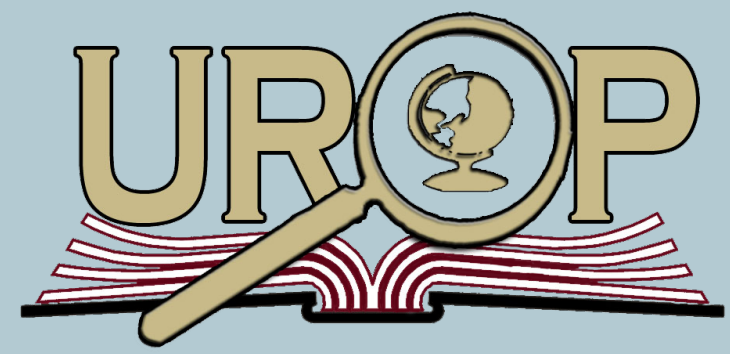


Spatial patterns of macroalgal dominance in the lagoons of Moorea, French Polynesia

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INTRODUCTION

- Coral reefs are diverse and valuable ecosystems that provide habitat and shelter for more than a million marine species.
- However, in recent years, we have seen ecosystems dominated by reef-building coral undergo **phase shifts** to macroalgae-dominated states that cannot provide the shelter that corals do.¹
- *Turbinaria ornata*, the dominant macroalgae present in Moorea, has very short dispersal distances of only a few meters, so we **hypothesize** that its spread through the reef is affected by the amount and spatial configuration of **available habitat (i.e. reef structure)**².
- **The goal of our research is to understand if habitat availability is correlated with the presence of macroalgae across and within sites.**
- Understanding the causes behind these shifts and being able to predict when they will occur can provide key insights into how to improve current management strategies³.

