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Seasonal Variation in Maglemosian Group Size and Structure

A New Model¹

by Ole Grøn

On the basis of the results of research on the organization of the dwelling space of the Maglemosian hunter-gatherers and the insight into household structure that these provide, a model for seasonal variation in group size, group structure, and settlement organization is advanced. In opposition to earlier models, it is argued that the largest groups obtained not during the winter but during the warmer part of the year and that camps during the period from April to October normally consisted of three to four dwellings placed along the shore at 40-m intervals. It is proposed that winter camps often consisted of an isolated winter house in some cases containing only two families.

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1. The results published here are a result of my work during 1985 on a project funded by the Danish Research Council for the Humanities, to which I wish to express my gratitude. An essential part of the information exploited in this paper was collected and excavated by Knud Andersen. I am grateful to him for the great kindness and promptness with which he has commented on my work and tried to provide all the information I asked for. Søren H. Andersen is thanked for his support and interest in my work. His identification of weak points in the arguments has caused several revisions of the manuscript and provided new inspiration. Numerous anthropologists and archaeologists have contributed discussion of and information about camp organization among hunter-gatherers and made important unpublished data available to me. I thank Knud Frydendahl, of the Institute of Meteorology, Copenhagen, for his reconstruction of the climate of Boreal times, Jesper Boldsen, of the Department of Social Medicine, University of Odense, for help with the analysis of data from the Åmose sites, and P. Crabb for revising the language. Full responsibility for the views put forward is of course my own.

The success of modern archaeology depends on its ability to produce reliable interpretations of prehistoric cultures in terms of dynamically interrelated social structures and resource utilization strategies. On the basis of ethnography, it has been possible to construct very general models of the social structures and ways of life that seem to be associated with the various kinds of economies that can be distinguished archaeologically. We have a general picture of the group structure, economy, and seasonal variability connected with the different aspects of non-food-producing cultures (Price and Brown 1985:9; Price 1981:79; Renouf 1984:25), but in no instance has a satisfactory interpretation of a specific prehistoric hunter-gatherer society been possible.

The Maglemose culture is a hunter-gatherer culture that existed in the North European lowlands from 7500 to 6000 B.C. A number of finds from northwestern European bogs of dwelling floors consisting of bark and branches and tools of bone, antler, and wood have provided an exceptional insight into the more perishable aspects of this culture. The aim of the present paper is, on the basis of previously obtained results concerning the organization of space within the dwellings of the Maglemose culture and the structure of the groups inhabiting these dwellings (Grøn 1983, 1987a, b), to discuss the settlement patterns in terms of interrelated social and exploitative strategies. On a preliminary basis, a rather specific model for seasonal rotation and seasonal variation in group size and structure that seems to emerge from the archaeological material is sketched. The model is partly in opposition to views previously held, but as it is based on a close examination of the individual sites and on recent results from a number of relevant disciplines, it is hoped that it can be confirmed by further research.

The Isolated One-Family Dwelling

A traditional conception of the majority of Maglemosian sites archaeologically investigated as representing single isolated dwellings housing only one nuclear family (Andersen, Jørgensen, and Richter 1982:83; Andersen 1983:182-83; Becker 1953:181; Brinch Petersen 1972:72, 75) has for years underlain research on this culture. This view was partly based on the fact that Maglemosian material was often found in small "isolated" concentrations. Where such concentrations were found so close as to suggest that they might reflect a larger contemporaneous settlement, they often differed too much typologically and thus chronologically (Becker 1953:181). Moreover, the limited size of the concentrations sometimes found in connection with preserved bark floors of 25 m² or less intimated that the inhabiting group probably did not exceed a nuclear family (Andersen, Jørgensen, and Richter 1982:83; Becker 1953:181; Blankholm 1985:68; Brinch Petersen 1972:74-75; 1973:94; Welinder 1973:6).

In the course of the '70s, a subtler picture emerged. According to this, summer settlements had consisted of

isolated single-family dwellings and winter settlements of somewhat "larger units" of an unspecified kind, possibly inhabited by several families (Brinch Petersen 1973:94–95; Welinder 1971:190–91; 1973:6–8). As no convincing archaeological evidence for a winter site in the area in focus was known and only a very small part of one of the proposed winter sites—Holmegård V—had been excavated, these suggestions were rather hypothetical.

The ethnographic literature reveals that the multifamily dwelling (often with no more than 10–15 m² per family) is very common among hunter-gatherers and that single- and multifamily dwellings are often in use simultaneously (e.g., Rogers 1967a:7; Jenness 1970:65–76; Radcliffe-Brown 1964:412–14). On the basis of the archaeological materials it has now been argued that the dwelling units represented in the Maglemosian material are of two kinds: single-family dwellings of approximately 12 m², such as Duvensee W.8, Bare Mosse II, and Ulkestrup II, and two-family dwellings of approximately 24 m², such as Ulkestrup I, Svanemosen 28, and Duvensee W.6. The two types are distinguished on the basis of their internal organization as this is reflected in the distribution of tool types and the positions of hearths (Grøn 1983:34–39; 1987a, b; Welinder 1971:181–83). They seem to be represented in the material with approximately equal frequency.

In opposition to the two models proposed for the Maglemose culture—that the population was dispersed in isolated dwellings probably inhabited only by single (perhaps extended) nuclear families year-round or that this was the case in summer whereas larger groups assembled in winter—winter and early spring must have been periods of sparse resources during which dispersion in small units would seem natural and perhaps even necessary, whereas summer and autumn were periods of relatively rich and diverse resources that made assembly of larger groups possible. The mammals present were non-migratory and evenly distributed, and only some fish (salmon and some kinds of trout) and perhaps some birds may during shorter periods and at certain locations have been exploited as concentrated local resources (see appendix; also see Iversen 1967:380–81, 389–90; Odum 1971:51–52). According to the results of Henrik Tauber's analysis of the C¹³ and C¹⁴ content of human bones (Tauber, personal communication), the Maglemosian groups we are today able to study cannot regularly have had access to maritime resources (though there is likely to have been contact with Maglemosian "coastal" groups living in areas now submerged).

Some non-food-producers who exploit coastal resources or concentrated localized and predictable inland resources seem to share a number of features (such as restricted mobility, often sedentariness, with settlements supporting large aggregations of people, more or less formalized leadership, specialized technology, etc.) that diverge from the "traditional" generalizing picture put forward at the symposium "Man the Hunter" (Lee and DeVore 1968), where the basic characteristics of hunter-gatherer societies were seen as their mobility and

flexible social structure (Renouf 1984:19, 24). Given the evenly distributed (as opposed to locally concentrated) and mainly non-migratory interior resources available in Pre-Boreal and Boreal times to the Maglemosian groups we are able to study, it is difficult to imagine how a more "complex" cultural level than one conforming to the "traditional" conception of a flexible mobile society could have been supported (Renouf 1984:21). The archaeological material in fact strongly indicates that these groups—probably in opposition to the later much more coastally oriented Ertebølle culture that not unlikely was influenced by contact with Neolithic cultures—constituted a mobile society represented at a number of excavated sites that apparently reflect only single short-term occupations.

On the whole, it seems likely that group size increased during periods with rich resources (summer and autumn) and decreased during meagre periods (winter and spring). This is not to say that dispersion/aggregation is determined only by the seasonally available resources, but in this specific case, because winter resources were limited, the only likely alternative seems to be a society consisting of groups of very few families only living year-round in an environment that in summer could easily support larger aggregations of relatives and friends. Beyond the technical advantages deriving from living in groups containing several hunters who can collaborate or cover a larger area in small groups and thus provide a more constant inflow of hunting resources, it must not be overlooked that man is a social animal and normally enjoys social contact within larger groups when this is possible (Balıkcı 1970:58; Birket-Smith 1929:71; Silberbauer 1981:195, 278). A tendency to disperse and aggregate with the carrying capacity of the resources has been observed in a number of hunter-gatherer cultures exploiting interior environments with a resource structure similar to that of the Maglemose culture (e.g., Rogers 1967a:4; 1973:2, 33; Silberbauer 1981:194–98).

Contemporaneity of Spatially Separate Dwelling Units

A great number of small, typologically "pure" Maglemosian sites appear to have been located on the peat on the shores of lakes or of small islands in freshwater basins, often with the dwelling only a few metres from the water (Andersen 1983:176–77; Andersen 1979:194; Brinch Petersen 1973:94). Since this location must have been rather inconvenient in winter, and as is indicated by the organic remains preserved at a number of these small sites (Andersen 1983:179; Andersen, Jørgensen, and Richter 1982:175; Becker 1945:63; Bokelmann 1980:324–25; 1981:29–30; Brinch Petersen 1973:74; Friis Johansen 1919:126; Henriksen 1980:132; 1976:148), the dwellings appear to have been used from early spring (at the latest April) to autumn (at least October). Because the idea of summer and autumn camps consisting of only one or two families (in one isolated dwelling) differs, as I have said, from what might be expected, the

hypothesis is here advanced that these camps probably often consisted of several contemporaneous dwellings.

An important thing to keep in mind here is that the dwellings of hunter-gatherers belonging to a single settlement may actually be spaced farther apart than immediately expected (Briggs 1970:177, 188; Burch 1975:251–52; Gould 1968:109–10; Hayden 1979:138, 153; Howitt 1904:733–35; Antropova and Kuznetsova 1964:815; Watanabe 1973:48). This implies that sites that have been interpreted as spatially separated “isolated” dwellings representing different periods of settlement may in some cases be contemporaneous and thus reflect larger settlements or parts of such larger settlements. The excavation method hitherto employed, with its inherent focus on concentrations of finds and their immediate surroundings, is one likely reason that larger units consisting of more dwellings may have been overlooked. From an archaeological point of view, however, there are serious methodological problems in demonstrating or merely giving credence to assumptions concerning the possible exact contemporaneity of spatially segregated sites.

One method that can be applied to sites with preserved wood is dendrochronological analysis. If bark and a reasonable number of tree rings of a suitable kind of tree are preserved, it should be possible to see whether two dwellings are contemporaneous, even if only a relative dating can be obtained. Giddings, in an attempt to solve a similar problem with the excavated dwellings of the Kobuk River culture, used this method, but since it apparently had been customary here to use old driftwood for dwelling construction, his attempt was not as successful as one might wish (Giddings 1952:105–10). With the many preserved stakes from the two Ulkestrup “huts,” only 30 m apart centre to centre (Andersen, Jørgensen, and Richter 1982:11), relative dendrochronological dating could probably have shown whether they were contemporaneous or not. Unfortunately, none of the stakes are preserved, since it has been normal practice to discard such wooden objects once they have been measured and the species identified. It can only be hoped that new finds will yield an opportunity to apply this method.

Reassembly of lithic material from Palaeolithic and Mesolithic sites has yielded a number of interesting results (Fischer 1975:156–57; Skar and Coulson 1987; Stapert 1985:60–61). It may well be possible to refit flint from separate contemporaneous concentrations belonging to the same settlement. If it can be demonstrated that flint has been transported from one small typologically pure concentration to a second apparently contemporaneous one and vice versa, this will have to be regarded as a strong indication of the exact contemporaneity of the two sites. Where people from one settlement were picking up material from an earlier one, the transport of material would be expected to be only one-way. With the Maglemosian, however, the often enormous amounts of lithic material, not unusually 20,000–40,000 pieces of flint per dwelling, combined with the very small size of many of these pieces (microflints) in most

cases precludes any such refitting. With materials that are heavily calcified, as is often the case with the material from the waste layers of Maglemosian sites, unambiguous refitting of the smaller pieces may be practically impossible.

As studies of spatially structured behaviour within Maglemosian dwellings seem to have been rather successful, a third possibility might be to study the spatial configuration of the “summer” dwellings to see whether a uniform and repeated settlement layout can be distinguished. From ethnography it is known that the dwellings of hunter-gatherers are seldom randomly distributed but often reflect the social relations between neighbouring households and will often be within a certain culture-specific interval (e.g., Burch 1975:251–52; Gould 1968:109–10; Gusinde 1931:203–4; Honigsmann 1961:56; Howitt 1904:773; Silberbauer 1981:166–67, 222; Williams 1968:166). With the Maglemosian, the structure of the camps inhabited between April and October must be expected to be simplified by the fact that all the dwellings are likely to be only a few metres from the water. In contrast to situations in which circular or more complicated “two-dimensional” camp arrangements are used (Fraser 1968; Yellen 1977:70–71; Spencer and Gillen 1928:501), this is likely to lead to a less complicated “one-dimensional” arrangement along the shore.

The Spacing of Contemporaneous Dwellings

From 1943 to 1951, large-scale industrial exploitation of peat was carried out in the Åmose basin on Zealand. Peat litter was produced by harrowing and mechanically removed in 1–5-cm-thick layers over large areas. As a consequence, the surface of the basin at that time appeared as a large unbroken plain. At the periphery, the peat was removed to its total thickness of 20–30 cm. In the central areas, as much as 1.5 m was removed in many places without reaching bottom; here exploitation had to be stopped because of groundwater. During this period of systematic horizontal removal of relatively thin peat layers, large areas of the basin were regularly surveyed on a voluntary basis by Knud Andersen for the Danish National Museum, and very important material from a large number of Mesolithic sites was collected and recorded (Andersen 1983:12–19).

According to Andersen, the recording of the locations and areas of the sites is exact to a tolerance ± 2 m per 100 m within each of the large complexes (Andersen 1983:16, 18, and personal communication). Later archaeological survey within some of the same areas of the basin carried out under the direction of Anders Fischer for the Department of Ancient Sites and Monuments of the Ministry of the Environment has yielded only a few new Maglemosian sites, whereas sites of some of the following phases are found in larger numbers (Fischer 1985:170–75, and personal communication). It therefore seems likely that nearly all reasonably observable Maglemosian sites that were preserved until 1943 within

the large complexes for which observations were made particularly carefully have been recorded. It appears that the recording of at least the Maglemosian sites within large areas of the Åmose bog has a degree of representativeness that is unique for archaeological materials.

Of importance for this analysis is that contemporaneous dwellings belonging to a single settlement, since they were placed near the same shore, must be expected to be found at nearly the same level in the peat. Thus it seems very probable that all the major observable elements of what may be large, contemporaneously occupied Maglemosian settlements that had not been removed or heavily damaged before Andersen's survey have been recorded, though not as such. Unfortunately, it has not been possible from the data recorded to reconstruct the levels of the sites found.

Some of the recorded sites from the Åmose basin must be assumed to represent not dwelling locations but minor activity areas (Andersen 1983:176). Because the primary purpose of this analysis is to examine the structure of Maglemosian settlements, it is important to distinguish these two categories in the material recorded. As the collection of material was not carried out with equal intensity at all sites and amateur collectors are known to have been active in the area during the period of systematic collection (Andersen 1983:18), the amount of material from a site is a poor criterion for its assignment to one category or the other. Assuming that the activities within and around a dwelling will be much more varied than those in a minor activity area and that the variation in the composition of the materials collected from the different sites will be the factor least affected by varying intensity of collection, the number of object types connected with human activities has been used as the basis of a distinction between the two categories of sites. The following types of objects are regarded as reflecting various aspects of human activity: microliths, microburins, scrapers, knives, burins, borers, blades with retouch, flakes with retouch, blades, cores, flint axes, stone axes, hammerstones, pendants, bone points, bone/antler axes, worked bone or antler, and remains of domesticated dog. Bones of wild animals without traces of human working do not necessarily reflect human hunting and are thus not regarded as an indicator of human activity. As blades are the best-defined category of flint waste and in this case have been most consistently collected, other categories of flint waste have been omitted from this analysis.

