
Section I : Reciprocity and Redistribution

HUNTING IN FARMING SOCIETIES : THE PREHISTORIC PERSPECTIVE

Marek ZVELEBIL*

Summary

This paper examines the role of hunting amongst prehistoric farming communities in Northern Europe and considers the role of products of foraging in trade and exchange from the Neolithic through the Iron Age.

Recent ethnographic data suggest that hunting and gathering continues to play an important role amongst subsistence farming societies, either as (1) a risk buffering strategy, (2) for socio-ideological reasons or (3) in response to demand for furs and other wild animal products by more advanced, complex societies, or as a combination of the above factors. Mechanisms of reciprocity and redistribution, specialism for trade and exchange, as well as prestige and luxury trade would have been involved in the movement of hunting and gathering products arising from these situations.

Based on a review of the ethnographic evidence, I present a model for the use of wild resources among subsistence farmers from the Neolithic period onwards, and suggest how the operation of this model could be recognised in prehistoric faunal assemblages as well as other aspects of the material culture. This model is then examined against the archaeological record of Neolithic, Bronze Age and Iron Age settlement in the East Baltic, Finland and Scandinavia. I conclude that the major patterns of wild resources used conform to the model, but that unpredicted variation emerged concerning the timing and co-occurrence of the different strategies of wild resource use. While contributing to our understanding of the wild resources used among farming societies, the model requires more detailed application, which would take into account regional conditions and taphonomic factors.

Key Words

Hunting and Gathering, Farming, Northern Europe, Wild Resources, Trade and Exchange

Résumé

La chasse dans les sociétés agro-pastorales : perspective préhistorique.

Cet article examine le rôle de la chasse dans les sociétés préhistoriques agro-pastorales de l'Europe du Nord et s'intéresse à la place des produits de cette activité dans le commerce et les échanges, du Néolithique à l'Age du Fer.

De récentes données ethnographiques suggèrent que la chasse et la collecte ont continué à jouer un rôle important dans l'approvisionnement de ces sociétés : (1) pour se prémunir contre les aléas de la production, (2) pour des raisons socio-idéologiques, (3) dans les sociétés les plus avancées, pour répondre aux besoins en fourrures ou autres produits issus d'animaux sauvages, ou encore pour ces trois raisons réunies. Le transfert des produits des chasses et collectes réalisées dans ces conditions a sans doute mis en jeu des mécanismes de réciprocité et de redistribution.

En se fondant sur une recension des observations ethnographiques, l'auteur propose un modèle pour l'utilisation des ressources sauvages par les éleveurs-agriculteurs, depuis le Néolithique. Il suggère les moyens de reconnaître le fonctionnement de ce modèle dans les assemblages fauniques préhistoriques, au même titre que les autres éléments de la culture matérielle. Le modèle est ensuite examiné au regard des données archéologiques du Néolithique, de l'Age du Bronze et de l'Age du Fer, sur la côte orientale de la Baltique, en Finlande et en Scandinavie. L'auteur conclut que les grandes lignes de l'utilisation des ressources sauvages sont en accord avec le modèle, mais qu'il existe des variations imprévisibles en ce qui concerne la succession chronologique des différentes stratégies. Bien qu'utile à la compréhension de l'utilisation des ressources sauvages dans les sociétés agro-pastorales, le modèle nécessite une application plus détaillée, qui devra prendre en compte les particularismes régionaux et les facteurs taphonomiques.

Mots clés

Chasse et collecte, Agriculture et pastoralisme, Europe du Nord, Ressources naturelles, Commerce et échanges

* Department of Archaeology & Prehistory, University Sheffield, Sheffield S10 2TN, UK.

Introduction

Wild resources in prehistoric farming societies have received little attention so far. Cultural evolutionary models, and the idea of technological progress continue to influence our thinking about social evolution. Within these frameworks, the continued use of wild resources has often been regarded as a mark of stagnation and backwardness, while the development of farming was acknowledged as a mark of progress and a harbinger of civilisation. As a consequence, little attention has been paid to hunting in farming societies ; it has been generally assumed, explicitly or implicitly, that soon after the introduction of farming, wild resources lost their social and economic significance and contributed little or nothing to the economic basis or social reproduction of the society. While this may have been true for some neolithic societies, it has not been the case for others. Taking the East Baltic and Scandinavia as examples, I would like to consider the role of hunting in farming societies and investigate how it may be reflected in the archaeozoological record.

The use of hunted resources in farming societies

I regard the transition to farming as a gradual process, passing through the phases of availability, of substitution and of consolidation (fig. 1) (ZVELEBIL and ROWLEY-CONWY, 1984). During this process, domesticated plants and animals came to replace wild resources, with the decisive economic shift occurring in the substitution phase. The conceptual and social changes associated with agricultural transition, however, extend into and in part define the preceding availability phase and the succeeding consolidation phase. The consolidation phase comes to an end when the socio-economic conditions of an area become indistinguishable from those of the agricultural hinterlands.

Let us consider now those early farming societies, where wild resources continue in some use. What will be the use of such resources in societies where the majority of food comes from agriculture and animal husbandry ? Bearing in mind ethnographic and historical analogues, we can recognise three types of use :

1. The use of game as a risk-buffering strategy.— (HALSTEAD and O'SHEA, 1989 ; O'SHEA, 1989). As HALSTEAD and O'SHEA have shown, the use of wild resources can be one among a number of responses to

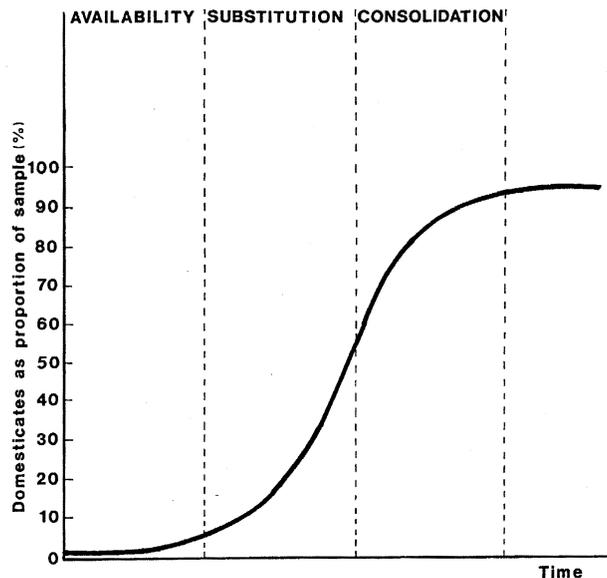


Fig. 1 : Availability model for the transition to farming (after ZVELEBIL, 1986).

