Biogeography and Biodiversity in Oman: a Survey of Octocorals

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Introduction

Little is known about the biogeography and biodiversity in Oman, a coastal nation with a largely unexplored ocean. Samples collected from Oman came from Mirbat, a deep area prone to seasonal upwellings–it is colder and more nutrient rich–(Wilson 2007) and Muscat, home to rocky shores and wall communities, with warm and shallow waters (Paulay et al. 2018)–conditions we expect to see in other areas of the ocean with the advancement of climate change. We quantified biogeography and biodiversity via a method called DNA barcoding, which usesa similarity threshold and specific genes to determine if two octocorals are different species.

Fig 1 | Map of Oman with Muscat (East) and Mirbat (West) shown with black dots.

Objectives

1. Understand which species are present in Oman
2. Characterize the diversity within and between Mirbat and Muscat

Methodology

Extract DNA → Amplify Genes using PCR → Sequence DNA

Align sequences using LaserGene → Construct phylogenetic trees using MEGA 11 → Use ASAP for species delimitation: threshold of 0.1-0.5%

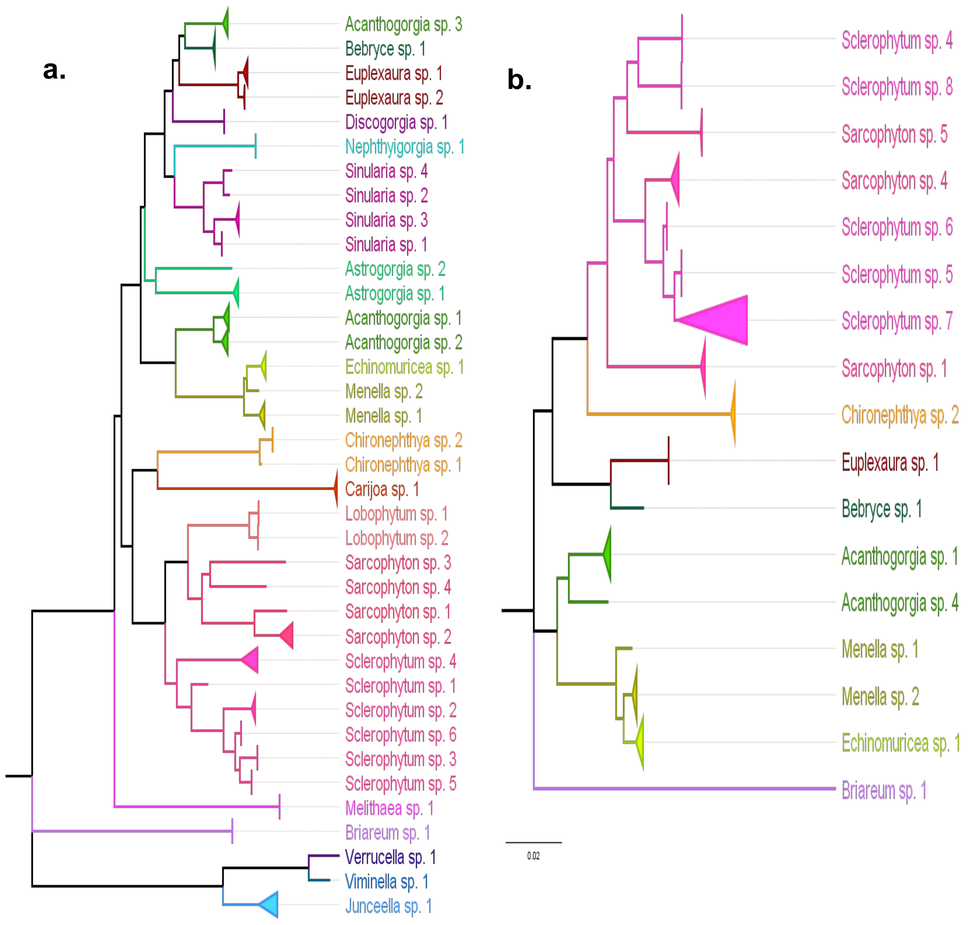
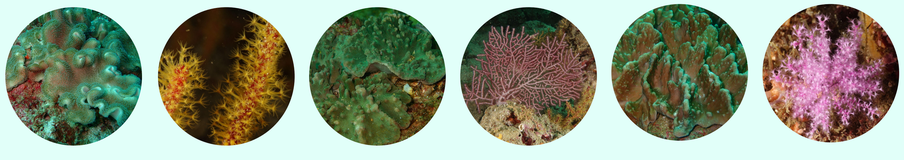


Fig. 2 | Phylogenetic trees made via neighbor joining of species present in (a) Mirbat and (b) Muscat based on sequencing the 28S barcoding gene



Sarcophyton sp. 5 | Echinomuricea sp. 1 | Sclerophytum sp. 1 | Menella sp. 2 | Sclerophytum sp. 1 | Acanthogorgia sp. 1

Results

The genera *Melithaea*, *Junceella*, *Sinularia*, *Carijoa*, *Astrogorgia*, *Discogorgia*, *Lobophytum*, *Nephthyigorgia*, *Viminella*, and *Verrucella* were all unique to Mirbat, whereas there were no genera unique to Muscat (Fig. 2). Across all 18 genera present in Mirbat, 24 species are unique to the region, while only four species are unique to Muscat: *Acanthogorgia* sp. 4, *Sarcophyton* sp. 5 and *Sclerophytum* sp. 7 and 8.

Table 1 | A representation of species and genera diversity in Oman, broken down by location.

Location	Samples sequenced	Number of Genera	Number of Species
Mirbat	143	19	38
Muscat	80	9	16
Both	223	19	60

Conclusions

The 24 species unique to Mirbat are likely not present in Muscat due to the warmer temperatures and shallower waters present in Muscat. Likewise, the four species present in Muscat but not Mirbat are likely not adapted to survive in the seasonally colder waters of Mirbat. Most of the species unique to Muscat are zooxanthellates (*Acanthogorgia* are not), and thus require light for their photosymbionts. The shared species are likely more flexible in terms of temperature. Many of the genera unique to Mirbat are gorgonians, not soft corals, suggesting that gorgonians have a preference for colder, deeper waters, with less light, which is supported by existing literature. The four *Sinularia* species in Fig. 2a suggests that what we consider to be a singular *Sinularia* species, *Sinularia brassica*, may be multiple, but further research is necessary to confirm these results.

Acknowledgements

We would like to acknowledge grant NSF DEB-1856245 for funding our research, Professor Catherine McFadden for her guidance, Katie Erickson for her advice, Yvonne Reinholtz for her help in maintaining the lab, and our labmates for their support.

References

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