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The movement of groups versus territoriality in the research into prehistoric hunter-gatherers – an overview

La circulation des groupes versus la territorialité dans la recherche sur les chasseurs-cueilleurs préhistoriques – un aperçu

Die Wanderung von Gruppen versus Territorialität in der Erforschung prähistorischer Jäger und Sammler – ein Überblick

Thorsten UTHMEIER

Abstract: The article is dedicated to the discussion of models that describe, and in part explain, different strategies of mobile hunter-gatherer groups to control access to limited resources. After an overview over the most important streams of research concerning territoriality in social sciences, geography, ethnography and archaeology, a short description of the different modes and scales of hunter-gatherer mobility is given. Although studies in cultural anthropology take into account a large array of ecological and social reasons in theory as explanatory factors for the development of territorial behavior, data available in the Palaeolithic record allows best for the specifics of the respective ecological context for the presence or absence of territoriality. The proposed definition of territorial behavior therefore focuses on the influence or control of the access of people to defined geographic areas in order to minimize the probability of conflicts over localized key resources. A survey of the available concepts to defend territory boundaries revealed that Palaeolithic populations with low population densities and high residential mobility most likely have practiced social boundary defense, which is based on a communicative system shared by both insiders and outsiders. The last section of the article discusses the scientific value of behavioral ecology to predict the presence of different modes of territoriality. Because it is based on the availability of resources, return rates and carrying capacities of different habitats, it is supposed that the ‘defendability model’ with its simple 2 by 2 contingency table may still be valuable in the investigation of Palaeolithic territorial behavior.

Keywords: Hunter-gatherer, Mobility, Territoriality, Social boundary defense, Communication, Behavioral ecology.

Résumé : L’article est consacré à la discussion des modèles qui décrivent, et en partie expliquent, les différentes stratégies des groupes de chasseurs-cueilleurs mobiles pour contrôler l’accès à des ressources limitées. Après un aperçu des principaux courants de recherche sur la territorialité en sciences sociales, en géographie, en ethnologie et en archéologie, une brève description des différents modes et échelles de la mobilité des chasseurs-cueilleurs est proposée. D’un point de vue de la territorialité, les données montrent qu’un large éventail de raisons écologiques et sociales doivent être prises en considération comme facteurs explicatifs. Les données disponibles pour les contextes paléolithiques permettent de cerner la relation entre les contextes écologiques et les comportements territoriaux. La définition proposée du comportement territorial se concentre donc sur l’influence ou le contrôle de l’accès des personnes à des zones géographiques définies afin de minimiser la probabilité de conflits pour des ressources clés localisées. Une enquête sur les concepts disponibles pour défendre les limites territoriales a révélé que les populations paléolithiques à faible

densité de population et à forte mobilité résidentielle ont très probablement pratiqué la défense des « limites sociales », qui repose sur un système de communication partagé par ceux intégrés à ce système et ceux qui en sont extérieurs. La dernière section de l'article discute de la valeur scientifique de l'écologie comportementale pour prédire la présence de différents modes d'exploitation des territoires. Parce qu'il est basé sur la disponibilité des ressources, les taux de retour et les capacités de charge des différents habitats, il est supposé que le « modèle de défendabilité » avec son simple tableau de contingence 2 par 2 peut encore être utile dans l'étude du comportement territorial paléolithique.

Mots-clés : Chasseur-cueilleur, Mobilité, Territorialité, Défense des limites sociales, Communication, Écologie comportementale.

Zusammenfassung: Der Artikel ist der Diskussion von Modellen gewidmet, die verschiedene Strategien mobiler Jäger-Sammler-Gruppen zur Kontrolle von begrenzten Ressourcen beschreiben und zum Teil erklären. Nach einem Überblick über die wichtigsten Forschungsströmungen zur Territorialität in den Sozialwissenschaften, der Geographie, Ethnographie und Archäologie werden die verschiedenen Arten und Maßstäbe der Mobilität bei Jägern und Sammlern kurz beschrieben. Hinsichtlich des territorialen Verhaltens bei prähistorischen Jäger*innen und Sammler*innen wird betont, dass in Anlehnung an soziologische und ethnographische Studien zwar grundsätzlich eine Vielzahl an erklärenden Faktoren in Betracht gezogen werden können. In Anbetracht der für das Paläolithikum und Mesolithikum zur Verfügung stehenden Daten ermöglichen aber vor allem Analysen der jeweiligen Umweltkontexte Vorhersagen zum Vorliegen und zum Ausmaß territorialen Verhaltens. Die vorgeschlagene Definition für territoriales Verhalten fokussiert deshalb auf die Kontrolle des Zugangs zu Gebieten, in denen Schlüsselressourcen vorkommen. Ziel ist die Minimierung der Wahrscheinlichkeit von Konflikten um örtlich begrenzte ökonomische und/oder soziale Ressourcen. Eine Zusammenstellung der verfügbaren Konzepte zur Kontrolle von Gebietsgrenzen bei Jäger*innen und Sammler*innen zeigt, dass die Wahrscheinlichkeit einer Kontrolle von lokalisierten Schlüsselressourcen vor allem bei Gruppen mit geringer Bevölkerungsdichte und hoher Residenzmobilität zu erwarten ist. Statt der Errichtung physischer Grenzen erfolgt die Kontrolle durch sozialen Diskurs, der ein allen Beteiligten bekanntes Kommunikationssystem voraussetzt. Der letzte Abschnitt des Artikels diskutiert den wissenschaftlichen Nutzen der Verhaltensökologie, um die Anwesenheit verschiedener Arten von Territorialität vorauszusagen. Da es auf der Verfügbarkeit von Ressourcen, den Ertragsraten und Tragfähigkeiten verschiedener Habitate beruht, wird angenommen, dass das „defendability model“ mit seiner einfachen zweidimensionalen Kreuztabelle immer noch wertvoll für die Untersuchung paläolithischen Territorialverhaltens sein kann.

Schlüsselwörter: Jäger-Sammler, Mobilität, Territorialität, Verteidigung sozialer Grenzen, Kommunikation, Verhaltensökologie.

THIS ARTICLE is concerned with situations where the mobility of one group is delimited by another group. More specifically, it tries to elucidate the limitations to the mobility of hunter-gatherers caused by the establishment of territories and their use rights. The main aim is to give an overview of basic approaches to territorial behavior among humans and their application to Palaeolithic hunter-gatherer societies.

‘TERRITORY’ AND ‘TERRITORIALITY’ – SOME BASIC DEFINITIONS

‘Territory’ and ‘territoriality’ are two closely intertwined concepts which must be defined before they are discussed. ‘Territory’ is the spatial reference frame for ‘territoriality’, while ‘territoriality’ is the behavior connected with the establishment and maintenance of territories (Casimir, 1990). Of course, definition is related to theoretical approach. In the case of territoriality in human societies, theories are applied from fields as diverse as animal ethology, ecology, and cognitive archaeology. The different definitions of each apply in their own right, in that they refer to specific aspects of territoriality. However, they are not exclusive and from my point of view can be used with profit in combination to describe the multi-factorial phenomenon of territoriality. The section starts with a very short summary of the history of research.

History of research

Summarizing overviews of the history of research into territoriality in both ethnographic and prehistoric studies can be found in Casimir (1990), VanValkenburgh and Osborne (2013) and Kelly (2013). Because territoriality impacts on many aspects of human societal and economical relationships, research on the subject goes back to the beginnings of cultural anthropology (table 1). According to VanValkenburgh and Osborne (2013), early reflections about territoriality were mainly published by the pioneers of social evolutionism. For example, Lewis H. Morgan considered territoriality to be the basic and primary element of social solidarity, anterior to all other elements of social structure (VanValkenburgh and Osborne, 2013). However, he was nevertheless convinced that territoriality was of little or no relevance in egalitarian societies, and that it only became important in stratified societies or states (Kelly, 2013, p. 152). This view changed with the growing corpus of data from ethnographic field studies. One of the first to challenge the view that the social structure of hunter-gatherers was too simple for the establishment of territories was, according to Kelly (2013, p. 152), Frank Speck (1915, cf. Kelly, 2013, p. 152). From the widespread distribution of the phenomenon, he concluded that it must have originated very early in human history and he was the first to argue for a correlation between the respective group size and the availability of the resources needed to sustain it.

