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Coralline algae as integral components of shallow-marine ecosystems: Anecdotes of past resilience and future outlook

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ABSTRACT

Coralline red algae are among the major groups of calcified benthic biota thriving in the marine photic zone globally as crustose and erect forms, attached to the substrate or forming free-living nodules (rhodoliths). From the deep-time geological past to the modern era, coralline algae have been highly valuable carbonate producers and ecosystem engineers but received lesser attention compared to the visually dominant corals and kelps. Coralline algal beds denoting extremely productive habitats cover wide-ranging coastal shelf and upper slope horizons of the Earth but several gaps persist in our understanding of their systematics, productivity, net carbon flux dynamics and inputs to the oceanic carbon cycle. The current review emphasizes on the taxonomy, ecology and distribution of coralline algae in the shallow-marine ecosystems deciphered both in the context of Recent environments and fossil archives. Numerous discrepancies exist particularly in the taxonomy of fossil coralline algae, strongly dependent on morpho-anatomical study approaches. The communities of biologists and palaeontologists worldwide need to manifest a shared knowledge platform and present a viable nomenclature scheme to facilitate summarizing the critical functional traits associated with coralline algae. Persistent occurrence of several coralline genera from the Cretaceous period to the Holocene epoch reflect high-end resilience across multiple extreme events including Cretaceous-Palaeogene (K–Pg) mass extinction, Palaeocene-Eocene Thermal Maximum (PETM), Early Eocene Climatic Optimum (EECO) and Middle Eocene Climatic Optimum (MECO). In view of the ongoing global change phenomena like ocean warming, acidification and adverse sea-level fluctuations, future outlook pertaining to the studies of coralline algae should essentially seek both quantitative and qualitative datasets from diverse domains of the Earth. This should be supplemented with special focus on the response of corallines to past hyperthermals and climate change, when corals perished at large scales compared to the relatively tenacious corallines.

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