Quaternary International xxx (2016) 1–5

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Issues in the identification of umbones in California mussel shell assemblages

Michael A. Glassow

Department of Anthropology, University of California, Santa Barbara, CA 93106-3210, USA

ARTICLE INFO

Article history:
Available online xxx

Keywords:
California prehistory
California mussel umbones
Mytilus californianus
Identifiability
Shell fragmentation
Archaeological laboratory procedures

ABSTRACT

Archaeologists investigating California coastal sites have used fragments of California mussel (*Mytilus californianus*) shells with umbones for two purposes: estimating the minimum number of individuals (MNI) represented in a shell assemblage and obtaining measurements that serve as proxies of mussel valve length in studies of variation in mussel sizes. Identification of umbones depends fundamentally on the ability of laboratory personnel to identify umbones, particularly if fragments are small. However, two factors affect identifiability: degree of fragmentation and tactics used by prehistoric mussel collectors. Both factors affect the proportion of small and difficult-to-identify umbones in an assemblage. Difficulty in identifying mussel umbones can be mitigated by laboratory protocols that ensure identification of umbo fragments and assessment of the degree of success in implementation of the protocols.

1. Introduction

Shells of California mussel (*Mytilus californianus*) are ubiquitous at coastal archaeological sites along the California coast where rocky intertidal habitats exist, often comprising more than 75% of the shellfish assemblage as determined by MNI or weight (e.g., Jones, 1995; Glassow et al., 2008, p. 23; Braje et al., 2012, p. 115). Archaeologists whose assemblages of shellfish remains contain California mussel shells have separated fragment with umbones (i.e., beaks or hinges, Fig. 1) for two principal purposes: 1) to determine minimum number of individuals (MNI) in the context of studies of dependence on mussels as a food resource relative to other species of shellfish represented in an assemblage and 2) to ascertain size variation in mussel valves in the context of studies of predation intensity. The umbo of a California mussel valve is a non-repetitive element (Mason et al., 1998, p. 307; see also; Claassen, 1998, p. 104), necessary for determining MNI. The umbo not only is a distinctive feature of a valve, it is also the most durable part because it is the thickest and consequently survives intact more readily than other parts. As well, morphological features at or near the umbo are discrete and generally well preserved, and measurements of, or between, these features correlate with valve length to varying degrees (Campbell and Braje, 2015; McKechnie et al., 2015; Singh and McKechnie, 2015).

Inferences concerning aspects of prehistoric subsistence activities and ecological adaptation require that mussel umbones be recognized in assemblages of shellfish remains despite variation in their size and physical characteristics. A collection of umbones, in other words, should be representative of the number of shell valves deposited at an archaeological site. In this paper I address issues surrounding the identifiability of mussel shell umbones: the varying degrees of fragmentation of mussel shells, differences in collecting behavior of prehistoric shellfish collectors, and the abilities of laboratory personnel to identify umbo fragments. The first two factors influence identifiability of umbones, but identifiability fundamentally depends on the abilities of laboratory personnel and procedures.

2. Effects of fragmentation

California mussel valve fragments from coastal California sites with identifiable umbones may vary in size from less than 2 mm to more than 10 mm (Figs. 2–4). Many factors contribute to fragmentation of shells within archaeological sites. The most obvious of these include breakage while extracting meat, exposure of shells to the elements before becoming buried under cultural or natural deposits, burrowing within archaeological deposits of such animals as gophers, annual shrink–swell cycles of clayey soils containing shells, and trampling of surfaces containing shells by people or animals, either prehistorically or during modern times. In general, the longer that any of these factors has been affecting shells, the

E-mail address: glassow@anth.ucsb.edu.

http://dx.doi.org/10.1016/j.quaint.2015.09.098
1040-6182/

Fig. 1. Interior of a California mussel valve showing the location of the umbo.

greater the degree of fragmentation. Also contributing to fragmentation are valve shape and structure of the shell material (Wolverton et al., 2010), and likely valve size as well.

To recover samples of valve fragments for analysis, archaeologists working in California collect column samples that often are processed using flotation. The heavy-fraction portions generally are caught by screens with a mesh size of 1/16″ (~1.5 × 1.5 mm openings). In a laboratory, the samples commonly are rescreened using sieves with mesh sizes of 1/4″ (~6 × 6 mm openings) and 1/8″ (~3 × 3 mm openings), resulting in size categories of 1/4″–plus, 1/8–1/4″, and 1/16–1/8″. Archaeological deposits may contain umbo fragments smaller than 1/16″ (~1.6 mm), but these typically are not collected. As Figs. 2–4 show, a correlation exists within some assemblages, if not all, between the size of the mussel valve from which the umbo fragment comes and size category resulting from sieving, but the correlation is not perfect (see also Glassow, 2000, Fig. 2). Some umbo fragments in the two smaller size categories come from larger shells, although the fragmentary nature of many of the umbones may prevent estimation of valve size using established proxies. Given the wide variation in the size of valve fragments with umbones, comparability of assemblages must be based on a consistent minimum mesh size of the sieves used to size-sort the shell fragments.

The amount of the umbo that is still intact also may be an issue. For instance, if just the dorsal or ventral side of the umbo is present, it would be less recognizable. Similarly, umbo tips lacking any portion of the valve toward its posterior end would be ambiguous. Even though umbones are the thickest portion of a mussel valve, they are nonetheless subject to breakage that degrades their identifiability.

Fig. 2. Mussel valve fragments with umbones within the 1/4-inch-plus size category.

Fig. 3. Mussel valve fragments with umbones within the 1/8–1/4-inch size category.

3. Effects of prehistoric collecting behavior on umbo numbers and sizes

Based on White's (1989) analysis of mussel size variation, Jones and Richman (1995) proposed that prehistoric mussel collectors living along the California coast used two basic mussel collecting tactics, plucking and stripping. Plucking entails selection of just the relatively large individuals within a mussel bed, whereas stripping entails removal of all individuals regardless of size. The difference between the two is related to intensity of human predation on mussels, as plucking is economically a more efficient tactic (Jones

Fig. 4. Mussel valve fragments with umbones within the 1/16–1/8-inch size category.

Please cite this article in press as: Glassow, M.A., Issues in the identification of umbones in California mussel shell assemblages, Quaternary International (2016), http://dx.doi.org/10.1016/j.quaint.2015.09.098