Unraveling the reproductive plasticity of scyphozoan polyps in response to diverse environmental conditions

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Abstract

Phenotypic plasticity drives the adaptive response of organisms to different environmental conditions. Within marine metazoans, scyphozoans ("true" jellyfish) display a high degree of adaptation. Identified within the Ediacaran fauna, they survived often extreme environmental conditions throughout the long history of life on Earth and colonized almost all seas. At present, they seem unaffected by global warming and increased anthropogenic stressors, while the closely-related anthozoans appear vulnerable to present conditions. However, how scyphozoans achieve such adaptive success remains little known. Only recently, the observation of co-occurring different modes to produce young medusae (monodisk and polydisk strobilation, indirect development) in the polyps of *Aurelia relicta* and *Cotylorhiza tuberculata* suggested that a variety of reproductive strategies may be key to the phenotypic plasticity of scyphozoans. Additionally, the production of young medusae (ephyrae) by polyps is one of the factors determining mass appearances of adult medusae (outbreaks). Therefore, assessing the environmentally-induced effects on reproductive strategies and the molecular signaling driving them will improve knowledge of the ecology and evolution of this group but also of processes acting in different taxa. Despite the central role of ephyral production, environmental conditions and molecular signaling that modulate reproductive plasticity along with the morphological and ultrastructural changes that characterize the different reproductive types have received little attention.

To define the response of scyphozoan polyps to environmental conditions in terms of ephyral production strategies, *C. tuberculate* polyps will be maintained at different combinations of temperature and feeding regimes in order to: 1) determine rates of reproductive plasticity; 2) identify the transcriptional profiles regulating the phenotypic plasticity under the diverse experimental conditions; 3) describe morphometric and ultrastructural features of polyps and ephyrae associated with each reproductive mode using light and electron microscopy. Overall, these results will greatly improve the understanding of the evolutionary success of this ancient group of marine organisms and their population dynamics in present and future scenarios.