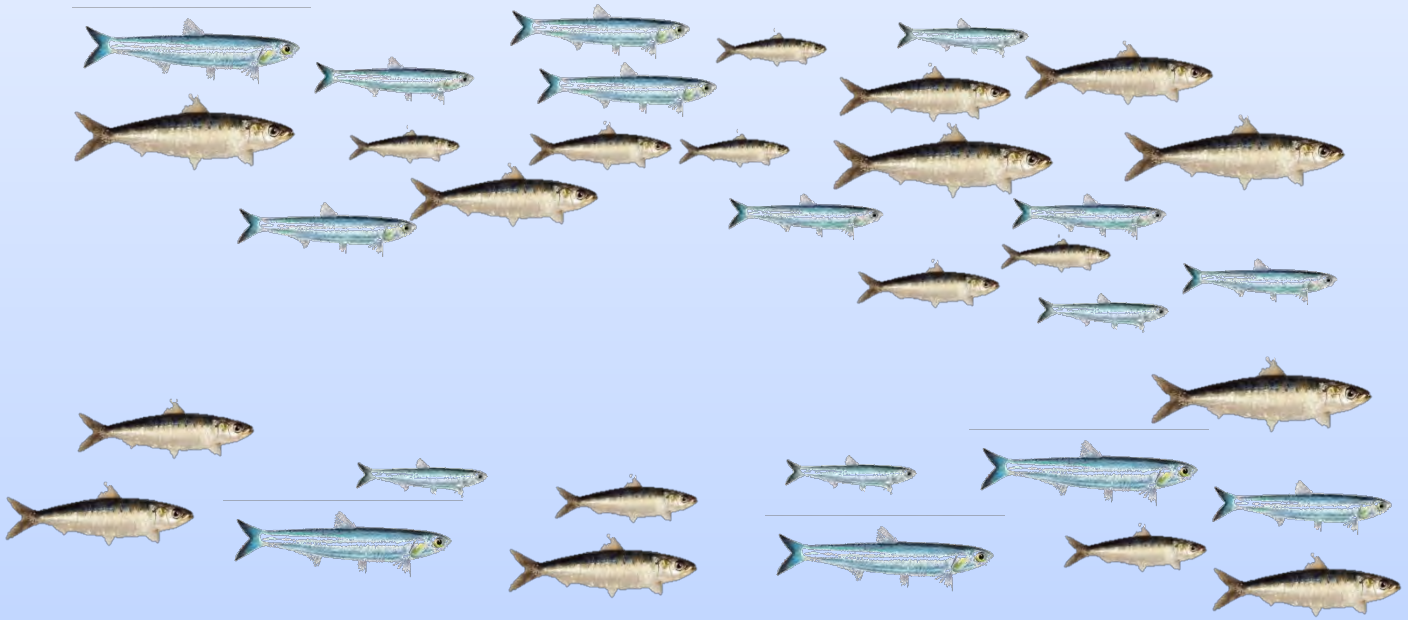


Lowest prolonged values of mean weight

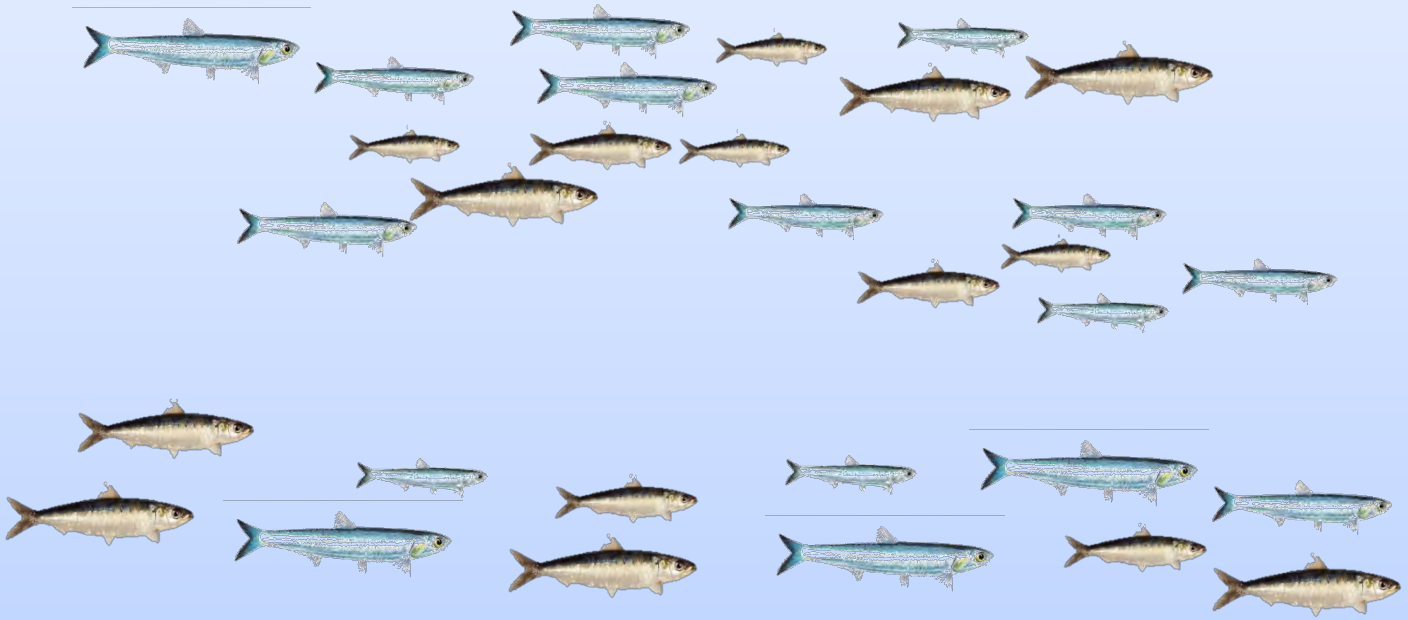


Lowest prolonged values of body condition



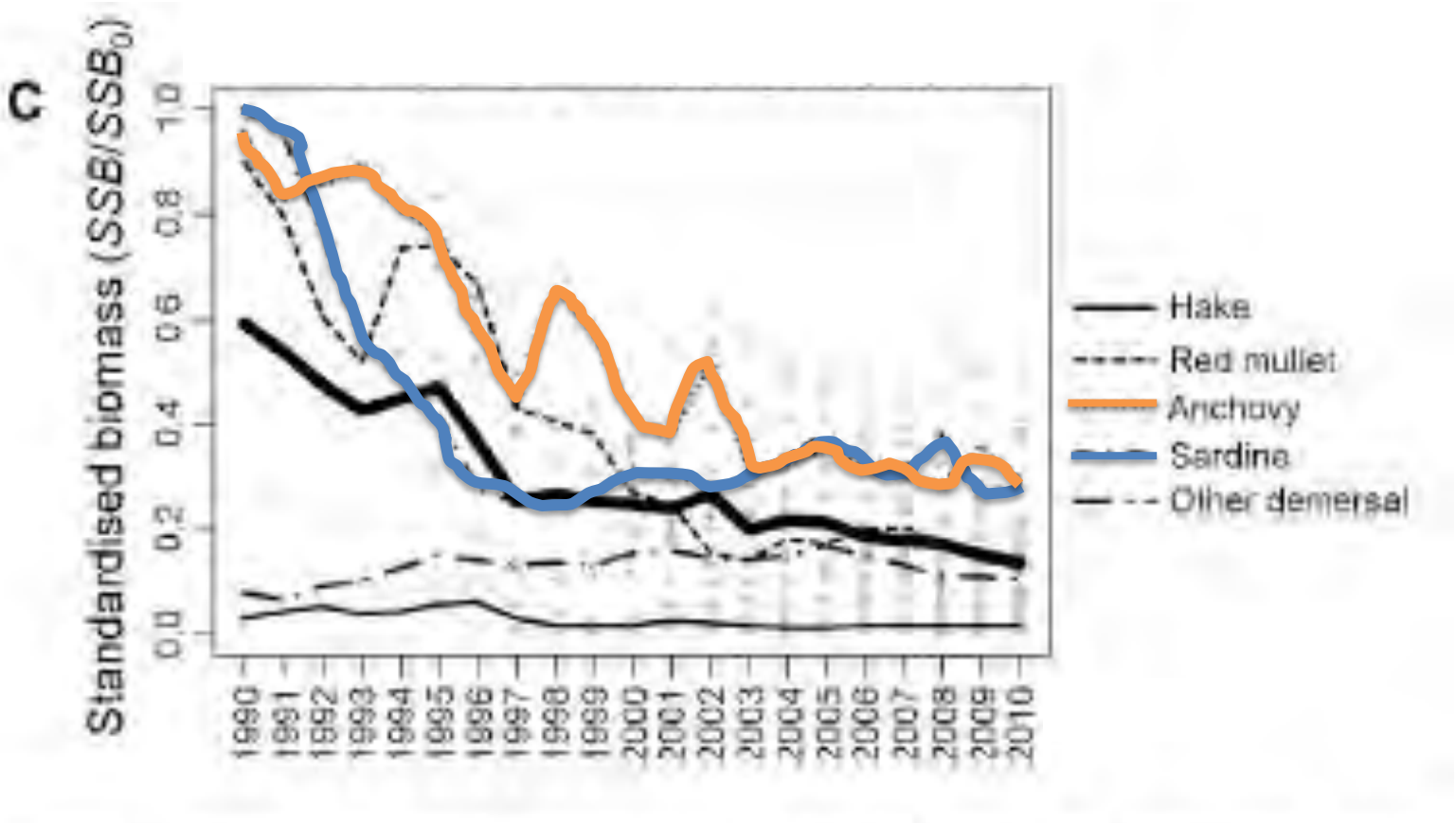


Slightly increasing abundance
Smaller size
Poorer body condition



Slightly increasing abundance
Smaller mean size
Poorer body condition

Large individuals



Temporal trend in the Mediterranean fish stocks (Vasilakopoulos *et al.*, 2014)

Does small pelagic fish communities change at a larger more heterogeneous scale?

