Woods Hole Oceanographic Institution

Biology Department Seminar

Thursday, August 8, 2024 – 12:00 Noon

Interactions Between Nitrogen and Temperature on the Metabolism of the Red-Tide Mixotrophic Dinoflagellate *Karenia* Spp.

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The toxic mixotrophic dinoflagellate *Karenia* spp. forms blooms almost annually in the Gulf of Mexico, especially on the West Florida Shelf (WFS). Blooms typically initiate in early fall but can persist from months to years. Daily, *Karenia* vertically migrates to the surface water during the day, possibly experiencing changes in temperature, light, nitrogen (N), and prey type and availability. Therefore, these studies aimed to examine the interplay between *Karenia's* photo-autotrophic and phago-mixotrophic metabolism and the short-term fluctuations in environmental conditions to understand how these factors may relate to the conditions under which *Karenia* spp. are found in the WFS. *K. mikimotoi* culture balanced photon flux pressure with consumption in overall metabolism when pulsed with NO3-, NH4+, or urea over the range of 15-25°C as shown by photosynthetic fluorescence. However, when shifted to 30°C, cells were significantly stressed, but urea-enriched cells showed a smaller decline in fluorescence, implying that urea might induce a photoprotective mechanism by increasing metabolic "pull." Studies conducted with natural *K. brevis* winter and summer populations showed that thermal history played a critical role. Unusually, summer blooms had higher biomass but were stressed photosynthetically and nutritionally. However, urea enriched summer cells had higher uptake rates as well as carbon and N cell-1, especially in warmer waters, showing differential thermal responses based on N forms. Mixotrophy grazing measurements showed that *K. brevis* grazed *Synechococcus*. Grazing did not selectively target specific qualities of prey, but ingestion rates were a function of prey-to-grazer ratios. NanoSIMS confirmed 15N incorporation from *Synechococcus* in *K. brevis*. In natural communities of *K. brevis*, ingestion rates were also significantly related to prey-to-grazer ratios and by temperatures to a lesser degree when incubated at ambient (24°C) and ambient temperature ± 5°C (19, 29°C). Grazing on *Synechococcus* indirectly reduces the photosynthetic performance of prey, especially at warmer temperatures.

HYBRID! **In Person**: Redfield Auditorium **Zoom:** https://whoi-edu.zoom.us/j/97000865816 Meeting ID: 970 0086 5816 **By phone**: Find your local number: https://whoi-edu.zoom.us/u/adIvMow3LQ