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“What do I do with all these shells?” Basic guidance for the recovery, processing and retention of archaeological marine shells

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ABSTRACT

Marine shells can be common on archaeological sites (even forming sites), and provide large amounts of information about the human past if recovered appropriately. However, guidance for appropriate recovery remains unformulated or not explicitly formulated, leading to too many, too few, and too biased assemblages being excavated, extracted, processed and archived. Guidance is derived for minimum and maximum sample sizes, field sampling methods and deposit priorities, extracting shells from the matrix, and accepting and retaining shells in archive.

1. First principles

It may surprise field archaeologists and curators to find a work aimed at them in a volume aimed mainly at shell specialists, but excavator, specialist and curator are working in partnership: the excavator extracts and the curator guards what the specialist investigates. Misunderstandings between these three can lead to the irrevocable loss of the information about the human past which all three seek and employ. This work seeks to foster mutual understanding amongst field, specialist and curatorial archaeologists regarding shell remains, by deriving basic guidance for their treatment. The author's experience is primarily British: some of the archaeological terminology will appear oddly British for an international journal, but the principles may well apply in other regions or may stimulate the explicit formulation of protocols in those regions for sampling, analysis and conservation of archaeological shells. This protocol formulation is under way in some regions, particularly for shell middens (Peacock, 1978; Kent, 1992; Stein, 1992; Claassen, 1998, 99–104; Gutiérrez Zugasti et al., 2011; Bowdler, 2014; Woo et al., in press), and more broadly, by implication (Reitz, 2009).

The aim of archaeological excavation is the production of a site archive, the physical objects which show how people lived in the past, and the records that show how closely those objects are associated or separated in space and time (Brown, 2011, 3). Excavation is dissection: whether one views it as controlled destruction (Wheeler, 1954, 1) or as displacement of evidence according to learned rules (Lucas, 2001), excavation is an ‘unrepeatable experiment’ (Barker, 1982, 12), and only the archive survives to act as the record of it. The excavation director producing the site report is merely the first to rely on the archive, the first to discover whether the archived physical objects and recorded associations answer questions. The principal objective of the site report is to alert the wider community to the nature and quality of the archive, so that wider community, present and future, can assess how useful the archived physical objects and recorded associations will be for them. Since excavation permanently destroys the site, the principal aim of excavation is the recovery of all types of human-modified objects in an interpretable manner; whatever site-specific research aims led to the excavation remain secondary.

Therefore the key to making a useful archive is ‘to concentrate on collecting data relevant to the research design of the project, while adhering to accepted standards of recovery for materials that might be of interest to other researchers’ (Dibble et al., 2005, 317–318). It follows that materials specialists must state plainly to field archaeologists what those ‘accepted standards of recovery’ are. Without these statements of standards, materials specialists force field archaeologists to continue to exhibit what Claassen (1991) politely calls ‘normative thinking’: continued reliance on old practices even though those practices have reached their limits for producing any new insights. For example, the dissemination of such recovery standards led to the regular archaeological use of land-snails (Evans, 1972, 41–45), mammal bones (Meadow, 1980), fish bones (Jones, 1982), and plant remains (Renfrew et al., 1976).

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Field archaeologists can be disconcerted by calls to alter fieldwork techniques. Often, they assume that any problems about recovery of archaeological evidence were resolved in the past for those techniques to have become established, so they can rely on those techniques to calculate excavation time, effort and cost. Unfortunately, this assumption is unfounded. Firstly, fieldwork techniques have never been fixed: they are altered periodically to better extract evidence of past human lives. In Britain, the methods of Stukeley (1740, 44–46) were no longer acceptable to Pitt-Rivers (1887–98), whose methods were no longer acceptable to Wheeler (1954), whose methods were no longer acceptable to Barker (1982). Secondly, there is no established set of fieldwork techniques, but many, using different techniques to satisfy different priorities. The prehistorian in his neat square excavation unit is dumbfounded by the shovelling away of whole deposits at once by the medieval urbanist; both are dumbfounded by the happy use of the diesel-engined backhoe by the multi-period ruralist. Archaeological fieldwork has always been amended to improve the information provided to materials specialists, so those specialists can answer archaeological questions. Field archaeologists must expect this amendment to continue, because they benefit from it: they get materials that can answer their questions better, and they only need to collect materials in useful amounts.