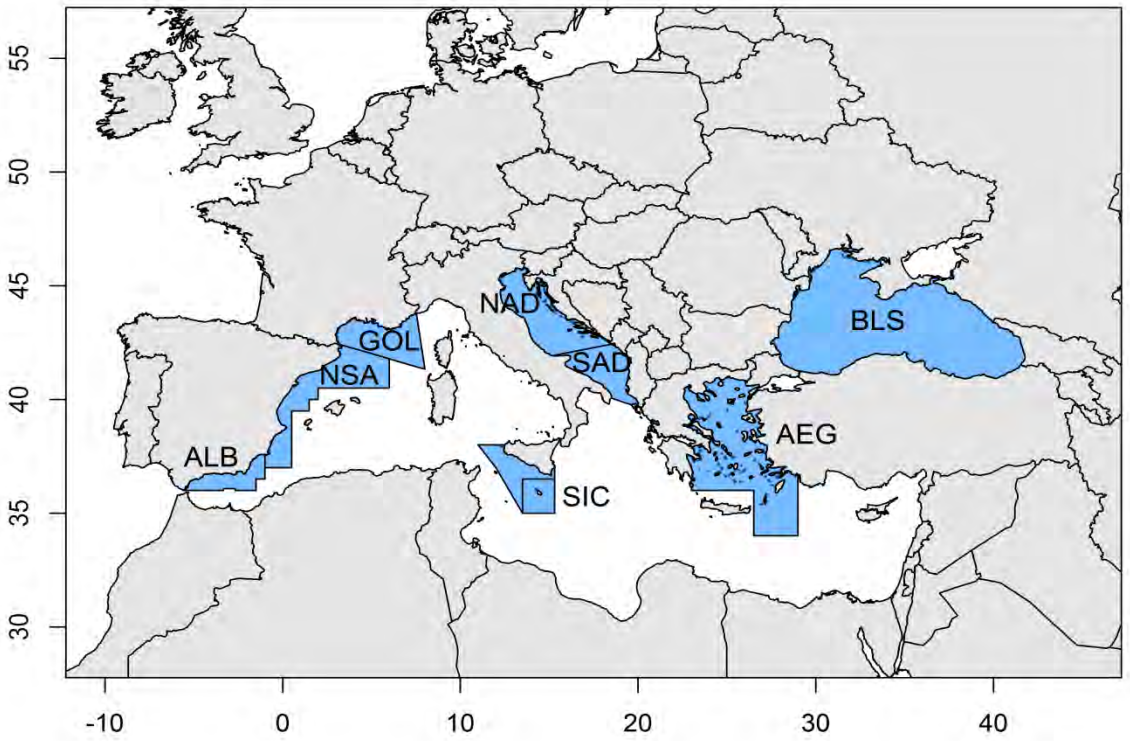
Do body condition and size decline as well in other areas?

Are these changes driven by a global pattern or by more local processes?

Biological data

1975-2016
Scientific and commercial
samplings (253 000 individuals)

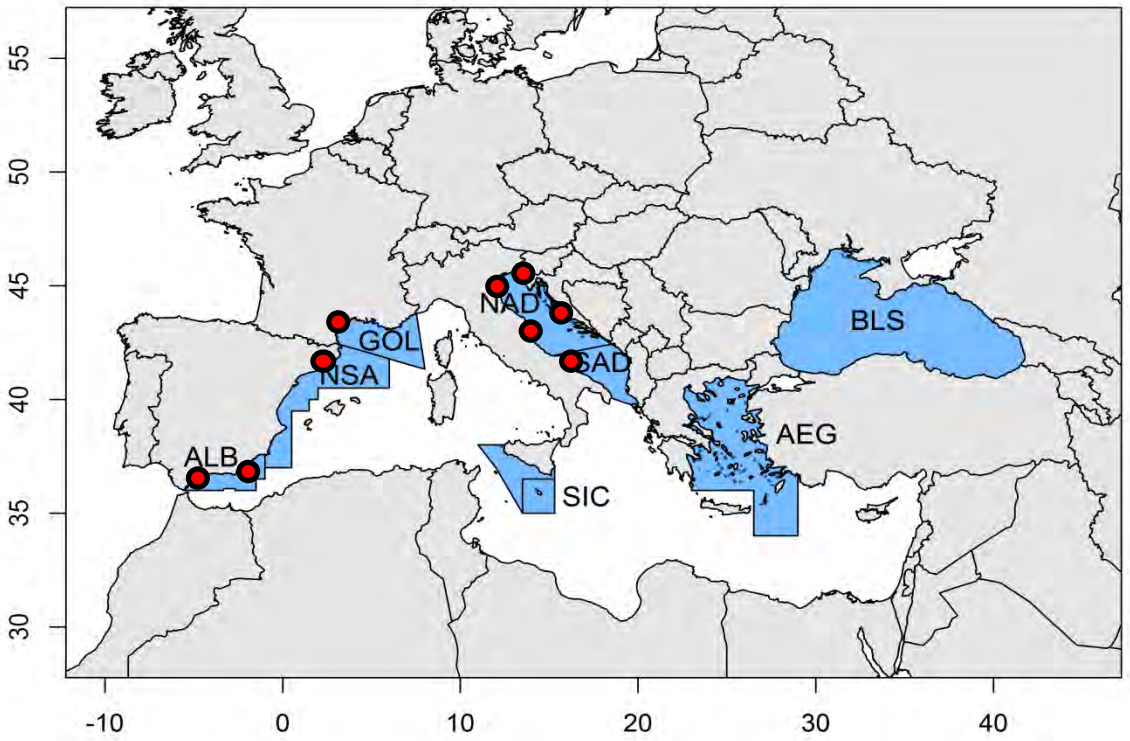
Size
Weight



Biological data

1975-2016
Scientific and **commercial** samplings (253 000 individuals)

Size
Weight



Biological data

1975-2016
Scientific and **commercial** samplings (253 000 individuals)

