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Large-scale distribution of three deep-water squaloid sharks: Integrating data on sex, maturity and environment

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Abstract

Deep-water sharks exhibit species-specific reproductive strategies, which include segregation by sex, size and reproductive stage. However, due to the wide spatial distribution of most species, available information, usually collected at a regional scale, is usually not adequate to infer species reproductive spatial dynamics. This study draws together information on the distribution of reproductive stages of three species of squaliform sharks: Portuguese dogfish *Centroscymnus coelolepis* (Somniosidae), leafscale gulper shark *Centrophorus squamosus* (Centrophoridae) and birdbeak dogfish *Deania calcea* (Centrophoridae), gathering data from several geographical areas from the Atlantic, Indian and Pacific Oceans. For each species we analysed the sex ratio and the spatial patterns of reproductive stages within regions, considering the influence of geographical area, depth, season, temperature and salinity. The combination of statistical methods used in this study successfully identified a number of life history patterns which reflect different use of habitats by sex and life cycle stage. Pregnant females of the three species are spatially segregated, inhabiting shallower and/or warmer waters. In the case of the leafscale gulper shark this segregation might be associated with large scale migrations. In contrast, in Portuguese dogfish all adult maturity stages occur in the same geographical area. Pregnant female birdbeak dogfish were rare in all samples. Larger immature specimens of all the three species distribute deeper than the remaining maturity stages in most of the regions analysed. Mature males of leafscale gulper shark and birdbeak dogfish were more broadly distributed than mature females, supporting the possibility of sex-biased dispersal. Neonates and small sized specimens were scarce in the Northeast Atlantic potentially explained by their concentration in nurseries, and/or by gear selectivity. Management measures will benefit from considering the geographic scale of demographic variation between species. However, standardized collaborative approaches will be needed for comprehensive assessment.