For each site the distance from its centre to the centre of the nearest site of the same category ("dwelling location" or "minor activity area") was recorded. As none of the sites had fewer than two types of objects represented, the dividing line between "minor activity areas" and "dwelling locations" was tentatively set between two and three, three and four, four and five, etc. (fig. 1) in an attempt to find a meaningful dividing line between the two categories of sites if one existed. A distinction between two and three types of objects present at the sites (fig. 1A) does not produce a meaningful graph. The nearest-neighbour distance amongst the sites with three or

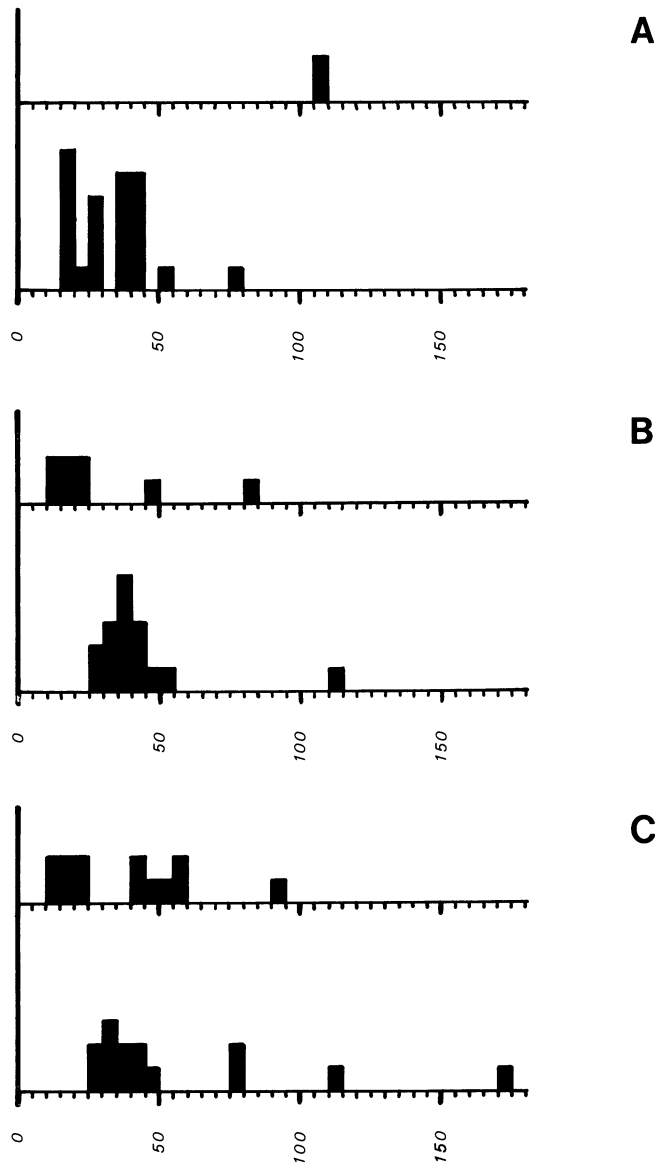


FIG. 1. Distances (in metres) between adjacent "minor activity areas" (upper histograms) and "dwelling locations" (lower histograms) with the dividing line between the two categories set between (A) two and three, (B) three and four, and (C) four and five types of objects reflecting human activity at the sites.

more types of objects present gives a diffuse picture, and only two distances are recorded within the group of proposed minor activity areas (two types of objects or fewer).

A distinction between three and four types of objects present produces quite a different picture (fig. 1B): the group of proposed dwelling locations shows a nearest-neighbour distance of 25–55 m, with a mean of 38.9 m, a dispersion of 6.7 m, and a coefficient of variation of 17.2%. The presumptive minor activity areas are spaced quite differently, with a nearest-neighbour distance of 15–25 m. A distinction between four and five types of

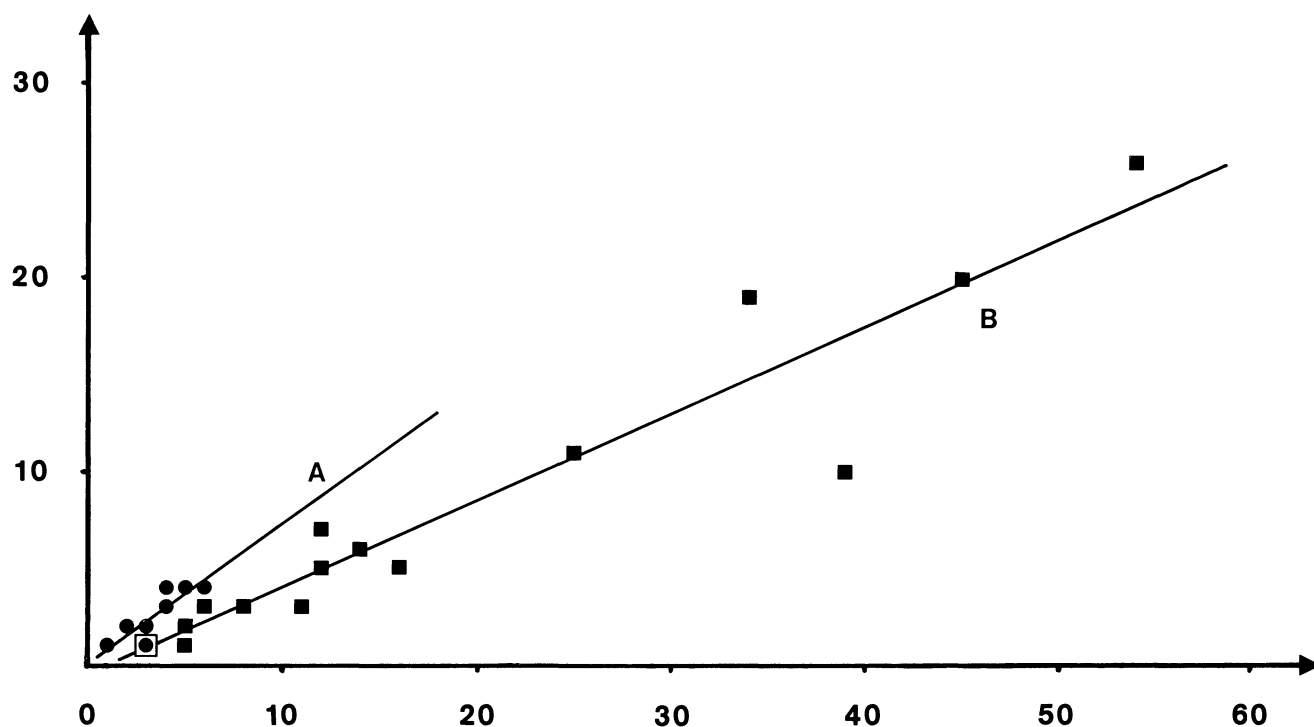


FIG. 2. Number of objects reflecting human activity, excluding blades, found at each site (horizontal axis) and maximum number of items belonging to a single type of such objects (vertical axis). Circular dots, "minor activity areas"; squares, "dwelling locations." Lines A and B are produced by linear regression of the values for "minor activity areas" and "dwelling locations" respectively.

objects (fig. 1C) weakens the peak for the graph of proposed dwelling locations and produces two peaks on the graph of proposed minor activity areas, one of which is identical with the earlier one whereas the other seems to represent a group of sites spaced like dwelling locations. Apparently the picture is blurred by two groups with different characteristics. From the preceding it should be clear that in this case the only possible meaningful distinction between the two categories of concentrations of Maglemosian material is made on the basis of a distinction between three and four types of objects. By definition, therefore, concentrations with three types of objects or fewer will be regarded as minor activity areas and concentrations with four types of objects or more as dwelling locations.

That the minor activity areas are not found less than 15 m apart may indicate that sites closer together have been recorded as a unit. As there is no essential difference in area between the two categories of sites (Andersen 1983:176), the fact that the nearest-neighbour distance for dwelling locations is 25–55 mm cannot be explained as reflecting a similar effect, causing sites less than 25 m apart to coalesce.

In an attempt to demonstrate that the limited number of types of objects represented at the minor activity areas is due not solely to the small amount of material present there but also to a less differentiated typological composition, the total number of objects found at each site was plotted against the number of objects of the dominant

type at each site (different types of objects may be dominant at different sites). As blades are found in relatively large quantities at all the sites but do not give any indication of site-specific activities (microwear analysis has not been conducted), they were omitted from the analysis. A marked tendency (fig. 2) for the most common object-type to be represented in relatively larger quantities at the minor activity areas than at the dwelling locations was taken to indicate the less diversified composition of the former. Linear regression for the dwelling locations produces a line through (0.00, -0.53) with 0.45 as the coefficient of inclination and 0.95 as the coefficient of correlation. For the minor activity areas the corresponding values are (0.00, -0.05), 0.73, and 0.82. This result suggests that in dwelling locations the dominant type of object will be represented on average by approximately 45% of the objects found at the site (blades having been excluded) whereas in minor activity areas it will take up as much as 73%. Our distinction between the two categories of sites seems meaningful, then, with regard to the number of types of objects found at the sites, the distance between the sites, and the relative composition of the materials found at the sites.

Organization of Summer Settlements

The dwelling locations of the Maglemose culture in the areas studied in Åmose bog are distributed horizontally

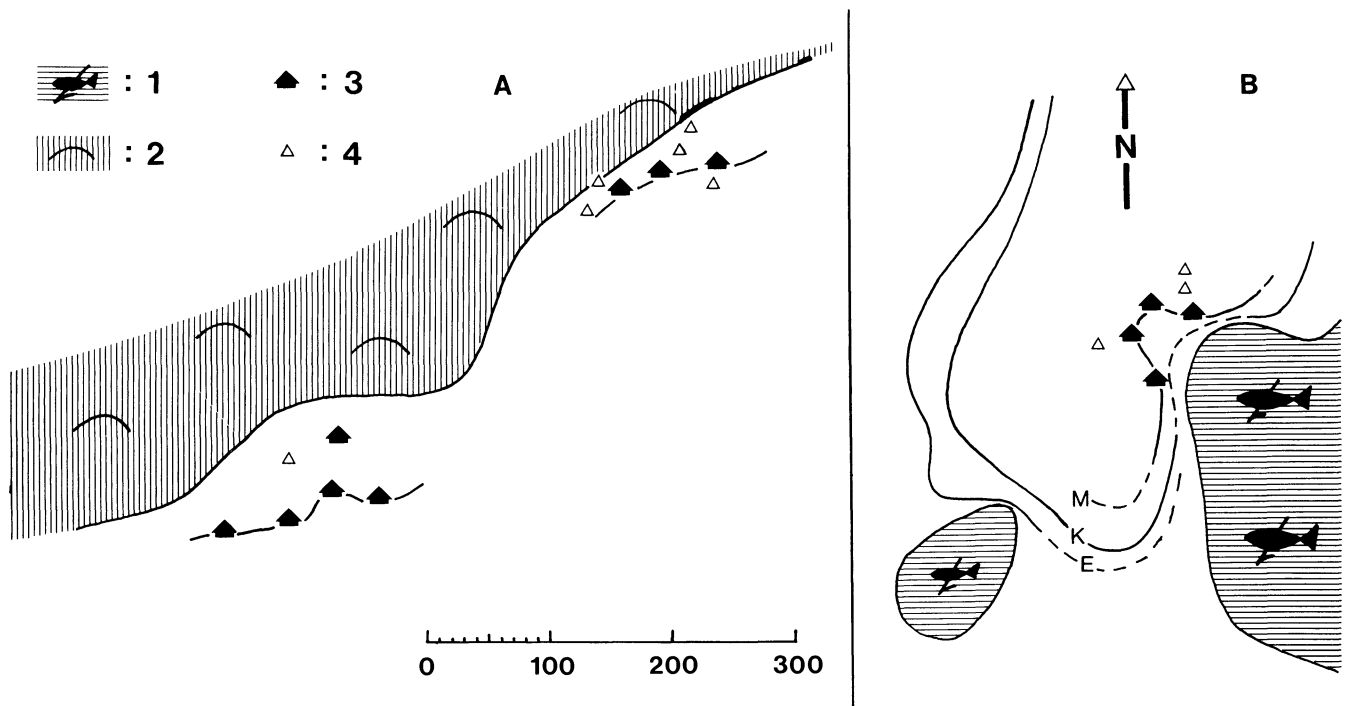


FIG. 3. Horizontal distribution of (A) the Tømmerup Central and Tømmerup East complexes and (B) the Kildegård complex. 1, fishing areas; 2, solid ground (in contrast to the peat on which most of the sites were located); 3, dwelling locations; 4, minor activity areas. On the basis of the configuration of the fishing areas and the horizontal distribution of the sites of the Maglemose, Kongemose, and final-Mesolithic Ertebølle cultures, the shores of these three phases have been tentatively reconstructed within the Kildegård complex and marked M, K, and E respectively.

in three concentrations, one from the Kildegård complex and two from the Tømmerup complex (one from Tømmerup East and one from Tømmerup Central). The concentrations consist of three, four, and five dwelling locations, respectively (fig. 3).

At Tømmerup Central, four of these dwelling locations (Tø-17, Tø-23, Tø-24, and Tø-25) are on a line probably representing a stage in the development of the prehistoric shore (Andersen 1983:177-85, 189). A fifth dwelling location (Tø-27) here is clearly north of the apparent shoreline and thus, if it represents a dwelling, very likely connected with an earlier sequence of development of the shore. We may here, then, have a settlement consisting of four dwellings about 40 m apart.

At Tømmerup East three dwelling locations (Tø-29/30, Tø-31, and Tø-33) are seen on a line parallel to the one at Tømmerup Central, apparently also here representing a stage in the development of the prehistoric shore. The westernmost dwelling location here consists of two concentrations (Tø-29 and Tø-30) of material that were so close together that it was impossible to keep them apart during the collection and recording of material (Andersen 1983:59-60). On the basis of typological similarities, Andersen estimates that these two are contemporaneous. It looks as if a settlement of three dwellings with approximately 40 m between their centres might have been located here. The two "inseparable"

units might also represent two contemporaneous dwellings or two dwellings of which only one is contemporaneous with the larger settlement. Two contemporaneous dwellings located side by side might be expected to have contained very closely related households.

At the Kildegård complex, four dwelling locations (Ki-20, Ki-21, Ki-22, and Ki-32) are found together. Though they are not in line, it seems rather likely that the shore sequences they are bound to are contemporaneous. As is indicated by the horizontal configuration of the nearby fishing area, marked by 59 bone points from fishing spears probably lost during fishing from boats (Andersen 1983:155-68) (fig. 3), these four locations may have been placed around a little bay and so have made up a settlement consisting of four dwellings approximately 40 m apart. The two central ones are the two Ulkestrup "huts" where both bark floors and stakes that were probably part of the dwelling structures were found during Andersen's excavation (Andersen, Jørgensen, and Richter 1982:13-19; Grøn 1987a). Six radiocarbon dates have been obtained from the two dwellings. From the northern one ("Hut I") hazelnuts and charred wood from the waste layer yielded the datings 6190 ± 100 B.C. and 6420 ± 130 B.C., respectively. From the southern one ("Hut II") a birch bole from the floor, rolls of birch bark from the floor, burnt pine wood from the waste layer, and

tinder fungus from the waste layer gave the datings 6230 ± 100 B.C., 6220 ± 120 B.C., 6080 ± 140 B.C., and 6100 ± 140 B.C., respectively (Andersen, Jørgensen, and Richter 1982:77). The samples that had the least age when deposited in the culture layer ("own age") are the hazelnuts of the northern one and the birch-bark rolls of the southern, the datings of which differ by only 30 years. The difference between the hazelnuts and the birch bole from the southern dwelling is only 40 years. The C¹⁴ datings thus do not negate the idea of the contemporaneity of the two sites.

Connected with the Kildegård complex, north of the concentration of dwelling locations, is what seems to be an isolated dwelling location (Ki-30) (Andersen 1983:50, fig. 5). As the recording of the material collected from this area must be regarded as very reliable (Fischer, personal communication), this interpretation may be correct.

From the Verup complex, two sites have been recorded 40 m apart (Andersen 1983:77, fig. 8). As the survey of this area was made less carefully than with the two complexes in focus here and other sites are likely to have been overlooked, they will be omitted from the discussion of the general settlement organization.