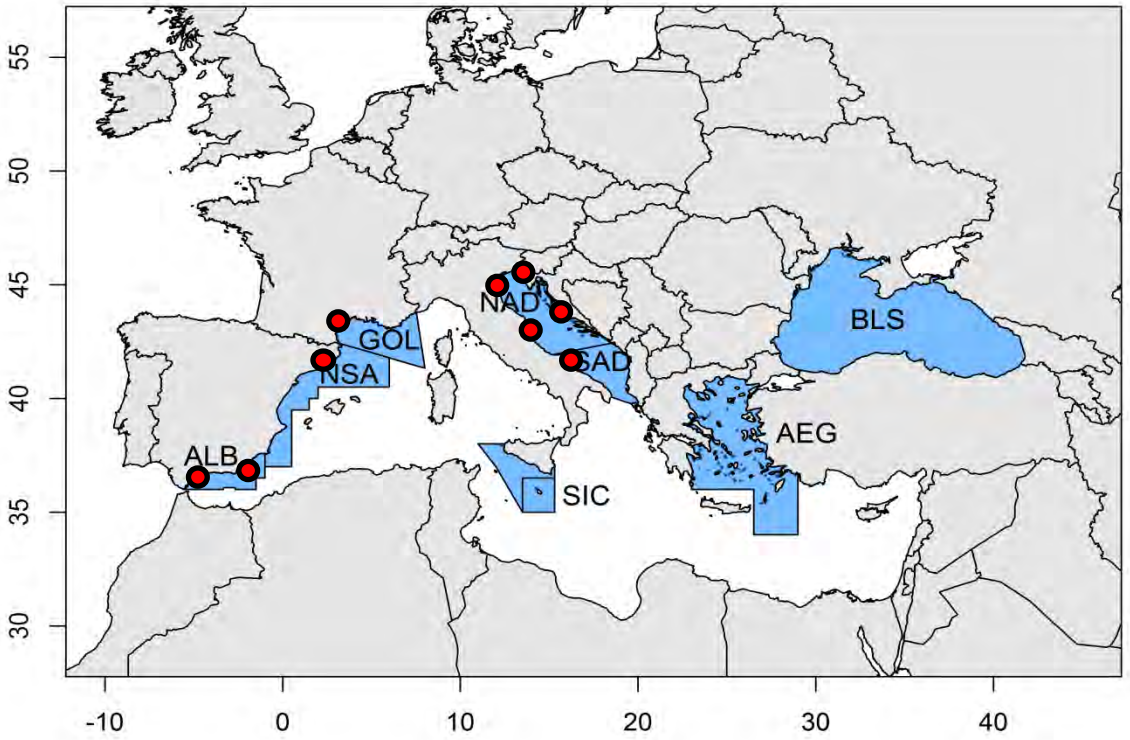
Size
Weight

Environmental data

2002-2015
Satellite
Sea surface Temperature
Chlorophyll-a
Ekman energy

Climatic indices
North A. Oscillation
Multidecadal A. Oscillation
Western M. Oscillation

River runoffs

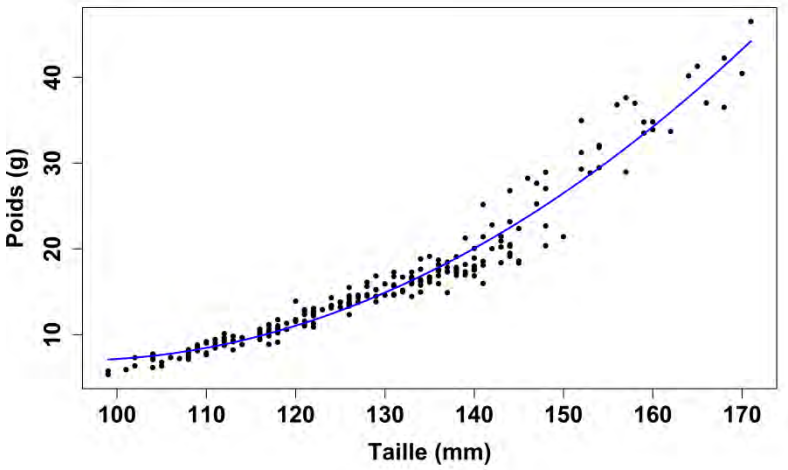


Body Condition:

= Proxy of the quantity of **stored energy**

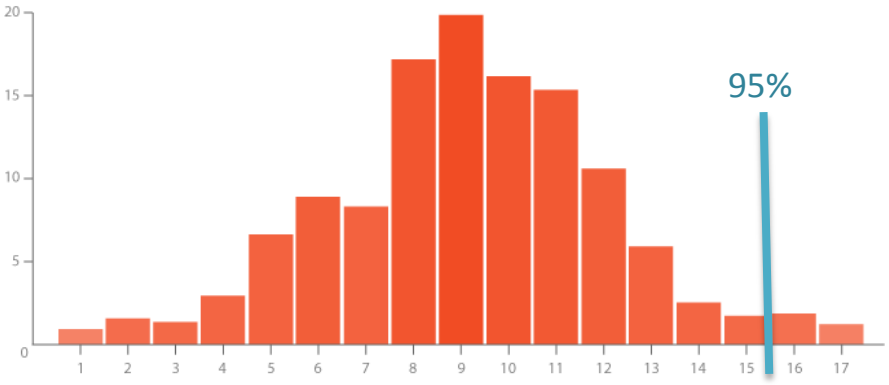
Determinant for the **individual health status** and **fitness**

