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Ecological genomics for coral and sea urchin conservation in times of climate change

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If atmospheric CO2 levels continue to increase, it is predicted that the average ocean sea surface temperature will also increase and ocean pH will decrease to levels not experienced by marine organisms for millions of years. Understanding the impact of these stressors will require the study of several marine organisms, and this knowledge will be fundamental to our ability to predict possible effects along large geographical regions and across phyla. Ecological genomics, defined as the use of molecular techniques to answer ecological questions, offers a set of tools that can help us better understand the responses of marine organisms to changes in their environment. In the present work we are using genomic tools to characterize the response of corals and sea urchins to environmental stress. On one side, coral species represent a useful model due to its functions as “environmental sentinels” in tropical ecosystems; on the other hand, species of sea urchins, with the recent sequence of the genome of the purple sea urchin S. purpuratus, offers important genomic resources. Recent results in corals and in sea urchins have shown that the response to stressful conditions can be detected using molecular genomic markers. Continued study of the mRNA expression patterns of several important gene families including calcification genes as well as genes involved in the cellular stress response such as heat shock proteins, will be valuable index of ecological stress in marine systems. These data can be integrated into better strategies of conservation and management of the oceans.