The Origin of Agriculture in Denmark: A Review of some Theories

by PETER ROWLEY-CONWY

INTRODUCTION

The purpose of this contribution is to compare some general views of the spread of farming into southern Scandinavia, and to see which of these is most in accord with the archaeological information now available.

The starting point will be the evidence of a long co-existence between farmers in north central Germany and foragers in the west Baltic region. This evidence comes largely from radiocarbon dating. The early neolithic settlement of Eitzum, belonging to the LBK culture, has been dated to 4530 ± 210 bc. 250 km to the north lies Siggeneben-Süd, with the earliest published neolithic date in southern Scandinavia, 3230 ± 65 bc. This may be compared with the distance of about 1000 km from Eitzum to Korlat in Hungary, where the LBK is dated to 4490 ± 100 bc. The LBK apparently spread so rapidly across central Europe that C 14 dates 1000 km apart are indistinguishable. Thereafter, farming took 1300 radiocarbon years to spread a further 250 km (fig. 1).

A reason for this long delay has been sought in the nature of the pre-existing foragers in southern Scandinavia. Coastal foragers are likely to have had greater population density than most central European foragers (Paludan-Müller 1978). There is evidence that the western Ertebølle settlement pattern involved permanently occupied base camps, which may also mean larger group size. It may thus be that forager adaptations were a viable alternative to farming at least for a time (Rowley-Conwy 1983, Zvelebil and Rowley-Conwy 1984). I have argued that a decline in marine resources, particularly the oyster, may have reduced the viability of the forager economy and thus have led to the adoption of farming in the Ertebølle area (Rowley-Conwy 1984a).

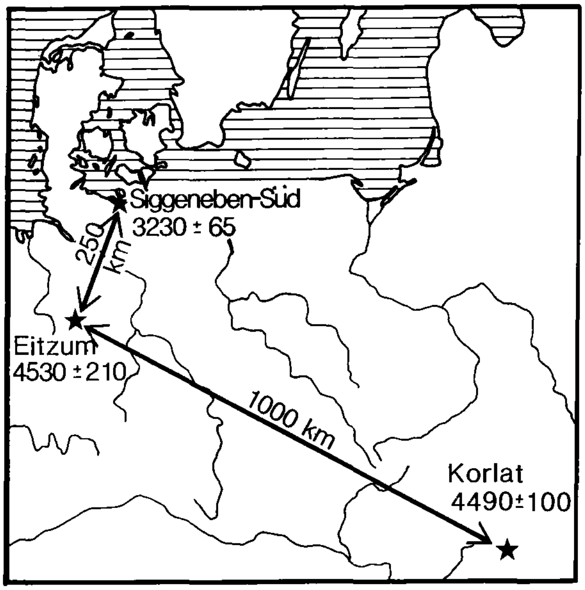

Fig. 1. The delay in the spread of agriculture into southern Scandinavia as revealed by radiocarbon dating.

This is the background against which views of the spread of agriculture will be examined. Any such review involves grouping explanations into categories, and such categorisation is largely a matter of personal choice. The following groupings of explanations are therefore only one possible typology, resulting from the personal viewpoint of the author.

PROGRESS MODELS

These models are based on the assumption that farming is automatically an improvement on foraging, and that farming will therefore be adopted relatively quickly once it becomes available to foragers so long as environmental conditions are suitable.

On the basis of this assumption, questions were asked as to which foragers were most likely to adopt agriculture quickly. As early as 1952, Sauer suggested that the original agriculturalists were derived from foragers of a particular type: "above all, the founders of agriculture were sedentary folk" (1952, 22). The most likely candidates were "well-situated, *progressive* fishing folk" (ibid., 23, added emphasis). This view has subsequently been applied to the spread of agriculture as well as its origins. Sedentary fishers have been seen as "pre-adapted" to adopt agriculture more quickly than nomads (e.g. Waterbolk 1968, 1982).

How well do the expectations of this view fit with the Danish evidence? At first site it would seem – not very well. The long delay in the spread of agriculture into Denmark (an area suggested to have contained sedentary fishers) seems to be a powerful argument against the rapid adoption of farming by such groups. Danish soils are light and easily worked, yet fertile, and farming arrived in the region at the time of the postglacial climatic optimum, so environmental barriers cannot be placed in the way of farming.

Two questions must first be examined, however. Firstly, how rapid an adoption should we envisage? If it is true that the German LBK culture represents immigrant farmers, while the spread of farming into Denmark represents its adoption by indigenous foragers, then perhaps a millennium might be a reasonable time span for foragers to become acquainted with farming techniques and to adopt them. Secondly, what is the evidence for agriculture within the Ertebølle? If claims for Ertebølle agriculture can be supported, then the adoption might have taken place over a much quicker period.

