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Ocean acidification threat? How pH affects burrowing behaviour of Nereis diversicolor and its bearing on mass extinction scenarios

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Mass extinctions are often characterised by a loss of bioturbators. The Early Triassic interval is dominated by laminated facies defined by the ichnofabric index (II) as having no bioturbation (II1). The Permian-Triassic is the crisis in which ocean acidification (OA) is most widely implicated, but this remains controversial. Does a relationship exist between pH and ichnofabric index? We tested the effects of altered pH on the rag worm Nereis diversicolor. Aquarium tanks were filled with coloured sand and mud and 20 individuals of N. diversicolor each. Tanks were filled with distilled water with salinity 16‰ adjusted to pH 7.0, 7.5, and 8.0 (5 replicates of each) and kept at 16°C for 5 weeks. Aquaria were photographed weekly to permit classification of their ichnofabric index. After 5 weeks, tanks at pHs 7.0, 7.5 and 8.0 had mean II of 2.6, 3.2 and 2.4 respectively. No tanks exhibited the near-total loss of bioturbation seen at the Permian-Triassic boundary, but acidification stress during that event persisted over much longer timescales than we can replicate. Nevertheless, our experiments show that altered pH reduces bioturbation activity, lending tentative support for a role for OA in extinction crises that record a drop in ichnofabric index.