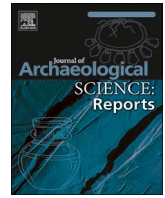


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Flexible approaches: Adapting analytical techniques and research designs to suit variable landscapes and cultural structures

Humanity is highly adaptable based on evidence from regional culture histories, dominant climatic patterns, ecosystem availability, and subsistence practices. Astounding resourcefulness in solving short- and long-term challenges is routinely demonstrated by cultural groups pursuing variants of agro-pastoralism, hunting, fishing, gathering, and horticulture.

Pursuing specific economic strategies often leads cultural groups to exhibit similar patterns of social organization and material culture. Observation of this trend has led anthropologists to note, and archaeologists to infer, that describing a population based on socio-economic structure allows readers to extrapolate broader patterns of behavioral and cultural patterns. The interpretive value of such analogies lies in the degree of similarity between the organisms or structures being compared; an assumption that may not be equally valid under all circumstances. In archaeological literature there is persistence of socio-economic categorizations (e.g., hunter-gatherers, pastoral nomads, and sedentary agriculturalists); perhaps due to explanatory efficiency but perhaps determined culturally according to the norms of Western culture.

The assumption that there will be identifiable modes of cultural structure and patterns of behavior often serves as a starting framework for the integration of analytical techniques. Challenges frequently arise when the analytical method used is based on an explanatory framework infused with assumptions that are poorly suited, or not valid for the given region, time, or population under study.

Most of the Earth's landmass is located in the northern hemisphere, where arctic, boreal, and sub-boreal environments dominate. Archaeologically, this vast territory is characterized by long sequences of hunter-gatherer adaptations which in many places retained their viability until historical times. There are also a host of localized ecotones that provide seasonal access to resources that are more broadly expected to relate to specific climatic zones, or provide mutually exclusive modes of subsistence.

For example, portions of Scandinavia and Japan support both grain agriculture and seal/whale hunting, one requiring temperate conditions, the other ice floes, with the results being myriad combinations of reliance on domesticates and wild resources and the maintenance of technological suites and socio-economic structures necessary to provide both flexibility and labor organization to survive (Friedman, 2012; Pinhasi and Stock, 2011; Temple, 2010).

Environmental conditions favoring preservation of organic materials such as human and animal osteological remains, organic residue on pottery, hides, and textiles allow for the application of various new methods in the archaeological sciences. Consequently, research on northern hunter-gatherer adaptations has recently seen a period of dynamic growth in the development and application of scientific techniques in archaeology (e.g., chemical techniques for diet, mobility, and chronology, artifact sourcing, genetics, bioarchaeology, cultural exchange models, GIS models, and geophysical methods). Many of these techniques were developed within the intellectual framework of non-historical sciences and only demonstrated archaeologically on select regions and periods of time.

Studies of northern hunter-gatherer groups have forced a reexamination of analytical methods, as gaps appeared between material culture available, the potential scientific data contained in a given assemblage, and the research questions being asked. This explanatory gap is often the result of differences between the underlying assumptions and the capabilities of analytical techniques to be applied in new and different ways from established examples.

This special issue presents current scientific research on northern hunter-gatherers in Eurasia and North America with emphases on novel techniques, integrative approaches, modeling of hunter-gatherer adaptive strategies and behavior, examination of the underlying theoretical assumptions related to archaeological scientific techniques and how explanatory structures must be adapted in order to address specifically some of the unique complexities relating to reconstructing the behavior of hunter-gatherers.

This special issue is structured in order of scale of analysis, starting with large-scale studies. The ultimate goal is to help produce a clearer picture of how researchers approach the intellectual nuances of analyzing northern-hunter-gatherers at the scale(s) of individual life-history, site-specific, and regional/population levels of analysis comparable with traditional archaeological assemblages.

One aspect of research often thought of as unique to hunter-gatherers is colonization of unpopulated territory (Kelly, 2003). The arrival of new predators will impact any ecosystem, leading to disruption and eventually a new balance. Humans are distinct from other predators in that they can simultaneously influence a variety of floral and faunal environmental factors. Insofar as environments without previous human histories (e.g., North America prior to Late Pleistocene deglaciation) the reaction to the arrival of new predators has often been portrayed as catastrophic. Humans have been deemed responsible for large-scale ecological collapses in many regions (e.g., Australia, New Zealand, Madagascar) (Burney and Flannery, 2005).

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New human inhabitants have to learn and adapt to a combination of familiar niches and resources, and alien territories in terms of raw material acquisition and unfamiliar floral and faunal risks. The story of how humans interact with new environments will be more complex than either complete destruction upon arrival, or the simple imprinting of previous patterns of ecological exploitation in new regions. The question is not whether humans will have impact(s), or that they may well be catastrophic for floral and faunal communities, but rather that we must recognize that newcomers will not be operating “optimally” and there will be behavioral peculiarities with the archaeological evidence of colonization. Examples of oddities would be characteristics like the preferential use of distant raw material sources when local sources of equal and greater quality may be available but difficult to locate, or the avoidance of faunal/floral resources similar to those used in ancestral lands but potentially unfamiliar in new landscapes.

There are however multiple ways in which the concept of colonization can be characterized, through the progression of exploration, learning curves in unfamiliar territory, expedition(s), ephemeral settlement, and eventual settlement persistence (Rockman and Steele, 2003). Expedition(s) by people seeking resources may entail a high degree of mobility for many generations. This will make it difficult to identify the difference between an ephemeral site, chosen for sufficiency and re-used over extended periods of time, and the intentional choice of settlement and/or interaction sites (e.g., potlatch sites) that will be influenced by cultural as well as environmental interactions.