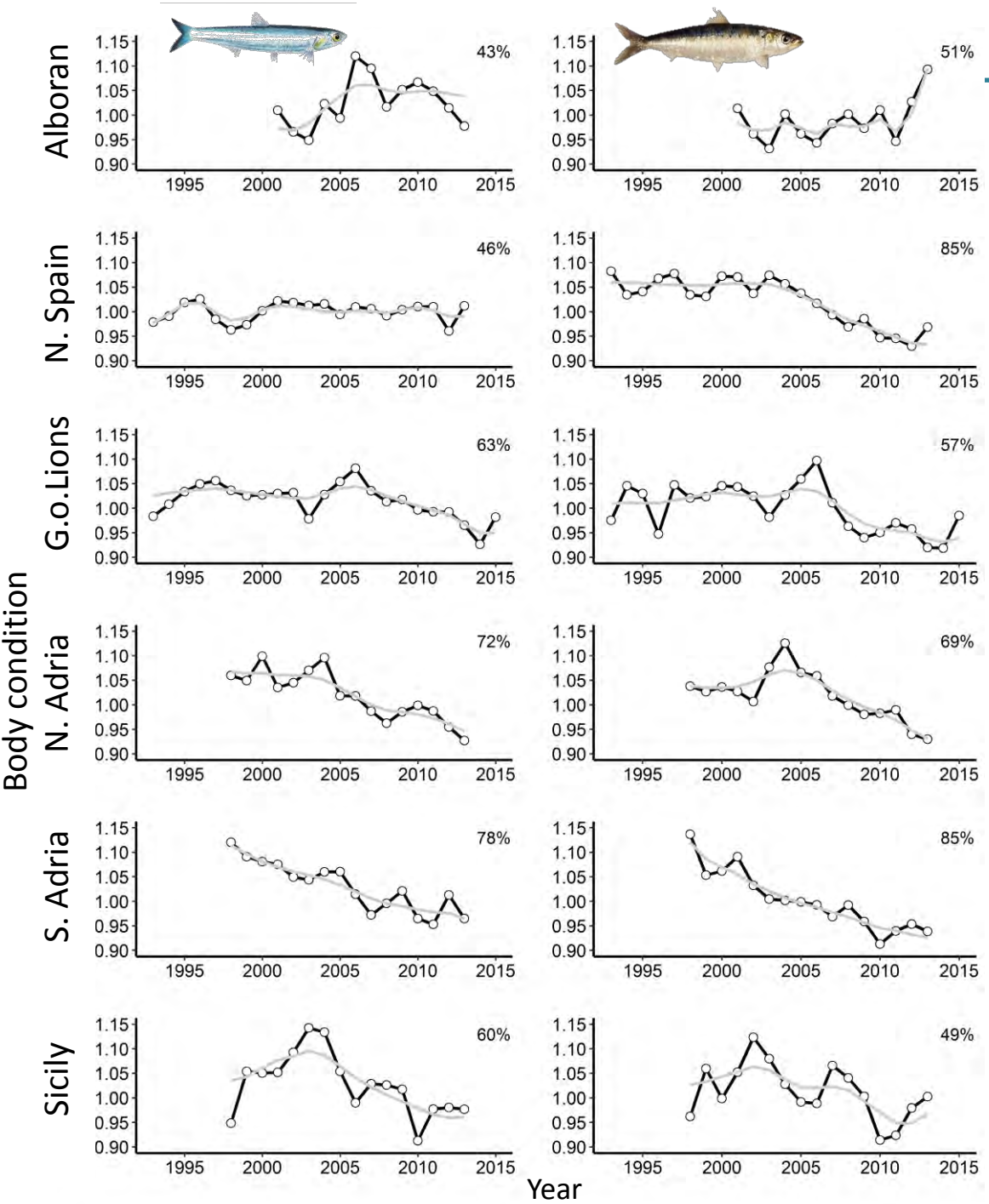
Relative Condition Index

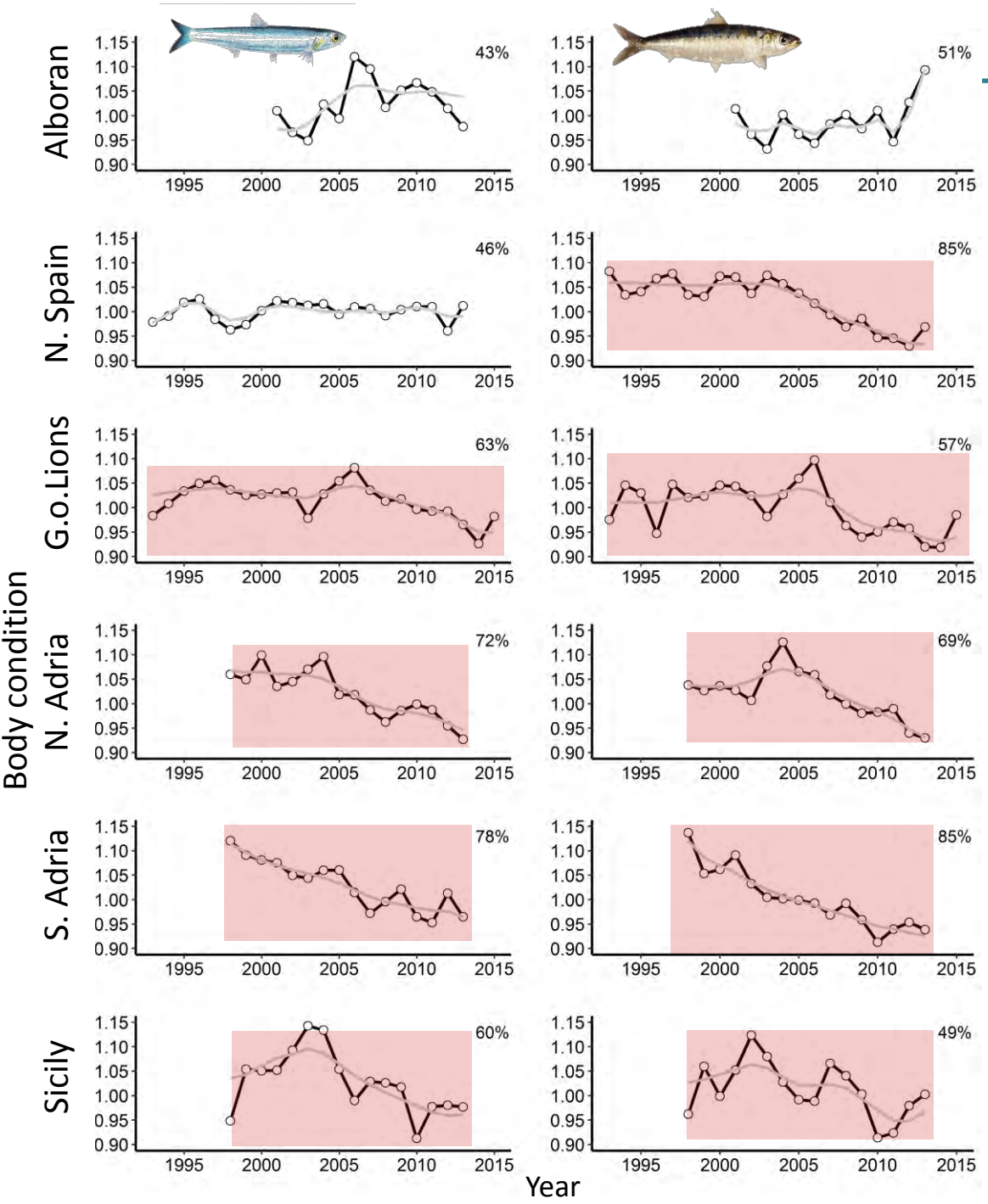


Maximal Size:

95% percentile of the size distribution



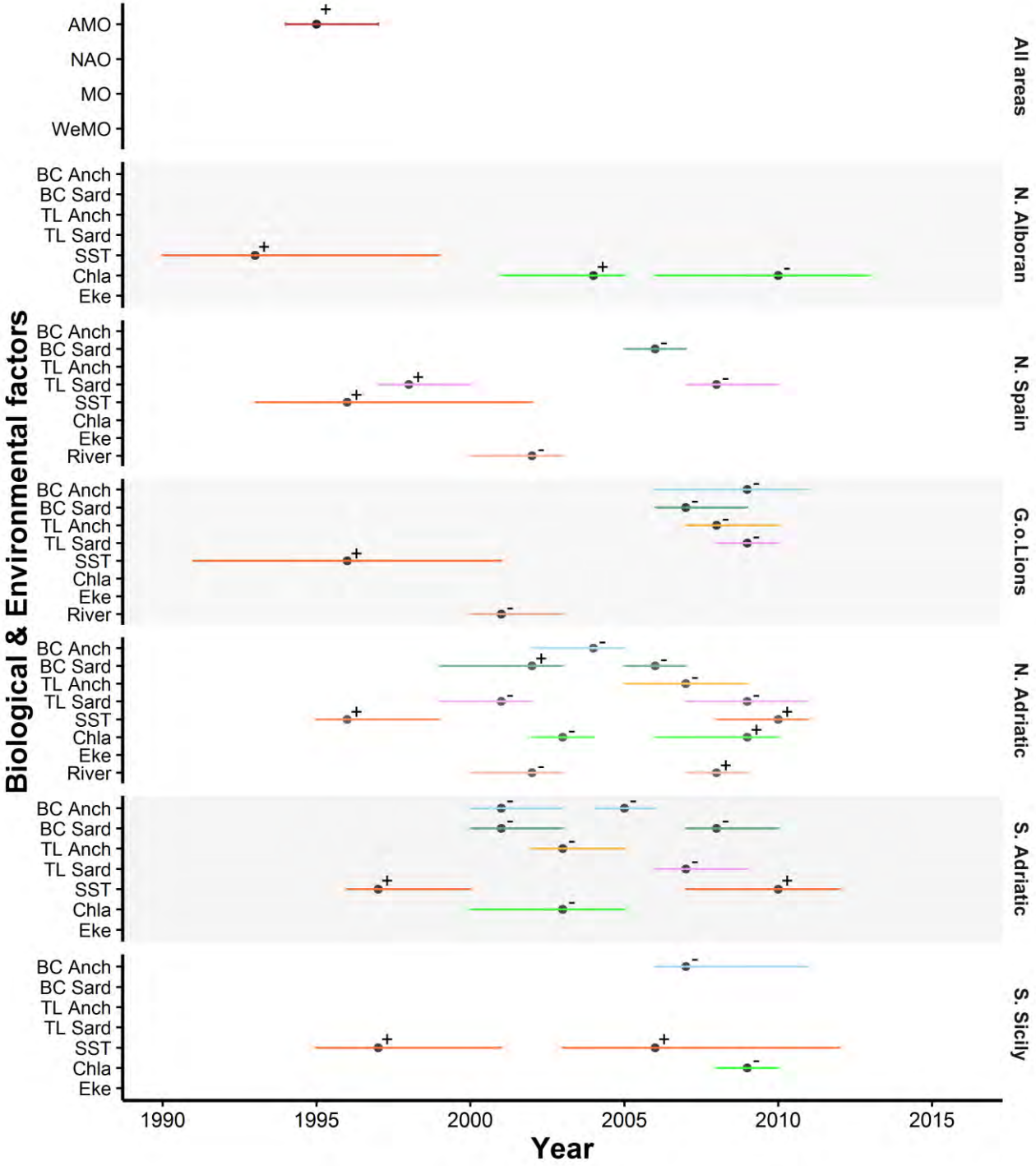

Alboran
N. Spain
G.o.Lions
N. Adria
S. Adria
Sicily
Body condition
Year
43%
51%
46%
85%
63%
57%
72%
69%
78%
85%
60%
49%
1.15
1.10
1.05
1.00
0.95
0.90
1995
2000
2005
2010
2015

