

# Effects of environmental conditions on the morphology of corals on Rapa Nui (*Easter Island*)

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## Background

The traditional emphasis on measuring coral cover does not allow understanding which classes of individuals are affected by environmental perturbations (Edmunds & Rigel 2020). To address this gap, we collected information on the morphology of hardstone corals (*Porites lobata*) at Easter Island (fig. 1 & 2), to understand the effects of wave action on the development of coral colonies (diameter and height).

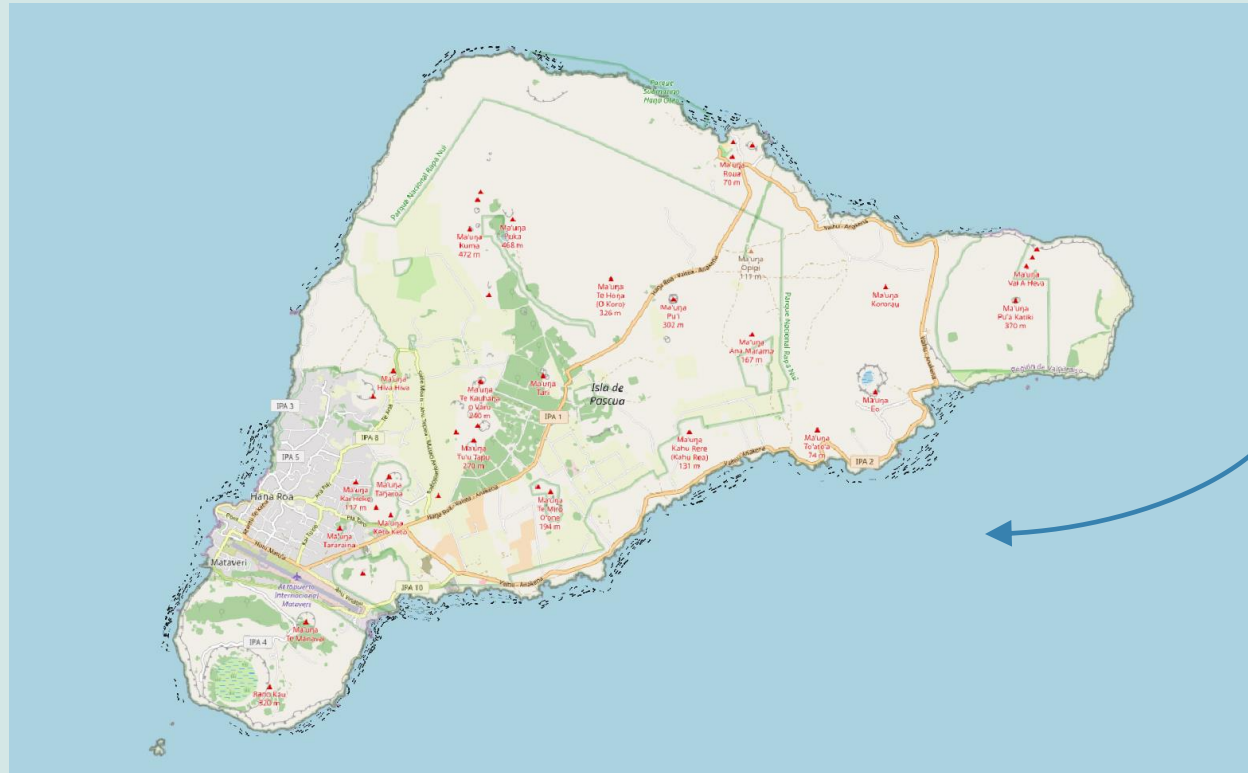


Figure 1: Rapa Nui (Easter Island)



Figure 2: Location of Rapa Nui (Easter Island)

## Methods

The seafloor was mapped using boat surveys. The images obtained were georeferenced with OpenDroneMap. In QGIS, polygons were drawn around individual *Porites lobata* colonies in order to measure their sizes.



