

Chapter 5

Patterns of Phanerozoic Bioturbation

This study focused on the application of ichnology in the characterization of depositional environments. In particular, it developed quantitative approaches for the study of ichnological systems, including the IchnoGIS method. This framework - based on network theory and geostatistics - allowed the environmental characterization of modern environments and suggested the application of network theory on fossil ichnological systems. In this regard, this study developed a methodological framework to model ichnosites - both fossil and modern - as networks, the topology of which reflects environmental processes. In addition, ichnonetwork analysis suggested the response of ichnological systems to global dynamics.

These results provide prominent grounds for the study of modern and fossil ichnological systems, encouraging the application of ichnonetwork analysis as a single template for understanding the bioturbation patterns of the Phanerozoic.

More specifically, several important directions for further work are identified. From a neoichnological perspective, continental environments are lacking an extensive study (Bromley, 1996; Buatois and Mángano, 2011), therefore the ichnological response to the marine-freshwater gradient is an important research question to be investigated. In this regard, the preliminary survey of the Tagliamento river (Italy) shown a notable diversity and abundance of biogenic sedimentary structures (Fig. 1).

From a palaeoichnological perspective, some of the major ichnosites of the Pramollo ichnolagerstätte are lacking an ichnonetwork approach. In this regard, preliminary results on the

Corona, Auernig and Carnizza Formations indicate a similar network topology with respect to the ichnonetworks of the Val Dolce and Meledis-Pizzul Formations (Fig. 2).

Whereas the aforementioned approaches concern a fine-scale (ichnosite-scale), ichnonetwork analysis could synthesize ichnological data at a coarser domain of scale, including information on several ichnosites over the whole Phanerozoic. In this regard, the dataset on which the Seilachierian ichnofacies are built (Seilacher, 2007) represents an ideal ground to elucidate the bioturbation patterns of the Phanerozoic and test the ichnofacies model itself (Fig. 3).

REFERENCES

- Buatois, L. A., and M. G. Mángano. 2011: *Ichnology: Organism-Substrate Interactions in Space and Time*. Cambridge University Press, Cambridge / New York, 358 p.
- Bromley, R. G. 1996: *Trace fossils: biology, taphonomy and applications*. Chapman & Hall, London, 361 p.
- Seilacher, A. 2007: *Trace fossil analysis*. Springer, Berlin. 226 p.

FIGURES

Fig. 1. Trench sampling reveals a rhizolith (Rh) and insect traces (Tr), the latter of which are intersecting a rippled surface. Modern fluvial plain of the Tagliamento river (Italy).

Fig. 2. Ichnonetwork of the Corona-Auernig-Carnizza Formations (upper Carboniferous; Pramollo, Italy). Nodes are sized and coloured by degree,

Fig. 3. Ichnonetwork of the dataset on which the Seilachierian ichnofacies are built (Seilacher, 2007).

