

Cleaning archaeological fish scales

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Summary

A method is described for the cleaning of fish scales from archaeological deposits prior to identification and estimation of age at death.

Introduction

On the surface of cycloid and ctenoid fish scales, the types most commonly found in archaeological deposits, are a series of striations, the circuli. The circuli in many cases form diagnostic patterns which may be used, to a lesser or greater extent, to derive data about the age, growth rate, and size of the fish (Casteel 1976; Bagenal 1974; 1978). It is the interpretation of the circuli which is described as 'reading' the scales, but most fish scales recovered from archaeological sites are difficult to read.

The scales often have a lot of particulate material, both organic and mineral, adhering to their surfaces. Typically archaeological scales are stained with organic substances, and iron salts. The combination of the various contaminants encountered in fish scales of archaeological origin, make it difficult to use transmitted or incident light microscopy to observe and measure their surface features. It is, therefore, necessary to clean archaeological scales before any work may be undertaken with them. Low-power microscopy has proved to be the most reliable method of initially assessing the potential of various scales for analysis. To use the microscope well, the scales in question should ideally be mounted between two glass slides. Mounting archaeological scales is not a completely trouble-free operation. The scales are often dry and brittle, and rarely flat. It is very easy to shatter and destroy archaeological material if it is not first softened (see below) before attempting to mount it.

Techniques investigated

Several techniques for cleaning scales were tried, the emphasis being on simplicity, speed, and the ability to clean a lot of material at once. Mechanical shakers are available in many laboratories, so cleaning was first attempted using one of these machines. Various test cleaning solutions were devised: 5% caustic soda (NaOH), dilute household bleach ('Domestos'), water, household soap, tetra-sodium pyrophosphate

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($\text{Na}_4\text{P}_2\text{O}_7 \cdot 10\text{H}_2\text{O}$) and diaminoethanetetra-acetic acid ($[\text{CH}_2\text{N}(\text{CH}_2\text{COOH})\text{CH}_2\text{CO}_2\text{Na}]_2 \cdot 2\text{H}_2\text{O}$ - EDTA). About 9 ml of each of these solutions was placed in 10 ml vials which contained a few archaeological scales. The jars were attached to a Stuart flask shaker and the machine run for ten minutes, at the slow speed setting. On completion of this trial period, the scales were removed from their vials and washed thoroughly in water. The scales were then observed under a microscope and the success of the cleaning assessed by eye. Photographs were taken at each stage of the operation, so that independent evaluations could be made.

Most successful were the treatments which used tetra-sodium pyrophosphate and EDTA. Pyrophosphate was very good at removing particulate materials from the surface of the scales. EDTA very successfully removed organic stains from the scales. Subsequently, it was decided to combine the two most successful treatments to produce the best overall result, by removing the coarse particulates from the scales first with sodium pyrophosphate, then using EDTA to remove the stains.

The overall cleaning process that has been most successful is an operation which uses an Ultrasonic cleaning tank (the one used was manufactured by Kerry Ultrasonics Ltd). First the scales were separated and placed into a vial containing sodium pyrophosphate. The mixture was put onto an ultrasonic shaker and agitated for ten minutes. The scales were then removed from the vial and thoroughly washed in water, after which the scales were placed in another vial which contained EDTA and ultrasound-treated for a further five minutes. The scales were then thoroughly washed in water and placed between sheets of blotting paper to dry them. The scales were ready to mount between slides immediately, as they were both clean and softened.

Though the mechanically shaken system was fairly good, its results - when compared with those using the same cleansing agents, but in an ultrasonic tank - were distinctly inferior. A further advantage to the ultrasonic system is that it is often only necessary to clean the scales once in pyrophosphate in order for them to be usable for interpretative purposes.

References

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Manuscript received: 15th March 1989