

Preface

During evolution our planet saw five catastrophic events driven by oxygenation of the atmosphere, carbon dioxide emissions, volcanic eruptions and asteroid impacts, each of which extinguished most of the biota. But after each wipe-out, evolution started triggering more advanced organisms. The Cretaceous-Tertiary extinction eradicated 75% of all plant and animal species about 66 million years ago caused by the impact of a massive asteroid 10 to 15 km in diameter. The most prominent victims were the non-avian dinosaurs. The largest marine extinction has been documented 250–300 million years ago with an event of massive ocean acidification. Today, many scientists are convinced that we are nearing the next mass extinction, this time resulting from the activities of a single species, *Homo sapiens*. It is proven that increasing emissions of carbon dioxide from fossil fuel burning and altered land usage result in global climate change. The question is whether we can stop the global heating at 2° or 3° or 4.5°C. The latter scenario would be catastrophic: the difference between the global mean temperature during the last ice age and today was about 4.5°C. The reason for the uncertainty in the predictions depends on which scenario we will follow. The Intergovernmental Panel on Climate Change has developed a number of models with different inputs, ranging from an immediate stop of CO₂ emissions to business-as-usual. Additional anthropogenic impacts on the biota include stratospheric ozone destruction and pollution. The oceans have absorbed over 90% of the Earth's excessive heat, resulting in ocean warming and deoxygenation with enhanced stratification. The oceans and terrestrial ecosystems are exposed to multiple stresses, but they respond differentially. The ratio of primary production in the oceans vs. terrestrial systems will change, leading to contrasting differences in food supply capacities. Marine ecosystems are responsible for mitigating global climate change and feeding a rapidly growing human population, but they are under a plethora of manmade stress factors including ocean warming, acidification, deoxygenation, and increased exposure to solar UV radiation due to enhanced stratification. These changes alter marine physical and chemical environments to different extents in different regions with wide-range consequences for the food webs up to decreased production for human consumption. This volume reviews the effects of anthropogenic stress factors and their interactions on the aquatic biota.

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Spring 2018