Indian Ocean microborers in a living coral: How explore their abundance's variability over 50 years?

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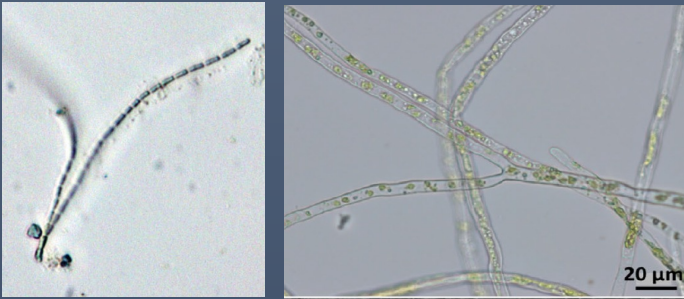
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Context

 Reef carbonate budget :
balance between constructive
and destructive forces

 **Boring Microflora
(cyanobacteria, algae,
fungi):** One of the main
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Boring Microflora (cyanobacteria, algae, fungi): One of the main agents of bioerosion in reefs

Main Objectives

- **Develop a new method** allowing the study of the abundance of traces left by microborers (microborings) in the skeleton of living corals relying on a Machine Learning approach

- **Apply this innovative method to a coral core** of a **living massive coral *Diploastrea* sp** collected in Mayotte in October 2018 and covering the last 50 years

- **Determine the possible factors influencing microborings' abundance** in the studied coral core
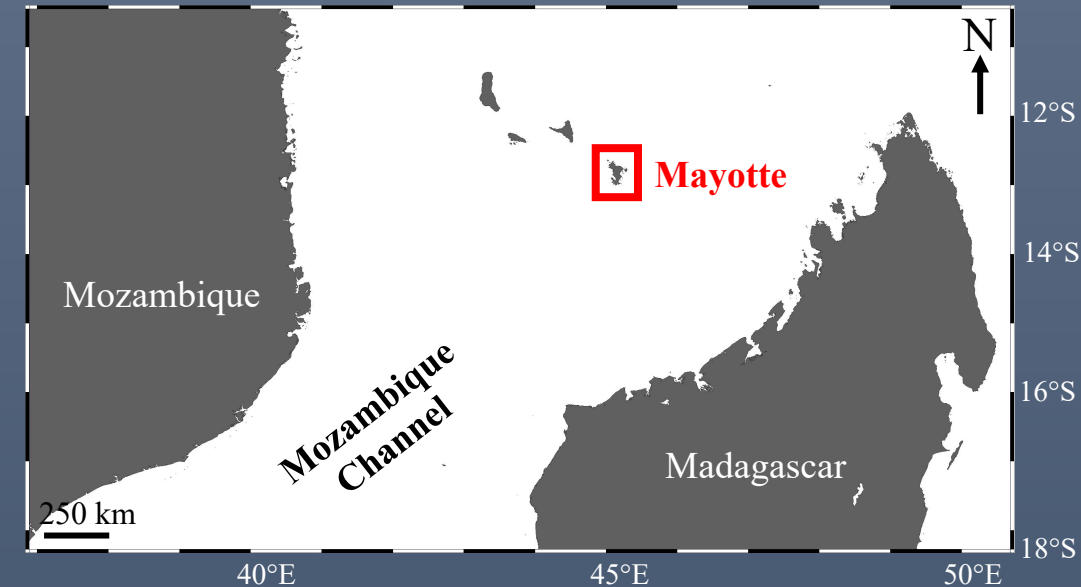
➤ **Quantification of microborer's traces**

Holy Machine Learning!