Social evolutionism	Behavioral ecology and evolutionary ecology	Environmental approaches	Cultural geography	Agency-based approaches
<p>Hebert Spencer, 1877</p> <ul style="list-style-type: none"> - territory synonymous to ‘environment’ - parallel evolution of societies and controlled spaces into increasingly larger and more complex aggregates <p>Lewis H. Morgan, 1877</p> <ul style="list-style-type: none"> - basal element of social solidarity - evolutionary development from control through kinship to governmental control <p>Leslie White, 1949</p> <ul style="list-style-type: none"> - tribal societies cluster in villages with spatial divisions - civil societies control territories by political systems <p>Morton Fried, 1967</p> <ul style="list-style-type: none"> - egalitarian societies with open territorial systems - ranked societies with non-exclusive territories around villages - power in stratified societies and states based on property and territory control <p>Allen Johnson and Timothy Earle, 2000</p> <ul style="list-style-type: none"> - territoriality key to solve problems occurring at evolved stages of socioeconomic integration - family level: access to resources by kinship, control of territories impractical - local group level: control of territory by warfare (threats, organized battles) - regional polity: well defined territories controlled by professional militaries 	<p>Rada Dyson-Hudson and Eric A. Smith, 1978</p> <ul style="list-style-type: none"> - ‘defensibility model’ - correlation between resource distribution and socio-spatial organization 	<p>Claudio Vita-Finzi and Eric Higgs, 1970</p> <ul style="list-style-type: none"> - site catchment analysis - exploitation territory and annual territory as fixed properties 	<p>Edward Soja, 1971</p> <ul style="list-style-type: none"> - animal territoriality close analogy to human territoriality - ‘personal territory’ (egocentric space) and ‘societal territory’ (controlled by social institutions) <p>Robert Sack, 1986</p> <ul style="list-style-type: none"> - territorial control is an option on every social scale - territorial rights more easy to communicate than complicated sets of rules 	<p>Maria Nieves Zedeno and Derek Anderson, 2010</p> <ul style="list-style-type: none"> - short-range: agencies and practices of daily life - mid-range: social and political institutions - long-range: technological, ecological and ritual bodies of knowledge

Table 1 – Overview of basic approaches to the investigation of territoriality in ethnography, geography and archaeology.

Tableau 1 – Aperçu des approches fondamentales de l'étude de la territorialité en ethnographie, géographie et archéologie.

Tabelle 1 – Überblick über die grundlegenden Ansätze zur Untersuchung der Territorialität in der Ethnographie, Geographie und Archäologie.

In the 1960s, this paradigm was changed, and hunter-gatherers were perceived as groups whose mobility was not constrained by storage facilities, site infrastructure and territories and thus as societies without conflicts over resources (Lee and DeVore, 1968). This notion was mainly based on case studies of the Ju/'hoansi in southern Africa, presented during the influential conference 'Man the Hunter' organized by Lee and DeVore (1968). These groups were seen as the epitome of egalitarian, free-moving hunter-gatherers. Later in the 1970s, fresh ethnographic data showed that even among the Ju/'hoansi, a less visible, socially controlled, and yet localized territoriality existed for the use of waterholes (Lee, 1979; cf. Kelly, 2013, p. 155). At about the same time, behavioral ecology became influential in both cultural anthropology and archeology. Borrowing a model from animal ethology, resources – initially exclusively food resources – were perceived as cost-benefit units (Kelly, 2013, p. 156-158). This made it possible to link resource distribution, climate, and the degree of socio-spatial control of access to resources in models that allowed for cultural-anthropological and archaeological predictions. I will comment on one of these models, the 'defensibility model' by Dyson-Hudson and Smith (1978), in greater length in one of the following sections. At roughly the same time, important contributions came from cultural geography. Behavioral ecology and cultural geography – enriched by the cognitive aspects of territoriality that have come into focus in the last three decades – are the source for most of the definitions discussed here.

In the study of Palaeolithic societies, the term 'territory' is often neutrally used to specify areas of resource acquisition. The most widely used terminology distinguishes between 'annual territory' and 'seasonal territory', the latter often differentiated into the 'foraging radius' (or 'home-range', 'camp range') of daily procurement trips and the 'logistical radius' (fig. 1) of groups practising more complex subsistence tactics, with distant field camps for reaching far-distant critical resources (Binford, 1980; Kelly, 2013). Beyond these spatial units is the 'maximal territory', encompassing the total area in which information is gathered. Depending on the social density of the network, such areas can be large, especially when 'second-hand' information obtained through loose contacts with others outside the immediate network is counted as well.

Scales of mobility

Viewed on a large spatio-temporal scale, the subsistence tactics of most hunter-gatherers involve various degrees of mobility (see e.g. Lee and DeVore, 1968; Binford, 1980 and 1982; Kelly 2013, p. 77-113 for a more detailed summary), which, according to Murdock (1967), can be classified as fully nomadic, semi-nomadic, semi-sedentary, and fully sedentary. In general, this classification refers to the movement of camps occupied by the entire group, where a system of shelter, food accumulation, and food consumption is established. Movements of such camps are termed 'residential moves' (Binford, 1980

and 1982) or 'macro moves' (Weniger, 1991) (table 2). The most appropriate term for central places used by both the producers and the consumers of resources is perhaps 'home base' (Vita-Finzi and Higgs, 1970), because it not only describes the site's function, but also some of its social meaning. A wealth of literature addresses concepts of hunter-gatherer mobility (table 2), with numerous case studies for the Palaeolithic as well as for recent groups (for a summary see Kelly, 2013). Moves can be differentiated according to the number of people involved, their expertise, and the specific or generalized aim of the move, e.g., resource acquisition, relocation of the home base, visits to other groups, ritual purposes, etc. Depending on the approach, the motivation to move is seen variable, although in many analyses the underlying assumption is that resource acquisition is one of the major triggers. In fact, almost all ethnographic case studies show that even in sedentary or semi-sedentary groups, subsections of the group usually travel to areas distant from the home base in order to acquire resources. Substantial distinctions are often made between mobility in the vicinity of the home base, which allows a return for the night, more distant travel by some members of the group, requiring overnight stays away from the home base, and residential moves by the entire group. Complementing the macro moves of residential mobility, 'logistical moves' (Binford 1980 and 1982) or 'micro moves' (Weniger, 1991) make up the potential overall mobility of a group (table 2).

Another aspect of mobility is the distance of moves. While the distances between the home base and areas of activities from which sub-sections of the group return to the home base define the size of the 'site territory' (Vita-Finzi and Higgs, 1970) or 'camp range' (Binford, 1982), macro moves of the home base circumscribe the 'annual territory' (Vita-Finzi and Higgs, 1970) or 'annual range' of the group (Binford, 1982). In addition to ranges relevant for the actual exploitation of resources, ethnological studies show that hunter-gatherers also move within an 'extended range' (Binford, 1980, p. 8) which is regularly surveyed for intelligence purposes and – less often – includes a 'visiting zone' (Binford, 1982, p. 8). The 'extended range' overlaps with the contemporaneous ranges of neighbouring groups. It is important to underline that the different scales of mobility described above are nothing more than a heuristic model deduced from ethnographical studies. Whether the entire model is applicable to actual prehistoric cases, or only parts of it, must be verified on a case-by-case basis. For example, Kelley (2013, p. 85) suggests that ethnographic case studies should collect data on

'[...] (1) the number of residential moves made each year, (2) the average distance moved, (3) the total distance moved each year, (4) the total area used over the course of a year, and (5) the average length of a logistical foray.'

