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Variability of microborer abundance in a living massive coral over the last 50 years studied using a new machine learning approach (Mayotte, WIO): new insights on the effects of environmental factors on reef microborers.

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- Coral reefs are increasingly in jeopardy due to global changes which affect both reef accretion and bioerosion processes. Among those processes, microborers, and especially the chlorophyte *Ostreobium* sp., play a major role in reef carbonate dissolution. The dynamics of this process in dead reef carbonates under various environmental factors such as ocean acidification, sedimentation, and eutrophication began to be relatively well understood over a short period of time (month to year scale). In contrast, the long-term effects of environmental factors on reef microboring communities and their erosive activity remain poorly known, limiting predictions of coral reef evolution by 2100. Massive coral colonies are great bio-carbonate archives recording environmental conditions over decades and are known to be colonized by microboring floras and especially the chlorophyte *Ostreobium* sp., forming sometimes eye visible green bands. Massive corals offer therefore the opportunity to study the long-term effects of environmental changes on microboring communities and to understand the possible implication of green bands in coral resilience. Here we studied microboring communities along a coral core of a massive *Diploastrea* sp. collected at 15 m depth on the outer slope of the northeastern barrier reef in Mayotte in October 2018. The studied coral core length (~15 cm) allowed to determine the coral vertical extension rate reconstructed via an X-ray image analysis, its skeletal density based on new image analysis of a CT scan, and microboring community abundance based on an innovative machine learning approach over the last 50 years. The machine learning approach (with a precision of 93%) allowed analyzing very quickly hundreds of scanning electronic images taken along the coral core to quantify the surface area occupied by microboring galleries within the coral skeleton. Our results show a shift in microboring community composition at a breakpoint around the ’80s (1985 – 1986). Before the ’80s, the community was dominated by large galleries mainly distributed along the main growth axis of the coral colony (most probably made by phototrophic microborers) while after the ’80s the community was mainly dominated by two types of thinner galleries widely distributed within the coral skeleton. Surprisingly, our results also revealed a significant

decrease in microboring galleries' abundance over the last fifty years. Important abundances were not correlated to the presence of green bands nor to the coral vertical extension rate but were positively correlated to the skeleton density. Those trends will be discussed in the light of historical temperature change, temperature anomalies, precipitations, wind, insolation period, and the measured coral skeleton parameters (density, coral extension rate, and calcification rate) to highlight the possible main drivers influencing microborer abundance in massive corals.