

Reconstructing Parrotfish Tooth Size Distributions Over Millennia and Across Ocean Basins

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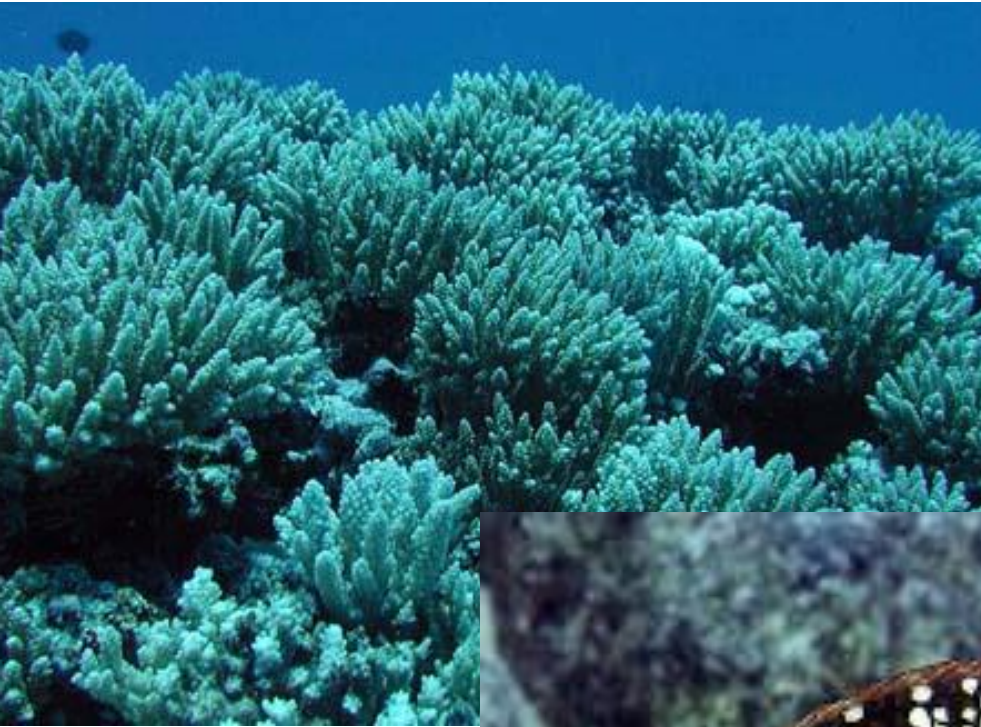
Algal competition threatens coral reef health



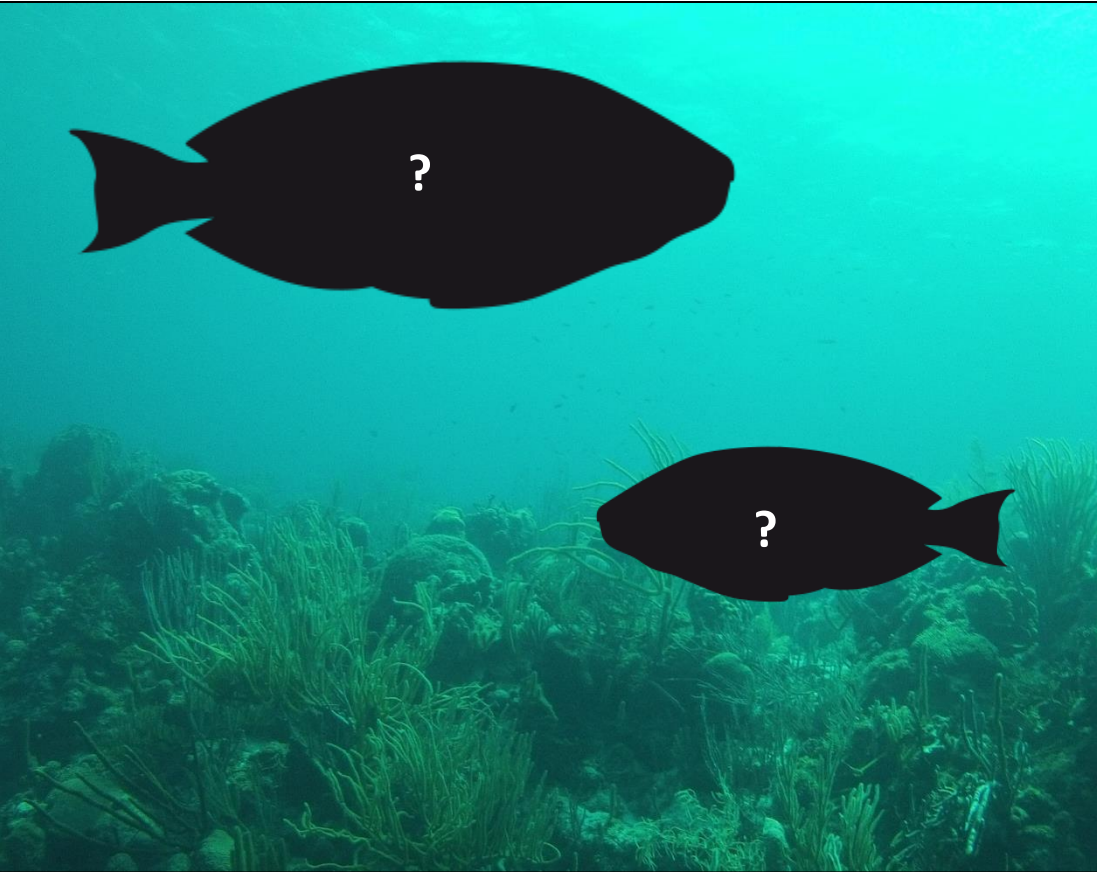
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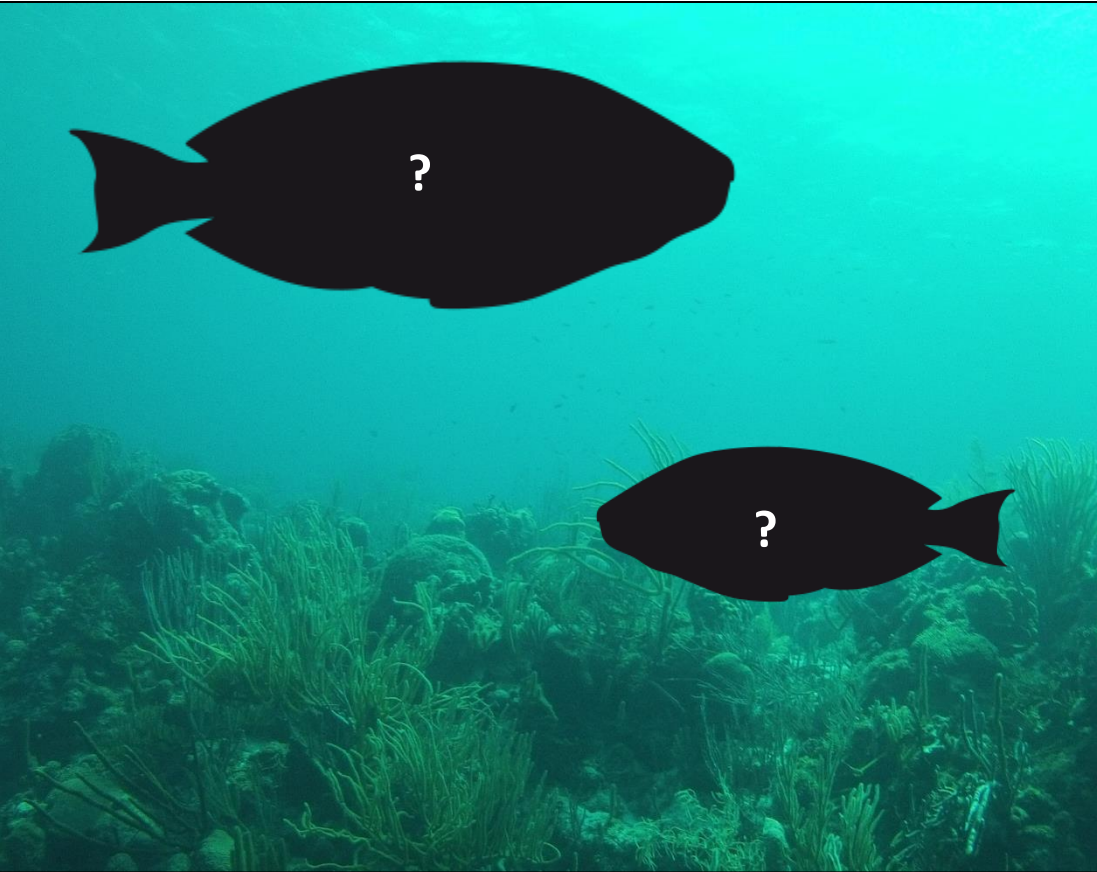
Parrotfish regulate competition



