

# Mangrove Response to a Rising Sea Level on an Undisturbed Atoll

## RESEARCH QUESTION

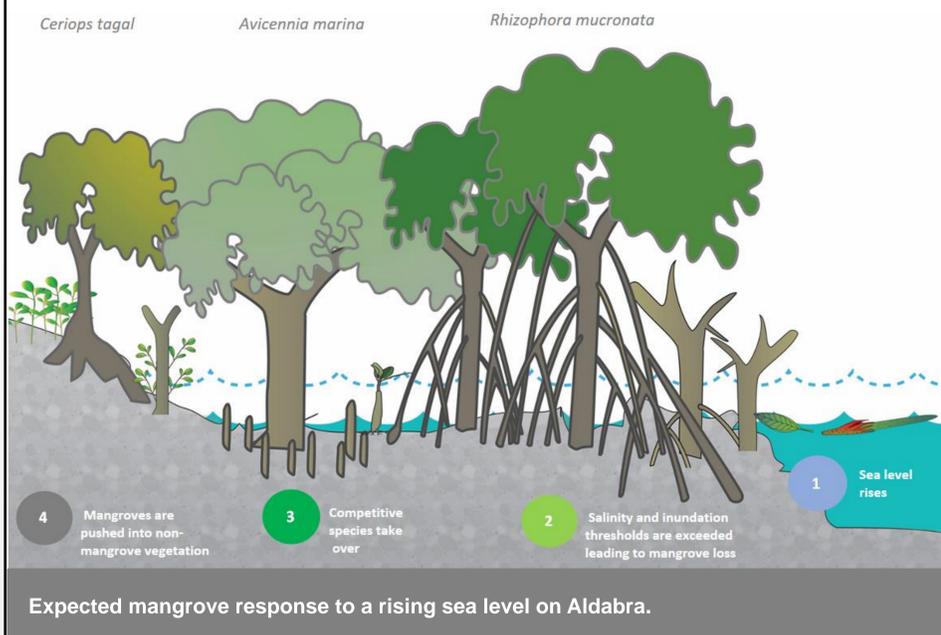
How does the mangrove forest on Aldabra Atoll respond to an increasing sea level in the Indian Ocean?

## RESEARCH GOALS

1. Assess change in mangrove extent over the past 35 years.
2. Generate baseline mangrove tree species diversity and structure data in relation to their environment.
3. Quantify changes in species composition in the largest mangrove stand (Bras Cinq Cases) over the past 60 years.

## BACKGROUND INFORMATION

Low-lying islands and endemic biodiversity are challenged by habitat loss because of sea level rise. Around Aldabra, an atoll in the Indian Ocean, sea level has increased over the past decade at a rate exceeding the global average [1]. This could lead to an increase in inundation and salinity experienced by mangrove species lining the lagoon of the atoll. The assessment of the long-term stability of this undisturbed habitat is critical for the diverse range of fauna that depends on it.



## METHODS AND DATA

### 1. Mangrove extent

- Multi-temporal post-classification change detection from 1985 - 2018 using Landsat satellite imagery.

### 2. Mangrove species diversity and structure

- Plot-based diversity and structure [2] available from a field survey in 2016 on Grande Terre.
- Upcoming campaign 20Q19: record species distribution, structure, seedling regeneration, abiotic variables (inundation period, soil salinity and elemental concentrations) in 72 plots of 5 x 5 m across two islands.

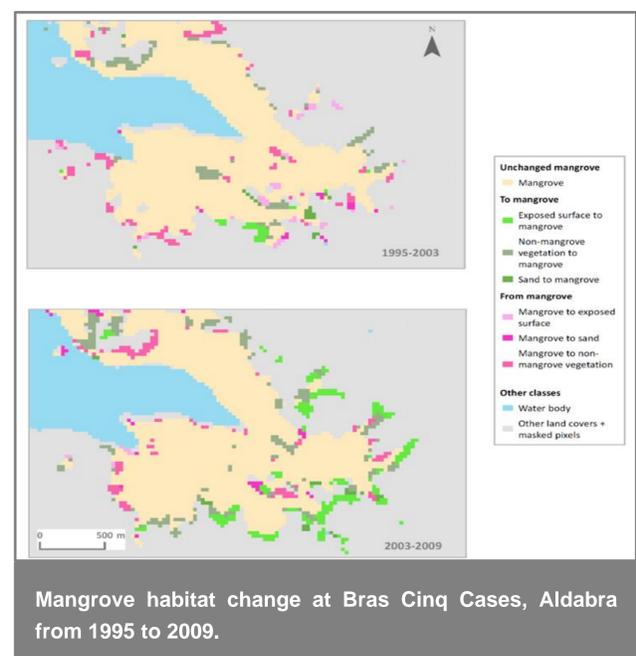
### 3. Species composition

- Classification of drone imagery from 2015 over Bras Cinq Cases and comparison with species map from expedition in 1967 [3].

## PRELIMINARY RESULTS

### 1. Mangrove extent

- Net gain of 174 ha in mangrove area from 1995 to 2019 (total mangrove area 1720 ha).
- Stands are dynamic, especially at their landward margins.
- Considerable retraction in mature mangrove stands on exposed coasts means an increased probability of loss in functional diversity.



### 2. Mangrove species diversity and structure

- *Rhizophora mucronata* is structurally dominant, followed by *Ceriops tagal* and *Avicennia marina* (on average taller and larger).

### 3. Species composition

- *Rhizophora mucronata* replaced *Avicennia marina* as the dominant species at Bras Cinq Cases. Mangrove species evenness is decreasing.

## PROJECT BY

### ANNABELLE CONSTANCE

[annabelle.constance@ieu.uzh.ch](mailto:annabelle.constance@ieu.uzh.ch)

University of Zurich

Remote sensing and spatial ecology (IEU)

## PHD SUPERVISORS

Gabriela Schaeppman-Strub

Nancy Bunbury

Owen Petchey

Michael Schaeppman

## REFERENCES

[1] THOMPSON, P., Piecuch, C., Merrifield, M., McCreary, J., & Firing, E. (2016). Forcing of recent decadal variability in the Equatorial and North Indian Ocean. *Journal Of Geophysical Research: Oceans*, 121(9), 6762-6778. doi: 10.1002/2016jc012132

[2] CONSTANCE, A. (2016). Mangroves on Aldabra – Habitat Change Trends, Stand Structure and Species Composition (MSc.). University of Zurich

[3] MACNAE, W. (1971). Mangroves on Aldabra. *Philosophical Transactions Of The Royal Society B: Biological Sciences*, 260(836), 237-247. <http://dx.doi.org/10.1098/rstb.1971.0013>

## COLLABORATORS

April Burt

Rowana Walton

Dennis Hansen