Hunter-Gatherer Adaptation and Resilience
A Bioarchaeological Perspective

Hunter-gatherer lifestyles defined the origins of modern humans and for tens of thousands of years were the only form of subsistence our species knew. This changed with the advent of food production, which occurred at different times throughout the world.

The chapters in this volume explore the different ways that hunter-gatherer societies around the world adapted to changing social and ecological circumstances while still maintaining a predominantly hunter-gatherer lifestyle.

Couched specifically within the framework of resilience theory, the authors use contextualized bioarchaeological analyses of health, diet, mobility, and funerary practices to explore how hunter-gatherers responded to challenges and actively resisted change that diminished the core of their social identity and worldview.

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Interrogating the Alterity of Hunter-Gatherers in Bioarchaeological Context: Adaptability, Transformability, and Resilience of Hunter-Gatherers in the Past

Daniel H. Temple and Christopher M. Stojanowski

1.1 Initium

This chapter presents a social history for the conceptualization of hunter-gatherers in anthropological and bioarchaeological research. Hunter-gatherers are of great interest to anthropologists and bioarchaeologists because these populations represent a lifestyle that dramatically contrasts with Western industrialized capitalism. It is on the basis of alterity that hunter-gatherers were targeted by Western scholars (Barnard, 2014; Pluciennik, 2002). Despite the fact that hunter-gatherer lifestyles are often constructed based on the practice of othering, there exists compelling evidence for an integrated pattern of transformation and endurance found among hunter-gatherers. These populations experience cultural transformation and endurance in ways that approximate cultures that adopt agricultural lifestyles, while maintaining resource procurement as a primary mode of subsistence. This suggests that cultural evolution is relevant to hunter-gatherer populations, but may be acting in ways that substantially differ from the unilineal or progressive notion espoused by cultural evolutionists over the past 150 years. Here, cultural evolution is defined as the myriad ways in which culture changes and acknowledges human agency and intentionality in this process – that is, culture change is not dependent upon environmental pressures alone, and the broader endurance or transformation of social behavior is contingent upon human intentionality and environmental context. Bioarchaeological research infrequently integrates the concepts of adaptation and resilience (see below for exceptions) when interacting with hunter-gatherer assemblages and frequently relegates these groups to comparative samples, usually stepping stones to agriculture. The goal of this book is to discard the notion of alterity that is attached to the hunter-gatherer lifestyle and orient these populations within the broader auspices of resilience and adaptation. This volume uses bioarchaeological data to understand the integration and persistence of hunter-gatherer cultural and socioecological identities as well as the circumstances acting to promote whole-scale change within these systems. Thus, this volume synthesizes hunter-gatherer adaptation, resilience, and transformation within the context of cultural and environmental challenges, while militating against what Fitzhugh (2003: 8) referenced as the facile notion that evolution requires hunter-gatherers to transform
into agricultural economies. This approach embraces the idea that culture change in hunter-gatherers is an intentional and purposeful act that occurs in response to a variety of cultural and environmental catalysts, while the enduring legacy of hunter-gatherer identities remains a unifying theme.

Hunter-gatherers are frequently defined by the absence of domesticated foods and the presence of small-scale, mobile settlements (Lee and Daly, 1993). Others report that hunter-gatherers exist on a continuum of behavioral variability from high levels of mobility and loosely organized social structure to sedentary populations with elevated complexity in social organization (Binford, 1981). Hunter-gatherers are labeled “foragers” and “collectors” based on relative degrees of mobility and complexity on this continuum. Dialectical arguments juxtapose the term “forager” against “hunter-gatherer” with the goal of more precisely defining the lifestyle in question and differentiating the uniqueness of human perception and intentionality compared with the extractive goals of non-human animals (Ingold, 1988a). Hunter-gatherers, in this sense, are differentiated from foragers based on the idea that hunter-gatherers produce subsistence economies via the objectification of work.1

Hunter-gatherers occupy myriad ecological zones, and the productivity of these ecosystems is often reflected by mode of food procurement (Harris, 1969; Kelly, 1995). Diversity in the mode of food procurement among hunter-gatherers is associated with the continuum of delayed- versus immediate-return economies (Hayden, 1995; Woodburn, 1982). Immediate-return hunter-gatherers have smaller population densities, egalitarian social systems, and procure resources that are immediately available. Conversely, delayed-return hunter-gatherers have complex levels of social structure, live in larger, more sedentary communities, intensively harvest and store wild resources, and sometimes domesticate plants. The placement of hunter-gatherers within the continuum of delayed- and immediate-return economies adds diversity to communities that represent a broad spectrum of lifestyles.

Critical analyses of the hunter-gatherer concept as applied to populations who domesticate plants compellingly argues that anthropological studies are often trapped by the hegemony of dualistic epistemology (Crawford, 2008). Specifically, many populations exist in a transitional zone between hunting and gathering and agricultural economies via the existence of complex social structures and domestication. Importantly, this work suggests that these populations represent transitional phases between hunter-gatherer and intensive agricultural economies, and anthropologists are missing events in the evolution of cultural complexity by rendering these populations as socially constructed categories (hunter-gatherer/agriculturalist). This critique is of great interest to hunter-gatherer studies because it addresses the oversimplification of human cultural complexity into binary oppositions by suggesting that there are numerous subsistence groups who transcend categorization. The problem here is the underlying assumption that these transitional societies are

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1 The objectification of work references the reciprocal relationship (see below) between hunter-gatherers and the natural environment. This term emphasizes the socially and ecologically embedded networks in which hunting and gathering are produced and reproduced.
moving toward a progressive goal rather than existing in a cultural state that was produced through local knowledge and intentionality (i.e., Ingold, 1998). In addition, this work also assumes that the hunter-gatherer construct exists as a singular category rather than a working definition that applies to populations who vary along a lifestyle continuum (e.g., Binford, 1981; Hayden, 1995; Woodburn, 1982). This volume and others (e.g., Bettinger, 1991; Fitzhugh, 2003; Kent, 2002a) argue that agricultural economies are not the end-product of all hunter-gatherer economies, even among communities who seemingly exist in a transitional state. There are, in fact, many examples of delayed- and immediate-return hunter-gatherers who maintain contact with intensive agriculturalists and herders, yet consciously choose not to adopt these lifestyles (e.g., Kent, 2002b; Marlowe, 2002; Walker and Hewlett, 1990). Archaeological examples of populations who intensively consumed and likely domesticated plant foods or coexisted with animal herders are also numerous (e.g., Crawford, 2006; Da-Gloria and Larsen, 2014; Humphrey et al., 2014; Rowley-Conwy and Layton, 2011; Stojanowski and Knudson, 2014; Temple, 2007; Turner and Machado, 1983; Walker and Erlandson, 1986). Furthermore, there exists a marked contrast in the production of hunter-gatherer subsistence economies through practice and ideology. Specifically, hunter-gatherers conceptualize relationships with nature in a far different way than that observed among agriculturalists. This conceptualization reflects worldviews surrounding dominance and care versus incorporation. The relationship between agriculturalists and domesticates is conceived as a singular transaction—the humans care for plants and animals, and rituals associated with these organisms are associated with this dominion (Ingold, 1988b; but see Rindos, 1984). By contrast, hunter-gatherer relationships with nature are tethered to what might be called an eternal ontology of interactions—one in which humans and nature are tethered to a cyclical, ever-unfolding set of material and spiritual relationships (Atuy, 1997; Ingold, 1988a, b, 1998). These findings militate against the “transitional” nature of delayed-return hunter-gatherers who domesticate plants or herd animals, and instead suggest that these populations fit best within the broader continuum of the hunter-gatherer construct. This construct resists singular definition, but encompasses diverse communities in which the primary mode of production revolves around food procurement, while this mode of production is objectified through the construction of ideologies (sensu Shanks and Tilley, 1982).