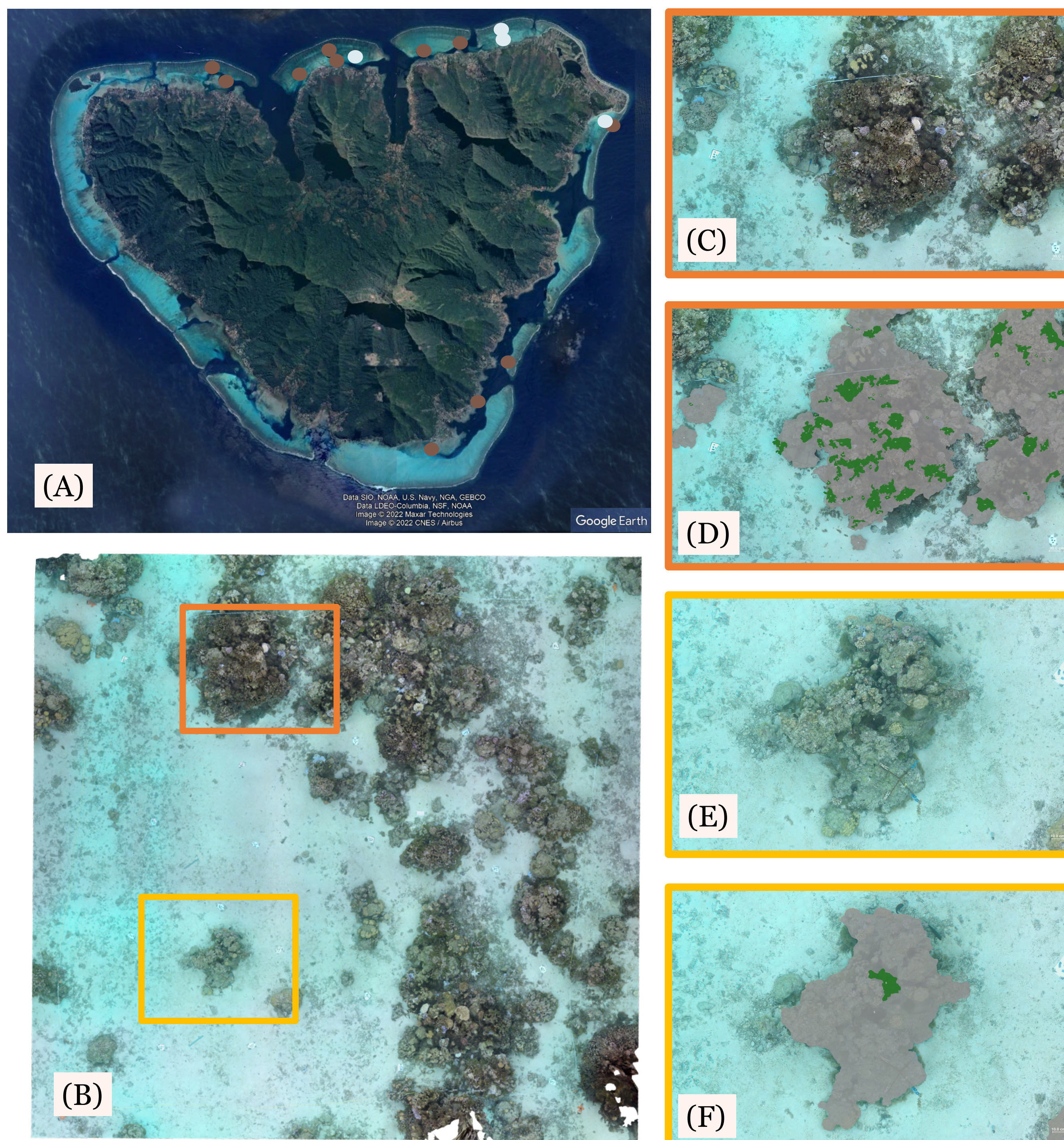


FIGURE 1:

(A) Map of sampled sites in Moorea, French Polynesia
 (B) Avaiti 1 Site Orthomosaic
 (C, D) Zoom-in #1 of reef structure and its annotations
 (E, F) Zoom-in #2 of a reef structure and its annotations

METHODS

- Annotated and labeled **orthomosaics**, high resolution images that account for elevation, in Taglab software
- Captured area covered by coral structures and *T. ornata* across four 15x15m sites
- Exported the data into **shapefiles**, a vector data format containing **geospatial information**
- Ran analyses regarding reef structure and distribution of macroalgae through the programming language R
- On the **across site level**, we looked at whether there was a correlation between the amount of structure and amount of macroalgae.
- **Within sites**, we looked at whether there was a relationship between the sizes of individual structures and the amount of algae on them.