- Studied coral core = 50 years (1964-2018)
- > 1500 SEM images to cover the period!
- Machine learning → Quick analysis of images
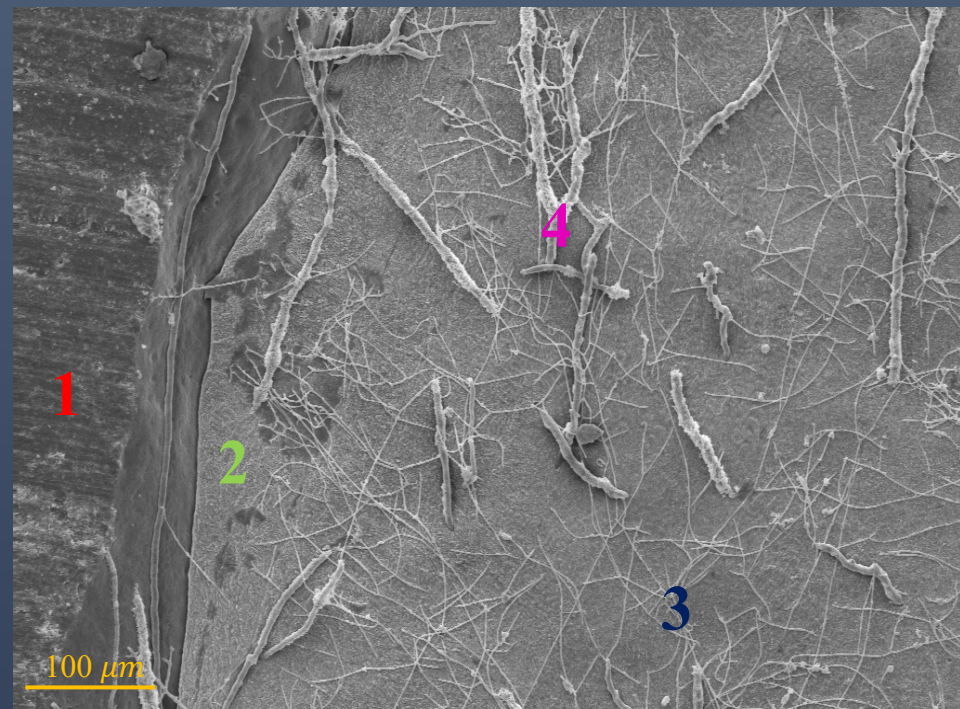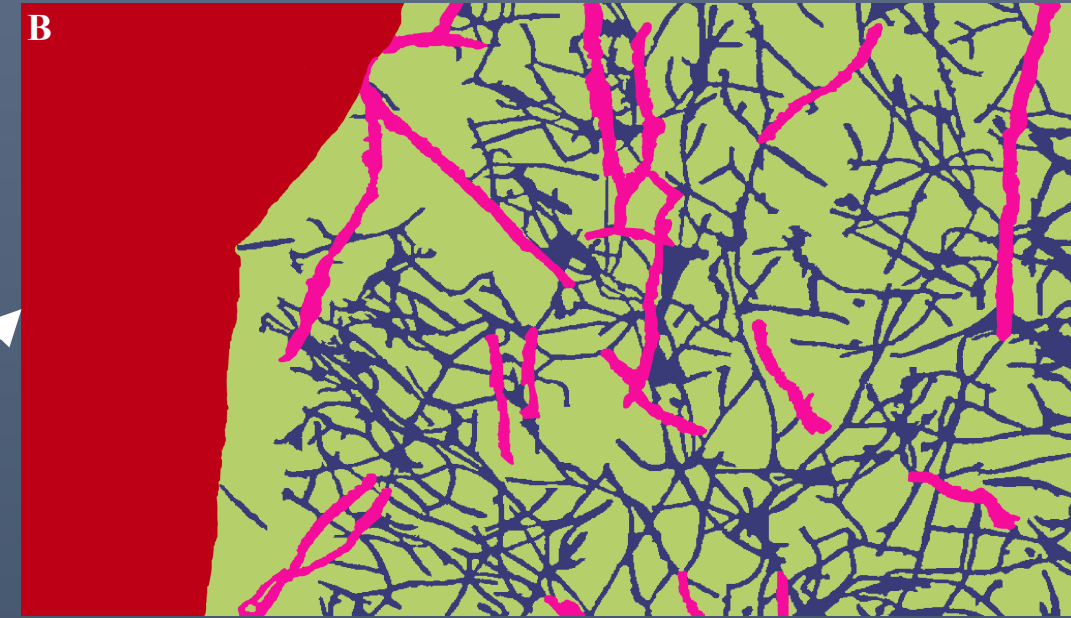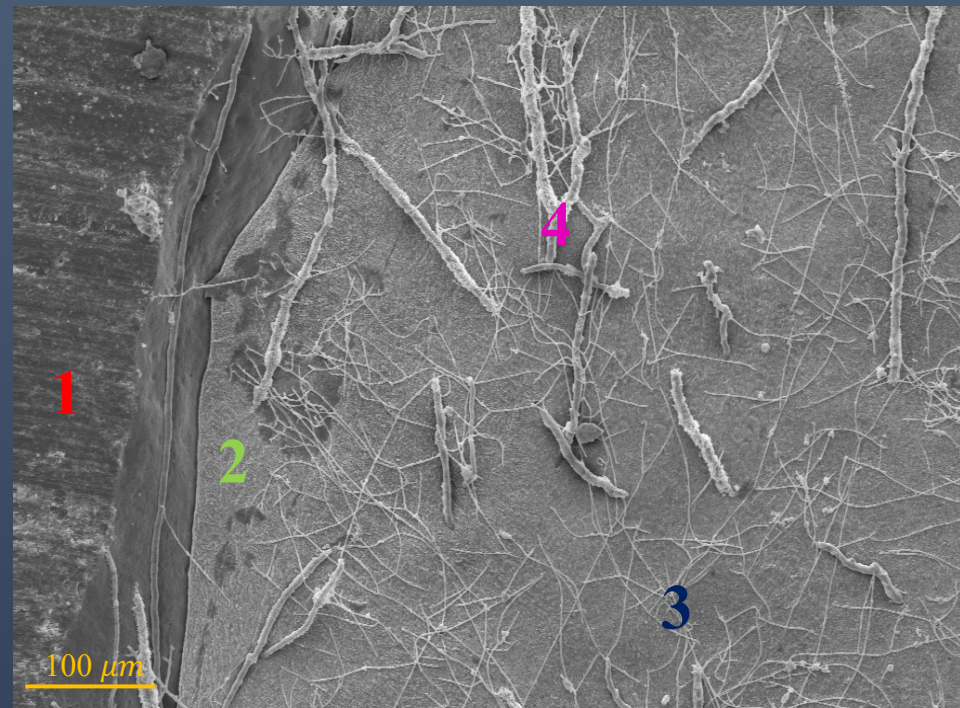