According to the preceding considerations, the general layout of the Maglemosian camps from April to October in the Åmose basin seems to be three to four dwellings approximately 40 m apart centre to centre, placed only a few metres from the shore. In this connection it must be noted that the site north of the "Ulkestrup settlement" is so far from the possible larger camps that it was very probably not connected with them. The possibility that isolated dwellings were used in some situations during the same period must be kept in mind (see below).

Minor activity areas are mostly found in connection with concentrations of dwelling locations, between 15 and 40 m from the shorelines indicated by the latter. Interestingly, they show a tendency to occur in pairs approximately 20 m apart (fig. 2B); of nine minor activity areas, six are paired in this manner. The easternmost one at Tømmerup East must be later than the nearby dwelling locations or represent waste material thrown into the water, since it is located on the "water side" of the shoreline indicated by the dwelling locations (fig. 3). Thus it seems that only two minor activity areas connected to the possible larger camps are not paired. The use of well-defined activity areas at some distance from the camp for activities that it was forbidden to carry out there is reported, for example, for the Netsilik Eskimos (Balikci 1970:36–37).

The typological datings of the Ulkestrup huts seem according to Andersen to vary within a range of 50–100 years or less (Andersen, Jørgensen, and Richter 1982:83). In this phase of the Maglemosian the microlith types and especially the ratio of triangles to lanceolate points are, according to the classical typology, the most important chronological indicators. That the material from Hut I contains 92 triangles and 37 lanceolate points whereas 150 triangles and only 2 lanceolate points were found in Hut II (Andersen, Jørgensen, and Richter

1982:25) should therefore indicate some difference in time. In this case, however, 14 of the triangles of the Svørdborg type from Hut II appear to be somewhat obscure, since a number of them have both the bulb and a "propeller retouch" at the pointed end (p. 27). Andersen is inclined to think that these actually served as lanceolate points and not as triangles (p. 28). This would yield a ratio of triangles to lanceolate points of 91 to 38 for Hut I and 136 to 16 for Hut II, and from a classical typological point of view contemporaneity should be possible. According to my own analysis of impacts on the microlithic arrowheads from the Ulkestrup huts, the whole group of so-called Svørdborg triangles seems problematic. From a functional point of view it consists partly of a mixture of "regular" triangles with the bulb and the impacts mainly at the broad end, where a short, straight retouch is found, and partly of long, narrow "lanceolate" points with bulb and impacts mainly at the pointed end and an oblique basis consisting of straight retouch (Grøn 1985:22–23 and in preparation). Obviously the latter have been confused with triangles because of their morphological similarities. Since in many cases it will be extremely difficult to make a reliable distinction between these two types, this may be a general typological problem that obscures the typological development of the later phases of the Maglemosian on Zealand, where the Svørdborg type is mainly found. Because rather pronounced differences more likely due to personal working style and ability than to chronological differences can sometimes be observed in Maglemosian microliths (Bokelmann 1981:185; Grøn 1983:39–40), the exact contemporaneity of the two huts cannot be excluded on a typological basis. Elsewhere a case has been made for only one phase, rather than two, as Knud Andersen is inclined to think, at Hut II (Andersen, Jørgensen, and Richter 1982:17–19; Grøn 1987a).

According to Andersen, there are minor typological differences between most of the individual Maglemosian sites in each of the three larger settlements here proposed. The concentrations of material within each of these settlements seem typologically to represent intervals of 100–200 years (Andersen, personal communication), but considering the very limited number of microliths and other typological indicators found at most of the sites and the typological problems outlined above, these datings should not be given too much weight. In the light of the possible existence of observable individual working habits and the possibility that the presence of different microlith types in different relative quantities may to some degree reflect the hunting of different animals and thus not solely be a chronological indicator (Grøn 1985:22–23), there seems to be no serious contradiction between the rather limited typological variance present in the material and the point of view that most of the sites represent a few large settlements in use for less than one year. Thus limited typological differences (indicating differences of 100–200 years of "typological" time) are here regarded as less important for the evaluation of the possible contemporaneity of a number of Maglemosian sites than the spatial organiza-

tion of these sites. Clearly a review of the traditional Mesolithic typology is needed. A final solution to the typological problem can be obtained only by excavation of new sites where the exact contemporaneity of the dwelling areas can be demonstrated by relative dendrochronology.

To sum up, according to the interpretation represented here, the general impression of the Maglemosian "summer camps" that we obtain from the Åmose material is that of rather systematically organized settlements consisting of three to four dwellings placed along the shore at intervals of 40 m centre to centre, possibly with minor activity areas placed more or less behind them. As the dwellings seem each to have contained one or two families (Grøn 1987*a, b*), the population should be on the order of three to eight families at these camps, which were probably inhabited between April and October. Considering the specific resource structure, this idea seems to fit the known ethnographic data much better than the idea of isolated single dwellings containing only one family.

The Size of Hunting Groups

As it is difficult through other excavated Maglemosian settlement materials to gain an insight into camp organization, an attempt has been made to obtain an idea of the size of hunting groups through an analysis of two nearly intact skeletons of aurochs which, though mortally wounded, had escaped their Maglemosian hunters (Aaris-Sørensen 1984:172; Hartz and Winge 1906:231). The basic assumption is that, as is known from a number of ethnographic cases, a single hunter only rarely during the first phase of a hunt has the opportunity to loose more than one arrow at a hunted animal. In the final phase of the hunt—if it is successful—the animal will often be killed with a spear, an axe, or some instrument other than an arrow (Balikci 1970:41; Laughlin 1968:309; Parker 1975:214; Silberbauer 1981:212). The reason the number of arrows is limited is that the effective range of the various kinds of "primitive" bows is 10–30 m (Gusinde 1931:230–32; Laughlin 1968:309; Rasmussen 1931:170; Silberbauer 1981:206). When an animal is struck, it normally runs off immediately, making it difficult for the hunter to aim at it and quickly taking it out of effective range. Hunter-gatherers are usually careful not to risk damaging their arrow shafts, which are very demanding to make, by shooting with little chance of success.

In 1905, the nearly intact skeleton of an aurochs (the "Vig bull") was uncovered during peat digging in a bog near Jyderup, Zealand. Two intact microliths and one fragmented one were found in or around the lung region. Two wounds, one fresh and one healed, both with small flint chips embedded in them, were found on the outer surfaces of the seventh and the ninth right ribs. The flint chips from the fresh wound did not fit the fractured lanceolate point and may therefore represent a fourth point.

That other points or fragments of such were overlooked during the excavation, carried out by the landowner before the Danish National Museum became involved in the case (Hartz and Winge 1906:225–27), is very likely. Both shoulder-blades showed penetration by what seems to have been a spear or a lance thrown from the left (Noe-Nygaard 1973:247). Three or four arrows—and probably more—and at least one spear/lance seem to have hit the animal before it found its way into the lake where it died of its wounds or drowned (Hartz and Winge 1906:231).

As the normal hunting strategy with hunter-gatherers—when no permanent structures such as corrals are used—is based not on the instant killing of the hunted animal but on a severe wounding that weakens, stresses, and immobilizes it to such a degree that it can be followed and killed after a period of pursuit, perhaps of several days (Laughlin 1968:309), the inclination for the single hunter to risk a second arrow must be expected to decrease with increasing number of hunters shooting, because this increases the chance that the first hit will be effective. The three or four arrows involved in the final hunt of the Vig bull are therefore likely to reflect a hunting group of at least three or four hunters, if we regard the holes in the shoulder-blades as resulting from an attempted but unsuccessful final phase of the hunt.

Another nearly intact skeleton of an aurochs bull was found in 1983 at Prejlerup, close to the spot where the Vig bull was found. Fifteen microliths and microlith fragments were found in this skeleton. The fragmented state of eight out of nine recognizable lanceolate points indicated that these had served as arrow tips, whereas the intact state of the three triangles found indicates that these had served as barbs (Brinch Petersen 1984:19). Therefore eight or nine arrows—at least—seem to have struck the animal before it found its way into the water (Grøn 1985:22–23). As the arrows here had mainly struck its left hind leg, whereas none seem to have hit the vital organs, it must be assumed that the bull was rendered more or less immobile (shot "three-legged") by the hunters (Aaris-Sørensen 1984:172). In this case it is possible that they were able to follow the animal closely and repeatedly get within shooting range from behind. Therefore the eight or nine arrows may reflect a hunting group consisting of fewer than nine hunters. On the other hand, this number of arrows seems too large for one or two hunters. A reasonable guess would lie between these two extremes.

The radiocarbon dating of the Prejlerup bull is 6460 ± 90 B.C. (Aaris-Sørensen 1984:171). According to an analysis of the teeth, it was probably killed in the late autumn (Grue 1984:30). Had the hunt been in winter, when the lakes of the time were probably firmly frozen (see appendix), it must be supposed that the animal would not have been left on the ice by its hunters. That the Vig bull evaded its hunters may indicate, again, that this hunt too did not take place in winter. The hunting-group sizes indicated by the two aurochs skeletons therefore seem to support the idea that hunting groups with more hunters than would be expected from a single

household consisting of one or two families existed in the period April–December.

An Isolated Winter House?

In 1973 a Maglemosian site was excavated at Flådet, Langeland, by the Langelands Museum (Skårup 1979: 10–11). The site was situated on an eminence that at the time of occupation must have been an island approximately 120 m west-northwest–east-southeast by 70 m north-northeast–south-southwest (Skårup 1979:12). According to Fredskild's palynological analysis of the bog deposits in the expected shore zone, it looks as if the sedimentation during the first part of the Boreal was disturbed by a lowering of the water level in the basin (Skårup 1979:27–31), which according to the vertical configuration of the disturbed area cannot have been much higher than Level 320 (fig. 4). The palynological dating is in accordance with the typological dating of the site to the earlier Boreal (Skårup 1979:31–32, 101–4).

Whereas the Maglemosian "summer camps" (apparently inhabited in the period April–October) seem to have been placed on the shore, with the dwellings only a few metres from it, and often on peat deposits that must have been difficult to inhabit in winter (Andersen 1983:177, 179; Brinch Petersen 1973:94; Welinder 1971:190–91), the Flådet site was on solid ground (Skårup 1979:15), almost as far from the water as possible—only slightly to the northeast of the highest point and centre, about 20 m from the nearest shore (fig. 5). If the island during the earlier Boreal, as indicated by Fredskild's investigations (Skårup 1979:23–24), was covered by pine and birch forest with scrub of hazel and aspen, the vegetation must have given maximum protection against winds from the east, west, and south. Since

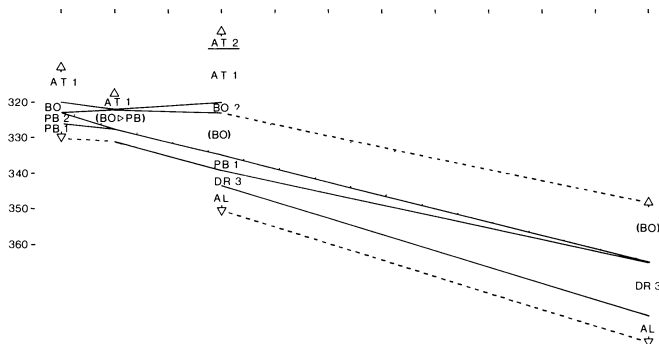


FIG. 4. Reconstruction of the geological situation in the bog north of the Flådet site. AL, Allerød; DR, Dryas; PB, Pre-Boreal; BO, Boreal; AT, Atlantic. Hatched area, zone of disturbance, within which material from the Boreal was clearly predominant, probably reflecting wave activity during a phase of low water level (close to Fredskild's 320-cm level) in the basin during the earlier parts of—and perhaps most of—the Boreal. (Based on Fredskild's geological investigations reported in Skårup [1979:17–34].)

according to Frydendahl (see appendix) eastern, southern, and to a lesser degree western winds seem to have predominated during the winters of the earlier Boreal, the site would have been well protected in winter. As a dwelling placed only a few metres from the shore during the apparently long continental winters of the Boreal (see appendix) would have been unnecessarily exposed to cold winds and, during periods of calm weather, to cold air collecting at the bottom of the basin just above the ice, placing winter dwellings at some distance from the water would probably have been advantageous. This is, for instance, the pattern observed among the Mistassini (Rogers 1967a:9; 1973:5) in a natural setting sparser and colder than but not very different from that of southern Scandinavia during the Boreal.

Holmegård V has been considered a winter site on the basis of its location on solid ground opposite the other sites in the Holmegård basin and the absence, despite favorable conditions for preservation, of the bone points probably used for spear-fishing (Becker 1953:181–82). Spear-fishing was, during spring/summer/autumn, apparently carried out from boats (Andersen 1983:155–66). The absence of bone points might indicate that fishing from boats was not possible because the water was frozen. The culture layer at Holmegård V was up to 50 cm thick and covered an area about 80 m east-west by 60 m north-south (Fischer 1975:155, and personal communication) on the northern part of a little headland jutting into the basin from the south. The site clearly represents several settlement phases (Becker's notes from his excavations in 1945 and 1948). The excavation was made in the southwestern part of the site, partly on and north of an 80-cm-high east-west-oriented edge that marks the northern limit of a sandy terrace and probably represents an earlier phase of the south shore of the basin. Habitation here had apparently been centred on the terrace, where only a few square metres were excavated (Becker's notes).

New excavations at the site were made in 1970–71 by Anders Fischer northwest of and—according to my recent reconstruction of the exact positions of the two excavations—apparently less than 2 m from Becker's excavation. It looks as if Fischer was here investigating a west-northwest–east-southeast-oriented shore zone in the peat approximately 15 m north of the sandy terrace that may be contemporaneous with the material excavated by Becker. Fischer observed during the digging of a drainage ditch oriented north-south close to the excavation area that hazelnut shells, which are very often found at summer sites with good conditions for preservation, were found only in the northernmost part of the area. Cloven sticks of wood, more rarely preserved, were found in the excavated area farther to the south (Fischer, personal communication). Together these indications may reflect a situation in which the southwestern parts of the large settlement area were once—or more likely several times—used for winter habitation withdrawn at least 15 m from the water, placed on solid ground, and oriented to the north (like the Flådet site), whereas the northern parts of the site were repeatedly used for "sum-