1.2 Hunters-Gatherers: An Anthropological History

The conceptualization of hunter-gatherers within the academic world has an extended history with pre-Enlightenment roots (Pluciennik, 2002). Specifically, ideas of hunter-gatherers were constructed by Western scholars attempting to contrast economic systems with early forms of capitalism (Barnard, 2014). It is within these writings that a lifestyle of capriciousness was established as the binary opposition to capitalistic society: complex/simple, active/lazy, progressive/regressive, and wealthy/destitute were ways in which the social institutions that are often attributed to hunter-gatherers were compared to industrial states. These contrasts
were personified by the infamous epithet of “nasty, brutish, and short” in an attempt to define lifestyles that contrast with industrialized capitalism (Hobbes, 1651). The political philosophy of Jean-Jacques Rousseau depicted hunter-gatherers as an ideal state of human nature. In particular, philosophers such as Rousseau (1754) argued that human morality experienced a zenith in the “primitive” past because these groups were free from the corrupting influences of materiality. While Rousseau clearly held a view of hunter-gatherer cultures that was similar to cultural evolutionists, for example juxtaposing these cultures as intermediate stages between ape-men [sic] and civilization, the idea that these groups held key insights to human morality was novel. This conceptualization of human nature reflects an ideology that is often given the derisive appellation Noble Savage, and in some cultures tied to collective fetishizations of authenticity, where the ability to identify with an indigenous past empowers nationalist revisions of history (Hudson, 2004). Thus, the Romantic depiction of hunter-gatherers serves as the binary opposition to the “nasty, brutish, and short” narrative, yet remains mired in unilineal paradigms that are used to privilege nationalist identities.

Anthropological conceptualizations of hunter-gatherers date to the founding of the discipline. Hunter-gatherer economies were included as the “savagery” stage in the unilineal evolutionary schematic of “savagery, barbarism, and civilization” (Morgan, 1877). These phases described human cultural progress based on subsistence economies, marriage residence, and political organization. The existence of contemporary hunter-gatherers was, however, a confounding variable – how could a progressive world produce populations that represented the lower stages of culture? In Ancient Society, Morgan (1877) cites the work of Samuel Morton, suggesting that the apparent stasis of contemporary hunter-gatherers, and specifically American Indian cultures, was explained by inferior brain sizes. Hunter-gatherers were also included in the primitive echelon of Frazer’s (1890) unilineal classification of religious belief in human societies. The work argues that the savage mind cannot distinguish between the material and spiritual worlds, and that this worldview is defined based on a belief that human actions control nature.

These anthropological works were not to be outdone by Darwin (1890), who described hunter-gatherers as an initial template for civilization, but erroneously suggested that contemporary hunter-gatherers existed in an arrested state of social development. For example, Darwin (1890) argued that environmental constraints limit cultural progress and cites the impact of cold on Esquimaux [sic] hunter-gatherers as an example. These conceptualizations of hunter-gatherers are contextualized within the paradigm of transmutationism. In particular, numerous examples of how energy and perseverance produce successful, progressive societies are provided, including references to the success of American colonists, and the apparent inheritance of this energetic perseverance by future citizens of the United States.

The response of cultural evolutionists to the existence of contemporary hunter-gatherers is comparable to the approach of early Darwinian naturalists when confronted by creationists about the dearth of fossil evidence for transitional phases (Marks, 2012). Darwinian evolutionists argued that human ethnic groups represented
transitional phases leading from African apes to modern civilizations to parry against the argument that fossil evidence was lacking. In so doing, these early evolutionists permitted and even advocated for white European supremacy, when the ethical choice was to acknowledge the veracity of the creationist critique. The same paradox confronted cultural evolutionists when attempting to explain coexistence of industrial nation states and egalitarian hunter-gatherers. Cultural evolutionists argued that contemporary hunter-gatherers existed in a state of arrested development – a context in which cultural and ecological forces acted to produce human communities that relied on food procurement as a primary subsistence economy, but still maintained flexibility in response to the broader cultural and ecological landscape.

The paradigms of cultural evolutionists were questioned by historical particularists who viewed culture, including hunter-gatherers, as a unique process that was governed by historical experience and local knowledge – cultural similarities were seen as a result of diffusion, and environmental factors producing similarity in behavior were discounted or minimized (Boas, 1911). The work of Boas (1911), in particular, sought to combat what might be termed inequalities of complexity by demonstrating porousness in the expression of complexity between “primitive” and “civilized” communities. Historical particularists argued that hunter-gatherers were products of a unique past that helped populations adjust cultural traditions to local circumstances through shared knowledge and/or collective experience. This approach valued the knowledge-base of hunter-gatherer communities as equally important to the knowledge-base of industrialized nations and sought to diminish the idea that human culture existed on a ranked scale.

Cultural ecologists were critical of historical particularism inasmuch as this theoretical paradigm argued that parallels in culture might be useful to disentangling broader patterns of human adaptation to the environment (Steward, 1955). Specifically, facets of shared culture among geographically disparate hunter-gatherers were conceptualized as having a unique origin within communities (one that was part of shared collective knowledge), but could represent a general pattern of adaptation among hunter-gatherers in a broader geographical spectrum. The opportunity to test the hypotheses of cultural ecology on the rich ethnographic record prompted the Man the Hunter symposium in 1968. The seminar produced a large edited volume that integrated social, archaeological, and biological approaches to the study of hunter-gatherers (Lee and DeVore, 1968). One of the most important contributions in that volume addressed the integrated and varied lifestyles of hunter-gatherers, arguing that hunter-gatherer biological and cultural variability was part of an integrated pattern of knowledge accumulated into the mind and body during the developmental process (Laughlin, 1968). This essay provided key insights into the concept of human culture as a social tradition (see below) by tracing the developmental and socioecological context for hunting and gathering behavior from a life history perspective.

The contemporary analog to this approach is human behavioral ecology, which evaluates the role of “socioenvironmental” variables in producing behavioral
diversity and similarity across a range of human populations (Winterhalder and Smith, 2000). The underlying assumption of this research is that human behavioral choices are optimized by natural selection based on the benefits and costs of behavioral choices within each environment. Winterhalder and Smith (2000) note that human behavioral ecology is distinct from most approaches in cultural anthropology because the approach relies on Neo-Darwinian and hypothetico-deductive reasoning. The work emphasizes the considerable plasticity in human behavioral choices, while simultaneously recognizing that these choices are constrained by environmental context and represent long-term adaptations shaped by natural selection – the currency of choices varies depending on environment (Laland and Brown, 2003). By and large, this approach values environment as a primary driver of socioecological and cultural transformation in hunter-gatherer lifestyles and does not interact with persistence, outside the auspices of evolutionary stable strategies. In addition, behavioral ecology does not differentiate between the deeper processes of change such as internally directed changes that promote sustainability or whole-scale transformations that render previous systems unrecognizable. Finally, behavioral ecology does not interact with the agencies and historical contingencies that structure human interactions with the natural world (Smith, 2013).

