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# Morphological characterization of growth anomalies on coral genera *Acropora* and *Pachyseris*

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## INTRODUCTION

**Growth anomalies (GAs) or skeletal tissue anomalies** are a particular type of coral disease, which etiology is still under investigation, with potential links to anthropogenic stressors and extreme temperature conditions. GAs are recognized as true tumors that not only impact the morphology of the polyps but also mine biological functioning, compromising the reproductive capabilities, feeding abilities and the capacity of defending against external agents.

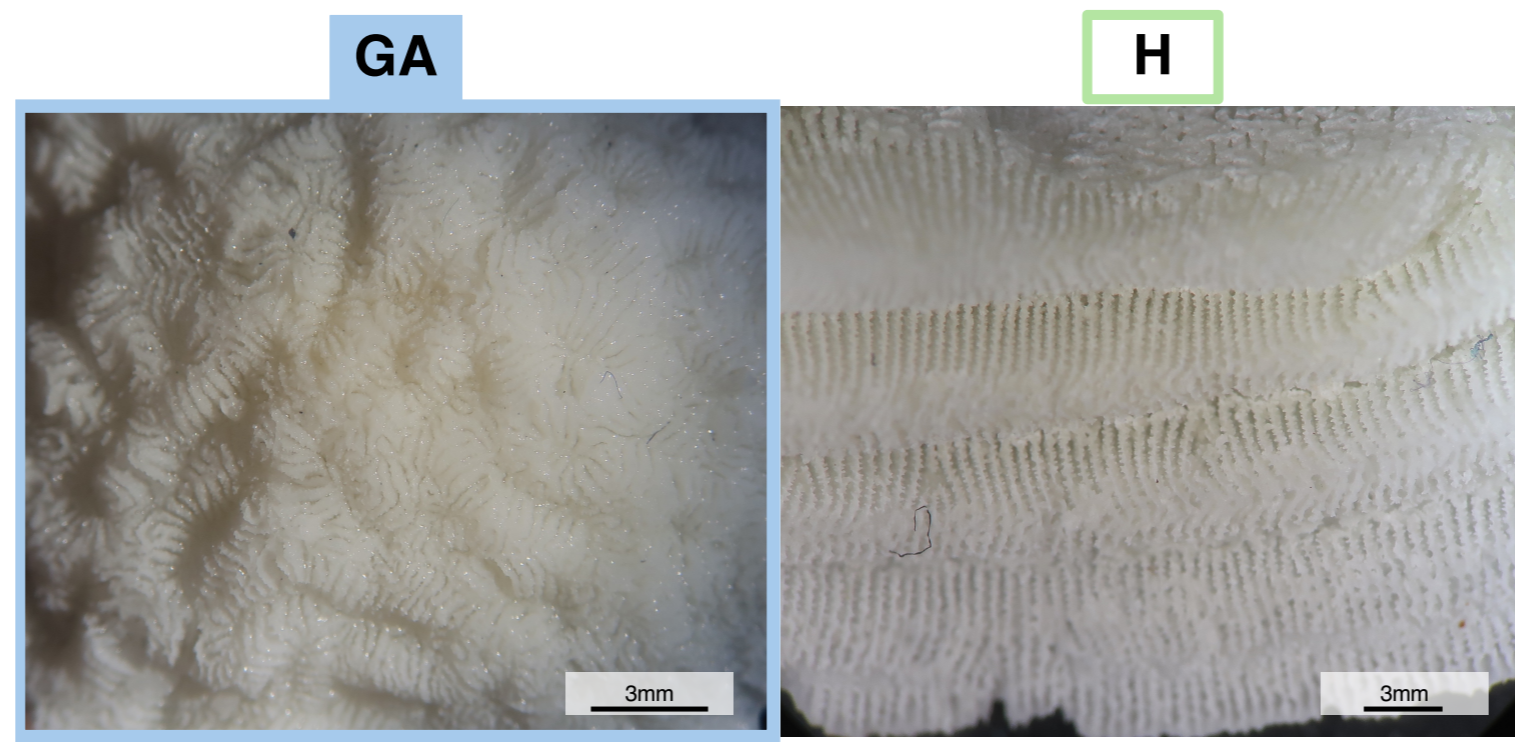


Fig.1: Pachyseris diseased (GA) and healthy (H) skeleton under the stereomicroscope.

## MATERIAL & METHODS

Fragments belonging to *Acropora* and *Pachyseris* genera, both healthy and tumoral, were collected from different locations in the central atolls of the Republic of the Maldives. They were treated and prepared to be analyzed at the **Scanning electron Microscope (SEM)** (Tescan Vega 5136XM). The resulting SEM images were employed to perform macro-morphological analysis of the main skeletal characters, calyx measurements and comparisons between the two coral genera.