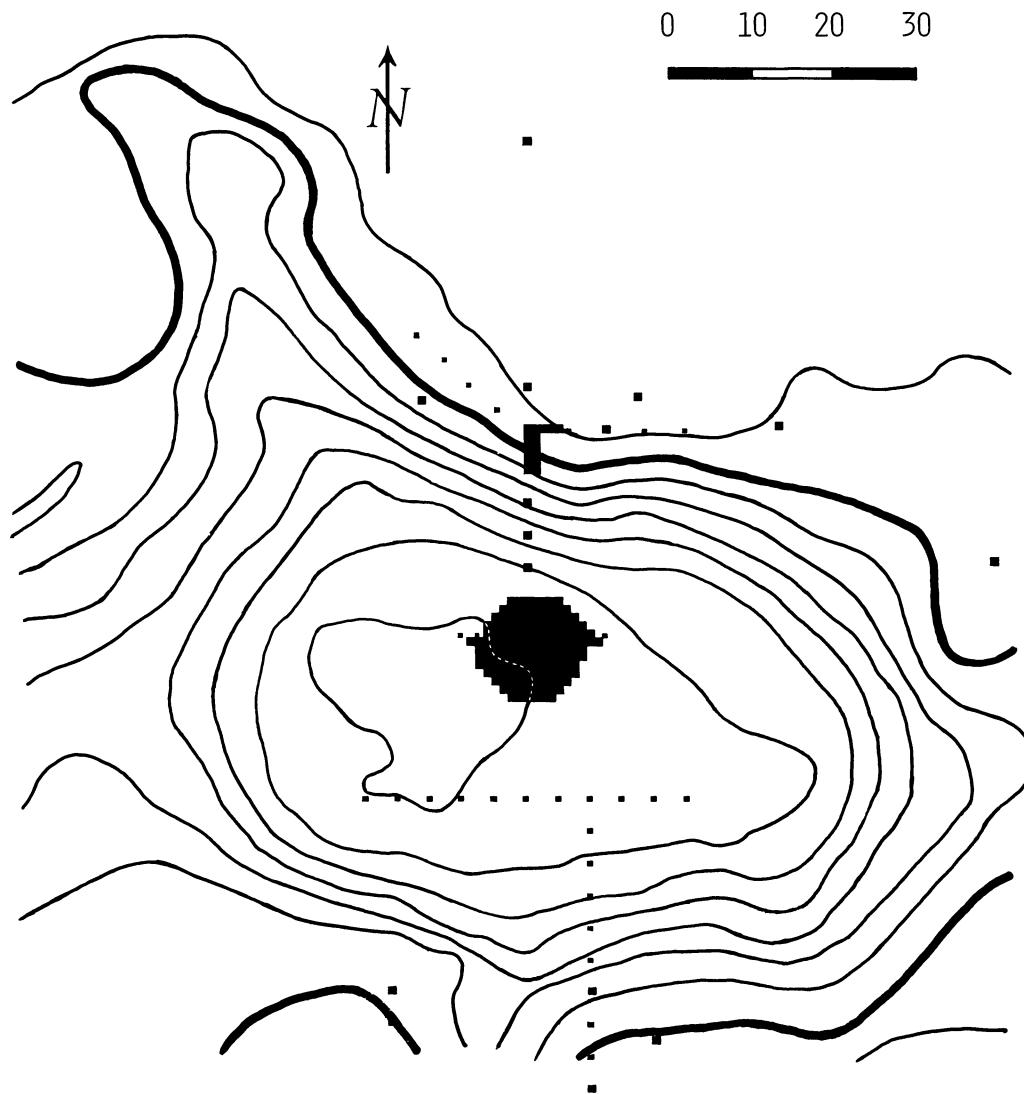


FIG. 5. Plan of the eminence on which the Flådet site is situated. Excavated areas (trial pits and main area) are shown in black. Contour equidistance 20 cm. Thick contour line marks the proposed shoreline. Horizontal distances in metres. (Based on Skårup [1979: Plan 1].)

mer habitations" with dwellings situated only a few metres from the water on the peat deposits. As the material excavated by Becker must on a typological basis be dated to the first half of the Boreal (Becker 1953:182), a period when the water level of the freshwater basins generally seems to have been low (Skårup 1979:27), this situation is not unlikely. An analysis of the material from Holmegård V, including an analysis of the bone and antler material with special regard to seasonal indicators, is in preparation with a view to obtaining a more thorough understanding of winter sites in general.

In relation to the known "summer" sites, the area of the Flådet site, with its 15 by 15 m (Skårup 1979:9), is extremely large. If the horizontal distribution of the artefacts and the hearths had not been similar to the symmetrical pattern known from the proposed 24-m² two-family dwellings, with two concentrations of microliths and often two hearths (at Flådet indicated by concentra-

tions of burnt flint), and the material from a typological point of view not been extremely uniform (Skårup 1979:93, and my own detailed metrical analyses of the microliths), it would have been tempting to interpret the site as reflecting several overlapping settlement phases. From the distribution patterns (fig. 6A and B), it is obvious that this is unlikely. As with the proposed two-family dwellings, the axis of symmetry is at right angles to the nearest shore (fig. 5) (Grøn 1987b).

To determine the form and size of the possible dwelling, an analysis of the relative distribution of the different categories of flint waste—blades, microblades, and flakes—was undertaken. Since the distribution of flint waste did not in itself give any clear indication of the existence of a physical border ("wall effect") (fig. 6C), it was thought that the composition of the waste might do so. For each square metre, the number of microblades was multiplied by the number of flakes. This was then

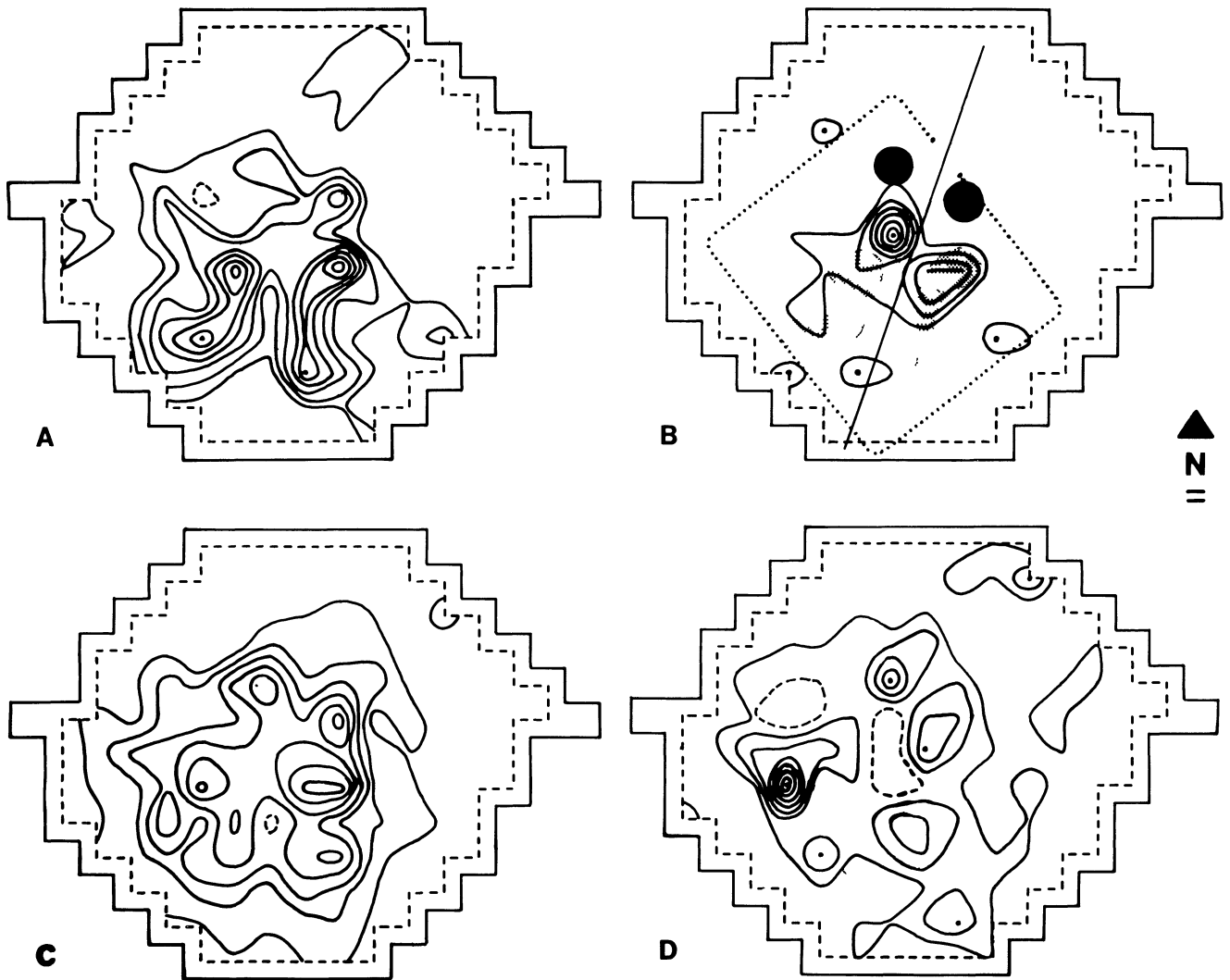


FIG. 6. Flådet: Distribution of (A) microliths (equidistance 2); (B) scrapers (equidistance 1), concentrations of burnt flint (black), and microliths (hatched areas); (C) flint waste (equidistance 100); and (D) axes and fragments of axes (equidistance 1). (Based on Skårup's notes and Skårup [1979:15, 108, 110, 112]; reconstruction of dwelling area of B based on fig. 7.)

divided by the square of the number of blades to analyse the "balance" between blades and the other two categories of waste: $(\text{microblades} \times \text{flakes})/(\text{blades})^2$. From these values equidistant contour lines were drawn. As appears from figure 7, a rectangle 6–7 by 7–8 m is indicated by the curves, within which microliths, scrapers, and hearths (concentrations of burnt flint) are arranged symmetrically around an axis that marks something very close to a diagonal division. In other words, the same diagonal organizational pattern that has been observed with the proposed 24-m² two-family dwellings seems to be present here on a larger scale.

Of further interest is the fact that in the squares in which it might be expected that persons sat (Grøn 1987b), i.e., in the centres of the two crescent-shaped microlith concentrations, and at positions 2 m north of

these centres—apparently connected with the two concentrations of scrapers—are four "holes" with a relative underrepresentation of microblades and flakes. As it must be considered unlikely that the inhabitants allowed themselves to come "under fire" in their fixed positions in the dwelling space when flint-knapping was going on, the "holes" can be interpreted as areas covered by sitting mats that were cleaned after each period of flint-knapping. Four similar "holes" have been observed at Svanemosen 28, which is interpreted as a two-family dwelling. A fifth "hole" near the southern corner of the rectangle at Flådet may indicate the presence of a person not reflected in the distribution of the tools or any fixed object. This corner opposite the entrance would, according to Ränk and Paulson (Paulson 1952:63–65), be the place where any "seat of honour" would be located.

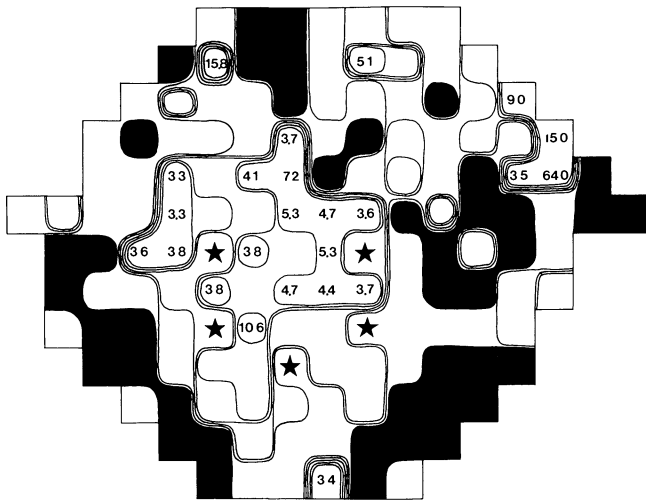


FIG. 7. Flådet: Horizontal pattern of the relative composition of flint waste—(microblades \times flakes)/(blades)²—calculated for each square metre. Equidistance 0.5. Levels below 0.5 are shown in black. To avoid violating clarity, contour curves have not been drawn for values larger than 3.0; these values are stated directly on the figure. Proposed positions of persons are marked by stars.

The distributions of flint waste and axes are in accordance with the rectangular plan, though apparently not as informative (fig. 6C and D).

One surprising thing is the apparent size of the dwelling at Flådet, double that of the proposed 24-m² two-family dwellings normally associated with settlements occupied between April and October (Andersen 1983: 174, 179; Brinch Petersen 1973:94; Grøn 1987b) and thus indicating another kind of settlement situation. As a number of the activities that are carried out outside in warmer weather can be expected to have taken place inside in winter, the idea that the winter dwellings of hunter-gatherers will often contain more space per person than dwellings in other seasons does not seem unreasonable.

According to Binford (personal communication), among the Nunamiut one-family winter houses are larger than one-family summer dwellings. Similarly, Tanner (personal communication) reports that the maximum space available per family among the Mistassini is found in the communal houses used when winter is at its coldest and people are relatively sedentary, whereas the minimum space per family is found during early and late winter, when nomadism is at its maximum. Some caution must be applied in this case, as the introduction of steel axes and even chain saws may have resulted in the construction of larger winter dwellings than originally. The phenomenon of relatively large winter dwellings and relatively small summer dwellings apparently also applies to the winter igloos and summer tents of the Copper Eskimos (Jenness 1970:64–65, 81), but it generally seems to be very difficult to generalize on this point. What seems to be important for how large a dwelling is

made per person is (1) how difficult suitable building materials are to obtain, (2) the climate (construction of a dwelling may be unnecessary), (3) whether space-demanding activities (such as drying fish) during certain seasons have to be carried out inside, (4) the availability of fuel for heating, and (5) the length of the period the dwelling has to be occupied. With regard to the fifth point, there is a marked tendency to build dwellings with relatively more space per inhabitant and of a more permanent character if they are to be used repeatedly for a number of years, for instance, during the seasonally restricted exploitation of a rich local resource.

The number of axes and fragments of axes found at Flådet, 125, is much larger than is usual with the smaller "summer" dwellings. At Ulkestrup Hut I and Hut II, Svørdborg II, Svanemosen 28, Stallerupholm (apparently a one-family unit of which a few square metres have not been excavated), Bare Mosse II, Duvensee W.6 and W.8, and the eastern concentration at Klosterlund (probably representing a one-family unit), 4, 6, 6, 17, 20, 0, 0, 9, and 19 axes were found respectively (Skårup 1979:42; Andersen, Jørgensen, and Richter 1982:20; Brinch Petersen 1973:70; Blankholm and Andersen 1967:66; Bokelmann, Averdieck, and Willkomm 1981:23; Bokelmann, personal communication). This also indicates that Flådet is a site of another kind.

According to the preliminary results of a microwear analysis carried out by Nicole Symens, Laboratorium voor Prehistorie, Leuven, a sample of 22 axes and reshaping flakes of axes from Flådet shows traces of light work—most likely whittling or planing of wood and/or bark with a lot of abrasives involved; that heavy work can probably be excluded is indicated by the virtually undamaged state of almost all the working edges (even the ones removed by reshaping). Only one axe shows rather heavy edge damage, pointing to a somewhat heavier task (Symens, personal communication). Apparently some rather extensive woodworking activity took place at the site. One activity that might explain the presence of microwear appearing as traces of whittling or planing is straightening the sides of and barking of a considerable number of slender boles for the construction of a wooden dwelling.

Another possible woodworking activity, the building of boats from tree trunks, would have required refined carpentry, and it appears unlikely that planing would have been carried out before the boat had been given its final form by chipping and the bark had thus already been removed. At the moment (experiments have not yet been carried out) the amount of whittling or planing indicated by the 125 axes also appears to be rather large for a boat, whereas it appears less surprising in the context of dwelling construction. Boats constructed of trunks have not been found earlier than the late-Mesolithic Ertebølle culture (5200–4000 B.C.). (Andersen 1980:17–19; Brinch Petersen et al. 1979:66–67). By this time a dense forest with large trees had developed, whereas it is doubtful whether trees of sufficient quality and size were available in the open Boreal forests.

No traces of a wooden dwelling were observed in the subsoil during the excavation of the Flådet site (Skårup, personal communication), but a log structure does not necessarily leave traces in the soil. A log structure of the kind aboriginally used by the North American Indians would have left only one or a few central postholes (Binford, personal communication) and a log cabin none.

In contrast to the proposed 24-m² two-family dwellings, where the hearths are placed rather centrally, at Flådet the two hearths are apparently just inside and on each side of what seems to be the entrance (fig. 6B). In a close structure, this would be an advantageous placing of the heating sources because of the way the air would circulate. A placing of the heating sources just inside the door is found, for instance, in the winter habitations of the Eskimos and the Yukagirs of Siberia, who use rather close dwellings during the cold season (Jenness 1970:65–76; Stepanova and Khramova 1964:793–94).

If the tentative interpretation of the Flådet site is correct, it is interesting to note that this winter dwelling was probably an isolated one. Though the hill (the former island) has been subjected to depth ploughing, no other concentrations of Maglemosian material have been revealed. Further investigations are planned to elucidate whether we are really faced here with an isolated winter house.