In examining the first question, one point needs to be born in mind. The farmers and the foragers were not isolated from each other. Evidence for exchange across the forager/farmer boundary is available in the form of shaft-hole axes of central

European origin in Ertebølle contexts in Denmark (Fischer 1982). Pots from the neolithic Baalberg and Michelsberg cultures have been found in Ertebølle-Ellerbek levels at Rosenhof (Schwabedissen 1979a). It has recently been suggested that elements of the farming economy could have spread into southern Scandinavia along routes already opened by gift exchange (Jennbert 1984). We therefore have no reason to suppose that the fishing groups were cut off from the potential source of the farming economy.

Ethnographic evidence would not lead to the conclusion that foragers are in any sense too "primitive" or backward to adopt farming if there is a good reason to do so. Limited cultivation by predominantly forager groups is well attested: various north American groups grew tobacco (Forde 1934), and the Ainu of northern Japan grew millet for making beer (Watanabe 1972). Schrire (1980) has questioned the existence of any hard boundary between Bushman foragers and non-Bushman farmers. No sharp physical or cultural boundary exists, and groups and individuals may adopt or give up pastoralism for a variety of reasons (Schrire 1980).

It seems likely, therefore, that agriculture could have been adopted in Denmark very much more quickly than it was, had there been a good reason. Given the flexibility of human behaviour suggested by the ethnographic examples, there seem to be no grounds for assuming a 1000 year incapacity on the part of the foragers to take up farming.

Claims for agriculture in the Ertebølle thus assume a crucial importance. If these claims are supported, then the delay was much less than 1000 years. The progress views could thus still be relevant. I will argue, however, that the evidence does not support Ertebølle farming.

The classic work of Troels-Smith (1953) in the bog Aamosen demonstrated that pollen evidence of farming went back as far as the elm decline and no further. Radiocarbon dating makes it clear that the Ertebølle ends at about the time of the elm decline (Tauber 1972). There is thus little or no pollen evidence for Ertebølle farming, and Ertebølle pottery does not have cereal impressions (S.H. Andersen 1973).

Other claims for Ertebølle agriculture have rested on the presence of bones of "domestic" cattle in some Ertebølle sites. Separation of domestic cattle from native aurochs has always been a problem, particularly with regard to the fragmentary bones recovered from settlement sites. The usual method has been to compare such fragments with complete skeletons of definitely identifiable wild and domestic cattle found in bogs. If the settlement fragments are too small to fit into the aurochs size range, they are classified as domestic animals.

An early example was cattle lower third molars from Dyrholm I. These were so small that they were for a long time regarded as domestic (Degerbøl 1963). The Dyrholm I phase precedes the classic Ertebølle, and so dates before about 3700 bc. This would thus represent a very early date for the introduction of domestic cattle into Denmark. These teeth have recently been reclassified as wild, however: the first domestic animals are now thought to date from around 3100 bc, and are thus compatible with a neolithic TRB origin (Degerbøl and Fredskild 1970).

