

Trophic relationships in the eastern English Channel: how to simplify food web structure description for trophic niche determination?

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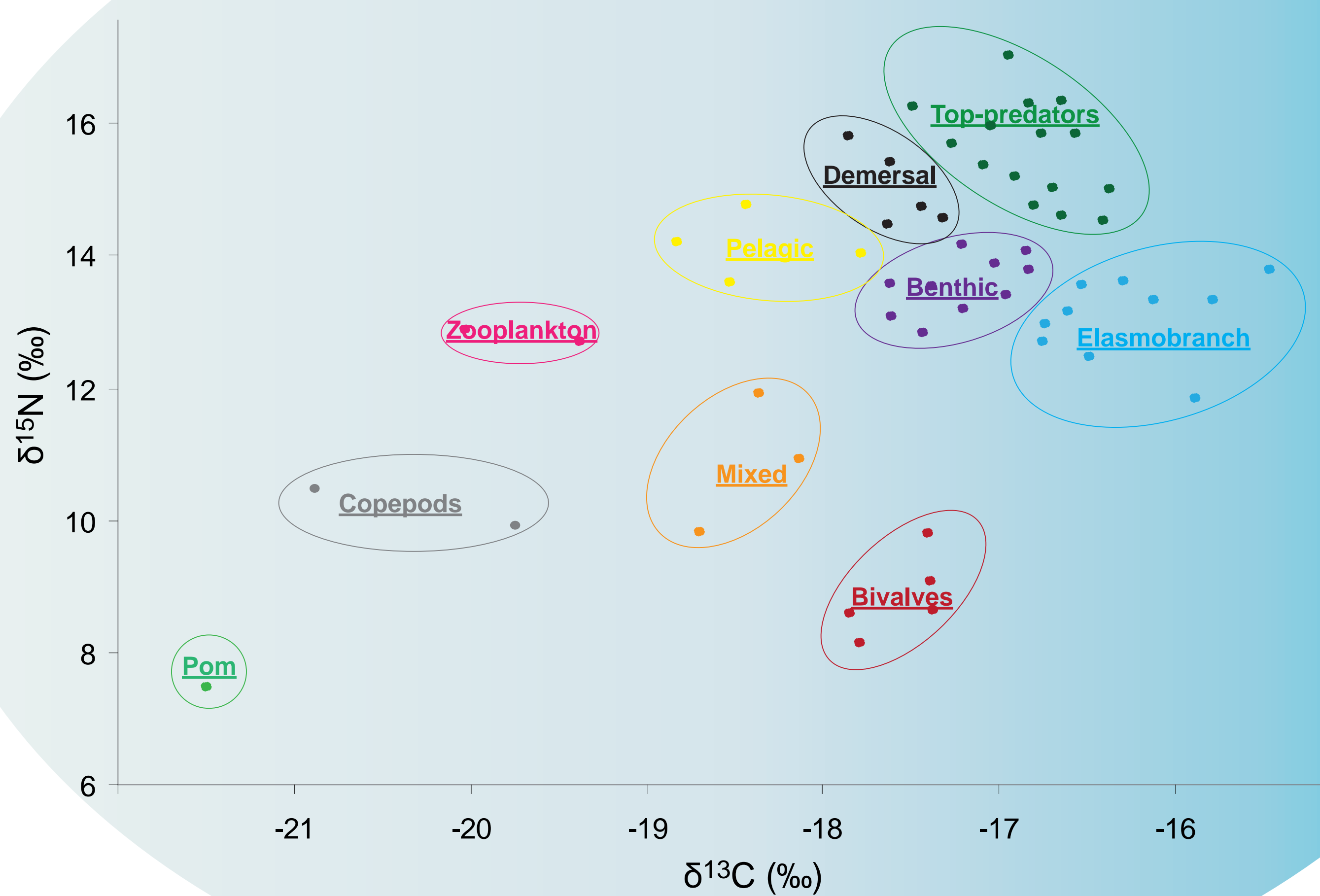
Context

Since its first definition by Elton in 1927, the perception of species trophic niche has greatly evolved and several tools were developed to study this particular component of the ecological niche. More precisely, stable isotopes draw interest and are used to describe species trophic and isotopic niches. Using this tool, we simplified the food web of the Eastern English Channel into functional groups to further determine consumers' trophic niches and the resulting potential overlap of utilized food resources.