Availability phase : foraging principal means of subsistence. Domesticates less than 10 per cent of total remains.

Substitution phase : farming strategies developed while foraging strategies retained. domesticates 10-50 per cent of total remains.

Consolidation phase : farming principal mode of subsistence. Domesticates more than 50 per cent of total remains.

unpredictable variability in agricultural yields. By putting their eggs into both the wild and domesticated baskets, farming communities minimised the effect of variation in yields and the danger of famine.

2. The use of game as a social resource.— This is a more contentious issue. In her survey of hunting among subsistence farmers, Susan KENT (1989) emphasised hunting as a socially significant strategy. Hunting served as an expression of identity for males, as a justification of their role in a society, a display of strength, a way of obtaining a female, an excuse for not farming and a reason for getting away from the village and females. Kent argues that hunting takes place primarily for socio-ideological reasons, and plays a crucial role in the negotiation of power between males and females.

At a more abstract level, structural and cognitive anthropologists have argued that wild animals form an association with things male, external, wild and natural, in opposition to things female, domestic, internal and

socialised, which are associated with domestication (LEVI-STRAUSS, 1962 ; 1966). While it remains open to question whether these social and cognitive frameworks can be applied to concrete prehistoric situations, such as the European neolithic or the Bronze Age (but see HODDER, 1990), at the very least we should examine the archaeological record for the evidence of wild animal symbolism in farming societies.

3. The use of game as a commodity of trade.— Fur and hide of wild terrestrial animals, and fat of sea mammals served as items of trade in the historical period (TEGEGREN, 1965). Fur, hides and fat may also have been items of trade and exchange in prehistory, with early farming societies playing an active part in their procurement. Such exchange could have taken several forms, either between different farming communities with differential access to wild resources, or between the core farming areas transformed into complex societies, and peripheral farming settlements still in the process of consolidation of farming. In either case, such an exchange framework would have served also as a risk-buffering strategy (HALSTEAD and O'SHEA, 1989) and as a vehicle of social stratification.

Archaeological signatures

How could one recognise such changes in the use of wild animals in the archaeological record ? Faunal remains are an obvious type of data to investigate. But a major problem with faunal data lies in linking it with human behaviour. How can variation in faunal remains be used as a signature for social and economic changes occurring in society ? Problems of taphonomy, sample bias and problems of interpretation mitigate against such use. Any attempts to use faunal remains in this way are of necessity heuristic and can only be justified as models against which the variation in the data can be compared. In such a way, it may be possible to recognise different patterns of use. Related evidence, such as rock art and symbolic representations of wild animals may be brought into play.

In the context of early farming societies, it could be predicted that the use of hunted resources will decline as farming develops. The pattern of decline will be subject to local conditions, but if the use of hunted animals as a risk-buffering mechanism, as a social resource, and as an item of trade did occur, then certain regularities, illustrated in figure 2 should be observed.

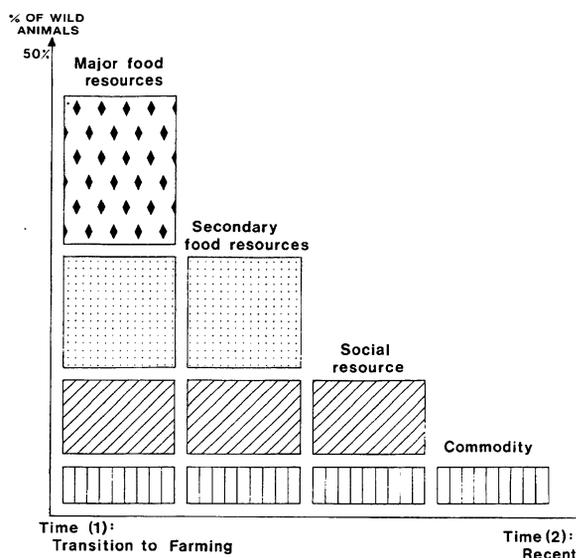


Fig. 2 : A model of use of wild animals in early farming societies (for explanation, see text).

In the first phase, early farming societies are expected to make extensive use of hunted resources, which will include the use of large and small game as a buffering resource, the use of animals for social reasons and also as items of trade.

With increased residential permanence, reduced territories and agricultural intensification, access to large (or preferred) game will become limited by the territorial requirements of large game. As a consequence, the exploitation of smaller (or secondary) game will increase. Concentration on smaller game will eventually reduce the productivity of this strategy to the point when it will be no longer viable as a regular risk-buffering mechanism.

In the following phase, wild animals will retain their significance as a social resource and as an item of trade. With the continuing development of farming, however, domestic animals, such as horse and cattle, will replace the wild animals as symbols of strength and status.

Based on ethnographic data, however, three aspects of this process need emphasis ; men, associated with hunting, tend also to be associated with social reproduction ; women, associated with domesticates, are also associated with biological reproduction ; second,

while wild animals and humans are often viewed in the same category, domestic animals are often viewed as analogous to objects ; and third, market exchange systems emphasise the economic value of animals (KENT, 1989 ; LEVI-STRAUSS, 1966).