While these evolutionary paradigms are important mechanisms for interpreting culture change, the present volume also focuses on the enduring legacy of hunter-gatherer economies and how persistence may facilitate change within socioecological or cultural systems. In addition, the ways in which agency, learning, perception, and worldviews help structure these responses are emphasized (Cannon, 2011). This volume endeavors to demonstrate how hunter-gatherers produced enduring legacies in terms of subsistence (as materialistic and symbolic modes of production) and broader expressions of social identities such as mortuary rituals, embodied components of the self, relationships with nature, and ethnicity. Hunting and gathering requires intentionality and planning, specifically reflecting the individual perception of the environment in which organisms are defined according to essential attributes, and the individual controls interactions with the environment – Ingold (1988a: 274) labels this process “purposive social action,” referencing the production of subsistence economy and social interactions through hunting and gathering. This approach does not assume any particular social organization is tethered to hunter-gatherer lifestyles, but that the subsistence mode is tied to human relational boundaries. Here, hunter-gatherers are granted a broader agency through intentionality and identities that are symbolically bound to hunting and gathering as a way of life.

Cultural transmission among hunter-gatherers begins at a young age where visual observation, teaching, and copying form the basis for social learning (Jordan, 2014; Kamei, 2005; Muraki, 1999). Cultural transmission is seen as a conserved process and coherence of social traditions may follow predictable pathways. Items of a strictly functional purpose are more frequently subjected to modification in construction, while items with high levels of ritual or symbolic value as well as those with design
constraints have greater levels of coherence (Jordan, 2014). Within this framework, culture is seen as having a high level of ontological fidelity, and this fidelity likely helps maintain cultural transmission across generations. Of course, as pointed out by evolutionary ecologists, all populations are challenged by cultural and ecological imperatives that threaten survival. Under these circumstances, anthropologists must understand how these challenges are met. However, the dynamics of change are complex, and the deeply ontological nature of behavioral learning suggests that the framework for collective social action has both internal and external mediators. Cultures may transform or persist, and within persistence and transformation, the processes must be differentiated as having internal or external mediation.

Resilience theory provides an additional and useful theoretical lens through which hunter-gatherers must be evaluated and one that places hunter-gatherers within the framework of collective social action. The development of the resilience paradigm is associated with ecological systems theory, where this paradigm was first derived as an alternative to the study of extinction (Holling, 1973). The term resilience references the capacity of relationships within a system to absorb external stressors and persist (Holling, 1973). Examples of ecological resilience include circumstances in which organisms encounter changing landscapes, yet demonstrate persistence in terms of population size or foraging strategies. Socioecological resilience is the target of a vast majority of studies, and the socioecological system references the mutually dependent relationship formed by humans and the biosphere (Berkes and Folke, 1998). That is, the nature of the biosphere is determined by the behavior of surrounding animals, including humans, while human behavior is, in turn, influenced by the nature of the biosphere. The concept of resilience is often organized into adaptive cycles (Gunderson and Holling, 2002). These cycles are illustrated as a figure-eight, infinity symbol – adaptive cycles are associated with four specific phases: growth (use of the land for natural resources), conservation (accretion of natural resources from the land), release (sudden change within the panarchy2), and reorganization (returning to or building new basins of attraction3) (Figure 1.1).

Walker et al. (2004) differentiated between resilience, adaptability, and transformability as terms that respectively differentiate between what is maintained, how it is maintained, and the capacity to fundamentally alter the system in the face of failure. Thus, resilience focuses on persistence, while adaptation references the broader trade-offs or flexibilities that permit the preservation of cultural or ecological continuity. By contrast, transformability focuses on drastic alterations that render previous socioecological or cultural systems unrecognizable. Models of the adaptive cycle emphasize “revolt” and “remember” phases of reorganization that reproduce or produce newly resilient populations (Folke, 2006). Here, “remember” represents a

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2 Panarchy is a term that references the role and source of change within systems, and by turn, influences the capacity for resilience, adaptability, and transformation (Holling and Gunderson, 2002).

3 Basin of attraction is the region in state space in which a system tends to remain (Walker et al., 2004). The term may be used to describe persistent behaviors, socioecological conditions, or landscapes. Basins of attraction are featured during the reorganization phase of the adaptive cycle and may be reproduced or newly produced through transformation.
pattern of adaptability and resilience within the system, while “revolt” represents transformation of the system. Conceptual models of resilience/adaptability and transformation provide a useful way to differentiate these processes (Pearson and Pearson, 2012): Resilience/adaptability is associated with adaptive shifts that are derived from the internal components of system identity. By contrast, transformative change is associated with movement away from the preexisting system, often highlighted by external solutions to problems that make a system untenable.

Archaeological research focuses on sustained time periods, and therefore provides unique contexts for incorporating resilience theory (Redman, 2005). Examples of this incorporation are demonstrated by studies evaluating the persistence of salmonid fishing over a 7000-year period in the Pacific Northwest, as well as those challenging the myth of collapse in some of the most famous anthropological examples of social disintegration (Campbell and Butler, 2010; McAnany and Yoffee, 2012). Overall, the use of resilience theory has great importance in explaining how humans use local knowledge and behavioral plasticity to mitigate the stressors of environmental perturbations, while maintaining unifying themes in cultural identity. The concept is flexible enough that populations are not viewed within the linear vacuum of replacement versus stasis, but instead are seen through a lens of complexity that is willing to grant that cultures experience environmental transitions in myriad ways and behavioral changes permit the persistence of important hallmarks of cultural identity. Thus, the reorganization of populations following environmental change does not necessitate collapse or whole-scale changes to the cultural identity of local populations, but instead revolves around persistence and plasticity: persistence of

Figure 1.1. Model of the adaptive cycle after Holling and Gunderson (2002). Image produced by Brandie S. Temple.
behaviors that are important to the maintenance of cultural identity and plasticity in behaviors that permit survival in a changing world.

As noted above, a comprehensive study of hunter-gatherers relies heavily on knowledge, historical contingencies, perceptions, and worldviews structuring behavior (Cannon, 2011). In this sense, resilience theory should also be applied to hunter-gatherer cultural systems. The concept of cultural resilience is defined as “the capacity to maintain livelihoods that satisfy material and moral (normative) needs in the face of major environmental or sociopolitical shocks” (Crane, 2010: 2). Cultural resilience frequently interacts with ethnicity as ethnicity references a group of individuals who are defined based on common cultural beliefs, practices, and values (Kent, 2002a). The persistence of ethnic identity, in particular, receives special attention in terms of cultural resilience because these affiliations buffer against stress through the maintenance of broad networks of social support (Clauss-Ehlers et al., 2006). In addition, resilient cultural systems also grant agency to flexibility within socioecological systems or interact with these systems to produce socioecological resilience (Adger, 2000; Daskon, 2010). One way that ethnic identity interacts with resilience theory is through cultural memory (Redman and Kinzig, 2003). Archaeological research has the capacity to uncover evidence for the use of memory in a variety of contexts reflecting the material and symbolic components of social structure in the past, and the deep time perspective afforded to this research is particularly informative regarding persistence and transformation (Redman, 2005).

