

Characterization of *Pleurobema Rubrum* Shells

Angela Wang¹, Michael J. Detisch¹, Jillian J. Cramer¹, W. Brent Seales¹, T. John Balk¹, Katharine G. Napora²

¹University of Kentucky College of Engineering

²Florida Atlantic University Department of Anthropology



SHELL BACKGROUND

- Freshwater bivalves have shown promise as biological indicators for studying climate and water conditions through study of the annual growth bands of their shell growth.
- Variations in growth band width inform climatic considerations such as growth season length and temperature changes.
- Trace levels of other compounds may be incorporated into calcium carbonate matrix of shell during growth, which may be useful in monitoring pollution levels in lakes or rivers.

LOCATION/TIME PERIODS

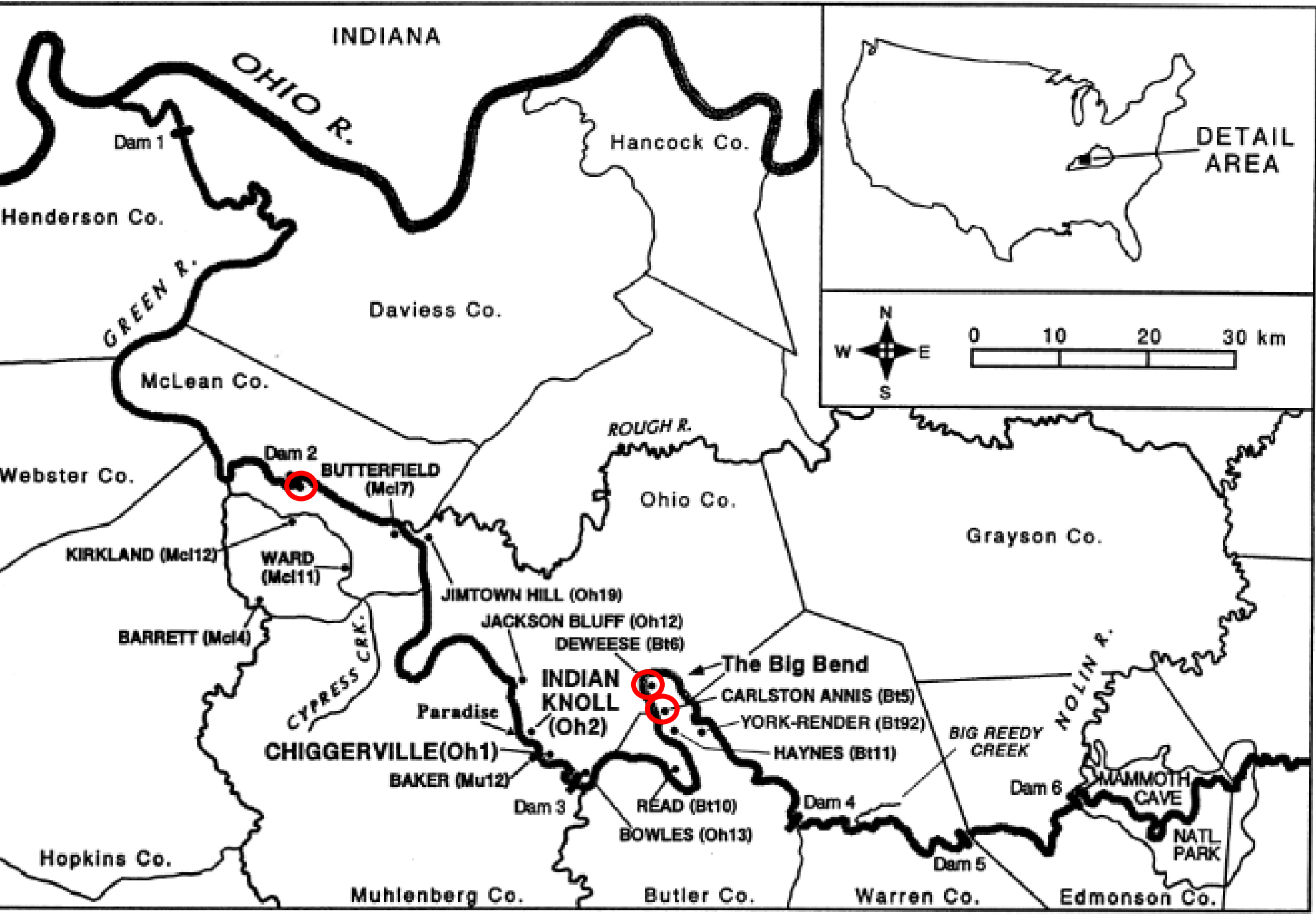
Four *Pleurobema rubrum* shells, a species of freshwater mussel found near the Green River in Kentucky, were selected from archaeological and historic sites for study.