A Model for Seasonal Rotation and Resource Strategy

From the above material, a reconstruction of Maglemosian seasonal rotation and resource strategy will here be attempted. It must be kept in mind that error may attend the construction of a general model based on what are interpreted as large summer camps from a single basin on Zealand and two possible winter camps from Lange-land and a second basin on Zealand, respectively. At the same time, the tendencies in the available material seem to indicate a model that, while not identical to any known from present-day hunter-gatherers exploiting resources with a similar spatial and seasonal structure in a temperate climate, does fall within the limits of what might be expected on that basis and therefore is at least more likely to be “true” than the hitherto suggested relatively “primitive” ones. It can only be hoped that the proposal of such a model will cause some constructive discussion and perhaps in time prove to be not too far from the truth.

It looks as if larger settlements, consisting of three to four dwellings (probably with a roughly equal representation of one- and two-family units) placed only a few metres from the water and approximately 40 m apart centre to centre, were in use during a period from April at the latest/early spring to at least October/late autumn (Andersen, Jørgensen, and Richter 1982:175; Andersen 1983:179; Becker 1945:63; Bokelmann 1980:324–25; Brinch Petersen 1973:74; Friis Johansen 1919:26; Henriksen 1980:132; 1976:148). As the two Ulkestrup huts seem to belong to a single such settlement and at both

the seasonal indicators indicate habitation from April at the latest to late summer (hazelnut shells, seeds of yellow water lily, and stones of cornelian cherry indicating September/October) (Andersen, Jørgensen, and Richter 1982:12, 175; Andersen, personal communication), it is possible that at least in some situations this kind of camp may have been in constant use for as long as half a year.

In contrast to this, what seem to be briefly occupied camps, apparently focused on the utilization of a single resource such as hazelnuts, were in use during the hazelnut season (Bokelmann 1981:183; Bokelmann, Averdieck, and Willkomm 1981:29). Whether such sites must be viewed as “extraction camps” bound to more permanent and perhaps larger base camps or as representing situations in which larger camps could not, because of scarcity of resources, be maintained for as long as the Ulkestrup huts cannot at present be determined. The site that seems to represent an isolated dwelling on the peat in the Åmose basin should perhaps be seen in this perspective.

The Flådet site has been interpreted as an isolated two-family winter dwelling. As it was placed on a little island in the centre of a prehistoric bog basin that must have measured 1.5–2 km² at that time, the interpretation can be meaningful only if the climate produced a solid ice cover that was capable of carrying traffic to and from the island. In other words, the winter temperatures in the area had to be more constantly below zero than is the case today. From Frydendahl’s reconstruction of the climate during the Boreal it appears that the weather in the area during winter was more constant than today and that the lakes must be assumed to have been covered by solid ice from the beginning of December to the beginning of April (see appendix).

The earliest seasonal indications from the bones preserved at the shore-bound sites on the peat point to April at the latest. The question has been whether this reflects the time of year when habitation at this kind of site began or merely the fact that skeletal indications of the preceding months are found in only a few animals. The climatic reconstruction indicating that these positions were not habitable before the beginning of April is therefore very interesting. Apparently winter quarters were abandoned and the shores of the lake basins settled as soon as the ice disappeared. The latest seasonal indications from the “summer” sites point to September/October. This may reflect the abandonment of these camps at this time but may also be due to lack of observed skeletal changes typical of the following months.

A phenomenon that seems to be known from most nomadic hunter-gatherers is camps representing the one or two yearly gatherings of shorter or longer duration—depending on the available resources—of larger groups normally consisting of about 100 individuals or more and representing one or more bands (Rogers 1967b:42–47; Gusinde 1931:203; Silberbauer 1981:195–96, 301–3; Damas 1972:283–84; Gould 1969:256–57). These “assembly camps” play an important role as social, religious, and communicative centres.

The proposed Maglemosian camps must have contained from 3 to 8 families, probably with an average of around 5–6. It seems reasonable to assume that each family consisted of one “married” couple, 2–3 children, and perhaps 1–2 grandparents, or approximately 5–6 individuals (Honigsmann 1961:20; Rogers 1963:55–58). In some cases a spacing of at least three or four years between children among hunter-gatherers seems to be the consequence of strain on women due to hard work (e.g. carrying infants); in other cases it is apparently obtained more consciously by late weaning and infanticide. As children will normally marry rather early and thus lose their status as “children,” a nuclear family seldom has more than 3 children (Silberbauer 1981:159–60; Burch 1975:124–29; Divale 1972). The proposed camp type must thus be assumed to have contained between 15 and 48 individuals with an average of around 30. Compared with the parallel situations known from ethnography, and considering the relative richness of the biotope in southern Scandinavia during Boreal times, it seems reasonable to interpret these settlements as the camps of hunting groups rather than of entire bands. Assembly camps would be expected to have been several times larger. The primary questions raised by these considerations are at what time of year such assembly camps may have been in use and in what topographical context they should be sought.

As has already been mentioned, it follows from the structure of the resources that assemblies are unlikely to have taken place in winter. Since the Maglemosian existed in a continental situation with a temperate climate, resources in general must have been at their maximum in autumn (fruits, nuts, etc., being ripe, roots having stored nourishment for the spring, and the animals being fat for the winter), and this would be the season when the Maglemosian bands could most easily have obtained the resources necessary for assemblies.

Though it cannot be ruled out that the proposed camp type was abandoned briefly in summer while the assembly took place and afterwards reinhabited by hunting groups, a more plausible and, from a resource-strategic point of view, better solution would be to place the assemblies between October, when we have the latest seasonal indicators from the “summer” sites, and the beginning of December, when ice and snow would have impeded movement by boat and over land. By placing such assembly camps in connection with the river systems, which owing to the low sea level during the Boreal period (Jelgersma 1979:244–45) were apparently rather extensive, it would also have been easy to exploit the probably large numbers of trout and salmon that must have been spawning in November/December. A number of hunter-gatherers are known to rely heavily on this resource (e.g., Gillespie 1981:15–16). Such camps might have been located on larger but—to facilitate fishing—not too large watercourses in situations in which conditions for preservation are poor and the possibility that the sites have been heavily eroded by the remodelling of the river beds is great. Thus it is possible that a rather important aspect of the Maglemosian has escaped the

attention of archaeology. It must be stressed that sites representing assemblies of whole bands, perhaps occupied year after year for centuries or even longer, must be expected to have been large and extremely difficult to distinguish from accumulations of material representing overlapping settlements of other kinds.

That fishing—especially for pike—was an important economic activity at the camps apparently inhabited between April and October is evident from the bones preserved at these sites (Friis Johansen 1919:128; Andersen, Jørgensen, and Richter 1982:151–52; Henriksen 1980:129; 1976:146; Sarauw 1903:194). The location of these sites in the immediate vicinity of fishing sites marked by numbers of lost bone points from fishing spears (Andersen 1983:155–66) must also reflect the economic importance of fishing. In one case from the Kongemose culture—the phase that follows the Maglemosian—the base of a bone point was found at one site (in the Åmose basin) and its other half at a fishing site only a few hundred metres away (Andersen 1983:46, 48, fig. 57, 6, 7). That the shores of the lake basins were apparently inhabited as soon as the ice had disappeared is likely to reflect the importance of pike as a resource after a long and probably rather meagre winter. In April and May it migrates to extremely low water to spawn and can be caught in large quantities without much effort.

The two presumptive winter sites, Flådet and Holmegård V, are both placed centrally in prehistoric lake basins on solid ground, oriented to the north, the former on what was an island and the latter on a north-oriented headland. In winter these would have been very favourable locations, since the shores of frozen lakes generally attract animals. From both positions it would have been possible to watch the movements of the animals on the shore without disturbing them more than absolutely necessary and thus to have been in an ideal situation for hunting.

With regard to general annual movement, from the C¹³ and C¹⁴ content of human bones it must be concluded that regular contact with the seacoast was of minimal importance. According to Tauber (personal communication), of the remains of four human skeletons, three clearly indicate a terrestrial diet whereas one showed a slightly marine content. A regular seasonal rotation between the interior and the major watercourses leading from the Ancylus Lake to the North Sea is possible, but if Flådet and Holmegård V really are winter sites the important factor in their placement was apparently a particular position in a lake basin (though Flådet was only 4.5–5 km from one of these main watercourses [Skårup 1979:111]). The finding of elks probably killed in the period from December to February in the Pre-Boreal (7450 B.C. ± 140, 7590 B.C. ± 222, and 7660 B.C. ± 116) at sites which must at that time have been rather far from the large rivers (Jelgersma 1979:244–45; Møhl 1980) indicates that at least the people of the very early Maglemosian did not regularly visit these in winter. As it was probably easier in autumn to catch salmon/trout in watercourses that were not too wide than in the fewer

large ones, and considering the relative richness of the biotope, it must be concluded that the size of the area exploited by a band of 100 persons or more, compared with that for similar groups of hunter-gatherers described ethnographically, may have been relatively small.

Conclusion

This paper represents an attempt to interpret Maglemosian settlements in the North European lowland as reflections of a dynamic social structure functioning as an adaptive mechanism in the utilization of the available resources. The model advanced implies that group size varied with—and was in fact proportional to—the amount of resources available at a certain time of year: winter sites were inhabited by as few as 2 families, whereas the sites used during the main part of the more productive part of the year were inhabited by 5–6 families on average—perhaps living in the same basin for the whole period—and assembly camps in November held at least 15–20 families utilizing the resources of the autumn. More or less pronounced local variations of the pattern of adaptation must be assumed (e.g., Jacobi 1978), but because of the character of the material it has been impossible to do more than sketch what appears to be a general model for the area. It may be hoped that future research—and especially excavation along new lines—will support or reject this model and in one way or the other lead to a more detailed understanding of the interaction of social and natural forces in the Mesolithic cultures that preceded the important change to a Neolithic economy.

Appendix: The Climate of Denmark in Boreal Times

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Climate in the Boreal was strongly affected by the presence of ice over parts of eastern North America and the relative warmth of Europe, giving rise to a strong southwest–northeast steering of cyclonic activity from the edge of the ice across the Atlantic to the north of Europe. Climatic processes were held firmly in check by the marked contrast between warm and cold air masses, which meant that climate was much more stable than that of today. The difference between summer and winter was more marked and the transitional seasons shorter than at present. It is therefore not easy to find areas today where the climate resembles that of the Boreal. While northern Poland, for example, has summer and winter temperatures resembling those of Boreal Denmark, both seasons are shorter and spring and autumn longer; above all, there is a lack of stability. Stability might perhaps be found in northern Canada, but there temperatures are far too low.

It has also to be remembered that Denmark was in land connection with southern Sweden and England. The nearest west-southwest coast thus lay west of Ireland, and the east coast of Jutland followed a line from Rørvig through the eastern edges of Anholt and Læsø to the Skaw. Jutland's west coast lay some way out in the present North Sea, while in the Baltic basin there was a freshwater lake, the Ancylus Lake, drained by a river along the course of the present Great Belt. This lake extended only to Stevns and Falsterbo, so the present western Baltic and inner Danish waters were land.

The climate was therefore continental, with hot summers, cold winters, and low precipitation.

The moderating effect that the Baltic today exerts on winter temperatures in Denmark did not obtain at that time. The Ancylus Lake rapidly froze, thus augmenting the tendency to a continental climate. There were still glaciers in the mountains of Scandinavia and in North America. Mean winter temperature was -1°C , or about 1.5° lower than today, with deviations of only $2-3^{\circ}$ above and $5-6^{\circ}$ below the mean.

Prevailing winds were light and mainly from the east and south; westerlies played a lesser role, and northerlies were of little importance. Today southwesterlies prevail. As it was colder in the areas east and south of Denmark, it was dry, cold winds and clear skies that characterised the winter.

Precipitation was presumably 60 mm (half of the present-day figure); November precipitation was also low.

Weather conditions were very constant from year to year and throughout the winter, with infrequent thaws, so snow remained through the winter. Lakes were presumably frozen from the beginning of December to the beginning of April.

The limited cloud cover resulted in strong radiation during the night and considerable insolation during the day (although not so great during mid-winter, when the sun is only 11° above the horizon at noon), so air temperature varied greatly during the course of the day. This would have resulted in early night-frost in autumn and especially late night-frost in the spring.

In summer, the Ancylus Lake, like the Baltic today, exerted a moderating influence on temperatures, though somewhat less because of the greater land areas to the east at that time. The combination of limited cloud cover and long summer days produced heavy insolation, so mean summer temperature was about 16.5°C (0.5° warmer than today). In summer, too, stable conditions were the rule, although less than in winter, and variation from year to year was therefore not very great. Deviations were seldom more than a couple of degrees warmer and in wet and cloudy circumstances about 4° cooler.

Summer rainfall, too, was less than at present, at a guess 130 mm (only three-quarters of the present figure).

Westerlies were quite common, as they are today, but with the difference that while westerlies today are relatively strong, cool, damp, rain-bringing winds with much cloud, they had in the Boreal passed over large tracts of land and were in summer warm and dry. This led to cloudless skies and calm weather, thus contribut-

ing to the stabilization of climate; cyclones were quite infrequent. There was, however, a weak mean north-westerly tendency, and this implies that there were now and again winds from a north-of-west quarter. These winds would have been oceanic and led to coldish, damp and cloudy weather and perhaps to an occasional extremely cold summer.

As only limited facts are available on Boreal climate (see Lamb 1977), the foregoing account must be treated with caution.

Comments

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Grøn's contribution is interesting and thought-provoking, but the manner in which the data base is treated calls for some critical comments.

That our knowledge of chronological relationships cannot be more precise than it is at present has, as regards the reasoning about, for example, the contemporaneity of huts, no very great significance. It is, however, important to note that Grøn, in his evaluation of settlement patterns during the annual cycle, makes use of sites whose chronologies comprise the entire span of Boreal time, almost a thousand years. This in itself would not be so important if environmental conditions had remained constant within this time interval, but this is simply not the case. Considerable changes in the flora—and partly also in the fauna—can be demonstrated, from relatively open forest at the beginning of the period to a denser, more shaded forest type. In addition, the majority of East Danish sea basins were transformed into marshland through regrowth during the time in question, radically altering the environment in the vicinity of the bog sites.

The fact that the relationship between water and land altered considerably within the area and during the period under review has also by no means been taken into consideration. Grøn mentions, almost in passing and on the basis of personal communication, that evaluations of the C^{13} content of skeletal remains from inland settlements indicate that the groups studied "cannot regularly have had access to maritime resources." According to the same source, Tauber, the skeletons in question have yielded C^{13} values of between -17 and -20‰ . C^{13} content may well depend, however, upon which species of fish were consumed and the degree to which they constituted a staple. Nor can the conditions that obtained in the context of the saltwater Litorina Sea during the Atlantic period be uncritically equated with those that obtained in the context of the Ancylus Lake, with its fresh-

water fauna. This aspect is particularly crucial in the case of East Danish coastal settlement along the shores of the Øresund, if not, indeed, of the entire Baltic area, during the Late Mesolithic Ertebølle period. Some Danish sites have produced C^{13} values of between -12 and -16‰ (Tauber 1982:236). In contrast, two skeletons from the contemporaneous cemetery of Skateholm I, on the southern Swedish Baltic coast (Larsson 1984:18–27), have yielded values of -17‰ and -20‰ respectively. That the cemetery was situated on a small island in a lagoon with an inflow of salt water from the Litorina Sea shows that intimate connection with the sea does not necessarily mean that skeletal material will provide distinct evidence of marine food consumption. A grave from the Baltic island of Gotland—dated to $6,100 \pm 75$ B.C., i.e., late in the Boreal period—gave an equally low value, -18‰ . This grave was situated ca. 2 km from the Ancylus Lake (Larsson 1982), and the location of the site argues for maximum exploitation of maritime resources, particularly when one considers the size of Gotland and the almost certainly limited access to terrestrial fauna in the form of big game. Grøn's formulation of the relationship between coastal and inland settlement finds, in my opinion, no support in C^{13} values. During a later part of the period there was a marked rise in sea level, which means that coastal settlements from the Maglemosian period are today to be found at depths of between 20 and 6 m below sea level (Larsson 1983).