## RESULTS

	GA	Acropora	H	
<b>Calyx Diameter</b> 0.681 ± 0.14 mm				<b>Calyx Diameter</b> 0.605 ± 0.12 mm
<b>Corallite wall (cw)</b> Undistinguishable				<b>Corallite wall (cw)</b> Circular and well defined
<b>Septa (s)</b> Not developed, few or absent				<b>Septa (s)</b> Complete and developed
<b>Coenosteum</b> Chaotic arrangement, more porous and lax				<b>Coenosteum</b> Reticular and well organized under a smooth surface
<b>Spinules</b> Bristle-like and thin projections irregularly shaped with long but uneven vertical extension				<b>Spinules</b> Finger-like projections, thick and well developed
<b>Spinular ornamentations</b> Sharp and irregular				<b>Spinular ornamentations</b> Rounded and nicely developed tree-like

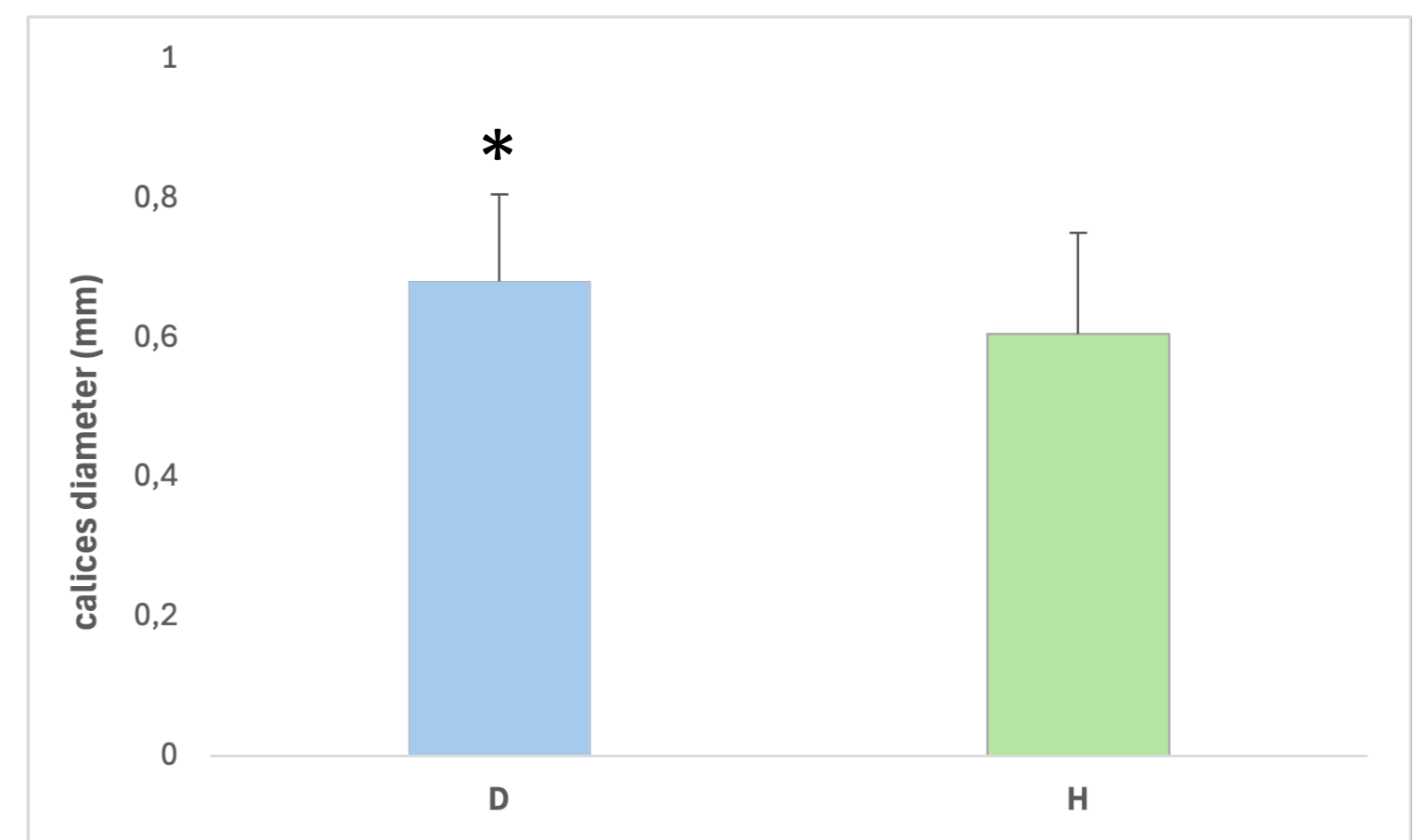


Fig.2: Comparison of corallite diameter (mean±SD mm) in diseased (D) and healthy (H) skeleton. The asterisk (\*) shows the significance (Mann-Whitney U Test, p<0.001\*).

Fig.3: SEM images showing macro-morphological differences between diseased (GA) and healthy (H) skeleton in *Acropora*. (a) Corallites with indication of septa (s) and corallite wall (cw), (b) coenosteum, (c) spinules and (d) spinular ornamentations.