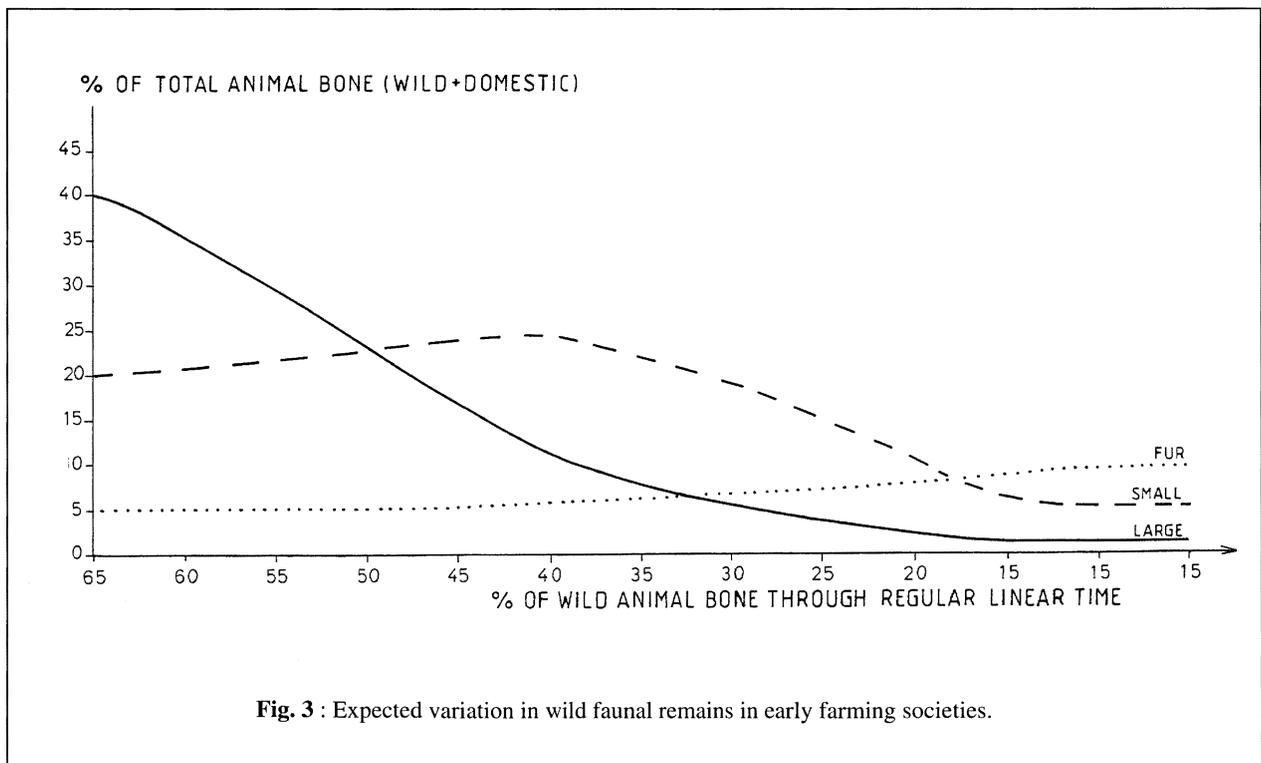
With the reduced role of hunting as a regular source of food, a perceptual shift can be expected to take place, when hunted animals are no longer regarded as a part of men's ideological justification for their role in society. Wild animals will lose most of their symbolic significance. The principal use of wild animals will now be for their pelts and hides, as items of trade. This will in turn reinforce their perception as a commodity, an object, a source of wealth : a perception akin to that of domestic resources (INGOLD, 1974 ; PAINE, 1971). This marks the last phase in the use of wild resources, one characterised by the increased exploitation of fur game and other marketable resources.

In the faunal assemblages, the first phase should be marked by successive peaks in the exploitation of preferred and secondary resources, as these decline, the exploitation of fur game should come into prominence. Since this takes place against the background of a decline in the overall use of wild resources, the pattern will be one of changing principal components in the wild resource

assemblage, rather than an absolute rise in any one category (fig. 3). The use of wild animals as a social and ideological resource should be apparent from zoomorphic representations in rock carvings, sculpted objects and mortuary contexts. In bone assemblages, parallels to such symbols may be found in any unusual patterning of bone elements which may indicate ritual treatment instead of, or in addition to, consumption as food.

Hunting in the east Baltic and Scandinavia

Let us now review the evidence for hunting in the early farming societies in north-east Europe, particularly the lands adjacent to the eastern shore of the Baltic sea, (now divided into, Latvia, Estonia, Finland and northwest Russia). Although the traces of cultigens and domesticates occur in this area sporadically from c. 2500 BC, bones of domesticates constitute less than 10 per cent of the total sample until the first millenium BC (PAAVER, 1965 ; ZVELEBIL, 1981 ; 1985). The subsequent transition to farming as the principal means of subsistence occurred during the Bronze and Iron Ages, about 1200 BC - 400 AD. This is evident not only from the osteological and palynological record



(HUTTUNEN, 1980, PAAVER, 1965, SALO and LAHTIPERA, 1980, DONNER, 1984, ZVELEBIL and ROWLEY-CONWY, 1986), but also in the relocation of settlements into areas with light sandy clays and loams and other soils optimal for farming (GRAUDONIS, 1967; JAANITS, 1959; ZVELEBIL, 1981).

In terms of the "availability" model of agricultural transition, the *substitution phase*, then, began c. 1200 BC and lasted until 500 BC in the East Baltic, and until about 100 AD in southern Finland (fig. 4). From 500 BC settlements in the East Baltic contain less than 40 per cent of wild faunal remains. This marks the beginning of the consolidation phase; further decline to about 20 per cent can be noted on the sites dating to the first four centuries AD (fig. 5). In southern Finland, palynological

and zoological indices of agricultural intensification mark the beginning of the consolidation phase c. 100 AD (ZVELEBIL, 1981, ZVELEBIL and ROWLEY-CONWY, 1986). On the northern and eastern fringes of the area, foraging remained an important source of diet into the Medieval period: first as a subsistence basis of independent hunting communities, later, (from c. mid-first millennium AD) as hunting lands - the *eramaa* - of agricultural communities further south (TEGEGREN, 1965; JUTIKKALA, 1949).