Sites of shells

- DeWeese shell mound
- Annis mound
- Baber Hotel

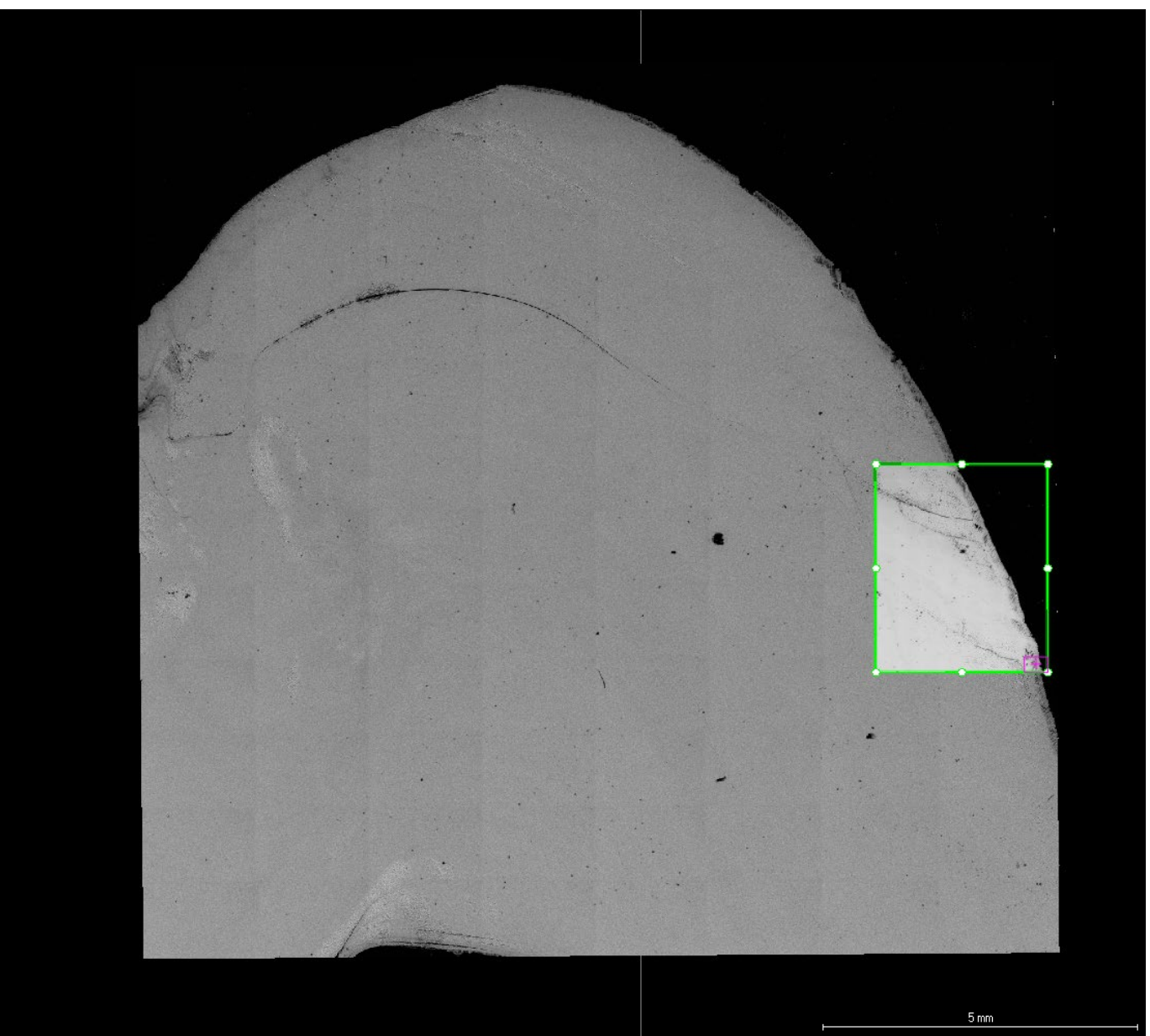
Time periods of focus

- Late Archaic (~3000-1000 BC)
- Mississippian (~1100-1450 AD)
- Early 19th century (1830-1840)



Map of Green River with major archaeological sites, locations of shells circled in red. Retrieved from Morey, Crothers, et al. (Geoarchaeology, 2002).