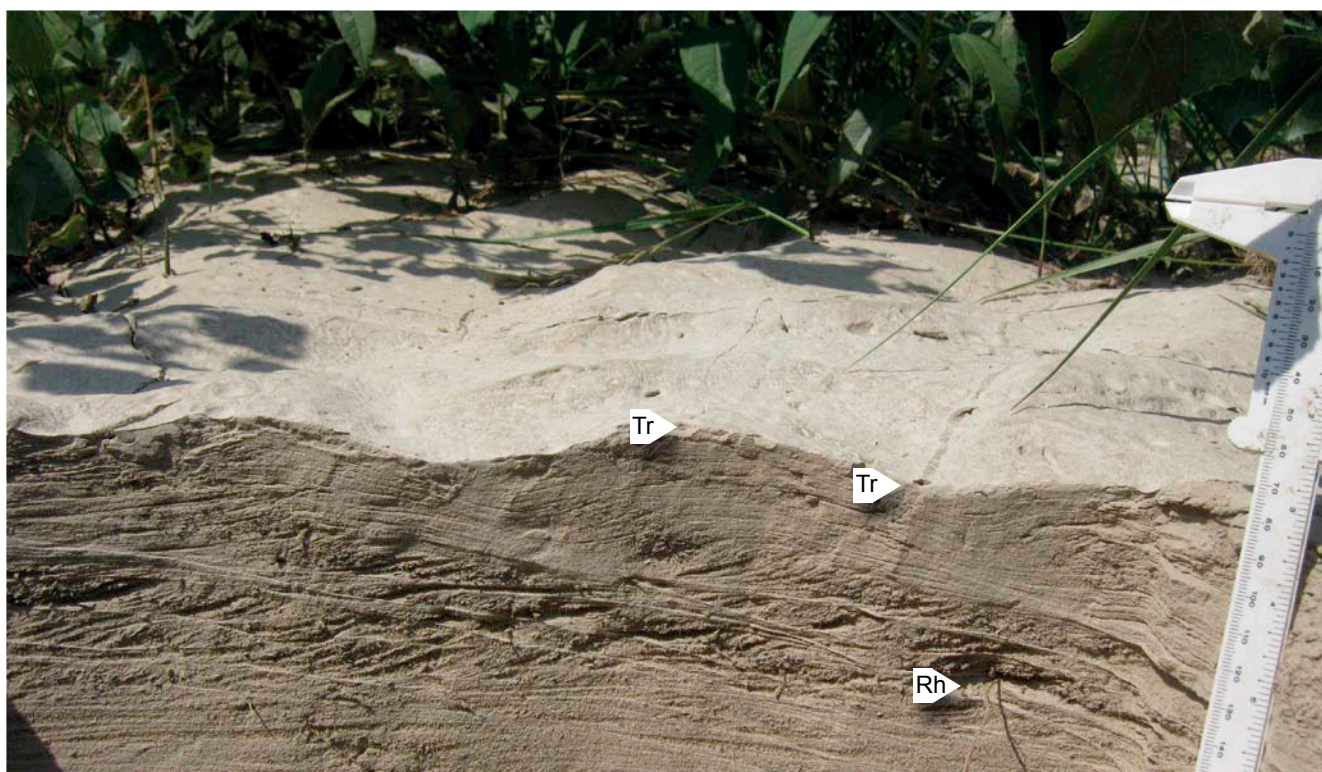


Fig. 1.

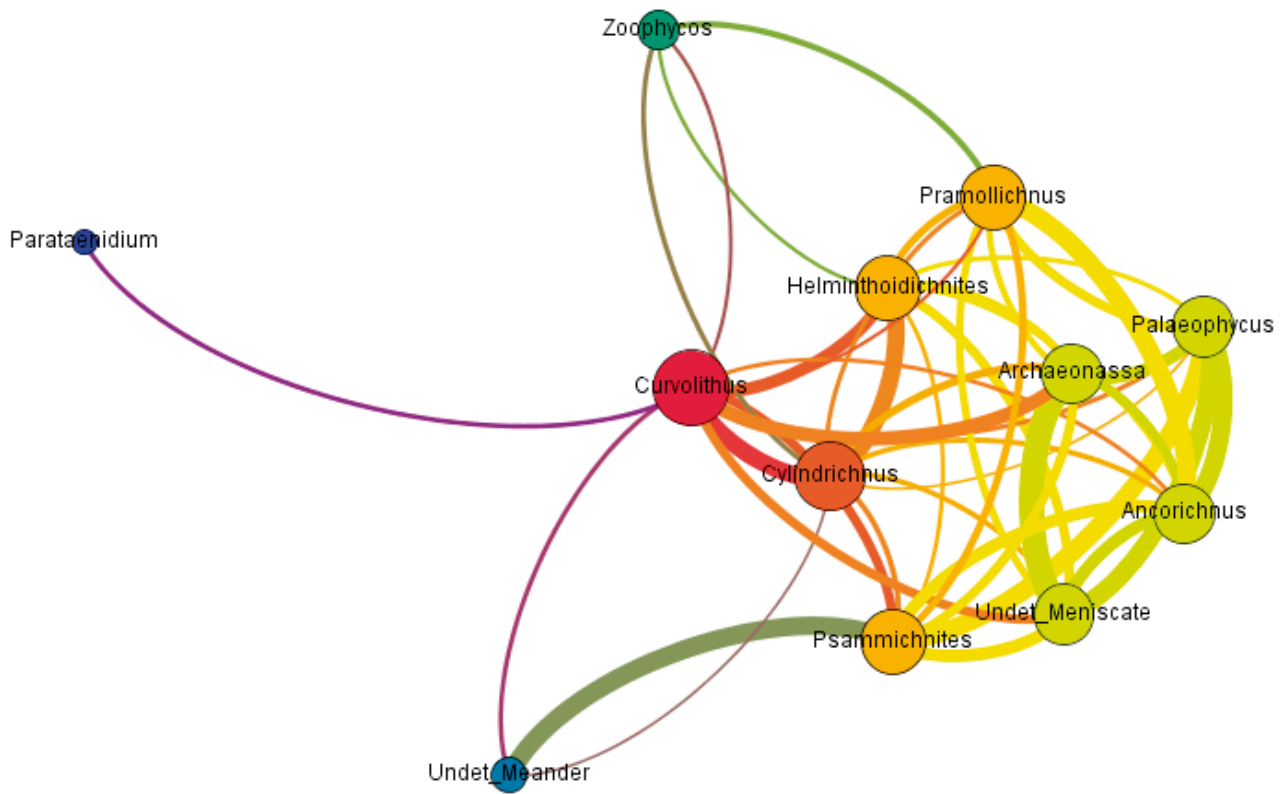


Fig. 2.