How have parrotfish populations changed over time?



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Survey data doesn't give the full picture

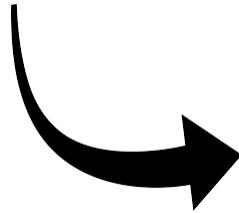


1950

Survey data doesn't give the full picture



1950

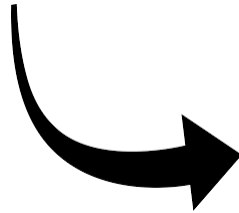


1980

Survey data doesn't give the full picture

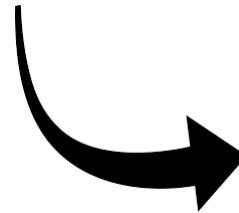


1950

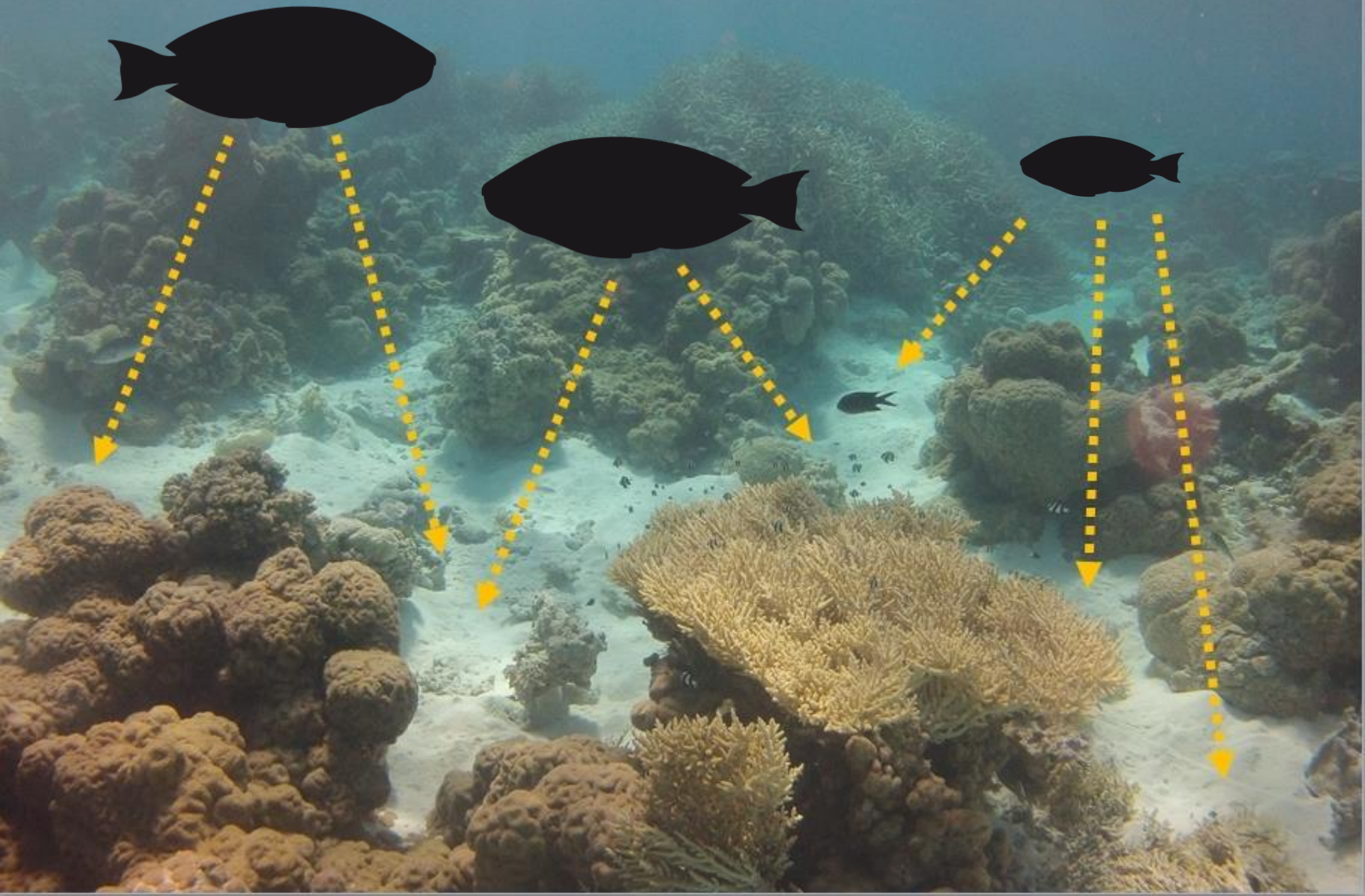


2008

1980



Solution: fish tooth microfossils



Questions

How does the size and relative abundance of parrotfish teeth differ:

1. over the last 6000-8000 years in the Caribbean?
2. between select sites in the Caribbean and Pacific?

Sample Collection: Fossil and modern reefs in the Dominican Republic



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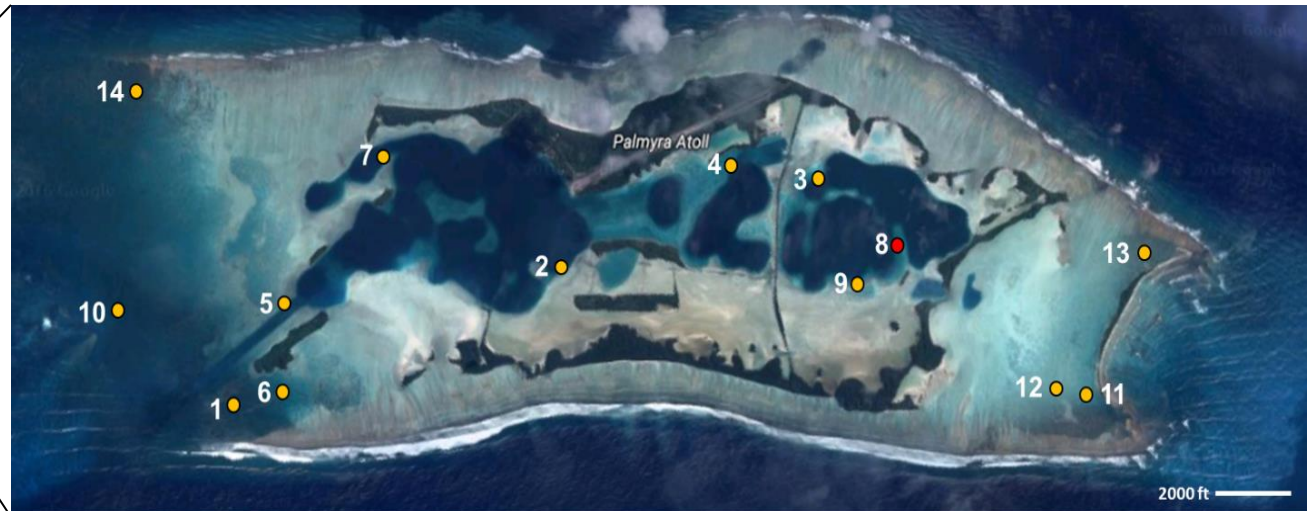
Sample Collection: Fossil and modern reefs in the Dominican Republic



