PRZEGLĄD ARCHEOLOGICZNY TOM 72 (2024), PP. 19-31

Dualistic seasonal changes in the Late Glacial of the Central European Plain – towards a socio-archaeological concept of Late Palaeolithic mobility

Author: Jakub Mugaj

PL ISSN 0079-7138, e-ISSN: 2657-4004

DOI: https://doi.org/10.23858/PA72.2024.3755

https://rcin.org.pl/dlibra/publication/279464

Jak cytować:

Mugaj, J. (2024). Dualistic seasonal changes in the Late Glacial of the Central European Plain – towards a socio-archaeological concept of Late Palaeolithic mobility. Przegląd Archeologiczny, 72, 19–31. https://doi.org/10.23858/PA72.2024.3755

Przegląd Archeologiczny
Vol. 72, 2024, pp. 19-31
PL ISSN 0079-7138
DOI: 10.23858/PA72.2024.3755

JAKUB MUGAJ*

DUALISTIC SEASONAL CHANGES IN THE LATE GLACIAL OF THE CENTRAL EUROPEAN PLAIN – TOWARDS A SOCIO-ARCHAEOLOGICAL CONCEPT OF LATE PALAEOLITHIC MOBILITY

ABSTRACT: The paper presents basic concepts regarding seasonal changes in hunter-gatherer societies (derived from processual, evolutionary and social theories) and the resulting models of mobility. The text presents the current applications of these models in studies on the Late Palaeolithic communities of the European lowlands and the reasons for their use. It also examines the possibilities and limitations of using an alternative dualistic model based on the newest research on the Late Palaeolithic settlement, particularly its early period related to the Hamburgian Culture occupation.

KEY WORDS: Late Palaeolithic, mobility, seasonality, hunter-gatherer studies

1. INTRODUCTION

Mobility is one of the basic features describing the way of life of hunter-gatherer groups, both historical ones existing in modern times and prehistoric ones related to the Stone Age. For many human groups, seasonal movement was the important framework of life that determined the basic dynamics of their functioning. In addition to the subsistence strategies, it is their mobility that is one of the most frequently described characteristics of hunter-gatherer societies and often serves as the basis for their classification (Murdock 1967; Lee, De Vore 1968; Kelly 1995).

The phenomenon of seasonal settlement mobility was attributed to European communities of the Upper Palaeolithic and particularly the Late Palaeolithic period. However, direct archaeological evidence of this type of annual settlement variability has been modest. The particular mobility model was concluded primarily on the basis of ethnographic analogies and an understanding of hunter-gatherer mobility resulting from the theoretical approaches mainly of the processual paradigm. Recently, the issue of hunter-gatherer mobility in the Palaeolithic has gained new interest (Sobkowiak-Tabaka *et al.* 2022). Research on European Late Palaeolithic settlement over recent decades has revealed extensive evidence of seasonal changes in many aspects of the lives of Late Glacial human groups.

The paper presents three general concepts of the mobility of hunter-gatherer communities, which are related to different theoretical perspectives: adaptive

* Corresponding author: **Jakub Mugaj**, Ośrodek Studiów Pradziejowych i Średniowiecznych, Instytut Archeologii i Etnologii PAN, 61-612 Poznań, ul. Rubież 46; e-mail: j.mugaj@iaepan.edu.pl; https://orcid.org/0000-0002-2822-2962
Received: 19.03.2024; **Revised**: 15.07.2024; **Accepted**: 29.07.2024

Declaration of competing interest: The author declare that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

(processual), evolutionary and social. These concepts have had a significant impact on the archaeological discourse on the mobility and functioning of human communities in the Late Palaeolithic of lowland Europe. The aim of this article is to indicate the possibilities of applying the concept of dualistic seasonal changes, related to the social theoretical perspective, based on the current state of research on Late Palaeolithic communities and the available archaeological records.

2. THEORETICAL FRAMEWORK FOR HUNTER-GATHERERS MOBILITY MODELS

2.1. Processual approach – forager-collector model

The most common concept of mobility in archaeological studies of past hunter-gatherer societies is based on Lewis Binford's adaptive systems model. The founder of the New Archaeology based his influential theory on the earlier work of neo-evolutionists, particularly Leslie White and Julian Steward (Trigger 2006, 387). The former described the culture of human societies as a thermodynamic system based on appropriate energy conversion. Therefore, according to White, development requires resources of this energy, and technology for its use, allowing social systems to maintain stable continuation (Jordan, Cummings 2014, 36). This law was formulated by the simple equation: Culture = Energy × Technology (C = E × T). Steward, in turn, introduced the environmental factor into the concept of neo-evolutionary cultural ecology (Steward 1936; 1955). He pointed out that the resources that human groups can use are simply the environment in which they live. The exploitation of these resources is the work of energy conversion that White mentioned. Cultural development is therefore an optimal use of existing ecological resources. The reformulation of White's equation in that manner (made by archaeologist B. Meggers) was simply: Culture = Environment × Technology (Meggers 1960). Steward focused on the study of hunter-gatherers because he considered them, according to a simple evolutionary principle, as societies at a lower level of development, whose systems are not complex and therefore much more dependent on external conditions. Different ways of life of hunter-gatherers resulted from different external conditions causing different adaptations, confirming the multidirectional, multilinear development postulated by neoevolutionists. Steward's concept of cultural ecology had a profound impact on further research on prehistoric hunter-gatherer societies (Garvey, Bettinger 2014, 77; Bettinger *et al.* 2015, 50-51).

The assumptions of Steward's cultural ecology and White's earlier concepts formed the basis of the theory of New Archaeology proposed by L. Binford (1962, 218; 1965). According to the classic processual definition, Binford considered culture to be an extrasomatic system of responses to changing environmental conditions – an 'extrasomatic means of adaptation' (White 1959, 8). When examining various hunter-gatherer communities from a processual perspective, it was not difficult to come to the conclusion that settlement mobility, so characteristic of this type of society, is the basic means of adaptation to the conditions determined by the uneven, variable distribution of resources. Thus results from the climatic conditions reduced to a coefficient most often described as the effective temperature 'ET' (Bailey 1960, 3-4; Binford 1980, 13; Kelly 2013, 44).

Based on research among hunter-gatherer groups from various areas of Africa and Alaska, Binford created the most influential collector-forager model in studies on hunter-gatherer mobility (Binford 1980, 5-12). It described two basic strategies of movement and obtaining food by hunter-gatherer groups. These strategies were two ends of a shifting spectrum of mobility. The use of an appropriate strategy does not involve conscious choice, but according to adaptive approach assumptions, it corresponds directly to the ET factor.

