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Human Ecology

Biocultural Adaptations in Human Communities

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1 History, Concepts, and Prospects

Humans are the ecologically dominant component in their respective habitats, certainly ever since they accomplished the transition from an extracting to a producing mode of food procurement. Humans attempt to appropriate nature, the living and inanimate environment, for their purposes by intervening in natural processes. They accomplish this within the framework of their personal interests and collective goals; and in order to reconcile and pursue these interests and goals, they develop strategies to facilitate the use their environment and to secure their survival. But at the same time humans are subject to change in the context of evolutionary processes, both biological and cultural. Human adaptation thus always embraces the twin aspects of cultural strategies and biological conditions and outcomes. The diversity and correspondence of solutions humans develop to co-ordinate these two sides of life support systems, to maintain and change them, is at the heart of human ecology.

Humans share their habitats with a multitude of other life forms. Like these, humans have to adapt to the given or, in the course of time, changing basic environmental conditions to achieve long-lasting use of their habitat. These basic conditions are largely provided by default settings in terms of certain natural factors, e.g. climate, geomorphology, soil properties or species diversity. However, humans themselves change these basic conditions by applying survival strategies, e.g. techniques, agreements, rules and modes of organisation, which they develop to facilitate survival in their habitat; and they manipulate and shape their environment as part of their adjustment strategies.

Humans first of all – and this again they share with other organisms – have to be suitably equipped with a set of biological traits to be adequately adapted to the respective environmental conditions. Such adaptive responses can be genetically coded, e.g. certain physiological reactions to cold or heat stress, and they provide a reaction norm of genetic plasticity from which different phenotypes emerge, are selected as successful responses to environmental variability and eventually lead to differences in allele frequencies between human populations (Cavalli-Sforza et al. 1994). But, more importantly, adap-

tive solutions for coping with ecological constraints are also found as culturally coded survival strategies. They take the form of acquired information that is constantly modified, increased and passed on across generations in a non-genetic, as it were socio-genetic, way. Although incipient cultural traditions can be observed in non-human primates (e.g. Tomasello 1999), humans are, above all, distinct in their ability to adapt culturally to ecological basic conditions. It is this flexible and lasting cultural adjustment, based on skills, knowledge and experience in achieving success or dealing with failure of environmental utilisation, which explains why humans have been so successful in spreading across the planet.

Their cultural, and to a certain extent also their phenotypic, variability allowed anatomically modern humans to seize a durable foothold, even far away from the habitat in which their natural history began. From an evolutionary point of view, such adaptations serve for nothing but survival in the first place and it is hard to tell whether this is about overcoming seasonal shortages or safeguarding long-term survival in a locality once it is inhabited. The two are inseparable. Human adaptability encompasses biological adaptations and, particularly, cultural responses and the concomitant behavioural reactions.

The variety of these cultural responses to different abiotic and biotic environmental conditions will be explored in the following. But it has to be kept in mind that environmental conditions perceived as natural today are in fact quasi-natural only, because they are uniquely shaped by humans, from subtle modification to radical change and interference, and may require new adjustments if necessary. The natural foundations of human existence are culturally mediated and the outcomes impact upon biological operational sequences: humans are genuinely biocultural by definition. These dynamic interrelations between humans and their environment are interconnected by functions and processes that are mutually dependent and affect each other. Therefore, the true meaning of biocultural refers exactly to a situation where biological conditions need to be explained as a result of the establishment and perpetuation of cultural strategies. But how and by which means do human populations succeed in long-term survival in a certain habitat? Can general patterns be identified or is the success of cultural variability due to characteristics in local strategies? In other words: How are biology and culture intertwined?

A common link for these questions comes naturally with the topic of food procurement, as the basic prerequisite for humans to engage with their environment and the resulting biocultural adjustments. Food acquisition is the trivial condition of physical survival. It is at the same time a basic way in which organisms participate in material and energy flows in their habitat. This immediate connection between subsistence and human culture has been an emphasis of research into human/environment relations and ecological studies in anthropology from the outset (see Sect. 1.1) and has *mutatis mutandis* not lost anything of its relevance. Therefore, this intertwining of biological

and cultural characteristics of human communities will be dealt with (Chaps. 2–5) in topics either directly related to subsistence, i.e. the conditions of food acquisition, or those closely connected with the determinants or consequences of resource use.

Using ecological principles and ecosystem theory in anthropological research on human local populations has substantially contributed to a better understanding of the role of humans in nature, their influence on the environment and their being shaped by the environment. Therefore, in the course of this chapter, fundamentals of ecology are briefly introduced. Subsequently, and building on it, the suitability of the ecosystem concept for an application to human populations is discussed and subtopics relevant for further discussion are addressed with regard to possibilities of their application and modifications necessary to suit the interpretation of the complex non-linear or multiple stable-state conditions in human ecosystems. This will be preceded by a concise overview of theoretical positions and methods underlying the observation and analysis of interrelations between humans and their environment. This overview is really only meant to provide a very brief account of major relevant ideas and concepts, flashlights as it were, and the reader is referred to the much broader coverage of anthropological theory given, for example by Layton (1997), Barnard (2000) or Harris (2001). Primarily, only those trends will be presented here from which theoretical conditions for a cross-cultural and ecosystemic approach can be derived. The time frame, therefore, emphasises concepts developed in the second half of the twentieth century. The scientific starting points are numerous and their development, temporal succession and mutual pervasion demonstrate both the change in evaluating the role of nature and environment in their effects on humans and likewise the change in evaluating the effects humans and human culture have on the environment.

