

# Examining coral community composition and 3D habitat structure on natural and artificial coral reef substrate in Guam

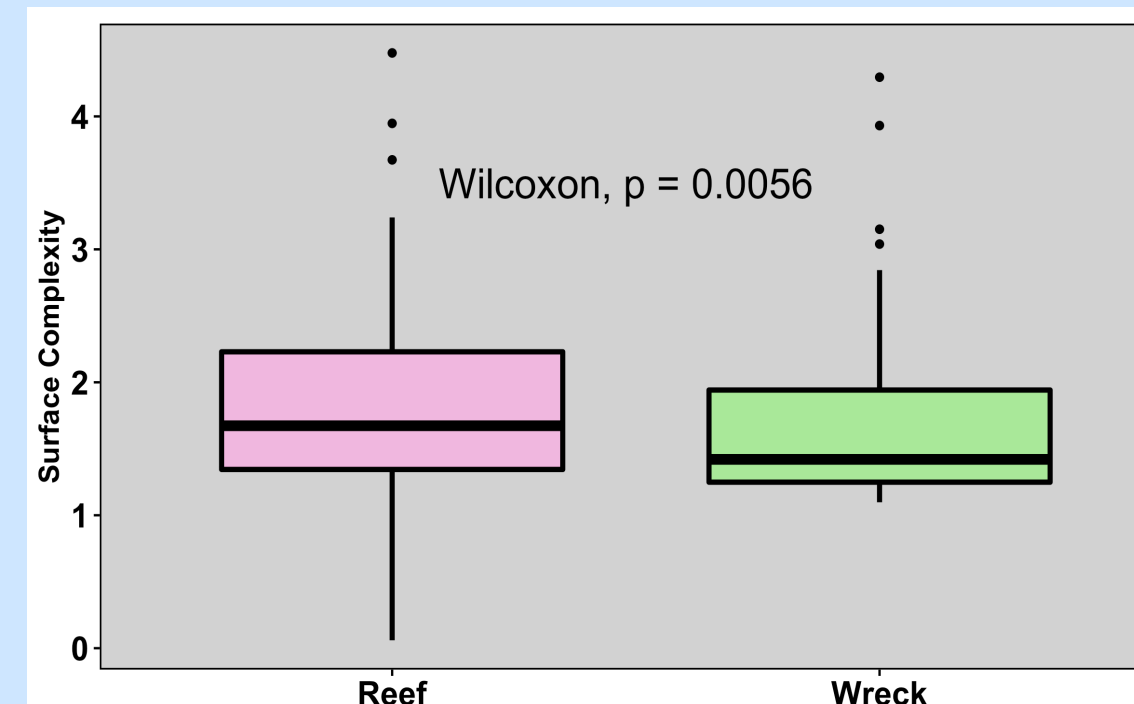
