Algal community structure in N'Gouja along a North–South and Shore–Slope gradient

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INTRODUCTION

Biodiversity support · Primary production

Macroalgae

Nutrient Cycling · Habitat Structure

Algal communities are widely used as indicators of environmental pressure (McCook, 1999)

Map of Mayotte

Characterized by a strong gradient

Hypothesis → Natural spatial variability in N'Gouja

Exposure · Substrate · Water flow

Does it influence macroalgal distribution ?

Aim of this study :

Characterize the composition and distribution of macroalgal communities at N'Gouja and assess how they vary along two spatial gradients :

Coastal–slope gradient (Shore–Slope) · Latitudinal gradient (North–South)

MATERIAL AND METHODS

① Site

N'Gouja
South of Mayotte

② Protocol

- 9 Stations (2 spatial gradients)
- 9 transects 30 m
- 7 quadrats of 1m x1m on each transect (every 5 m) a b c d e f g

In each quadrat we looked for :

Cover % by species · Grain size · Type of substrate

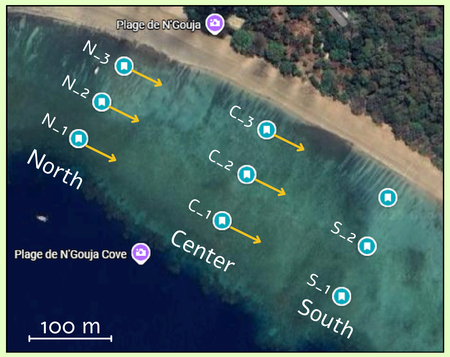


Fig.1 Map of the differents stations

③ Analysis of data

Diversity indices	→	Kruskal-Wallis
Differences across latitudinal and coastal-slope gradients	→	Post-hoc tests
Substrate composition and sediment grain-size distribution	→	Permanova

RESULTS

NORTH–SOUTH GRADIENT

① Diversity indices

- Variation in **Shannon** (p = 0,02) and **species richness** (p = 0,028).
- **Central** zone has a **species richness** index and a **Shannon** index **lower** than **North** and **South**. **A higher Simpson** index indicates **dominance** of tolerant **taxa** (Leite Jardim et al., 2025).

North ≠ Center ≠ South

→ **Central discontinuity in diversity**

② Algal community structure

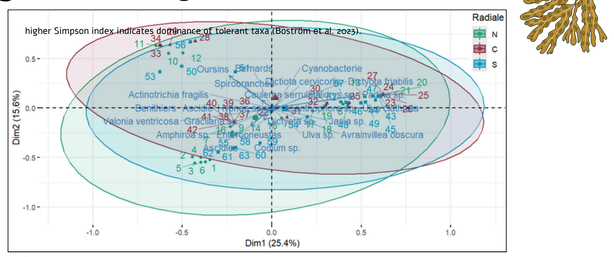
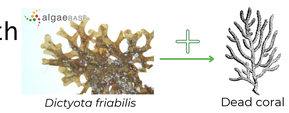


Fig.2 Structure of algal community and associated fauna

- **Overlap** among **North**, **Central** and **South** zones → **similar** community **composition**
- All **three zones differ** significantly (Parwise tests ; p.adj < 0,05) only for **algal community**.
- **Substrate** characteristics **structure communities** much more than radial position (Permanova ; p = 0.001).



SHORE–SLOPE GRADIENT

① Diversity indices

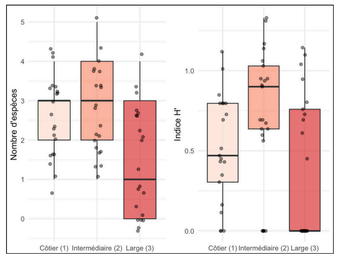


Fig.3 Algal species richness and Shannon diversity index (H') across the shore-slope gradient

- Variation in **Shannon** (p = 0,021) and **species richness** (p = 0,013)
- **Significant** impact of the shore-slope gradient on algal diversity : significantly higher Shannon diversity in the **offshore zone** compared to the **intermediate zone**.

② Algal community structure

- The nearshore-offshore gradient **significantly structures benthic algal community composition** (PERMANOVA R=11.1%;p=0.001).
- Benthic community differences along the gradient are driven by a shift from the dominance of **Padina sp.** (nearshore) to communities characterized by **Acanthophora sp.** and **Gracilaria sp.** (offshore).
- **Local substrate characteristics** are the primary drivers of **algal community composition**, explaining a significantly greater proportion of variation (R2=20.4%) than the nearshore-offshore spatial gradient (R2=11.1%, PERMANOVA, p=0.006)

DISCUSSION

Latitudinal gradient

- Lower diversity in the Central zone reflects local habitat constraints (Romoth et al. 2023).
- Only algae vary significantly, showing sensitivity to microhabitat conditions (Levenstein et al., 2022). Community structure is driven by substrate complexity rather than location (Lelièvre et al. 2025).

Coastal-slope gradient

- Local substrate characteristics are the main factor structuring algal communities, outweighting the spatial gradient. This confirms the primacy of local habitat heterogeneity over broad position (Lelièvre et al. 2025).
- Structurally complex taxa align with hard substrates contrasting with tolerant species (Padina sp.) which correlate with sand (high sedimentation) (Fong & Paul, 2011).

CONCLUSION

Substrate primarily controls macroalgal distribution but unmeasured biophysical factors could drive residual variance.

REFERENCES