1.1 Human Ecological Concepts: A Brief Overview

1.1.1 Environmental Determinism

Towards the end of the nineteenth and the beginning of the twentieth century, in the wake of colonial expansion, a constantly growing amount of information about foreign worlds had been accumulating. In order to classify exotic artefacts and ethnographic knowledge gathered through expeditions and voyages of discovery an attempt was made to systematically structure the evidence according to provenance. The observation that similar cultural characteristics were connected with certain geographical locations led to the assumption that the material culture and technology of a society was caused

by the specific makeup of the environment – the habitat in ecological terms (p. 3 in Hardesty 1977). The environment, in one way or another, was considered to have a determining effect on the possibilities of human cultural development. The view that similar environmental conditions would lead to similar forms in the political organisation of a society became popular in the emerging field of human geography, notably with the prominent proponent Friedrich Ratzel (1844–1904), but continued to be popular into the mid-twentieth century (e.g. Huntington 1945). Natural conditions such as climate or landscape were thus ascribed a strong formative power on human populations and their institutions, resulting in the notion of culture areas whose environmental make-up would define socio-economic expression of the human societies. Nature with its areas of different layout and composition provided, as it were, the default settings for paths of least resistance, by which humans reacted to the characteristics of their environment (p. 22ff in Moran 2000). It was this tradition of environmental determinism that called into play explanations of, for example, why dry areas were used to breed cattle rather than lay out irrigation fields. While the simplicity of this approach may have been attractive, its major assumptions have been proven wrong. The environment is not fixed and unchanging, nor are cultural responses to certain environmental conditions static. Rather, human culture kits are the result of flexibility, resilience and the ability to come up with alternative solutions even under the same or similar environmental conditions.

1.1.2 Possibilism

As a reaction to this strictly deterministic concept, a tradition of thought developed whose most eminent representative was Franz Boas (1858–1942). It was termed possibilism or historic particularism. According to possibilist thought, nature did not directly influence humans, but provided a framework and thus facilitated different possibilities of human development. Nature, as it were, offered the raw material from which traditions, belief systems or theories could develop. The role of nature was thought to be passive and any decision on the actual expression of culture traits, i.e. a realisation of the respective options under given environmental conditions, was due to the historic and cultural particularities and the selectivity by which societies made their choices. Human culture was not shaped by nature, but cultural decisions were thought to be subject to their own dynamics, so that cultural differences between populations would also be found in their respective particular cultural history. In the context of possibilism, it was not important to explain the origin of culture traits. Characteristics of the environment were not required in order to explain the presence of culture traits, but rather served as an explanation for their absence, i.e. the reason why they did not evolve. The absence of stone houses, for example, would be explained as a consequence of a lack of

appropriate raw materials in the habitat. Thus certain characteristics would not emerge, simply because they or the means to produce them were not available (p. 4 in Hardesty 1977).

This culture-centred view of humans within nature left little space for a dynamic role of the environment, but rather reduced it to a generally limiting element of human cultural development. At the same time, the emphasis on historical specificity precluded that similar environmental conditions could also lead to similar selectivity (p. 33ff in Moran 2000), i.e. the possibility of a cross-cultural comparative view was handicapped from the start by the primarily case-by-case nature of the possibilist assumption.

1.1.3 Cultural Ecology

Following the comparatively extreme theoretical positions of environmental determinism and historical possibilism, with their respective exclusive emphasis on either nature or culture, a quite different concept was developed during the 1950s. It broke with both traditions and instead postulated interrelations between humans and their environment, i.e. it proposed a dynamic view. In a seminal study, Julian Steward (1902–1972) developed the idea that causal connections would exist between natural environmental conditions, subsistence and the social structures of a population or society (Steward 1955). It was further postulated that those social and political structures which developed in societies under comparable environmental conditions and comparable subsistence patterns ought to show similar causal connections among themselves. This notion of a Cultural Ecology thus searched for regularities and common grounds in human behaviour, social structure and belief systems which would develop as responses to certain environmental situations. Steward's method was culture-comparative in time and space and designed with the aim to search for generalisations in the function and emergence of human behaviour. Conditions and modes of food acquisition constituted the most immediate link between environment and behaviour. The underlying mechanisms leading to the development of such behaviour were believed to represent a human universal, whose impetus would arise from the necessity to use the naturally available resources, such as food.

According to the concept of Cultural Ecology, social institutions possess an internal functional connection, e.g. as certain modes of production occur in combination with certain modes of social and political organisation or the division of labour in a society. On this condition, the effect of one variable on a limited number of further variables can be examined within the system, rather than having to examine the much more complex system of social organisation in its entirety. By emphasising diachronic comparison Cultural Ecology differs from classic functionalism (e.g. Malinowski 1960) in that it puts an emphasis on the investigation of change and its causes and less so on