Within this broader context, the variation in the wild faunal assemblage in the East Baltic is shown in figures 6, 7, 9, 10 and 12. These figures are based on a comprehensive analysis of faunal remains by PAAVER (1965), and they record the variation in bone counts

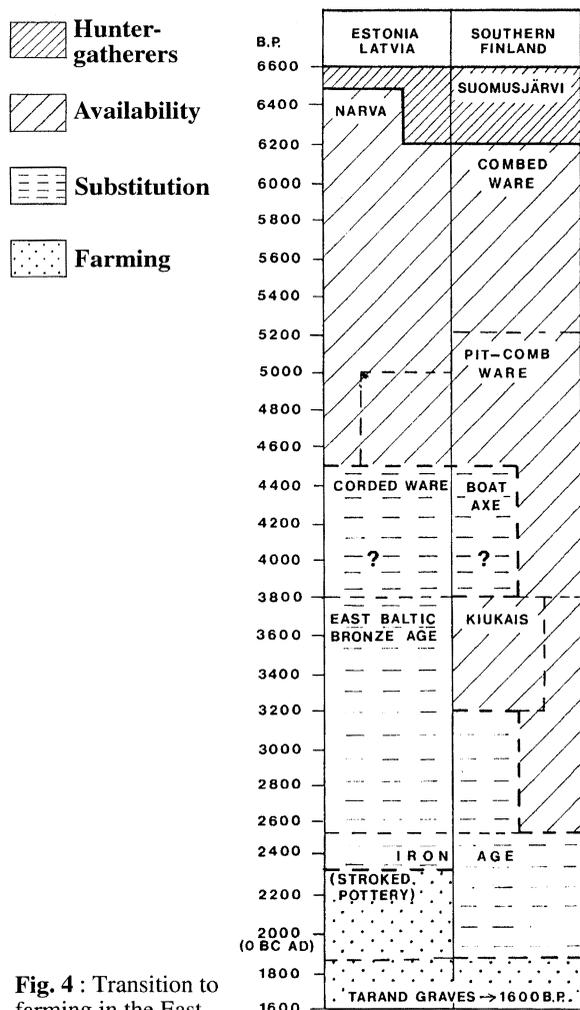


Fig. 4 : Transition to farming in the East Baltic in terms of the availability model.

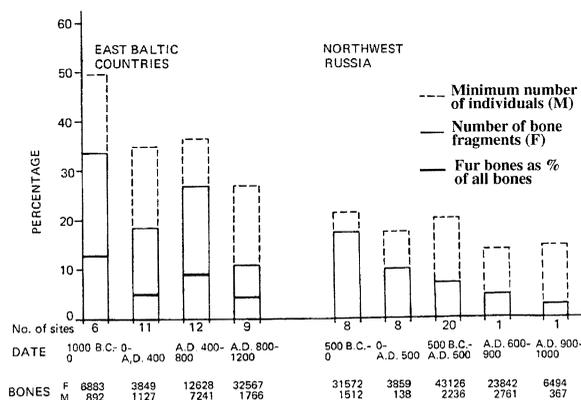


Fig. 5 : Decline in wild faunal remains in the East Baltic and Northwest Russia 1000 BC - 1000 AD (after ZVELEBIL, 1985).

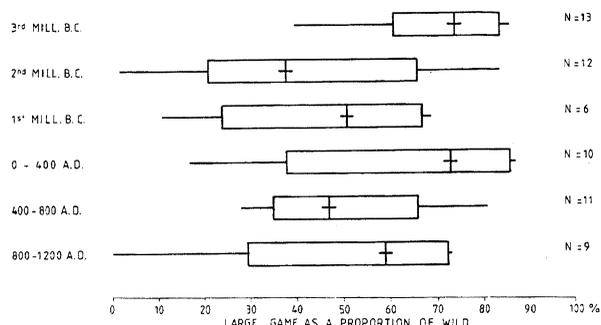


Fig. 6 : Variations in preferred, large game within the category of wild game. The box plots show the range of values, the standard deviation from the mean, and the median value, marked by a cross. N denotes the number of sites used in each calculation.

rather than minimum number of individuals. From these figures, we can make the following observations :

1. The pattern of variation in the use of large game goes some way to support the expectations under the model (fig. 6). From the six periods investigated, large game is in fact most represented in the earliest phase, the third millennium BC, when the East Baltic society can still be characterised as predominantly a hunting and gathering society in an availability phase. This is

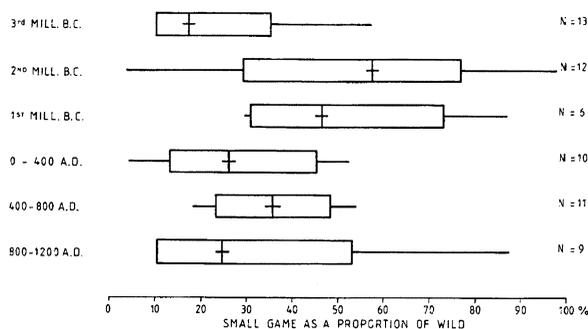


Fig. 7 : Variations in secondary, small game within the category of wild game.

followed by a decline in the second and first millennium BC, and a rise in the large game in the first millennium AD. This later rise was not predicted by the model and to that extent the model is not supported by the data.

2. The pattern of variation in the use of small game supports our expectations under the model (fig. 7). From the six periods investigated, secondary game is in fact most represented in the second and third phase, covering the second and first millennia BC, i.e. the early phases in the transition to farming. This suggests pressure on the available resource base of a hunting-gathering society, just prior to and in the early stages of the adoption of farming. The high values for secondary game persist until 2000 years ago (BC/AD boundary), i.e. some 500 years after a major decline in wild game as such between 1000 and 500 BC.

One problem here is the designation of preferred and secondary game, definitions intended to reflect the productivity rather than the size of resources. Bearing in mind the net production rates and processing costs, there is a clear break in productivity between terrestrial ungulates, such as wild bovines, pig, elk, red deer and horse, and other resources, in particular small game, aquatic resources (difficult to process), and predators (low density). This is illustrated in table 1.

Many predators and small game could also be classed as fur game, confusing the issue. Consequently, only those low-productivity species which we know

Rank	Species	Biomass (kg)	Edible Calories (meanweight as % of biomass x Calories/kg)	Density per km ²	Productivity (% max cull)	Net Production (Kcal)	Processing Costs
1.	Aurochs/Bison	687	0.5 x 2000 = 687.000	3.0	0.20	412.200	:1
2.	Pig	190	0.6 x 4840 = 551.760	3.0	0.20	331.000	:1
3.	Red deer	255	0.5 x 2000 = 255.000	4.0	0.20	204.000	:1
4.	Elk	320	0.5 x 2000 = 320.00	1.0	0.20	64.000	:1
5.	Horse	287	0.5 x 2000 = 287.000	1.0	0.20	57.400	:1
6.	Fish	1	1.0 x 1000 = 1.000	500.0	0.10	50.000	:3
7.	Seal (Ringed)	80	0.5 x 5000 = 200.000	2.0	0.10	40.000	:3
8.	Hare	3.5	0.5 x 2000 = 3.500	50.0	0.20	35.000	:2
9.	Roe deer	24	0.5 x 2000 = 24.000	6.0	0.20	29.000	:2
10.	Beaver	20	0.6 x 3000 = 36.000	5.0	0.15	27.000	:2
11.	Waterfowl	1	0.5 x 3000 = 1.500	20.0	0.50	15.000	:2
12.	Bear, Fur game, Predators		range of values		0.10	2100	:2

