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Sclerochronology – a highly versatile tool for mariculture and reconstruction of life history traits of the queen conch, \textit{Strombus gigas} (Gastropoda)

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The shell of the queen conch *Strombus gigas* provides a rapidly growing palaeoenvironmental proxy archive, allowing the detailed reconstruction of important life-history traits such as ontogeny, growth rate and growth seasonality. In this study, modern sclerochronological methods are used to cross-date the palaeotemperatures derived from the shell with local sea surface temperature (SST) records. The growth history of the shell suggests a bimodal seasonality in growth, with the growing season confined to the interval between April and November. In Glovers Reef, offshore Belize, the queen conch accreted shell carbonate at rates of up to 6 mm day^{-1} during the spring (April-June) and autumn (September-November). However a reduced period of growth occurred during the mid-summer months (July-August). The shell growth patterns indicate a positive response to annual seasonality with regards to precipitation. It seems likely that when precipitation levels are high, food availability is increased as the result of nutrient input to the ecosystem in correspondence with an increase in coastal runoff. Slow growth rates occur when precipitation, and as a consequence riverine runoff, is low. The SST however appears to influence growth only on a secondary level. Despite the bimodal growing season and the winter cessation in growth, the growth rates reconstructed here from two *S. gigas* shells are among the fastest yet reported for this species. The *S. gigas* specimens from Belize reached their final shell height (of 22.7 and 23.5 cm in distance between the apex and the siphonal notch) at the transition to adulthood in just 2 years.

The extremely rapid growth as observed in this species permits detailed, high-resolution reconstructions of life-history traits where sub-daily resolutions can be achieved with ease. The potential for future studies has yet to be further explored. Queen conch sclerochronology provides an opportunity to recover extremely high-resolution palaeotemperature records, which could be used to improve numeric climate models, where the shells essentially function as mineralized buoys. The shell recorder may also help to reveal changes in biogeochemical dynamics in benthic ecosystems on intra-seasonal timescales in the fossil record. Furthermore, sclerochronology provides a rapid, effective and highly versatile investigative strategy when compared to time- and cost-consuming fieldwork for improving fisheries management and maricultural pursuits.