4 classes were determined

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3 to 5 hours

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100 μm

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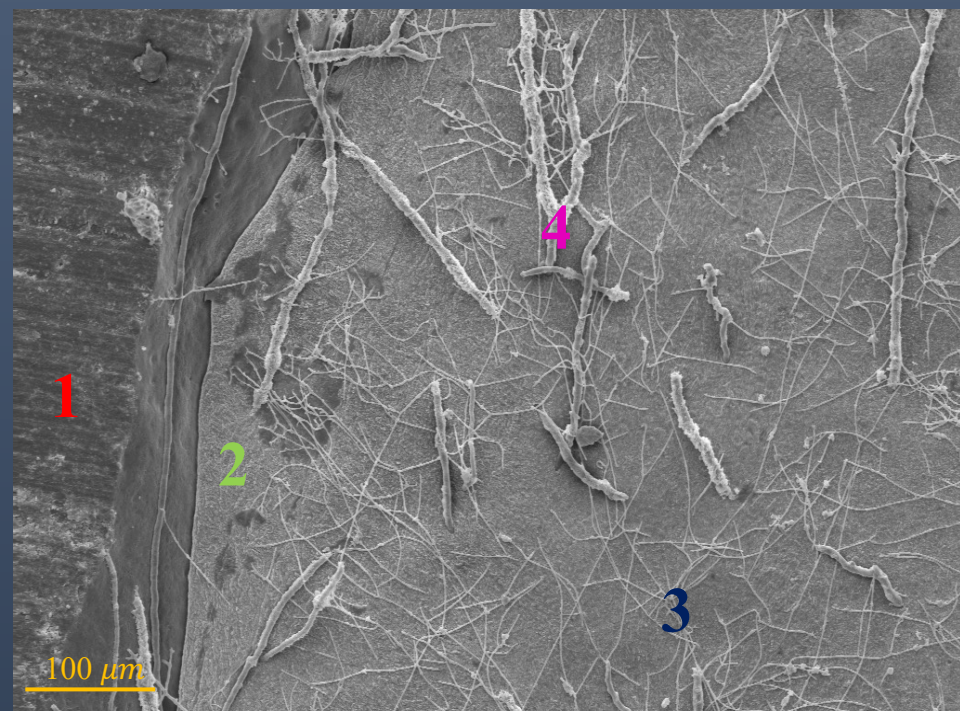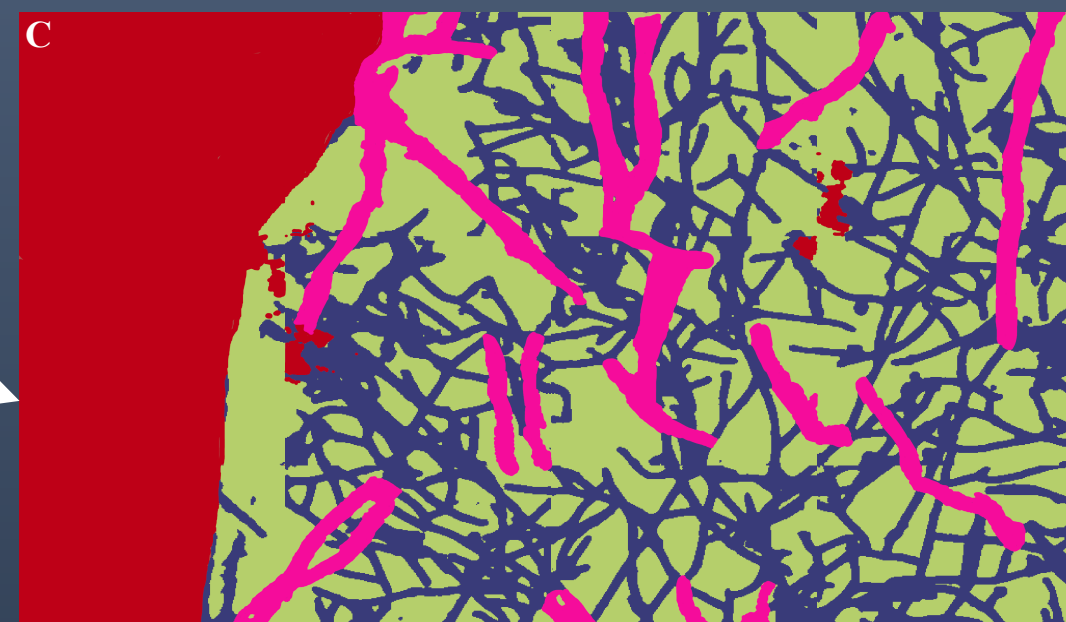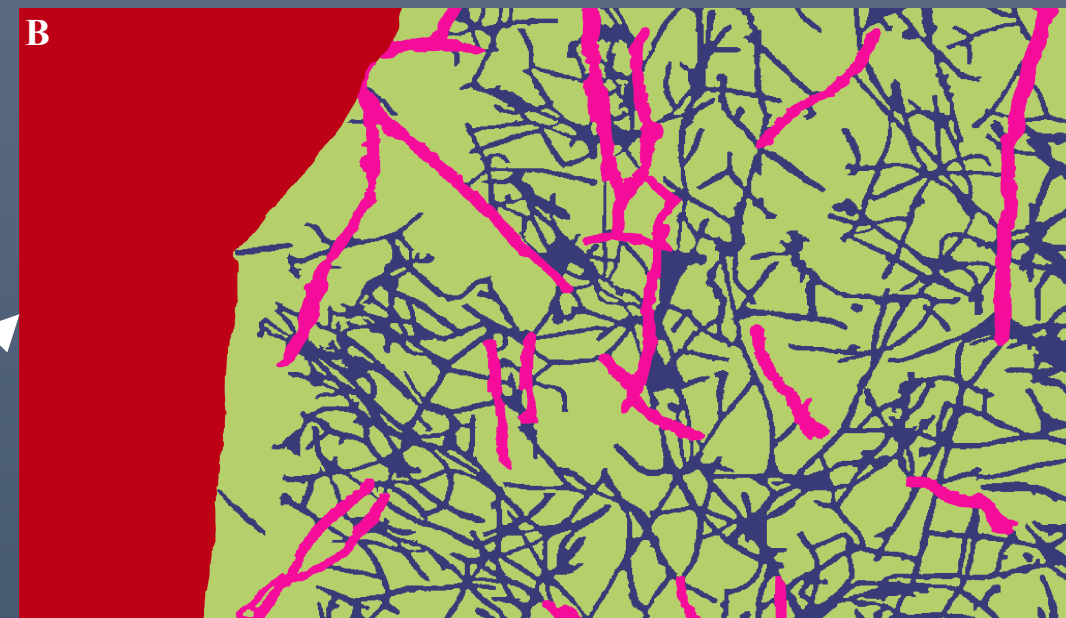- Machine learning → Quick analysis of images