This volume also explores collapse as an end-point for some adaptive cycles and tries to understand how resilience may be associated with this process. Collapse is defined as a significant and rapid loss of sociopolitical complexity (Tainter, 1988: 4). Collapse is traditionally studied in complex socioeconomic systems, particularly in communities with evidence for massive redistribution networks and state-level governmental structures. However, the increasing number of studies in resilience, transformability, and collapse demonstrate that this process occurs across the spectrum of cultural complexity and also incorporates socioecological and cultural systems (Butzer, 2012; Butzer and Enfield, 2012). Thus, collapse is possible within hunter-gatherer frameworks. Collapse entails deconstruction of the system, usually reductions in complexity or diversity (Tainter, 1988). Populations experience demographic collapse through declining numbers or extinction, sociopolitical collapse in the form of eroded institutional complexity, socioecological collapse through contractions in subsistence diversity, and cultural collapse in the form of lost coherency (Butzer, 2012). Some attempts at exploring collapse emphasize transformation as an important component of this process: “Societal collapse represents transformation at a large social or spatial scale, with long term impact on combinations of interdependent variables” (Butzer and Enfield, 2012: 3628). However, many transformations lead to improved systems, or at the very least, systems that allow populations the ability to continue living within a specific environment, even under severe duress (Hegmon et al., 2008; Pearson and Pearson, 2012). Collapse is, in this sense, differentiated from transformation. In including collapse in this volume it is also important to note that populations experience stress from multiple external agents including disease or
aggressive neighboring populations (Solich and Bradtmöller, 2017). Thus, even in circumstances in which populations appear resilient to challenges that arise through ecological perturbation, additional agents may challenge populations in ways that diminish population size and structure.

One important criticism levied upon resilience theory is that the paradigm strongly resembles systems theory, and in fact, initial explorations of resilience theory are derivative of this paradigm (Holling, 1973). Systems theory assumes that a series of interrelated hypotheses may be subsumed under a broad generalization, and that broad generalizations act as a primary starting point for understanding differentiation within organizations (Blau, 1972). This approach relies on a top-down process of deductive reasoning in which the confirmation of hypotheses at higher levels of generalization acts to prove those at lower scales (Hempel and Oppenheim, 1948). Faulseit (2016) points out that resilience theory is differentiated from systems theory by a “bottom-up” approach, addressing interactions of increasing scale. In addition, it is noted that the adaptive cycle includes differentiated systems within the panarchy, specifically how small/rapid and large/slow changes produce varied, often unpredictable outcomes (Faulseit, 2016).

In addition, systems theory views broad generalizations (i.e., systems) as mutually exclusive epi-phenomena linked through independent, increasingly small-scale observations (Blau, 1972; Hempel and Oppenheim, 1948). The strength of this approach is interconnectedness within each system. However, this remains problematic for the practice of anthropology as it presumes that “humanness” is compartmentalized into non-interacting, bounded systems, reinforcing a so-called science–theory divide in the evaluation of human culture in one instance and socioecological systems in the other. By contrast, approaches associated with practice theory focus on human agency as producing and reproducing variation and interaction within and between institutions, ecosystems, and even bodies (Bourdieu, 1972). Resilience theory has addressed this problem, specifically through the introduction of cultural resilience (see above) as an independent or interactive agency. Cultural resilience may be found under circumstances of transformation in socioecological systems, demonstrating the persistence of behavior as a social tradition. Cultural resilience may interact with socioecological conditions acting to legitimize transformations in behavior, thus demonstrating flexibility in system function through collective action and agency (Daskon, 2010). Cultural resilience also exists independent of socioecological resilience by responding to social, political, or environmental change through behaviors outside the domain of the socioecological system (Adger, 2000). Socioecological resilience is dependent upon entire cultural systems established around and supported by the biosphere (Berkes and Folke, 1998; Folke, 2006; Walker et al., 2004). In terms of studying hunter-gatherers, the interactive component of the cultural and socioecological system is emphasized as this behavior helps demonstrate the broader production of hunting and gathering through collective social action (sensu Ingold, 1988a), or what might be termed the reciprocal relationship between socioecological and cultural practices in hunter-gatherer worlds. In this sense, resilience theory,
as applied to bioarchaeological contexts involving hunter-gatherers, interacts with the human element of socioecological and cultural practices.

1.3 Archaeological Analysis of Persistent Hunter-Gatherers and Social Memory

Resilience theory is centered on the concept of persistence, or the ability to thrive in response to perturbations. Numerous archaeological studies (see below) engage with the idea of persistence in socioecological and cultural systems as well as endurance between the two. *The Oxford Handbook of the Archaeology and Anthropology of Hunter-Gatherers* (Cummings et al., 2014) sets forth a series of chapters that outline the persistence of hunter-gather socioecological systems through the agricultural transition in a variety of locations. These chapters represent an important contribution to the study of hunter-gatherer lifeways by demonstrating the longstanding, enduring legacy of hunting and gathering economies across one of the most transformative events in human history. The chapters evaluate hunter-gatherers in terms of subsistence strategies and include novel conceptualizations of the agricultural transition including *in situ* cultural developments that incorporated local hunter-gatherer knowledge of surrounding ecological systems. An entire subsection is devoted to the Neolithization [sic] of Europe, and these works focus on various iterations of a diffusion versus replacement model of agricultural adoption. Many of these works do not directly invoke resilience theory, but the idea of hunter-gatherers as persistent populations as opposed to those groups thriving in a state of arrested development is clear, as is the integration of culture as a social tradition (Cummings, 2014).

Archaeological research also explores the persistence of hunter-gatherers through social memories. Persistent places may be defined as landscapes of renewal where populations migrated into and away from particular locations, often coming together at designated times or for specific purposes (Schlanger, 1992). Social memories are associated with collective population-wide memories of events, places, or individuals that are invoked through various figures such as stories, images, or other sensationalizing experiences (Assman, 1995; Halbwachs, 1925). Persistent hunter-gatherers in North America altered the landscape to construct burial mounds that acted as immediately visible citations of the past, in many cases referencing ancient inhabitants of the landscape during subsequent agricultural periods (e.g., Buikstra and Charles, 1999; Thompson and Pluckhahn, 2010). The powerful nature of cultural memory in the mortuary context is exemplified by the deep roots of the ethnohistorically documented feasting rituals of the Huron and Algonkian people, which have archaeologically visible ties to prehistoric mortuary ritual among earlier Hopewellian people (Carr, 2005).

