Norian–Rhaetian sponges of eastern Panthassa: A harbinger of elevated dissolved silica in the Early Jurassic

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Sponge occurrences across the Norian–Rhaetian boundary in the Gabbs Formation (western Nevada, U.S.A.) indicate elevated dissolved silica (dSi) in the Late Triassic that continues into the Early Jurassic. Following the End-Triassic mass extinction, the early Jurassic recovery of this region includes the development of a shallow, sponge-dominated glass ramp; here we present data from microfossil surveys of the fossiliferous strata of the Gabbs Formation, which indicate the presence of lithistid and non-lithistid demosponges and hexactinellid sponges in shallow mid to inner ramp environments prior to the End-Triassic mass extinction.

Microfossils were liberated from the carbonate matrix using buffered acetic acid dissolution for samples across the Norian–Rhaetian boundary. The results of the microfossil survey show a consistent low presence of non-lithistid demosponges throughout the mid-ramp facies across the Norian–Rhaetian boundary. During the Norian Stage, lithistid and hexactinellid sponges appear relegated to slightly deeper portions of the mid-ramp. In the Rhaetian, lithistid and hexactinellid sponges appear in shallower portions of the mid ramp and in mid–inner ramp transition facies. In most sponge-bearing mid to inner ramp samples, echinoderm stereom and ostracods are commonly silicified.

The robust and interlocking skeletons of lithistid and hexactinellid sponges require higher dSi concentrations and are therefore often restricted to deep shelf settings. Though lithistids are commonly known from shallow-water environments, their co-occurrence with hexactinellid sponges in mid to inner ramp facies in the Gabbs Formation, and the silicification of other calcareous microfossils, suggest elevated dSi concentrations in shallow water settings across the Norian–Rhaetian boundary. The increase in silica-limited sponges is coincident with a negative $^{87}Sr/^{86}Sr$ excursion likely produced by the weathering of basalts or hydrothermal activity, of which both are potential sources of dSi. The elevated dSi concentrations in the Rhaetian allowed sponges to gain a foothold in shallow-water ramp environments, potentially aiding the development of sponge communities in the earliest Jurassic.