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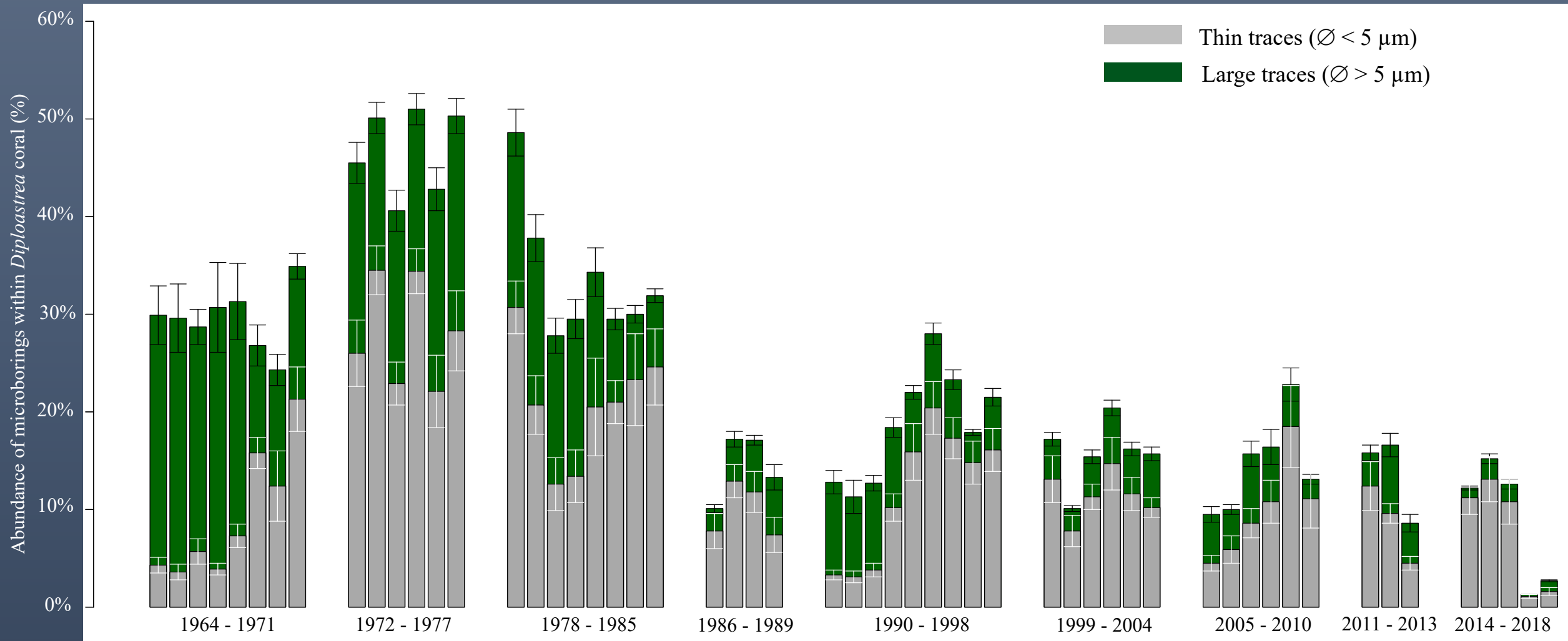4 classes were determined