The collector subsistence strategy type corresponds to logistical mobility, which involves moving the residential settlement unit – the central camp – to appropriate locations of key importance (water availability or large game resources, etc.) and organizing a network of smaller locations – in the form of logistical forays – to fulfil the various needs of the community – raw material provisioning, gathering, hunting, etc. (Fig. 1: b). The second type – forager subsistence strategy – was based on more frequent migration through the area without organizing a system of special trips and bringing resources to the central camp (Fig. 1: a). According to Binford's concept, foragers moved consumers after resources, while collectors brought resources to consumers (Kelly 2013, 78). Two basic attributes distinguished the two types of mobility and organization of the settlement system: the first was the frequency of movement, the second

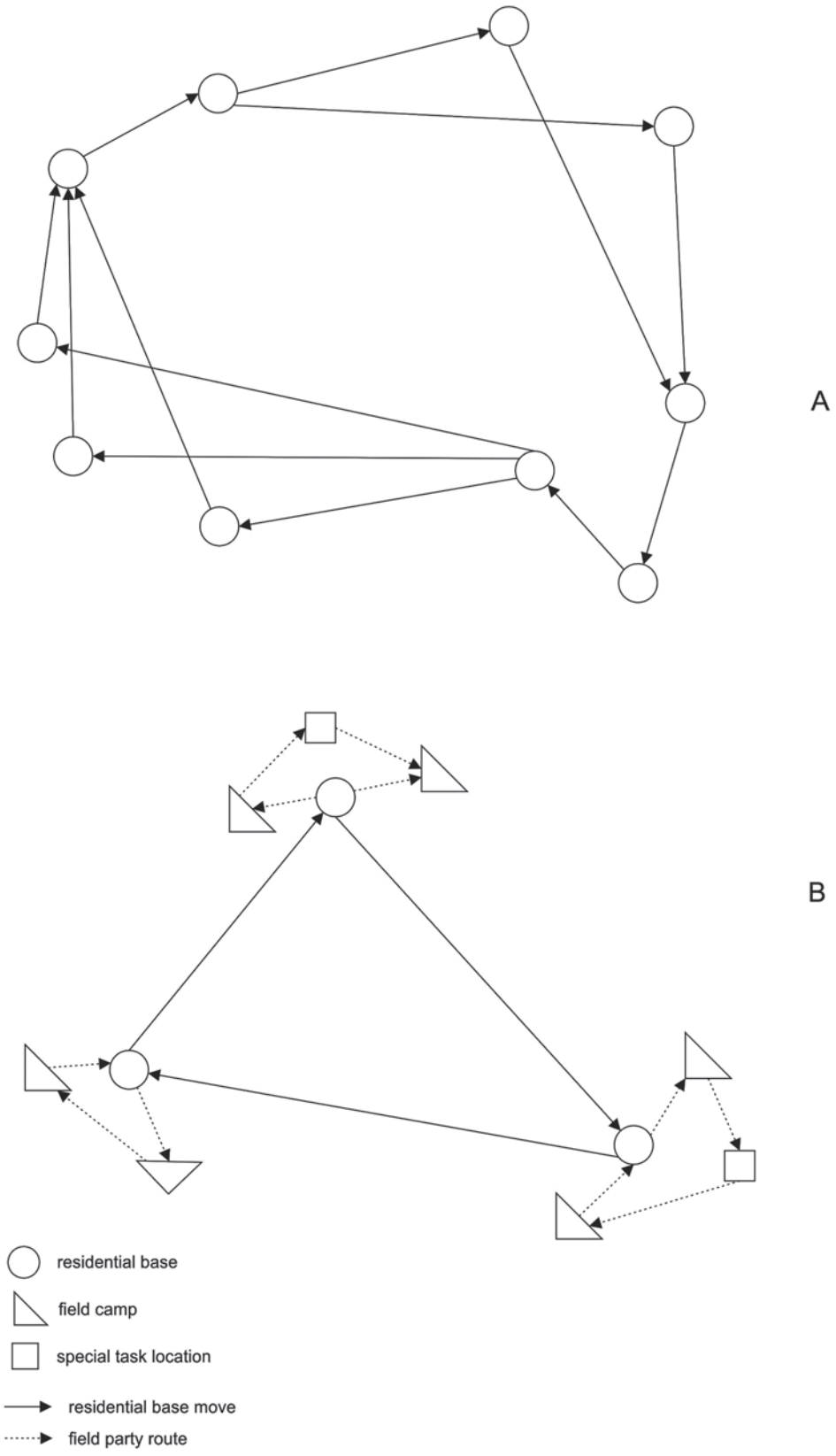

Fig. 1. Schematic representation of foraging (A) and collector (B) model
(according to Lane 2014)

was the diversity of sites. Seasonality plays a crucial role in establishing a particular system. Greater seasonal variation in the distribution of available resources was expected to influence adaptation to the logistical system. Because this variability increases as we move further north of the equator, logistical systems similar to those observed among the Inuit communities were reconstructed for the Late Palaeolithic period in lowland Europe after the pioneering phase of more mobile foraging mode (Riede 2014, 44-46; Pedersen *et al.* 2018, 95-96).

2.2. Evolutionary approach – fission-fusion model

The dynamics of mobility, in accordance with the commonly shared assumptions of cultural ecology, of hunter-gatherer groups are generally considered to be dependent on the dynamics of other features of the space in which they function. Particularly in higher latitudes, environmental conditions and climatic fluctuations result in variable exploitation possibilities and resource availability. It is indicated that such features of the environment – variable capacity – resulted in the development of appropriate features of spatial organization consisting of seasonal variability of human groups, analogous to environmental ones. Such adaptation is not only the result of specific existing factors, as predicted by the models created by the processual theory. According to other researchers, this form of dependence was developed through evolution and goes deep into the history of our species (Aureli *et al.* 2008; Marlowe 2005, 57-65). The fission-fusion model of variation is considered characteristic of human species broadly in the Stone Age, especially early hominid groups, but is also described as an attribute of many other mammal species such as elephants, chimpanzees and dolphins (Grove *et al.* 2012, 191; Lehmann, Boesch 2004). The term fission-fusion comes from biological anthropology and primatology and was used to describe the phenomenon on a large timescale. Seasonal variability within the meaning of the fission-fusion model is an evolutionary property, and group size flexibility is an adaptive feature. The term is defined as variation in spatial cohesion and individual membership in a group over time. According to this model, communities tend to cyclically integrate into larger groups and disintegrate into smaller ones. The factors causing such processes are mainly environmental risks, which are reduced thanks to the flexibility of the social structure (Lehmann *et al.* 2007, 629-630), reduction of predation risk through enhanced vigilance (Pulliam 1973), as well as access to a larger pool of potential mates (Wiley 1991). However, the cost of such a system is related almost exclusively to foraging (Lehmann *et al.* 2007). The principle that determined the selective suitability of the system of seasonal dispersal and group aggregation would be the excessive energy cost of maintaining large social groups with the simultaneous need for their grouping at least temporarily to gain knowledge about the landscape or resources and increase the gene pool (Fitzhugh *et al.* 2011). In such cases, periodic dispersal of the group is the most optimal strategy for acquiring the resources needed for feeding and resource exploitation. Continuous functioning in a large group would require finding an area adequately rich in biomass. The risk entailed in the group surviving in this form is too high. According to the above concept, evolutionary pressure forced seasonal changes in group size. The experiment using the gas model indicates that while in a lower latitude environment, random encounters were enough to maintain social cohesion, the higher latitude landscape and related reduced population density force the creation of mechanisms to increase the probability of meetings (Pearce 2014; Grove 2010).

