

SCRIMSHAW:



UNLOCKING THE CULTURAL AND BIOLOGICAL ARCHIVE OF SEA MAMMAL ART

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OBJECTIVES

This study examines the Scott Polar Research Institute (SPRI) sperm whale scrimshaw collection utilising micro-computed tomography (micro-CT), and biomolecular analysis (aDNA), to investigate the cultural, biological, and ecological history of whaling-era sperm whale populations. The primary objective of this research is to provide a case study demonstrating the interdisciplinary analysis of cultural/historical material through creating an artefact-based environmental and biological history of the London whaling industry. The key research objectives are to:

- Analyse scrimshaw iconography and identify/assess its importance in understanding Britain's Maritime History
- Estimate the age of the sperm whales represented within the SPRI scrimshaw collection using micro-CT to visualise internal growth-layer-groups (GLGs)
- Molecularly sex specimens through genetic analysis
- Examine potential scrimshaw provenance through analysis of iconography, and mitochondrial DNA (mtDNA) haplotype diversity

METHODS



ICONOGRAPHY

Scrimshaw iconography and motifs will be examined in an attempt to relate pieces to Britain's sperm whaling industry.

MAPPING

The geographic distribution of Britain's Southern Whale Fishery can be mapped using historical documents/data.



MICRO-COMPUTED TOMOGRAPHY

The examination of internal tooth morphology and age-estimation studies will be conducted using Micro-CT.

aDNA

Samples taken from the concave tooth root will facilitate molecular sexing and mitochondrial DNA analysis.



MICRO-CT RESULTS

- 22 of the 26 scrimshaw specimens scanned had observable cracking throughout the dentine. For 20/26 teeth, cracking extended from the apex of the pulp cavity.
- Pulp stones/dentine pearls were observed in 15/26 scrimshaw specimens. These were externally visible in 12 teeth.
- 2 modern sperm whale teeth from the Natural History Museum in London were also scanned; specimens displaying high GLG visibility and the presence of pulp stones.
- 10/26 specimens displayed relatively good visibility of growth layer groups (GLGs).
- For artefacts with relatively good GLG visibility age-estimation was qualitatively attempted, specimens being attributed a 'minimum age estimate'.
- Quantitative analysis of GLGs will also be undertaken through the examination of grayscale intensity mapping, undertaken across a transect of dentine.