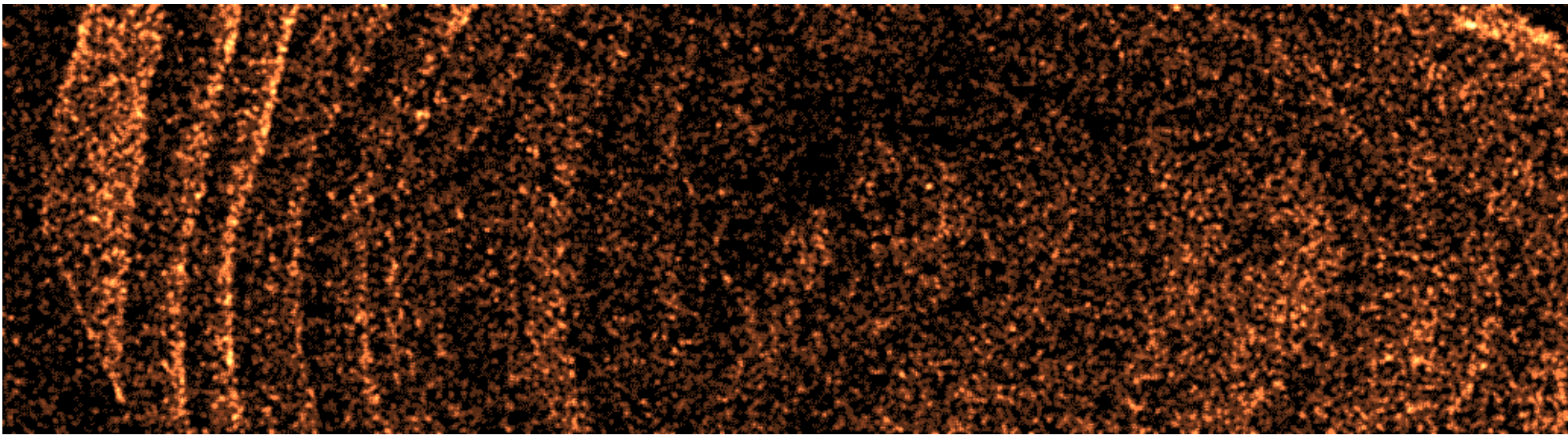
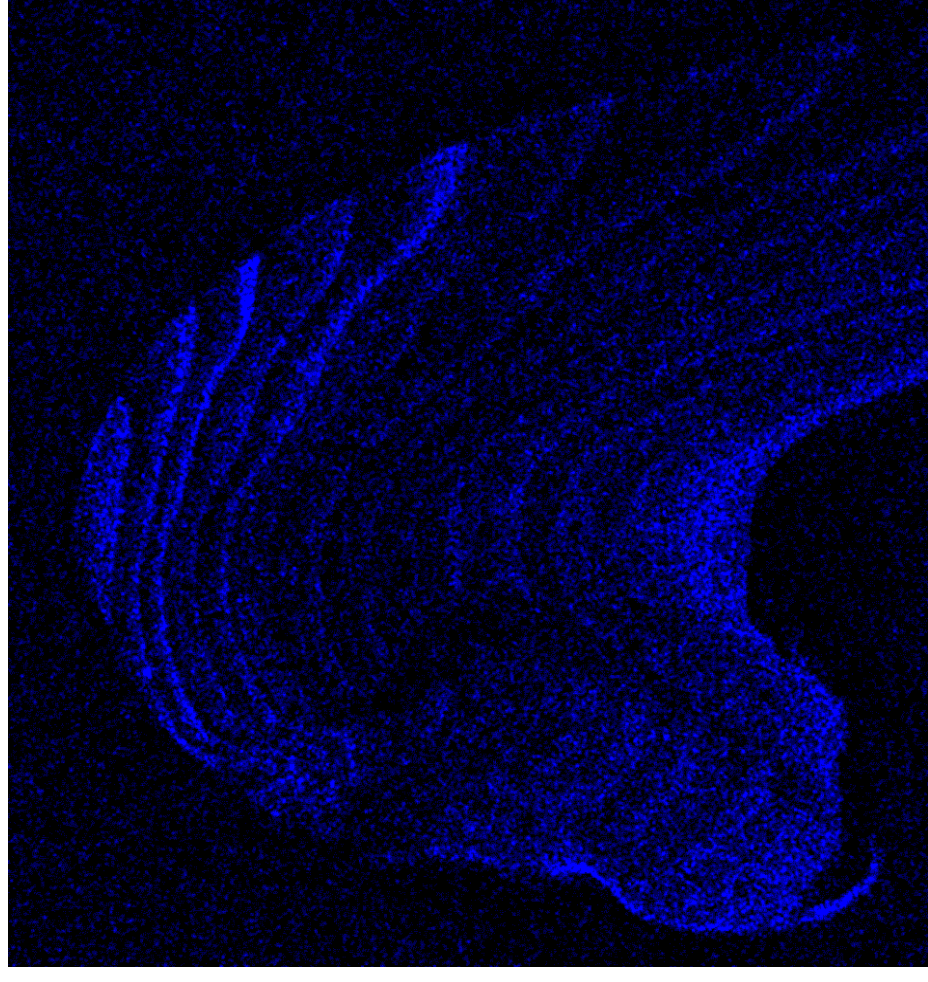