The relationship between coastal and inland settlement may have had a much more complicated structure than is apparent in Grøn's discussion. The same kind of small dwelling sites as described by Grøn are found in what would have been coast-adjacent areas during the early Late Boreal period (Larsson 1978:203–7; Strömberg 1986:76–77). It is by no means unreasonable to enquire why a plausible coastal settlement directly linked with an inland settlement has not been considered.

This does not mean that I reject Grøn's model. An interesting part of the article is devoted to the grouping of settlement remains. No similarly detailed basis for the interaction between dwelling site and activity area is given, however, and it would be of considerable value for the study of settlement patterns if this aspect had been accorded more attention. In at least one instance, Grøn expresses strong doubts about the contemporaneity of a certain dwelling site and a nearby activity area. Is the latter to be understood as the remains of a short-term camping site, in no way connected with the former? One cannot help suspecting that the differences between these two phenomena are dependent upon interrelated activities engaged in at different times in the annual cycle and not merely a clear distinction of the two.

The earlier models on which Grøn seeks to improve have, in my opinion, more or less the same theoretical basis as the one he proposes. All models must, of course, remain open to discussion until new excavations have provided us with material for more detailed analyses, but Grøn's is an interesting one well deserving of further work.

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This study increases our knowledge of early Mesolithic local and regional dynamics in Denmark. In so doing, it provides a base for further hypothesis testing while at the same time raising several important questions. I will not comment on the site data except to indicate that I find the arguments for site concentrations and relationships logically based. My only request would have been for a more specific discussion of the floral and faunal evidence for seasonality. The evidence cited is diffuse, and it is not clear whether it is also selective. I would, however, like to proceed to some matters of a more general nature.

Social/spatial models are central to an understanding of within- and between-group dynamics and hence the distribution of archaeological sites and their attributes. From the perspective of my own work on such models for the late Palaeolithic and Mesolithic, I find the model put forward here convincing. The types of site concentrations that have been distinguished argue for a lack of large-scale aggregation and dispersion. Though groups of structures are posited for the summer, the winter structures may be larger and house more people—a pattern for which there are ethnographic parallels. Combined with the fact that the maximal group is apparently a few families, this suggests that the resources under local exploitation are themselves reasonably widely distributed. What would thus seem apparent is a lack of dependence on either highly localized or seasonally concentrated resources, at least within the area under consideration. The presence of pike at a bog site might have provided a base for small groups spread around the area in the summer months, a pattern suggested over 30 years ago by Clark (1952). Such a pattern might support Grøn's suggestion that the area of band exploitation was relatively small. However, it should be pointed out that if the group remains small it must extend contacts to other such groups in order to maintain an operational social and marital system.

Two related matters need mentioning. First, I would caution against the assumption that winter mobility was limited by its difficulty. Though movement by boat would certainly have been curtailed, assuming the correctness of the climatic model, movement on foot might even have been improved, especially if devices such as skis or sleds were available. In wet and/or boggy areas winter permits unimpeded access, without the problem of alternating areas of dry land and water. If winter mobility is to be considered limited it should, I think, be on grounds other than simple difficulty of moving.

Second, the noted absence of large group concentrations is probably an artifact of preservation. On social grounds alone, irregular large gatherings should have occurred; their absence would place this culture effectively outside the boundaries of known ethnographic analogues. The lack of evidence for them may indicate that

they occurred in other areas, perhaps now under water, and/or that they were relatively infrequent, possibly since there was no associated economic pressure for them.

This consideration brings me to one last point concerning C^{13} stable-isotope analyses and their interpretation. Few Maglemosian determinations are yet available, and the details have not yet been fully published. Grøn is correct in stating that the available determinations do not suggest a marine-based diet. They would not, however, argue against a diet that included freshwater resources and are therefore compatible with the notion of a population moving eastward to exploit the freshwater proto-Baltic at this time. Further, the available determinations have been used to argue that eustasy/isostasy has robbed us of that part of the Maglemosian cycle that involved heavy exploitation of the marine region now submerged beneath the North Sea. By implication, we are considered to be missing the marine-dependent part of the culture that has been documented in the C^{13} determinations from later, Ertebølle specimens. Recent results from near-oceanic specimens (Bang-Andersen 1983, Hufthammer and Meiklejohn 1986, Johansen, Gulliksen, and Nydal 1986, Lie 1979) suggest that this may be a non sequitur. Two early Mesolithic burials from the Norwegian coastal zone dated as contemporary with the Maglemose or the earlier Kongemose (Viste and Bleivik) have C^{13} values directly comparable to the Danish materials and suggesting a mixed diet (values are between -15.9‰ and -17.1‰). In contrast, two terminal Mesolithic (late Stone Age) burials from Flakstad on the Lofoten Islands have C^{14} dates that are post-Ertebølle ($5,020 \pm 100$ b.p. [T-5076], $4,880 \pm 200$ b.p. [T-5110]) and C^{13} levels that are indicative of a strongly marine diet (-12.8‰ , -14.0‰). Thus it appears that at least some populations of Maglemosian age that were clearly coastal in location were not primarily marine in diet. Though extrapolation to the Danish Maglemosian case is still open to question, it may not be a logical deduction, *on the basis of the C^{13} values alone*, that Maglemosian populations did not have a movement pattern that included a coastal phase. This remains a very interesting area for study.

In conclusion, I like this article. I would hope that it would lead to further work, perhaps some of it departing from some of the ideas raised above.

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This article offers a simple story of life in the Maglemosian period of southern Scandinavia. The Maglemosian extends from 9,500 to 7,700 b.p., some 1,800 years, and is characterized by a distinctive set of microlithic armatures and certain other artifacts. Early postglacial hunter-gatherers exploited a wide range of animal species, emphasizing large game such as the European

elk, aurochs, and red deer as well as fish. Settlement remains document a number of summer lakeshore settlements with abundant fish bone and fishing equipment. Only a very few examples of winter occupation sites have been uncovered.

The data for this case study of seasonal variation in group size and group structure come largely from a series of 22 surface-collected Maglemose sites, occupied in the warmer months of the year, in the Åmose bog in western Zealand. Two excavated sites from other areas in Denmark are used as examples of winter settlements. The author's primary concerns are (1) the relationship between settlement and community size and (2) the assessment of contemporaneity of adjacent archaeological sites. I will address several aspects of this study, including its basic assumptions, methodology, and conclusions.

A very traditional and simplistic view of hunter-gatherer subsistence and settlement is promoted—one in which small groups are residentially mobile in response to resource availability and, in this case, follow dichotomous patterns of (1) warm- and cold-weather shifts in settlement and (2) deployment to either "dwelling locations" or "minor activity areas." This view of the nature of settlement systems is myopically reductive. An extensive and growing literature on hunter-gatherer settlement systems (e.g., Binford 1980, Kelly 1983, Torrence 1983, Woodburn 1980) suggests that variability and flexibility, not simplicity and regularity, characterize most forager adaptations.

Ethnographic analogy is employed in a naively direct fashion reminiscent of the state of the discipline 20 or more years ago. For example, the tropical Andaman Islanders are cited in a discussion of dwelling size in the Maglemosian period of northern Europe; a "seat of honor" is designated at the entrance of Maglemosian huts because of its reported presence in the circumpolar regions. Again, a substantial literature, here concerning the problems and pitfalls of direct analogy, is not consulted.

Statements about settlement are made on the basis of a limited sample of sites, located in an unusual topographic situation. The sites considered in this study do not represent the full range of settlements from the Maglemosian period. The Åmose sites were discovered as a result of the commercial removal of peat for fuel. Such extensive exposure of former land surfaces has not occurred elsewhere in Denmark, and a wide variety of other environmental situations may have played a significant role in the annual round of Maglemose hunters. This is particularly true for the coastal facies of the Maglemosian. Sites are known only from inland situations and likely represent only a minor series of occupations ancillary to the primary focus of settlement along the shoreline. Coastal sites from this period, when sea level was significantly lower and the shoreline was tens of kilometers distant from its present location, are today under the North Sea and the Baltic—almost inaccessible to archaeologists. A more sedentary pattern of occupation may well have prevailed in these maritime areas.

The distinction of "dwelling locations" and "minor activity areas" is artificial and nullifies much of the argument. There is very little evidence to suggest that such a dichotomy reflects actual types of prehistoric settlements. The author's search for criteria for distinguishing the two types of sites is a posteriori, and his calculation (1) ignores the possibility that the number of types is a function of length of occupation rather than the type of activity taking place and (2) forces a number of different kinds of settlements into two categories. Little additional evidence is provided to substantiate this dichotomy.

There is virtually no evidence that the various sites are contemporaneous. The author argues that several sets of "dwelling locations" in the Åmose basin must have been contemporary, on the basis of regular spacing and typological comparison. He also assumes that the "minor activity areas" were contemporaneous with the dwelling locations. Typology provides a chronological resolution of no greater than 200–300 years in the Maglemosian period. Further, regular spacing or "social distance" is unlikely to have been a major factor in the determination of settlement placement on lakeshores; considerations such as elevation, drainage, and access to open water must have been primary. Finally, it is extraordinary to learn that the Maglemosian sites in the Åmose bog were occupied almost simultaneously when the period extends for some 1,800 years. Obviously, an argument for contemporaneity is more difficult to document than one against, but Grøn offers very little evidence to suggest that these groups of sites were indeed occupied at the same time. The same evidence could also be used to argue that the sites were occupied sequentially during the same summer. New and more powerful methods of assessing site contemporaneity must be developed and applied before we can begin to resolve this question (Rafferty 1985).

That there are no satisfactory interpretations of specific hunter-gatherer societies certainly remains true. An approach which is theoretically and methodologically traditional as well as highly speculative is not likely to lead to new insights regarding the adaptations of foraging peoples in northern Europe. Models are simplifications of reality, but they must account for the variation that is present in both the archaeological and the ethnographic record. A view which assumes simple regularity is destined to be disappointing.

Grøn concludes by suggesting that future excavations can test this model. I would challenge him to list some testable implications of it in his reply.

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In this interesting paper Grøn reinterprets the Maglemosian settlement pattern of Zealand and Langeland, Denmark, offering it as a model of Maglemosian settle-

ment elsewhere in southern Scandinavia and northern Germany. He argues that, contrary to prevailing models, summer sites consisted of 3–5 dwellings containing 4–8 families and winter sites often consisted of single isolated dwellings. I find his arguments stimulating and think that it is fruitful to consider separate but nearby clusters of data as possibly connected within a single site rather than separate sites. The argument concerning the relatively large size of the summer sites, which is the crux of his reinterpretation, rests on demonstrating the contemporaneity of those clusters of data which represent dwelling locations. However, as he is well aware, establishing exact contemporaneity of archaeological data is a difficult task. As he suggests, the application of dendrochronology or refitting of lithics is too limited. Nor do overlapping radiocarbon dates or similarity in artefact assemblages establish contemporaneity. I think that his search for recurrent patterns of settlement layout, e.g., dwellings laid out in a circle or, as in this case, lineally along an ancient lakeshore, is an approach with much potential. At the same time, however, such patterns could be diachronic, for example, when a dwelling is built a given distance from an older one. I think that the regular spacing that Grøn perceives for three settlements in the Åmose basin is significant, and it will be up to future work to establish whether this arrangement is indeed recurrent.

The larger pattern that Grøn is reconstructing is that of the population aggregation and dispersal common to hunter-gatherer groups. Although he may well be correct in his interpretation of the seasonal population movement in Zealand and Langeland during the Boreal, I find the reasons he gives for it simplistic and, despite his claim to the contrary, environmentally deterministic. It is not enough to say that resources are scarce in the winter and therefore population must disperse. Not all hunter-gatherers disperse/aggregate in strict accordance with leanness/richness of resources. Although one response to dispersed and scarce resources may be to spread out in small groups, another may be to congregate for purposes of sharing and cooperation (e.g., Balikci 1970; Spencer 1959; cf. Renouf 1986 for an archaeological example). In the latter case, the population may then disperse during the richer months (when sharing and cooperation are unnecessary) to relieve the tensions of living in large groups. In other words, the pattern of population aggregation and dispersal varies for social and economic as well as environmental reasons (cf. Mauss 1979 [1950]). To say that “group size varied with—and was in fact proportional to—the amount of resources available” is to disregard the complexity involved in any pattern of annual population movement.

Finally, I would like to comment on the use of the results as a model of Maglemosian settlement elsewhere in the northern European lowlands. “Maglemosian” does not refer to a “culture” with a norm of seasonal duality involving population aggregation in the summer and fall and population dispersal in the winter. Groups adapt to their particular environments according to those environments’ features and their own social needs.

Thus the settlement pattern in the various regions and subregions of northern Europe during the Boreal must surely have varied with the specific conditions.

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Grøn’s description of seminomadic, low-density foraging groups undergoing seasonal flux in the southern Scandinavian postglacial boreal-forest habitat is a well-supported and theoretically imaginative reconstruction of early Mesolithic lifeways in Eurasia’s temperate zones as well as a useful methodological exercise. It pursues its central argument by exploiting methodically and critically every available line of direct and indirect evidence from an unevenly retrieved documentation over several decades, including topography, stratigraphy, ecology, spatial analysis of settlement and dwellings (for an example from the Netherlands see Musch 1982), analysis of lithic artifacts (another example of thorough analysis is in Jacobi 1978), and ethnographic analogs. The information thus gathered, while remaining open-ended in some respects, gives a more realistic picture of Maglemosian settlement systems by broadening and modifying the preceding, more schematic models. The author could perhaps have summarized the key subsistence items for each season. Winter settlements sheltered from cold winds by forest cover and summer residence near river resources parallel what is known for the North American subarctic forest. Another reason for settlements along the rivers was the protection against bothersome insects provided by the river breeze.

It is interesting that the examples of aurochs hunting involve the use of missiles. These animals are apparently protected to some degree against such weapons because their ribs are wider and more narrowly spaced than, for example, those of bison. Upper Palaeolithic cave art often depicts wild cattle with possible leg traps and bison hit by pointed missiles. The author cites ethnographic sources to the effect that megafauna is usually dispatched by spears or knives. At the late-glacial reindeer hunting site of Stellmoor, however, most of these animals were killed with arrows (Rust 1943, Clark 1976a). Finally, concerning subsistence strategy and the possible effect of animal-food carrying capacity on human group sizes, are there concrete indications in southern Scandinavia of the deliberate bush burning seen in the southern Pennines (Mellars 1976, and see Welinder 1983)? All in all, the Maglemosian yearly cycle described by Grøn differs significantly from the one reconstructed recently for Star Carr, where occupation recurred throughout the year (Andresen et al. 1981).

Grøn’s settlement and group-size model also raises issues concerning heterogeneity and levels of complexity in the social structure of Mesolithic communities of temperate or boreal Eurasia. The apparently egalitarian communities of Pre-Boreal and Boreal southern Scan-

dinavia, while self-sufficient, display little indication of the "affluence" postulated for much of the European Mesolithic (Clarke 1976; cf., e.g., other riverine settlements such as Lepenski Vir). Even for the subsequent, more intensified and semisedentary settlements of Mesolithic southern Scandinavia (Price 1985), it is difficult to identify evidence for a trend toward complexity and social hierarchy (Clark 1976b, Price and Brown 1985; cf., e.g., the later Mesolithic burial sites from northern Russia [O'Shea and Zvelebil 1984] or the Lake Baikal region [Okladnikov 1962]). Inegalitarian social structure was, however, already present during the late-glacial Palaeolithic in central Russia (Sofer 1985). The reasons for these different patterns and trajectories remain open for investigation. Recent ethnological research shows that ecologically impoverished and technologically simple foraging groups from the North American subarctic forest zone actually developed sharply delineated forms of social hierarchy based on kinship. This implies that inegalitarian social structures without elaborate material expression could have emerged in remote prehistoric times (Legros 1985) and so far escaped detection by archaeology, a point worth considering when dealing with simple settlement systems such as those of the Maglemosian.