Sample Collection: Palmyra Atoll



Sample Collection: Palmyra Atoll





EM16-5-2

EM16-5-8

EM16-5-5

EM16-5-7

EM16-4-2

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EM16-10-1

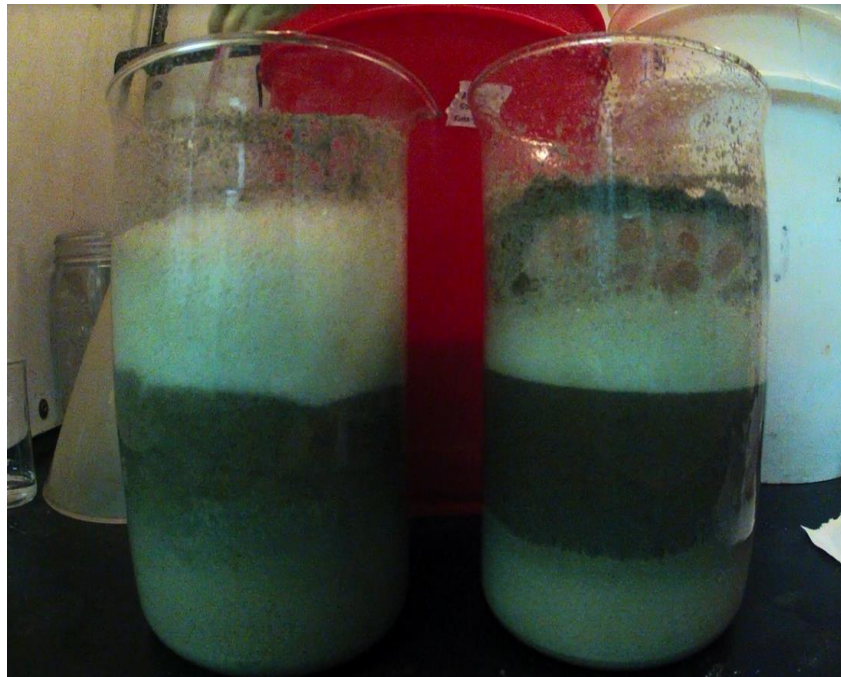
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Extracting teeth from samples

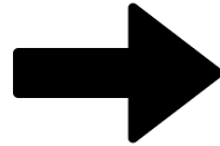


Acetic acid (vinegar)

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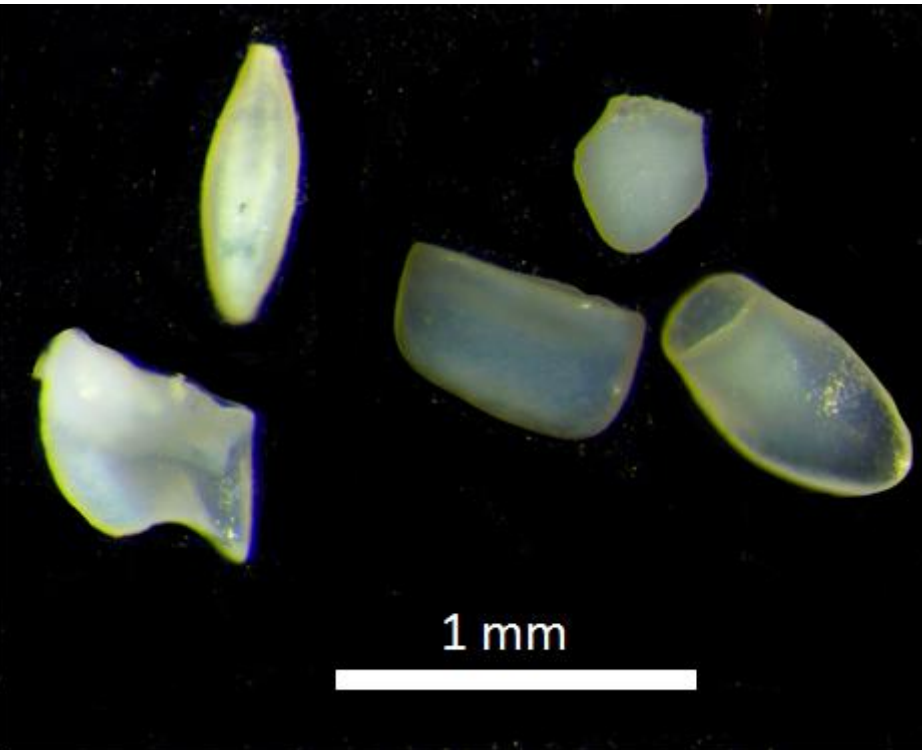


Acetic acid (vinegar)

