

Siphonophores are a planktonic, colonial cnidarians. Because of their locally high abundance and elaborate preying techniques (*e.g.* aggressive mimicry) they are believed to be one the most important predators of pelagic food webs. Siphonophore colonies are made up of functionally specialized individuals, called zooids, arranged along the colony stem in the iterative clusters, cormidia. Many of the most speciose suborders of siphonophores, Calyphorae, are characterized by intricate life cycle, in which gamete development takes place in a sequentially released from the colony, posterior-most cormidia. This self-contained, dispersive-reproductive stage is called eudoxid. In its lifetime calyphoran colony can release tens of eudoxids, each of which will live separately from parental colony, develop gonads and spawn gametes directly to the ocean. Because of that, the evolutionary unique reproductive strategy of Calyphorae has significant consequences for their population dynamics, but also comes with obvious ecological benefits. In spite of that, the process of eudoxid release remains virtually unstudied.

Objectives of this projects are therefore: (1.) describe the process of eudoxid release by understanding underlying cellular mechanisms, (2.) reconstruct evolutionary origins of this life cycle, and also (3.) evaluate resulting ecological benefits. The comprehensive analysis of the life cycle requires application of a broad spectrum of research techniques. Some experiments will have to be conducted on living specimens, therefore part of the work planned in this project will be undertaken at the Observatoire Océanologique de Villefranche-sur-Mer. This institute is located just by the Villefranche Bay, a basin well known for the high abundance and diversity of gelatinous organisms living there.

Cellular mechanisms of eudoxid production will be studied in cosmopolitan calyphoran *Abylopsis tetragona* by in-depth characterization of cellular morphologies of cell in the stem, including localizing actin and myosin fibers and experimental, pharmacological blocking of their activity. For the sake of realization of the second objective, first a putative role of one of the zooids (bract) in eudoxid release will be tested in broad range of calyphoran species. Then the new calyphoran DNA sequences will be generated with DNA barcoding that later with help of advanced phylogenetic methods will be used to reconstruct their evolutionary history and evolution of eudoxid production. Finalization of the last part of the project requires application of two different techniques. First, experiments will be conducted that will test if environmental conditions influence eudoxid production rate. The second approach will rely on analysis of seasonality and dispersal capabilities of eudoxids, and by so the ecological benefits they come with, by comparing spatio-temporal distribution of eudoxids and adult colonies in a global (using data from *Tara Oceans* expedition) and historical scales (using weekly plankton monitoring in Villefranche Bay, 1995-2017).

Aside from granting complex understanding of mechanisms and evolution of eudoxid production, as well as its ecological consequences for species, realization of this project will facilitate interpreting population dynamics of siphonophores, and as a result will allow for better recognition of their roles in ecosystems. Moreover, some of methods, planned in the framework of this project, have never been applied to siphonophore or even cnidarian research, thus this project will constitute a valuable source of information about methods in the ecological evolutionary developmental biology (eco-evo-dev).