Using the Machine Learning algorithm :
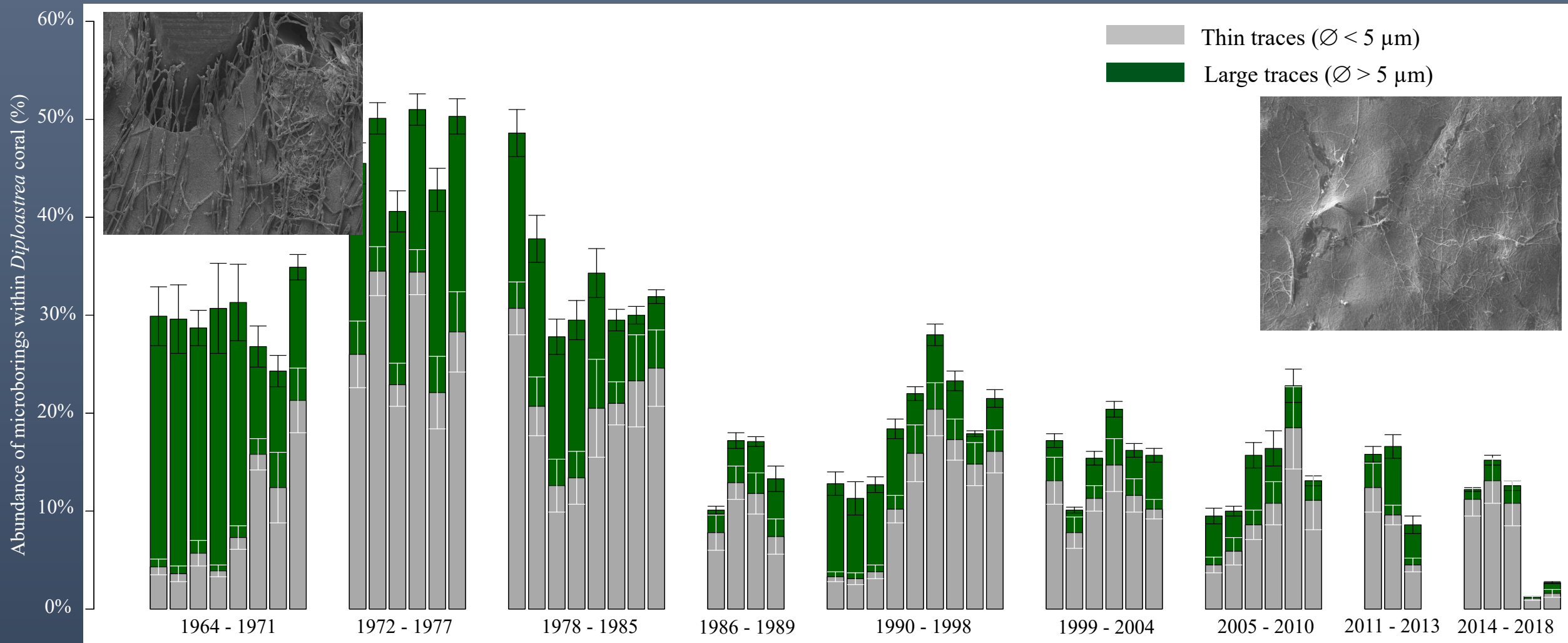**< 1s**
Accuracy: 93%