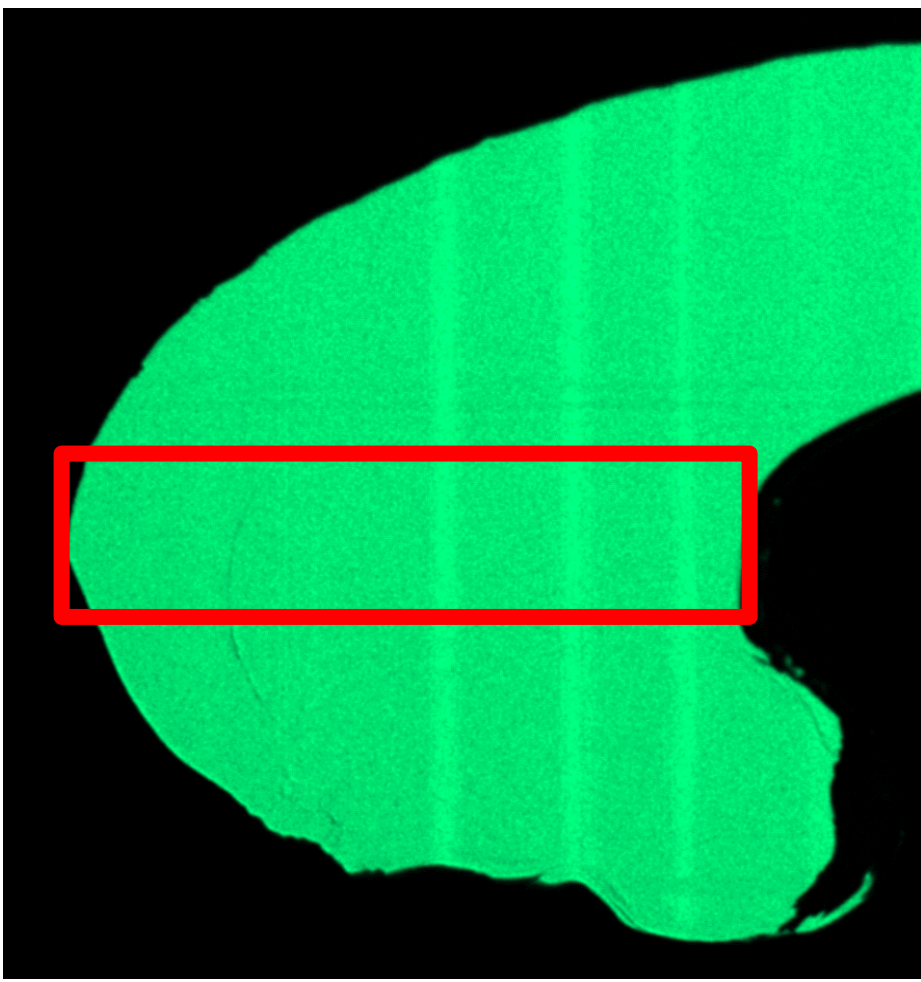
RESULTS



