Fishing and Bottom Water Temperature as Drivers of Change in Maximum Shell Length in Atlantic Surfclams (*Spisula solidissima*)

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Human-induced changes in life history traits of fished populations, including maximum body-size, are known in many fisheries. Maximum shell length of Atlantic surfclams (*Spisula solidissima*) on the Middle Atlantic continental shelf, obtained from federal fishery survey data from 1982-present, has decreased by 15-20 mm – a biomass reduction of nearly 40%. Two potential causes of this decreasing trend, size-selective fishery removal of large animals and stress due to warming bottom temperatures, were investigated using an individual-based model for post-settlement surfclams. Simulations showed that both fishing or warming bottom water temperature can decrease the maximum surfclam shell length (body size). Independently, either localized fishing rates of 20% or sustained bottom temperatures that are 2°C warmer than average conditions generate the observed decrease in maximum shell length. However, these independent conditions represent extremes and are not sustained in the MAB. The combined effects of fishing and warmer temperatures can generate simulated length decreases that are similar to observed decreases. Interestingly, year-to-year variability in bottom water temperatures can cause simulated shell length to vary by 20 mm over 10 to 15 years. Simulations also suggest that shell size composition of surfclam populations can recover if conditions change; however, that recovery could take a decade to become evident.

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