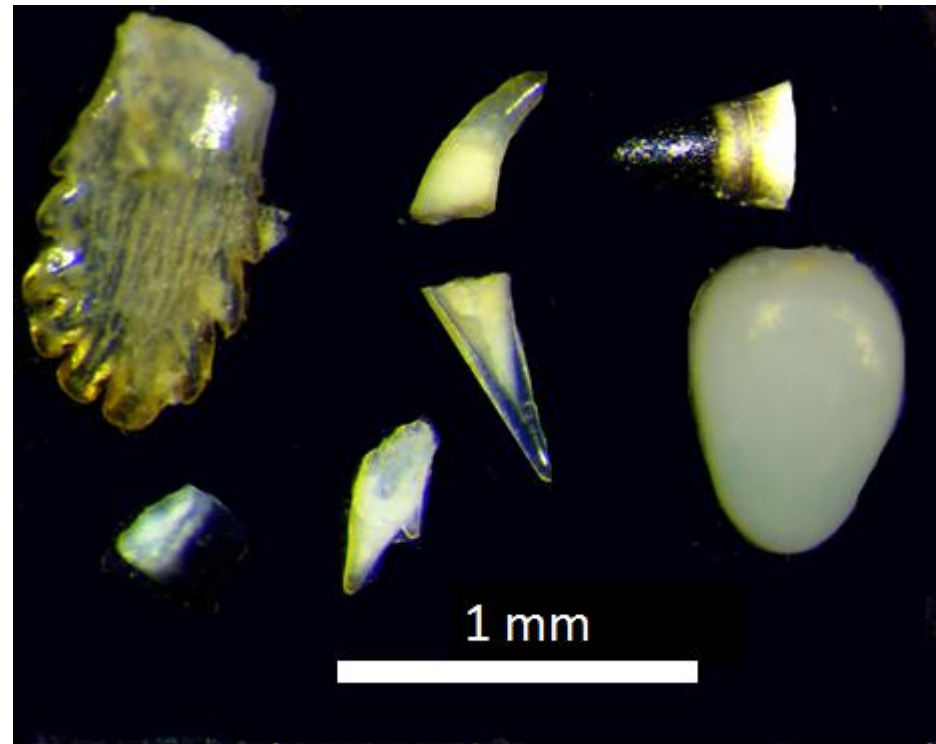


Sort and measure teeth

825 Teeth were Extracted and Measured

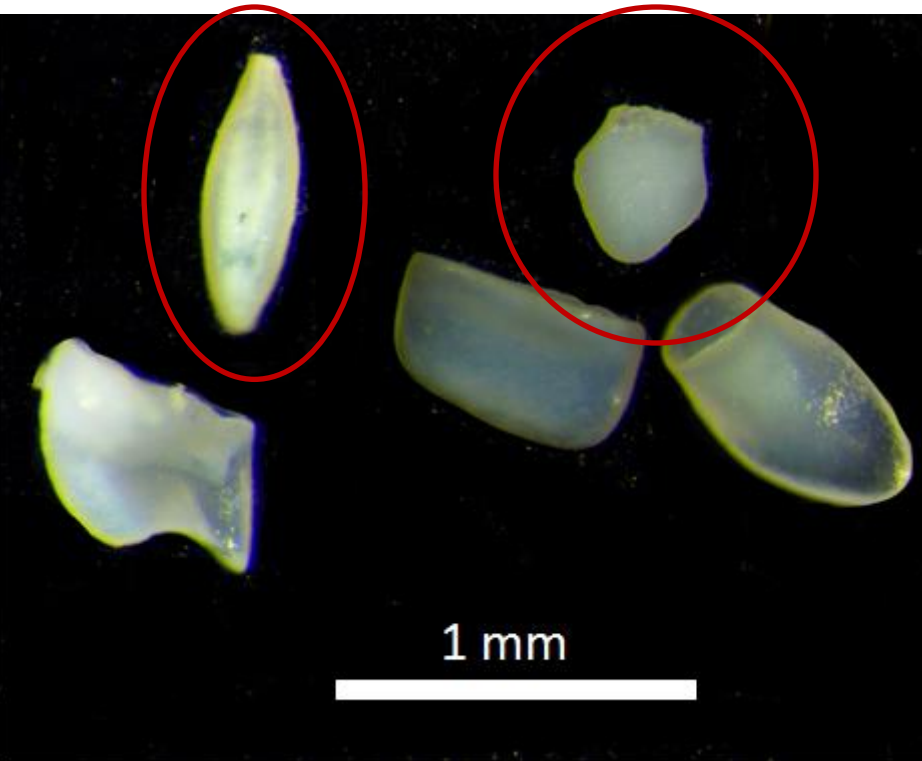


Parrotfish teeth morphotypes

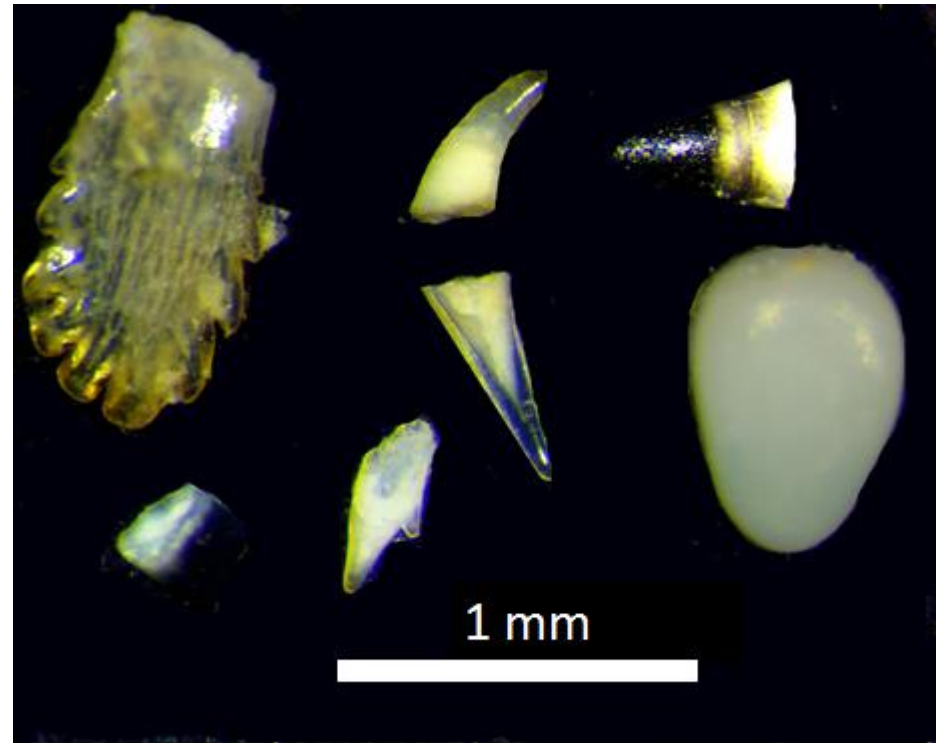


Tooth morphotypes of other fish

825 Teeth were Extracted and Measured

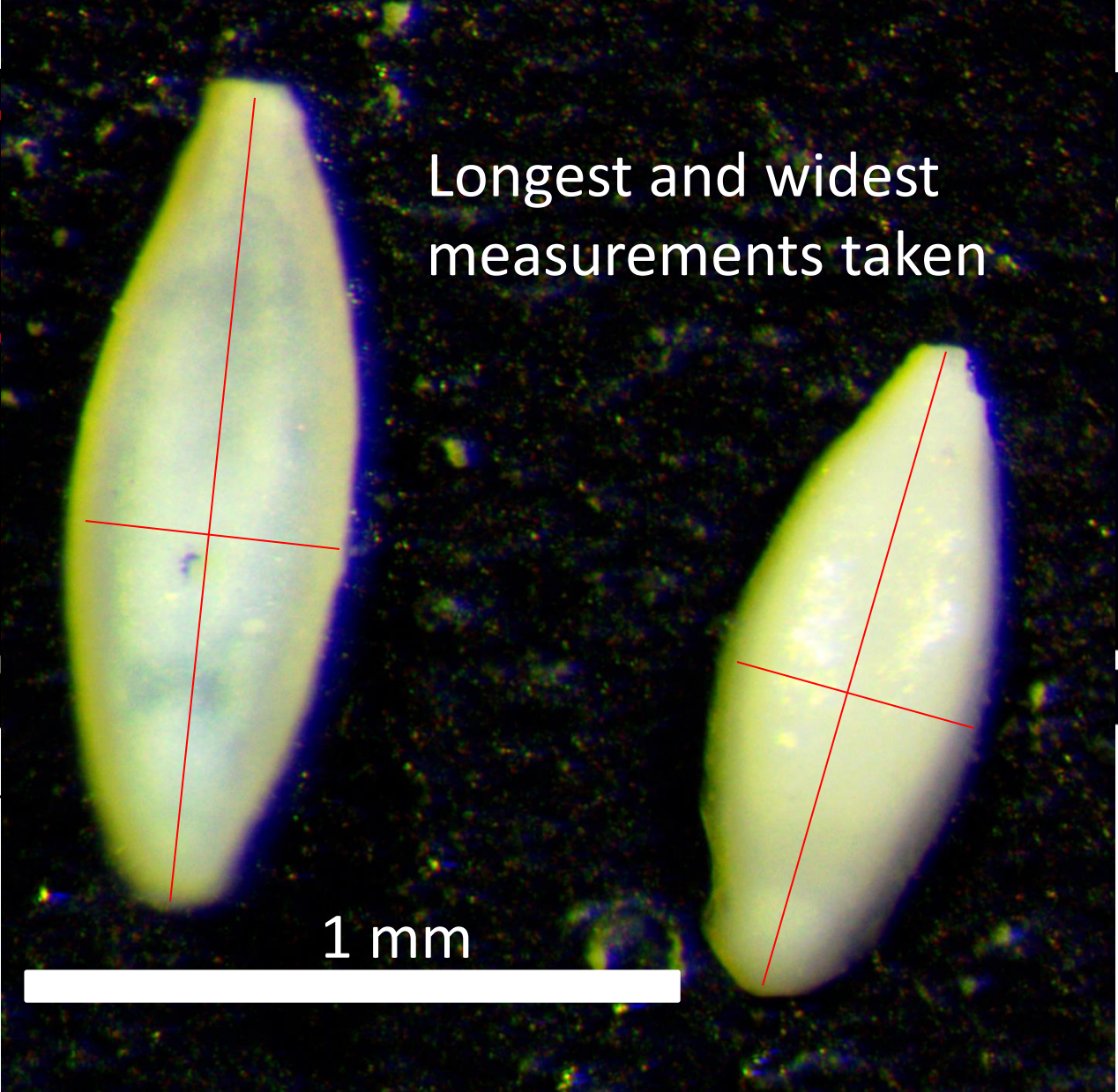


Parrotfish teeth morphotypes



Tooth morphotypes of other fish

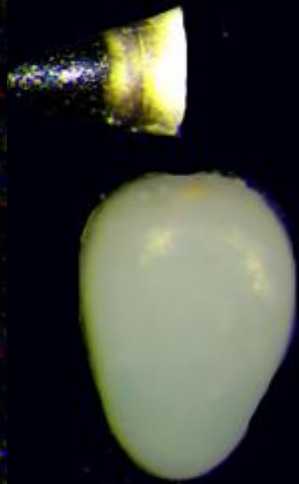
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Longest and widest measurements taken