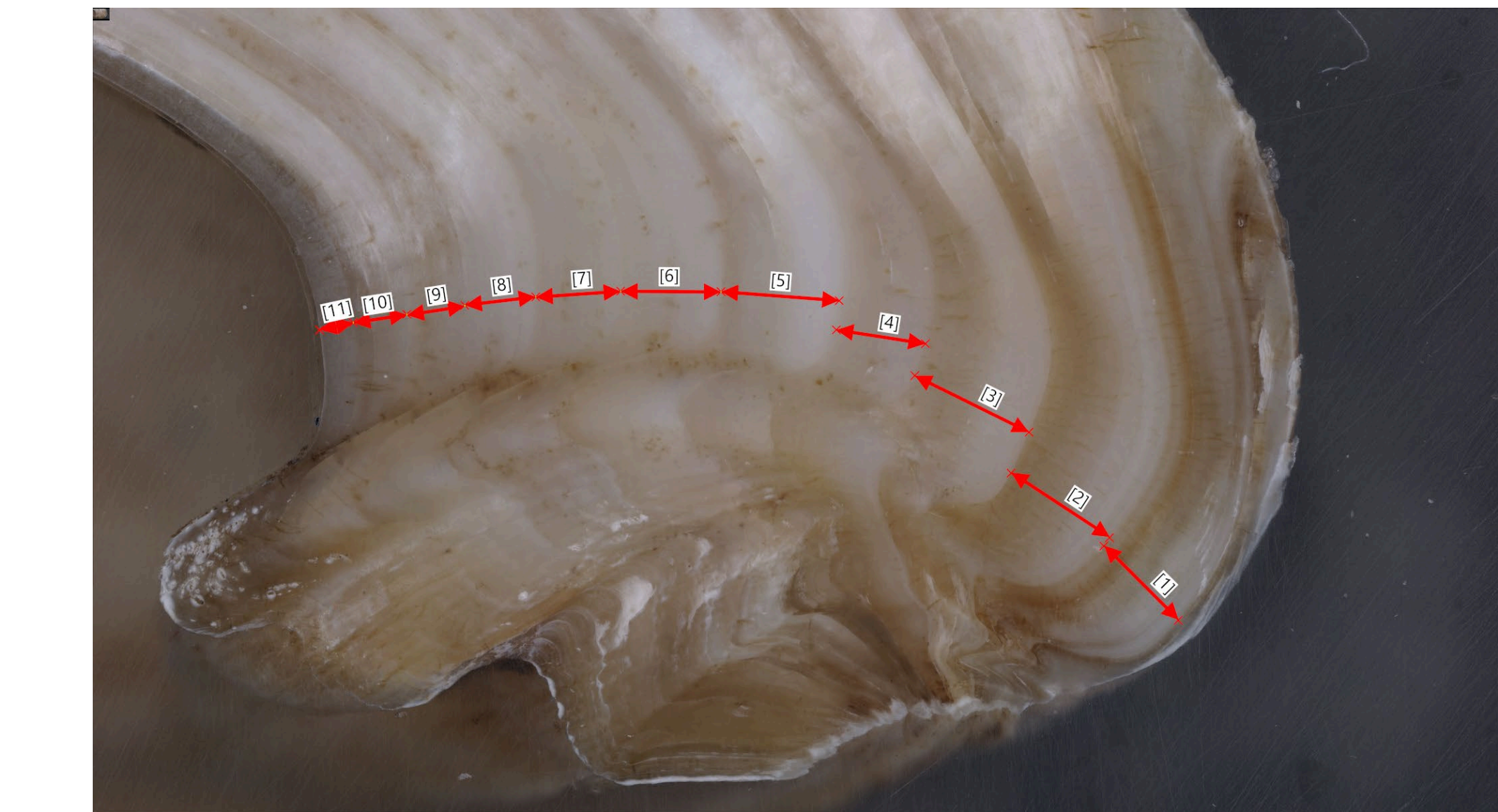
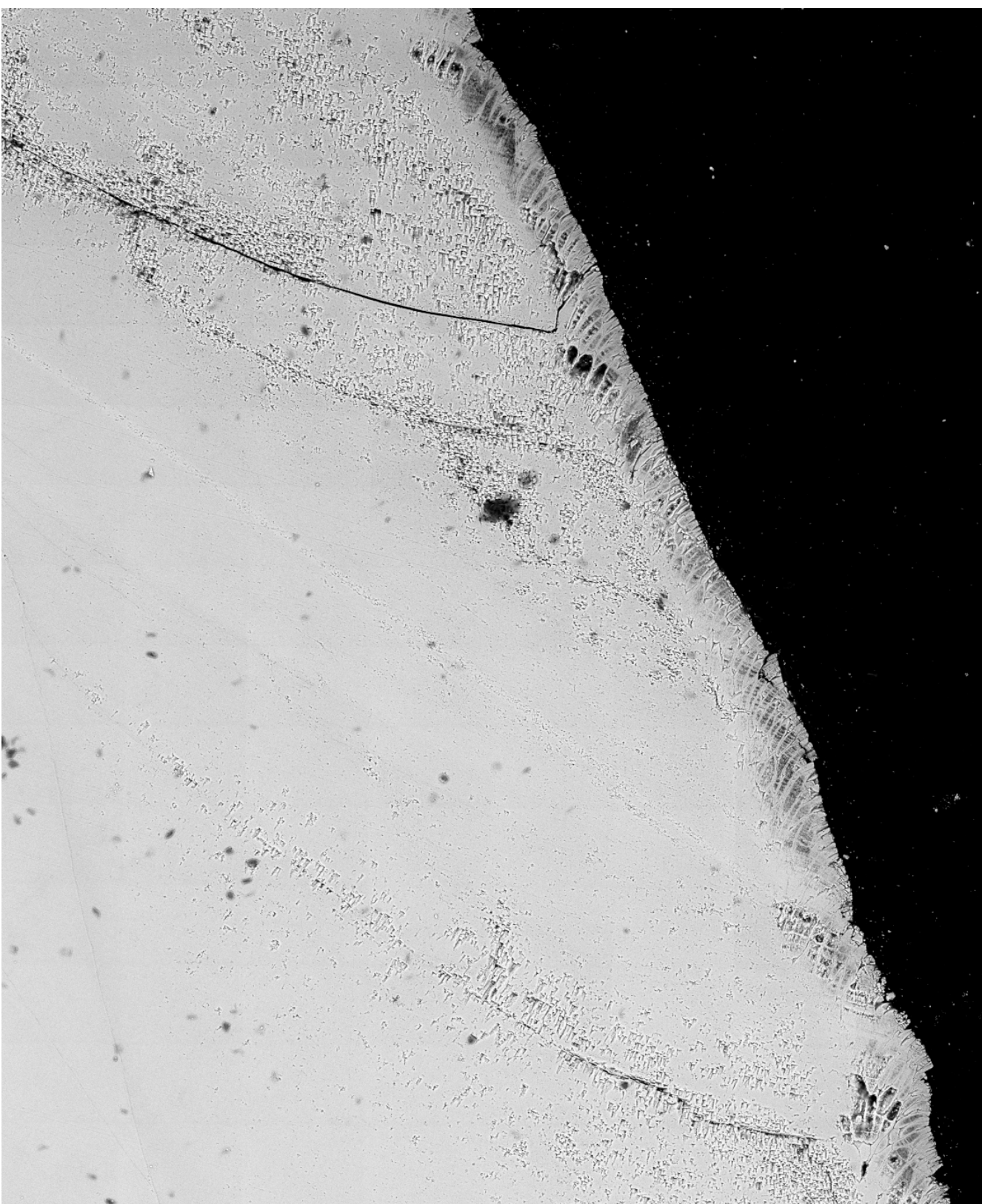
Stitched SEM backscatter electron image of Annis shell



