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Behavioral ecology and optimality: Seeking alternative views

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ABSTRACT

Compositional analysis were undertaken to understand if Tusayan Virgin Series ceramics were being traded between southern Nevada and the St. George Basin during the Pueblo III period to counteract the loss of a diverse resource base after the collapse of the trade networks with the Arizona Strip. This study suggests that Tusayan Virgin Series ceramics were not traded between the two regions and that ecological models of the economy may not fit preconceived notions of logical responses or optimality. The Uncertainty Avoidance Index is explored as a useful tool for understanding the psychological reasons behind less than optimal behavior.

1. Introduction

Human behavior is unusually complex and seemingly patterned leading many anthropologists to assume that behavior is adaptively designed. If behavior is adaptive, we can expect to test hypotheses that explain human behavior under precise ecological conditions. In this framework, behavior is adaptive when it deals with ecological variations in ways that increase an individual's predilection to survive and reproduce (Bird and O'Connell, 2006:143). In developing ecological predictions of advantageous behavior, adherents borrow heavily from the microeconomics of rational decision-making, specifically under circumstances of limited resources (Bettinger, 1987:131). For instance, in foraging economies behavioral decisions are made to maximize net gain per unit of time and energy expenditure. This paper explores the usefulness of such claims by testing the hypothesis that groups will minimize risk and scarcity by expanding trade networks to different ecological zones - a proposition common in risk minimization in Behavioral Ecology research (Winterhalder, 1990, 1997; Winterhalder et al., 1999; Halstead, 1989). Results from this study suggest that the breadth of trade networks in southern Nevada did not increase with growing risk or scarcity implying that human decision-making may not always be optimal or rational.

2. Behavioral ecology and optimization

Human Behavioral Ecology (HBE) has been used to study subsistence strategies among foragers ethnographically and archaeologically for over three decades (Thomas, 2007; Broughton, 1994; Smith, 1991; Simms, 1986; Bayham, 1979) and to a lesser extent the origins of agriculture (Keegan, 1986; Winterhalder and Goland, 1993; Piperno and Pearsall, 1998). HBE has been characterized by many as the phenotypic gambit (Bird and O'Connell, 2006: 146; see Winterhalder and Smith, 1992; Grafen, 1984) where natural selection favors efficient foraging behaviors to facilitate focus on other fitness related goals (Winterhalder and Kennett, 2006). Therefore, phenotypes (in this case behaviors) are expressed by the interaction of the physical, social, and biological environments. Moreover, the phenotypic gambit assumes that it is irrelevant to understand if behaviors are enculturated or biological. Thus HBE's intrinsic purpose is to develop hypotheses that test the persistence of fitness-related behaviors in particular ecological settings and not to understand the mode of transmission behind behaviors (Bird and O'Connell, 2006:146).

HBE hypotheses are developed by borrowing models from economics based on optimization analysis. Optimality models evaluate human behavior by gauging what the most rational decision would be for known ecological circumstances. Robust HBE models take into account risk sensitive behaviors that recognize the degree of luck innate to subsistence activities. As a consequence, these optimization models account for long term averages and unforeseeable shortfalls (Winterhalder and Kennett, 2006:12). For food-producers, many optimization models assume that trade networks are established in other ecological zones to optimize resources and minimize risk (Halstead, 1989; Winterhalder, 1990; Winterhalder et al., 1999; Connelly, 1979; Ford, 1979; Abruzzi, 1989). The hypothesis tested in this study predicts that when trade networks dissolve, new networks will form in a different ecological zone as a way to minimize risk.

The assets of optimality models are their generalizability and their simplicity, but this may also make them culpable of being one-dimensional and difficult to test. Critics have argued that humans may

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not always behave in ways that optimality models expect (Sih and Christensen, 2001). Detractors argue that HBE is flawed because it ignores cultural norms which guide economic behavior (Polanyi, 1957; Binford, 1983). However, Bettinger (1987:135) contends that explanations of economic behavior grounded on enculturated norms become purely descriptive because they do not account for the origin of cultural norms. This paper seeks to remedy this situation by arguing that psychology may be the underlying reason for humans not behaving optimally or rationally.

3. Background research and hypothesis

Current research in the Virgin Branch Puebloan region indicates that during the middle Pueblo II period there were strong socio-economic mechanisms linking the lowlands in southern Nevada to the uplands in the Arizona Strip (Fig. 1). Ties between these two areas are demonstrated by the presence of large numbers of ceramics produced in the uplands that have been recovered from lowland sites. Previous research on Virgin Branch pottery exchange has focused on the production zones and distribution networks of ceramics manufactured in the uplands (Harry et al., 2013; Allison, 2000; Larson et al., 2005); to date, however, little work has been conducted explicitly on lowland ceramic production and trade. This study focuses on ceramics believed to have been produced in the lowland Virgin Branch region of southern Nevada.

