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The combined effects of rising temperature and salinity may halt the future proliferation of symbiont-bearing foraminifera as ecosystem engineers

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Tropical calcifiers are key organisms for understanding marine ecosystem responses to global changes. Rising sea surface temperatures and extreme heatwaves affect symbiont-bearing tropical calcifiers such as corals and Large Benthic Foraminifera (LBF). In many ecosystems, parallel to warming, global change unleashes additional changes to the marine environment, and the combined effect of such multiple stressors may be more significant than those of temperature alone. One such stressor positively correlated to temperature in evaporation-dominated shallow-water settings is salinity rise. Much focus has been given to the effect of temperature rise and ocean acidification on LBF. However, less attention was given to studying the potential physiological effect of a future rise in salinity. Laboratory culture experiments were used to evaluate the combined thermohaline tolerance of one of the most common LBF species and carbonate producers, *Amphistegina lobifera*. The experiments were done under ambient (39 PSU) and modified (30, 45, 50 PSU) salinities and at optimum (25 °C) and warm temperatures (32 °C). Calcification of the *A. lobifera* holobiont was evaluated by measuring alkalinity loss in the culturing seawater, as an indication of carbonate ion uptake. The vitality of the symbionts was determined by monitoring pigment loss of the holobiont and their photosynthetic performances by measuring dissolved oxygen. The growth of *Peneroplis* (*P. pertusus and P. planatus*), a Rhodophyta-bearing LBF, which is known to tolerate high temperatures, was also evaluated under elevated salinities. The results show that the *A. lobifera* holobiont exhibits optimal performance at 39 PSU and 25 °C, and its growth is significantly reduced upon exposure to 30, 45, 50 PSU and under all 32 °C treatments. Salinity and temperature exhibit significant interaction, with synergic effects observed in most treatments. Our results confirm that *Peneroplis* has a higher tolerance to elevated temperature and salinity than *A. lobifera*, implying that a further increase of salinity and temperatures may result in a regime shift from *Amphistegina*- to *Peneroplis*- dominated assemblages.