Archaeological mortuary practices are also deeply tethered to the practice of collective memory and cultural identity in a variety of contexts. Prehistoric Yayoi-period farmers from Japan produced cemeteries with spatial structuring that required funeral processions to walk past earlier burials, demonstrating an acknowledgment...
of genealogy among these prehistoric populations (Mizoguchi, 2001). In using a macro-regional perspective, Thompson (2010) argues for the production of persistent places in the form of large-scale shell mounds during the southeastern US Middle Archaic as a variable process. These sites were produced through variable temporal rhythms including short-term events repeated over long-term occupations as well as short-term events with evidence for a hiatus between occupations. In a more recent intensive study of the El Montón site on Santa Cruz Island, evidence for persistent occupation is found in dwelling structures, burial practices, feasting, and the accumulation of material debris over a 4000-year period (Gamble, 2017). As a whole, the site preserved large-scale features that were visible from great distances and acted as daily reminders of earlier occupations, with evidence for rituals that reference these ancestral behaviors. In another example, hunter-gatherers along the Okeechobee River Basin, Florida modified local landscapes over a 2000-year period. The persistent nature of this behavior was sustained by the production of resource surpluses across these communities, suggesting interaction between cultural and socioecological resilience (Thompson, 2016). As a whole, archaeological studies of persistent behaviors and landscapes offer an important glimpse into the resilience of past populations – while some of these studies do not reference resilience specifically, the enduring nature of practice across transformative events suggests resilience was an omnipresent theme in the lives and lifestyles of these populations. In some instances, these behaviors collapse in response to drastic changes in the panarchy (e.g., Thompson, 2010), but the overall story is one in which behaviors and places acted to preserve the enduring legacy of ancestors.

1.4 Bioarchaeological Analyses of Hunter-Gatherers

Bioarchaeological research uses human skeletal remains and their associated mortuary contexts to explore the biocultural dimensions of the human past (Buikstra, 1977). A number of bioarchaeological studies evaluate the consequences for culture change among hunter-gatherers, specifically addressing the impact of climate change, ecological variability, hostile environments, and contact on the skeletal manifestations of physiological stress, activity, diet, and disease (Bernal et al., 2007; Cybulski, 1994; Hilton et al., 2014; Hoover and Matsumura, 2008; Lambert, 1993; Lieverse et al., 2007; Merbs, 1983; Temple, 2007; Walker and Lambert, 1989). In addition, morphological analyses of hunter-gatherer skeletal remains elucidate the broader process of functional and climatic adaptation to regional landscapes and subsistence activity (Auerbach, 2014; Stock, 2006; Stock and Pfeiffer, 2001, 2004; Temple and Matsumura, 2011; Weiss, 2003). These projects contribute to a greater understanding of hunter-gatherer diversity and adaptation. Hunter-gatherer communities also have important ceremonial and symbolic components tied to subsistence economies, mortuary ritual, and embodied aspects of identity (Fitzhugh, 2014; Kusaka et al., 2008; Losey, 2010; Losey et al., 2011; Maher et al., 2011; Stojanowski et al., 2014; Temple et al., 2011). The persistence of these behaviors in total is an important target of bioarchaeological inquiry.
The bioarchaeological approach also uses skeletal and dental indicators of stress among hunter-gatherers to evaluate biological and cultural variability across major adaptive transitions. This approach draws upon data collected from hunter-gatherer skeletal remains as a source of comparison. The initial bioarchaeological studies of the agricultural transition found that this period was associated with a degeneration of human well-being, exemplified by increases in dental caries, chronic systemic infection, growth disruption, and metabolic disease when compared to hunter-gatherer skeletal samples (Cohen, 2007; Cohen and Armelagos, 1984; Larsen, 1987, 1995). These findings allowed bioarchaeological research to question the Hobbesian view of civilization, while embracing the romanticized view of hunter-gatherer economies as highly efficient and exuberant communities, a theoretical paradigm resurrected by Sahlins (1968) and provided the appellation *Original Affluent Society*. A spate of later studies questioned the broader applicability of these findings, reporting that growth disruption, dental caries prevalence, evidence for chronic infection, and micronutrient deficiencies did not increase between hunter-gatherers and agriculturalists, and in many cases, agricultural economies acted to diminish local stressors through trade-offs with elevated fertility (Clark et al., 2014; Eshed et al., 2006; Lambert, 2009; Pietrusewsky and Douglas, 2002; Temple, 2010; Temple and Larsen, 2013). The findings of these more recent inquiries suggest that the agricultural transition, and hunter-gatherer biological variation specifically, cannot be categorized into the binary oppositions (healthy/unhealthy, mobile/stationary) created by Enlightenment and Romantic era philosophers. Instead, differences in mobility and well-being between hunter-gatherers and agriculturalists more likely represent regionally specific constellations of biocultural variability that were constrained by local environments. This approach clearly reflects a historical particularist paradigm. However, the idea that these populations experienced a mosaic of cultural adaptations that were guided by local ecologies should not be understated, as it is within the context of these regionally specific events that the broader process of cultural evolution and resilience is observable.

Bioarchaeological research that used hunter-gatherers as a benchmark to measure the relative success of the agricultural transition sought to elucidate the impact of culture change on human biological and cultural variability. Because hunter-gatherers acted as the earliest template for all agricultural societies, hunter-gatherer skeletal samples were invariably incorporated as the “before” snapshot in the range of human biocultural variation. The consequence of this paradigm for hunter-gatherers is unfortunate. Hunter-gatherers were inadvertently treated as a progressive phase leading toward agricultural economies, existing as a novelty or sample by which to measure the relative success of agriculture. While it is a truism that all agricultural and state-level societies are traceable to hunter-gatherer beginnings, it does not follow that an agricultural revolution is the only attainable form of cultural evolution available to hunter-gatherer communities (Bettinger, 1991; Fitzhugh, 2003; Jordan, 2014; Kent, 2002a; Marlowe, 2002; Steward, 1955).

The social history of bioarchaeology explains the inadvertent relegation of hunter-gatherers to “before” snapshots in the story of human evolution. Bioarchaeology
was developed as a contextual application of skeletal biology – it incorporated the theoretical paradigms of cultural ecology and processual archaeology to data collected using the methods of skeletal biology and paleopathology (Armelagos, 2003; Buikstra, 1977). This approach represented a radical departure from the essentialist, racial proscriptions of early twentieth-century skeletal biology, and this period of intellectual development represented the rise of a new theoretical paradigm following the intellectual crises of racial anthropology. The approach was largely successful as bioarchaeological research increasingly emphasized hypothesis testing and a process-based approach – one interested in testing the impacts of culture change and evaluating evidence for social complexity (Larsen, 2005). At the same time, the new approach received criticism for failing to interact with archaeological context (Goldstein, 2006) and an overreliance on a binary approach (positive/negative) to understanding the consequences of culture change (Temple and Goodman, 2014). These critiques should be reconciled against the idea that modern bioarchaeological theory was born out of a paradigm that privileged the causes and consequences of culture change, while unintentionally discounting the importance of persistence or interrogating the deeper internal versus external nature of these changes. In this sense, past bioarchaeological treatments of hunter-gatherers represent a historically progressive event, but one that was tethered to a cultural ecological paradigm. Despite this shortcoming, past bioarchaeological treatments of hunter-gatherers represent an important starting point for interrogating the evolution and endurance of hunter-gatherers as these approaches embraced hypothesis testing and resistance of racist typologies.

Bioarchaeological evidence for adaptation and resilience in the face of ecological disturbance is reported and represents an important theoretical foundation for ideas expressed in this volume, though not all of these studies explicitly interact with resilience theory (Baker and Kealhofer, 1996; Hoover and Hudson, 2016; Klaus and Tam, 2009a). An interest in adaptation and resilience in bioarchaeological context first appears in an edited volume that sought to highlight the idea that American Indians were not passive actors in the process of contact (Baker and Kealhofer, 1996). Instead, American Indians adapted to the culture changes associated with European colonization of the New World, and in many cases experienced persistence of cultural identities. Baker and Kealhofer (1996) argue that culture change does not necessitate collapse, and that adaptation combined with persistence is a normative hallmark of such processes.

