Seaweeds in Two Oceans: Beta-diversity (Appendices)

19 March 2017

This file was generated in R using Rmarkdown, with a bit of  thrown in:

sessionInfo()

## R version 4.0.1 (2020-06-06)  
## Platform: x86\_64-apple-darwin17.0 (64-bit)  
## Running under: macOS Catalina 10.15.5  
##   
## Matrix products: default  
## BLAS: /Library/Frameworks/R.framework/Versions/4.0/Resources/lib/libRblas.dylib  
## LAPACK: /Library/Frameworks/R.framework/Versions/4.0/Resources/lib/libRlapack.dylib  
##   
## locale:  
## [1] en\_US.UTF-8/en\_US.UTF-8/en\_US.UTF-8/C/en\_US.UTF-8/en\_US.UTF-8  
##   
## attached base packages:  
## [1] stats graphics grDevices utils datasets methods base   
##   
## loaded via a namespace (and not attached):  
## [1] compiler\_4.0.1 magrittr\_1.5 tools\_4.0.1 htmltools\_0.5.0  
## [5] yaml\_2.2.1 stringi\_1.4.6 rmarkdown\_2.3 knitr\_1.28   
## [9] stringr\_1.4.0 xfun\_0.14 digest\_0.6.25 rlang\_0.4.6   
## [13] evaluate\_0.14

The intention of this section is to show the approach and **R** scripts used to pull apart the spatial scales at which seaweed assemblages are structured around the coast of South Africa. Specifically, I wish to determine if these scales match those expressed by the coastal thermal provinces and the ocean regime underpinned by the Agulhas and Benguela Currents.

I use two data sets. The first, , comprises distribution records of 846 macroalgal species within each of 58 × 50 km-long sections (Appendix A) of the South African coast (updated from Bolton and Stegenga, 2002). This represents *ca*. 90% of the known seaweed flora of South Africa, but excludes some very small and/or very rare species for which data are insufficient. The data are from verifiable literature sources and John Bolton and Rob Anderson’s own collections, assembled from information collected by teams of phycologists over three decades (Bolton, 1986; Bolton and Stegenga, 2002; De Clerck et al., 2005; Stegenga et al., 1997). The second, , is a dataset of *in situ* coastal seawater temperatures (Smit et al., 2013) derived from daily measurements over up to 40 years.

A third data set of explanatory variables — the spatial variables () — is constructed as per the instructions in section *Preparation of spatial variables*, later on.

This is **R**, so first I need to find, install and load various packages. Some of the packages will be available on CRAN and can be accessed and installed in the usual way, but others will have to be downloaded from [R Forge](https://r-forge.r-project.org/R/?group_id=195).

Bolton, J. J. (1986). Marine phytogeography of the Benguela upwelling region on the west coast of southern Africa: A temperature dependent approach. *Botanica Marina* 29, 251–256.

Bolton, J. J., and Stegenga, H. (2002). Seaweed species diversity in South Africa. *South African Journal of Marine Science* 24, 9–18.

De Clerck, O., Bolton, J. J., Anderson, R. J., and Coppejans, E. (2005). Guide to the seaweeds of KwaZulu-Natal. *Scripta Botanica Belgica* 33, 294 pp.

Smit, A. J., Roberts, M., Anderson, R. J., Dufois, F., Dudley, S. F. J., Bornman, T. G., et al. (2013). A coastal seawater temperature dataset for biogeographical studies: large biases between *in situ* and remotely-sensed data sets around the coast of South Africa. *PLOS ONE* 8, e81944.

Stegenga, H., Bolton, J. J., and Anderson, R. J. (1997). Seaweeds of the South African west coast. *Contributions of the Bolus Herbarium* 18, 3–637.