Satellite-derived environmental indices and their relationships to higher trophic levels in the bay of Biscay



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- Identifiv spatial patterns and the temporal trends in the series 1999-2021 of monthly maps of SST and CHLa
- Explain these patterns and trends using forcing variables (meteo regimes and river outputs) \bullet
- Use these patterns and trends to explain trends in higher trophic levels: anchovy, sardine and dolphins

DATA

E C°

SST and CHLa satellite data (1999-2021)

AVHRR sensors. Daily temperatures are interpolated by kriging (Saulquin and Gohin, 2010)



SeaWiFS, MERIS, MODIS sensors. The raw data are transformed into chlorophyll *a* concentrations with the OC5 algorithm (Gohin et al., 2002) and interpolated according to Gohin (2011).

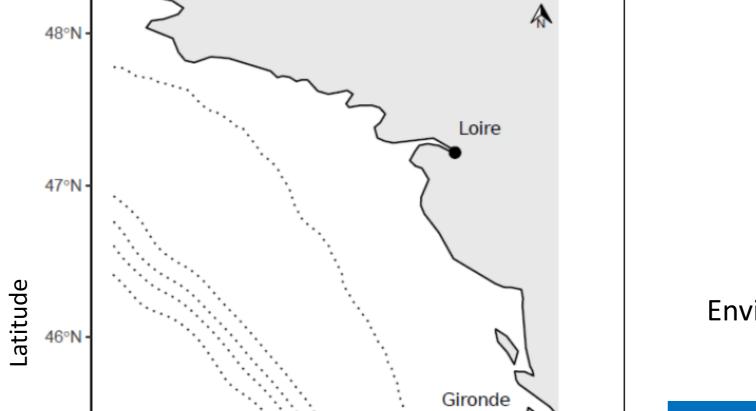
Environmental data

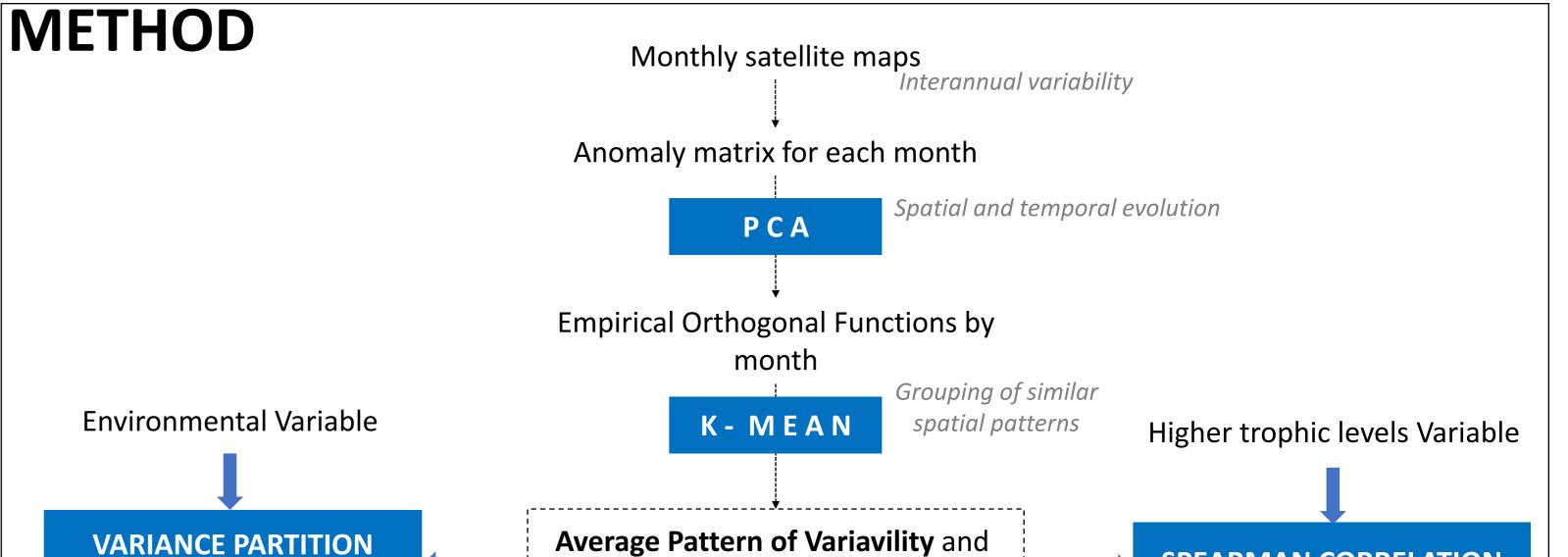
Climate indices (NAO, SCAN, EA, AMO) are from NOAA. Average river flow is provided by SCHAPI. Nitrogen and phosphorus inputs are available from the ODIMS platform. Windinduced turbulence was calculated using data collected off the Vilaine estuary. Wind direction was also calculated and tested.

