

DNA barcoding supports morphological evidence for a new genus of soft coral Alcyoniidae (Octocorallia)

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ABSTRACT

Alcyonacea are conspicuous members of reef communities yet the study of their ecology is confounded by inconclusive taxonomic knowledge. The addition of phylogenetic analyses and DNA barcoding to traditional taxonomic approaches has progressed the understanding of genus and species boundaries, however, few markers are suitable for studies of Alcyonacea as they are predominantly mitochondrial and evolve significantly slower in Octocorals than their nuclear counterparts. The taxonomic resolution of DNA barcoding was investigated in a number of shallow-water taxa from South Africa, and the utility of nuclear ribosomal RNA (28S), in addition to known mitochondrial markers, was assessed. A multi-locus barcode of *COI+MutS+28S* (2300bp) revealed clades with strong resolve to the species-level. One genus was especially targeted as morphological evidence has long suggested that a number of species should be reassigned to a new genus. This was substantiated by a highly supported monophyletic clade distinct from other Alcyoniid genera. In addition, 28S exhibited more parsimony informative sites, higher haplotype diversity, and delineated between species, making it a powerful addition to the existing mitochondrial barcode. Phylogenetic evidence is presented here for a proposed new genus and the first DNA barcodes for these taxa. This supports the reassignment of those species found to exhibit morphological discrepancies with their designated genus and incorporate incipient morphospecies.

1. TAXONOMY

Soft coral colonies of two genera, *Cladiella* and *Aldersladum*, were collected from world heritage site, iSimangaliso Wetland Park (isiWP) and Durban, South Africa. Reefs from isiWP occur at high latitudes and form marginal reef communities with high endemism^{1,2}. Sclerites (CaCO₃ spicules) embedded in various tissues of each colony were used to identify specimens to the genus and species-level where possible (Fig 1)^{1,2}. *Beta* was selected as a *nomen nudum* for a new genus of *Cladiella* specimens that did not exhibit typical genus characters as the taxonomic description of this genus is currently in preparation. *Beta* comprised former species of *C. australis*², *C. kashmani*² and undescribed *Cladiella* specimens (Fig 1, middle column) from the isiWP. *Beta* taxa were characterized by the **absence** of platelet-type sclerites in their polyp tissues (Fig 1, 1st row) unlike *Cladiella* and *Aldersladum*^{1,2}.

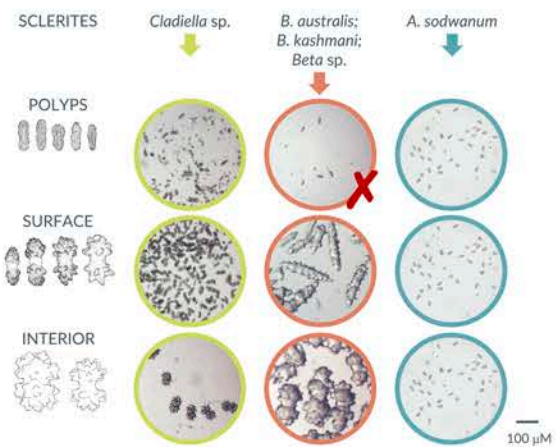


Fig 1. Sclerite compositions of comparable regions taken from genera *Cladiella* (●), *Beta* (●), & *Aldersladum* (●).

2. PHYLOGENETICS

Highly supported monophyletic clades were recovered for each genus: *Aldersladum*, *Cladiella*, and *Beta* (Fig 2). Automatic Barcode Gap Discovery (ABGD) delimited species that were congruent with morphological discrepancies. Intergeneric pairwise distances indicated that *Aldersladum* and *Cladiella* were more closely related to one another than to *Beta*. Generic boundaries were associated with the presence or absence of platelet sclerites in the polyp regions of the colonies. Congruence between genetic and morphological variation supports the reassignment of *B. kashmani*, *B. australis* and *Beta* sp. to a new genus.

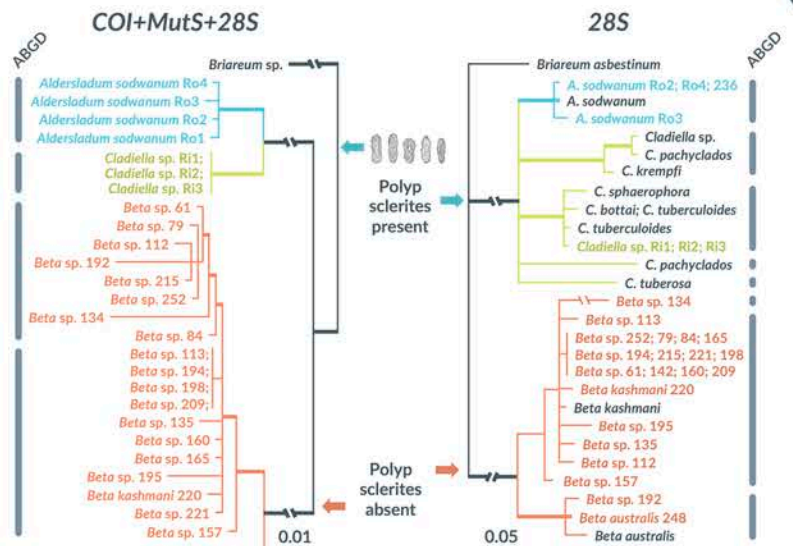


Fig 2. Bayes (B) and Maximum Likelihood (ML) phylogenetic consensus trees for concatenated barcode (left) and 28S (right). Vertical bars denote species clusters (ABGD). Branch thickness indicates support ($B \geq 0.90$; $ML \geq 80$). Genbank sequences denoted in grey.

CONCLUSION

The multi-locus barcode exhibited enough variation for generic and species delimitations for South African taxa. The presence of platelets in the polyps are a major distinguishing key to boundaries between these genera and the morphological and molecular evidence presented supports the necessity for a total revision of the genus *Cladiella*.

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ACKNOWLEDGEMENTS

R. Jackson (UKZN); Dr K. Sink (SANBI); G.Jones (SURG); Triton dive charters

