

What can the Proterozoic fossil record reveal about the evolution of early life?

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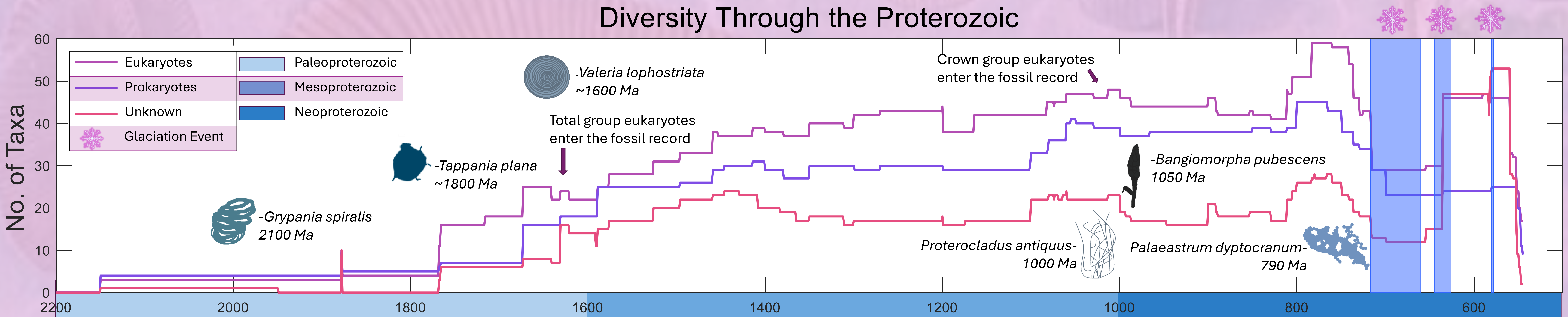


Fig. 1: Shows the relation between prokaryote and eukaryote numbers through time as well as how they relate to glaciation events

Introduction

- Life began very small so finding fossilized evidence of early organisms can be quite difficult
- Their delicate bodies are hard to preserve and classify
- The best specimens come from mudstone or shales with low concentrations of organic carbon and high clay content^[1]
- This information can narrow down possible locations for discovering exceptional microfossils
- New microfossils will enhance the record we currently have and help resolve sampling bias

Methods

If these fossils are so small, how do we even find them?

1. Rocks that have microfossils in them are digested in an acid solution
2. The remaining solution is neutralized and poured through a sieve^[2] (hopefully) leaving only microfossils behind
3. Microfossils are pipetted onto slides for observation and further study (Fig. 3)

Using a database of 300+ genera collected using the acid extraction method above, data was plotted in MATLAB to show trends in the diversity between both prokaryotes and eukaryotes throughout the Proterozoic eon, as well as origination and extinction of early genera.

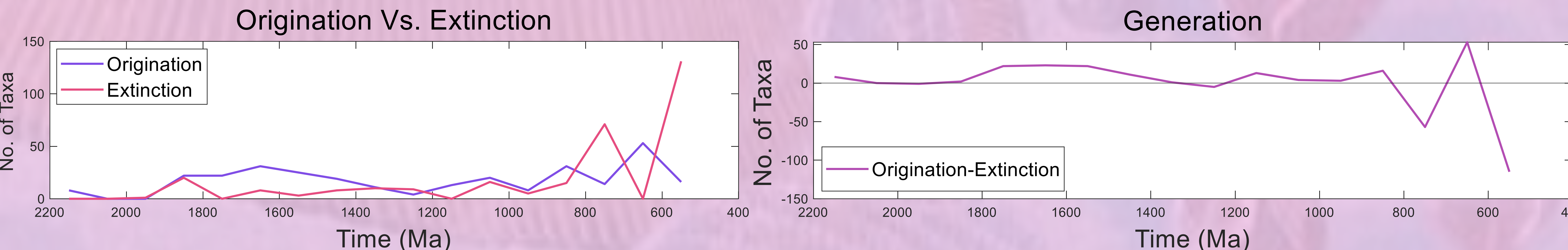


Fig. 2: (A) Graph of origination and extinction, (B) Generation of new taxa over time



Fig. 3: Izzy picking fossils (Photo taken by Clara Vicera) and example of a microfossil (*Bangiomorpha pubescens*).

Results

These graphs show that diversity gradually increases through time. However, we can see that it drops significantly during glaciation events in the Cryogenian. Unfortunately, these trends could be the result of sampling bias and discovering better fossils will help to improve the reliability of this dataset.

Conclusion

For us to be able continue to refine and improve the Proterozoic fossil record we must work on narrowing down the search field to look for fossils we know have the best chance of preservation. Studying how microfossils decay and preserve will give us the information we need to discover potentially groundbreaking samples that will help eliminate sampling bias and give us better insight into the evolution rate of eukaryotes, environmental factors that could have affected organism development, extinction events and more.

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References

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- (2) Armstrong, H. A., & Brasier, M. D. (2004). Microfossils. <https://doi.org/10.1002/9781118685440>
- (3) *Bangiomorpha pubescens* picture- <https://www.cbc.ca/news/science/bangiomorpha-fossil-sex-1.4314204>

