The importance of sharks and rays to coastal ecosystem function

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Project Summary

Predators can structure marine communities and influence ecosystem function and productivity via control of prey populations. The degree of influence that different predator species have on each other is less well understood. The degree of overlap in resource use among sympatric meso-predator species may indicate levels of interspecific competition and determine the likelihood of functional redundancy in the guild. Coastal elasmobranchs are believed to form a diffuse predator community that feeds on similar prey in a size-based, rather than species-based, manner. If true, sharks and rays may be expected to feed non-selectively based on prey availability, and provide a dampening effect on prey fluctuations, increasing food web stability. Elasmobranchs may benefit from competitive release in areas where teleost competitors are overfished, and adopt the functional roles of competitors that have been reduced to low densities. This project investigates the role of elasmobranch meso-predators in coastal Mediterranean food webs - a group that is likely to play an important role in prey dynamics but is itself influenced by a combination of fishing pressure and climatic variation. We will define the trophic niche occupied by coastal sharks and rays, and compare these with teleost mesopredators. Resource partitioning will be determined using stable isotope analysis coupled with examination of stomach contents, employing spatially explicit agent-based models that account for migratory behaviour by incorporating variation in the marine isoscape. The isotopic resolution of diet may be achieved at a finer scale using compound-specific analyses rather than more traditional bulk tissue analyses. By deconstructing individual amino acid signatures, better trophic discrimination can be seen in 'trophic' amino acids (such as glutamic acid), whereas negligible shifts are seen in 'source' amino acids. This approach is scarce in previous studies of elasmobranchs and teleosts, and we intend to investigate its use in the determination of life history traits from archival tissues (e.g. eye lenses and vertebrae) as well as for 'instantaneous' estimation of trophic niche from metabolically active tissues.