Two basic paths of the process that created the fission-fusion model are indicated, which differ in the direction of change (Aurelli *et al.* 2008). The first of them forced the division of an existing larger group. The original process was therefore the increasing complexity and number of interactions resulting from social benefits. The second path forced smaller groups to join a larger structure. Under this model, social interactions were not developed on a large scale, temporary joining into larger groups was forced by, for example, increased danger from predators. Societies developed along the first route tend to increase social complexity and group size (human groups), while societies following the second evolutionary path tend to live in solitary groups (other mammal species).

2.3. Social approach – dualistic model

Both of the above approaches, influential particularly since the second half of the 20th century, were based on the assumption of a more or less deterministic dependence of the forms of variability of the settlement system, mobility and economic bases of hu-

man groups on the surrounding natural environment. Even though supporters of processual and evolutionist approaches renounced the accusation of determinism, the inclusion of social and cultural factors in the mechanism of shaping economic or settlement strategies was most often only declarative.

Critics of environmental approaches referred to classic anthropological research on hunter-gatherer societies. Since the beginning of the 20th century, ethnology has been looking for an answer to the question, not so much about the origin of seasonal mobility from an evolutionary perspective, as the determining factor, but the very principle of its functioning in a specific socio-cultural and political context. This approach tries to determine the importance of seasonality for a given community and the impact it has on various aspects of life (Bird-David 1990; 1996; Ingold 2000). The earliest expression of this approach can be found in M. Mauss and H. Beuchet's study of the Inuit communities, which they conducted in 1904-1905 (Mauss 1979). They stated that cyclical seasonal changes are associated with the dualistic form of the entire social life of the Inuit. Seasonality concerns not only the subsistence strategies – exploitation of different marine mammals (walrus and seals) – but more importantly, also changes in the mode of social organization. The most visible effect of this dualistic nature was settlement structure. In winter, the Inuit concentrated into larger groups living in large camps. In the centre of the settlement there was a large house – *khasim*, which was used for common meetings, feasting and celebrations. In the summer, the group was dispersed and divided into smaller family units with greater mobility, living in small tents. Mauss observed analogous dualisms in religious, law and social life. In the summer, religion was practically nonexistent, only in the form of individualistic practices, appropriate prohibitions and healing magic. Property was individual, patriarchy prevails within the family, men were not limited by legal orders.

In turn, in winter, life was filled with beliefs, mythology, and the celebration of rituals. Each activity was associated with the completion of appropriate rituals and the presence of an *angekok* – a shaman. The concept of individual ownership disappears and was expanded to collective limits. Male power was delegated to a single leader – an older man, or shaman. The strict relationships between individuals were suspended, which was expressed in greater freedom of sexual behaviour.

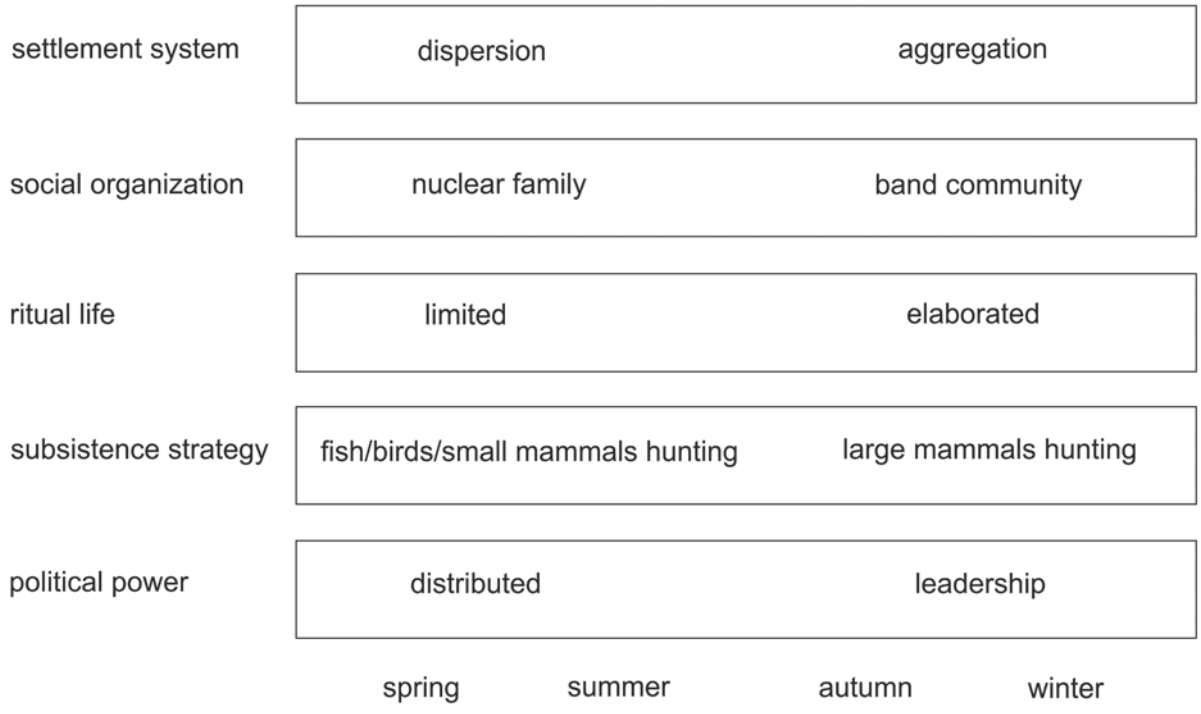

Fig. 2. Scheme of the seasonal dualistic model and its manifestation with reference to the socio-cultural system

Examples of deep social seasonal change can be found in many hunter-gatherer societies. Seasonal transformation can be very clearly reflected even in personal identity – among the Kwiakiutl tribe, people take on different names in the winter cycle, different names in the summer cycle (Boas 1966).