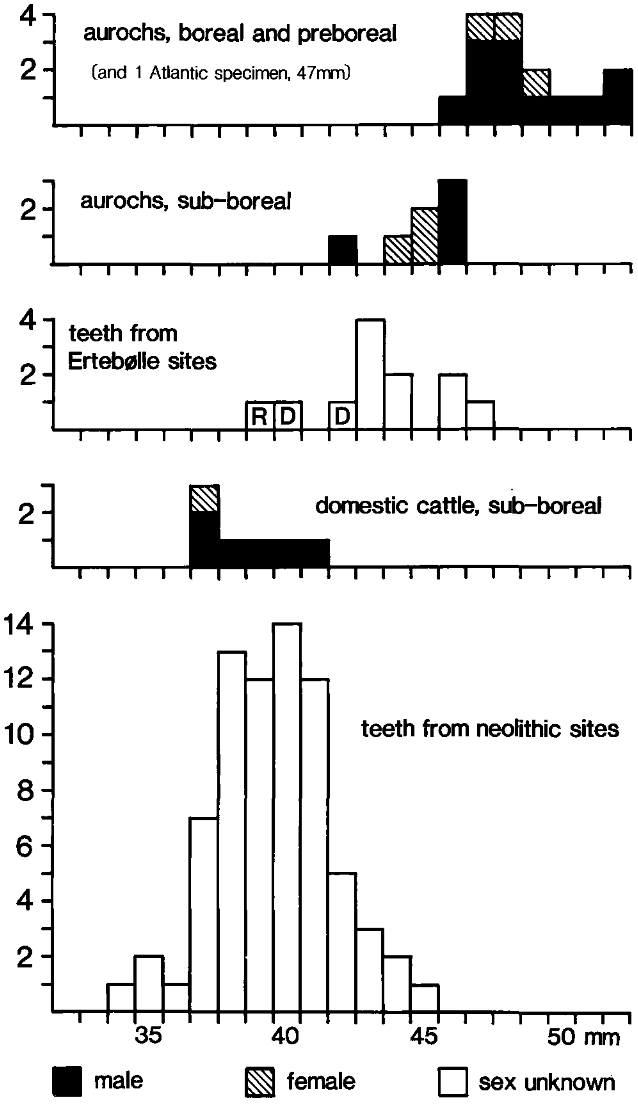

Fig. 2. Maximum lengths of cattle lower third molars, comparing bog finds of sexed skeletons with teeth from settlements. Measurements from Degerbøl and Fredskild 1970, except Rosenhof, from Nobis 1975. D = Dyrholm, R = Rosenhof.

The reason for this reclassification is that until recent years it was not clear just how small female aurochs could be. Early bog finds of complete skeletons were preponderantly of males, as these very large animals aroused more interest when discovered. The smaller females were less often reported. As the size range of females has been extended downwards, it has become clear that neolithic domestic bulls and wild females are in fact of similar sizes (see e.g. fig. 3). The claimed Ertebølle domestics fall within this overlap zone, and may (on size) equally well be wild females as domestic males. Domestic females are on the other hand small enough, and wild males large enough, to be definitely identified. Ertebølle sites

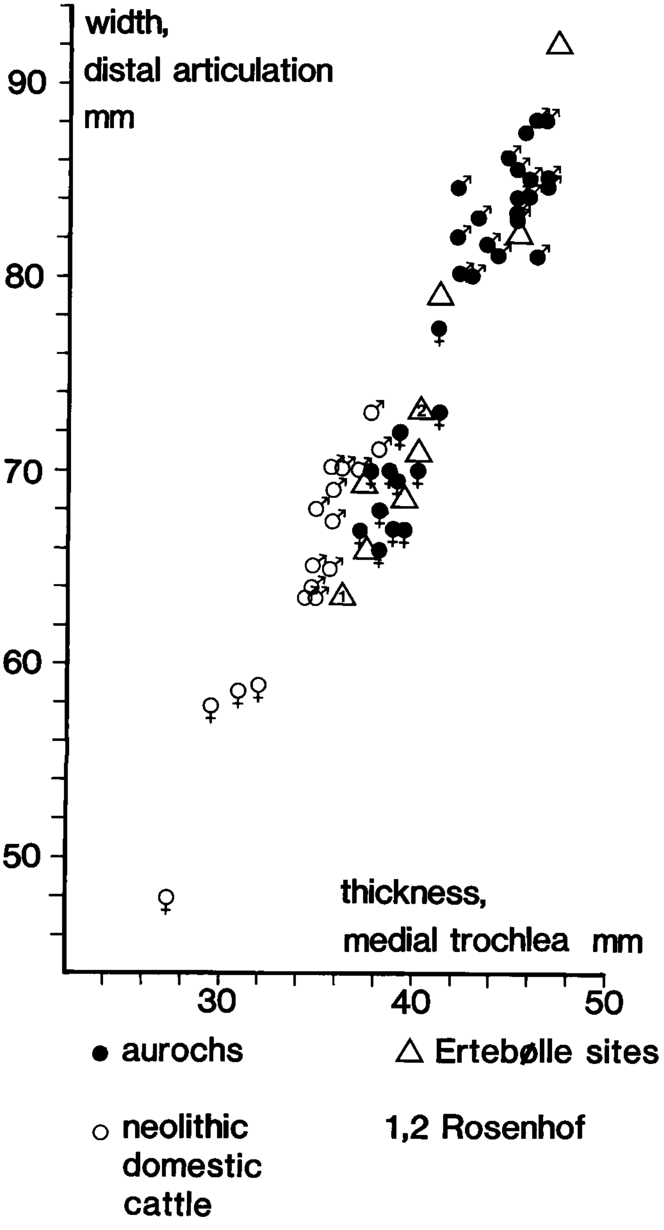

Fig. 3. Metacarpal dimensions of mesolithic and neolithic cattle. Measurements and sexes from Degerbøl and Fredskild 1970 with additions; Rosenhof from Nobis 1975.

contain no domestic females, but have numerous wild males. It is therefore logical to regard the overlap specimens as wild females, not as domestic males (Degerbøl and Fredskild 1970). No good evidence for sheep exists for the Ertebølle (Clark 1975), and claims for domestic pigs have not been advanced.

