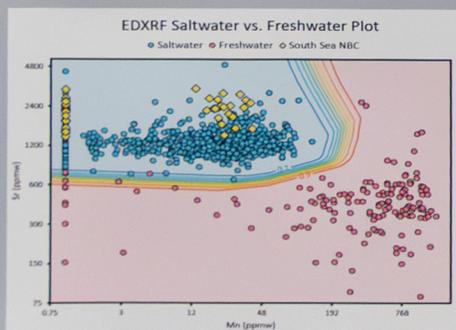


INTRODUCTION



- "South Sea keshi" pearls are non-bead cultured (NBC) pearls from *Pinctada maxima* mollusks.
- For this study, 43 NBC pearls were selected for their organic-rich concentric cores, with weights ranging from 0.18–1.96 ct, sourced from a pearl farm in Australia.
- The internal structures of these cores and nuclei were studied using Real time X-radiography (RTX) and computed microtomography (μ -CT) and visualized by grinding down some of the pearls to reveal their cross sections.
- Organic-rich cores refer to the dark and light gray concentric structures seen in the X-ray images of these pearls while nucleus refers to their light gray centers.
- Raman analysis was also performed on the cross sections to identify the composition.

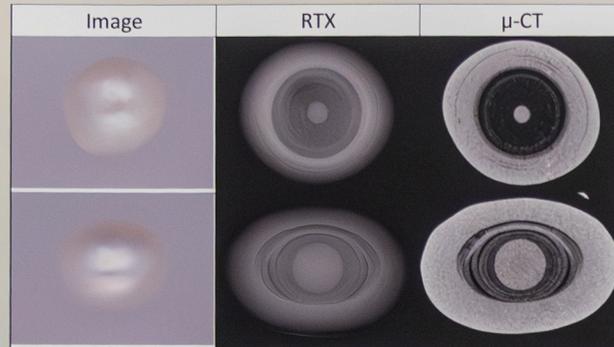
ENVIRONMENT



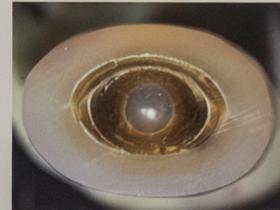
A plot distinguishing saltwater from freshwater pearls using concentrations of Sr and Mn generated from energy-dispersive X-ray fluorescence (EDXRF) analysis. The results indicate the pearls grew in a saltwater environment.

INTERNAL STRUCTURES

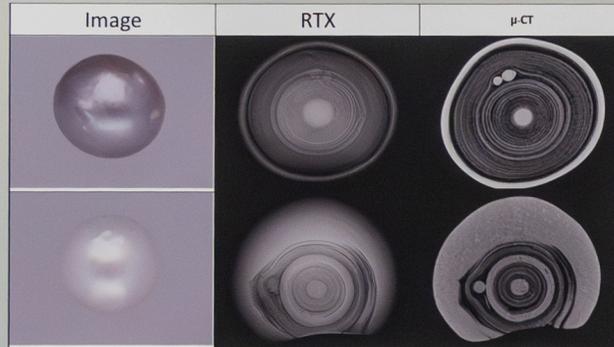
• Cores with a light gray nucleus



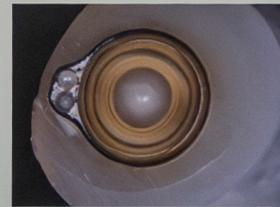
These pearls have an organic-rich concentric core with a large light gray nucleus in the center. Raman analysis indicates the cores are aragonitic.