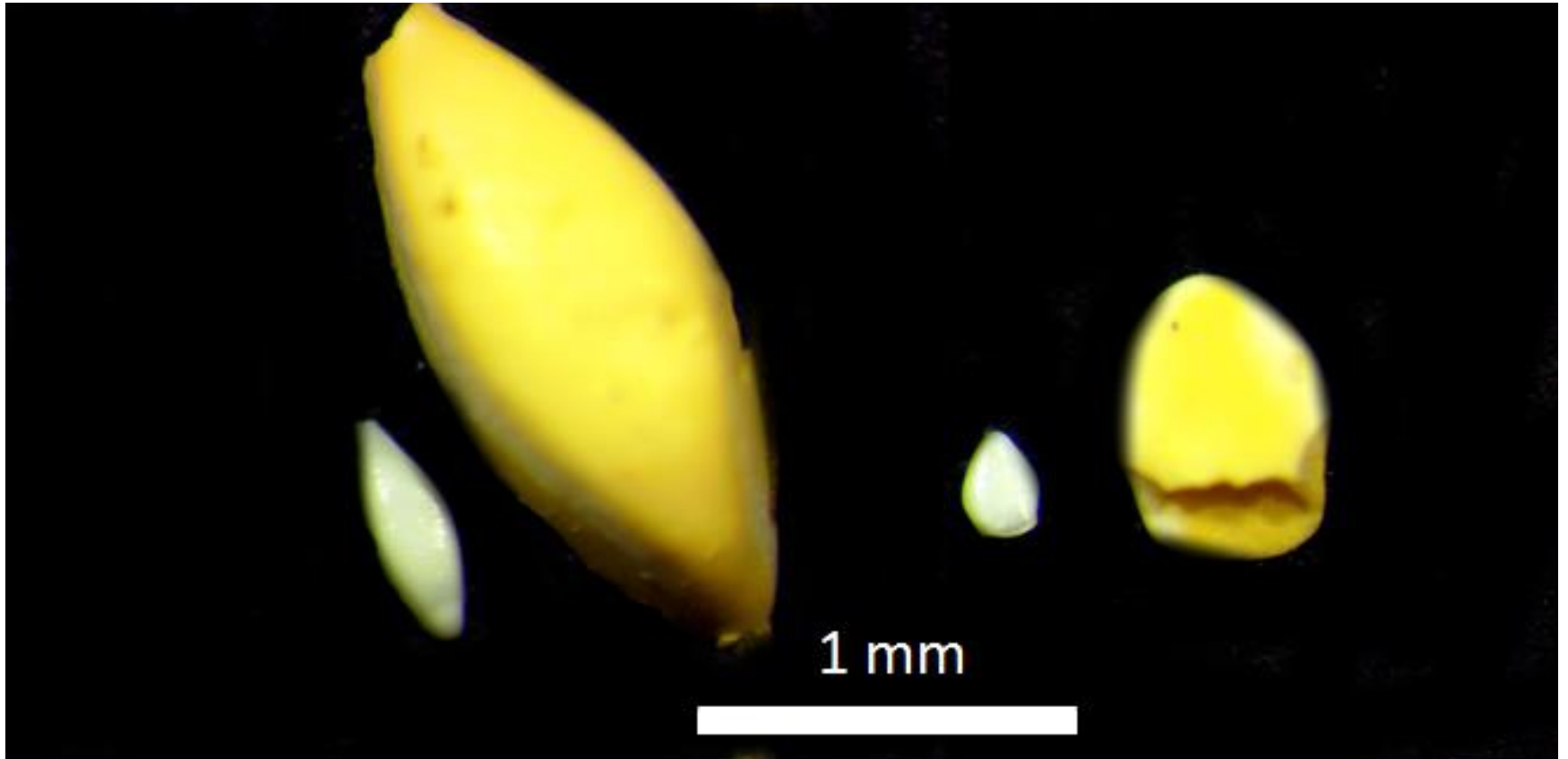
Parrotfish



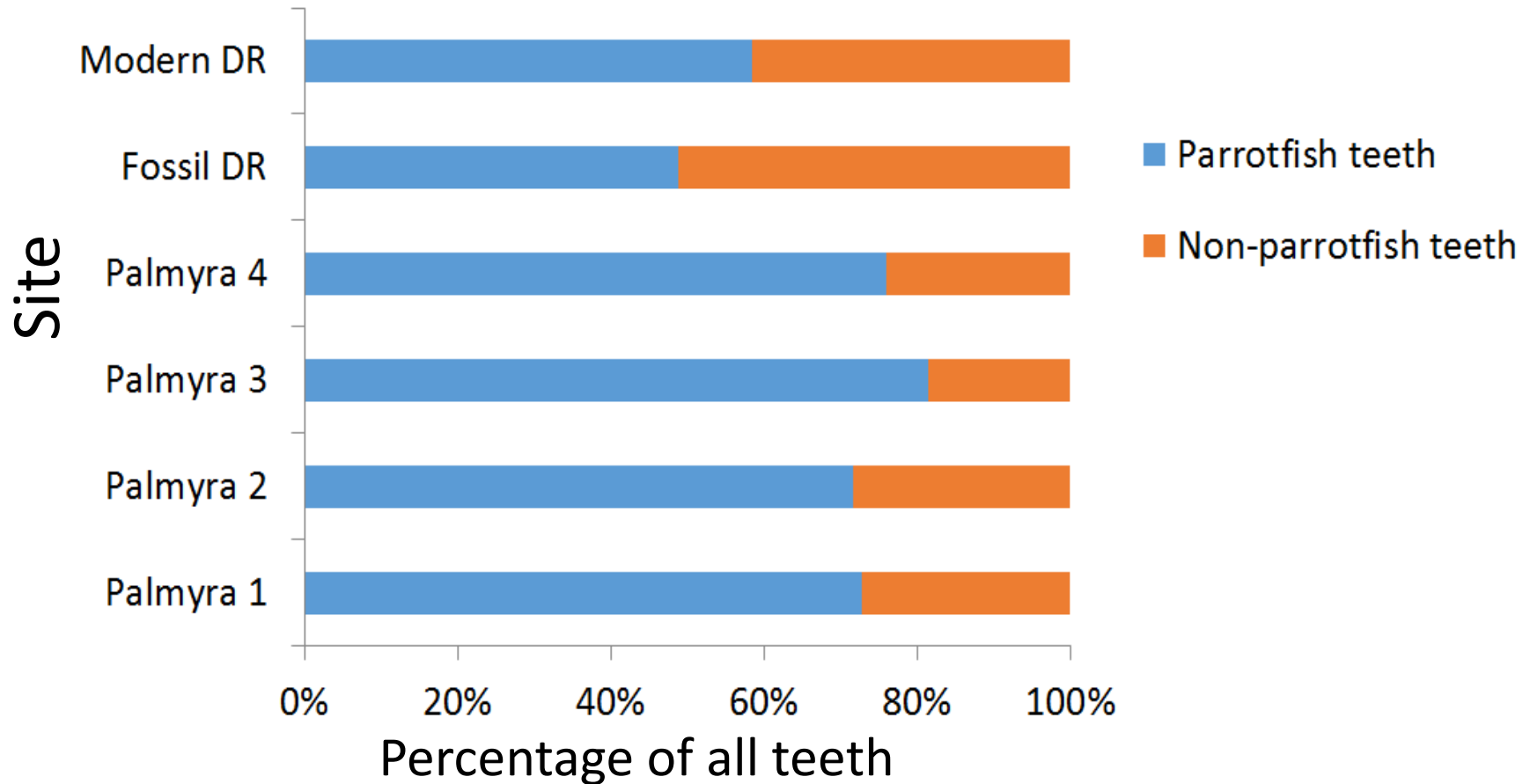
other fish



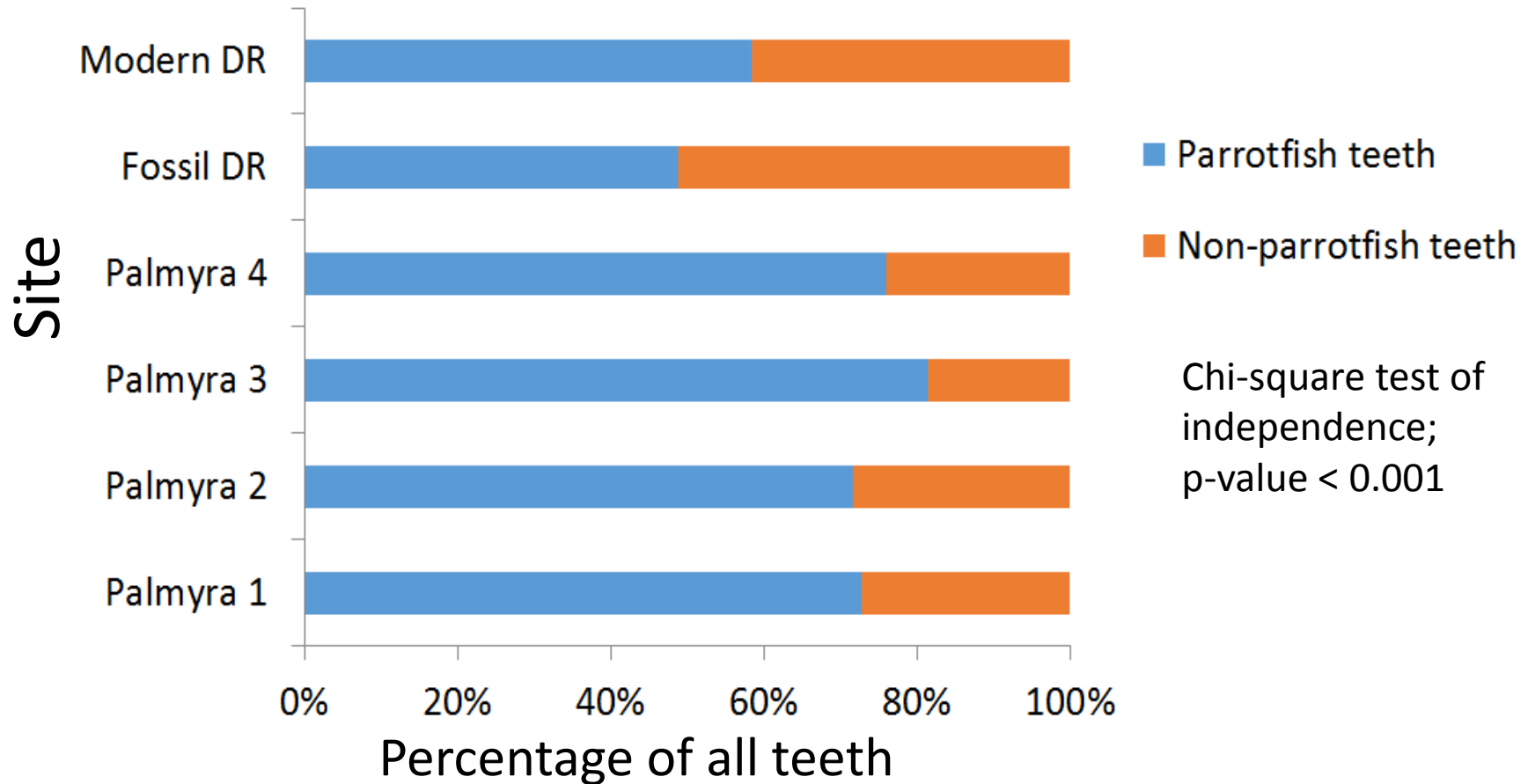
Large yellow teeth found in modern DR