Be that as it may, ethnographic models not only allow expectations and testable hypothesis to be formulated, they also offer a suitable terminology for describing the phenomenon of interest.

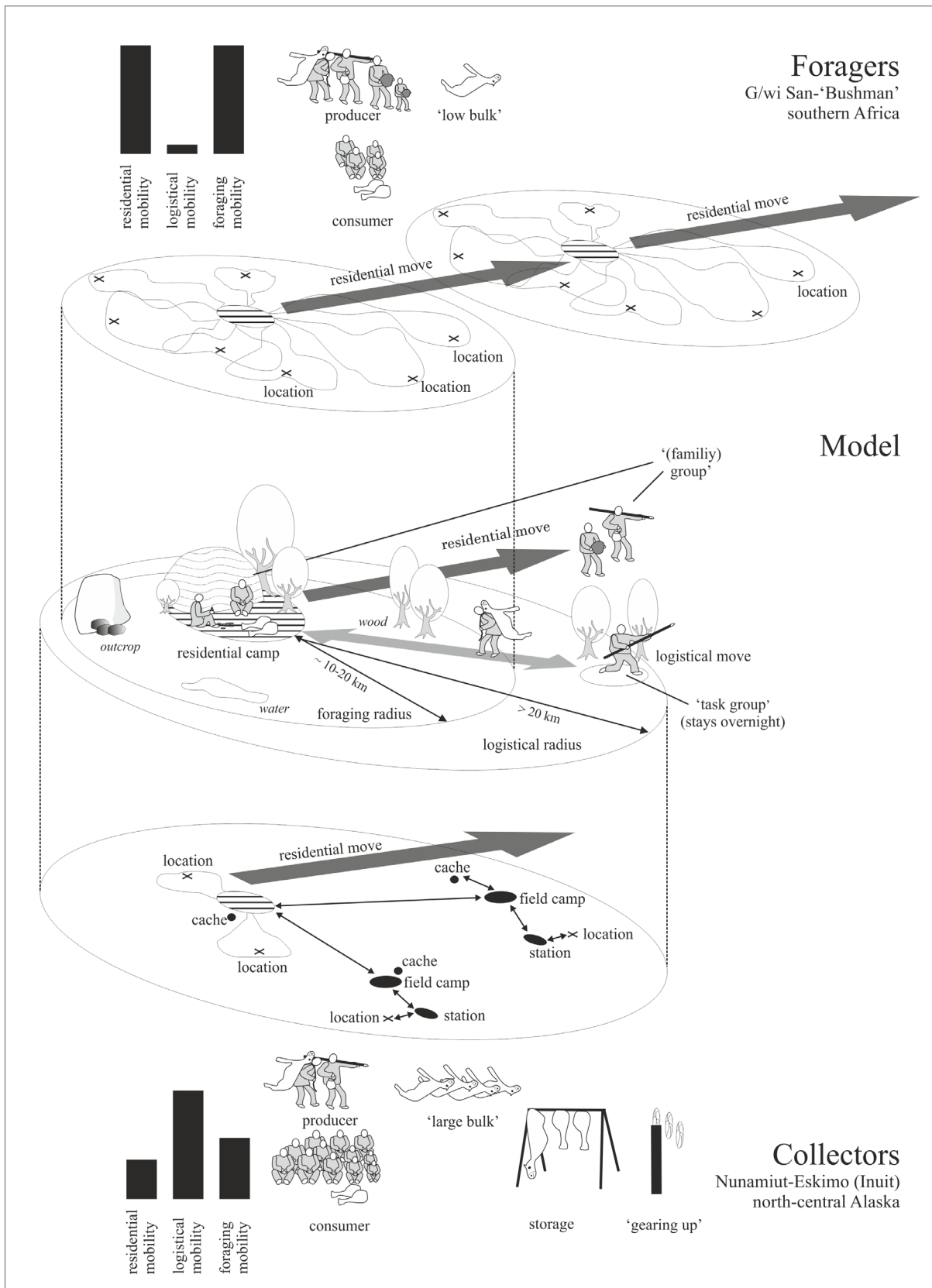


Fig. 1 – Key elements of mobility in the subsistence tactics of foragers and collectors according to Binford (1980) (taken from Chabai and Uthmeier, 2006, fig. 18-29).

Fig. 1 – Éléments clés de la mobilité dans les tactiques de subsistance des cueilleurs et des collecteurs d’après Binford (1980) (extrait de Chabai et Uthmeier, 2006, fig. 18-29).

Abb. 1 – Hauptbestandteile von Mobilität in den Subsistenztaktiken von foragers und collectors nach Binford (1980) (aus Chabai und Uthmeier, 2006, Abb. 18-29).

Author(s)	Spatial aspect	Terminology used by different authors and correlations proposed by the author of this article		
Binford, 1980	Area	camp range		annual range
		foraging radius	logistical radius	seasonal/annual territory
	Type of site	residential camp	field camp	all types of sites
Station, location				
Vita-Finzi and Higgs, 1970	Distance	home base	-	series of home basis with respective exploitation territory
		exploration territory		
Binford, 1980	Distance	10-20 km	> 20 km	Depending on habitat
		mobility around the residential camp on a daily basis		mobility without return to the residential camp on the same day
	Mobility	individuals and sub-group(s)	special task group	entire group
	Type of move	foraging move	logistical move	residential move
micro move		macro move		

Table 2 – Different scales of mobility of Prehistoric hunter-gatherers according to different authors.

Tableau 2 – Différentes échelles de mobilité chez les chasseurs-cueilleurs préhistoriques selon différents auteurs.

Tabella 2 – Verschiedene Maßstäbe der Mobilität bei prähistorischen Jägern und Sammlern nach verschiedenen Autoren.

In what follows, I will follow the suggestion of Binford (1982, p. 7) and use the term ‘range’ when dealing with subsistence tactics, and ‘territory’ when referring to inter-group competition. In addition, by using the term ‘home base’, I will try to avoid a common misunderstanding that equates the term ‘residential camp’ and/or ‘base camp’ with specific subsistence tactics.

Mobility and hunter-gatherer subsistence tactics

The spatial mobility of individuals and groups is best understood as a cross-cultural phenomenon, independent of specific economic or social systems. The everyday activities of the overwhelming number of humans in both prehistoric and later societies were and are related to various degrees of spatial mobility between one or more place(s) where cooperative social actors/units meet to collectively satisfy basic needs (nutrition, sleep), and specific places of resource acquisition, production or

social activity. Not only evident structures, such as stone dwellings and storage facilities, but other data, such as the occurrence of the ecological niche for house mice (Weissbrod et al., 2017), suggest that about 15,000 calBP a process started in the Levant which resulted in a considerable decrease in the annual mobility of hunter-gatherer groups (Bar-Yosef and Belfer-Cohen, 1991). Despite a certain variability, it is assumed that Natufian groups already led a semi-sedentary or even sedentary life. In the case of the European Palaeolithic, discussion of the possibility of a year-round presence at one and the same site is restricted to specific sites such as Dolní Věstonice (Wojtal et al., 2018). Apart from these, there is a large consensus that European Palaeolithic hunter gatherers lived as mobile – and not (semi-)sedentary – groups, and that therefore, regardless of their respective subsistence tactics, home bases (as locales where all cooperating members of the respective [seasonal] group met) existed and were moved. What did vary, depending on the subsistence tactics developed in relation to the temporal-spatial availability of

resources, knowledge of those resources and – probably – use rights to harvest them, was the frequency of moves, the existence and, if present, the number of ephemeral sites – e.g. ‘field camps’ and ‘stations’ for special tasks, in the terminology of L. R. Binford (1980 and 1982) – and the distance between these locales.

