Evolving the human niche

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Boivin et al.'s (1) article profoundly deepens scientific understanding of anthropogenic global ecological change from Pleistocene to present by offering robust new evidence of early human transformation of the biosphere that should influence discussions on Anthropocene formalization (2, 3). As ecologists and evolutionary theorists, we applaud this work. However, we are also concerned that this paper represents a missed opportunity to bring archaeology, ecology, and evolutionary theory closer together.

Boivin et al. (1) characterize the ecological consequences of "human niche construction" without linking this directly with evolutionary processes (4–8). "Evolutionary pressures" and "evolutionary trajectories" are noted, yet ecological inheritances, the basis for niche construction theory (9), are not included, nor are cultural inheritances or processes of natural, artificial, or cultural selection. Although "cultural niche construction" appears, cultural evolution (6, 7) is neither mentioned nor linked with niche construction, leaving "human niche construction" without its essential evolutionary context, to mean only "human alterations of ecology"—or ecosystem engineering by humans.

A human niche cannot be understood without integrating niche construction with cultural evolution and social change. Human alteration of ecology is inherently social: socially learned and socially enacted (4). Long-term changes in the human niche are produced by evolutionary processes acting on both ecological and cultural inheritances (4, 5). Complex cultural packages such as agriculture emerged and spread through long-term processes of cumulative cultural evolution (6, 7), facilitated by such factors as high-fidelity social learning, large populations, within-group cooperation, and multilevel selection.

The spread of *Homo sapiens* across the continents, the emergence of larger-scale societies, and human transformation of the biosphere are the consequences of these evolutionary processes (4, 7). Working together across disciplines in a common evolutionary framework based on niche construction theory might yet guide human societies toward a better Anthropocene (10).

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