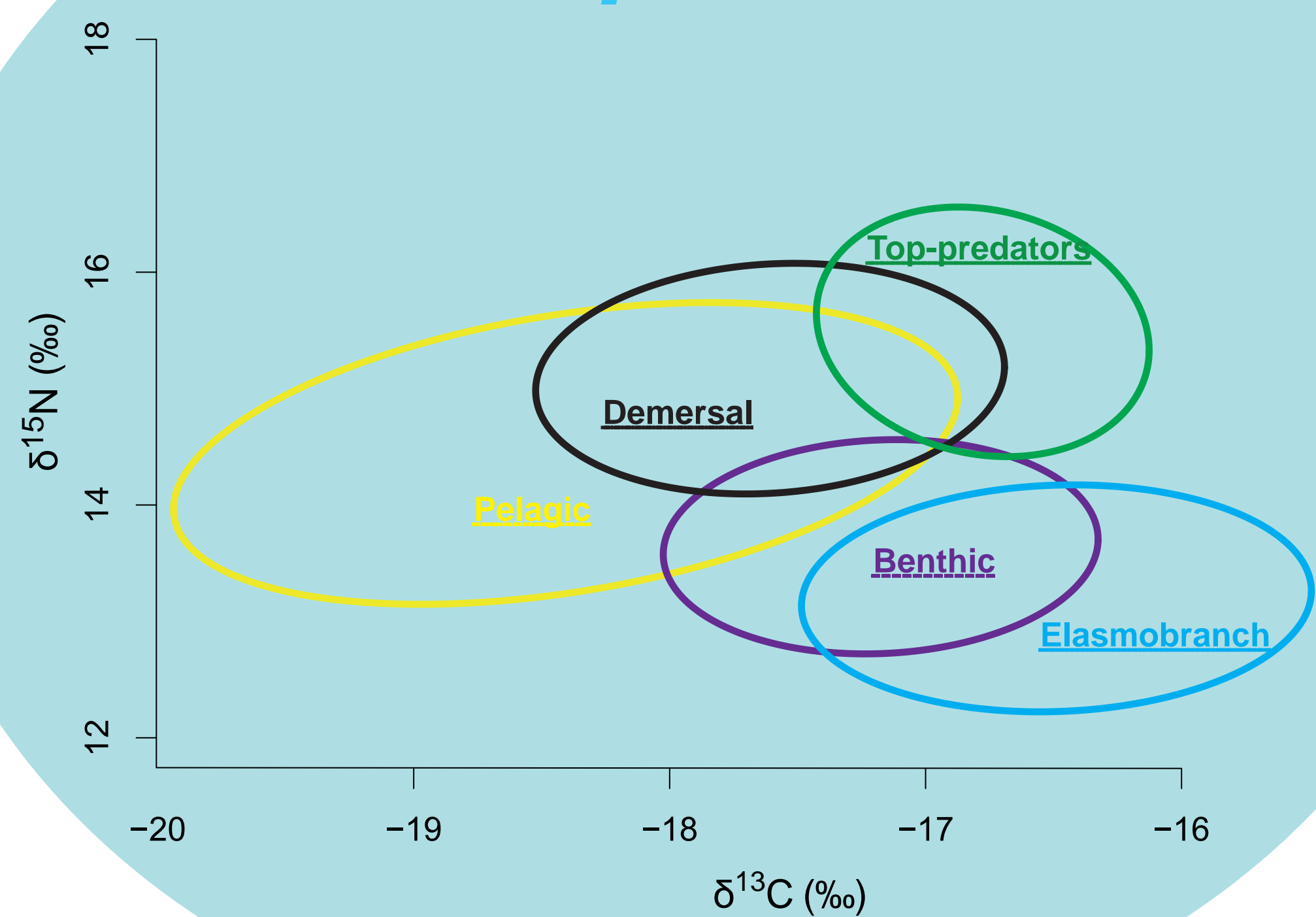
Methods

We used the Eastern English Channel as a case study. We sampled the **food web** from particulate organic matter to top-predator fish. Then, we performed $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ **stable isotope** analysis to determine individuals' trophic position. Afterwards, hierarchical cluster analysis coupled to a bootstrap procedure were used to determine **functional groups**. Finally we ran SIAR² mixing model as well as SIBER³ routine to determine consumers' **trophic and isotopic niches**.

