Mechanisms behind the metabolic flexibility of an invasive comb jelly

Mnemiopsis leidyi is an invasive comb jelly which has successfully established itself in European seas. The species is known to produce spectacular blooms yet it is holoplanktonic and not much is known about its population dynamics in between. One way to gain insight on how M. leidyi might survive between blooms and how it can bloom so fast is to study how the metabolism of this species actually responds to environmental changes in food and temperature over its different life-stages. To this end we combined modelling and data analysis to study the energy budget of M. leidyi over its full life-cycle using Dynamic Energy Budget (DEB) theory and literature data. An analysis of data obtained at temperatures ranging from 8 to 30 °C suggests that the optimum thermal tolerance range of M. leidyi is higher than 12 °C. Furthermore M. leidyi seems to undergo a so-called metabolic acceleration after hatching. Intriguingly, the onset of the acceleration appears to be delayed and the data do not yet exist which allows determining what actually triggers it. It is hypothesised that this delay confers a lot of metabolic flexibility by controlling generation time. We compared the DEB model parameters for this species with those of another holoplanktonic gelatinous zooplankton species (Pelagia noctiluca). After accounting for differences in water content, the comparison shows just how fundamentally different the two energy allocation strategies are. P. noctiluca has an extremely high reserve capacity, low turnover times of reserve compounds and high resistance to shrinking. M. leidyi adopts the opposite strategy: it has a low reserve capacity, high turnover rates of reserve compounds and fast shrinking.