A similar cyclical variability of socio-political life was presented by Levi Strauss in his studies of the Nambikwara group in South America (Levi-Strauss 1967). From a structuralist perspective, Levi-Strauss indicated the visible dichotomies emerging between the rainy and dry seasons. In the first period, the population was concentrated in large settlements. When the hunting economy was limited and horticulture dominates, the social structure becomes hierarchical, with the institution of the group leader at the top. The group was dispersed into hunting family units without a leader in a political sense in the dry season.

Similarly, Richard Lowie has observed among the tribes of the Great Plains of North America that institutions of power presence during the aggregation phase of the buffalo hunting season disappear during seasons of dispersal (Lowie 1948). The very strong power of the leader was radically limited.

Graeber and Wengrow indicate the socio-political aspect as crucial when considering the seasonality of hunter-gatherers (Wengrow, Graeber 2015; Graeber, Wengrow 2021, 78-113). According to researchers, hunter-gatherer groups consciously use the seasonality of social life with a cyclical aggregation and disintegration as a key tool for stabilizing social organization. It allows for equalizing inequalities and limiting the accumulation of power (the leveling mechanism).

According to the social approach, mobility is only one aspect of a wider phenomenon of seasonal changes that encompasses the entire social, political and cultural structure. The basic function of cyclical changes was the preservation of values important to hunter-gatherer communities, constituting the essence of social life, such as equality, egalitarianism, and communitarianism.

3. SEASONALITY IN THE EUROPEAN LATE PALAEOLITHIC – ARCHAEOLOGICAL DATA

The Late Palaeolithic was a period when the lowland areas of Europe were opened to human settlement after the retreat of the last glaciation and the withdrawal of the ice sheet to the north. The climate underwent gradual transformation, which resulted in parallel changes in the vegetation and animal species composition. Three main cultural units related to the Late Palaeolithic period are distinguished: the settlement of the Hamburgian related to the earliest phase of the Late Glacial, followed by the Federmesser settlement and the Ahrensburgian/Sviderian settlement of the Younger Dryas period.

The relationship between the various concepts of mobility in studies on hunter-gatherer societies may be briefly presented in overview with reference to the main theoretical approaches (processual, evolutionary and social). While the social approach is well established in anthropological research on hunter-gatherer communities, it has rarely been used as an interpretative framework for hypothetical mobility systems in the Late Palaeolithic. Therefore, the model of dualistic changes of a multi-aspect social character does not function in archaeological discourse as a real alternative narrative to the more commonly accepted explanations suggesting the key role of factors external to cultural systems. The overview of archaeological evidence from the Late Palaeolithic period presented in this paper aims to fill that gap and apply the concept of dualistic seasonal changes in Late Palaeolithic societies.

The three main categories, namely paleoenvironmental records, settlement data and art objects, are considered as potential proxies of dualistic seasonal change.

3.1. Paleoenvironmental record

The basic data enabling the determination of the season in which a given site was inhabited and used are environmental data. The species composition of faunal inventories often allows us to determine at what time of the year the hunting took place. Such data indicate short- or medium-term stays in camps where large game hunting took place. It should be noted that in the Late Palaeolithic period, the most common large mammal was reindeer, in particular in the Early Late Glacial period (GI-1e) and in the Younger Dryas period (GS-1). For sites from the Hamburgian settlement period (GI-1e), reindeer remains indicate hunting in autumn (Bratlund 1994, 75-78; 1996, 38-39; Wild 2019, 24-25). The autumn is the optimal time to hunt for several reasons. The first is the annual development cycle of reindeer. In this season, all individuals have the most mature antlers. Accumulating en-

ergy reserves for winter causes animals to gain weight – this applies especially to females, while males enter the optimal period in late summer and remain in good condition in autumn. In the period from September to January, reindeer skin is of good quality (best in late summer). The second reason is the cyclical behaviour of animals, which, while migrating to winter pastures, gather into larger migratory herds just before dispersing. This migration takes place in October/November and is connected with the mating season. The second migration period repeats in June. For all Hamburgian sites in the so-called Tunneltal (Stelmoor, Meiendorf, Poggenwisch) the autumn period (early and late) was identified as the hunting season. The presence of other bone remains of a horse and birds (geese and swans) was considered to have been brought from a previously (late summer) occupied site (Bratlund 1994, 70-71).

Based on unique finds from the Tunneltal, where significant amounts of reindeer bone remains were discovered in the peat layers, a number of models of the movement of Hamburgian hunters in the Lowland area have been created (Rust 1954; Tromnau 1976; Bokelmann 1979; Degerbøl, Krog 1959; Jacobi 1981). Depending on the adopted model, the northern European sites have been interpreted as autumn-winter or spring-summer camps of Hamburgian hunters, established during the seasonal migration cycle following migrating reindeer herds. The mobility of hunter-gatherers, although related to seasonal changes, was considered to be closely dependent on the behaviour of the animals that were the main source of food.

A completely different species composition from that known from the Tunneltal study is presented in the inventory obtained from the Hamburgian site in Mirkowice (Kabaciński, Sobkowiak-Tabaka 2009). The bones found in a hearth there belonged to an arctic hare, a pike and cyprinids. A single antler fragment was also recorded. It is believed that the best period for catching freshwater fish such as pike or carp is spring and early summer. If the period of residence of the Hamburgian groups at a site, completely different from that of the Tunneltal, can be interpreted in this way, the species composition of eaten animals would correspond to a different period of stay, indicating seasonal mobility throughout the annual cycle.

Diverse economic bases are also confirmed by data for the later settlements associated with the Allerød period (GI-1d-1a). A large part of the remains, especially from the older phase of the Federmesser settlement (the sites of Klein Nordende, Reichwalde but also Lubrza and Rotnowo), are bones of large ungulates – elk, deer, reindeer and roe deer (Bokelmann *et al.* 1983; Benecke 2001; Sobkowiak-Tabaka 2017). Other site (e.g., Alt Duvenstedt) are dominated by small mammals: beaver, hare, fox and bird species (Clausen 2004).

Other evidence of the high variability of diet, composed mostly of freshwater fish, comes from isotope analyses performed on human bone remains from a Bonn-Oberkassel double burial (Nehilich, Richard 2015). Although it does not provide direct evidence of seasonality, the data confirm that fish were an important source of nutrition for Late Palaeolithic groups, at least for part of the year, and subsistence strategies were not limited to large game hunting.