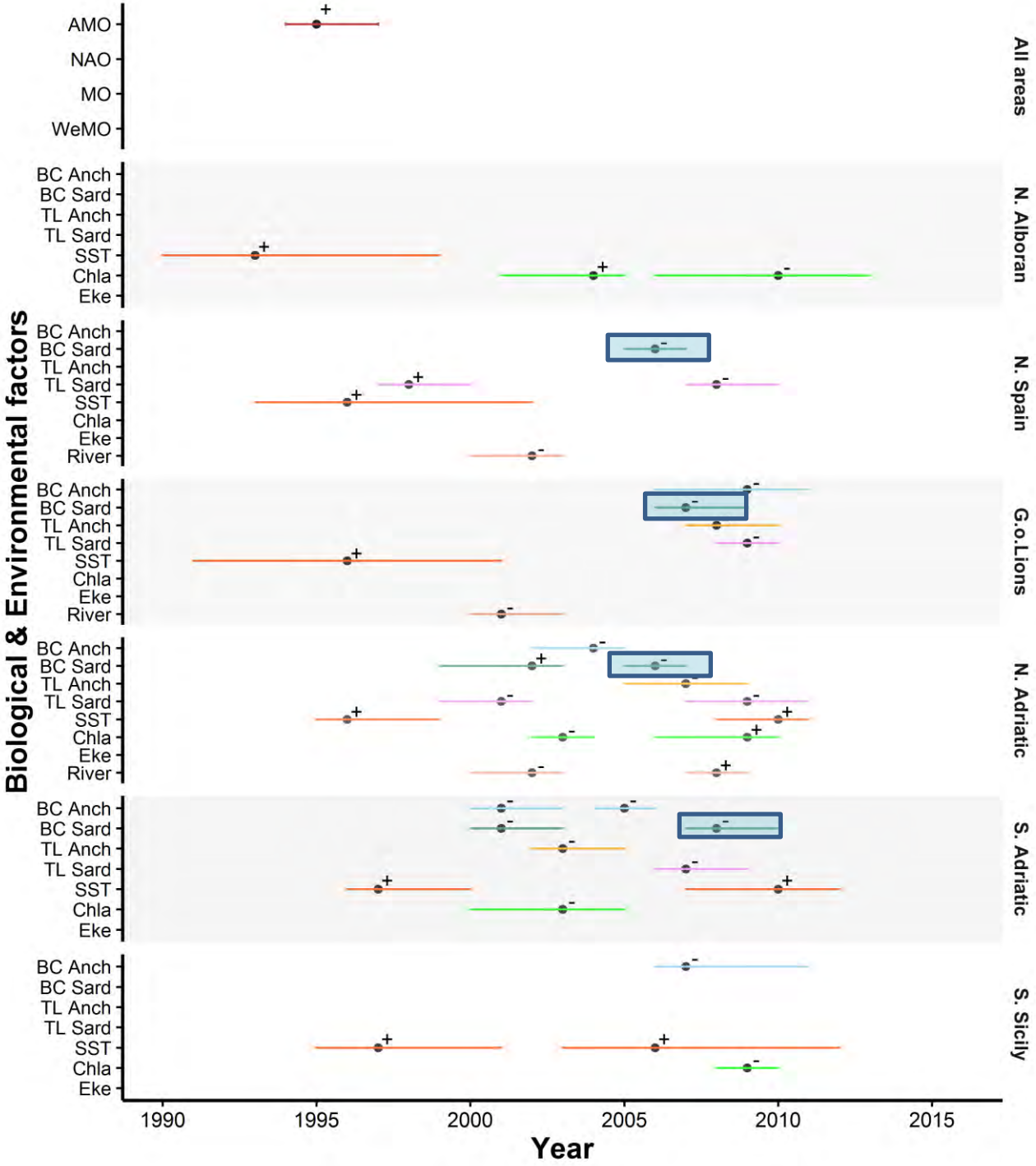


MEDIAS data:

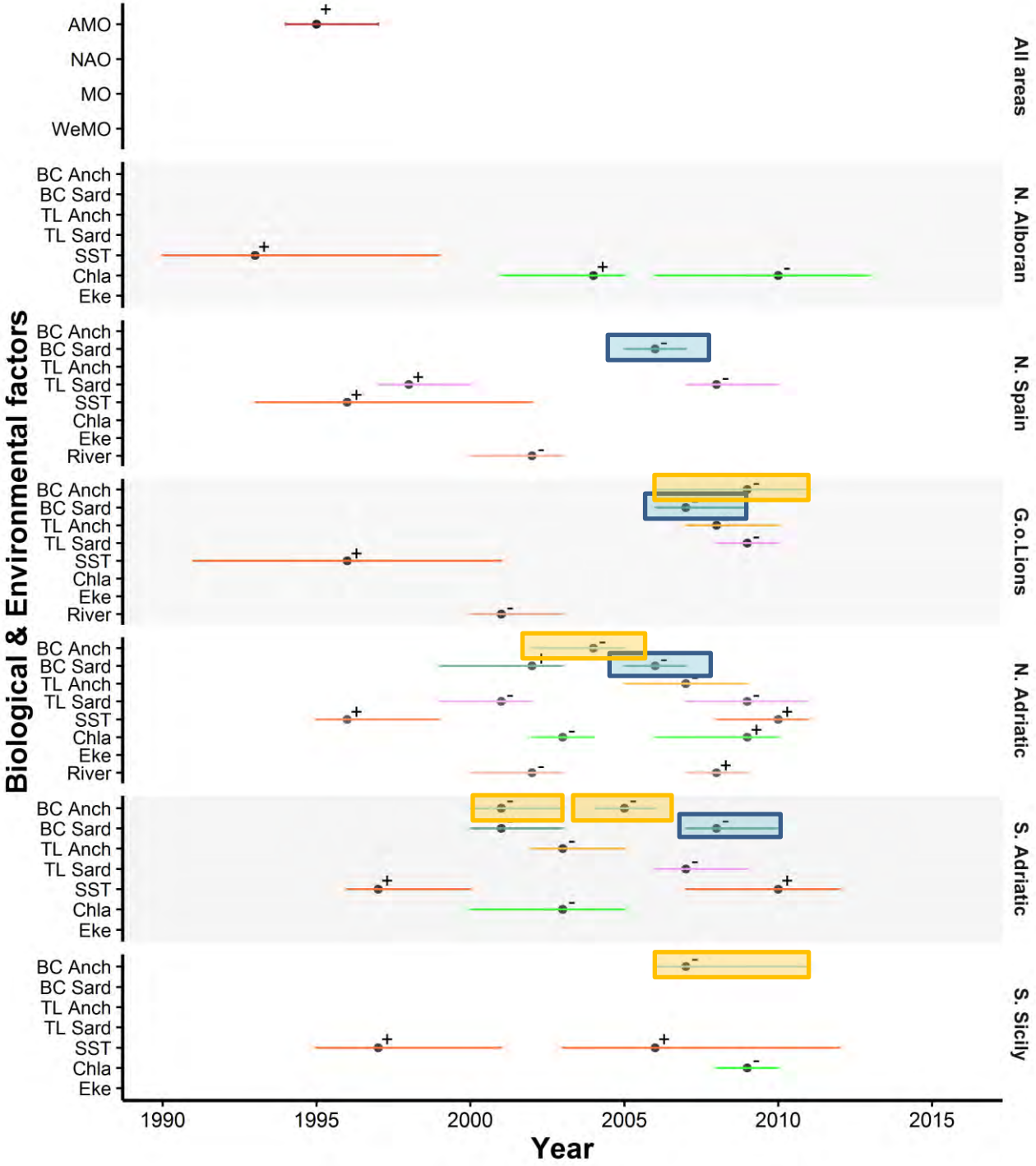
Decreasing fish body condition in most areas for both species