BAY OF BISCAY (Studied area: 5°W-0°W, 43°N-48°N)

48°N

47°N





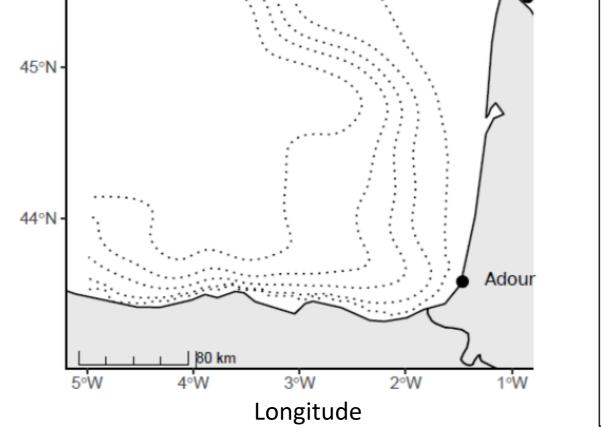


High trophic levels data



Average fish length and recruitment (age 1) for anchovy and sardine come from the PELGAS survey (Doray et al., 2016). Common dolphin mortality is estimated between 2010 and 2021 by PELAGIS (Peltier *et al.,* 2016).

SEA SURFACE TEMPERATURE



ALGORITHM

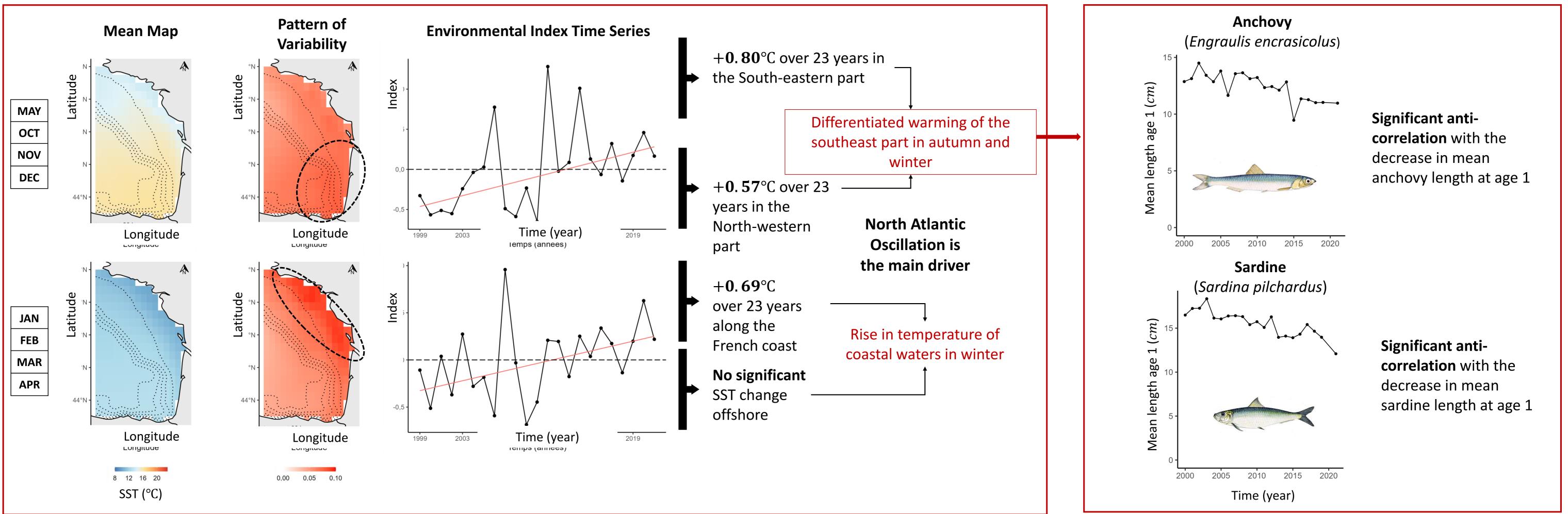
associated Environmental Index

SPEARMAN CORRELATION

Empirical Orthogonal Functions (EOF) were applied by month to the series of maps to extract spatial patterns of variability and the time series of their associated amplitudes. Similar spatial patterns were then grouped. An average index per year was calculated for each group of patterns.