In early historic Peru, the chapel of San Pedro de Mórrope yields evidence for mortuary practices that demonstrate the persistence of Moche ceremonial behavior within colonial rituals (Klaus and Tam, 2009a). Resilience of local beliefs and integration into Catholic doctrine represents a process of ethnogenesis for the colonial Muchik people who actively manipulated traditional beliefs during a time of unprecedented and generally negative social, political, economic, and ecological change. It is important to note that this trend is documented during a period of increased systemic stress. Klaus and Tam (2009b) report evidence for increased growth suppression in prepubertal children, chronic infectious disease, and suppressed fertility.
Thus, this work documents persistence of culture in increasingly vulnerable populations. The work (Klaus and Tam, 2009a) also emphasizes ethnogenesis, but the merging of identities found in the construction of colonial Muchik culture certainly represents the enduring legacy of earlier Moche communities.

More recently, resilience was explored among prehistoric Jomon foragers from northwestern Kyushu, Japan in relation to the introduction of wet-rice agriculture (Hoover and Hudson, 2016). The work uses archaeological evidence for the persistence of Jomon hunting and gathering for several centuries into the Yayoi cultural phase. Few changes in the frequency of dental and skeletal indicators of stress are reported during a period in which agricultural economies were introduced to the region from Northeast Asia. These results suggest that the persistence of an autonomous Jomon culture forestalled the shifts in stress patterning that are common in many studies of the agricultural transition (e.g., Cohen and Armelagos, 1984; Larsen, 1987, 1995) – here, similarities in stress experiences are used to evidence resilience on the part of indigenous Jomon cultures across the transition to wet-rice agriculture. Findings reported by Hoover and Hudson (2016) are integral to the themes of this volume because this work demonstrates that the replacement of hunter-gatherer economies is not an inevitable result of contact with agricultural populations and that autonomous hunter-gatherer cultures resist biocultural changes associated with agricultural economies.

Taken as a whole, findings from these studies suggest that the application of resilience theory to bioarchaeological research provides an opportunity to understand how populations absorb the stressors of cultural and ecological transitions and persist or transform. Bioarchaeological evidence of behavior elicited through studies of diet, mobility, stress, disease, mortality, and/or mortuary practices may provide evidence for sudden/drastic or slow/gradual behavioral changes and the extent to which such changes involve internal or external mediations of the system. In particular, populations are often challenged by abrupt cultural or ecological disruptions, and bioarchaeological research has the capacity to explain where shifts occur in socioecological and cultural systems in response to stressors and whether internal or external remedies are sought.

Bioarchaeological research can also evaluate precariousness. Precariousness references the threshold for change within a socioecological or cultural system (Walker et al., 2004). Bioarchaeological evidence for the stressors absorbed as well as mortality risk may provide evidence for latitude (maximum change a system may sustain) or resistance (the relative ease or difficulty in changing a system). Specifically, the circumstances in which evidence for stress is found may increase the precariousness of a population yet still promote resilience and adaptability through varying degrees of latitude and resistance. Stressors that exact mortality may help push populations beyond this threshold and promote transformation as the system becomes untenable.

Finally, bioarchaeologists have the capacity to identify collapse and understand how this process fits within resilience theory. Bioarchaeologists may highlight the context for collapse and transformation by evaluating rigidity and vulnerability. Rigidity and diminished quality of life may increase the precariousness of
socioecological and cultural systems and increase the likelihood of collapse as these populations may be less responsive to sudden or drastic changes within the panarchy (Folke, 2006; Hegmon et al., 2008; Walker et al., 2004). Bioarchaeological studies may also see evidence for persistence following collapse or transformation, adding further complexity to the issue of culture change. These studies dare to ask if collapse is ever truly observed (McAnay and Yoffee, 2010).

1.5 Edited Volume Organization

The chapters in this volume provide an initial step in identifying how bioarchaeological research has the capacity to answer questions surrounding resilience of socioecological and cultural systems. The volume is organized into three sections: socioecological resilience, cultural resilience, and collapse. These works address how human populations face challenges to socioecological and cultural systems. Internal and external changes represent trade-offs between resilience/adaptability and transformability, while in some cases collapse of the system reveals underlying vulnerabilities that were imposed by drastic change.

Socioecological resilience is explored by a number of chapters in this volume and is associated with patterns of diet and mobility (Pfieffer and Harrington, Bernal et al., Schulting, Temple, Cameron and Stock). Pfieffer and Harrington provide a broad overview of lifestyle including environmental stress exposure, interpersonal violence, and habitual activity in Late Stone Age hunter-gatherers from the South African Cape. The work uses human skeletal remains to provide a longue durée viewpoint on the capacity for population persistence, survival of tradition, and the environmentally specific nature of adaptation in groups from this region. The work also seeks to place variation in morphology such as body size and skeletal growth in the context of a resilient population, one in which environmental challenges were abated by material technology. Bernal et al. explore questions of socioecological and demographic resilience using zooarchaeological data and mitochondrial DNA analysis during the Pleistocene–Holocene transition in Patagonia. Often referenced based on demographic collapse during the late nineteenth and early twentieth centuries, this work explains how populations adapted to change during intense climatic oscillations while maintaining the demographic character of the population over an approximately 10 000-year period. Importantly, the work speaks to the broader themes of resilience/adaptability and transformation by exploring how shifts in local behaviors helped maintain population survival. Evidence for persistence in these indigenous hunter-gatherers is of particular importance since European colonialism wrought incredible suffering and eventual extinction in this region. In Northwestern Europe, Schulting explores how populations exposed to climatic changes and agricultural economies responded to these challenges. Here, Schulting uses stable isotope analysis to understand how flexibility and rigidity in dietary behavior may be associated with persistence and transformation of socioecological systems. Thus, the work speaks to how the internal systems of populations may render these groups vulnerable to change or permit persistence in changing environments.
In another instance, Temple uses dental caries prevalence and long bone diaphyseal morphology to explore questions regarding resilience/adaptability or transformation of socioecological systems in response to climatic cooling during the Late/Final phase of the Jomon period. The work seeks to understand whether these populations experienced whole-scale change in terms of diet and mobility patterns, or if changes were experienced within the internal parameters of the preexisting socioecological system. In addition, archaeological mortuary analysis is used to understand whether shifts in burial practices represent transformation of the cultural system, or whether these changes were grounded in internally resilient components of the Jomon socioecological system. Finally, tooth extraction patterns between the two phases of the Jomon period are also used to explore questions regarding how ethnic identity may persist across time and space and how collective cultural memory produces cultural resilience. Cameron and Stock explore how long bone diaphyseal morphology corresponds to differing phases of the adaptive cycle during the introduction of herding economies to South African hunter-gatherers. The work seeks to characterize functional adaptation to hunting and gathering environments as a baseline for diaphyseal morphology. The chapter then seeks to differentiate between resilience/adaptability and transformation during the arrival of herding practices from southern Africa, particularly as it corresponds to habitual activity.

