Seasonality Studies

Douglas J. Kennett
Department of Anthropology
University of California, Santa Barbara
Santa Barbara, CA 93106

Prehistoric hunter-gatherers and farmers, like their modern counterparts, lived their social, economic and ritual lives in regular cycles that fluctuated throughout the year. These changes often involved the movement or reorganization of settlements within a large territorial range. Archaeologists are faced with the difficult, but fundamental, task of reconstructing these dynamic patterns of settlement with the static and incomplete remnants left by prehistoric peoples. Seasonality studies are used to reconstruct the seasonal use of particular locations within larger settlement systems. Studies of seasonality range from the simple presence or absence of seasonally available plants and animals to more complex analytical techniques borrowed from biology and chemistry.

Ethnographers studying indigenous people around the world in the 19th and 20th centuries noted variations in settlement and subsistence through the year as well as cyclical changes in social and religious activities. In many cases these fluctuations occurred in accordance with seasonal changes in the natural environment. For instance, the aboriginal people inhabiting the Pacific Northwest coast of North America aggregated together in large settlements near streams during summer salmon runs. For these people this was a time of collaboration, heightened ritual activity and socio-economic interaction (Barnett, 1975).

Archaeological investigations into seasonal variations in prehistoric settlement, subsistence and social organization burgeoned in the 1960's and 70's as one component of the "New Archaeology". Unlike the archaeological investigations of the early 20th century that concentrated on the development of culture histories, the "New Archaeology" focused on reconstructing prehistoric subsistence and settlement patterns. Willey's (1953) seminal work on prehistoric settlement patterns in the Viru Valley of Peru provided the impetuous for such investigations. Willey described settlement patterns as "the way people deploy themselves across a landscape". Winter's (1969) elaborated upon this idea by making the distinction between *settlement patterns*--the geographic distribution of sites dating to a particular time interval, and the *settlement systems*--the functional relationships between sites when the system was extant. Determining the season that people lived at particular locations during the year became an integral part of reconstructing functional relationships between sites within prehistoric settlement systems.

A number of techniques have been devised to extract seasonal information from the archaeological record. Initially the season of site occupation was determined by the simple presence or absence of seasonally available plants and animals. This is the oldest and most frequently used method for estimating the season of site occupation. Winter's (1969) was the

first to effectively use seasonally available plants and animals to infer season of site occupation. His study demonstrated that people living in eastern North America during the Archaic Period visited riverine locations during fall and winter months. This estimation was based on the presence of white tail deer, elk and migratory birds in archaeological deposits dating to this time period. Clearly, this method requires a thorough understanding of the distribution and biology of the plants and animals used by prehistoric people. A strong argument, based on palaeoenvironmental reconstruction, also must be made for these patterns existing in the past. In addition, problems of differential preservation must be accounted for. Difficulties resolving these issues have made such seasonality estimates unreliable. Pike-Tay (1991) suggests that the presence or absence of seasonally available resources should be used as a preliminary measure of seasonality that can be used to develop testable hypotheses.

Beyond the presence or absence of animal remains in archaeological deposits, certain skeletal elements may contain seasonal information. Particular physiological events during the life cycles of animals create visible changes in their skeletons and teeth. These events are often seasonally or age related. Seasonality estimates can be inferred from analogous events in modern populations of animals. Epiphyseal fusion, the joining of cartilage to the articular surface of bone, occurs in different skeletal elements at various times of an animals life. Estimates of age can then be converted into the season that the animal was killed. Like epihyseal fusion, the eruption and wear of teeth, the shedding of antler and the presence of osteoporosis in the bones of birds and mammals are seasonally sensitive. The drawback of these techniques is that the diet, nutrition and health of animals can alter the timing and nature of these physiological events.

A variety of more complex approaches for estimating the season of resource use and site occupation have developed over the last 20 years. Of these, the microscopic analysis of growth increments in teeth, bone, fish otoliths, mollusc shells and antler pedicles, has been the most widely used technique (Monks, 1981). An organisms growth rate is influenced by seasonal changes in the environment. Growth increments in an organisms skeleton (or exoskeleton) record these cyclical changes. Based on studies of modern animals, the season of death can be estimated and inferences of seasonal resource and site use can be made.

Finally, oxygen isotopic analysis of marine mollusc shells is potentially the most accurate, but under utilized, method for making seasonality estimates. The technique was initially recognized as a powerful tool for palaeoenvironmental reconstruction because $^{18}O/^{16}O$ ratios in shell contain information about the physical and chemical environment of their growth. Shackleton (1973) showed that the oxygen isotopic ratios in marine shells were temperature dependent and that the $^{18}O/^{16}O$ ratio in the final growth increment of mollusc shells represents the water temperature at the time it was collected by prehistoric people. Kennett and Voorhies (1994) extended the application of this technique to estuarine molluscs, determining that the

oxygen isotopic composition of marsh clam shells reflected large scale salinity fluctuations created by seasonal changes in rainfall.

A great deal of progress has been made in the area of seasonality studies over the last 20 years. It must be remembered, however, that regardless of the method employed to estimate the season of site occupation, a sound interpretive framework is necessary to make meaningful statements about the prehistoric past. Successful reconstructions of site seasonality and overall settlement patterns combine ethnographic and ecological analogies to develop multiple working hypotheses. These hypotheses are then augmented with indirect measures of seasonality, such as the location of sites on the landscape or the orientation of dwellings at a particular site. The presence or absence of seasonally available resources can then be used to narrow down the season of site occupation. Finally, more accurate techniques must be employed to test each hypothesis. Multiple lines of evidence will ensure the most accurate seasonality estimates and the best reconstructions of prehistoric subsistence, settlement and social dynamics.

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