In the reconstruction of Palaeolithic mobility, the differentiation between the subsistence tactics of ‘foragers’ and ‘collectors’ proposed by Binford (1980 and 1982) was highly influential. In short, he proposed a continuum, at one end of which forager groups in habitats with an even distribution of resources made numerous residential moves over short distances in pursuit of those resources (‘camp to food’), while at the other end, collector groups in habitats with an uneven distribution of resources positioned consumers near to one critical resource and dispatched special-task sub-groups on long-distance trips to outlying stations to procure other resources (‘food to camp’). Based on classic ethnographic case studies, for instance, of the Palaeo-Arctic Inuit and the southern-African San, Binford (1982, p. 8-11) also developed different generalized patterns for the moving of home bases. According to him, foragers in resource-rich habitats mostly follow a ‘half-radius continuous pattern’ or a ‘complete-radius-leapfrog pattern’ with regular, but not far-reaching moves of the home base into neighboring camp ranges. In lower biomass environments, he argues that hunter-gatherer groups apply a point-to-point pattern of macro-moves, relying on previously acquired knowledge about distant resource availability.

It is not so much the heuristic value of Binford’s model of foragers and collectors that has been criticized as its untested and wholesale transfer to the Palaeolithic record. The Palaeolithic reality might have been much more variable. For example, studies of Middle Palaeolithic subsistence patterns in southern Germany (Richter, 1997) and the Crimea (Chabai and Uthmeier, 2006; Uthmeier and Chabai, 2010) discuss the possibility that one and the same group may have applied both ‘forager’ and ‘collector’ tactics within an annual cycle, or periodically, depending on seasonal or long-term changes in the accessibility of critical resources. Equally questioned is the strict correlation of cold environments on the one hand, and a strictly collector subsistence tactic on the other. One of the most prominent alternative hypotheses is the one proposed for the subsistence tactics practiced during the Magdalenian in the Paris Basin (Audouze, 2006) and along the shores of Lake Neuchâtel (Müller et al., 2006). Based on faunal analysis and evident structures, both studies come to the conclusion that the dispersed, to a large extent localized resources were not, as predicted by the collector model, procured by long-distance micro-moves between the home base and field camps or hunting stations. Instead, it is argued that the entire group moved from one localized specific resource to the next in a series of macro moves (‘serial specialists’: Kelly, 2013, p. 122-125, cf. Audouze, 2006, p. 692). One consequence of this is the observation that despite short times of occupation, a wide range of

activities was conducted at each of the sites (‘camp de chasse résidentiel’: Audouze 2006, fig. 2).

Territory as social phenomenon

Viewing territoriality as a social phenomenon, the cultural geographer Sack (1986) defined it as

‘the attempt by an individual or group to affect, influence, or control people, phenomena, and relationships, by delimiting and asserting control over a geographic area. This area will be called territory’ (Sack, 1986, p. 16).

It is important to stress that Sack (table 1) understood the establishment of territories as a flexible social alternative to spatial control. His example of parents that declare the kitchen as ‘off-limits’ for their children for security reasons is instructive in this regard, as it points to the small social scale and, at the same time, the situational character of certain variants of territorial behavior.

Territory in the context of ethological theory

Approaching territoriality from the perspective of ethological theory, Edward Soja (1971) differentiated between ‘personal territory’ and ‘societal territory’ (table 1). Whereas ‘societal territory’ can be seen as the equivalent of the above-cited definitions of ‘territory’, ‘personal territory’ is individually constructed and depends, among other things, on socialization and individual preferences. However, the fact that the existence of personal territory is, on the one hand, an inter-cultural constant, but on the other is shaped by the biography of the individual, hinders an archaeological analysis.

Social territories and territoriality

Territoriality, in its behaviorally relevant aspect, can be defined from both an economic and a cognitive point of view. Casimir (1992) established a widely acknowledged ecological definition of territoriality as a

‘cognitive and behaviorally flexible system which aims at optimizing the individual’s and hence often also the group’s access to temporarily or permanently localized resources, which satisfy basic and universal or culture-specific needs and wants, or both, while simultaneously minimizing the probability of conflicts over them’ (Casimir, 1992, p. 20).

As an ethnographer, fighting against a purely ethological and evolutionary view of territoriality, he naturally put the main emphasis on the social aspects of territoriality and combined these with economic needs, environmental stress, and social flexibility. The cognitive aspects have also been highlighted in recent decades by archaeologists. In her overview of the different archaeological approaches to territoriality, Dillian (2003) defines the term from a cognitive perspective as providing