Palmyra has higher relative abundance of parrotfish teeth than both DR sites

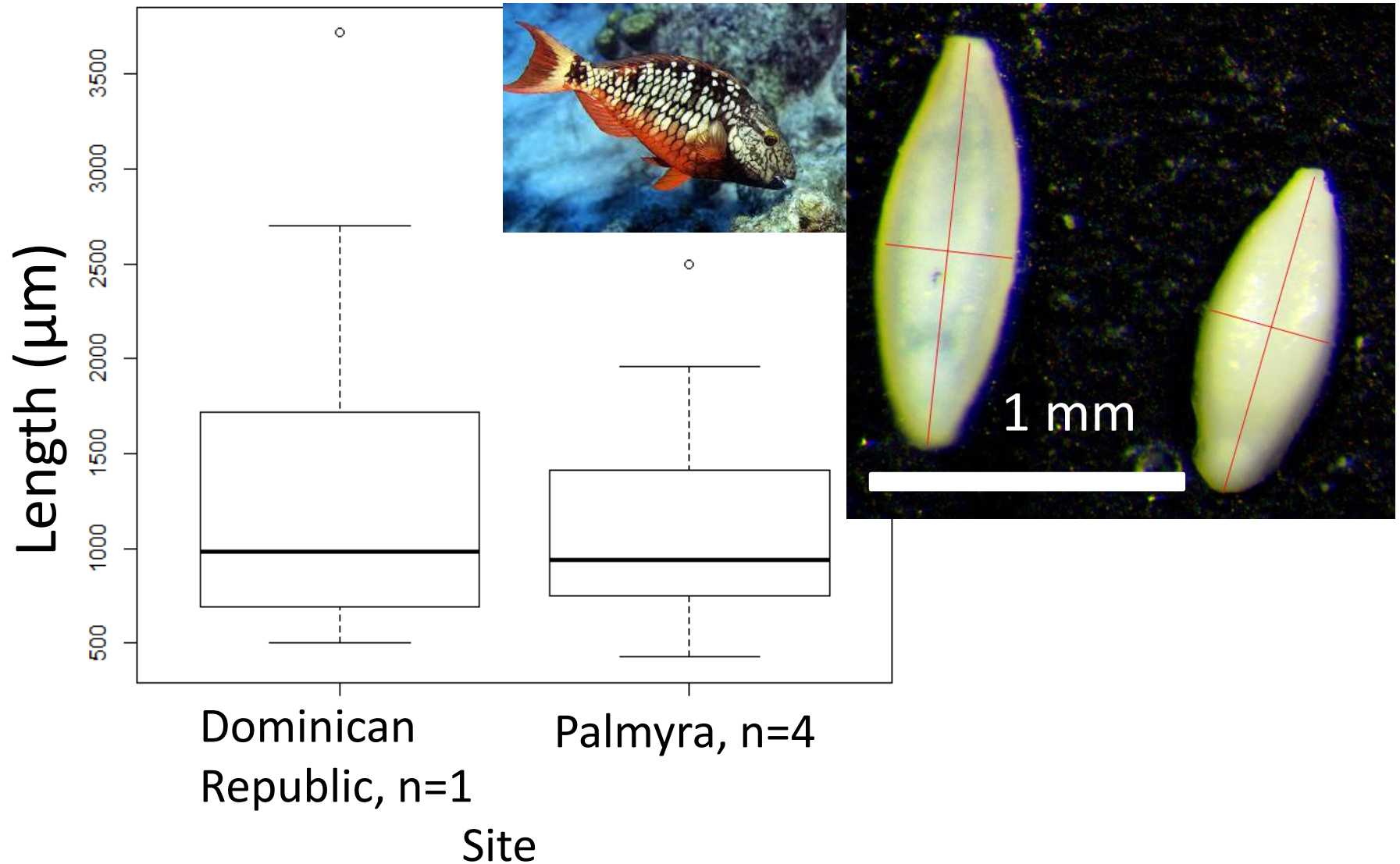


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