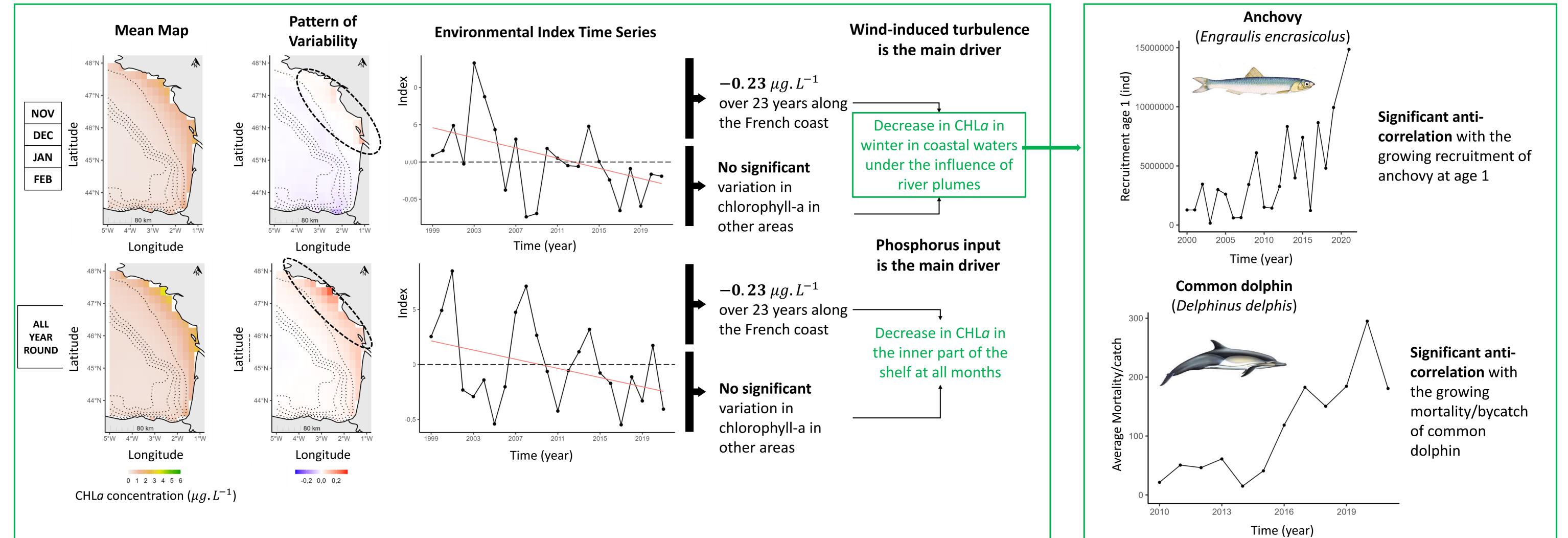
A variance partition algorithm was applied to explain the constructed indices. To link higher trophic levels to the indices, spearman correlations were used.

HIGHER TROPHIC LEVELS



CHLROPHYLL-A

HIGHER TROPHIC LEVELS



TAKE HOME MESSAGES Phosphorus C° **North Atlantic Oscillation** Wind induced turbulence input • Decrease in CHLa concentration over the year Warming of Biscay waters (Coast South-East part) and in winter Longer summer season as winter and autumn are • Decrease occurs in coastal waters hotter Autumn and winter are hotter Increase in common dolphin mortality (bycatch) Decline in the size of small pelagic fish and in anchovy recruitment

ABOUT



Hi! I am Baptiste and I had the pleasure to work with Pierre and Antoine on this subject. If you have any questions about my work or would like to have access to my manuscript: please don't hesitate to contact me! I'd also like to pursue in marine sciences by continuing to work on interactions between trophic levels, this time with a greater focus on higher levels. If you have any opportunities that might fit the description, I'd be delighted to discuss them with you! We kindly thank the Delmoges project for supporting this work!



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