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The article presents an interesting attempt to describe the full seasonal settlement pattern of the Maglemosian culture. This is the kind of description we should all be aiming at (after all, until we know how systems operate, we cannot discuss the reasons they change), but I have a number of major reservations about the specific arguments put forward.

The first concerns Grøn's contention that ecological considerations suggest agglomeration in summer and dispersion in winter. Resources may be fewer in winter, but they are also likely to be more concentrated (e.g., mammals in patches of better grazing or browse), and one would expect a corresponding human concentration at this time, as most recent studies have in fact suggested. In summer, on the other hand, the more widely available food sources would permit greater human dispersion. The interesting appendix, cited in support of the author's arguments, in fact offers little that is directly relevant to this point; I would argue that environmental factors could have had precisely the opposite effects to those the author suggests. The continental environment presented by Frydendahl would not be characterised mainly by "evenly distributed (as opposed to locally concentrated) and mainly non-migratory" resources. Storage is nowhere discussed, and this too could be a major influence for agglomeration in the winter.

In his ethnographic discussion, Grøn distinguishes between coastal, more "complex" groups and others that he describes as conforming to the more "traditional"

picture put forward by Lee and DeVore. This ignores the "logistically mobile" groups commonly found in higher latitudes (Binford 1980), which are intermediate between the complex coastal and the Lee/DeVore types. Use of the landscape is usually more complex than envisaged by the model put forward here, and consideration of this type of hunter-gatherer group would have been welcome. Sites of these groups are commonly used by task groups, not just family or multifamily residential units; however, the family or multifamily group is the only one considered here, and it would be interesting to know whether any evidence exists for task-group sites (e.g., hunting camps). The consideration of the artifact scatter at Flådet is interesting, but Grøn omits any discussion of other work in this field: work by Blankholm (1985) considers the very same sites and should at least have been mentioned. I am not competent to discuss the methodological issues involved, but Blankholm does *not* appear to agree that the sites can be divided into one-family dwellings of ca. 12 m² and two-family dwellings of ca. 24 m².

Thus neither ecology nor ethnography would lead me to the hypothesis put forward here. What is crucial is, as always, the evidence. The only real argument for the simultaneous occupation of four dwellings is the ca. 40-m spacing observed in the Åmose "dwelling locations." This is attained only when some artifact scatters are classed as "minor activity areas" rather than "dwelling locations" and so removed from the reckoning. This is carried out by a comparison of the *number of tool types* in each scatter, tools as disparate in size as microburins and axes. Whether the recovery methods were adequate to permit this is questionable, as they involved surface collection from peat diggings in localities sometimes already visited by collectors (cf. the differential loss of artifacts under 20 mm even during trowel excavation documented by the experiments of Bang-Andersen [1985]). Reconstructing the hunting-group size from the number of arrows in aurochs carcasses must be dismissed as fanciful. The flight mechanism of wounded animals in woodland involves concealment; following up and locating such animals (probably using dogs) and repeating this process perhaps several times, with arrows being shot on each occasion, could produce a carcass with a large number of arrows in it without this number's bearing any relationship to the number of hunters. Quite apart from anything else, the Vig and Prejlerup aurochs are the victims of *unsuccessful* hunts and thus tell us nothing about successful encounters.

I am thus sceptical of the arguments in favour of larger group size in summer. There are also problems with the small group size suggested for the winter. Whether Flådet is really a winter settlement is open to considerable doubt despite the author's arguments—the excavator had no difficulty in regarding it as a "conventional" summer site (Skårup 1979). The lack of organic evidence at Flådet means that definite evidence is lacking. The possibility that major winter sites could have been located along the watercourses draining the Ancylus Lake needs further examination. These areas are now

under the sea, but it is significant that submarine settlements of this period have been documented in the sorts of locations one would expect, i.e., estuaries (Larsson 1983). Major winter base camps here seem at least a possibility—one which would of course not preclude the use of inland winter hunting camps (Flådet?) of the kind known from the Ertebølle culture.

I thus agree with the author's aims but disagree with his conclusions. Examination of the full seasonal round of hunter-gatherer settlement is an essential task in Mesolithic studies, and this article highlights the potential of the Maglemosian in this respect.

Reply

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The C^{13}/C^{14} content of animal and human bones generally seems to give a good indication of the degree to which individuals depended on maritime resources (resources originating in salt water) (Tauber 1982). The method makes no distinction between dependence on freshwater resources (such as the Baltic ice lake) and dependence on terrestrial ones, and therefore it is natural that the skeleton Larsson mentions from 6000 B.C. in this area contains only -18‰ . It still seems to me likely that the Maglemosian groups that we are able to study today cannot regularly have had access to maritime resources.

As for a possible rotation between the summer sites we know from the interior and winter sites on the shore of the Ancylus Lake, first, in terms of resources a location on a reasonably large interior freshwater lake surrounded by a diversified biotope is not unlikely to have been better than a position on the shore of the Ancylus Lake. Second, that many sites have been identified as summer sites is simply a consequence of their frequent placement on the edges of the peaty banks of bog basins, with the result that organic waste containing seasonal indicators easily found its way into the preserving water. In winter these locations were uninhabitable because of a rise in the water level of the basin, and the cold air collecting over the ice would have caused the winter sites to have been placed farther from the shore than the 3–5 m usual for summer ones. Therefore the waste from these sites is likely to have been spread across the land and the ice, where it would have been exposed to a greater degree to dispersal and destruction by humans, dogs, wild animals, and chemical and climatic factors. The scarcity of winter sites may very well be the consequence of seasonal variation in the preservation of seasonal indicators. Third, activities seem to have been carried on in the interior in the winter. As I have mentioned, elks were killed there. The Flådet site seems to differ from what is known about the six dwellings with the same internal spatial organization from spring/

summer/autumn. Furthermore, both Flådet and the other proposed winter site, Holmegård, seem to have been placed in optimal situations with reference to winter wind directions, and neither was located on the shore of the Ancylus Lake. Price's opinion that the now-submerged coastal aspects of the Maglemosian were probably more important than those we know from the interior has no basis in the material and must be characterized as speculation.

Knud Andersen's important surveys in the Åmose basin 1943–51 are little known except to archaeologists specializing in the Danish Mesolithic, and when the results were finally published in 1983 it was in Danish only. Therefore, to correct some apparent misunderstandings, I will briefly outline the situation. The peat in large areas of the basin was scraped off in layers of a few centimeters each to a depth of 1.5 m (Andersen 1983:13–14). Repeated surveys made it possible not only to record many sites as clearly delimited concentrations of lithic and organic material but also to register their spatial configurations at different levels as they were "sliced" horizontally (p. 16). In a number of cases it was possible first to distinguish the settlement surface, containing a clearly delimited oblong/rectangular concentration, and later to identify at a somewhat deeper level a waste layer a few metres from that concentration (pp. 16–17 and Andersen, personal communication). In two cases where proper excavations were carried out (the two Ulkestrup huts), stakes probably representing wall construction surrounded rectangular dwellings with floors made of bark and branches, charcoal, hazelnuts, hearths, and enormous amounts of flint. On the basis of these huts, the situation at many of the small concentrations located and studied by "surface collection" seems susceptible of reasonable interpretation (pp. 176–77). Against this background, I consider it likely that Andersen is right in thinking that a number of concentrations may be brief "episodes" rather than proper settlements (p. 176 and personal communication). The methods used to separate "dwelling locations" and "minor activity areas" are necessarily, because of the nature of the material, rather rough. In spite of this, it is interesting that the separation made is supported by two different and independent methods of analysis and that it gives rise to a spatial pattern that is repeated three times. Because of the method of survey it seems likely that very few Maglemosian sites if any were overlooked in the area in question. Though exact contemporaneity of individual concentrations cannot be demonstrated, this spatial pattern may very well represent one contemporaneous settlement. It is well known that one important factor in the placement of Maglemosian dwellings is direct access to open water, as most dwellings are within 3–5 m from the contemporary shores. Since nearly all the sites that must have been inhabited in spring/summer/autumn are placed in areas where the shores had only a slight elevation and since drainage apparently had little influence on the location of dwellings (in some cases floors made of thick layers of branches and bark must have been constructed to insu-

late against the moist underlying peat), it is not unlikely that "social distance" was rather important in the organization of Maglemosian settlements, as it has been found to be in most "primitive" societies. In general, the social structure of a society seems reflected in the layout of settlements. One of Price's objections to the idea of the contemporaneity of the sites in question is that the Maglemosian lasted 1,800 years. I find this irrelevant to the problem at hand. That the Maglemosian settlement in the areas of the Åmose basin in which surveys have been carried out falls typologically within a much narrower time range is a matter of fact.

I postulate the existence of groups consisting of only a few families in winter and somewhat larger groups (about six families in three or four dwellings) in summer because in the available material what I interpret as summer settlements seem to consist of more dwellings and to have contained more inhabitants than the proposed isolated winter log cabin at Flådet. Of course, new excavations may change this picture, but on the basis of the existing data I can draw no other conclusion than the "simplistic" one. Basically, I consider it more important to distinguish the behaviour of prehistoric hunter-gatherers than to postulate, without any basis in the data, more complicated models containing numerous elements operating and interacting in uncontrollable ways. That the resources of summer may have "permitted" dispersal may be unimportant if groups for social reasons preferred to take advantage of the richness of resources to gather in larger groups. Larsson is right that the environment varies somewhat over the course of the Maglemosian period. How this affects the settlement pattern is difficult to see on the basis of the available material. According to my own studies, the internal spatial organization of dwellings and the quantitative relation between one- and two-family dwellings remains unchanged throughout the period (Grøn 1983, 1987a, b). My opinion is that changes in subsistence strategy and perhaps settlement structure appear only with the transition from Maglemose to Kongemose, but this remains to be demonstrated. That the Maglemosian represents a "complex" hunter-gatherer society lacks any support in the material. Something that may be a complex hunter-gatherer society develops in the late Mesolithic, but this may very well to some degree be due to contact with contemporaneous Neolithic cultures.

Rowley-Conwy asks for discussion of other work on distributional analysis. I have mentioned my own 1983 work, and I have two other papers in press (1987a, b). Blankholm's (1985) main concern was to distinguish the form, size, and orientation of Maglemosian dwellings, and his postulate (p. 69) that there is no repetitive spatial organization of Maglemosian sites is not supported by any published analysis of the material. As I have already pointed out, my own studies show that within dwellings there are two regular organizational patterns of distribution of individual artefact types, different kinds of waste material, and in some cases structural remains (e.g., Flådet, fig. 6). Since the two dwellings that were excavated in the Åmose basin apparently contain both

male and female activity areas in the positions in which these would be expected, it is reasonable to conclude that these dwellings were not inhabited solely by task/hunting groups. This is supported by the fact that the dwellings represent a span from approximately April to October.

Rowley-Conwy suggests that the number of arrows in an aurochs carcass may not relate to the number of hunters, being instead the result of repeated volleys in the course of pursuit. In the Prejlerup aurochs, however, nearly all the arrows hit the same part of the body, in terms of hunting efficiency the least advantageous one—the hind part and especially the left hind leg. A more likely explanation seems to be that a number of hunters for some reason had to shoot when the animal was in a bad position to be shot at.

My intention was to present a more detailed and up-to-date picture than the traditional one of the subsistence strategy and group structure of the Maglemose culture. I have attempted, on the basis of the existing material and ethnographic data, a formulation that can be tested by further archaeological research. Though the Maglemosian material is probably the prehistoric hunter-gatherer material with the greatest potential, it can only give a rough idea of the answers to a limited number of questions. Therefore a logical next step is to seek out places in which the ideas advanced here can be confirmed or rejected. In this case the places with this potential seem to be the submerged bog basins that in Mesolithic times were freshwater lakes. Here the conditions of preservation are known in some cases to have been even better than in the land-based basins. This means that exact contemporaneity of dwellings may be possible to determine by relative dendrochronology if stakes from the dwellings are preserved. Further, the postulated winter dwellings should be possible to find under better conditions of preservation. Finally, it should be possible to elucidate the mystified coastal aspect of the Maglemosian. Thanks to the financial support of the Augustinus Foundation, the initial surveys of a joint archaeological-geological project aiming at the solution of these problems will begin in spring 1987.

References Cited

- AARIS-SØRENSEN, K. 1984. "Om en uroksetyr fra Prejlerup og dens sammenstød med Maglemosekulturen," in *Nationalmuseets Arbejdsmark*, pp. 169–73. Copenhagen.
- ANDERSEN, K. 1983. *Stenalder bebyggelsen i den vestsjællandske Åmose*. Copenhagen.
- ANDERSEN, K., S. JØRGENSEN, AND J. RICHTER. 1982. *Maglemose hytterne ved Ulkestrup Lyng*. Copenhagen.
- ANDERSEN, S. H. 1979. "Maglemosekultur," in *Arkæologisk Håndbog: Leksikon over Danmarks Forhistorie*. Edited by Mogens Rud, pp. 193–97. Copenhagen.