3.2. Settlement structures – lithic record

Another important indicator that may suggest the cyclical seasonal variability of hunter-gatherer groups in the Late Palaeolithic are flint inventories – their size, number, composition and spatial arrangement. The functional diversity resulting from both the typological and technological composition of the inventories and the results of use-wear analyses implicitly indicate, similarly to environmental data, a different period of occupation in the particular camps. Confirmed plant processing may limit the interpretation of the season of stay to the vegetation period (e.g., for the sites in Lubrza – Sobkowiak-Tabaka, Diakowska 2019). The correspondence analysis and variability of the tool structure measured by the convergence index indicate the existence of several functional groups that may exemplify seasonal mobility (Wiśniewski *et al.* 2022, 62-63). Similar conclusions are drawn from the analysis of the density of artefacts and tools of Federmesser settlements (Sobkowiak-Tabaka, Diachenko 2022, 115).

However, the diversity of sites is most often described by the number of flint artefacts and the ratio between the number of tools and cores in the entire inventory (Weniger 1989, 344-345), or by the number of registered structures, usually in the form of flint concentrations regarded as remains of the basic settlement units. Such data for the Late Palaeolithic prove equally high variability for the entire Late Glacial period. While until recently the early period associated with the settlement of the Hamburgian communities was considered to represent a different type of mobility (corresponding to Binford's forager model)

with low differentiation of camps in terms of size and function (Riede 2014, fig. 10), discoveries from the past decade or so allow us to reject such a reconstruction of mobility. The identification of new sites, especially in western Poland, confirms both the existence of large aggregation sites containing several thousand flint elements grouped into at least several flint concentrations with different functions and the existence of medium-sized camps (probably used by single families) as well as specialized single-flint processing sites. The simple core and tool index (Fig. 3) and diagram of total number of lithic specimens of classic Hamburgian sites (Fig. 4) indicate great variability in settlement size even in the earliest phase of the Late Glacial with at least a few sites that could be described as aggregation large camps. Similar high variability in site size is visible for the Federmesser settlement. Examples of a large settlement in this case include Rekem (De Bie, Caspar 2000), Całowanie (Schild *et al.* 2011) or Reichwalde (Volbrecht 2005), with over 20,000 flint products, with an average of about several thousand in other sites. For the Ahrensburgian/Sviderian settlement, such 'mega camps' can be found in Cichmiana, Kochlewo and Rydno. Among the groups of sites with a special function, camps such as Hoornseveld and Teltwisch stand out, where almost all the tools are scrapers (Sobkowiak-Tabaka 2017, 175).

3.3. Art objects

It is worth recalling here another element of material culture, that is most often closely related to the ritual sphere – art. In Conkey's study of the Magdalenian in the Iberian Peninsula, the aggregation and dispersion model was based on the difference in the decoration of mobile art objects (Conkey 1980). The presence of cave art was an indication of ritual activities performed during the aggregation phase of the settlement cycle.

Unfortunately, archaeological sources related to art from the Late Glacial period of the European lowlands are very limited. However, in the context of the phenomena of seasonality and cyclicality, it is worth mentioning a decorated object from Rusinowo dated to the Allerød period (Płonka, Kowalski 2017). It is a fragment of an antler tine with decorations in the form of a series of 'zigzags' arranged in lines one below the other. Based on the analysis of patterns, researchers have suggested that the particular lines of

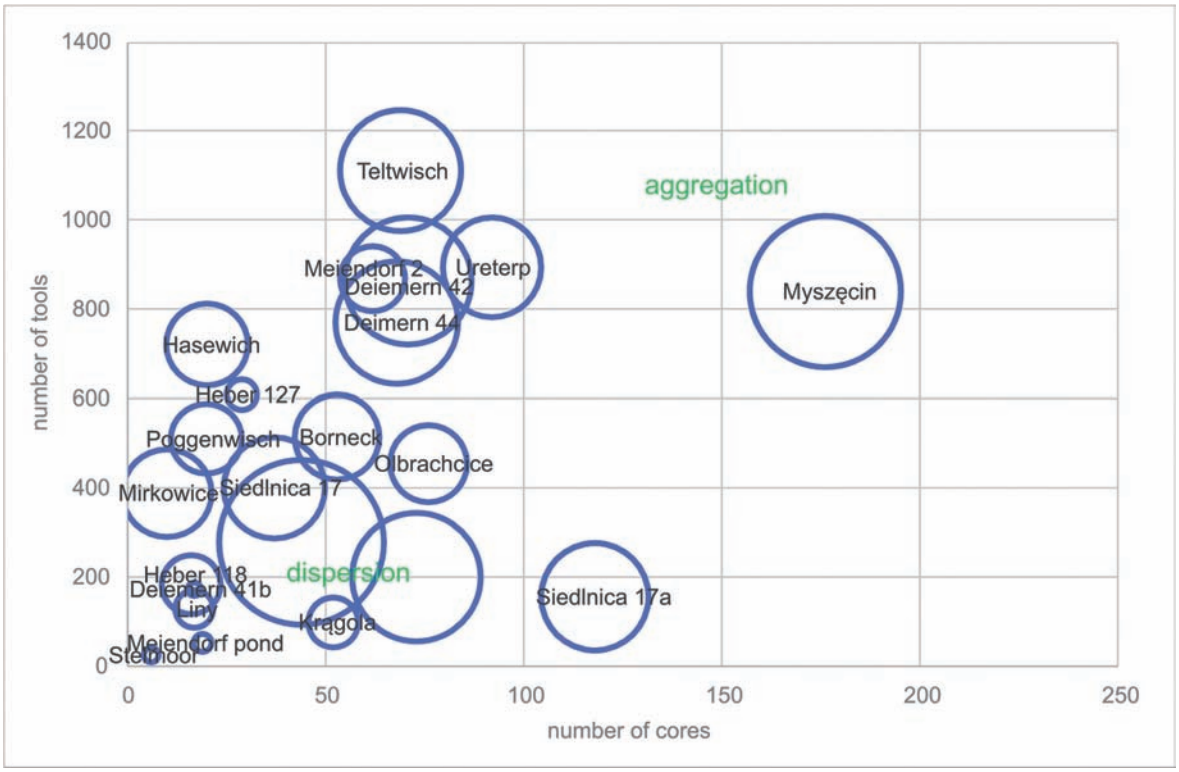

Fig. 3. Diagram of classical Hamburgian settlement diversity and size indicated by proportion between core and tool numbers. The different size of bubbles represent the total number of lithic specimens

