

Long term monitoring: Temporal series analysis of a rocky shore's intertidal and subtidal benthic communities at Anchieta Island State Park

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Background

Climate change presents threats of great complexity, expected biodiversity loss, sea level rising and pH reduction (MIESZKOWSKA *et al.*, 2013), which might result on biological changes in vertical distribution and in community structure (HAWKINS *et al.*, 2013a). The Brazilian coast lacks long term monitoring projects designed to the early detection of climate change effects on rocky shores biodiversity (COUTINHO *et al.*, 2016; CRUZ-MOTTA *et al.*, 2010). Such scenario highlights the importance of better understanding how abiotic correlates with species coverage in benthic zones.

Community composition in rocky shores are mostly sensitive to major abiotic changes (PELLIZZARI *et al.* 2014) which brings up potential ways to asses future impacts of climate change in marine costal biodiversity.

Former data based on Lenhaverde B. (2017) showed seasonal changes throughout the year, and tested *ReBentos* monitoring protocol, as adopted by me.

Study goals

1. Set temporal series monitoring by following *ReBentos* rocky shores protocol.
2. Correlate abiotic data (sea level rise; sea surface temperature, salinity) with dominant species coverage (>80%) and band width, regarding patterns or trends.

Methods

Study Site: intertidal and subtidal communities at the right side rocky shore of Palmas Bay – Anchieta Island State Park, Ubatuba. São Paulo (23° 32' 13.1" S 45° 03' 47.3" W) (Figure 1).

Sampling: Photoquadrats at 3 intertidal levels and 2 subtidal levels. At each level with 5 fixes quadrats (dependent sampling design, Figure 2) following *ReBentos* rocky shores protocol.

Periodicity: Three times during summer and winter season (2014 to 2020).

Analysis: Percent coverage - photoQuad (Trygonis & Sini, 2012) (Figure 3). Band width (Figure 4) - Multivariate analysis (non-metric dimensional scaling nMDS; principal component analysis – PCA).



Figure 1. Study site: Intertidal zone.