Figure 3: Data collection

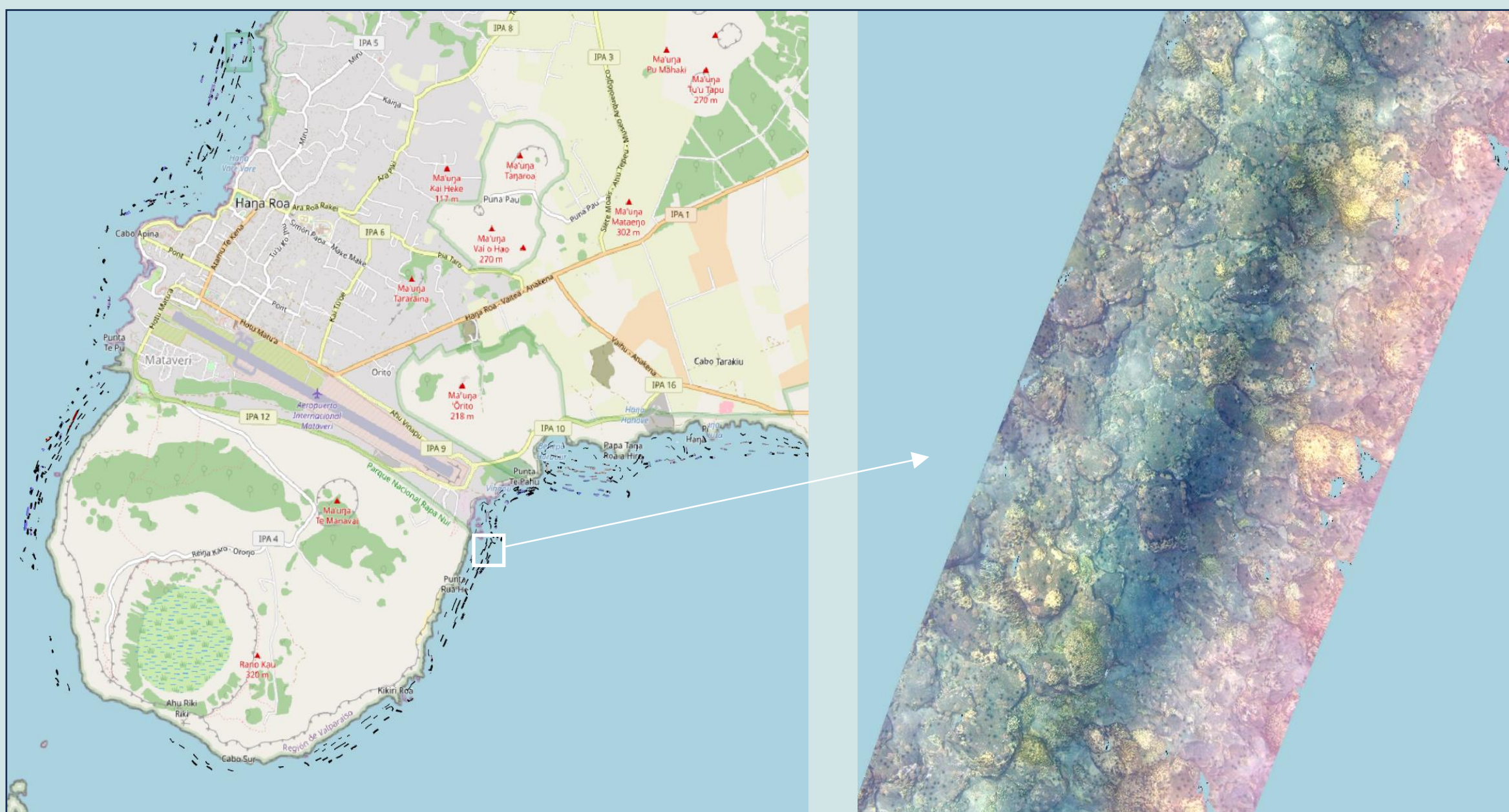


Figure 4: Images obtained from the boat survey are georeferenced with OpenDroneMap to be used in QGIS

