

## **THE CAMBRIAN BEGINNING OF THE ORDOVICIAN RADIATION**

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The late Middle and early Late Cambrian succession in Iran (Elburz Mountains, Mila Formation) contains the first reefs and hardgrounds of the Ordovician type. The reefs are microstromatolites and spongal (lithistid) bafflestones. The development of extensive hardgrounds formed by shell hash served as a substrate for the reef initiation. These hardgrounds are the first hardgrounds recorded up to now. Aragonite marine cements, which are common in the Early Cambrian reefs, are absent. Articulate brachiopods, whose valves consisted of low Mg-calcite, and echinoderm ossicles of high Mg-calcite are the principal shell contributors for the hardground formation which kept pass into the Ordovician. In Iranian sections, skeletal stromatolite-lithistid reefs start together with true eocrinoid hardgrounds which require calcite-sea conditions for the development.

Three principal factors determine the appearance and following success of rich Ordovician biota: (1) The elimination of Early Cambrian-type biota; (2) the development of relatively large and abundant benthic animals with calcite shells able to produce hardgrounds; (3) the probable alternation of aragonite-facilitating conditions into aragonite-inhibiting conditions. The commence of reefs and hardgrounds are among principal factors providing the Ordovician radiation and diversification due to high potential of these ecosystems for the nich splitting. Among other factors, the intent deployment of the pelagic real and the appearance of new relatively more powerful predator groups (e.g., cephalopods, conodont) has to be mentioned. All these processes started already by the end of the Cambrian.