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➢ **Variability of microborings' abundance over the last 50 years**
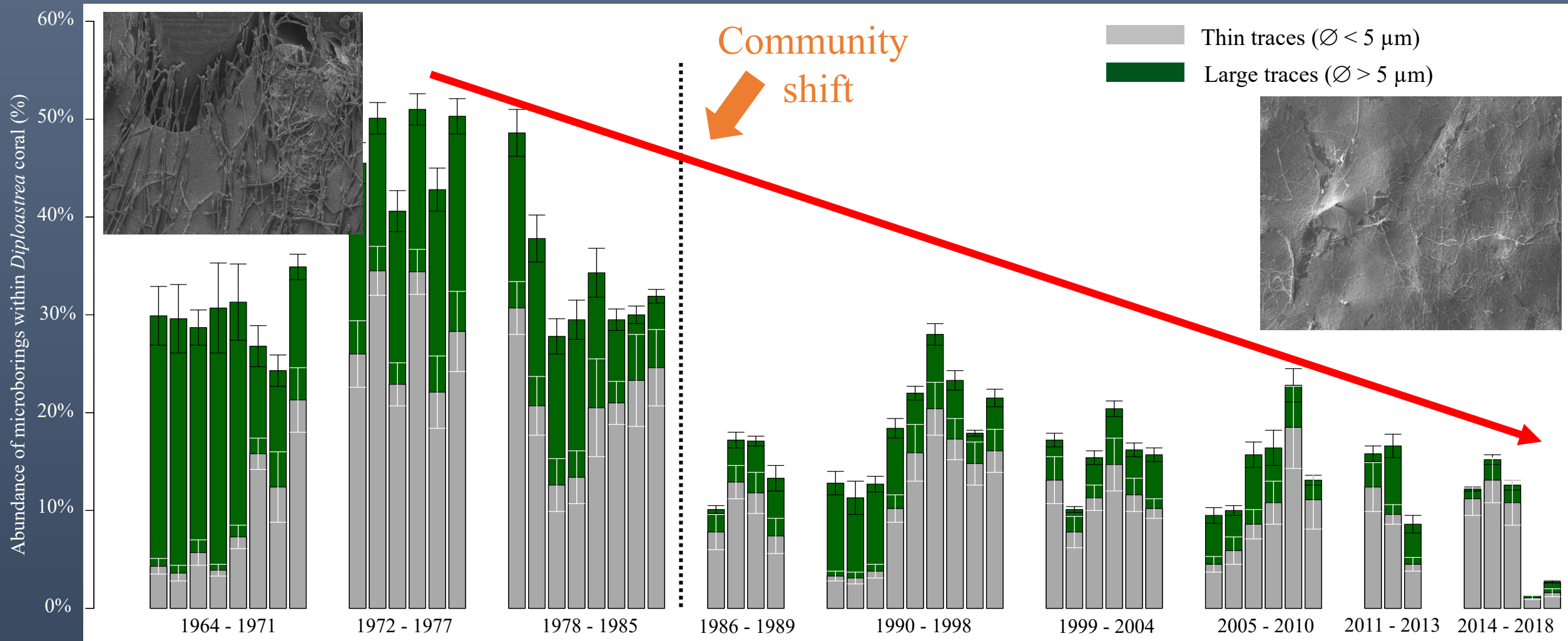
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Community shift

Legend:
- Thin traces ($\varnothing < 5$ µm)
- Large traces ($\varnothing > 5$ µm)