(see ZVELEBIL 1981)

Table 1 : Productivity of different wild animal species used in north-east Europe. The last column denotes ranking, reflecting search and processing costs: a factor by which the net production costs were divided (after ZVELEBIL, 1981).

ethnographically were eaten on a sustained basis were designated as “secondary resources” : this includes fish, fowl, seal, beaver, bear, hare and roe deer. Fish and fowl were considered separately from the other small game and they showed no variation in the level of use. The variation in the level of exploitation of the other resources reflects the settlement’s local environment, but the overall level of use of such resources among the late foragers nevertheless remains high, suggesting a classic resource shortage explanation for the adoption of farming.

3. There is extensive evidence for the social use of wild animals in the early stages of the transition to farming. The wild animal symbolism is replaced by agrarian symbols during the consolidation phase, as farming becomes the principal means of subsistence.

In Northern and Eastern Europe, representations of wild animals in what could be regarded as ritual

contexts go back into the Mesolithic. They form a part of an integrated system of beliefs, for which fascinating parallels can be found in the ethnohistorical sources of the boreal zone. Material representations include sculpted terminals of wooden household utensils, such as spoons, bowls and ladles, zoomorphic axe and maceheads, rock carvings and zoomorphic ornamentation of pottery vessels (fig. 8). Elk, bear and waterbirds are the most common representations, followed by beaver, boar, fish, snake and whales or seals. Grave goods contain beaver jaws and perforated incisors of beaver, elk and bear, and a whole range of wild animal bones. These finds signify a hunter-gatherer ideological system, which is distinctly different from the designs and symbols of ancient agricultural Europe.

The important point is that hunter-gatherer symbolism survived the introduction of farming. Two thirds of the elk and bear-headed terminals have been dated into the second millenium BC (CARPELAN,

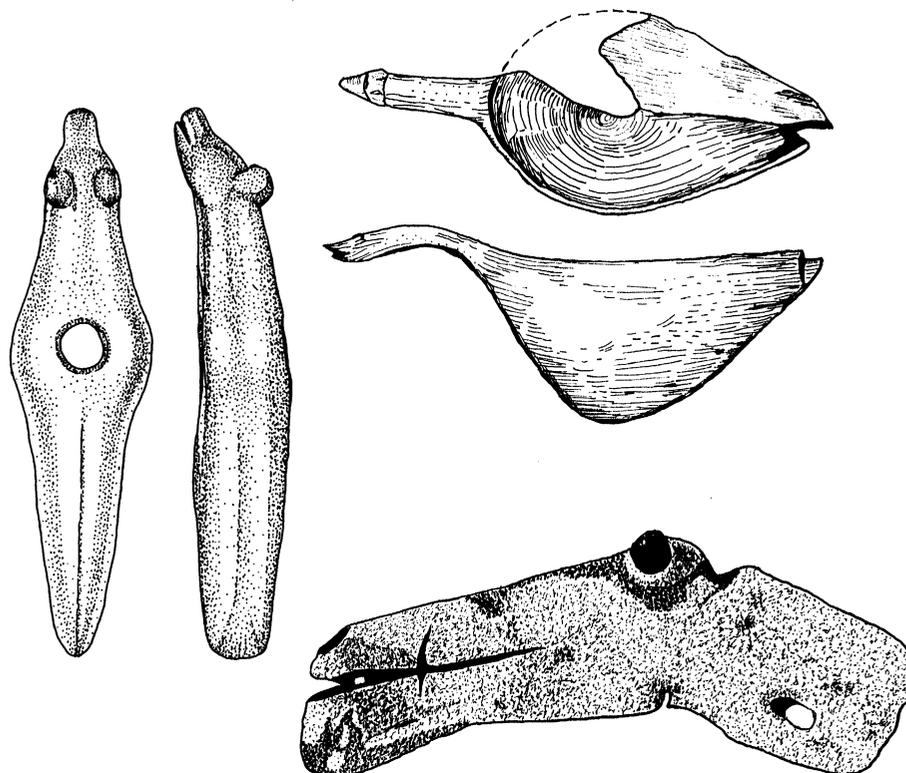


Fig. 8 : Zoomorphic carvings from Northern Europe. Bear shaft hole axe : Tulguba, Karelia. Elk head carved of wood : Rovaniemi, Finland. Wooden ladle : Usvyaty, Northwest Russia (after CARPELAN, 1975).

1975), a period when farming was being introduced into north-east Europe and boreal Scandinavia. Rock carvings indicate that such terminals may have been carried around on poles or fastened to sterns of ships. In Karelia and northern Scandinavia, petroglyphs depicting hunting scenes continued in use during the second millennium BC, while the contemporary "agrarian" rock art of Southern Scandinavia, dated into the Bronze Age, features stags, boars, snakes and game birds along with livestock. Bronze Age cairns in southern Sweden, and rock carvings in Bohuslan depict hunting scenes in association with "phallic" men, emphasising the male-hunting relationship (GELLING and DAVIDSON, 1969 ; WIHLBORG, 1978). Amber and bone figurines, perforated tooth pendants, and wild animal remains in mortuary contexts occur in Finland and Estonia until the beginning of the first millennium AD, when the major change in the art style takes places (SELIRAND and TONISSON, 1984 ; KIVIKOSKI, 1967). In summary, it would appear that the hunter-gatherer ideological system survived intact until the end of the second millennium BC : shortly after the beginning of the substitution phase ; and that it continued in a more fragmented form for another millennium : its final demise coinciding with a fall in the number of wild faunal remains and the beginning of the consolidation phase.

Ethnographic analogies can add substance to such bony symbolism. Bear ritual was widespread among the Siberian people, and if we take the Ainu as an example, bear represented not only a symbol of strength, but also the wisdom of nature, and a guardian of forest animals, upon whose approval success in hunting depended. The bear's ritual killing and dismemberment would result in a burial of postcranial bones separately from the skull, a pattern which is potentially recognisable in the archaeological record (OHNUKI-TERNEY, 1974).