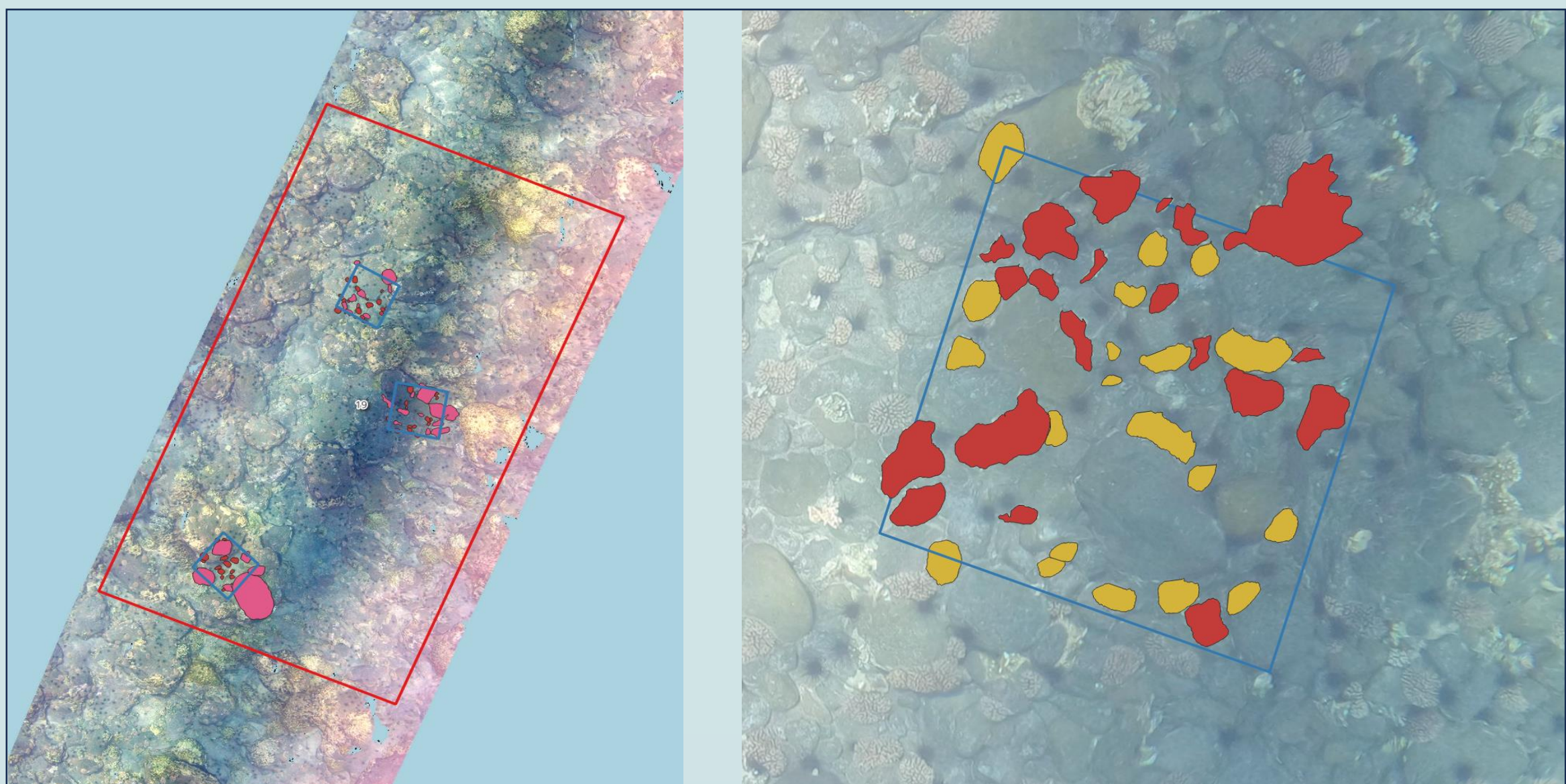


Figure 5: Individual colony species are annotated by manually drawing polygons

## Results

### Colony height-area relationship

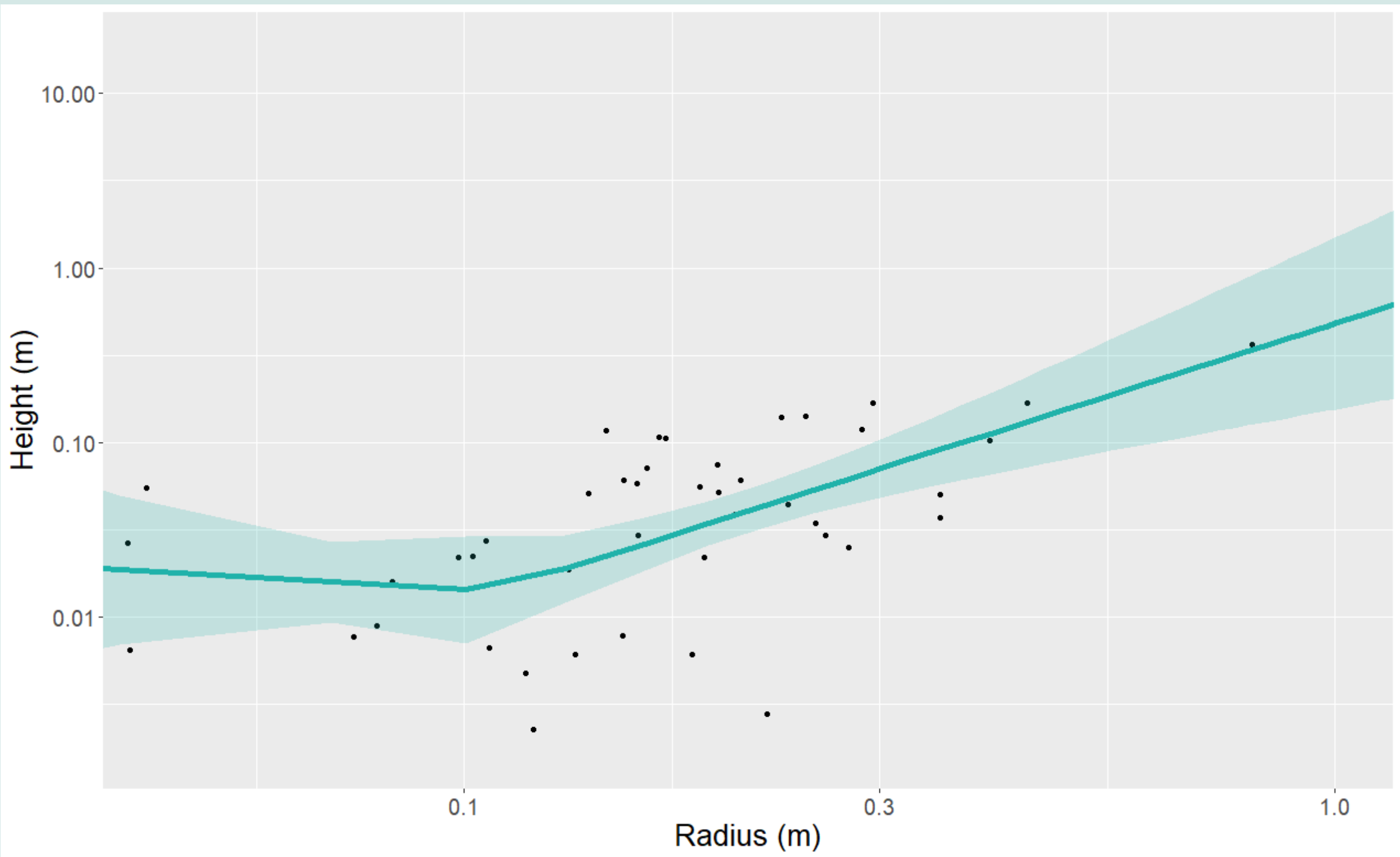


Figure 6: Scatterplot of *Porites lobata* radius vs height

For corals with radius  $<0.1\text{m}$ , there appears to be no relationship with height  
For corals with radius  $>0.1\text{m}$ , the height increases with radius ( $p < 0.01$ ).