Y-axis: Abundance of microborings within *Diploastrea* coral (%), 0% to 60%

X-axis categories: 1964 - 1971, 1972 - 1977, 1978 - 1985, 1986 - 1989, 1990 - 1998, 1999 - 2004, 2005 - 2010, 2011 - 2013, 2014 - 2018
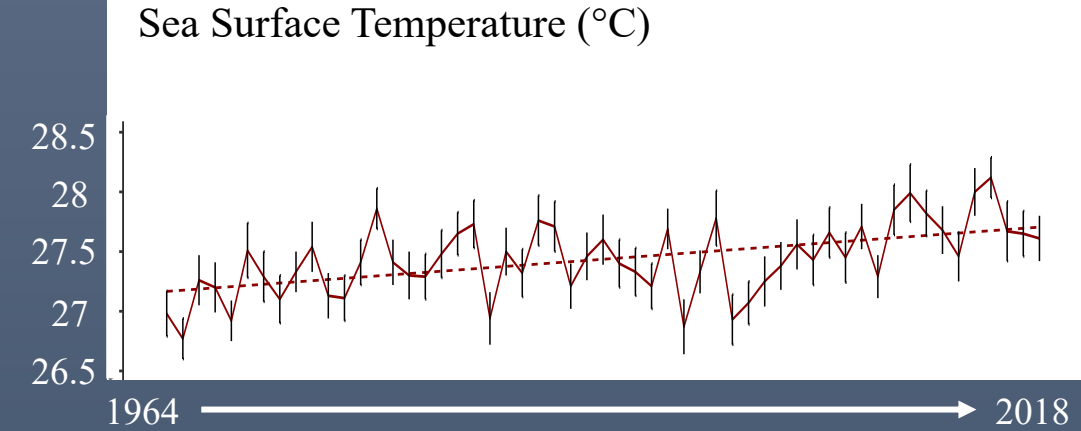
▪ **Significant decrease of microborers' abundance over the last 50 years with an important community shift around 1985**

➢ **Main Conclusions:**

▪ **The increase of SST and positive SST anomalies** over the last decades, (+0.12°C/decade) **could explain the significant decrease of microborers' abundance in the massive coral *Diploastrea* sp. from Mayotte**. These factors may be combined to other abiotic and/or biotic factors such as seawater pH, metal trace pollutions, nutrient concentrations (under investigation).

Sea Surface Temperature (°C)

28.5
28
27.5
27
26.5

1964   2018

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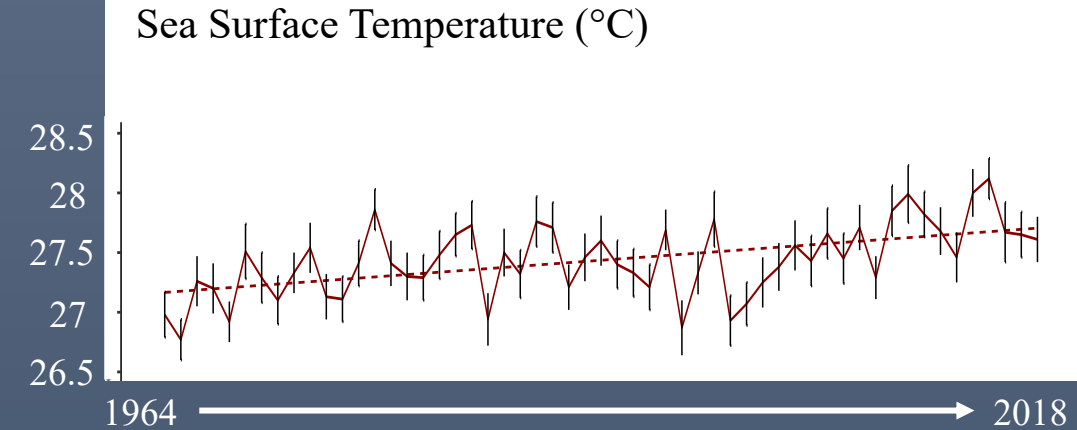- Article in Review in *Frontiers in Marine Sciences*

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➤ **Take Home Mes**

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- **The new developed approach allows** analyzing a large number of accuracy of 93 %.

- This innovative method **could be applied to other coral species** differences in skeletal composition, structure.

- **Significant decrease of microborers' abundance over the last 50 ye** needs to be confirmed in other massive coral cores from the Western to understand its origin and consequences for the resilience of coral re

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