



Paleo-archives of Cnidaria and Porifera in space and time

Proceedings of the 13th International Symposium on Fossil Cnidaria and Porifera

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This Thematic Issue hosts the Proceedings of the 13th International Symposium on Fossil Cnidaria and Porifera, held at the Università degli Studi di Modena e Reggio Emilia (Italy) on September 3-6, 2019. It was the congress of the International Association for the Study of Fossil Cnidaria and Porifera, organized every four years since the first edition in Novosibirsk (Russia) in 1971, and then hosted by many different countries all over the world (France, Poland, USA, Australia, Germany, Spain, Japan, Austria, Russia again, Belgium, Oman). In Modena, the general Assembly changed the name and statute of the association, now named International Fossil Coral and Reef Society (IFCRS: <https://www.cnidaria.nat.uni-erlangen.de/IFCRS/>).

For the first time organized in Italy, the Symposium aimed to bring together participants from all over the world to discuss and share the most recent advances of studies on fossil corals and sponges, coral reefs and associated biota. The congress theme “Looking back to see ahead” was chosen to highlight the importance of the fossil archives to understand the response of the biosphere to long-term environmental perturbations and to promote interdisciplinary approaches from a body of interested palaeontologists, biologists but also specialists in other disciplines.

There is a striking evidence that coral reef systems are currently navigating a world of warming temperatures, rising sea levels, and changes in oceanographic conditions and water quality. This combination of direct and indirect anthropogenic stressors is severely threatening coral reefs causing their decline worldwide (Pandolfi et al., 2003; De'ath et al., 2009; Harborne et al., 2017), and predicting their future development is thus a priority challenge (Pandolfi et al., 2011).

Coral reefs, and in general reef environments, have experienced a variety of climate boundary conditions during the recent and the geological past, and investigating their evolution in the fossil record is crucial to place the observed changes in modern reefs into a long-term context. Reefs, reef organisms and reef attributes of the past are precious archives for tracing the impact of transient, oscillatory and abrupt changes of environmental factors over large-time and spatial-scales, from yearly to millennial, and from individual reefs to entire oceans

(Kiessling, 2005, 2009; Pandolfi & Kiessling, 2014; Renema et al., 2016).

Contributions to this Thematic Issue are organized by stratigraphic order and provide a multi-scale overview of Cnidaria, Porifera, reef organisms and reef environments across the Phanerozoic by a broad spectrum of approaches (systematic palaeontology, palaeoecology, palaeobiogeography, taphonomy, facies analysis, etc.)

The Issue starts from the deep time, with a thorough overview of the long fossil record (from the Cambrian to the Eocene) of cnidarian medusae (jellyfish)-bearing deposits and analysis of the palaeoenvironmental conditions and factors that progressively led to the restriction of their preservational potential through the Phanerozoic (Young & Hagadorn, 2020).

The Palaeozoic record is represented in this Issue by the Carboniferous-Permian time window. Lower Carboniferous solitary rugose corals from Ukraine (Ohar, 2020) and tabulate and rugose corals from the Moscow Basin (Russia) (Somerville et al., 2020) are described and framed into the palaeogeographic context of the period, providing new data about possible connections between the Eastern European basin, Palaeotethys and North America. Still from the Carboniferous (Upper Mississippian), but from South China, is reported and interpreted the endosymbiotic relation between solitary rugose corals and large soft-bodied worm-like organisms, as evidence of the importance of the symbiotic interactions between organisms to better understand exploitation of ecospace and the formation of specific niches within the ecosystem (Lin & Herbig, 2020). Contributions related to the Carboniferous period end with the Pennsylvanian of the Cantabrian Mountains (northern Spain), where a combined palaeontological-sedimentological study reveals the presence of remarkable algonospongia-chaetetid mounds (Rodríguez-Castro et al., 2020). A detailed systematic description of lower Permian solitary rugose corals from Slovenia underlines a gregarious mode of growth for these corals (Kossovaya et al., 2020); whereas a rarely preserved case of intraspecific competition in rugose corals is explored from Permian (Guadalupian) reef blocks of Oman (Weidlich, 2020).

From the Palaeozoic, this Issue moves forward in time until the Cenozoic, with contributions spanning from the

lower Eocene to the Miocene, and from Mediterranean to Caribbean and western Atlantic regions. The discovery of the new aphyroid scleractinian coral genus *Nancygyra* in the lower Eocene (upper Ypresian) reef limestones of Monte Postale (northern Italy) highlights the diversification of scleractinians during a time represented by a marked decline of coral reefs (Bosellini et al., 2020a). The Eocene deposits of northern Italy are also well known for the occurrence of siliceous sponges and are herein investigated from the Lutetian of the Chiampo area in order to provide a first interpretation of their taphonomic history and depositional environment (Frisone et al., 2020). A peculiar coral-larger foraminifera association is documented from the upper Eocene of Jamaica, with the first record of a solitary discoid coral settled on a *Lepidocyclus* test (Stemann & Robinson, 2020). The Oligocene, well known as the apex of Cenozoic coral reef growth, is documented in this Issue by the description of reef corals from Austria that represent the northernmost fauna reported to date for Rupelian time (Baron-Szabo & Sanders, 2020), and by the study of the coeval reef coral assemblages and facies of the Lessini Shelf as a base to review and assess the alternative reef depositional models proposed for this area (Bosellini et al., 2020b). The reconstruction of the Oligo-Miocene diversification patterns of the staghorn coral *Acropora* in the western Atlantic is the subject of the last paper of this Issue, testifying the role of the fossil record for better understanding the present-day success of the most diverse living genus of reef-building corals (Wallace et al., 2020).

Finally, we would like to underline once again the importance of this international effort in providing precious contributions to the knowledge of the reef systems of the past as the basis for modelling the future of our richest marine biological systems. Looking back to see ahead!

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