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Taphonomy as a proxy for stable shell constructions

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The fossil record demonstrates that multi-plated echinoid skeletons can survive the often complex pathways of fossilization in considerable numbers. Fossilized remains range from single plates to larger fragments and complete specimens. Clypeasteroid echinoids show an extensive preservation potential due to internal supports and plate interlocking. The sea biscuit *Clypeaster rosaceus* is therefore not only in the focus of paleontological research, but also a role model for bioinspired constructions in civil engineering due to its outstanding preservation potential.

Tests of this echinoid have been analyzed in the natural environment with respect to taphonomic signals of disarticulation or interplate fragmentation (breaking apart along plate boundaries) and intraplate fragmentation. Taphonomic observations of this echinoid allows for the identification of both stabile and weak parts of the skeleton as well as skeletal connections. Disarticulation and fragmentation patterns are studied with respect position on the test, intensity and corresponding taphonomic grades. The observed disarticulation and fragmentation pattern are then compared to the skeletal architecture and reinforcement systems of these echinoids as observed by x-ray micro-computed tomography scan (µCT) and scanning electron microscopy (SEM).

First results show that *Clypeaster rosaceus* predominantly break along the perradiad sutures, which are located within rows of ambulacral plates resulting in up to five pie-shaped fragments. Correlations of the fragmentation patterns with µCT and SEM investigations indicate that test disarticulation follows the less reinforced region in the test where the pie-shaped fragments show a high degree of skeletal reinforcements reflected primarily by internal supports that connect the oral and aboral side of the skeleton.