Cultural resilience as expressed through mortuary practices, dietary behavior, skeletal indicators of stress and disease, mobility, and evidence for interpersonal violence is also explored by a variety of chapters (Da-Gloria and Bueno, Latham and Coupland, Bornemann and Gamble, Stojanowski, Justice and Temple, and Bartelink et al.). Da-Gloria and Bueno use bioarchaeological data to explore the question of persistent places and resilience in the hunter-gatherers from the Lagoa Santa karst formation in Brazil. This geological formation was continuously, though variably, occupied over a 7000-year period, and populations thriving within this landscape between 9000 and 7500 BP left evidence for intensive mortuary programs. The chapter utilizes these skeletal remains to evaluate bioarchaeological evidence for stress, diet, disease, and interpersonal violence. These data help explain whether the populations of this region bear similar bioarchaeological signatures to other persistent hunter-gatherers, or if there are unique bioarchaeological signatures in the Lagoa Santa remains that are particular to time and space. In addition, the chapter challenges interpretations of abandonment of the region with archaeological evidence for changes in territorial strategies aimed at maintaining persistence of place.

Bornemann and Gamble evaluate cultural resilience in prehistoric indigenous populations from California during the earliest stages of contact with European colonialists using archaeological mortuary analysis. The work draws upon theoretical paradigms emphasizing socioeconomic inequality as well as ritual and symbol in the structuring of these behaviors, and explores how these rituals shifted due to interaction with new cultures, yet remained anchored to preexisting cultural systems.

Stojanowski approaches resilience in a sample of hunter-gatherers from the Gobero paleolake formation in Niger through the evaluation of dietary practices as an embodied form of cultural identity. The work compares oral indicators of diet and
disease between Early and Middle Holocene occupations of the sites to one another
and three pastoralist economies to understand whether a dietary shift to pastoralism
is possible to detect. The work incorporates archaeological evidence for diet and
ritual practice to further tease apart this question, focusing on the idea that the
hunting and gathering/pastoralism dichotomy is a deeper reflection of cultural
practices.

Letham and Coupland evaluate lavish burial practices in hunter-gatherers from
the Pacific Northwest to understand whether mortuary ritual among these popula-
tions helped promote cultural resilience. Hunter-gatherers from the Pacific North-
west Coast are well known for lavish ceremonial practices that include ritual
displays of wealth through gift giving and disposal of material items. These
ceremonies often manifested as funerary rituals, and the chapter by Letham and
Coupland explores how these rituals promoted social stability during times of
environmental stress and social turmoil. Thus, the chapter seeks to demonstrate
that funerary rituals acted as a primary way to reinforce and perpetuate cultural
traditions in these hunter-gatherers.

Justice and Temple use archaeological mortuary practices to explore the concept of
cultural resilience following population migration away from, and back to, Point
Hope, Alaska. These migrations resulted in the production of the Tigara culture, a
population event associated with ethnogenesis between Ipiutak and Birnirk cultures.
The chapter focuses on Ipiutak and Tigara pre-adult skeletal remains and mortuary
treatment. The chapter tests the hypothesis that the two populations demonstrate a
shared disposition toward the use of mortuary symbols that reflect a reciprocal
relationship between hunting and gathering and cultural behavior, as well as the
possibility of a shared spiritual landscape. In addition, the chapter tests a second
hypothesis that predicts the ontology of personhood was similar between the two
groups and that these similarities will be reflected in the archaeological mortuary
record.

Bartelink and colleagues use skeletal indicators of interpersonal violence to chal-
lenge long-held assumptions regarding the relationship between violence and envir-
onmental challenges. Here, the work evaluates evidence for violence from contexts of
diminished ecological productivity (Little Ice Age) as well as during periods of social
turmoil associated with the introduction of new cultural traditions between the Early
and Middle periods. Comparing evidence for interpersonal violence over time and
space ultimately helps to explain how socioecological resilience and drastic cultural
transformation may impact the expression of violent behavior.

Population collapse and extinction is explored by the final two chapters. The
Sadlermiut Inuit people were lost to epidemic disease waves in the early twentieth
century. The chapter by Merbs provides bioarchaeological, archaeological, and
ethnohistorical evidence for the identity, subsistence economy, behavior, and disease
experience of the Sadlermiut population. These data represent the culmination
of more than 50 years of research among these hunter-gatherers. The work estab-
lishes evidence for isolation and intensification in socioecological practices,
while documenting demographic collapse. In a second case, Littleton provides a
bioarchaeological and ethnohistoric account of demographic and cultural collapse among the Australian Aboriginal populations of the Western Riverina. The chapter uses bioarchaeological and ethnohistorical accounts to portray a population that produced a highly resilient socioecological and cultural system. Bioarchaeological and ethnohistoric evidence is presented to understand how contact with Europeans eroded resilience within these populations, leading to collapse. These works strongly refute notions of vulnerability rooted in cultural evolutionist paradigms surrounding collapse, vulnerability, and technology. Instead, these chapters are included to illustrate that longstanding, intensive adaptation to a highly specialized environment and diminishment of resilience through colonial practices established the context for demographic collapse in these populations. It should be emphasized that in both instances, Littleton and Merbs effectively portray populations that were well adapted to harsh ecological conditions. Yet in both circumstances, collapse was accelerated by newly introduced agents (disease and aggressive colonization) that disrupted and diminished population size and structure. Thus, cycles of resilience are complex and must be considered across multi-causal states.

References


2 Regional Continuity and Local Challenges to Resilience among Holocene Hunter-Gatherers of the Greater Cape Floristic Region, South Africa

Susan Pfeiffer and Lesley Harrington

2.1 Introduction

2.1.1 Resilience in the South African Landscape

The southern African landscape yields evidence of human evolution that dates from long before the emergence of our species. It is also the site of early evidence for the complex behaviors associated with contemporary humans. The southerly region that provides the earliest, most complete record of our species is the Greater Cape Floristic Region (GCFR). This is an area of roughly 80,000 km², characterized by floristic diversity, abundance of geophytic plants, and other associated terrestrial food resources, abutting a resource-rich coastline (Allsopp et al., 2014). It is a region where the resilience of hunter-gatherer adaptations is apparent through diverse lines of evidence, including archaeology, genetics, and bioarchaeology.

There is archaeological evidence for the resilience of the knowledge needed to exploit the GCFR. Aspects of that knowledge are reflected in artifacts and in skeletal biology. The earliest evidence of sustained human success in the GCFR dates from MIS6 (from about 195,000 BP) (Marean et al., 2014). Perhaps the earliest distinctive characteristic of the GCFR Stone Age behavioral package is regular exploitation of marine resources. For this, nuanced understanding of lunar cycles and tides is required. From subsequent millennia, there is evidence of knowledge regarding the mental mapping needed to exploit patchy plant resources (Bradshaw and Cowling, 2014), including the skills needed to harvest underground storage organs; the ability to exploit plant and animal toxins (Deacon, 1992; Wooding et al., 2017); and the connectivity needed to maintain a social safety net. Taken together, this conceptual tool kit was unique to the GCFR and appears to have been relatively resistant to change during the Middle and Later Stone Ages (Barham and Mitchell, 2008; Deacon and Deacon, 1999; Marean et al., 2014; Mitchell, 2002). The continuity in distinctive technologies and ecogeographic decisions (about how to use and move about the landscape) can be used to provide evidence of the resilience of cultural traits in hunter-gatherer populations living in southern Africa, particularly between about 40,000 BP and the present period known archaeologically as the Later Stone Age (d’Errico et al., 2012, 2016; Marean et al., 2014).

