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Bioclimate envelope model to evaluate impacts of climate change on *Placopecten magellanicus* in the Gulf of Maine

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The distribution and growth of many benthic species are closely tied to their surrounding environment, which fluctuates over space and time. A bioclimate envelope model was developed to evaluate the potential impacts of climate variability on sea scallops (*Placopecten magellanicus*). Bioclimate envelopes were established through Habitat Suitability Indices (HSI) based on bottom temperature, bottom salinity, bottom current speed, depth, and bottom composition. The relationship between sea scallops and each environmental variable was identified using Suitability Indices (SIs) which were based on standardized scallop abundance generated from 8 years of a dredge survey data carried out along inshore and offshore areas along the Maine coast. A regional ocean model (Finite-Volume Community Ocean Model) was integrated with the HSI to hindcast spatiotemporal variability of bioclimate envelopes for sea scallops in coastal waters of Maine and New Hampshire from 1978 to 2013. Distinct associations with habitat variables were identified among scallops inhabiting inshore and offshore locations. Thus, model predictions were based off either inshore or offshore SIs accordingly. Model predictions indicate an improvement in habitat suitability in shallow areas since 1978 and decrease in deeper habitats. This research provides a modeling framework to evaluate climate change impacts on scallops in the Gulf of Maine over a broad spatio-temporal scale and can be used to devise future studies of this species.

Keywords: Bioclimate envelope, Sea Scallops, Habitat Suitability

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