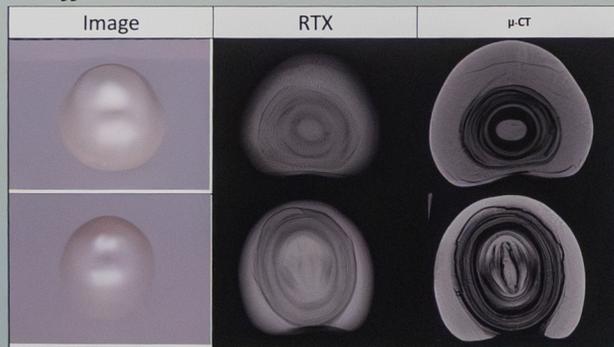
• Seed-like features



Seeds or “globuli” are small round aragonitic features found within the organic-rich layers of the pearls. They appear light gray in X-ray imagery.



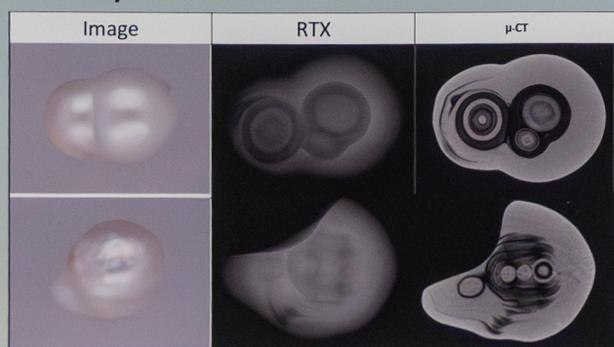
• Off-round nuclei



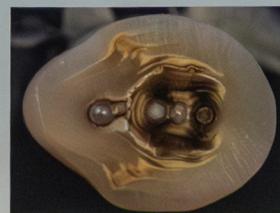
These pearls have off-round aragonitic nuclei at the center of their organic-rich cores.



• Multiple cores and nuclei

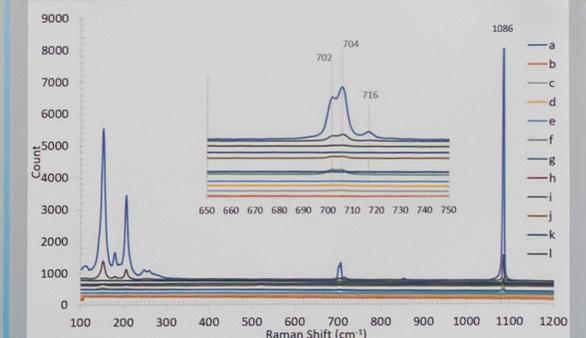
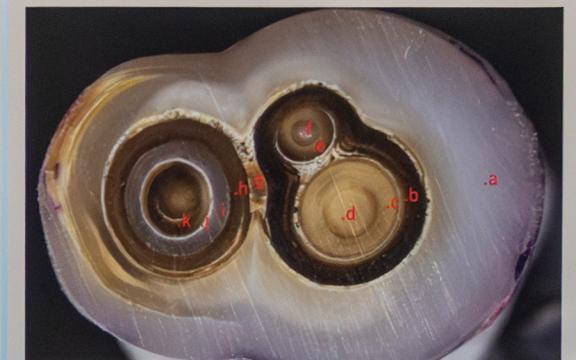


Multiple cores or nuclei aggregates surrounded by organic-rich structure.



CROSS SECTION ANALYSIS

Raman spectroscopy showed aragonite from a series of peaks between 100–280 cm^{-1} , a 701/704 cm^{-1} doublet and a peak at 1086 cm^{-1} . Raman peaks show stronger intensity in the nacre and nucleus and weaker intensity in light gray bands in the core. The nacre (spots a and i) also show a weak calcite peak at 716 cm^{-1} . No peaks were seen in the organic rich bands in the core due to high fluorescence.



CONCLUSION

The texture and structural features of organic-rich concentric cores such as aragonitic nuclei, globuli, multi-core formations, and off-round shapes are key indicators of NBC pearls from *Pinctada maxima* mollusks. Cross-sectional and X-ray analyses reveal consistent core compositions across samples, typically combining conchiolin and aragonitic nacre, with occasional weak calcite signals.

ACKNOWLEDGEMENTS

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