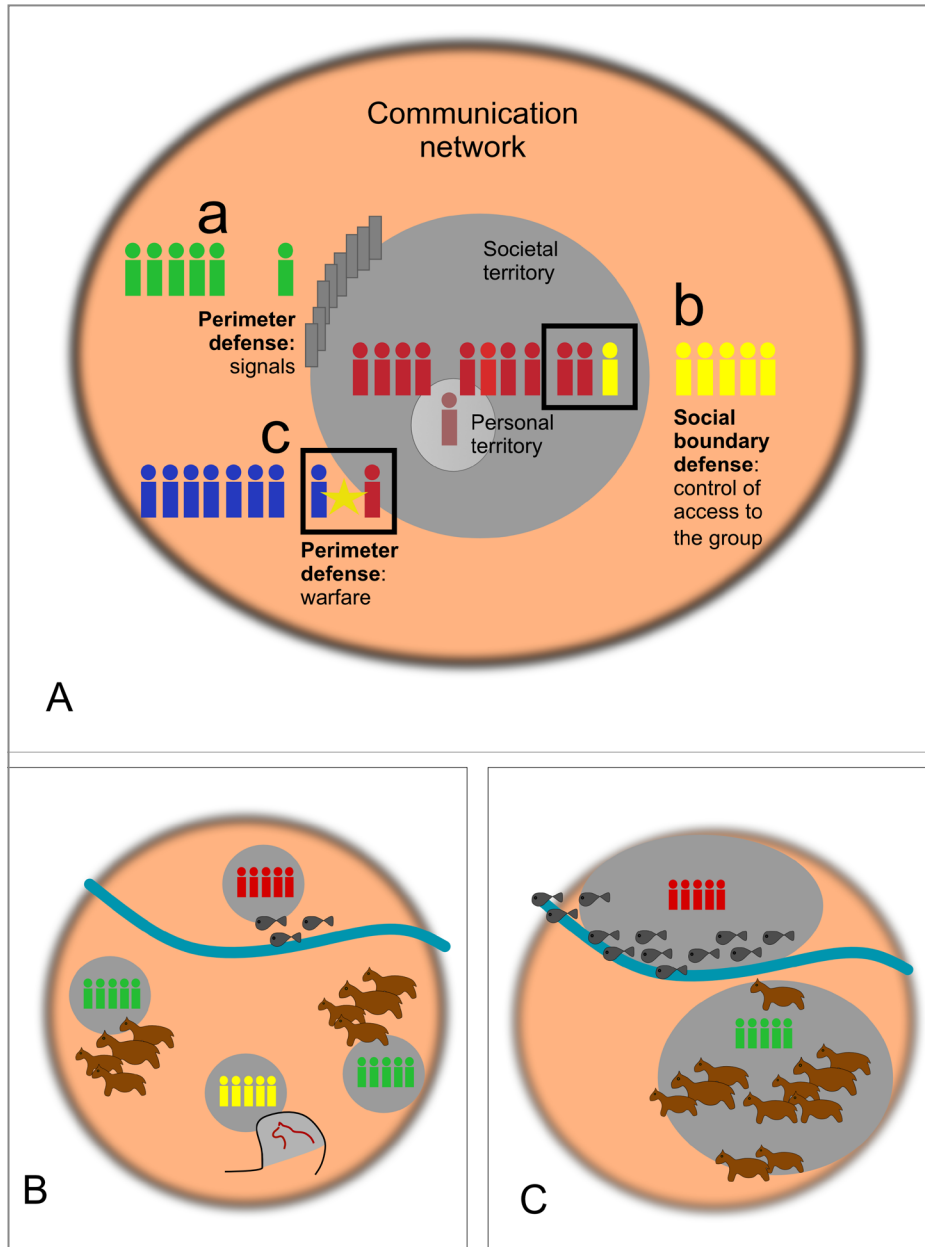


Fig. 2 – Major features of territoriality systems and strategies of boundary defense (in red: territorial group; other colors: individuals/groups which want to participate in the harvesting of resources in the territory of the red group). A: Overview of different elements of territory defense (note that all are based on a system of communication; a: defense along a line of demarcation; b: defense by warfare; c: social boundary defense based on formalized processes of asking and allowing); B: Scheme for spatially and temporally restricted territorial patches in cases of low resource density; (note the territorial defense of a cave with parietal art as example of the defense of non-nutritional resources); C: stable territories when resource density is high (for more details see text).

Fig. 2 – Principales caractéristiques des systèmes de territorialité et stratégies de défense des frontières (en rouge : groupe territorial ; autres couleurs : individus/groupes qui veulent participer à la récolte des ressources sur le territoire du groupe rouge). A : Vue d'ensemble des différents éléments de défense du territoire (notez que tous sont basés sur un système de communication ; a : défense le long d'une ligne de démarcation ; b : défense par la guerre ; c : défense de la frontière sociale basée sur des processus formalisés de demandes et d'autorisations) ; B : Schéma pour des parcelles territoriales restreintes spatialement et temporellement dans les cas où la densité des ressources est faible (notez la défense territoriale de la grotte avec l'art pariétal comme exemple pour la défense des ressources non nutritionnelles) ; C : territoires stables lorsque la densité des ressources est élevée (pour plus de détails, voir le texte).

Abb. 2 – Wichtigste Merkmale von Territorialitätssystemen und Strategien zur Grenzverteidigung (in Rot: territoriale Gruppe; andere Farben: Individuen/Gruppen, die am Sammeln der Ressourcen im Gebiet der roten Gruppe teilnehmen möchten). A: Überblick über verschiedene Bestandteile der Gebietsverteidigung (es ist zu beachten, dass alle auf einem Kommunikationssystem beruhen; a: Verteidigung entlang einer Demarkationslinie; b: Verteidigung durch Krieg; c: Verteidigung sozialer Grenzen basierend auf formalisierten Prozessen des Fragens und Erlaubens); B: Schema für räumlich und zeitlich begrenzte Gebiete, wenn die Ressourcendichte gering ist (beachten Sie die Gebietsverteidigung der Bilderhöhle als Beispiel für die Verteidigung von Ressourcen, die keine Nahrungsquellen sind); C: stabile Gebiete, wenn die Ressourcendichte hoch ist (mehr Details siehe Text).

'[...] the infrastructure that may ensure access to localized resources.... [It] is a cognitive construct that serves as way to distinguish "us" and "them" and [...] defines a group and dictates who is entitled to the rights and privileges associated with group membership. [...] [It] defines who may be considered a foreigner, imposing restrictions on those who fall within this category' (Dillian, 2003, p. 124).

In the case of hunter-gatherers, territoriality is about the control of resources, which are best understood not only as 'basic' nutritional resources, but also resources required to satisfy culture-specific needs and wants and thus including, among other things, specific areas within a cultural/ritual landscape.

Résumé: a combined definition of territory and territoriality

To sum up, the definitions above may be combined as follows:

Territoriality aims to affect, influence, or control the access of people to geographic areas – called territories – to minimize the probability of conflicts over localized key resources within them, leading to a social infrastructure that includes a cognitive construct of social and spatial group identity.

BASIC ELEMENTS OF TERRITORIALITY: BOUNDARIES, BOUNDARY DEFENSE, AND COMMUNICATION

As a rule, territoriality is constituted of the following components (Dillian, 2003):

- a boundary,
- a concept of defending that boundary, and
- a communicative system for advertising the existence of the boundary, its spatial contextualization and potential social sanctions for the violation of the boundary as well as the possibility of an authorized use of the otherwise defended territory.

In addition, the following preconditions are often inherent in explanatory models of territoriality:

- localized key resources, and
- potential conflicts surrounding the harvesting of key resources.

In cases of minimal resource predictability and low population density, it is assumed that the need for any boundary defense is low to negligible (Cashdan, 1983). Localized key resources relevant for the establishment of territories are staple resources for satisfying daily needs. Again, it is acknowledged that resources are not restricted to food, but can also be ritual, political, etc. At the same time, resources must be viewed as being part of 'resource

complexes', i.e., interdependently connected to knowledge, social relations, etc. Even if resources critical for group survival are predictable (at least to some extent), there must be a balance between the wish to exclusively secure resources for one's own group and the need to cooperate for backup during resource crises. This is where the estimation of risk comes into play (Cashdan, 1983). Risk is the uncertainty left after predictions are made on the basis of knowledge and experience, because the latter includes experience of natural variability or extreme events. The establishment of territories and boundaries is more profitable when the risk of low harvests within the defended area is small. Conversely, in high-risk environments with temporal, spatial and quantitative fluctuations of key resources it must be assumed that the benefit of defending territories is outweighed by cooperation. The following sections deal with the basic elements of territoriality: boundaries, boundary defense and communication.

Boundaries

The establishment of a territory is based on the spatial definition of its boundaries by the group or individuals that exploit it and by other groups or individuals that have conflicting interests in harvesting in the same area. The social definitions of use rights and the positive or negative sanctions that will result from acceptance or defiance of them are established by interdependent negotiations between the different interest groups. In social theories of interaction, e.g., symbolic interaction (Blumer, 1969; cf. Münch, 2002, p. 259-282), communication is necessary not only for the establishment of norms and rules, but also for the maintenance or reconstruction of the social bundle of ideas, values and networks that make up a world view. Therefore, territories can be an important spatial component of social identity (fig. 2). If the establishment of territories and boundaries is understood as an ongoing process of negotiation between the internal and external social actors, then it becomes clear that delimiting a geographic area and asserting control over it can be flexible. The degree of territoriality can depend on changes in the social situation or environmental changes that influence the quantity of resources available for harvest. With regard to size and spatial range, it is important to stress that a territory does not necessarily have to cover a large area (fig. 2). It can just as well be temporally, spatially and functionally patchy, depending, for example, on the season, the distribution of (key) resources, or the importance of specific (e.g. ritual) places and areas (Kelly, 2013). If looked upon from a rational choice theory perspective and understood as a bundle of norms and expectations, territoriality, like all social constructs, has positive and negative consequences, some of which may not even be intended, but occur collaterally (Coleman, 1990; Esser, 1993). For example, living in a defended territory has the advantage of exclusive use rights, but the recurrent harvesting of localized resources in one and the same area, accompanied by the fact that alternative search areas are not accessible due to the neighboring territories of other groups,

may lead to an increase in search time. In other words, assuming that other territories exist in the immediate vicinity, a system of territories minimizes search options outside one's own range. Equally negative might be the fact that exclusion often leads to competition and – possibly long-term – conflict. Conversely, the need to organize a defensive system may intensify the social bonds within one's own group and thus strengthen social identity. Other positive, yet not primarily intended, feedbacks are possible. In general, the communication inherent in maintaining boundary defense systems will lead to an intensification of social contacts. For example, the need to communicate may be attractive for both insiders and outsiders, because information other than that directly linked to territorial access can be gained, too (Cashdan, 1983). In addition, repeated successful, balanced, reciprocal interactions involving asking and permitting within an accepted social framework ('honesty') will lead to an established network of insurance against crises.

