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Shallow subtidal to intertidal hummocky cross-stratification like structures preserved in the Lower Ordovician Mungok Formation, Yeongwol Group, Korea

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So-called “Mungokri stromatolite” was designated as Natural Monument of Korea #413 in 2000. It occurs in the upper part of Lower Ordovician Mungok Formation, Yeongwol Group. The designated “stromatolite” occurs as a steep cliff, comprising an extensive bedding surface of more than 30 $\times$ 30 m in size. The bedding surface is characterized by hundreds of mound-like structures (or “hummocks”) that are $\sim$5 cm high and 40–60 cm wide, superficially resembling LLH-type stromatolite. Bedding surface with abundant mud cracks occur in a bed 260 cm above the “stromatolite”. The entire succession is now dolomitized, and primary sedimentary structures are mostly obscured. In cross-section, it shows elongated, low-relief oval bedform resembling that of hummocky cross-stratification (HCS) rather than that of stromatolite which would show flat bottom and curved upper surfaces. Detailed microscopic observation on the “stromatolite” reveals repetitive occurrence of erosive boundaries and normal grading within the structure with muddy intraclasts, discarding its biogenic origin. These new observations suggest it is not relevant to regard the “Mungokri stromatolite” as a real stromatolite; rather it represents a physical sedimentary structure, probably HCS. If this structure is real HCS, then it may represent a rare ancient example of HCS that preserved in shallow subtidal to intertidal environment, as evinced by desiccation crack-bearing layers above the structure. Shallow-water HCS identified from Recent tidal flat of the western Korean Peninsula could be an analogue of the “Mungokri stromatolite”. This study therefore demonstrates importance of detailed scientific studies before designation of geoheritage.