The few claimed domestic cattle from northern Germany are thus the only remaining candidates for the late mesolithic of south Scandinavia. Of the four bones definitely claimed as domestic, one is a lower third molar of *Bos* from Rosenhof (Nobis 1975). This is very close in size to two teeth from Dyrholm (fig. 2). As the Dyrholm teeth are among those reclassified as wild by Degerbøl (Degerbøl and Fredskild 1970), however, the Rosenhof tooth could equally well be from a wild female. A distal metacarpal from Rosenhof has been claimed as domestic (Nobis 1975). This bone is plotted as no. 1 on fig. 3. If it is domestic, it should clearly be a male. Degerbøl presents an index for this bone for distinguishing males and females (Degerbøl and Fredskild 1970). When this is plotted (fig. 4), the Rosenhof bone does not overlap the male range, however (apart from the exceptional Klarup aurochs bull). If the bone is from a female, then it must, because of its large size, be a *wild* female.

Scapulae from Rosenhof and Bregentwedt-Förstermoor (Nobis 1962, 1975) do fall in the domestic range (fig. 5). Stock rearing in the southern Ertebølle cannot be assumed, however. The bones could perhaps derive from animals acquired from farmers to the south, or indeed from animals that had escaped from these farmers and were then hunted by the mesolithic groups. Individual domestic cattle might conceivably have been acquired from the farmers for prestige reasons, but it does not seem very likely that cattle should be kept if they were only to provide such a minor part of the food intake.

Some bones fall in the overlap zone between wild and domestic (e.g. Rosenhof metacarpal 2 in fig. 3). These are sometimes claimed to be evidence of the local domestication of aurochs (Nobis 1962, 1975, 1978; Schwabedissen 1962, 1979b, 1981). It must be born in mind, however, that a size overlap does not necessarily imply a transitional behavioural type; and the marked size difference between wild and domestic animals of known sex would seem to argue against the local domestication of aurochs. The intermediate sized animals could equally well be wild females.

Traces of cereal pollen have been claimed at Rosenhof (Schütrumpf 1972). The problems of cereal pollen identification have been stressed by S.T. Andersen (1978). One potsherd from Rosenhof had an impression of a cereal grain. In the same level were pots imported from both the Michelsberg and the Baalberg neolithic cultures (Schwabedissen 1979a), so the possibility that the grain impression arrived as an import cannot be dismissed.

There thus seems to be little or no evidence for agriculture in the Ertebølle. This reaffirms the existence of a 1000 year availability phase (Zvelebil and Rowley-Conwy 1984), in which farming was close by but not taken up. This in turn casts doubt on the "progress" view: the adoption of agriculture was evidently not always automatic and inevitable. Other factors are clearly at work.

LONG TERM POPULATION GROWTH MODELS

The long, slow, inexorable process of population increase has often been given the role of motive force behind many of the changes visible in the prehistoric record. This has the advantage of being a universal explanation once population increase is assumed. As population grew (so runs the argument), resources were gradually overexploited more and more, until a new socioeconomic organisation became necessary. The most thorough statement of this approach is that put forward by Cohen (1977); his book, *The Food Crisis in Prehistory* is subtitled "Overpopulation and the origins of agriculture". Cohen reviews a series of estimates of the annual rate of population growth for Pleistocene foragers, varying from 0.0007% to 0.003%, and comments "these estimates for Pleistocene population growth may be slightly low, but they must be of essentially the correct order of magnitude (op. cit., 53).

Applying this to Denmark, there are clearly two alternative ways in which this model could work: (1) *internally*, with forager population rising to a point where the adoption of agriculture by the foragers became necessary; and (2) *externally*, with farming population in Germany rising and forcing colonists to move into Denmark, regardless of the situation of the local Danish foragers.

There are problems with the internal view. The sort of long term population growth usually envisaged is shown in fig. 6. This may very well reflect the situation on a worldwide basis, but ecological considerations suggest very strongly that the local picture in any one area would be very different. In Denmark, postglacial variations in sealevel, vegetation, climate and fauna would surely have caused relatively massive alterations in population through time. A more useful model is probably that put forward by Bronson (1977), emphasising a high degree of short term fluctuation in any one area (fig. 7).