Boundary defense

According to Elizabeth Cashdan (1983), the boundary of a territory can be defended by 'perimeter defense', which takes place at the actual line of demarcation, controlling access to the territory, or by 'social boundary defense', which is based on differently formalized processes of asking and allowing within a social network of insiders and outsiders (fig. 2). The different strategies of boundary defense occur in different environmental and social settings, and with interdependent relations between these variables.

'Perimeter defense' (fig. 2) is a means of controlling access to a territory either by marking the perimeter with material signals or by using social agents to conduct periodic patrols or all-day observation and control of the boundary. Conflicting interests over access to resources are solved directly at the boundary by communication, aggressive threats or warfare. Perimeter defense can be accompanied by formal communal activities such as ceremonies or feasts, with outsiders as guests, to consolidate knowledge of existing territories and to facilitate an exchange of views (including views about potential changes in the use rights). The costs of monitoring territory perimeters increase with territory size and decrease with group size. 'Social boundary defense' (see also Kelly, 2013, p. 158-161 for ethnographic examples) is an entirely different strategy of boundary defense (fig. 2). Instead of actually controlling the perimeter of the territory, it aims to control the relationship between the group that claims use rights or is acknowledged to have them, on the one hand, and outsiders who wish to have access, on the other. A typical form of social boundary defense is delayed reciprocal altruism, embedded in formal greeting ceremonies and formal negotiation about trespassing rules. At first sight, social boundary defense seems to be a weak strategy, because it is not based on perimeter control. To assess its potential effectiveness, it is interesting to put oneself in the position of an outsider calculating the costs of respecting

or infringing a socially defended boundary. Of course, the probability of detection and the possible consequences of being detected after unauthorized access are major aspects in the decision-making. On the other hand, depending on the probability of a positive answer to a request for access, communication with the holders of the territory may be accompanied by first-hand information about the distribution of desired resources, which – in the case of agreement – may drastically reduce the search time. Other positive consequences can be additional information about topics unrelated to territorial issues, as well as the feedback effects of networking inherent to communications with positive results. Furthermore, a working system of territoriality with repeated reciprocal access to the territories of the groups involved can be a mutual insurance in phases of environmental or social stress.

Simple cost-benefit calculations for both strategies would seem to show that perimeter defense is more costly and may therefore be expected to occur in areas with dense and predictable but localized resources that supply large groups within small ranges. Social boundary defense, by contrast, is less costly from the point of view of energy expended, as it relies on communication instead of a physical presence at the boundary. It allows small-sized groups to control the larger territories which are often a consequence of less predictable and more dispersed resources. Such an analysis would accord with behavioral ecology, which assumes that cost-benefit calculations govern the emergence of territories:

'[...] territorial behavior is expected when costs of exclusive use and defense of an area are outweighed by the benefits gained from this pattern of resource utilization' (Dyson-Hudson and Smith, 1978, p. 23).

The example of the Akulmiut given by Dillian (2003, p. 129-130) shows that boundary defense can be complex and involve both types of strategy (Andrews, 1989, p. 429-442). The Akulmiut (Andrews, 1989) are an Inuit group living between the Yukon and Kuskokwin Rivers that practices group aggregation in winter and group dispersal during the short summer. Villages are placed near to predictable and localized key resources, e.g., whitefish and, to a lesser extent, blackfish, which are exclusively harvested by the regional group. Territorial boundaries are defined by geographic features, which are given names, and group membership is displayed by clothes and gear. The boundary defense of fishing territories near to the villages consists of aggressive posturing at the perimeter, sometimes followed by warfare. Meanwhile, social boundary defense also exists, in the form of ceremonies between insiders and outsiders. In addition, territorial behavior is flexible in so far as travel routes are open to other groups. Superabundant resources, such as salmon, are usually shared with neighboring groups, although they are not treated as communal. Finally, a more dispersed distribution of resources during the summer means that the winter groups must split up to hunt and fish over larger territories. The outer areas can only be controlled by dispersal.

A positive feedback of dispersed harvesting over large areas during the summer is the exchange of information with distant relatives and partners as well as the establishment of a buffer zone that allows the spread of knowledge regarding exclusive use rights.

Communication

‘Resources are not there for the taking, but they may be there for the asking. The giving of permission is the giving of a gift - and it puts the receiver in debt. [...] land-tenure systems develop in response to the long-term condition of an ecological system and the evaluation of past actions and future possibilities of a petitioner. A strong tendency toward permission-granting gives human land tenure its own particular character’ (Kelly 2013, p. 158).

Even if a boundary is marked by a perimeter and the will to share use rights is limited, the establishment and defense of a territory are based on a communication network between insiders and outsiders, who share geographical and the environmental knowledge of the wider area. A precondition for a working system is that both parties are able either to decode perimeter signals (e.g., symbols, markings, cultural landscape) or to communicate directly. This is far from inevitable, as it implies a shared knowledge about respective norms, values, practices, and customs. Strangers who do not possess this knowledge cannot successfully participate (or can do so only to a limited degree). In this case, misunderstandings and conflicts are to be expected.

TOWARDS AN IDENTIFICATION OF TERRITORIALITY IN THE ARCHAEOLOGICAL RECORD: SOME SUGGESTIONS

In this article, territoriality is defined as a means of controlling access to localized key resources by establishing a social infrastructure to minimize the probability of conflict. Because it requires social infrastructure and the cognitive construct of social and spatial group identity, the presence or absence of territoriality is an important aspect of understanding Palaeolithic hunter-gatherer behavior and is related to some of the key questions asked by archaeologists when studying Palaeolithic material culture. The entanglement of territoriality with the availability of key resources (at least in the context of the definition developed here) also links it with questions of climate, environment, and the ecological consequences of human subsistence tactics. In the above contexts, territoriality falls into the bracket of middle range theory and micro- or meso-scale analysis, but it is also relevant for diachronic and/or large-scale spatial analysis; for instance, estimating Palaeolithic demography based on spatial data (e.g. isolines calculated from largest empty circles between sites to identify spatial clusters: Maier et al., 2016; Maier, 2017).

The example of the Akulmiut, described above, shows that mobile hunter-gatherers may not only establish territories but also practice aggressive boundary defense. At the same time, it also underlines the variability of territorial behavior, which correlates with the seasonal ebb and flow of localized key resources and social relatedness to other parties. The key to the degree of territoriality in Akulmiut communities lies in the availability of resources; interestingly, a low degree of territoriality is related to phases of both superabundance and deficit of key nutritional resources. Although other factors certainly influence spatial territoriality, it is difficult to deny the importance of environmental factors. The ‘defendability model’ described and discussed in the following section is a classic approach that makes predictions for the degree of territoriality based on the availability of resources.

Behavioral ecology: A useful model for the prediction of Palaeolithic territoriality?

A set of predictions for the degree of territoriality of Palaeolithic groups, depending on the richness of their habitat and developed in the framework of behavioral ecology, became popular in Palaeolithic archaeology. In general, it was based on the understanding that humans are rational, in so far as they calculate the cost-benefit ratio of resources and decide in favor of resources which provide the maximum amount of energy for the minimum amount of effort (Dyson-Hudson and Smith, 1978; see also Kelly, 2013, p. 156-158).

The most influential model of territorial behavior based on the return rates of key resources was developed by Dyson-Hudson and Smith (1978). It has been labelled the ‘defendability model’ and is based on a cost-benefit model of economic defendability, which is

‘[...] determined by [...] the particular distribution in space and time of critical resources’ (Dyson-Hudson and Smith, 1978, p. 23).