This narrative meshes well with genomic evidence that consistently dates the divergence of the indigenous populations of southern Africa from about 160,000 to
110 000 BP (Nielsen et al., 2017). Archaeological and genetic lines of evidence complement one another (Schlebusch et al., 2012, 2013). Human burials add another line of direct physical evidence of people who lived in the GCFR. Though the bulk of the human skeletal record dates to the mid-Holocene, the homogeneity of cranial shape (Stynder, 2006; Stynder et al., 2007a, 2007b), dental size and shape (Black, 2014; Black et al., 2009), and diverse skeletal dimensions (Ginter, 2011) are consistent with the evidence that the population existed for many millennia, relatively undisturbed by major perturbations from new peoples or changes to regional climate (Bradshaw and Cowling, 2014). Insofar as resilience is defined as the property or the ability to maintain “healthy functioning” in response to external stressors (Bradt-möller et al., 2017), peoples of this region provide a superb example.

Bioarchaeology adds new dimensions to how resilience can be documented among people from the GCFR. Assessment of skeletons for the timing of growth disruption and evidence of stress markers, provides insights into the success of past lifeways. Aspects of the specific GCFR behavioral package are reflected in skeletal and paleodemographic characteristics. Reliance on trekking for exploitation of resource patches, exploitation of plant and animal toxins for hunting (facilitating light-draw bows), and use of tools for geophyte extraction can all be studied through biomechanical analyses. Reliance on marine protein sources can be evaluated using stable isotopes. Additionally, human skeletons provide evidence of biological stress during which challenges to resilience were addressed. Evidence for stress that appears to have arisen from population density in the second half of the Holocene includes transient variability in adult body size, territoriality, and interpersonal violence. These disruptions could have marked the end of the Late Stone Age, but seem not to have done so. Later Holocene responses to the arrival of a new subsistence option (pastoralism) were diverse, but hunting and gathering within the GCFR persisted until the historic era.

2.1.2 Population Continuity

Modern genetic diversity among descendants indicates that KhoeSan peoples were numerous since the origin of the lineage, with evidence of substantial numbers since at least 120 000 BP (Kim et al., 2014; Pugach and Stoneking, 2015; Tishkoff et al., 2007). Genomic studies have identified a tripartite, ancient KhoeSan population structure, with inner divisions variably attributed to linguistic (Scheinfeldt et al., 2010) and geographic (distance) (Montinaro et al., 2017). KhoeSan hunter-gatherer lifeways continued until European colonization (450 BP), after which time warfare,
disease, and enslavement eroded the lifeways of GCFR groups at the Cape. Northern and more interior regions were less directly affected by the European newcomers. Descendant San-speaking groups in more interior locales have continued to follow lifeways that include hunting and gathering to some extent. These populations now live in the modern states of Botswana, Namibia, Zimbabwe, and Angola, especially in the Kalahari.

While the GCFR groups known archaeologically may represent lineages that were somewhat distinct from the survivors of historic times (Morris et al., 2014), core components of the genome, tool kit, and subsistence approaches show strong links with ethnographically/historically known groups (Deacon and Deacon, 1999; d’Errico et al., 2012). Most descriptions of San-speaking peoples are observations from interior, semi-desert landscapes (the Kalahari and adjoining regions). The best-known works focus on the Ju’hoansi (or !Kung), G/wi, and /Xam (Lee, 1979; Marshall, 1958; Silberbauer, 1981; Skotnes, 2007). When drawing on this literature, one must avoid “reading back” the ethnographically documented situation into the prehistoric past, thus assuming rather than investigating similarities between recent and ancient societies (Barham, 1992; Wadley, 1992). While recognizing that the information is historically contingent, ethnographic and historic observations provide a framework for hypothesis formation in archaeology and bioarchaeology.

2.1.3 The Geographic Setting

The GCFR (Born et al., 2007), with its rich archaeological evidence of the Later Stone Age, is predominantly within the Western Cape Province, although it extends into the Eastern Cape Province along the coast. It reaches from the coast to the Cape Fold Mountains, which form a partial barrier between the coastal forelands and the higher, drier, more climatically variable interior of South Africa (Figure 2.1).

The GCFR is home of the fynbos (pronounced fain’boss, meaning fine bush in Afrikaans) and other unique plant communities. The region is characterized by restios (reeds), ericas, proteas, aloes, and plants with underground storage organs (known as geophytes or corms) (Cramer et al., 2014; Day et al., 1979). Differences in bedrock substrate and precipitation lead to locally distinct patterns of abundance, but throughout the area available plants provided food, bedding, medicinal products, and poisons used for hunting. The very high diversity of plants in the GCFR is one of the important distinctions between this environment and the Kalahari, where KhoeSan descendant groups are found today (Marean et al., 2014). Throughout the GCFR, small to medium-sized mammals could be exploited. The size and diversity of prey animals declined from the late glacial period to the Holocene, reflecting a drying of the climate throughout the region (Faith, 2013). Hunting technology included hafted, light poison-tipped arrows that delivered a neurotoxin, likely combined with the practice of persistence tracking (Wadley et al., 2009). Based on both the excavated material and dietary stable isotope studies, marine protein sources may have been more important than terrestrial sources for most communities. The frequently rocky shores reliably yielded food, through action of the cold Benguela oceanic current on
the Atlantic side and the warm Agulhas current on the Indian Ocean side (Jerardino, 2016; Jerardino et al., 2013). These are strong currents, with sharks, stingrays, and other hazards. Perhaps the absence of appropriate raw materials is a further explanation for the absence of boats (Marean et al., 2014). This was a coastal, not maritime, adaptation. There is no evidence for watercraft.

The cultural stage known as the Later Stone Age (LSA) of southern Africa, from ca. 40 000 BP to historic times, developed in situ from Middle Stone Age (MSA) antecedents (Ambrose, 1998), with some divergence of opinion about when to mark the LSA’s beginning (Barham and Mitchell, 2008; Deacon and Deacon, 1999; Mitchell, 2002; Villa et al., 2012; Wadley, 2015) and about the nature of the transition (Mackay et al., 2012). While archaeological evidence of the LSA can be found throughout southern Africa, the comparatively mild, stable climate and availability of resources made the GCFR region an important focus of hunter-gatherer exploitation. Both MSA and LSA populations are characterized as immediate-return hunter-gatherers (as per Woodburn, 1982). The most informative sites are found in rock shelters, many of which were used as habitation sites, sometimes for prolonged periods (but see Mackay, 2016).

Features of LSA material culture traced to the MSA (d’Errico et al., 2012) include hunting with bows and arrows, the use of composite poisoned bone arrowheads, relatively short and light spears, digging sticks weighted with bored stones, and the presence of standardized ostrich eggshell beads that were prepared using grooved stones (but see Pargeter, 2014; Pargeter et al., 2014). The exploitation of ostrich

Figure 2.1 The southern African Cape and the Cape Fold Mountains. Zones of winter (WRZ), summer (SRZ), and year-round (YRZ) rainfall are identified. The shaded region with Cape Town as its focus (to the left) is the region from which perimortem trauma cases have come. The small shaded area along the south coast (to the right) marks the location of Plettenberg Bay, the Robberg Peninsula, and Matjes River Rock Shelter. Map prepared by Robert Gustas.