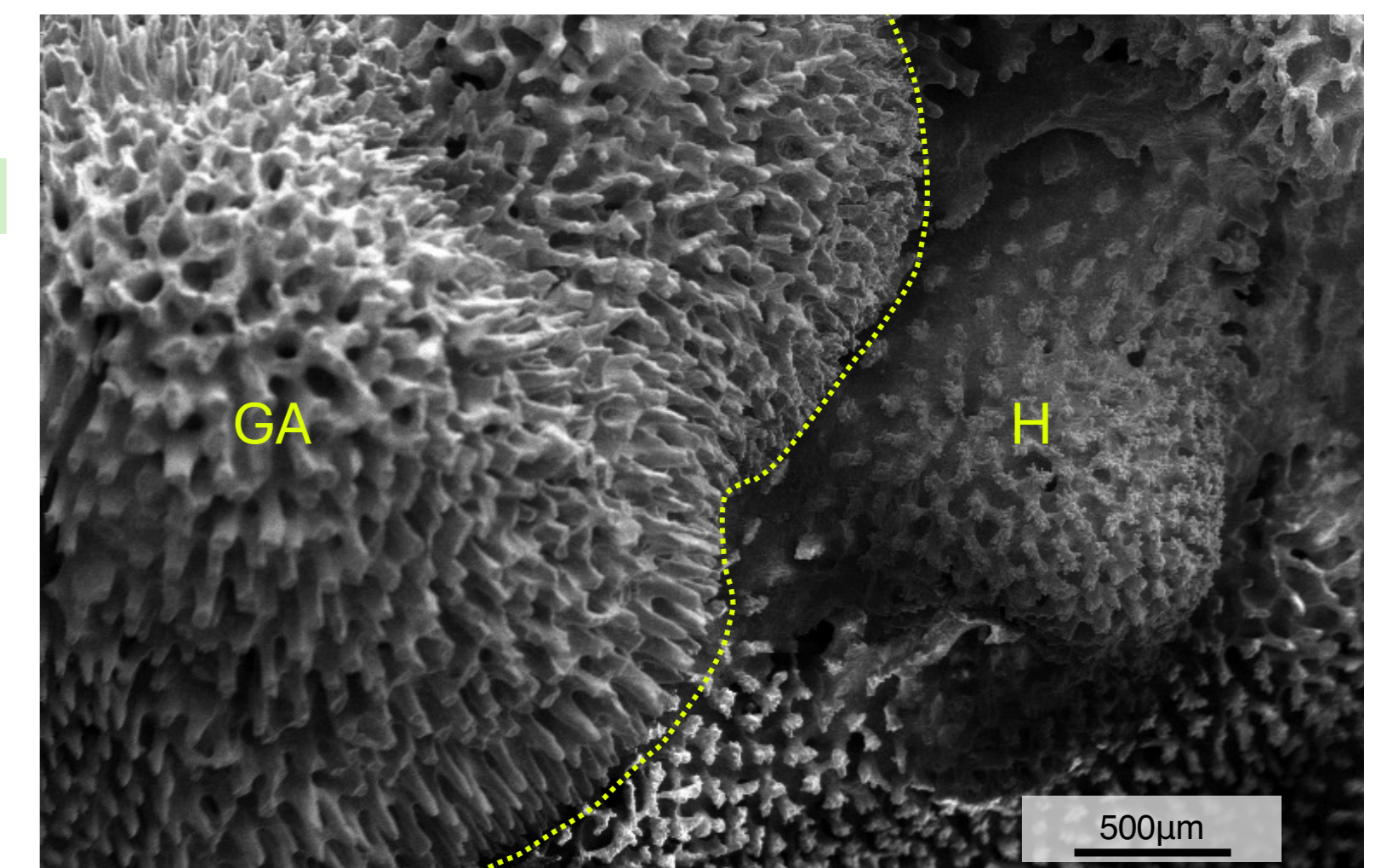


Fig.4: SEM images showing the tumor/healthy skeleton interface. GA indicates the growth anomaly limited by the yellow dashed line and the healthy counterpart H.

	GA	Pachyseris	H	
<b>Calyx</b> Chaotic and random arrangement				<b>Calyx</b> Arrangement in long and continuous rows parallel to each other
<b>Radial elements</b> Haphazard and irregular organization. Missing the zigzag pattern				<b>Radial elements</b> Regularly spaced and equally distributed in parallel lines. Clear zigzag pattern
<b>Columella</b> Abortive or absent				<b>Columella</b> well recognizable dash-like processes

## DISCUSSION

The corallite in the tumor, when rarely present, results **enlarged** (Fig.2) and missing a proper structure, which may affect the polyp capacity of carrying out the normal functions necessary for the survival. The rapid and uncontrolled accretion of the skeleton typical of the growth anomalies compromises the integrity of the skeleton, which results weak and fragile, thus causing impairments at a functional and biological level.

Fig.5: SEM images showing macro-morphological differences between diseased (GA) and healthy (H) skeleton in *Pachyseris*. (a) calices (b) radial elements and (c) columella.