The temporal and spatial distribution of key resources can be further differentiated into two aspects: predictability and density (fig. 3). It is advantageous to know where and when the chances of encountering and harvesting a key resource are highest, while the benefit of excluding others from access to the resource is further raised when it is dense. Furthermore, a uniform and predictable distribution of resources leads to better return rates for individuals if they disperse to mutually exclusive foraging areas. Within the model, an ‘effective density’ of key resources is proposed that can be measured from average density over a broad area, average density within a microhabitat when resources are patchy, and fluctuation of density over time. Thanks to the generalizations purposely made within the model, the four possible combinations of high or low predictability and high or low density can be related to high or low probabilities of territoriality and the form of that territoriality can be defined

(Dyson-Hudson and Smith, 1978). Below, the four hypotheses of fig. 3 are grouped according to the probability of the establishment of territories.

1) High predictability of resources, resulting in a high to medium probability of territoriality

– High predictability and high density of key resources (fig. 3C): given conditions of high density and high spatial and temporal predictability of key resources, territories with exclusive use-rights are to be expected. Especially when key resources are localized and abundant, boundaries will be not far from home bases and defense costs will therefore be comparatively low. Residential and logistical mobility will also be low, at least during the harvesting period, and the richness of the resource will feed large group sizes, especially when storage is applied. If the abundant resources are evenly distributed, the cost-benefit ratio of establishing territories will be even

higher due to the fact that cooperation is not necessary and competition is low, minimizing defense costs.

– High predictability, but low density of key resources (fig. 3D): harvesting of resources under these circumstances requires high mobility over large areas, and therefore small group sites. This makes the defense of boundaries costly and restricts territoriality to home ranges, which can be defended if the total area is not too large. ‘Home range’ in an ethological sense is the

‘[...] area traversed by an individual in its normal activities of food gathering, mating, and caring for young’ (Burt, 1943, p. 351, cf. Powell and Mitchel, 2012, p. 349),

and in the case of hunter-gatherers, describes the mosaic of food acquisition locations around a home base. If the density is below a certain threshold, sharing with other groups may not be an option.

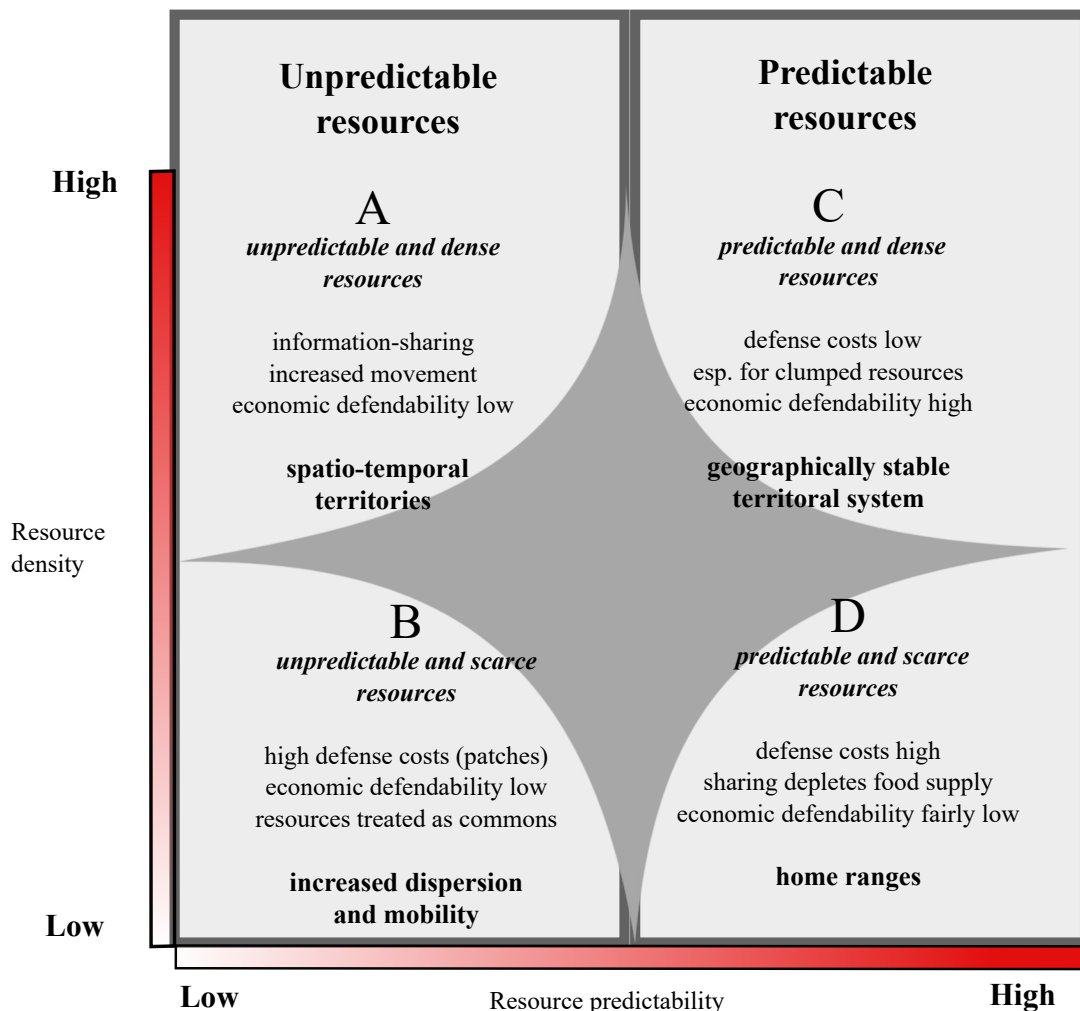


Fig. 3 – Four predictions of the economic defendability model according to Dyson-Hudson and Smith (1978, fig. 1, redrawn by the author).

Fig. 3 – Quatre prédictions du modèle de défendabilité économique d’après Dyson-Hudson et Smith (1978, fig. 1, redessinée par l’auteur).

Abb. 3 – Vier Voraussagen des economic defendability model nach Dyson-Hudson und Smith (1978, Abb. 1, nachgezeichnet durch den Autor).

2) Low predictability of resources, resulting in a low probability of territoriality. Sharing may not be an option if it leads to a too low harvest for each group.

– Low predictability, but high density of key resources (fig. 3A): dense, but at the same time unpredictable key resources will lead to communal information sharing and high mobility.

– Low predictability and low density of key resources (fig. 3B): under these circumstances, the establishment of territories does not make sense. The boundary defense costs will be high, due to large areas and low group sizes. It is to be expected that mobility will be high and group sizes small, and that land resources will be treated as communal.

Geographically stable territorial systems are most likely under conditions of high density and predictability of key resources. In cases where key resources are predictable but of low density, the best cost-benefit ratio is linked to control of access to the foraging radius, or ‘home range’, of the home base. By exerting such control, groups can avoid the harvest of a scarce resource being depleted by sharing with outsiders. Unpredictable resources result in lower benefits from territorial control, which can become uneconomical if the product of predictability and density falls below a minimum threshold. With regard to the degree of information exchange inherent in the logic of the model, it is worth mentioning that resource acquisition in an environment where resources are highly predictable can be managed without much information exchange. The opposite is the case in environments with a low predictability of resources. This having been said, it is important to stress that information exchange for purposes other than the prediction of key economic resources, such as the curation of social networks as back-up for periods of crisis, or mating networks, is another matter and might be established, and vary, independently of the environmental conditions.