Microscope image of DeWeese shell 2



Top: Optical image of Annis shell **Middle left:** XRF image of Annis beak (Ca) **Middle right:** XRF image of Annis beak (Mn) **Bottom:** XRF image of Annis beak section boxed in red (Mn)



DeWeese shell 2 umbo with measurements

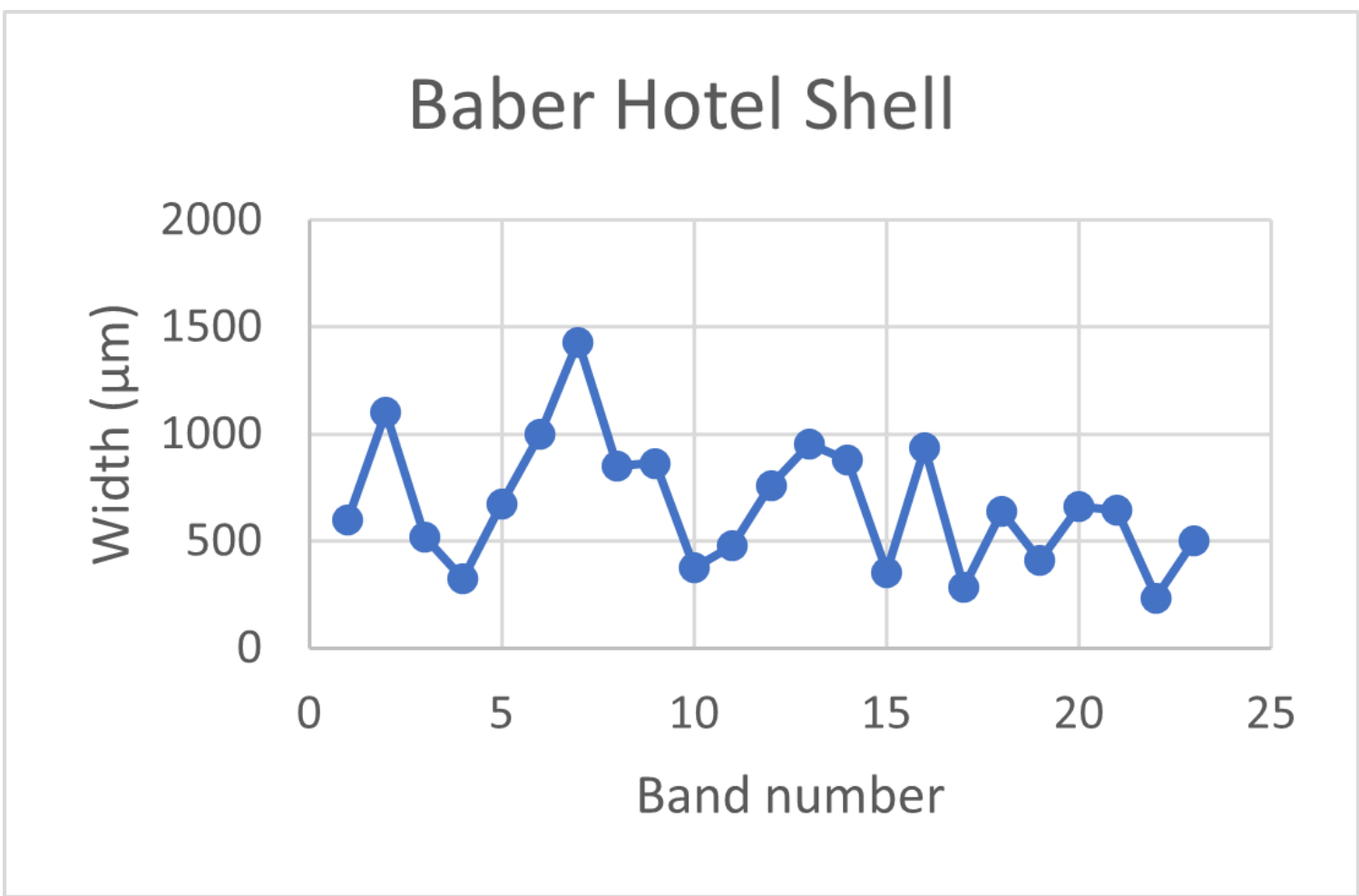
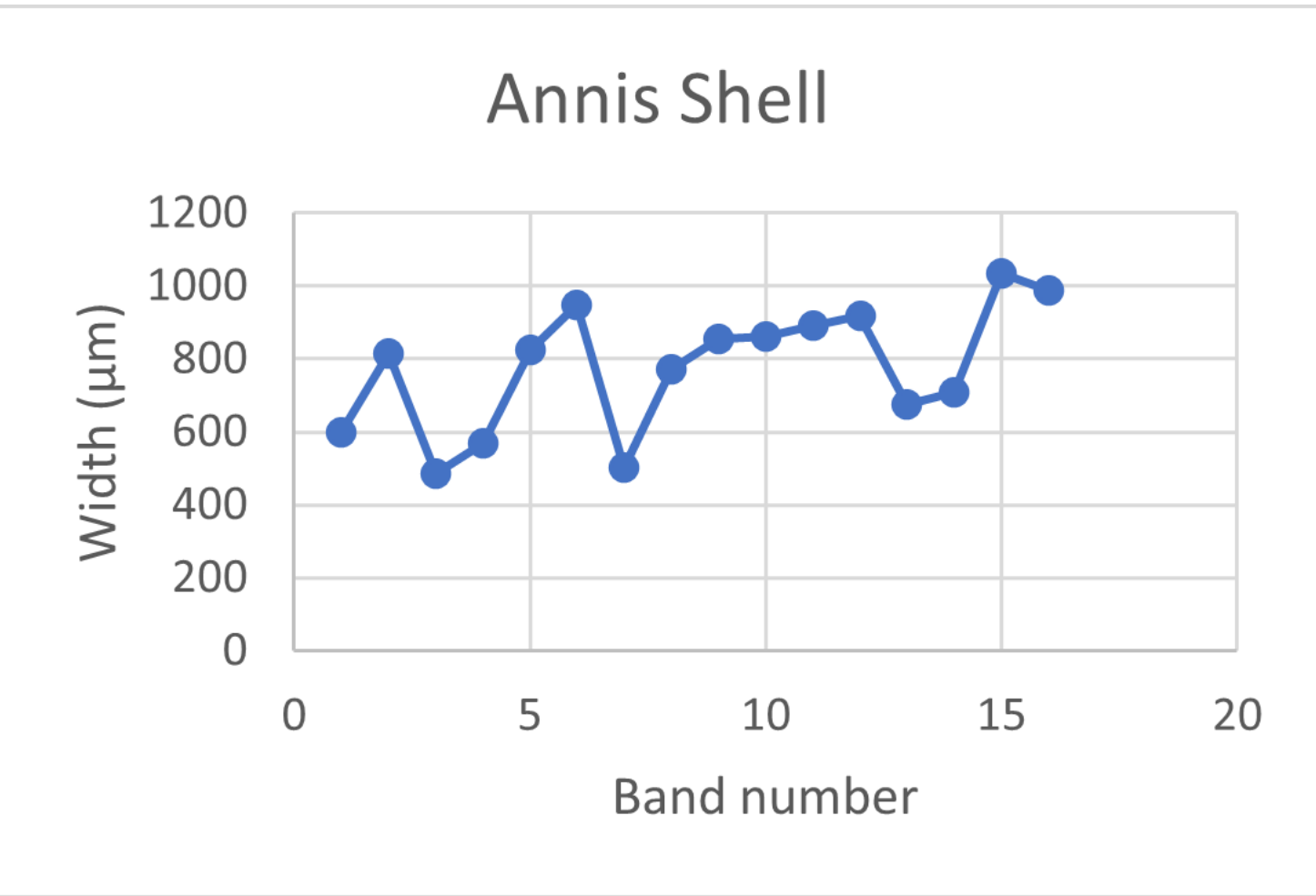
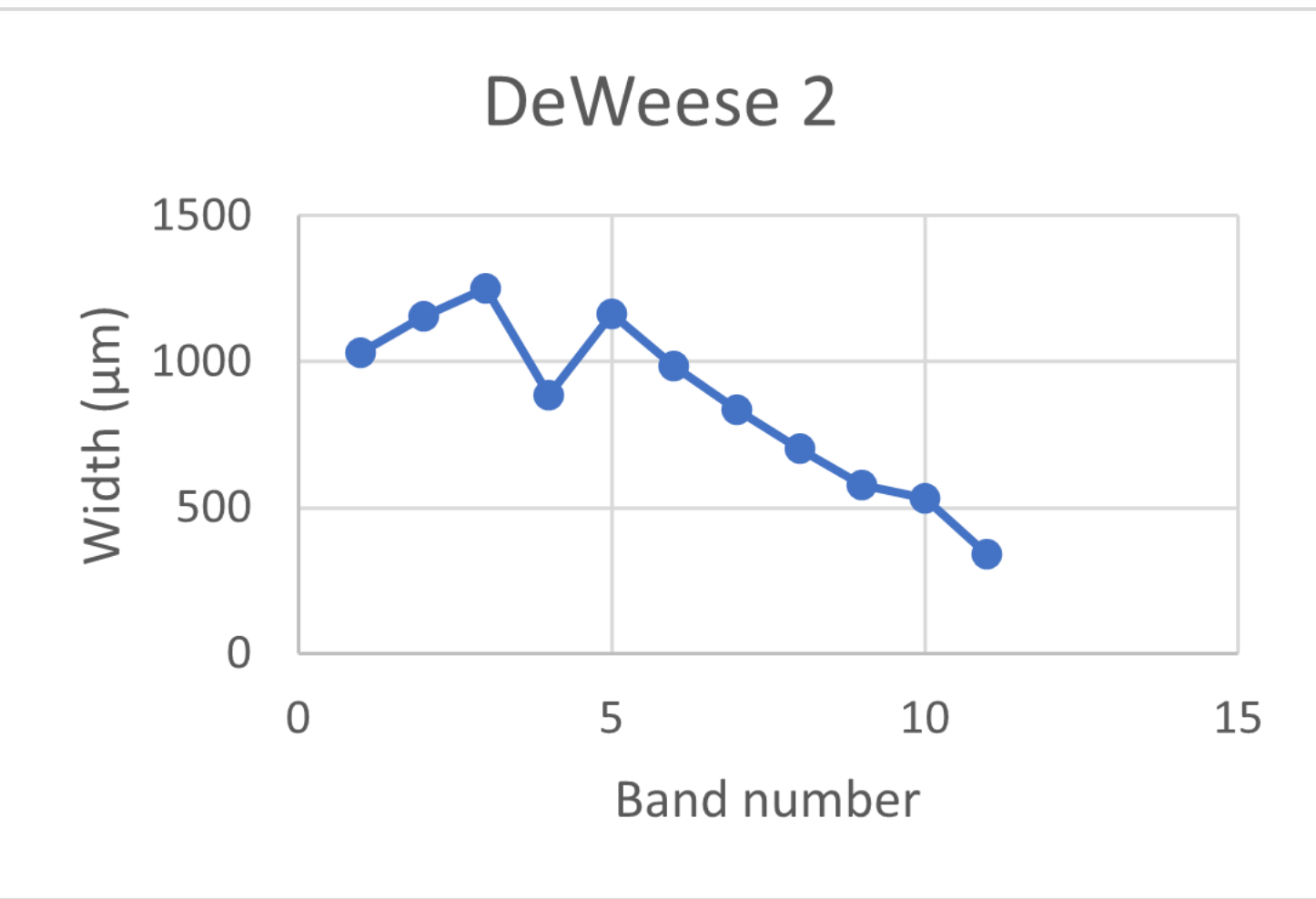
SEM backscatter electron image of Annis shell section

CONCLUSION

- Identified and prepared historic/prehistoric shells for cross-sectional analysis using optical/electron microscopy for annual growth band width measurements.
- Expected downward trend in band width overshadowed by yearly growth variations, likely due to shorter life-spans
- Elemental analysis was performed via EDS and scanning micro-XRF with most of the shell being CaCO_3 .
- Trace levels of Mn were also found which varied between growth bands and within a single band.
- Mn concentration in the CaCO_3 structure has been shown to correlate with an increase in biological or organic material in the water habitat as well as decreased shell growth rates in winter.

ACKNOWLEDGEMENTS/REFERENCES

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Claasen, C. P. (2005)., Dunca, E., et al. (2005)., Marin, F., et al. (2012)., Morey, D. F., et al. (2002)., Sandefur, T. A., et al. (2008), Siegele, R., et al. (2001).



Graph of annual growth band width trends. The growth trend of shells should be decreasing however, DeWeese shell 2 is the only one that seems to fit the trend.