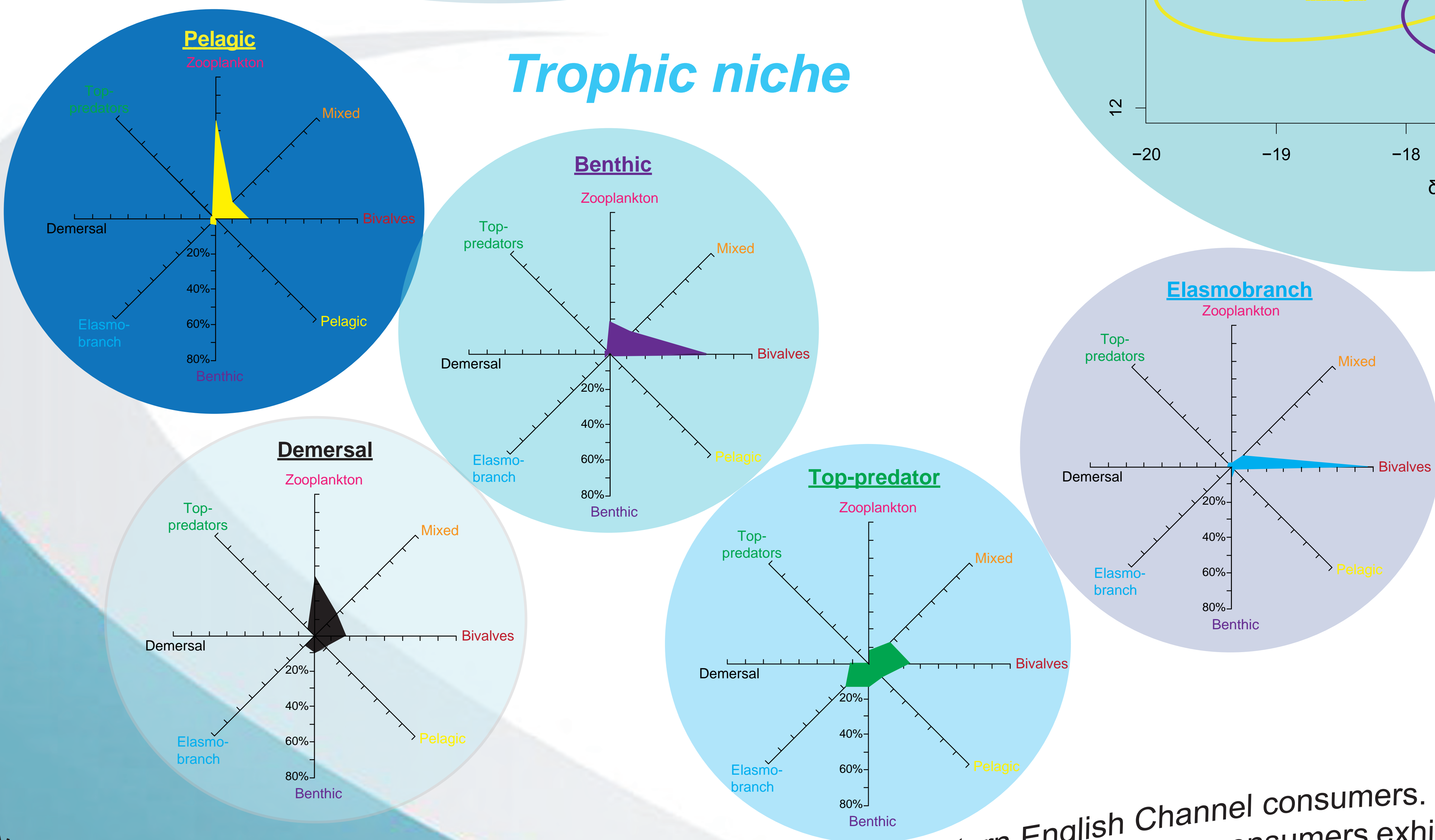
Functional groups



Isotopic niche



Trophic niche



Two trophic pathways, one benthic and one pelagic are supplying Eastern English Channel consumers. Pelagic fish and elasmobranches present the largest isotopic niches but also the most specialized diet. Globally, secondary consumers exhibit a specialist behaviour, with pelagic fishes preying on zooplankton and elasmobranches or benthic fishes preying on the benthic pathway. Tertiary consumers (demersal and top-predator fish) are identified as generalists. They are located high in the food web and linked to both trophic pathways. Both approaches, isotopic or trophic niche calculation provided meaningful results. Isotopic niche gave information on the niche extent, relative position in the food web and potential overlap with other food web compartments and that without considering the signature of prey. However, determining trophic and isotopic niches jointly allowed to identify which kind of resources were shared between consumers.

References:
¹ Elton C (1927) The Animal community, Chapter 5. In: Animal Ecology, Sidwick and Jackson (Eds)
² Parnell et al. (2010) Plos One 5, e9672
³ Jackson et al. (2011) J. Anim. Ecol. 80:595-602



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