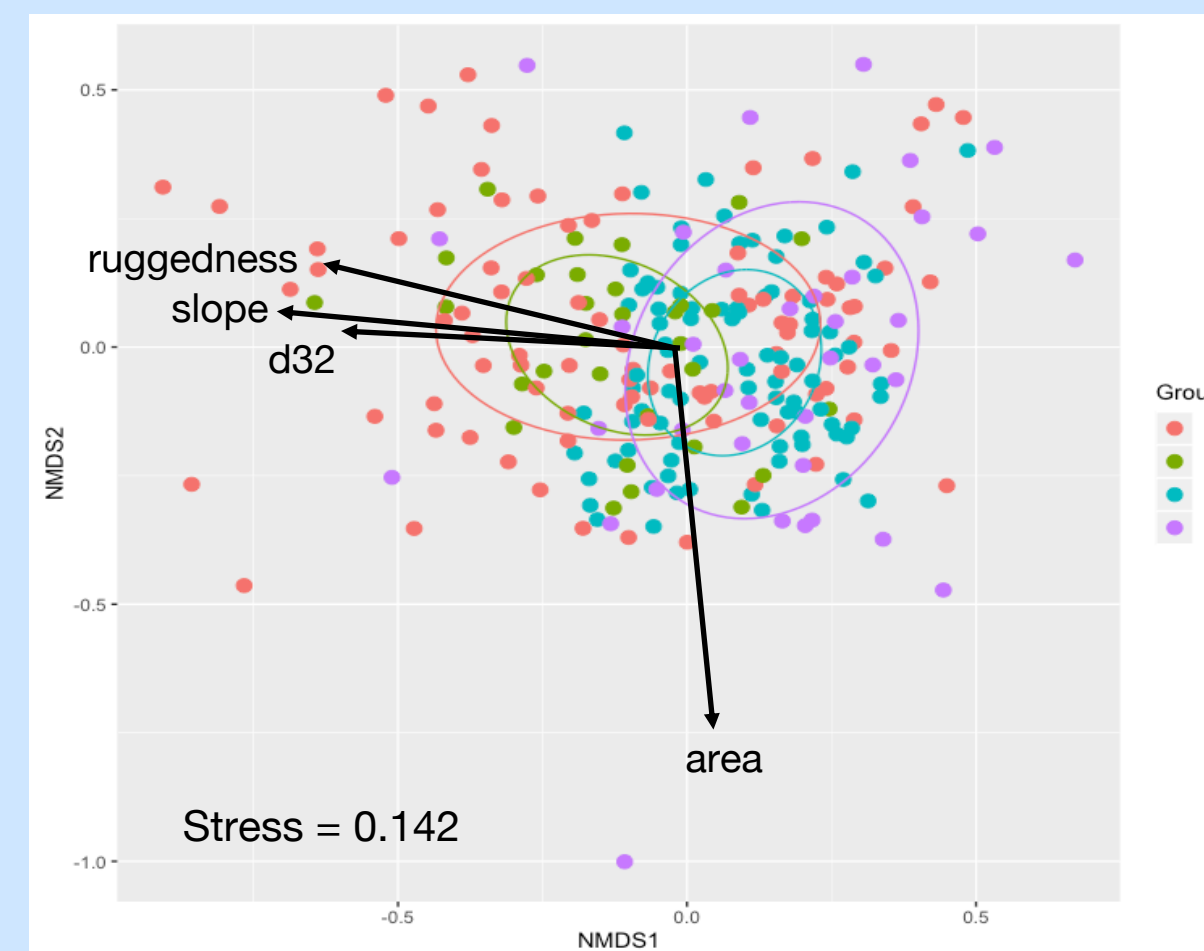
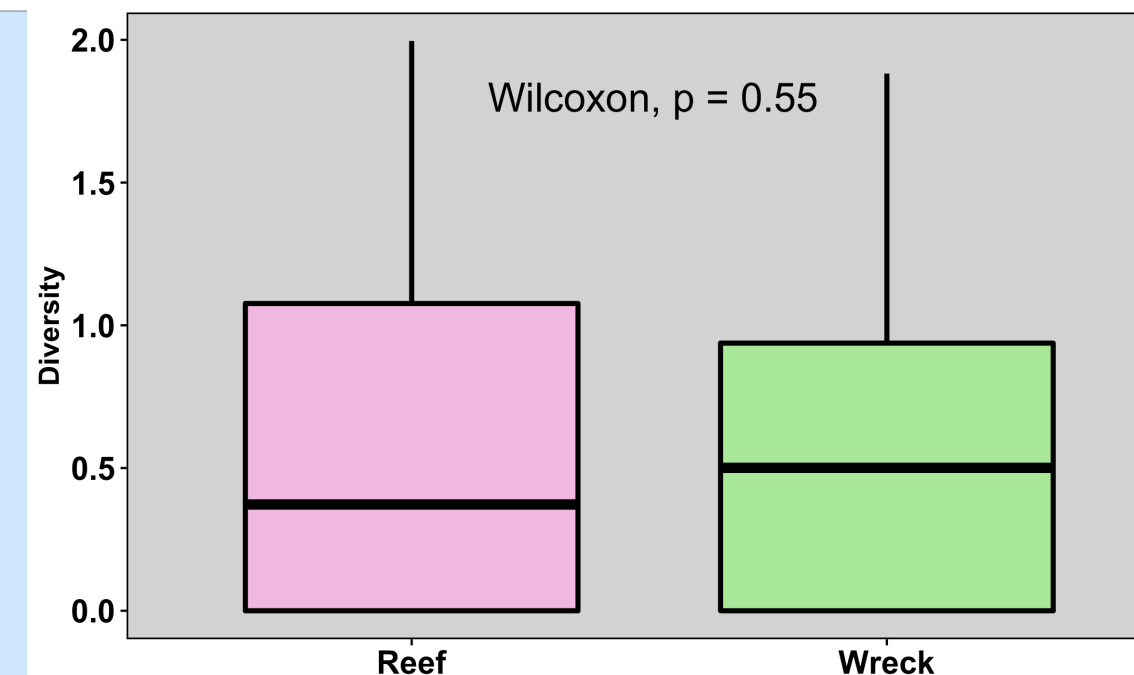
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## INTRODUCTION