Similar results (not shown) of **decreasing maximal size**

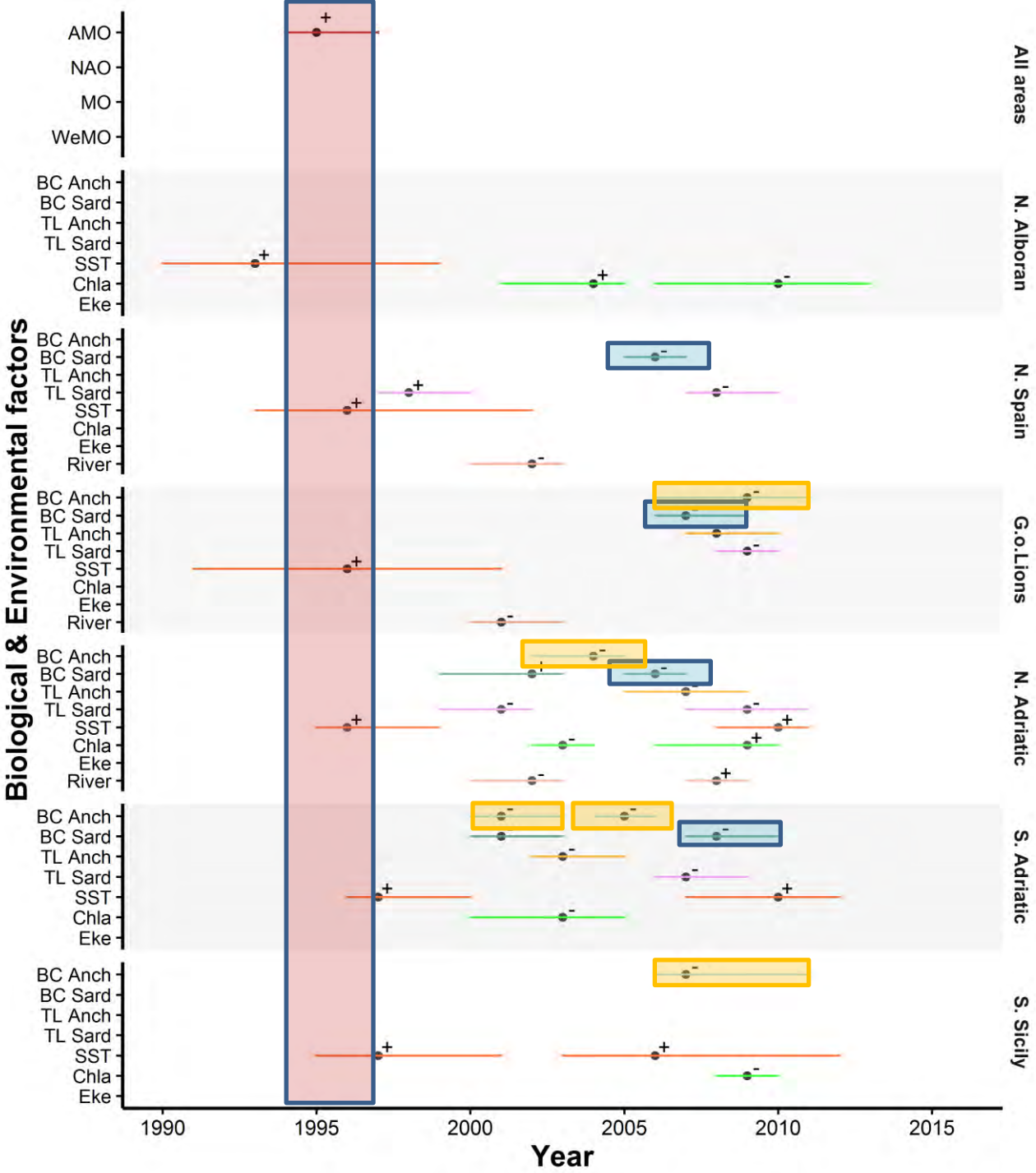

AMO
NAO
MO
WeMO
All areas
BC Anch
BC Sard
TL Anch
TL Sard
SST
Chla
Eke
N. Alboran
River
N. Spain
G.o.Lions
N. Adriatic
S. Adriatic
S. Sicily
Biological & Environmental factors
1990
1995
2000
2005
2010
2015
Year



