

TRANSECTS, QUADRATS OR POINTS?

What is the best combination to get a precise estimation of a coral community?

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Introduction

Large scale monitoring projects establish standardized protocols in order to capture information that can be comparable regardless of the spatial scales, the number of researchers involved, or other factors.

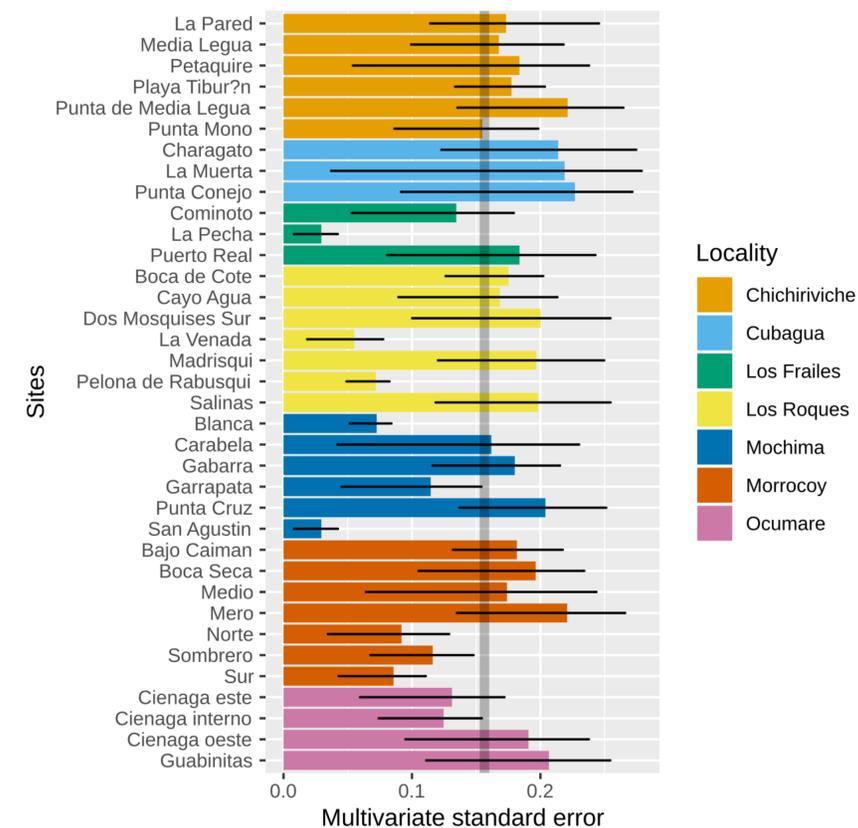
Typically, sampling effort is chosen based on power analysis, however this implies reducing multivariate data to a single dimension. Here, we present an assessment of the **multivariate precision** for a series of coral community surveys conducted in multiple locations of Venezuela between 2017 and 2018; and an evaluation of consequence of using a different combinations of number of points, quadrats, and transects over the multivariate precision.

Methods

We estimated the multivariate standard error *sensu* Anderson et al. (2014) on 36 previously surveyed sites using 4 transects, 15 quadrats per transect, and 25 random points per quadrat, following the GCRMN monitoring protocol. Next, we chose the 12 sites with the highest interquartile range of the multivariate standard error and tested the effect of repeating the sampling using different number of **transects, quadrats, points** per quadrat and their respective combinations. Finally, we used a linear regression on box-cox-transformed data to test effect of each variables on the multivariate precision.

Results

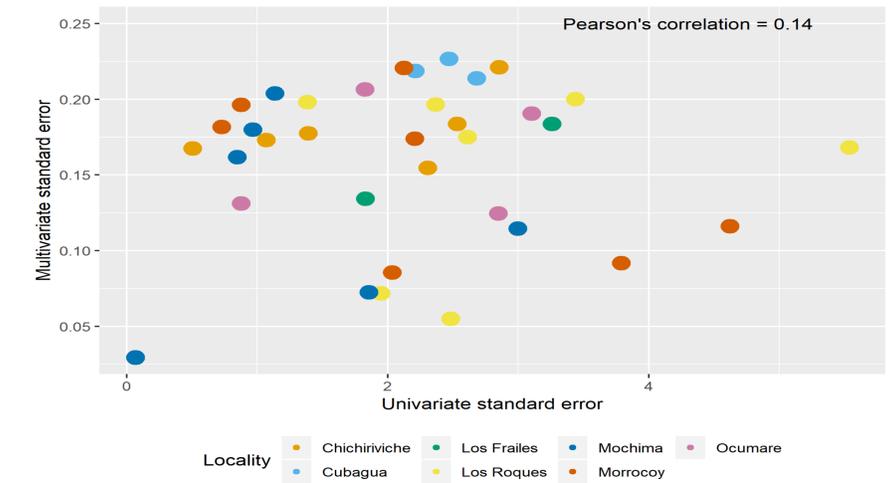
Our field setup of four 30m-long transects with 15 photoquadrats and 25 sampled points showed a highly variable multivariate standard error among sites (fig 1).



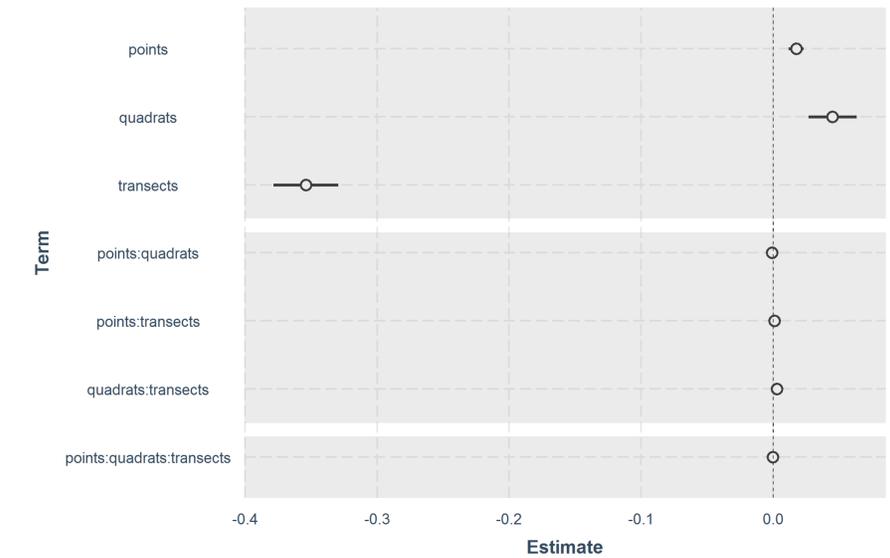
Multivariate standard error can be affected by spatial variation when using a fixed surveying criteria.

Increasing the number of transects, rather than points or quadrats, leads to a more precise estimation of the coral assemblage structure.

We compared this result with the standard error of total coral cover to assess potential correlations between both estimations.



A linear regression using Box-Cox-transformed data indicated that increasing the number of transects is the best approach to achieve higher multivariate precision ($Estimate = -0.35$, $t = -28.114$, $p = 2 \times 10^{-16}$).



Implications

- A proper representation of coral communities in a multi-scale survey requires a variable number of transects.
- Multivariate standard error can be used during a pilot survey before deciding the final criteria as a tool to improve comparability among spatial locations.
- This can be applied to long term surveys framed in conservation programs as an approach to gain information about reefs that are formed by multiple species, instead of reducing this complexity to a single variable.