The island of Guam has a storied history of maritime activity associated with wars and naval training. In Guam's waters, there's over 60 documented shipwrecks. The purpose of this study was to conduct a **comprehensive assessment of the coral reef community composition and 3D habitat structure on shipwrecks and the adjacent undisturbed coral reef area**. Characterizing coral communities is an important component of ecological monitoring as the **architectural complexity of corals creates the foundation of the habitat and profoundly influences overall ecosystem functionality**.

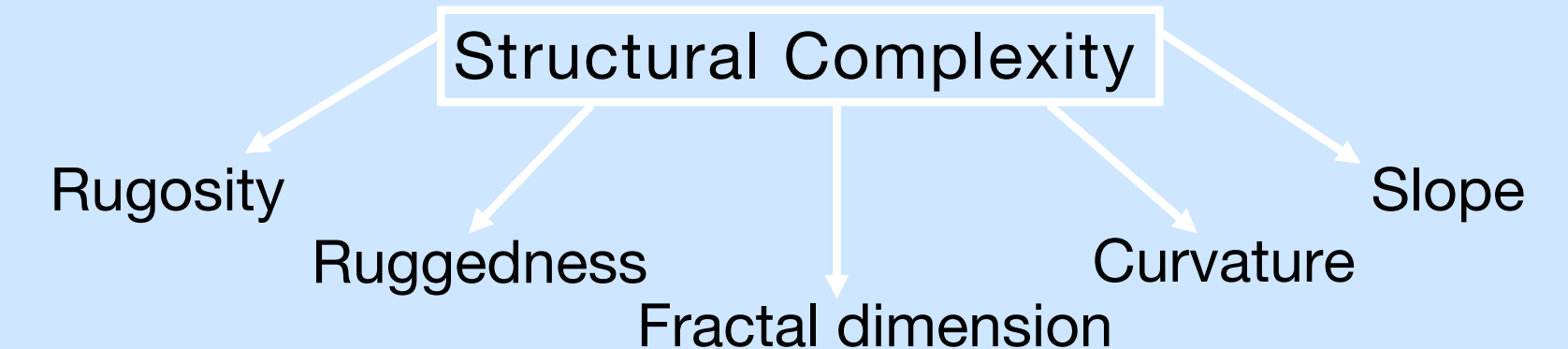
## 3-D RECONSTRUCTION

SCUBA divers collected overlapping (70-80%) images from **2x2m plots at 12 coral reef sites and 11 shipwrecks surrounding the island of Guam**. Overlapping imagery was processed using Structure-from-Motion (SfM) photogrammetry to create **high resolution 3D reconstructions** of the study sites using **Agisoft Metashape** software.



## DATA EXTRACTION AND ANALYSES

**Coral community composition** and **3D habitat structural complexity** metrics were quantified in CoralNet and **statistical software R** using the raster and rgeos packages.



## RESULTS

**Coral diversity** was **not** significantly different among coral communities on natural substrate and artificial wreck substrate ( $p > 0.05$ , Fig. 1). Nonmetric Dimensional Scaling (**NMDS**) computed with **bray-curtis dissimilarity** values shows site differences based on values of structural complexity (Fig. 2). Colors and clusters represent sites in several regions; North (N), South (S), Harbor (H), and Wrecks (W). The overlapping circles on the NMDS shows that the 3D habitat structure of the wrecks are **not** dissimilar to natural reef habitats. **Structural complexity** was found to be statistically different between coral communities on natural substrate and artificial wreck substrate ( $p < 0.05$ , Fig. 3).

## CONCLUSION

**Structural complexity significantly differs between reefs and wrecks**. Further analyses will be conducted to determine which structural parameters best explains this variability and which coral genus may be associated with such parameters.