### Residual height-wave action relationship

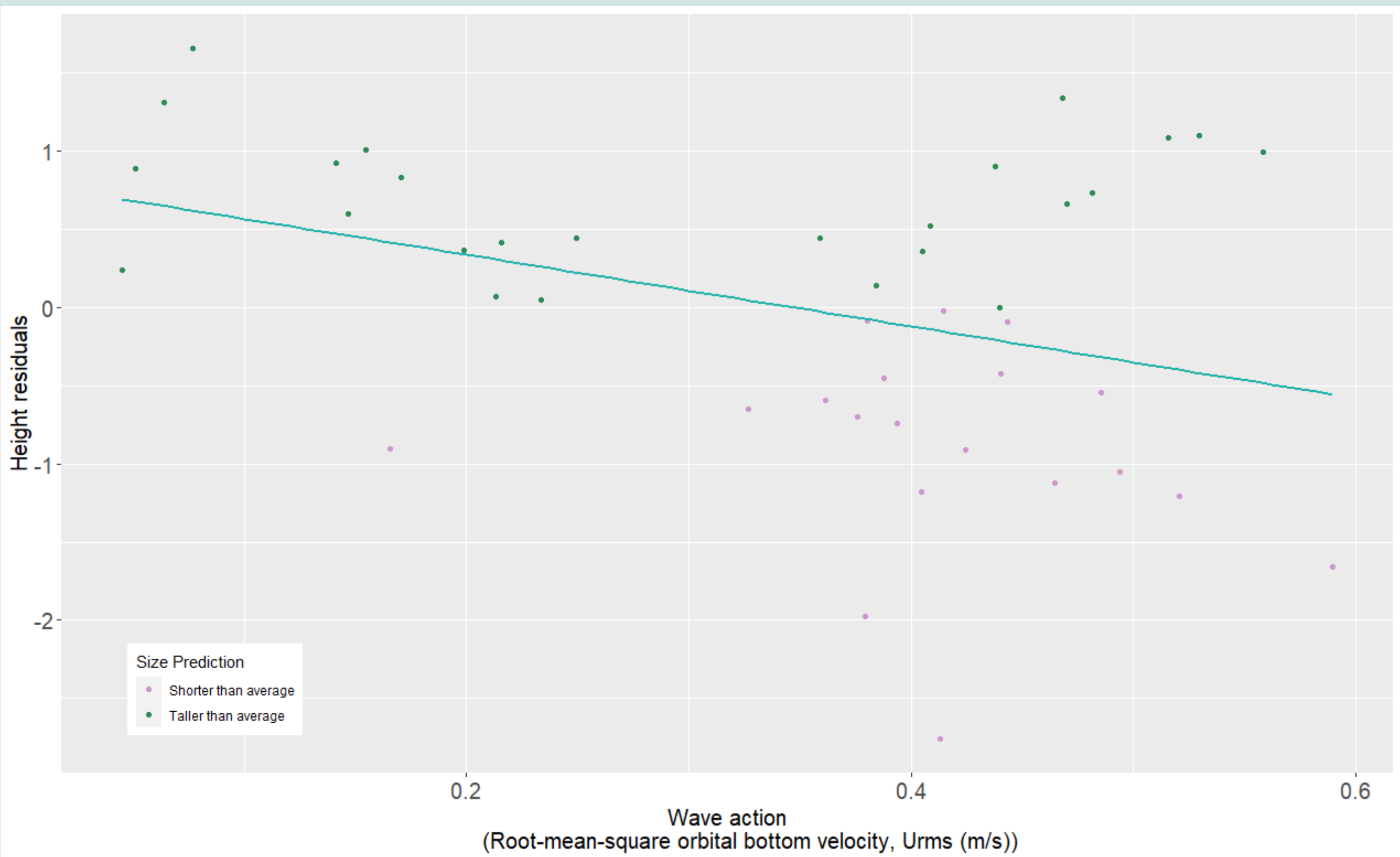


Figure 7: Scatterplot of wave action vs *Porites lobata* height residuals

Corals that are shorter than average are mainly present in areas with relatively high ( $>0.3\text{ m/s}$ ) wave action values. Corals that are taller than average grow in areas with all (0-0.6 m/s) wave action values.

## Discussion

### Missing data

On the North coast, *Porites lobata* colonies grow to such an extent they come into contact with other colonies (fig. 8). This affects the way they grow and makes it challenging to determine individual colony sizes. Therefore, these data have not been used in the analysis.



Figure 8: *Porites lobata* on the North coast

### Colony height

Colony height has been determined by subtracting the colony depth from the surrounding seafloor depth. Therefore, the obtained height of coral colonies growing into cracks might not reflect reality

## Conclusion

Colonies shorter than expected mainly grow in areas with relatively high ( $>0.3\text{ m/s}$ ) wave action values, suggesting that wave speed slows down coral growth. Taller than expected colonies grow in areas of any wave action value, suggesting that once a certain size is reached, the influence of wave action becomes negligible.