Kitchel (This Special Issue) uses lithic sourcing on chert quarries in Maine, Vermont, Massachusetts, New Hampshire, and Quebec to pursue goals of analytical refinement and settlement model testing. Researchers sourcing chert, and other cryptocrystalline silicates, have had highly variable success with geochemical methods of provenance analysis, dependent largely on regional geological histories. Visual identifications for regional chert sources have suggested that colonizing groups were rapidly familiar with their landscape. If these groups were familiar with the landscape however, then can they still be thought of as explorers or colonizers?

Clear recognition of raw material sources through geochemical, petrographic, or other indisputable means are central to being able to analyze material procurement strategies, so the demonstration that a given geochemical method (i.e., EDXRF) can discriminate between sources is an important element to the analytical side of this research. Once proven effective, it can then be used to investigate the visibility of aspects of the landscape learning process attributed to colonizing groups. In this case, by the time regional populations were archaeologically visible, their familiarity with the landscape was sufficient to have already surpassed the early stages of the colonization process.

This process of landscape learning and adaptation is not unique to hunter-gatherers, and process by which we examine archaeological evidence under circumstances where prior human evidence is absent improves our ability to analyze situations that may include technologically limited colonization. Northern British islands (e.g., Orkneys, Hebrides) show scant evidence for Mesolithic human presence, with long-term colonization not occurring until the Neolithic and requiring substantial adaptation of modes of subsistence that rely on more moderate conditions than are generally experienced there. For example, lacking adequate pastureland, Orkney sheep adapted to eat seaweed as a result of foddering and/or land use practices (Balasse et al., 2009; Jones and Mulville, 2016; Schulting et al., 2017). Several steps of colonization did occur in this region, but the rewards of settlement in this region were apparently not outweighed by the costs of material and effort in pursuing these environments. Another possibility is simply that exploration inadvertently eliminated the desirable plant, terrestrial animal and coastal resources (i.e., shellfish). The returns rates of this landscape were thus lower than other potential areas, discouraging settlement until demographic pressure of technical solutions changed circumstances (cf. Bettinger, 2015).

The reliance on domesticates precludes characterization of these Neolithic colonizers as hunter-gatherers, yet genetic information on red deer (*Cervus elaphus*) populations in the Orkneys (Stanton et al., 2016) and Ireland (Carden and Edwards, 2012) demonstrate that they were brought from the continental mainland by Neolithic colonizers. Without this genetic evidence, recognition of wild faunal materials could easily support conclusions of hunter-gatherer modes of subsistence in use in the region. Instead, we have to recognize that late Mesolithic and early Neolithic populations in the north Atlantic had intimate relationships with species that researchers are not traditionally familiar with identifying as humanly-moderated wild hunting stocks, or even as potential domesticates (cf. Sturdy, 1975).

The situation on the Orkneys is not radically different from the process by which arctic and subarctic hunter-gatherer groups became closely tied to reindeer/caribou (*Rangifer tarandus*) herds, through the process of hunting, familiarization, and ultimately shifting to nomadic pastoral control of previously wild reindeer stocks in some regions, while retaining periodic hunting on a mass-scale in other regions (Anderson, 2000; Binford, 1983; King, 2002). Landscape modification (e.g., Innes and Blackford, 2003; Innes et al., 2010; Simmons and Innes, 1987) is more often associated or directly attributed to agricultural groups, yet plays a strong role in their ability to survive in both hunting and pastoral groups.

In regions with strong ethnographic histories (e.g., Canada, Siberia, United States), this insight is often conflated with the overuse of analogies to explain prehistory. The production of storable surpluses is often attributed primarily to agro-pastoral groups.

Groups were argued to have had storage/intensification capabilities using similar socio-economic structures with animal products (e.g., salmon, bison, and reindeer) to those observed during ethnographic periods. Explanations for the similarity in long-term provisioning were often asserted to depend on links larger agricultural cultures as trading partners. Understanding that there were radical alterations of behaviors in prehistory or that intensification could occur in situ without the impetus of external trading and cultural influences from more sedentary groups still meet with skepticism. The reality that the domestication of the horse in Eurasia, and that the reintroduction of Spanish horses in North America radically altered indigenous behavior in both individual group subsistence decisions and spheres of cultural interaction that spanned the continent is becoming increasingly recognized (Anthony, 2007; Wood, 1998).

Bethke et al. (This Special Issue) investigate the extent to which social modification of the landscape enabled (or encouraged) the abilities of populations to organize and execute bison mass-harvests to produce storable surpluses for difficult winter hunting conditions and for products tradable to populations peripheral to the plains where horticultural efforts led to regional population centers and viable markets for bison-hunters. This research team integrated magnetic surveys with targeted excavations, and a faunal analysis strategy aimed at honoring the cultural sensitivity of the region, to preserve the integrity of subsurface deposits, and specifically address the extent to which processing efforts represented intensified methods and how they changed over time. The analytical challenges in this case centered around ensuring that remote sensing techniques could adequately address large-scale questions of prehistoric patterns of land use and that faunal analysis could detect behavioral changes without extensive excavation. Tailoring landscape scale surveys and research techniques to identify changes in a dynamic culturally-modified natural environment is difficult, but the results of this study both demonstrate the effectiveness of the effort and the utility of incorporating multi-tiered research strategies for problems that impacted regional landscapes.

That analytical method(s) can influence the outcome of research investigations should come as no surprise. The extent to which the availability and choice of methods can dictate future understanding and discussion of regional prehistoric behaviors is perhaps less well recognized. At the Kutoyis Complex (Bethke et al., This Special Issue), it was already understood that large scale bison hunting and processing were occurring well

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