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Novel experimental study of bioturbation activity in flood-like sediments in the northern Gulf of Eilat-Aqaba, Red Sea

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In the hyperarid environment of Eilat, Israel, ephemeral flashfloods can occur in the winter months, transporting the majority of sediment into the Red Sea. This study focuses on identifying conditions for flashflood deposit burial and preservation in the shallow Gulf of Eilat- Aqaba. The rate and depth of surface sediment movement via bioturbation are being quantified in this study through an in situ experiment, to help infer the conditions for flashflood deposit preservation. The movement of flood-like surface sediments was tracked using 1.5 g of fluorescent sediment tracers <63 μm. Twenty-seven sediment cores (diameter= 4.5 cm, length= 30 cm) were collected from the study region at 13 m water depth. Tracers were positioned on the surface of each core. Using novel instruments, the cores were transplanted into the seafloor at 9 sites, in triplicates of 3 treatments (fenced, caged, and open). Sediment cores were recovered at three intervals (t=1: 1 week; t=2: 19 days; t=3: 6 weeks) from each site. Each core was sliced at cm resolution, and representative subsamples were analyzed through photographs taken under a binocular microscope to quantify the presence of tracer vertically down each core. The observed bioturbation depth was $\sim$ 5 cm. There was no significant difference in the tracer distributions between treatments. Tracer distributions in cores from t=1 and t=2 exhibited diffusive profiles, while some core profiles from t=3 exhibited an accumulation of fine sediment at depth within the cores. A varying amount of the initial tracer was conserved within each core from each treatment and time interval. Our results are revealing that in this hyper-arid, active bioturbation environment, flashfloods do not appear to have the opportunity to be buried and preserved as definitive layers.