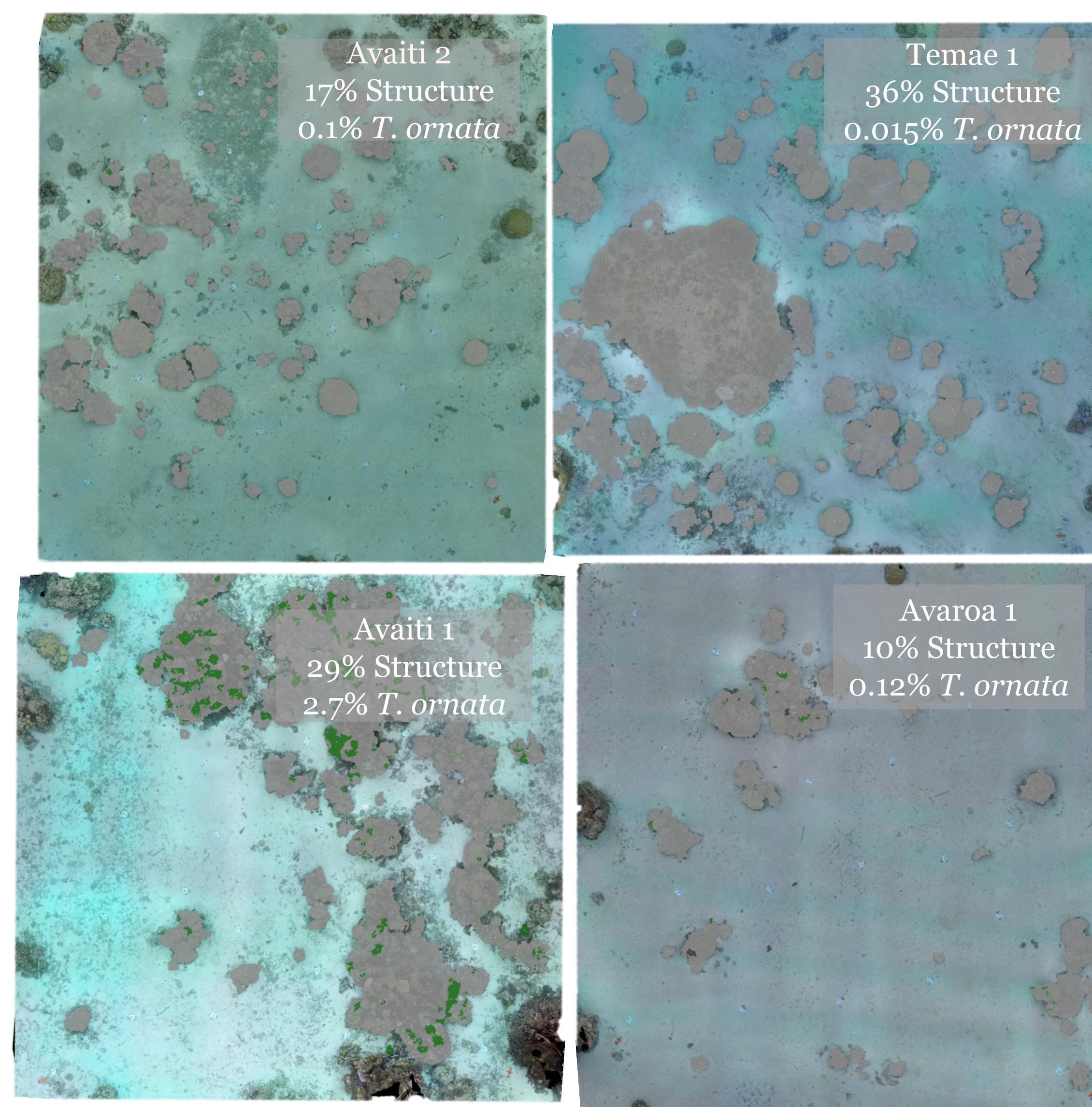


FIGURE 2: Annotated orthomosaics of 4 sites

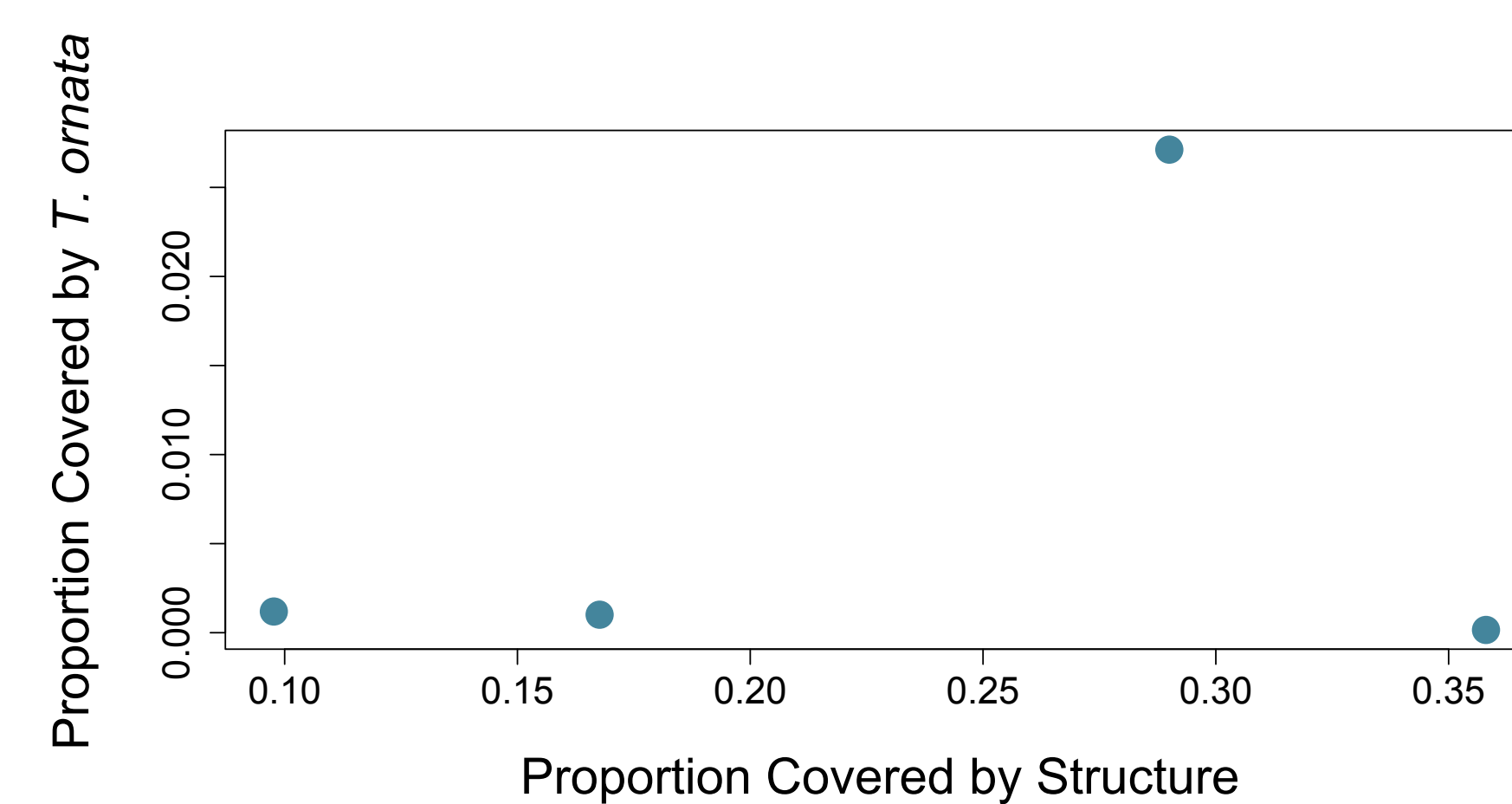


FIGURE 3: Scatter plot displaying the overall relationship between proportion covered by structure and proportion covered by *T. ornata* for each of the 4 sites

