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Dynamics of thermal tolerance limits in marine bivalves: extant fauna and palaeo-analogues (BivTRS)

Embedded in the Research Unit “Temperature-related stresses as a unifying principle in ancient extinctions” (TERSANE), this project is proposed to assess the physiological constraints imposed by so-called temperature-related stresses (TRS: warming, ocean acidification, and hypoxia) on two taxa of marine bivalves. Biv-TRS follows the hypothesis that common physiological principles underpin palaeo- and current observations of climate effects on marine organisms. Therefore, Biv-TRS will (1) investigate the physiological effects of changing temperature alone and of temperature together with the other climate change drivers in extant pectinoids and ostreoids from European seas. These two groups have a rich fossil record and experienced several extinction episodes. Among pectinoids, pectinids (scallops) are characterized by their unique capacity to swim while many sessile ostreoids (oysters) are cemented to the bottom, form dense beds and act as habitat engineers. In contrast to scallops, oysters are also found in the intertidal zone and more tolerant to variable environmental conditions. Biv-TRS will also (2) examine how the principles of oxygen and capacity limited thermal tolerance (OCLTT) become operative in the two groups and how and to what extent shifts in the first (sublethal) lines of thermal limitation are caused by ocean acidification, hypoxia, and the combined action of TRS. Further efforts will address the mechanisms involved in setting and shifting sublethal thermal limits, at whole organism, tissue and cellular levels. Focusing on two ecologically distinct taxa of marine bivalves with a rich fossil record will facilitate (3) the comparison with palaeo-biological results. Based on preliminary work we expect that oysters will be less sensitive long-term to TRS than pectinids and that the greater physiological plasticity of oysters scales up to evolutionary time scales. The physiological findings of Biv-TRS will therefore be compared with analyses of the patterns of both bivalve taxa during mass extinction episodes in other projects of this Research Unit such as TRS-data and J-Evo.