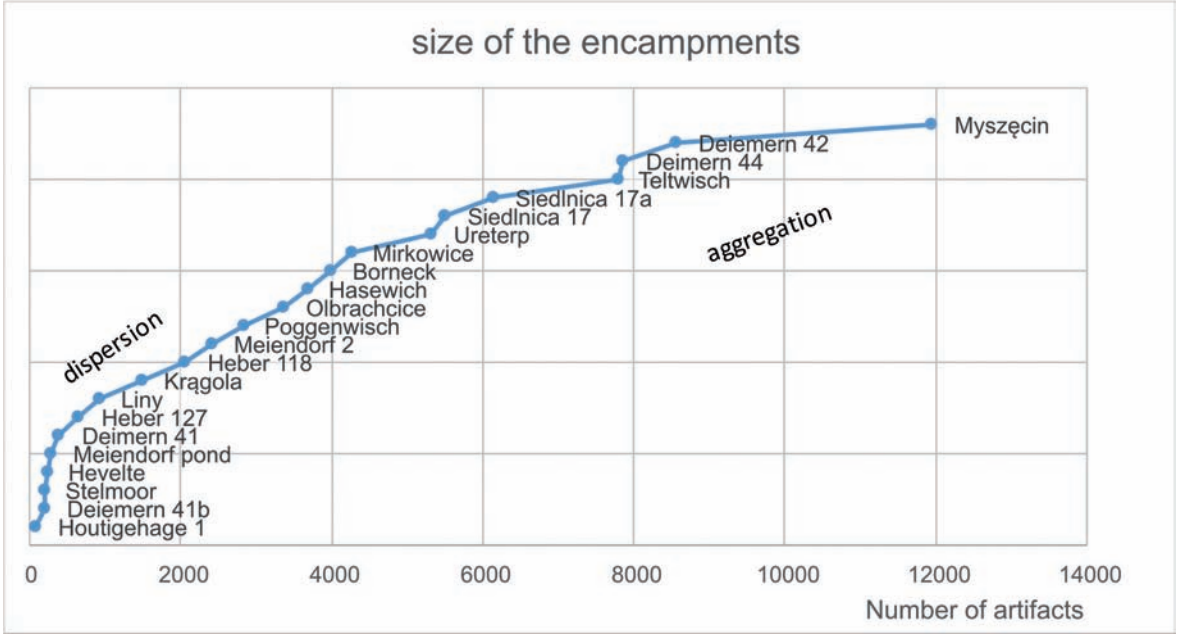

Fig. 4. Diagram of classical Hamburgian settlement size indicated by total number of artefacts

ornamentation were made by different people. The item was therefore cyclically "re-written" with subsequent characters. Although it is not possible to determine the time intervals between subsequent cuts, the authors suggest that the item is evidence of seasonally repeated rituals.

Similarly, a bone element from the Bonn-Oberkassel site (Henke 1986, Street *et al.* 2006) can be interpreted as an example of a non-utilitarian ritual object. The item has a series of regular cuts along its length and a roughly shaped end in the form of an animal head. The decorated object was part of a double burial dated to the Late Glacial (Orschiedt 2018). Besides the bone pin, a flat engraved bone plate and dog remains were recorded as well. The presence of decorated objects, and their potential ritual significance, may indicate the special importance of the buried people and their high social status related to their role in ritual activities (Płonka 2012, 437).

4. DISCUSSION

Based on the presented archaeological evidence, we can therefore conclude that seasonal changes in subsistence strategies correspond to settlement variability. The most famous valley sites rich in faunal remains, associated with hunting of migrating reindeer herds, indicate only a short period in the annual cycle of Late Palaeolithic hunter-gatherer communities and illustrate part of a complex system of settlement mobility.

Smaller camps, where the remains of fish and small mammals were found, correspond to the spring and summer locations occupied by the family groups during the dispersion phase. The places of aggregation can be correlated with the few settlements composed of many simultaneous flint concentrations, in which animal carcasses collected after autumn hunting were perhaps consumed.

The presence of large settlements suggests a dualistic model of the seasonal settlement system based on temporal aggregation into larger groups. Such settlements can be found in the Late Palaeolithic, both in the early period presented here, among the Hamburgian communities (Mugaj 2022), and in subsequent periods, among the Federmesser and Ahrensburgian/Sviderian groups. The presence of aggregation sites has also been described for the Magdalenian societies (Conkey 1980), which indicates that the phenomenon of seasonal aggregation and disintegration can be considered not as a manifestation of local adaptation to particular environmental conditions but as a *longue-durée* social phenomenon. This model persisted despite significant environmental changes in the Late Glacial period.

The current models of settlement mobility proposed for the Late Palaeolithic period use general

assumptions of cultural ecology and environmental determinism related to the processual theory. As a result, forager mobility in the earliest stage of the Late Glacial (Hamburgian groups) may be suggested, and a more logistical or flexible mobility pattern of the fission-fusion type may be suggested for later stages of the recolonization of European lowland (Federmesser and Ahrensburgian/Sviderian groups) (Riede 2014). The seasonal mobility in the Late Palaeolithic between upland and lowland, north and south, or west and east was regarded as a settlement behaviour dependent strictly on the seasonal distribution of the main prey (Baales 1999).

As suggested in this article, the application of the social approach and the model of broad seasonal sociocultural changes allows us to place the phenomenon of seasonality and settlement variability in a completely different interpretative framework.

Although there is no connection between art objects and a specific settlement context, season or particular settlement phase (dispersion or aggregation), the cyclical nature of ritual behaviour, confirmed by analyses of these objects, broadens the archaeological record and strengthens the hypothesis of a dualistic model of seasonal changes.

CONCLUSION

Several conclusions can be drawn from new studies on the seasonality and mobility of the hunter-gatherer community in the Late Palaeolithic. First, it should be stated that the archaeological record confirms seasonal variability in at least two aspects of life: subsistence economy and settlement mobility. The data indicate a dichotomist seasonal system, most probably with autumn-winter and spring-summer phases.

Secondly, the seasonal changes in the settlement structure took the form of cyclical aggregation, an example of which are large sites with many synchronous settlement structures, and a dispersion phase, manifested by sites consisting of one or a few lithic concentrations. The aggregation phase was, most probably, related to the autumn/winter, while the dispersion phase was related to the spring/summer periods.

Thirdly, both the dualistic settlement model and seasonal changes in the subsistence economy are permanent forms characteristic of the Late Palaeolithic communities of the Central European Plain throughout the entire Late Glacial (with their origins in earlier periods). Therefore, it seems that the climatic fluctuations of the Late Glacial did not affect the basic shape of the lifeways of human groups. It can therefore be concluded that adaptive mechanisms were not the key factor in the duration of the dualistic model of seasonal transformation of hunters-gatherers, although undoubtedly, as indicated by researchers exploring the concept of the fission-fusion model, evolutionary mechanisms had an impact on the formation of such ways of life in deep history.