RESULTS

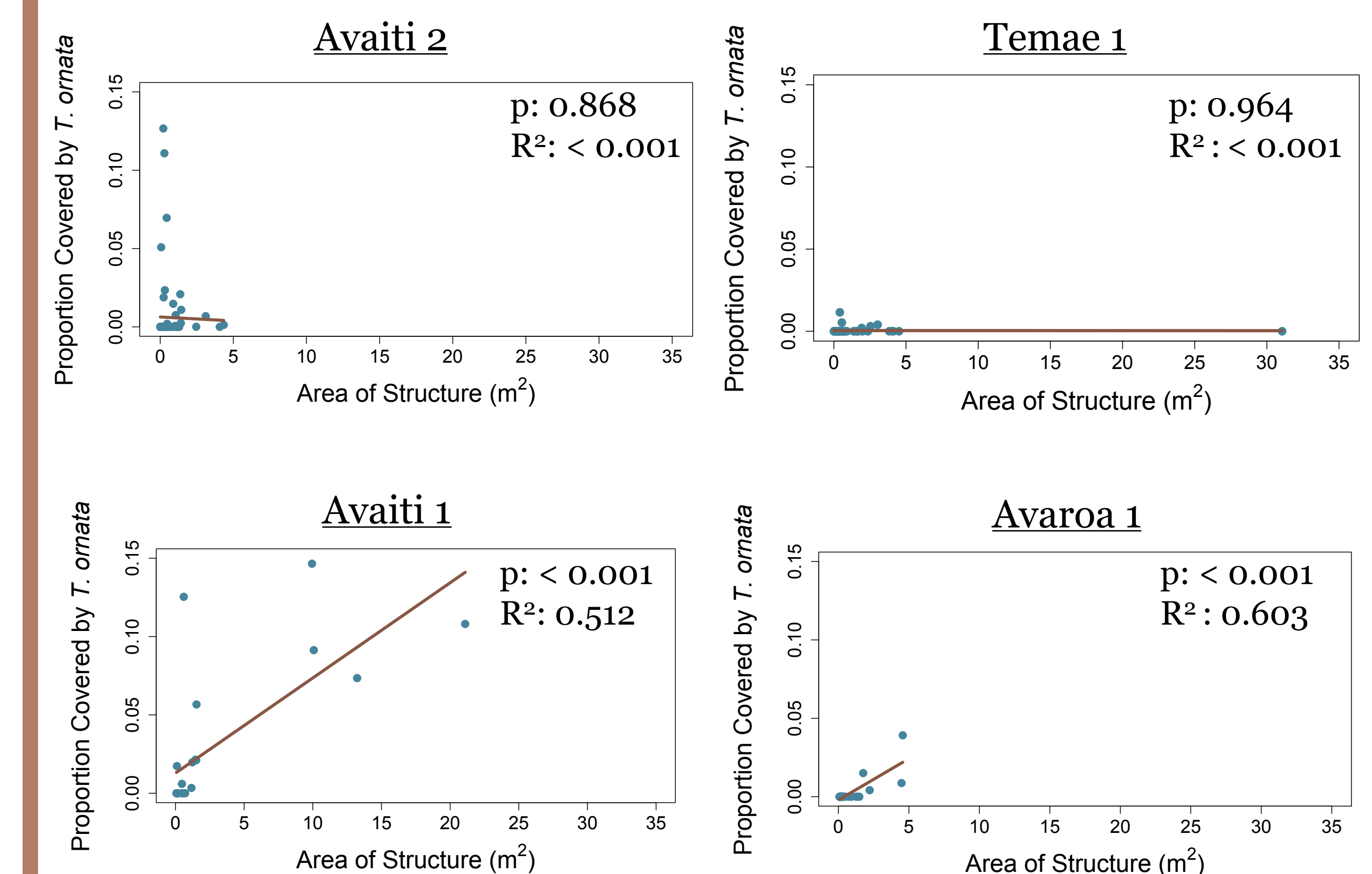


FIGURE 4: Scatter plots displaying the relationship between the size of an individual structure and the proportion of *T. ornata* settling on it for each of the 4 sites. Each point represents one piece of structure.

DISCUSSION

- With our results, we see that the sites we surveyed are vastly different from one another regarding their coverage of structure and the size of their individual bommies and algae patches.
- We found **no significant correlation** between habitat availability and amount of algae present **across sites**.
- **Strength and direction of relationships were variable within sites.**
- Seeing that there is not a consistent correlation between the amount of structure and algae present in a specific area, this hints at the presence of **other biological/environmental interactions** that could affect the dispersal and growth of algae.
- Some important outside variables include the presence of herbivores in the area, fishing practices, and the nutrient levels in the waters.

FUTURE DIRECTIONS

We hope in the future to expand the number of sites we annotate and analyze. We have raw data for 15 sites, so if we gather structure and algae coverage for the rest of these areas, we may begin to see a different relationship. Further, it is of great interest to examine algae growth longitudinally as we also have raw data from the same sites over the past 3 years. With this data, we can directly investigate algae dispersal patterns over time and how those differ with location.

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