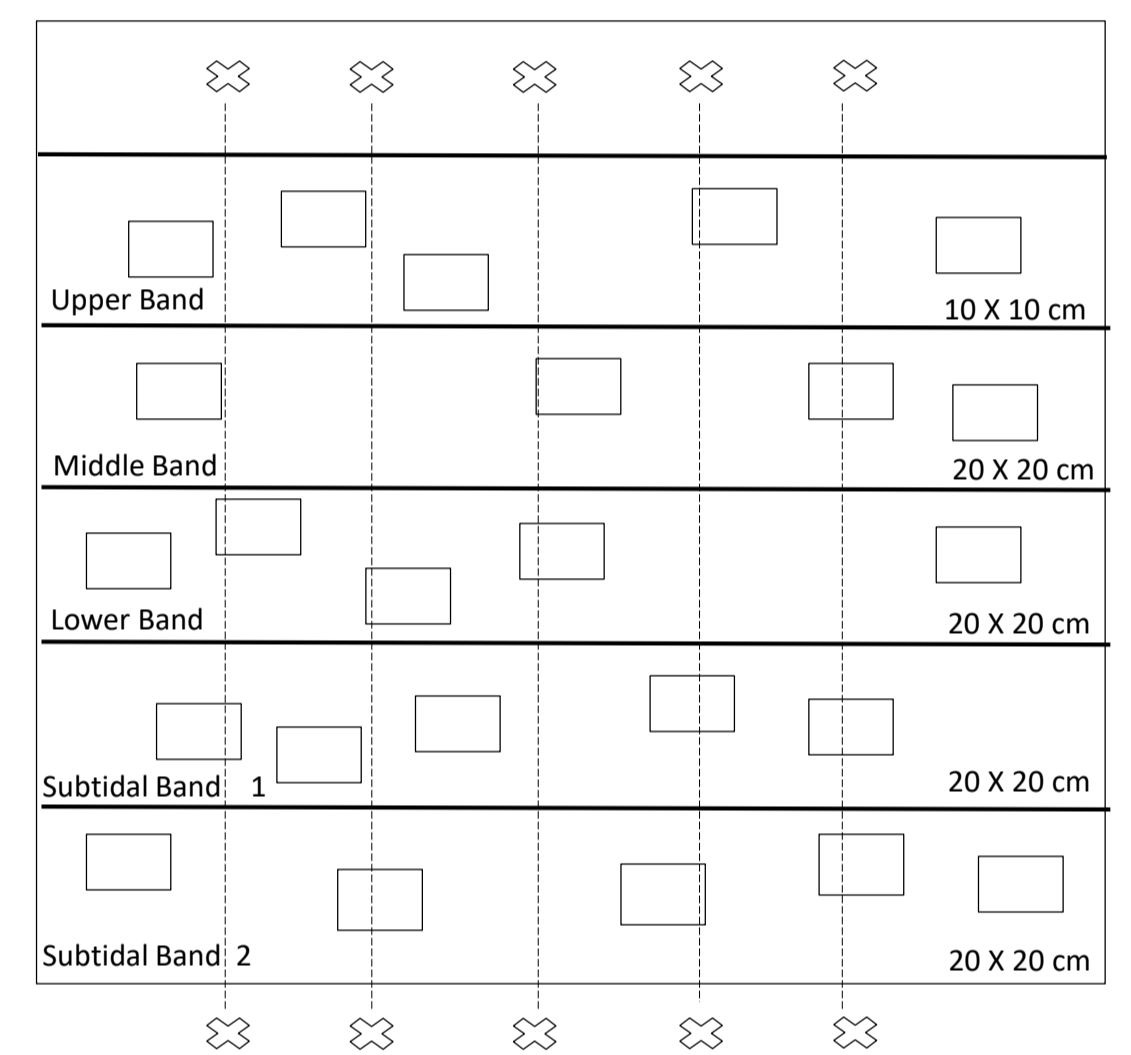


Figure 2. Sampling design. 5 photoquadrat per level and 5 vertical transects for band width data.

Preliminary results

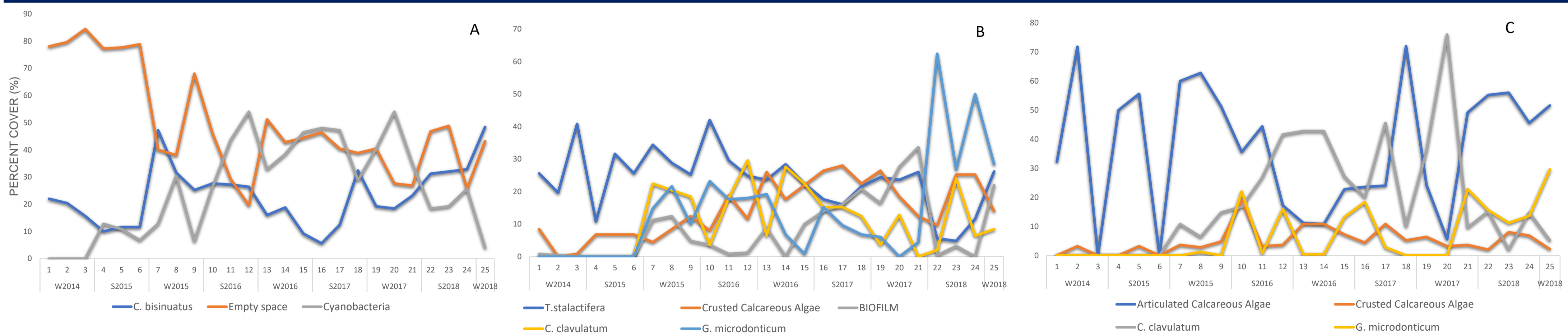


Figure 3. Intertidal dominant Species percent cover time series (2014 – 2018). Upper band (A), Middle band (B) and Lower Band (C).