Other examples include association of waterbirds with the dead, the burial of the dead "beyond the water" in Scandinavian mythology (GURINA, 1961 ; GELLING and DAVIDSON, 1969) and the frequent waterbird symbols on lakeside petroglyphs and on pottery ; or a belief in a common spirit of twinned land and sea animals (MINC and SMITH, 1989), and interlocking animal representations on Scandinavian petroglyphs.

The examination of faunal elements for any significant patterning, however, is complicated by butchering techniques, human mobility and site function, differential preservation and other taphonomic processes and the use of bone as artifacts. Even so, my

cursory examination of published faunal inventories from the East Baltic sites (PAAVER, 1965) revealed a lack of bear crania and lower jaws when compared to other elements and the MNI (minimum number of individuals) on sites dating to the second and first millennium BC (Tamula : 3 crania, 7 jaws, 32 MNI : Kreichi : 1 cranium, 4 jaws, 13 MNI : Mukukalns : 1 cranium, 4 jaws, 24 MNI : Ryuge : 1 cranium, 2 jaws, 16 MNI), the kind of pattern one would expect if jaws and crania were used in ritual. The sample is small, but it illustrates the potential of this approach in the search for social variables in the use of wild resources.

4. There are indications of an increasing use of wild animals as a commodity from about 400 AD. This can be detected from the fur game remains, which in this case include squirrel, fox, wolf, hare, beaver, bear, otter, lynx, marten, wild cat, polecat, mink, wolverine and badger. All such game with the exception of beaver, represents a poor source of food but a valuable source of fur. The furs of these animals were a major object of trade in medieval Russia (BULKIN *et al.*, 1978 ; SMITH, 1977) ; the *yasak*, a tax imposed on the indigenous inhabitants of Siberia was also payable in furs.

The data from the East Baltic indicates a significant increase in fur game within the category of wild resources from the 5th century onwards (fig. 9 and 10). To measure the variation in fur game, two indices were used : one excluding hare, beaver and bear, which could have been used for ritual reasons or as food (fig. 9), the other including these resources, which could have been also sought for their fur (fig. 10). In both cases it is clear that fur game exploitation rises relative to other game.

This can be explained by the continued use of fur game even though the use of other wild game declines in the first millennium AD (fig. 12). In fact, this pattern

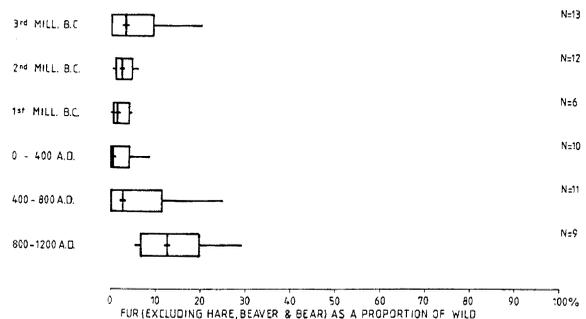


Fig. 9 : Variations in fur game, exclusive of bear, beaver and hare, within the category of wild game.

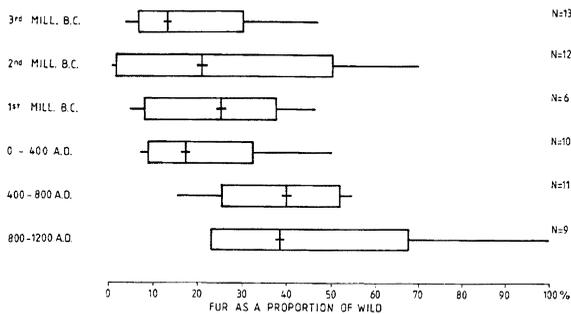


Fig. 10 : Variations in fur game, inclusive of bear, beaver and hare, within the category of wild game.

identifies a type of site with abundant remains of fur game but sparse remains of other game.

Prior to 400 AD, fur game values reflected the overall contribution of wild faunal remains : they were either low or high, reflecting the ecological conditions and the degree of transition to food production. From about the middle of the first millenium AD, however, a new pattern emerges : in addition to sites high or low in wild resources, sites are found - almost all fortified settlements - where a high contribution of fur game contrasts with an otherwise low occurrence of wild food remains. Rather than reflecting ecological conditions, this pattern denotes farming settlements involved in fur processing and redistribution.

These developments in the north-east Baltic are matched in neighbouring northwest Russia (fig. 11), where, in the context of the Dyakovo culture, the proportion of fur game rose from 43 per cent of wild fauna in the early settlements to 60 per cent in late Dyakovo horizons (0-500 AD) (TSALKIN, 1962). At Staraya Ladoga, an eighth to tenth century settlement with clear traces of manufacturing and trading activity, fur game composed 87 per cent of all wild resources (RAVDONIKAS, 1949).

More information about the industrial use of wild resources can be extracted from the composition of skeletal remains. Fortified sites and open settlements attached to hillforts contain from three to seven times the proportion of red deer and elk phalanges than other contemporary sites or the earlier sites of the hunting and gathering period. Metapodial fragments are also more frequent, whereas the meat bones occur in comparable proportions on all settlements. The most frequent bones are all associated with hide working processes, the

implication being that hides with metapodials and phalanges attached were brought for tanning. Tanning implements were found at Mukukalns, Staraya Ladoga and other settlements. At Osino, a hillfort in northwest Russia dating to the first millenium BC, the only fractures found on beaver bones were on the metapodials. All distal ends were broken off, a pattern indicating that beaver was mainly used for its pelt, and that pelts were removed from the carcass in the same way as today (ERMOLOVA, 1976).

Taken together, this evidence indicates that the contribution of hunting shifted from providing food to providing materials for manufacture and trade. The subsistence gap left by this change was filled by a great reliance on farming. The significant decline in wild faunal resources in the first millenium AD indicates the final demise of hunting for food, rather than a decline in hunting for fur game.

Southern Scandinavia

It could be argued that these developments on the fringes of agricultural Europe are of little relevance to more central regions. But a brief look at another area, the southern part of Scandinavia, indicates at least tentatively that similar events occurred here too.