During the Pueblo II period, as many as half of the ceramics used at lowland sites in southern Nevada are believed to have been produced in upland areas (Harry, 2005; Harry et al., 2013; Allison, 2000; Lyneis, 1995); however, by the end of the early Pueblo III period (A.D. 1250) the trade networks with the uplands had collapsed. Coincident with the collapse of these networks there was an increase in the production of sand tempered ceramics in the lowland Virgin area (Lyneis, 1992:41–43). This may be evidence for an increased amount of exchange between lowland households after the collapse of ties with the upland areas.

According to research in Behavioral Ecology, we can expect a balance between resource unpredictability and mechanisms that reduce this variation. Once exchange with the uplands had disappeared, lowland Virgin Branch Puebloan resources could have become more unpredictable than before. As ecological studies have shown, one way to reduce risk is to diversify resource use to many different environmental zones (see Abruzzi, 1989). For instance, if one zone experiences low agricultural yields, another zone may be able to make up the difference. Without the connection with the uplands, the lowland inhabitants could have had an increased risk of subsistence stress due to the loss of a more diverse resource base. Yet for any given society, we may expect a number of different risk reducing strategies. Many different ethnographers have shown that sharing, exchange, and ritual redistribution were important coping mechanisms for agriculturalists living in the harsh marginal environment of the American Southwest (Connelly, 1979; Ford, 1979). Moreover, archaeologists (Hegmon, 1989; Kohler and Van West, 1996) have also argued for exchange and sharing based models for the prehistoric Hopi and Chaco. Thus, the lowland Virgin Branch Puebloan, who had a very similar subsistence economy to ethnographic tribes, may have also used exchange or sharing as a risk avoidance mechanism.

The results of this study were used to evaluate the hypothesis that after the collapse of exchange relationships with the uplands, lowland households in southern Nevada began trading more with the St. George Basin in an effort to reduce the amount of resource variation. The St. George Basin was chosen because there are numerous Virgin Branch Puebloan settlements in the Basin presumably producing ceramics and trading throughout the region and the St. George Basin is ecologically distinct from the rest of the lowlands in southern Nevada and the uplands in the Arizona Strip. Neutron Activation Analysis was undertaken on fifty Tusayan Virgin Series ceramics from both House 47 and Main Ridge settlements in the Lost City Complex of southern Nevada and eleven clay and three sand samples from the St. George Basin, Utah and the Moapa Valley, Nevada in an effort to establish general areas of production.

4. Study area and environment

The lowland Virgin region examined here is situated in the Moapa Valley in southeast Nevada and the St. George Basin in southwest Utah. Generally, these areas are in the northern part of the Mojave Desert within the Colorado River drainage. Consequently, valley elevations tend to be lower and temperatures are higher than the Great Basin Desert to the northwest. The region is characterized by north to south trending mountains with peaks up to 10,000 ft above elevation and valleys that reach 246 ft below sea level (Fenneman, 1931).

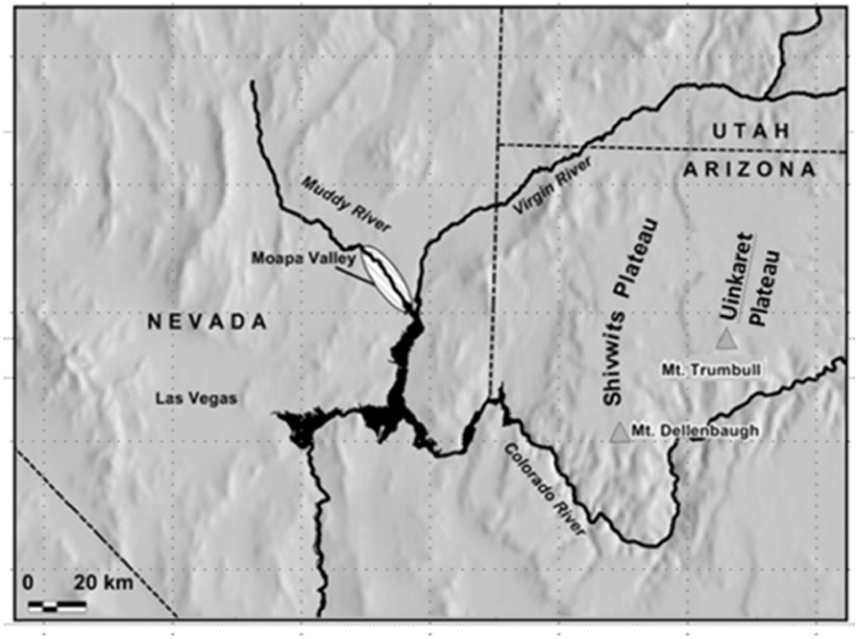

Fig. 1. Map of the Virgin Branch Puebloan region.