The mobility models existing, and most frequent in, archaeological discourse are most often based on processual theories (collector-forager model) or general assumptions of neo-evolutionistic cultural evolution and environmental determinism. To a great degree, the popularity and vitality of these trends in the archaeology of the Palaeolithic result from the significant limitations of the evidence. Research, devoid of data related to mobility other than environmental ones, naturally tends towards interpretations referring to adaptive concepts. However, in light of the presented data based on the newest research on the dualistic settlement model and ritual cyclicality suggested by mobile art objects, it seems justified to seek explanations of seasonal transformations in socially oriented theories undertaken in anthropological research on the cultural systems of modern hunter-gatherer groups. Therefore, the social approach to Late Palaeolithic seasonality goes beyond only analogical and speculative explanations, finding its basis in archaeological records.

Despite the very limited evidence available for the reconstruction of the life of hunter-gatherer groups in lowland Europe in the Late Palaeolithic, it seems that the current data allow us to adopt the concept of seasonality proposed by the social approach of anthropological studies, indicating other than purely economic and environmental aspects of the functioning of hunter-gatherer groups in dualistic models of settlement organization.

BIBLIOGRAPHY

Aureli F., Shaffner C., Boesch C., Bearder S., Call J., Chapman C., Connor R., Di Fiore A., Dunbar R.I.M., Henzi S.P., Holekamp K., Korstjens A.H., Layton R., Lee P.C., Lehmann J., Manson J.H., Ramos-Fernandez G., Strier K.B., Van Schaik C.P. (2008). Fission–fusion dynamics: new research frameworks. *Current Anthropology*, *49*, 627-654. http://www.jstor.org/stable/10.1086/586708 .

Baales M. (1999). Economy and seasonality in the ahrensburgian. In: S. Kozłowski, J. Gurba, L. Zaliznyak (eds.), *Tanged Points Culture in Europe* (64-75). Lublin: Wydawnictwo UMCS.

Bailey G. (1960). A method of determining warmth and temperateness of climate. *Geografiska Annaler*, *43*, 1-16.

Bettinger R., Garvey R., Tushingham S. (2015). *Hunter-Gatherers: Archaeological and Evolutionary Theory (second edition)*. New York: Springer.

Binford L. (1962). Archaeology as anthropology. *American Antiquity*, *28*, 217-225.

Binford L. (1965). Archaeological systematics and the study of culture progress. *American Antiquity*, *31*, 203-210.

Binford L. (1978). *Nunamiut ethnoarchaeology*. New York: Academic.

Binford L. (1980). Willow smoke and dogs' tails: hunter-gatherer settlement systems and archaeological site formation. *American Antiquity*, *45*, 4-20.

Binford L. (2001). *Constructing frames of reference: an analytical method for archaeological theory building using ethnographic and environmental data sets*. Berkeley: University of California Press.

Bird-David N. (1990). The giving environment: another perspective on the economic system of hunter-gatherers. *Current Anthropology*, *31*, 183-196.

Boas F. (1966). *Kwakiutl Ethnography* (ed. H. Codere). Chicago: University of Chicago Press.

Bokelmann K. (1979). Rentierjäger am Gletscherrand in Schleswig-Holstein? *Offa*, *36*, 12-22.

Bokelmann K., Heinrich D., Menke B. (1983). Fundplätze der Spätglazials am Hainholz-Esinger Moor, Kreis Pinnberg. *Offa*, *40*, 199-239.

Bratlund B. (1994). A survey of the Subsistence and Settlement Pattern of the Hamburgian Culture in Schleswig-Holstein. *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz*, *41*, 59-93.

Bratlund B. (1996). Hunting Strategies in the Late Glacial of Northern Europe. A Survey of the Faunal Evidence. *Journal of World Prehistory*, *10*, 1-48.

Conkey M.W. (1980). The Identification of prehistoric hunter-gatherer aggregation sites: The case of Altamira. *Current Anthropology*, *21*, 609-630.

Fitzhugh B., Phillips C.S., Gjesfjeld E. (2011). Modelling hunter-gatherer information networks: an archaeological case study from the Kuril Islands. In: R. Whallon, W. Lovis, R. Hitchcock (eds.), *Information and its Role in Hunter-gatherer Bands. Ideas & Perspectives* (85-115). London: Cotsen Institute of Archaeology Press at UCLA.

Garvey R., Bettinger R. (2014). Adaptive and Ecological Approaches to the study of Hunter-Gatherers. In: P. Jordan, V. Cummings, M. Zvelebil (eds.), *The Oxford Handbook of the Archaeology and Anthropology of Hunter-Gatherers* (69-91). Oxford: Oxford University Press.

Graeber D., Wengrow D. 2021. *The dawn of everything. A new history of humanity*. Milton Keynes: Allan Lane, Penguin Books.

Grove M. 2010. Logistical mobility reduces subsistence risk in hunting economies. *Journal of Archaeological Science*, *37*, 1913-1921. https://doi.org/10.1016/j.jas.2010.02.017

Grove M., Pearce E., Dunbar R. 2012. Fission-fusion and the evolution of hominin social systems. *Journal of Human Evolution*, *62*, 191-200. https://doi.org/10.1016/j.jhevol.2011.10.012

Henke W. 1986. Die magdalénienzeitlichen Menschenfunde von Oberkassel bei Bonn. *Bonner Jahrbücher*, *186*, 317-366.

Ingold T. 2000. *The perception of the environment: essays on livelihood, dwelling and skill*. London: Routledge.

Jacobi R.M. 1980. The Upper Palaeolithic in Britain, with special references to Wales. In: J.A. Taylor (ed.), *Culture and Environment in Prehistoric Wales: Selected essays* (15-100). Oxford: British Archaeological Reports 76.

Jordan P., Cummings V. (2014). Analytical Frames of Reference in Hunter-Gatherer Research. In: P. Jordan, V. Cummings, M. Zvelebil (eds.), *The Oxford Handbook of the Archaeology and Anthropology of Hunter-Gatherers* (33-42). Oxford: Oxford University Press.

Kabaciński J., Sobkowiak-Tabaka I. (2009). Big game versus small game hunting: subsistence strategies of the Hamburgian Culture. In: M. Street, N. Barton, T. Ter-

berger (eds.), *Humans, environment and chronology of the late glacial of the North European Plain* (67-75). Mainz: RGZM.

Kelly R. (2013). *The lifeways of hunter-gatherers. The foraging spectrum*. New York: Cambridge University Press.

Lane P. (2014). Hunter-Gatherer-Fishers, Ethnoarchaeology, and Analogical Reasoning. In: P. Jordan, V. Cummings, M. Zvelebil (eds.), *The Oxford Handbook of the Archaeology and Anthropology of Hunter-Gatherers* (104-150). Oxford: Oxford University Press.