Criticism of the defendability model

The defendability model is best understood as a heuristic tool for producing working hypotheses to be tested in archaeological case studies, rather than as a predictive model. It is certainly reductive, since it focuses only on the availability and abundance of key resources and implies a rather simple, merely ecological, model of human behavior. On the other hand, its simplicity – the entire model is operationalized in a four-quadrant matrix – means that can be applied in archaeological case studies, which usually rely on a restricted number of proxies. Admittedly, a reduction to simple environmental reasoning might be misleading. A good example are the results of the Magdatis project (for a summary see Pétillon et al., 2016), which showed that information networks during the Magdalenian in south-western France were not restricted by natural obstacles, nor were they spatially re-

stricted. Most importantly, environmental changes caused by global climate fluctuations affected the intensity of human land use but – with few exceptions – not the spatial aspect of the social infrastructure. However, the analysis focused on long-term and large-scale developments; the question of territoriality, by contrast, is relevant (and thus detectable) on a much smaller spatial scale, i.e., local to regional. Given that territoriality is largely based on communication and inter-group discourse, it is evident that this discourse is to be expected, first and foremost, within the same (large-scale) network of information exchange, and not between different networks.

The defendability model can be criticized in greater detail if applied to archaeology. Its shortcomings concern, first and foremost, control of the chronology in the data set, as well as control of variables within the cost-benefit calculations, such as search time, the social and symbolic capital of a group, and the actual group size. On the other hand, the model has the advantage of allowing expectations for an archaeological context to be derived from the respective environmental conditions and subsistence tactics. To some extent, data for the analysis can be deduced from excavated proxies (e.g., small and large mammal fauna, malacofauna, pollen, sedimentology, etc.) and provided by large scale proxies (e.g., oxygen isotopes from ice cores). Nevertheless, the identification of key resources relies on the existence of numerous archaeological sites of the same industry that have comparable absolute ages and at the same time form a regional cluster (e.g. identified by their belonging to the same raw material catchment); even then, the selected sites only hypothetically constitute one and the same land use pattern, but in fact provide a time-averaged data set.

A more fundamental concern is the question of whether the decision-making of Palaeolithic hunter-gatherers was related to cost-benefit calculations, and if so, whether this applied to decision-making in general or only to specific situations. Any discussion of this issue is difficult, as it touches on basic theoretical assumptions about human social behavior. Any standpoint in this debate is influenced by individual theoretical preference. I will therefore briefly elaborate on my own point of view on optimization theory in human decision making. It is based on H. Esser’s (1993) theory that human social action and decision making does, in general, follow optimization, but is restricted by situational and/or societal constraints. Human actors do evaluate and are, to certain extent, resourceful, but at the same time they are restricted by the limitations of their knowledge and power as well as by the social or ecological context of their situation. Although decisions are not, in most cases, simple stimulus-response reactions, but rational choices, aimed at maximizing subjective profit, they therefore nevertheless often end up being far from optimal in an objective sense. In addition, the expectations of other actors, or the way these are perceived, may lead to altruistic or even irrational decisions.

However, I am convinced that the decision-making of Palaeolithic hunter-gatherers in ecological matters was

mainly based on cost-benefit calculations, because sanctions resulted directly from the systemic hunter-gatherer-resources relations and could be socially discussed. There may have been exceptions where the criteria for judging the positive outcome of decisions were other than ecological, e.g., in the case of prestigious prey that were difficult to reach or dangerous to hunt. However, a positive evaluation would have been more probable if basic (nutritional) needs were satisfied on the long run. Apart from these theoretical models of human behavior, rationality and optimization in hunter-gatherer groups can be seen in the perception of ecological contexts. Linguistic studies in cognitive anthropology (Haller, 2005, p. 67-69) show that in present-day hunter-gatherer groups, knowledge of plants and animal species is organized according to taxonomies which consist of broad classes with only two levels of ranking. Interestingly, classifications as a whole are not holistic but selective, based on the visibility and the frequency of taxa in their respective habitats. Specific names are only given to species which are either frequent or play an important role in the economic system (as resource or threat). Thus both cultural anthropology and ethnography provide arguments for the relevance of behavioral ecology in hunter-gatherer communities, e.g. a close relationship between ecological decision-making and optimization.

Archaeological proxies for territoriality

What features of archaeological material remains might indicate the presence of territorial behavior? Most case studies of ‘territory’ in Palaeolithic archaeology are, in fact, dedicated to analyzing the home range or annual range of resource acquisition, rather than territoriality as such (for a summary see Kuhn, 2020). These studies mainly use raw material transportation distances as proxies for human mobility. If territoriality is investigated, it is often ornaments, including personal ornaments, and motifs of parietal art and their spatial distribution that are used as proxies to identify territories (see for example Fuentes et al., 2017). Another useful proxy might be the persistency and the complexity of home bases. ‘Persistency’ is defined by how often the base was re-used within short periods of time, and ‘complexity’ by the amount of work devoted to creating an infrastructure (e.g. were there solidly constructed dwellings, paving, and storage facilities?). Classic examples of home bases that can be defined as persistent and complex are, among others, Gravettian sites in Moravia (Wojtal et al., 2018), Epi-Gravettian sites such as Mezin and Mezirich (Soffer et al., 1997; Marquer et al., 2012), and Magdalenian sites like Gönnersdorf (Street et al., 2012) and a number of sites in the Saale-Unstrut region (Küßner, 2010; Uthmeier et al., 2017). Others, like Dolní Věstonice, show additional complexity in the long-term management of local resources, such as firewood, to secure their availability for future re-occupations (Pryor et al., 2016). The assumption made here is that an investment in infrastructure, aimed at or even proven to be related to an anticipated

future re-use, is in itself a value that has the potential to be secured by a spatial boundary defense. Although highly local, a boundary can be defended even during absences through communication, signals and/or sanctions imposed at later meetings. Perhaps the well-known markings on some of the larger skeletal elements of mega-herbivores adorning the dwellings at Mezin, Mezirich and other Ukrainian Epi-Gravettian sites (Soffer et al., 1997) can be interpreted in this way.

CONCLUSIONS

Territory is the spatial aspect of territoriality, a social phenomenon that aims to secure exclusive access to localized resources by restraining the mobility of other groups for resource acquisition purposes. Resources, though often perceived as merely nutritional, can also include a large array of both physiologically and socially determined wants and needs. In the case of Palaeolithic hunter-gatherers, the most applicable models for developing testable hypotheses about the degree to which territoriality was practiced are based on behavioral ecology and optimal foraging theory. In general, it is assumed that the denser and more predictable the resources, the greater the benefit of exclusively harvesting them. More specifically, high predictability of resources is associated with an increased probability of territoriality. In cases where resources are dense, territories with exclusive use-rights are to be expected; in situations with low densities of key resources, a home range is more probable. By contrast, hunter-gatherers in environments with a low predictability of resources generally profit more from cooperation than exclusion and either share information (when resource density is high) or treat the resources as communal (when the density is low). The ecologic contexts of the different modes of territoriality correlate to some degree with logistical and residential mobility. In general, the lower the mobility needed to cover a potential territory, the easier it is to defend. Perimeter defense relies on marking the perimeter of the territory and/or regular control of the boundaries. Such costly defense is not appropriate when the resources are less dense and less localized. Instead, social boundary defense is used, which aims at controlling the territories or home ranges through a communication network that makes violation socially unacceptable. Whatever the defensive tactics employed, territoriality is best understood as a bundle of social norms and expectations of behavior that is recurrently shared and negotiated between insiders and outsiders. To be effective, territoriality needs a common understanding of the rules and exceptions and is embedded in a system of communication and social interaction. Therefore, territoriality may not only secure and strengthen the intra- and inter-group relationships and social identities of the groups involved, but make available a better exchange of information and – given the possibility of reciprocal access – insurance in case of crises.

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Thorsten UTHMEIER
 Friedrich Alexander Universität
 Erlangen-Nürnberg
 Institut für Ur- und Frühgeschichte
 Kochstr. 4/18
 91054 Erlangen
 thorsten.uthmeier@fau.de