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Variability in fish larval retention at South Georgia, Southern Ocean: insights from numerical modelling

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The waters around South Georgia are amongst the most productive in the Southern Ocean, and support internationally important fisheries. However, there is significant inter-annual variability in fish stocks, and some species have failed to recover from historical overfishing. Dispersal and retention of the pelagic stages (eggs and larvae) of marine fish can play a key role in the maintenance of adult stocks, with variability in life history and environmental characteristics, including oceanographic flow fields, having a significant influence. Here we examine the influence of oceanographic and life history variability on the dispersal and retention of two species of Antarctic fish: Champsocephalus gunnari and Notothenia rossii. Whilst Notothenia rossii is no longer commercially fished due to depletion of the fish stocks and their failure to recover, Champsocephalus gunnari is fished on both the South Georgia and Shag Rocks shelves, and there is some debate as to the degree of connectivity between these two shelf populations. Predicted flows for the South Georgia region from a high resolution ($\sim$3 km) hydrodynamic model have been used to drive Individual Based Models of the early life stages of the two fish species. The simulations were repeated over 3 years, and the results analysed to provide insight into the roles of oceanographic variability, life history, and biological behaviour on dispersal and retention. Here we present the key findings of our research, and discuss their implications for fisheries at South Georgia.