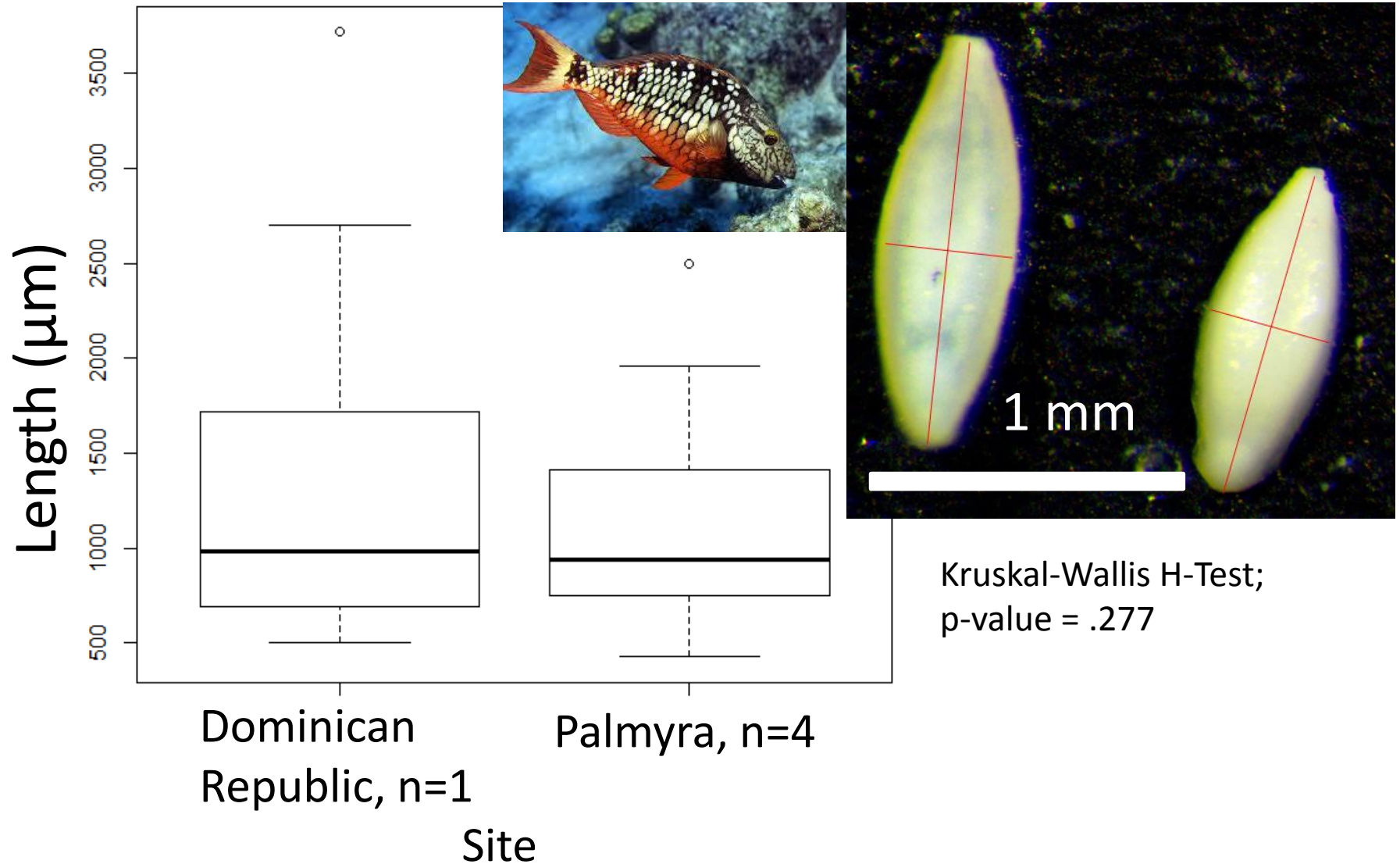


Palmyra samples represent 2 replicates of 2 sites, but no significant variation among these sites was found