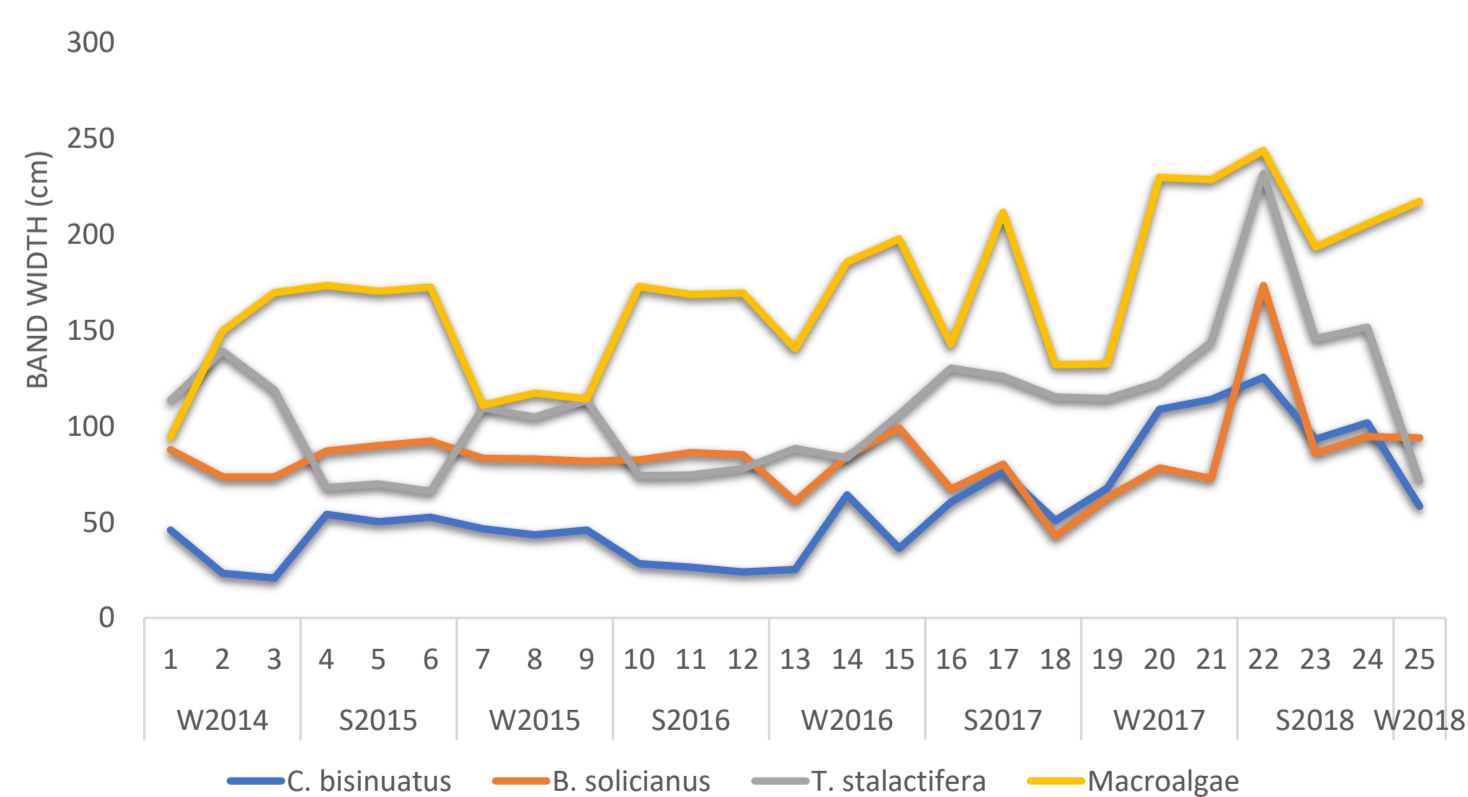
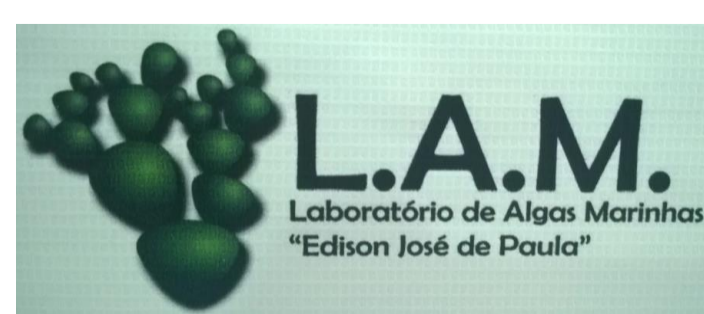


Figure 4. Intertidal dominant species band width over time (winter 2014 to winter 2018).

References

1. COUTINHO, R. *et al.* Studies on benthic communities of rocky shores on the Brazilian coast and climate change monitoring: status of knowledge and challenges. *Brazilian Journal of Oceanography*, v. 64, nsp. 2, p. 27-36, 2016.
2. CRUZ-MOTTA, J. J.; MILOSLAVICH, P.; PALOMO, G.; IKEN, K.; KONAR, B. *et al.* Patterns of Spatial Variation of Assemblages Associated with Intertidal Rocky Shores: A Global Perspective. *PLoS ONE* v. 5 n. 12, 2010. e14354. doi:10.1371/journal.pone.0014354
3. HAWKINS, S. J., FIRTH, L. B., MCHUGH, M., POLOCZANSKA, E. S., HERBERT, R. J. H., BURROWS, R. M. T. *et al.* Data rescue and re-use: recycling old information to address new policy concerns. *Mar. Policy*, v. 42, p. 91–98, 2013a.
4. HAWKINS, S. J., MIESZKOWSKA, N., FIRTH, L. B., BOHN, K., BURROWS, M. T., MacLEAN, M. A., THOMPSON, R. C., CHAN, B. K. K., LITTLE, C., WILLIAMS, G.A. Looking backwards to look forward: the role of natural history in temperate reef ecology. *Marine and Freshwater Research*, v. 67, p. 1-13, 2016.
5. MIESZKOWSKA, N., MILLIGAN, G., BURROWS, M. T., FRECKLETON, R., AND SPENCER, M. Dynamic species distribution models from categorical survey data. *Journal of Animal Ecology*, v. 82, p. 1215–1226, 2013. doi:10.1111/1365-2656.12100
6. PELLIZZARI, F., BERNARDI, J., SILVA, E.M., SILVA, M.C., YOKOYA, N.S. Benthic marine algae from the insular areas of Parana', Brazil: new database to support the conservation of marine ecosystems *Biota Neotropica*. 14(2): e20130011

Acknowledgements



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