Lehmann J., Boesch C. (2004). To fission or to fusion: effects of community size on wild chimpanzee (Pan troglodytes verus) social organisation. *Behavioral Ecology and Sociobiology*, *56*, 207-216. DOI 10.1007/s00265-004-0781-x

Lehmann J., Korstjens A.H., Dunbar R.I.M. (2007). Fission-fusion social systems as a strategy for coping with ecological constraints: a primate case. *Evolutionary Ecology*, *21*, 613-634. DOI: 10.1007/s10682-006-9141-9

Levi-Strauss C. (1967). The social and psychological aspects of chieftainship in a primitive tribe: the Nambikwara of northwestern Mato Grosso. In: R. Cohen, J. Middleton (eds.), *Comparative Politcal Systems* (45-62). Austin: University of Texas Press.

Lowie R. (1948). Some aspects of political organization among the American Aborigines. *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, *78*, 11-24.

Marlowe F. (2005). Hunter-Gatherers and Human Evolution. *Evolutionary Anthropology*, *14*, 54-67.

Mauss M., Beauchat H. (1979) [1906]. *Seasonal variations of the Eskimo.* London: Routledge.

Mugaj J. (2022). Seasonal Aggregation Site in Late Paleolithic – Intrasite Analysis of Large Hamburgian Encampment in Myszęcin, Western Poland. *Lithic Technology*, *47*, 106-116. https://doi.org/10.1080/01977261.2021.1967580

Nehlich O., Richards M. (2015). Dietary reconstruction of the two skeletons from Oberkassel by stable carbon and nitrogen isotope analysis from bone collagen. In: L. Giemsch, R. Schmitz (eds.), *The Late Glacial burial from Oberkassel revisited* (219-221). Darmstadt: Zabern.

Orschiedt J. (2018). The Late Upper Palaeolithic and earliest Mesolithic evidence of burials in Europe. *Philosophical Transaction of the Royal Society*, *B 373*. https://doi.org/10.1098/rstb.2017.0264

Pearce E. (2014). Modelling mechanism of social network maintenance in hunter-gatherers. *Journal of Archaeological Science*, *50*, 403-413. https://doi.org/10.1016/j.jas.2014.08.004

Pedersen J.B., Maier A., Riede F. (2018). A punctuated model for the colonisation of the Late Glacial margins of northern Europe by Hamburgian hunter-gatherers. *Quartär*, *65*, 85-104. DOI: 10.7485/QU65_4

Płonka T. (2012). *Kultura symboliczna społeczeństw łowiecko-zbierackich środkowej Europy u schyłku plejstocenu*. Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego.

Płonka T., Kowalski K. (eds.) (2017). *Rusinowo. The symbolic culture of foragers in the Late Palaeolithic and the early Mesolithic*. Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego.

Pulliam H.R. (1973). On the advantages of flocking. *Journal of Theoretical Biology*, *38*, 419-422.

Riede F. (2014). Success and failure during the Lateglacial pioneer human re-colonisation of southern Scandinavia. In: F. Riede, M. Taallavaara (eds.), *Lateglacial and postglacial pioneers in northern Europe* (33-52). Oxford: British Archaeological Reports.

Rust A. (1943). *Die alt- und mittelsteinzeitliche Funde von Stellmoor*. Neumünster.

Schild R., Królik H., Tomaszewski A.J., Ciepielewska E. (2011). *Rydno. A Stone Age red ochre quarry and socioeconomic center. A century of research*. Warsaw: Wydawnictwo IAE PAN.

Sobkowiak-Tabaka I. (2017). *Rozwój społeczności Federmesser na Nizinie Środkowoeuropejskiej*. Poznań: Wydawnictwo IAE PAN.

Sobkowiak-Tabaka I., Diachenko A. (2022). Approaching Late Paleolithic Seasonal Mobility on the North European Plain. In: I. Sobkowiak-Tabaka, A. Diachenko, A. Wiśniewski (eds.), *Quantitative Archaeology and Archaeological Modelling* (97-128). Springer.

Sobkowiak-Tabaka I., Kufel-Diakowska B. (2019). The shining piece of the puzzle: evidence of plant use in the Late Palaeolithic. *Archaeological and Anthropological Sciences*, *11*(4), 1373-1389. DOI:10.1007/s12520-018-0604-z

Steward J. (1936). The economic and social basis of primitive bands. In: R. Lowie (ed.), *Essays on anthropology in honour of Alfred Louis Kroeber* (311-350). Berkeley: University of California Press.

Steward J. (1955). *Theory of cultural change*. Urbana: University of Illinois Press.

Street M., Terberger T., Orschiedt J. (2006). A critical review of the German Paleolithic hominin record. *Journal of Human Evolution*, *51*, 551-579. https://doi.org/10.1016/j.jhevol.2006.04.014

Sturdy D.A. (1975). Some reindeer economies in prehistoric Europe. In: E.S. Higgs (ed.), *Paleoeconomy* (55-95). Cambridge: Cambridge University Press.

Trigger B. (2006). *A history of archaeological thought*. Cambridge: Cambridge University Press.

Vollbrecht J. (2005). *Spätpaläolithische Besiedlungsspuren aus Reichwalde. Reichwalde 1*. Dresden: Landesamtes für Archäologie mit Landesmuseum für Vorgeschichte.

Wengrow D., Graeber D. (2015). Farewell to the 'childhood of man': ritual, seasonality, and the origins of inequality. *Journal of the Royal Anthropological Institute*, *21*(3), 597-619. DOI:10.1111/1467-9655.12247

Weniger G.C. (1989). The Magdalenian in Western Central Europe: Settlement pattern and regionality. *Journal of World Prehistory*, *3*, 323-372.

White L. (1959). *The evolution of culture*. New York: McGraw-Hill.

Wild M. (2019). *Coping with the risk through seasonal behavioural strategies*. Schleswig-Holstein: Wachholtz.

Wiley R.H. (1991). Lekking in birds and mammals: behavioral and evolutionary issues. *Advanced in the Study of Behavior*, *20*, 201-291. DOI:10.1016/S0065-3454(08)60322-8

Wiśniewski A., Kozyra C., Chłoń M. (2022). Reading the Mobility of Late Palaeolithic Hunter-Gatherers. Case Study from the Sowin Site Complex in Relation to Late Palaeolithic Sites North of the Sudetes and Carpathians. In: I. Sobkowiak-Tabaka, A. Diachenko, A. Wiśniewski (eds.), *Quantitative Archaeology and Archaeological Modelling* (47-68). Springer.