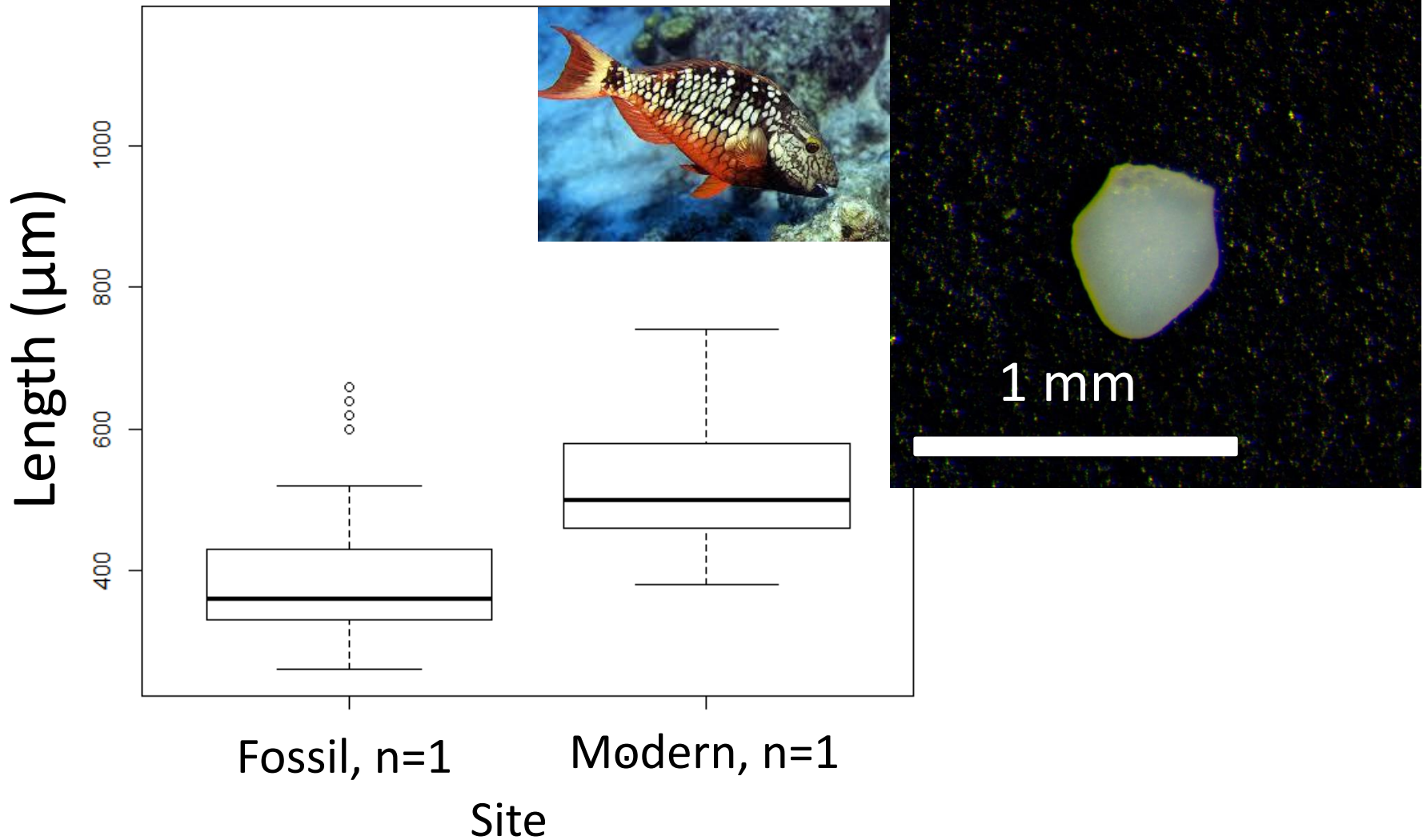
No significant spatial variation in parrotfish tooth length



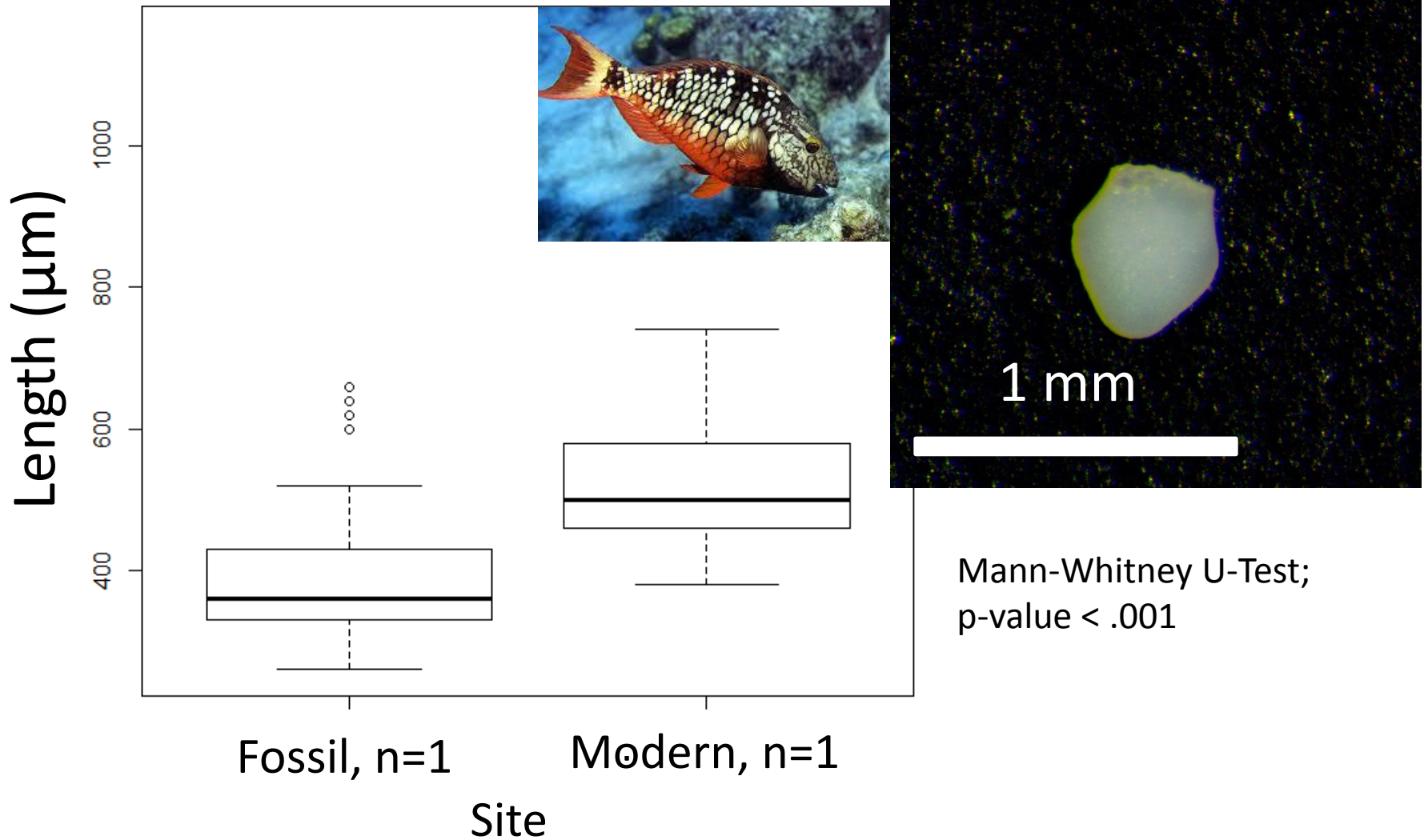
No significant spatial variation in parrotfish tooth length



Modern Dominican Republic reef teeth are significantly larger than fossil reef teeth



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Conclusions

- Using parrotfish tooth size and abundance as a model, **data suggest possible shift in parrotfish population size and structure in the Dominican Republic since the arrival of humans**

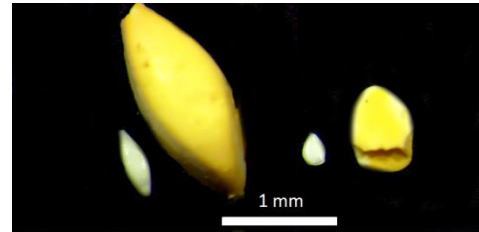
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- Spatial and temporal variation in relative abundance
- Unexpected result: modern DR teeth larger than fossil DR teeth
 - Large yellow teeth



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- Using parrotfish tooth size and abundance as a model, **data suggest possible shift in parrotfish population size and structure in the Dominican Republic since the arrival of humans**
- Spatial and temporal variation in relative abundance
- Unexpected result: modern DR teeth larger than fossil DR teeth
 - Large yellow teeth
- **Fossils can be used to reconstruct baselines, supplement survey data**



Continued Efforts

- Contribute to fish tooth reference collection, build more detailed database
- Further investigate spatial/temporal variation in tooth size-frequency distributions and relative abundance

Acknowledgments

Erin Dillon

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