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Quantifying seasonal movement overlap of mobile demersal fish species in a subarctic coastal marine protected area

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Abstract

The Gilbert Bay Marine Protected Area (GBMPA) was established in southern Labrador, Canada primarily to conserve a locally adapted and genetically distinct inshore population of Atlantic cod (*Gadus morhua*) and associated habitat. Despite this designation, monitoring efforts have demonstrated a substantial decline in the GB Atlantic cod (GB cod) population, largely attributed to fisheries removals at MPA boundaries. In addition to sustained fishing pressure, changes in fish community assemblages also threaten GB cod, increasing vulnerability to further reduction. We investigated local fish species interactions and habitat use within the GBMPA using acoustic telemetry to document seasonal movement patterns of GB cod, Atlantic cod from offshore populations (offshore cod), and Greenland cod (*Gadus macrocephalus ogac*). Fish implanted with acoustic transmitters were released within a passive acoustic array of receivers positioned throughout the MPA and contiguous marine waters, enabling monitoring of fish movements over a 3-year period. Additionally, we used substrate and bathymetry information derived from multi-beam sonar surveys to delineate habitat throughout the MPA. GB cod, offshore cod, and Greenland cod movements overlap during summer, with less pronounced overlap during winter. The area of summer overlap was primarily concentrated seaward, along the MPA boundary, where GB and Greenland cod mixed with offshore cod. In winter, while GB and Greenland cod moved inshore within the MPA, offshore cod were virtually absent. These residency and habitat use patterns likely relate to the availability of foraging habitat during the summer, and spawning/overwinter habitat requirements of each group during the winter and spring. Our study identifies important refuge habitats for GB cod and areas where there is potential competition with other local species. These data help us understand the important factors contributing to GB cod decline and can aid in refining management practices to accommodate seasonal movements and protect this species of conservation concern.

Keywords

acoustic telemetry, seasonal movement, habitat use, Marine Protected Area