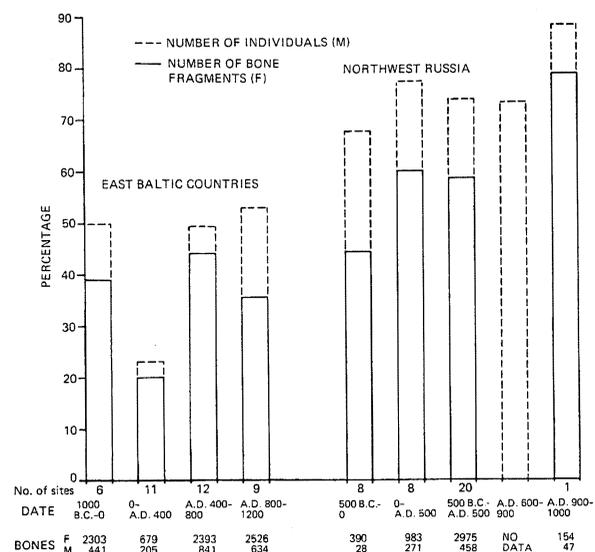


Fig. 11 : Bones of fur-bearing animals expressed as percentage of wild animals in the East Baltic and Northwest Russia. Columns 5-7 are Dyakovo culture, last two columns are Krivitchi and Staraya Ladoga (after ZVELEBIL, 1985).

Hunting continued in the Neolithic (ANDERSEN, 1983), although the contribution of each of the preferred and secondary resources remains to be evaluated. Even so, Jensen, for instance, recognised hunting sites as a distinct category in the Neolithic settlement pattern, and noted that hunting and gathering “continued as a significant part of the subsistence pattern of the farming communities for a very long time” (JENSEN 1982 : 93). Elements of hunter-gatherer ideology and symbolism persisted throughout the Bronze Age and into the first millennium AD (GELLING and DAVIDSON, 1969). Trading networks, established in the Bronze Age as a part of core-periphery relations and re-activated in the Roman Iron Age, are said to have involved trade in fur and hides, (KRISTIANSEN, 1987 ; HEDEAGER, 1987 ; ANDERSON, 1981), although the evidence for it in faunal assemblages has not been systematically examined. All this points to the same pattern of development as in north-east Europe, only in southern Scandinavia it occurred earlier.

In Western Europe the use of wild animals departed, at least in some areas, from the pattern described here. Often, in places such as the Paris basin, or in lowland Britain, the use of game is limited in the Early Neolithic, only to be followed by a distinct peak in the use of wild resources in the Late Neolithic. In other areas, such as Ireland, we have little evidence for the use of wild animals in the late Neolithic, but this is of little use to us since we lack reliable faunal evidence from the Early Neolithic. In summary, the pattern described for northern Europe may be only one among a number of patterns of hunting which prevailed among the prehistoric farming communities in Europe.

Conclusions

My intention here has been to examine the role of wild animals in prehistoric farming communities against a model of their possible use. While it is now clear that prehistoric farmers relied on hunted resources for a number of reasons, perhaps more so than has been hitherto acknowledged, the model itself is only partly supported by the data. Comparing the observed to predicted variation in faunal samples (figs 3 and 12), we come to the following conclusions. In the course of the first millennium BC, we can observe a major decline in wild animal resources, from over 90 to less than 40 per cent of the total faunal sample. This is at the expense of large, preferred game, and to this extent our model is supported. Small game remains an important source of

food until 0 BC/AD, when a further decline in wild resources to 20 per cent occurs. This is coeval with the reduction in the small game. Fur game remains important, indeed its representation is doubled from 4 to 9 per cent of the total sample between 400 and 800 AD. These patterns correspond to our model. The social use of wild animals declines at the end of the second millennium BC with further decline occurring at the beginning of the first millennium AD, together with an overall reduction in wild resources and small game. To this extent our model is not supported : hunter-gatherer symbolism ends earlier than predicted and does not extend beyond the period of use dominated by small game. The rise in the use of large/preferred game in the first millennium AD, not predicted by the model, can be tentatively explained as a result of stock regeneration and renewed hunting after a period of reduced hunting pressure in the first millennium BC.

In order to model reality more closely, other considerations such as taphonomy, environmental changes and population stability will have to be taken into account. In failing to do so, I have painted a very broad picture. But I hope I have shown that hunted resources continued to contribute in a major way to both the economy and the social life of farming societies after the adoption to farming. Our notions about the decision contingencies and operation of farming societies in other parts of Europe should be re-examined in this light.

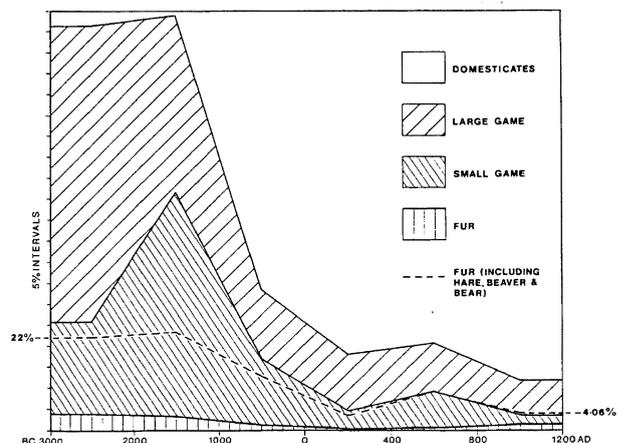


Fig. 12 : A cumulative graph showing the percentages of different categories of wild faunal remains as a proportion of all animal bones.

