

# Chokka squid (*Loligo vulgaris reynaudii*) abundance linked to changes in South Africa's Agulhas Bank ecosystem during spawning and the early life cycle

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Chokka squid biomass and catch are highly variable, likely owing to their links to changes in the ecosystem, which impact spawning and recruitment. A synthesis of basic ecosystem components for the domain in which chokka squid live (i.e. South Africa's west coast and Agulhas Bank) was prepared using published and new data. It included bottom temperature, bottom dissolved oxygen, chlorophyll, and copepod abundance. Alongshore gradients of these indicated that the main spawning grounds on the eastern Agulhas Bank are positioned where bottom temperature and bottom dissolved oxygen are optimal for embryonic development. This location, however, appears suboptimal for hatchlings because the copepod maximum (food for paralarvae) is typically on the central Agulhas Bank some 200 km to the west. Data on currents suggest that this constraint may be overcome by the existence of a net west-flowing shelf current on the eastern Agulhas Bank, improving survivorship of paralarvae by transporting them passively towards the copepod maximum. CTD data and a temporal analysis of AVHRR satellite imagery reveal the copepod maximum to be supported by a "cold ridge", a mesoscale upwelling filament present during summer when squid spawning peaks. In situ sea surface temperature (SST) data used as a proxy for cold ridge activity demonstrate considerable interannual variability of the feature, especially during El Niño-Southern Oscillation events. Negative linear correlations between maximum summer SST (monthly average) and squid biomass the following autumn ( $r=0.94$ ), and annual catch ( $r=0.69$ ), support the link between the "cold ridge/copepod maximum" and the early life cycle of chokka squid, and holds promise for prediction.

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Keywords: biomass, catch, chokka squid, cold ridge, currents, ecosystem, gradients, spawning, upwelling filament.

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