Micro-CT images of SPRI scrimshaw specimen 62-15-7

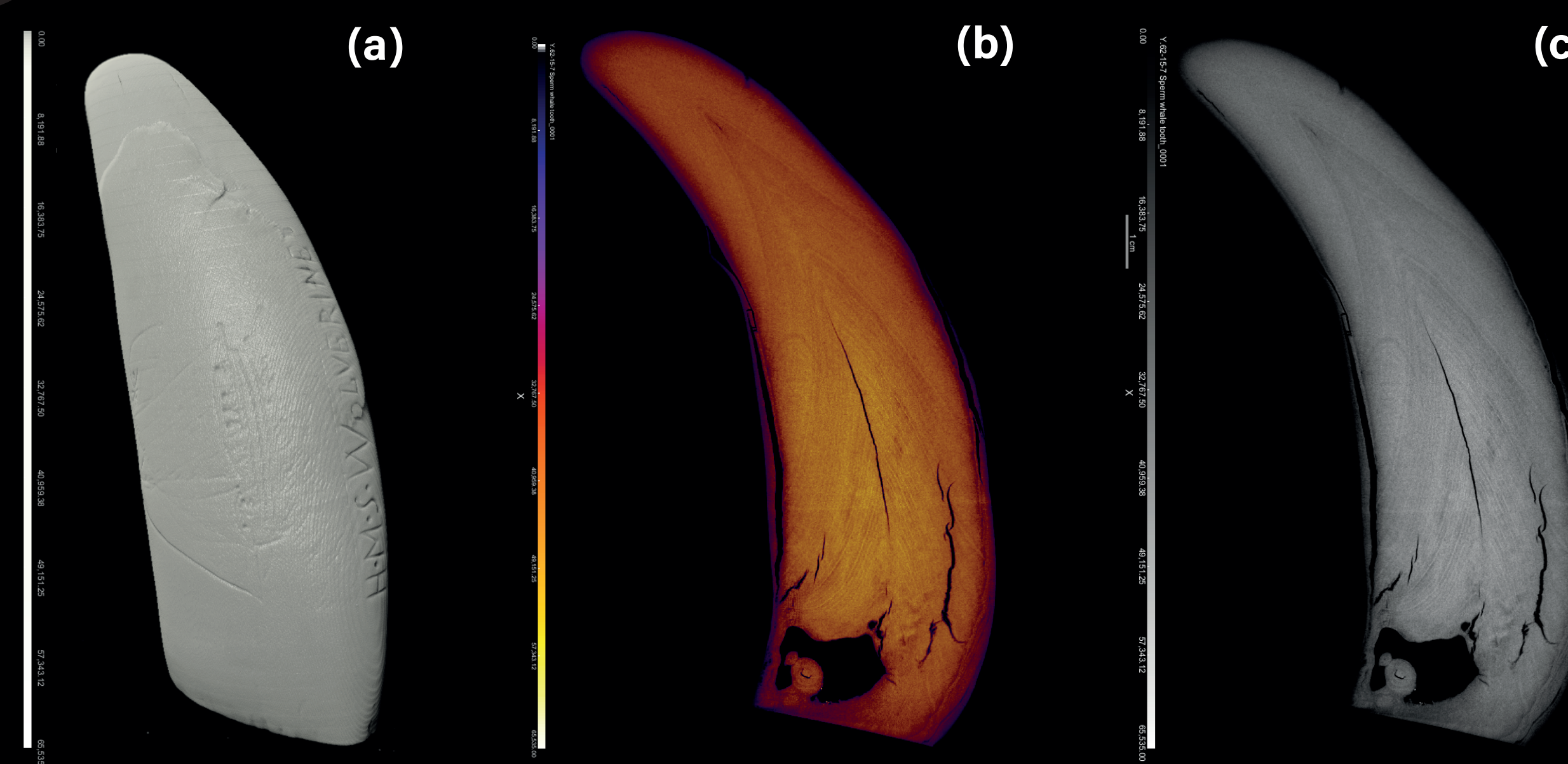
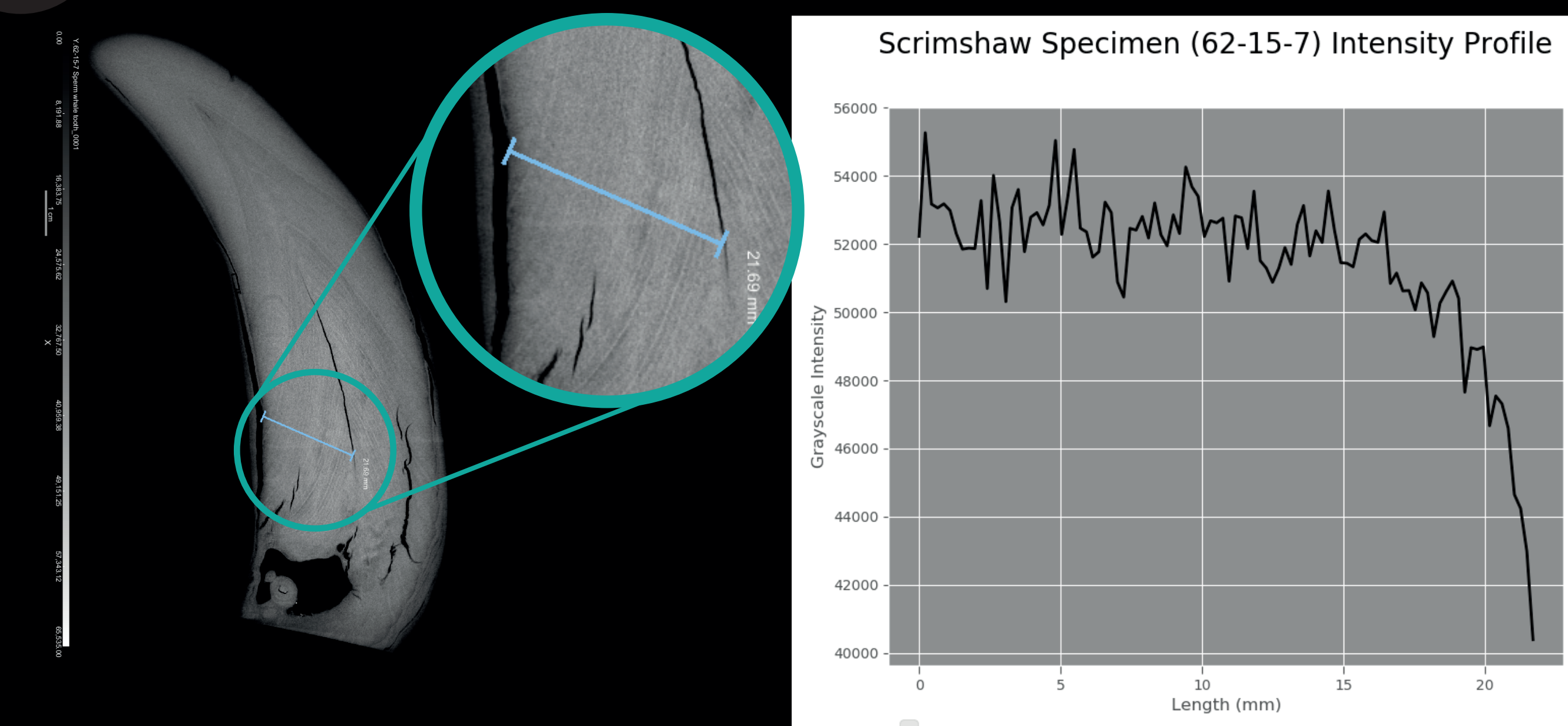