Bibliography

- ANDERSEN, S. (1983) : Kalvo - a coastal site of the Single Grave culture, *Journal of Danish Archaeology*, 2 : 71-80.
- ANDERSON, A. (1981) : Economic change and the prehistoric fur trade in Northern Sweden : the relevance of a Canadian model, *Norwegian Archaeological Review*, 14 : 1-38.
- BULKIN, V.A. DOBOV, I.V. and LEBEDEV, G.C. (1978) : *Arkheologicheskie Pamyatniki Drevnei Rusi 9-11 Vekhov*, Leningrad University Press, Leningrad.
- CARPELAN, C. (1975) : Älg-och björnhuvudföremål från Europas nordliga delar, *Finskt Museum*, 82 : 5-67.
- EDSMAN, C.M. (1965) : The hunter, the games, and the unseen powers, *In* : H. HVARFNER, ed., *Hunting and Fishing*. Norrbotens Museum, Umeå : 159-189.
- ERMOLOVA, N.M. (1976) : Ostatki mlekopitayushchikh s drevnego gorodishcha Osino, *Sovetskaya Arkheologiya* 1976, 3 : 217-27.
- GELLING, P. and DAVIDSON, H.E. (1969) : *The Chariot of the Sun*, Dent & Sons, London.
- GRAUDONIS, I. (1967) : *Latvia v Epokhu Bronzy i Rannego Zheleza*, Zinatne, Riga.
- GURINA, N.N. (1961) : Drevnaya Istoriya Severo-Zapada Evropeiskoi Chasti SSSR, *Materialy i Issledovaniya po Arkheologii SSSR* 87. Nauka, Moskva.
- HALSTEAD, P. and O'SHEA, J. (eds) (1989) : *Bad Year Economics : Cultural Responses to Risk and Uncertainty*, Cambridge University Press, Cambridge.
- HEDEAGER, L. (1987) : Empire, frontier and the barbarian hinterland : Rome and northern Europe from AD 1-400, *in* : M. ROWLANDS, M. LARSEN, and K. KRISTIANSEN, eds, *Centre and Periphery in the Ancient World*, Cambridge University Press, Cambridge : 125-40.
- HODDER, I. (1990) : *The Domestication of Europe*, Blackwells, Oxford.
- HUTTUNEN, P. (1980) : Early land use, especially slash and burn cultivation in the commune of Lammi, southern Finland, interpreted mainly using pollen and charcoal analysis, *Acta Botanica Fennica*, 113 : 1-45.
- INGOLD, T. (1974) : On reindeer and men, *Man*, 9 : 523-37.
- JAANITS, L. (1959) : *Poseleniye Epokhi Neolita i Rannego Metala v Priustye Reky Emaigi*, Akademia Nauk Estonskoi SSR, Tallin.
- JENSEN, J. (1982) : *The Prehistory of Denmark*, Methuen, London.
- JUTIKKALA, E. (1949) : *Suomen Historian Kartasto*, Helsinki.
- KENT, S. (1989) : *Farmers as Hunters*, Cambridge University Press, Cambridge.
- KIVIKOSKI, E. (1967) : *Finland*, Thames & Hudson, London.
- KRISTIANSEN, K. (1987) : Centre and periphery in Bronze Age Scandinavia, *in* : M. ROWLANDS, M. LARSEN and K. KRISTIANSEN eds, *Centre and Periphery in the Ancient World*, Cambridge University Press, Cambridge : 74-85.
- LEVI-STRAUSS, C. (1963) : *Structural Anthropology*.
- LEVI-STRAUSS, C. (1966) : *Mythologies II : Du Miel aux Cendres*. Paris.
- MINC, L. and SMITH, K. (1989) : The spirit of survival : cultural responses to resource variability in North Alaska, *in* : P. HALSTEAD and J. O'SHEA, eds, *Bad Year Economics : Cultural Responses to Risk and Uncertainty*, Cambridge University Press, Cambridge : 8-39.

- OHNUKI-TERNEY, E. (1974) : *The Ainu of the North-West Coast of Southern Sakhalin*, Holt, Rinehart & Winston, New York.
- O'SHEA, J. (1989) : The role of wild resources in small-scale agricultural systems : tales from the Lakes and the Plains, in : P. HALSTEAD and J. O'SHEA, eds, *Bad Year Economics : Cultural Responses to Risk and Uncertainty*, Cambridge University Press, Cambridge : 57-67.
- PAAVER, K. (1965) : *Formirovanie Teriofauny i Izmenchivost Mlekopytayushchikh Pribaltiki v Golotsene*, Akademia Nauk Estonskoi SSR, Tartu.
- PAINE, R. (1971) : Animals as capital : comparisons among northern nomadic herders and hunters, *Anthropological Quarterly*, 44 : 157-72.
- RAVDONIKAS, V.I. (1949) : Staraya Ladoga (Part 1), *Sovetskaya Arkheologia*, 11 : 5-54.
- SALO, U. and LAHTIPERA, P. (1970) : *Metallikautinen Asutus Kokemaenjoen Suusa*, Satakunnan Museon Kannatusyhdistys, Pori.
- SELIRAND, J. and TONISSON, E. (1984) : *Through Past Millenia : Archaeological Discoveries in Estonia*, Perioodkia, Tallin.
- SMITH, R.E.F. (1977) : *Peasant Farming in Muscovy*, Cambridge University Press, Cambridge.
- TEGEGREN, H. (1965) : Hunters and Amazons. Seasonal migrations in older hunting and fishing communities, in : H. HVARFNER ed., *Hunting and Fishing*, Norrbottens Museum, Umeå : 427-92.
- TSALKIN, V.I. (1962) : Zhivotnovodstvo i okhota v lesnoi polose vostochnoi Evropy v rannem zheleznom veke, *Materialy i Issledovaniya po Arkheologii SSSR* 107 : 1-79.
- WIHLBORG, A. (1978) : Sagaholm. A Bronze Age barrow with rock-carvings, *Meddelanden fran Lunds Universitets Historiska Museum 1977-78*, 2 : 111-28.
- ZVELEBIL, M. (1981) : *From Forager to Farmer in the Boreal Zone : Reconstructing Economic Patterns Through Catchment Analysis in Prehistoric Finland*, *British Archaeological Reports*, Int. Ser. 115, Oxford.
- ZVELEBIL, M. (1985) : Iron Age Transformations in Northern Russia and the Northeast Baltic, in : G. BARKER and C. GAMBLE eds, *Beyond Domestication in Prehistoric Europe : Investigations in Subsistence Archaeology and Social Complexity*, Academic Press, London : 147-75.
- ZVELEBIL, M. (1986) : Mesolithic prelude and neolithic revolution, in : M. ZVELEBIL ed. *Hunters in Transition*, Cambridge University Press, Cambridge : 5-16.
- ZVELEBIL, M. and ROWLEY-CONWY, P. (1984) : The transition to farming in Northern Europe : a hunter-gatherer perspective, *Norwegian Archaeological Review*, 17 (2) : 104-27.
- ZVELEBIL, M. and ROWLEY-CONWY, P. (1986) : Foragers and farmers in Atlantic Europe, in : M. ZVELEBIL ed., *Hunters in Transition*, Cambridge University Press, Cambridge : 67-94.
-