- . 1980. Tybrind Vig: Foreløbig meddelelse om en undersøisk stenalderboplads ved Lillebølt. *Antikvariske studier: Fortidsminder og Bygningsbevaring* 4:7–19.
- ANDRESEN, J. M., B. F. BYRD, M. D. ELSON, R. H. MCGUIRE, R. G. MENDOZA, E. STASKI, AND J. P. WHITE. 1981. The deer hunters: Star Carr reconsidered. *World Archaeology* 13:31–46. [NR]
- ANTROPOVA, V. V., AND V. G. KUZNETSOVA. 1964. "The Chukchi," in *The peoples of Siberia*. Edited by M. G. Levin and L. P. Potapov, pp. 799–835. Chicago: University of Chicago Press.
- BALIKCI, A. 1970. *The Netsilik Eskimo*. Garden City: Natural History Press.
- BANG-ANDERSEN, S. 1983. Svarthållå på Viste—boplass i 6000 år. *Arkeologisk Museum i Stavanger Småtrykk* 13:1–24. [CM]
- . 1985. Utgravd—tapt—gjenfunnet. *AmS-Skrifter* 11:5–23. [PR]
- BECKER, C. J. 1945. "En 8000-Årig Stenalderboplads i Holmegårds Mose: Foreløbig meddelelse," in *Nationalmuseets Arbejdsmark*, pp. 61–72. Copenhagen.
- . 1953. "Die Maglemosekultur in Danemark: Neue Funde und Ergebnisse." *Congrès International des Sciences Préhistoriques 1950, Actes de la IIIe Session*, pp. 180–83. Zurich.
- BINFORD, L. R. 1980. Willow smoke and dogs' tails: Hunter-gatherer settlement systems and archaeological site formation. *American Antiquity* 45:4–20. [TDP, PR]
- BIRKET-SMITH, K. 1929. *The Caribou Eskimos: Material and social life and their cultural position*. Copenhagen.
- BLANKHOLM, H. P. 1985. "Maglemosekulturens hyttegrundrids: En undersøgelse af bebyggelse og adfærdsmønstre i tidlig mesolitisk tid," in *Årbøger for Nordisk Oldkyndighed og Historie 1984*, pp. 61–77. Copenhagen.
- BLANKHOLM, R., E. BLANKHOLM, AND S. H. ANDERSEN. 1967. Stallerupholm: Et bidrag til belysning af Maglemosekulturen i Østjylland. *Kuml* (Århus) 1968:61–108.
- BOKELMANN, K. 1980. Duvense Wohnplatz 6. *Die Heimat: Zeitschrift für Natur- und Landeskunde von Schleswig-Holstein und Hamburg* 87:320–30.
- . 1981. Eine neue Borealzeitliche Fundstelle in Schleswig-Holstein. *Kölner Jahrbuch für Vor- und Frühgeschichte* 15:181–88.
- BOKELMANN, K., F. R. AVERDIECK, AND H. WILKOMM. 1981. Duvensee, Wohnplatz 8: Neue Aspekte zur Sammelwirtschaft im frühen Mesolithikum. *Offa* 38:21–40.
- BRIGGS, J. L. 1970. *Never in anger: Portrait of an Eskimo family*. Cambridge: Harvard University Press.
- BRINCH PETERSEN, E. 1972. A Maglemose hut from Svørdborg bog, Zealand, Denmark. *Acta Archaeologica* 42:43–77.
- . 1973. "A survey of the Late Palaeolithic and Mesolithic of Denmark," in *The Mesolithic in Europe*. Edited by Stefan K. Kozłowski, pp. 78–127. Warsaw.
- . 1984. "Femten små flintspidser i Prejlerup—hvem skød?," in *Uroksen fra Prejlerup*. Edited by Kim Aaris-Sørensen, pp. 19–23. Copenhagen.
- BRINCH PETERSEN, E., V. ALEXANDERSEN, P. VANG PETERSEN, AND C. CHRISTENSEN. 1979. Vedbæk-projektet. *Søllerødbogen*, pp. 21–97.
- BURCH, E. S. 1975. *Eskimo kinsmen: Changing family relationships in Northwest Alaska*. American Ethnological Society Monograph 59.
- CLARK, J. G. D. 1952. *Prehistoric Europe: The economic basis*. London: Methuen. [CM]
- . 1976a. Discussion of "Early animal husbandry," by M. R. Jarman, in *The early history of agriculture*. Edited by J. Hutchinson, G. Clark, E. M. Jope, and R. Riley, p. 95. *Philosophical Transactions of the Royal Society of London B* 275. [NR]
- . 1976b. *Mesolithic prelude*. Edinburgh: University Press. [NR]
- CLARKE, DAVID. 1976. "Mesolithic Europe: The economic basis," in *Problems in economic and social archaeology*. Edited by G. Sieveking, I. H. Longworth, and K. E. Wilson, pp. 449–81. London: Duckworth. [NR]
- DAMAS, D. 1972. "The Copper Eskimo," in *Hunters and gatherers today*. Edited by M. G. Bicchieri. New York: Holt, Rinehart and Winston.
- DIVALE, W. T. 1972. Systemic population control in the Middle and Upper Palaeolithic: Inferences based on contemporary hunter-gatherers. *World Archaeology* 4:222–43.
- FISCHER, A. 1975. An ornamented flint-core from Holmegård V, Zealand, Denmark. *Acta Archaeologica* 45:155–68.
- . 1985. Den vestsjællandske Åmose som kultur- og naturhistorisk reservat. *Antikvariske studier: Fortidsminder 1985* 7:170–75.
- FRASER, D. 1968. *Village planning in the primitive world*. London.
- FRIIS JOHANSEN, K. 1919. "En Boplads fra den Ældste Stenalder i Svørdborg Mose," in *Årbøger for Nordisk Oldkyndighed og Historie 1919*, pp. 106–235. Copenhagen.
- GIDDINGS, J. L. 1952. *The arctic woodland culture of the Kobuk River*. Philadelphia.
- GILLESPIE, B. C. 1981. "Major fauna in the traditional economy," in *Handbook of North American Indians*, vol. 6, *Subarctic*. Edited by June Helm, pp. 15–18. Washington, D.C.: Smithsonian Institution.
- GOULD, R. A. 1968. The Ngatatjara of Western Australia. *Southwestern Journal of Anthropology* 24:101–21.
- . 1969. Subsistence behaviour among the Western Desert Aborigines of Australia. *Oceania* 39:253–74.
- GRUE, H. E. 1984. "Hvor gammel blev Uroksen?," in *Uroksen fra Prejlerup*. Edited by Kim Aaris-Sørensen, pp. 28–30. Copenhagen.
- GRØN, O. 1983. Social behaviour and settlement struc-

- ture: Preliminary results of a distribution analysis on sites of the Maglemose culture. *Journal of Danish Archaeology* 2:32–42.
- . 1985. Mikrolitter som grund för datering: Dags för omvärdering? *Populär Arkeologi* 3(3):22–24.
- . 1987a. Dwelling organization: A key to the understanding of social structure in Old Stone Age societies? An example from the Maglemose culture. *Archaeologia Interregionalis* 8. In press.
- . 1987b. "General spatial behaviour in small dwellings: A preliminary study in ethnoarchaeology and social psychology," in *The Mesolithic in Europe: Proceedings of the Third International Symposium, Edinburgh 1985*. Edited by Clive Bonsall. In press.
- GUSINDE, M. 1931. *Die Feuerland-Indianer*. Vol. 1. Modling bei Wien.
- HARTZ, N., AND H. WINGE. 1906. "Om Uroxen fra Vig, Saaret og drøbtmed Flintvåben," in *Aarbøger for Nordisk Oldkyndighed og Historie*, pp. 225–37. Copenhagen.
- HAYDEN, B. 1979. *Palaeolithic reflections: Lithic technology and ethnographic excavation among Australian Aborigines*. Canberra.
- HENRIKSEN, B. B. 1976. *Sværdborg I, excavations 1943–44: A settlement of the Maglemose culture*. *Arkæologiske Studier* 3. Copenhagen.
- . 1980. *Lundby-holmen: Pladser af Maglemose-type i Sydsjælland*. Det Kongelige Nordiske Oldskriftselskab, Nordiske Fortidsminder 6. Copenhagen.
- HONIGMANN, J. J. 1961. *Foodways in a Muskeg community: An anthropological report on the Attawapiskat Indians*. Ottawa.
- HOWITT, A. W. 1904. *The native tribes of South-East Australia*. London.
- HUFTHAMMER, A. K., AND C. MEIKLEJOHN. 1986. Direct radiocarbon dating of the Viste burial, coastal Norway. *Mesolithic Miscellany* 7(2):7–8. [CM]
- IVERSEN, J. 1967. Naturens udvikling siden sidste istid. *Danmarks Natur* 1:345–445.
- JACOBI, ROGER. 1978. "Northern England in the eighth millennium B.C.: An essay," in *The early post-glacial settlement of northern Europe*. Edited by P. Mellars, pp. 295–331. London: Duckworth. [NR]
- JELGERSMA, S. 1979. "Sea-level changes in the North Sea basin: The Quaternary history of the North Sea," in *Acta Universitatis Upsaliensis Annum Quingentesimum Celebrantis*, vol. 2. Uppsala.
- JENNESS, D. 1970 (1922). *The life of the Copper Eskimos*. Pt. A, vol. 12. *A report of the Canadian Expedition 1913–18*. New York: Johnson Reprints.
- JOHANSEN, O. S., S. GULLIKSEN, AND R. NYDAL. 1986. ^{13}C and diet: Analysis of Norwegian human skeletons. *Radiocarbon* 28:754–61. [CM]
- KELLY, R. H. 1983. Hunter-gatherer mobility strategies. *Journal of Anthropological Research* 39:277–306. [TDP]
- LAMB, H. H. 1977. *Climate: Present, past, and future*. Vol. 2. London.
- LARSSON, LARS. 1978. *Ageröd I:B–Ageröd I:D: A study of Early Atlantic settlement in Scania*. *Acta Archaeologica Lundensia* 4(12). [LL]
- . 1982. De äldsta gutarna. *Gotländskt arkiv* 1982:7–14. [LL]
- . 1983. "Mesolithic settlement on the sea floor in the Strait of Öresund," in *Quaternary coastlines and marine archaeology: Towards the prehistory of land bridges and continental shelves*. Edited by P. M. Masters and N. C. Flemming, pp. 283–301. New York: Academic Press. [LL, PR]
- . 1984. The Skateholm Project: A Late Mesolithic settlement and cemetery complex at a southern Swedish bay. *Papers of the Archaeological Institute, University of Lund* 1983–1984:5–38. [LL]
- LAUGHLIN, W. S. 1968. "Hunting: An integrative behavior system and its evolutionary importance," in *Man the hunter*. Edited by R. B. Lee and I. DeVore, pp. 304–20. Chicago: Aldine.
- LEE, R. B., AND I. DEVORE. 1968. *Man the hunter*. Chicago: Aldine.
- LEGROS, DOMINIQUE. 1985. Wealth, poverty, and slavery among 19th-century Tutchone Athapaskans. *Research in Economic Anthropology* 7:37–64. [NR]
- LIE, R. W. 1979. Den eldste kjente nordmann og rogalending. *Frå Haug ok Heidni: Tidsskrift for Rogalands Arkeologiske Forening* 7:291–97. [CM]
- MAUSS, MARCEL. 1979 (1950). *Seasonal variations of the Eskimo: A study in social morphology*. Written in collaboration with H. Beuchat; translated from the French by J. J. Fox. London: Routledge and Kegan Paul. [MAPR]
- MELLARS, PAUL. 1976. Fire ecology, animal populations, and man: A study of some ecological relationships in prehistory. *Proceedings of the Prehistoric Society* 42:15–45. [NR]
- MØHL, U. 1980. "Elsdyrskeletterne fra Skottemarke og Favrbø: Skik og brug ved borealtidens jagter," in *Aarbøger for Nordisk Oldkyndighed og Historie* 1978, pp. 5–29. Copenhagen.
- MUSCH, J. E. 1982. Reconstructions of "hunter/gatherer" dwelling structures. *Mesolithic Miscellany* 3(2):3–5. [NR]
- NOE-NYGÅRD, N. 1973. The Vig bull: New information on the final hunt. *Bulletin of the Geological Society of Denmark* 22:244–48.
- ODUM, E. P. 1971. 3d edition. *Fundamentals of ecology*. Philadelphia: Saunders.
- OKLADNIKOV, A. P. 1962. "The temperate zone of continental Asia," in *Courses toward urban life*. Edited by R. J. Braidwood and G. R. Willey, pp. 267–87. Chicago: Aldine. [NR]
- O'SHEA, J., AND M. ZVELEBIL. 1984. *Oleneostrovski mogilnik*: Reconstructing the social and economic organization of prehistoric foragers in northern Russia. *Journal of Anthropological Archaeology* 3(1):1–40. [NR]
- PARKER, A. C. 1975 (1925). *The Indian how book*. New York: Dover Publications.
- PAULSON, I. 1952. "The 'seat of honour' in aboriginal dwellings of the circumpolar zone, with special re-

- gard to the Indian tribes of aboriginal America." *Selected papers of the XXIXth International Congress of Americanists*. Edited by Sol Tax, pp. 63–65. Chicago.
- PRICE, T. D. 1981. "Complexity in non-complex societies," in *Archaeological approaches to the study of complexity*. Edited by S. E. van der Leeuw, pp. 55–97. Cingula 6.
- . 1985. "Affluent foragers of Mesolithic southern Scandinavia," in *Prehistoric hunter-gatherers*. Edited by T. D. Price and J. A. Brown, pp. 341–63. Orlando: Academic Press. [NR]
- PRICE, T. D., AND J. A. BROWN. 1985. "Aspects of hunter-gatherer complexity," in *Prehistoric hunter-gatherers*. Edited by T. D. Price and J. A. Brown, pp. 3–20. Orlando: Academic Press.
- RADCLIFFE-BROWN, A. R. 1964. *The Andaman Islanders*. Glencoe: Free Press.
- RAFFERTY, J. E. 1985. The archaeological record on sedentariness: Recognition, development, and implications. *Advances in Archaeological Method and Theory* 8:113–56. [TDP]
- RASMUSSEN, K. 1931. *The Netsilik Eskimos: Social life and spiritual culture*. Copenhagen.
- RENOUF, M. A. P. 1984. Northern coastal hunter-fishers: An archaeological model. *World Archaeology* 16:18–27.
- . 1986. Excavations at a Younger Stone Age settlement in Varangerfjord, North Norway. *Polar Record* 23(144):273–88. [MAPR]
- ROGERS, E. S. 1963. *Hunting group–hunting territory complex among the Mistassini Indians*. National Museum of Canada Bulletin 195, Anthropological Series 63.
- . 1967a. *The material culture of the Mistassini*. National Museum of Canada Bulletin 80.
- . 1967b. "Band organization among the Indians of eastern subarctic Canada," in *Contributions to anthropology: Band societies*, pp. 21–50. National Museum of Canada Bulletin 228, Anthropological Series 84.
- . 1973. *The quest for food and furs: The Mistassini Cree 1953–1954*. National Museum of Canada Publications in Ethnology 5.
- RUST, ALFRED. 1943. *Die Alt- und Mittelsteinzeitlichen Funde von Stellmoor*. Neumünster: Karl Wachholtz. [NR]
- SARAUW, G. 1903. "En Stenalders Boplads i Maglemose ved Mullerup sammenholdt med Beslægtede Fund," in *Aarbøger for Nordisk Oldkyndighed og Historie* 1903, pp. 148–315. Copenhagen.
- SILBERBAUER, G. B. 1981. *Hunter and habitat in the Central Kalahari Desert*. Cambridge: Cambridge University Press.
- SKAR, B., AND S. COULSON. 1987. "A case study of Rörmyr II, a Norwegian Early Mesolithic site," in *The Mesolithic in Europe: Proceedings of the Third International Symposium, Edinburgh 1985*. Edited by Clive Bonsall. In press.
- SKÅRUP, J. 1979. *Flådet: En tidlig maglemoseplads på Langeland*. Rudkøbing.
- SOFER, OLGA. 1985. "Patterns of intensification as seen from the Upper Palaeolithic of the central Russian plain," in *Prehistoric hunter-gatherers*. Edited by T. D. Price and J. A. Brown, pp. 235–70. Orlando: Academic Press. [NR]
- SPENCER, B., AND F. J. GILLEN. 1927. *The Arunta*. London.
- SPENCER, ROBERT F. 1959. *The North Alaskan Eskimo: A study in ecology and society*. Smithsonian Institution Bureau of American Ethnology Bulletin 171. [MAPR]
- STAPERT, D. 1982. A site of the Hamburgian tradition with a constructed hearth near Oldeholtwolde (Province of Friesland, the Netherlands): First report. *Palaeohistoria* 24:53–89.
- STEPANOVA, M. V., AND V. V. KHRAMOVA. 1964. "The Yukagirs," in *The peoples of Siberia*. Edited by M. G. Levin and L. P. Potapov, pp. 788–835. Chicago: University of Chicago Press.
- STRÖMBERG, M. 1986. Signs of Mesolithic occupation in South-East Scania. *Papers of the Archaeological Institute, University of Lund* 1985–1986:52–83. [LL]
- TAUBER, HENRIK. 1982. Carbon-13 evidence for the diet of prehistoric humans in Denmark. *Pact* 7:235–37. [LL]
- TORRENCE, ROBIN. 1983. "Time budgeting and hunter-gatherer technology," in *Hunter-gatherer economy in prehistory*. Edited by G. Bailey, pp. 11–22. Cambridge: Cambridge University Press. [TDP]
- WATANABE, H. 1973. *The Ainu ecosystem: Environment and group structure*. Seattle: University of Washington Press.
- WELINDER, S. 1971. *Tidigpostglacialt Mesoliticum i Skåne*. Acta Archaeologica Lundensia in 80 Minore 1.
- . 1973. Stenålderns mosseboplatser. *Ale: Historisk tidskrift for Skåneland* 1:1–14.
- . 1983. Man-made forest fires in the Mesolithic. *Mesolithic Miscellany* 4(1):9–10. [NR]
- WILLIAMS, B. J. 1968. "Establishing cultural heterogeneities in settlement patterns: An ethnographic example," in *New perspectives in archaeology*. Edited by Sally R. Binford and Lewis R. Binford, pp. 161–70. Chicago: Aldine.
- WOODBURN, J. 1980. "Hunters and gatherers today and reconstruction of the past," in *Soviet and Western anthropology*. Edited by E. Gellner, pp. 95–117. London: Duckworth. [TDP]
- YELLEN, J. E. 1977. *Archaeological approaches to the present: Models for reconstructing the past*. New York: Academic Press.