Using trophic spectra for comparative analyses of fishing areas. Application to European fisheries.

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Using catch data and mean trophic levels to describe and compare fishing areas

- Catch data come from the International Council for the Exploration of the Sea (ICES) database using the FAO software FishStatPlus
- Mean trophic levels of each species are extracted from the FishBase database and are assumed stable from year to year within the study area

Spatial analysis: encouraging the eye to compare large fishing zones

Which TL exploited?

Catch Trophic Spectra are the result of the underlying ecosystem and of the fishing strategies. They highlight different types of exploitation in Europe.

Temporal analysis: visualizing shifts in exploitation

Searching for shifts

Plotting CTS for various time-periods allows to follow the fisheries evolution and observe major changes in exploitation. As an illustration, the Celtic Sea shows a progressive increase of small pelagic species in total catch (TL 3.4-3.8) in the last 20 years.

Which sensitivity of the CTS to the TL estimation?

The global shape of the CTS remains unchanged when using accurate values of TL based on stable isotope methods although the curves do not match and display a lag of 0.3 TL.

Which factors explain CTS variations with time?

CTS combine 3 distinct sources of variation in time: data reliability, exploitation schemes and modifications in the underlying ecosystem.

Catch Trophic Spectrum (CTS) is a descriptive tool summarizing a high amount of information on the exploitation in fishing areas. It promotes spatial and temporal comparative analyses and can help in detecting ecosystem phase shifts and associated changes in exploitation.

Coupling such analyses with data on biomass and more accurate estimates of TL should improve our understanding of fishing effects on trophic structure.

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Recipe for a trophic spectrum

A trophic spectrum is a graphical representation of an ecological variable X (abundance, biomass, catch) distributed along “non-discrete” trophic levels.

1. Assign each species a mean trophic level (TL). Aggregate X-values by TL increments of 0.1.
2. Smooth the X-distribution with a weighted moving average technique: X-values are spread along an empirical range of trophic levels.
3. Plot the smoothed distribution vs. trophic levels.