Regime shifts of body condition and maximal length in the 2000's

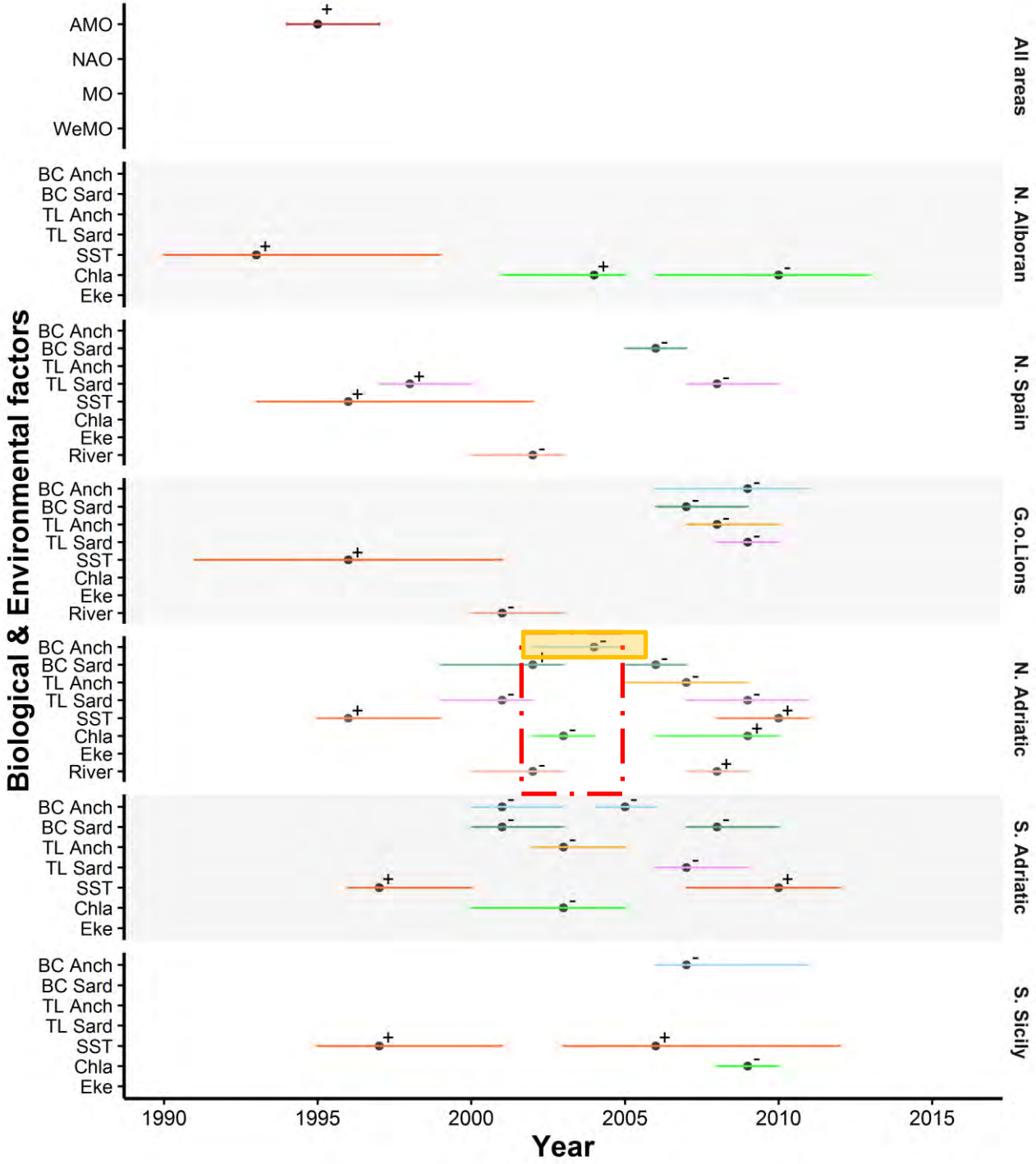


Regime shifts of body condition and maximal length in the 2000's



Regime shifts of body condition and maximal length in the 2000's

No evidences about an effect of a global environmental factor

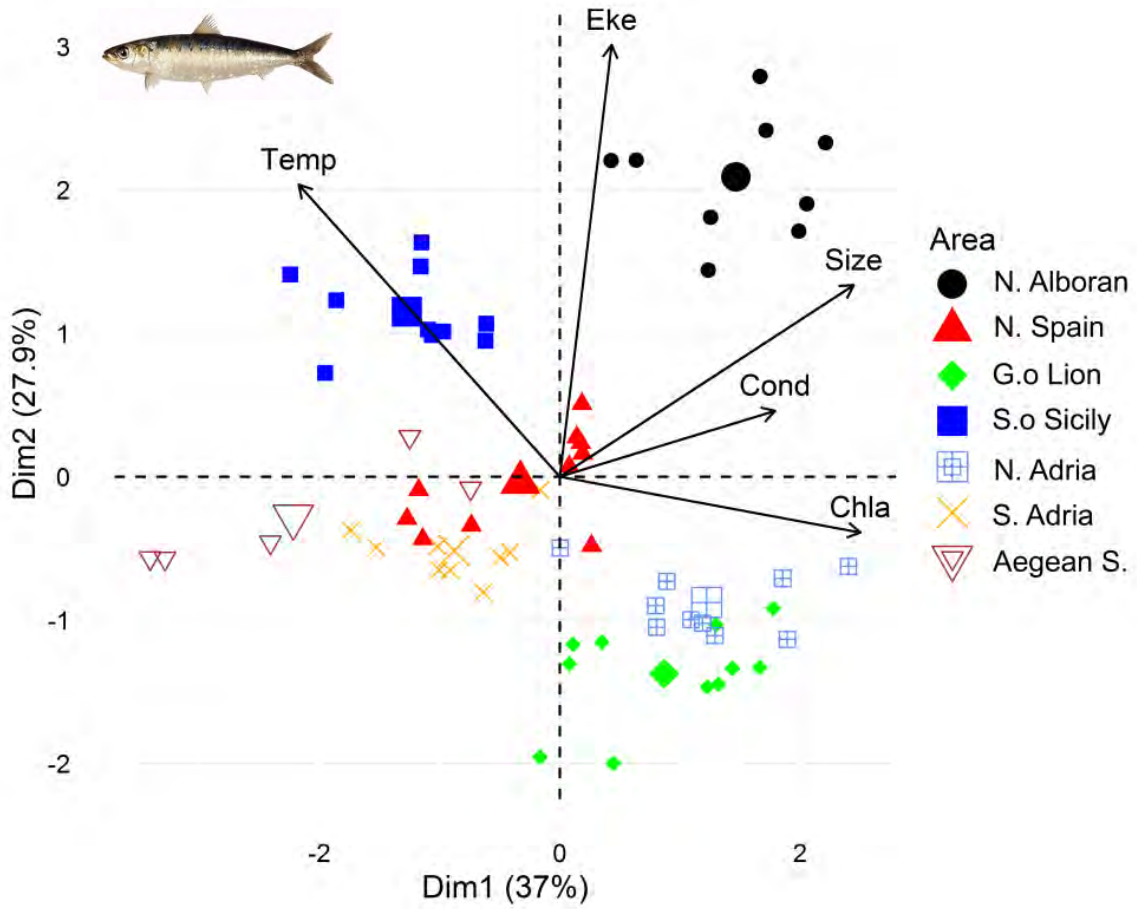


Regime shifts of body condition and maximal length

No evidences about an effect of a global environmental factor

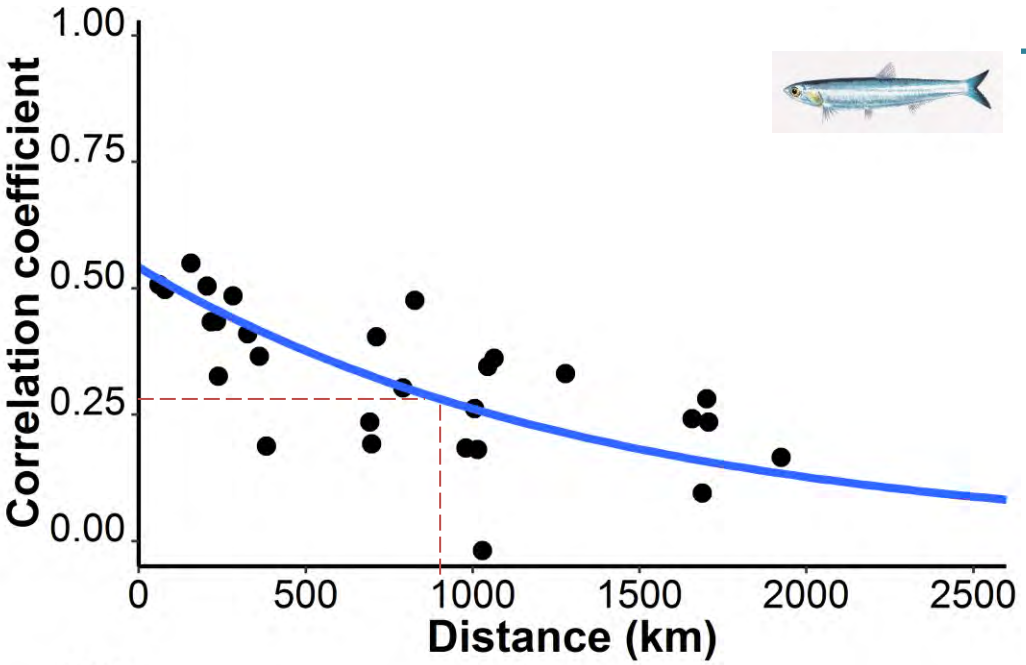
North Adriatic example:

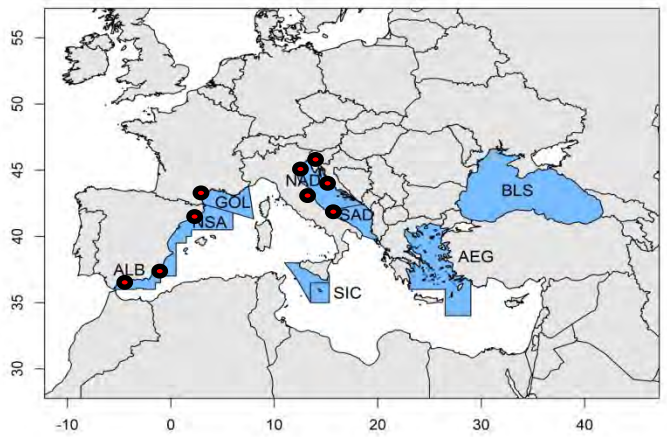
- River runoffs
- chl-*a*

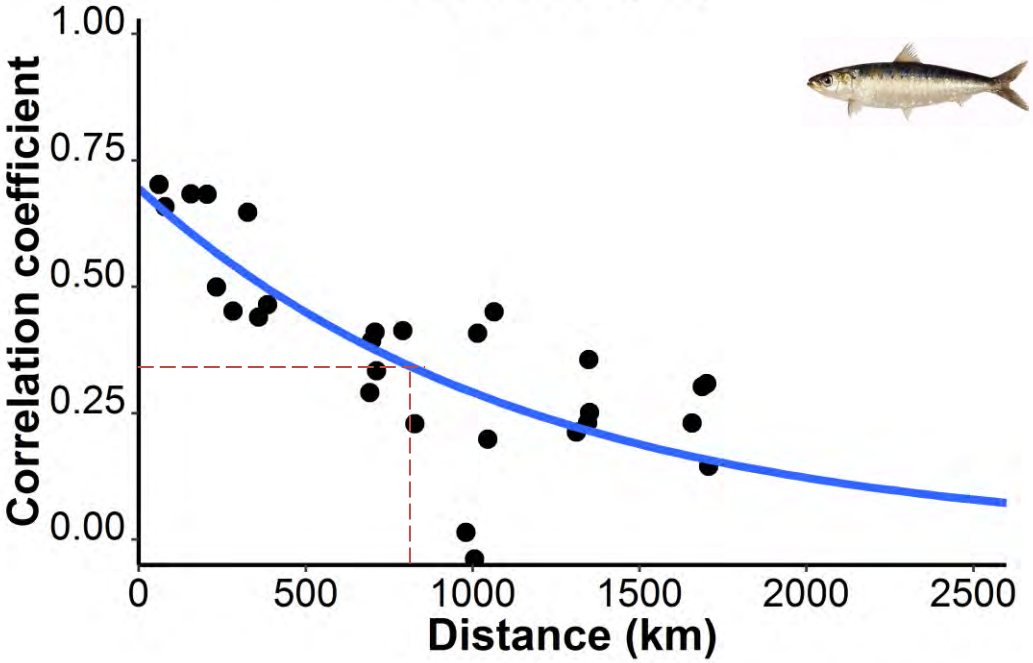


Spatial variability much higher than the interannual one (similar for anchovy)