Image (a): 3D reconstruction of specimen 62-15-7 showing impression of external carving/etching. Image (b) and (c) depict the internal morphology of tooth 62-15-7 showing clear cracking and GLGs; (b) with 2D LUT 'warm metal' preset applied and (c) with 2D LUT 'grayscale' preset. Scanned using the Nikon XTH225 ST macro-to micro-scale laboratory scanning system.



Grayscale intensity profile of scrimshaw specimen 62-15-7



Grayscale intensity values profile of orthogonal dentine transect of scrimshaw specimen 62-15-7. Transects are examined across 16-bit grayscale images which consist of 65535 possible gray levels. Analysis is being conducted to assess whether the number of peaks in the profile is consistent with the number of visually observed GLGs.

OUTCOMES

- Iconography suggests that 15 of the 26 scrimshaw specimens studied were created between 1810 and 1850+. The 1830s and 1840s are noted to be particular periods of interest.
- Using archival shipping records collated in the British Southern Whale Fishery (BSWF) database, destinations of Britain's fishery were mapped.
- Results highlight that Britain's sperm whale fishery, during the early-mid 19th century, was geographically diverse, spanning all major ocean basins.
- Micro-CT had some success in elucidating GLGs within the dentine layer of scrimshaw specimens. 7/10 teeth with 'good' GLG visibility were qualitatively attributed minimum ages of 25+. None were assessed to have a minimum age of less than 16 years. This suggests that the whales represented in the SPRI collection were older, sexually mature individuals.

SAMPLING

The next stage of this research is to sample the scrimshaw artefacts for genetic analysis. Experimentation is currently being undertaken to determine the optimal sampling methodology.

DRILLING

VS.

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DRILLING:

Drilling is a commonly applied sampling technique, however, there are several associated risks/limitations.

- Drilling creates friction/heat which negatively impact DNA preservation
- Vibrations and pressure from drilling can lead to cracking or fracturing
- Small burr sizes are generally favoured to reduce visual impacts of sampling. Small burr sizes = less material collected = fewer types of analysis can be conducted.
- Collection of dentine 'dust' is difficult and can lead to contamination or loss of material

IS THERE A BETTER OPTION?

- Currently experimenting with methods that do not produce the same heat or vibrations as drilling
- Ideally looking to identify a sampling method that will not degrade DNA during sampling, and will more easily facilitate the collection of dentine powder
- Also considering the methods for (and merits of) removing externally visible pulp stones from the cavity of applicable samples as an alternative to drilling a small hole