2. Shells: why bother?

2.1. Archaeological potential of marine shells

Archaeological marine shells preserve large amounts of the information archaeologists need. This volume shows some new applications; Thomas (2015a,b) provides a recent review; Claassen (1998) remains fundamental. Marine shells, by definition, are absent from human terrestrial habitats, so their presence on archaeological sites is the result of a long series of complex decisions; at the very least, their exploitation shows a species of hominin capable of thinking in this way (e.g.: Brown et al., 2011). Humans have gathered shells for many purposes (fish-bait, wind instruments, dye-production, building aggregate, or raw material for adornments, tools, and building mortar) but principally for food. As food remains, shells are richly informative about subsistence and the role of the coast in it (Bailey, 1975; Campbell, 2008a), its annual scheduling, the range of resources and habitats exploited, the effects of that exploitation on wild populations, and (since they are highly perishable, bulky, but sometimes found far from the sea) exchange networks and the speed and efficiency of transportation. Decision-making about the sources exploited can be reconstructed from the habitat ranges of the shellfish themselves, the organisms attached to or infesting them (Winder and Gerber-Parfitt, 2003), and the small unconsumed shellfish accidentally gathered with them (Bailey and Milner, 2008). Decision-making about relative harvesting effort in different parts of the same habitat can be reconstructed using size distributions and growth-rates (Milner et al., 2007) and the shape of the harvested shells (Kent, 1992; Campbell, 2010), or more precisely with their shape-size variation (Cabral and da Silva, 2003; Campbell, 2008a). The harvesting techniques employed and the long-term impact on the shellfish population of those techniques (e.g.: Jones and Richman, 1995 and Whitaker, 2008), and the technology used for harvesting (Hancock, 1967; Dupont, 2010; Campbell and Russell, 2014), and can also be reconstructed.

Shellfish build up their shells primarily with calcium carbonate using minerals extracted from the sea, at a rate which waxes and wanes daily and seasonally (e.g.: Richardson et al., 1980; Rhoads and Lutz, 1980 remains fundamental), recording harvest season (Laurie, 2008), seasonal temperature variation and past climate (Fenger et al., 2007), and the consequences of industrialization via heavy-metal pollution (Labonne et al., 1998; Gillikin et al., 2005). Cemented into the shell are bio-molecules suitable for absolute dating (Demarchi et al., 2011; Russell et al., 2011) and studying genetic variation (Doherty et al., 2007). Combining this incrementally-curated information can provide a comprehensive picture of environment, its variation between habitats, its change, and human response to that change (reviewed in Andrus, 2011).

2.2. Pros and cons

Shells have two advantages over most other archaeological remains. Firstly, they enter the archaeological record in statistically amenable numbers. Since each shellfish has little meat, even a single meal of a single person requires numerous shells. In this, shells are similar to lithics (Fladmark, 1982; Healan, 1995); ceramics or vertebrate remains usually have to be grouped by phase before statistical analysis. Secondly, they record themselves how they came to be preserved. Their fragility makes them exquisitely sensitive to the processes which formed and transformed the deposits in which they are found; formation history can be reconstructed using average size, size distribution, and extent of fragmentation (Gutiérrez Zugasti, 2011; Stein, 1992 remains fundamental).

This frequency and fragility also makes shells a fieldwork challenge. Excavation can rapidly produce large amounts of largely broken larger shells, which can challenge a project's processing and storage capacity, and which can be discarded by those unfamiliar with their archaeological potential. Clear guidance on how many shells to get, and how to get them, is probably more needed for shells than for any other kind of archaeological remains.

3. Recovery

Hand-recovery simply does not recover what really is preserved in an archaeological deposit (Payne, 1972): not potsherds (Orton et al., 1993, 46–47), not lithics (Ball and Bobrowsky, 1987; Dibble et al., 2005; Graesch, 2009), not plant remains (Struever, 1968), not animal bones (Clason and Prummel, 1977), not even human skeletons, articulated, in graves (Mays et al., 2012). What a field technician recovers by hand from a deposit depends more on that technician's interests and experience than what is in that deposit (Clarke, 1978; Levitan, 1982, 26–27). Prehistorians therefore routinely sieve their spoil. Unfortunately, on-site sieving does not solve the problem: since only fine-mesh wet-sieving minimises bias sufficiently for most other materials (Payne, 1972; Casteel, 1976; Ball and Bobrowsky, 1987; Graesch, 2009), field staff are also likely to miss the small but diagnostic fragments and unusual shells.

4. Sample size

4.1. Approaches to sample size

Entire volumes are dedicated to archaeological sampling (e.g.: Orton, 2000). Most agree with Claassen (1991, 258): ‘There is no specifiable amount of matrix that can be deemed statistically adequate for worldwide application, nor can there be a fixed size of sample useful worldwide’. Making possible what many consider impossible will require assumptions and compromises.

Materials specialists tend to grasp the nature of their materials using two concepts: range (the number of recognisable types, such as number of different species present) and composition (the proportion of identifiable specimens in each type, such as percentages of each species) (Orton, 2000, 159). Unfortunately both range and composition of a sample increase with increasing sample size (the

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