➔ Discrimination of the different areas

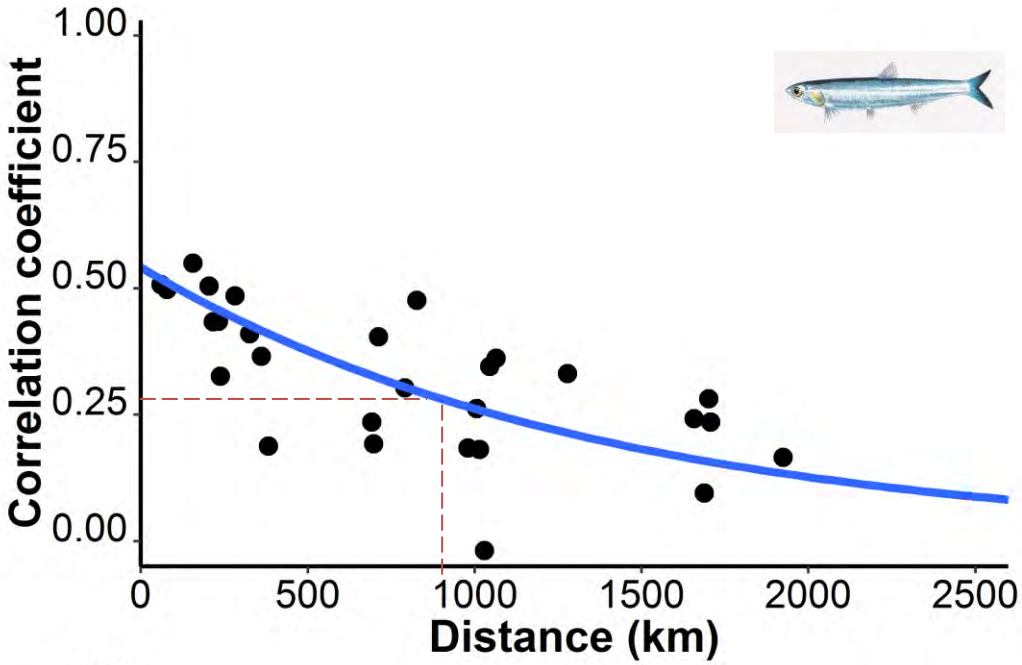


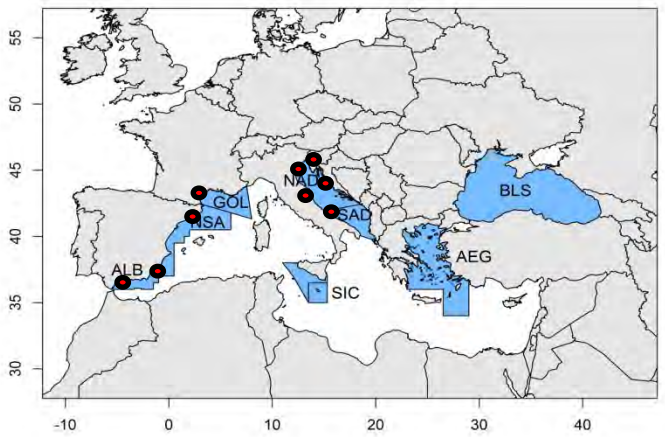


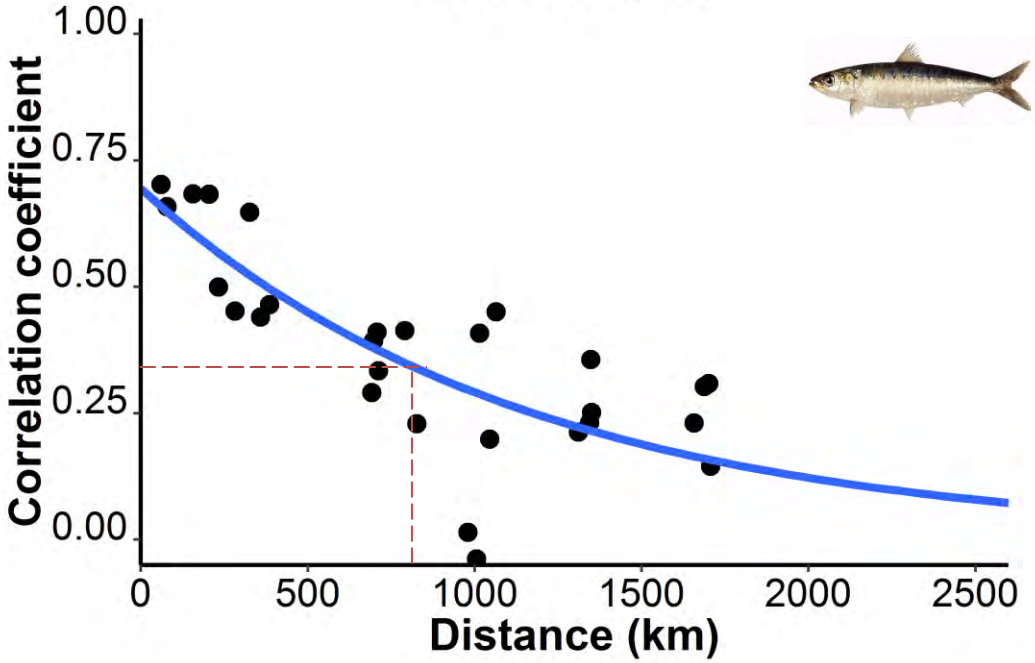


Data from **fisheries**:

50% decorrelation (d_{50}):
~ 900 km







Data from **fisheries**:

50% decorrelation (d_{50}):
~ 900 km

Very similar distance to those found on zooplankton
(Batchelder et al., 2012; Mackas et al., 2012)

Considering subareas is important in the Mediterranean context

❖ Body condition sharply decreased in most Mediterranean areas along years

❖ Body condition sharply decreased in most Mediterranean areas along years

- Body condition sharply decreased in most Mediterranean areas along years

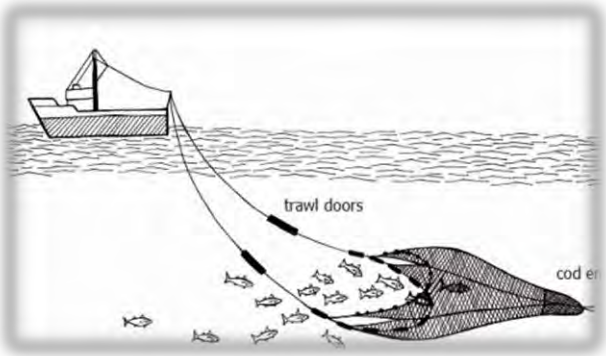
- But the decreasing pattern could not be explained with global environmental factors and the analyses highlighted the importance of regional scale due to the strong regionalisation of the environment

❖ **<u>Further considerations</u>:**

Zooplankton

Fishing pressure and **selectivity** in overexploited areas

Phenotypic plasticity but also
evolutionary dynamic



THANK YOU FOR YOUR ATTENTION

Ifremer

GFCM CGPM

Fisheries and Oceans Canada

Pêches et Océans Canada

THANK YOU FOR YOUR ATTENTION

Ifremer

GFCM
CGPM

marbec

Fisheries and Oceans Canada

Pêches et Océans Canada