Population fluctuations of this sort, due to variations in resource availability, are documented archaeologically. They may be envisaged as occurring on a timescale of, say, 100 years and upwards. A good example of the variation of a single resource is provided by Meldgaard's (1983) study of caribou. He demonstrates that the West Greenland caribou herd has regularly fluctuated in numbers from 10,000 to 100,000 on approximately a century-long cycle. A good archaeological demonstration of the variation of forager site numbers (and thus, presumably, of population) is provided by Jomon Japan (Oikawa and Koyama 1981). Site numbers vary greatly through time. Of particular importance is the fact that each region of Japan varies independently. Each region thus demonstrates a unique, local history of demographic change.

Changes on the sort of scale discussed here render irrelevant any minor background change in the order of 0.0007 to 0.003% annually. Such a minor increase cannot therefore have any crucial causative influence on the adoption of agriculture in a particular region. Regional, relatively abrupt changes of the sort modelled in fig. 7 must always have a much greater, more immediate effect than the background trend modelled in fig. 6. Whether indeed the fluctuations in any region ever averaged out to approximate the background trend is uncertain. Is there any theoretical basis for assuming that forager density per km^2 in an unchanging environment would necessarily grow? At all events, the difference between 0.0007–0.003% growth and szero population growth is virtually nothing.

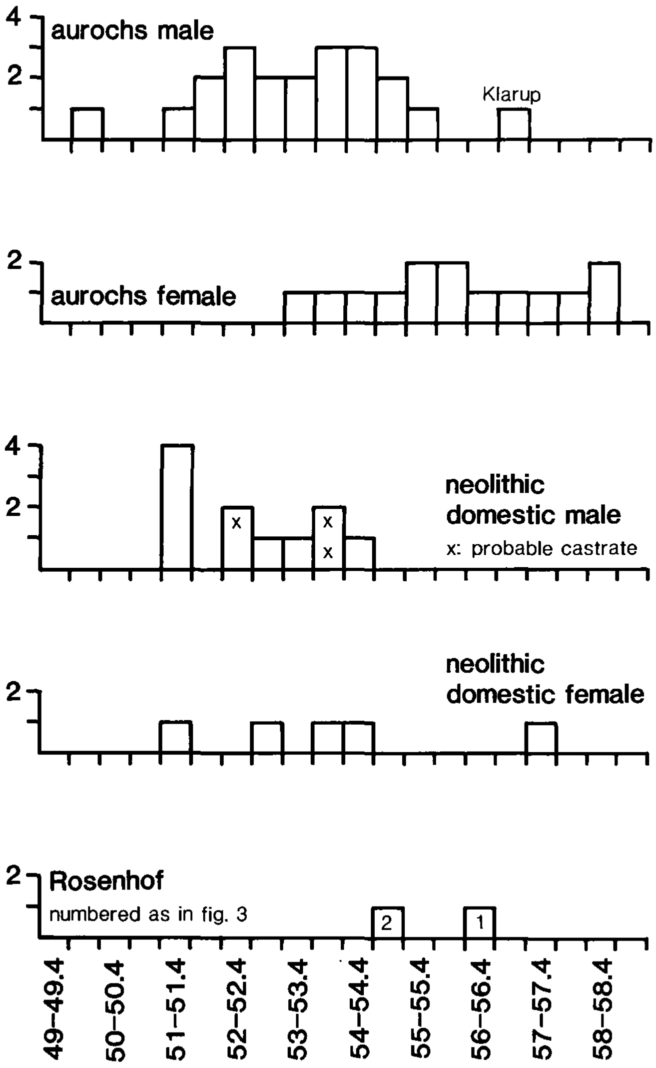

Fig. 4. Degerbøl's index of metapodial distal width, $\frac{\text{trochlea, anterior-posterior, } \times 1000}{\text{distal width}}$ applied to the cattle metacarpals shown in fig. 3. Measurements from Degerbøl and Fredskild 1970, except Rosenhof, from Nobis 1975.

The internal application of long term population growth models to the Danish situation does not therefore seem particularly helpful. Their external application to colonising farmers will now be considered.

The earliest farmers in a region are often regarded as likely to farm in a most extensive, least intensive manner. This view derives in large measures from the scheme put forward by Boserup (1965, 1981), in which population increase leads to ever greater intensification of agriculture. Boserup's model is based on a series of present-day, mainly tropical, examples. Among these examples, societies with higher population density do indeed farm more intensively (Boserup 1981, tables 3.5, 3.6, 3.10). This scheme is thus a *typology of agricultural intensity* based on modern tropical communities – and not the docu-

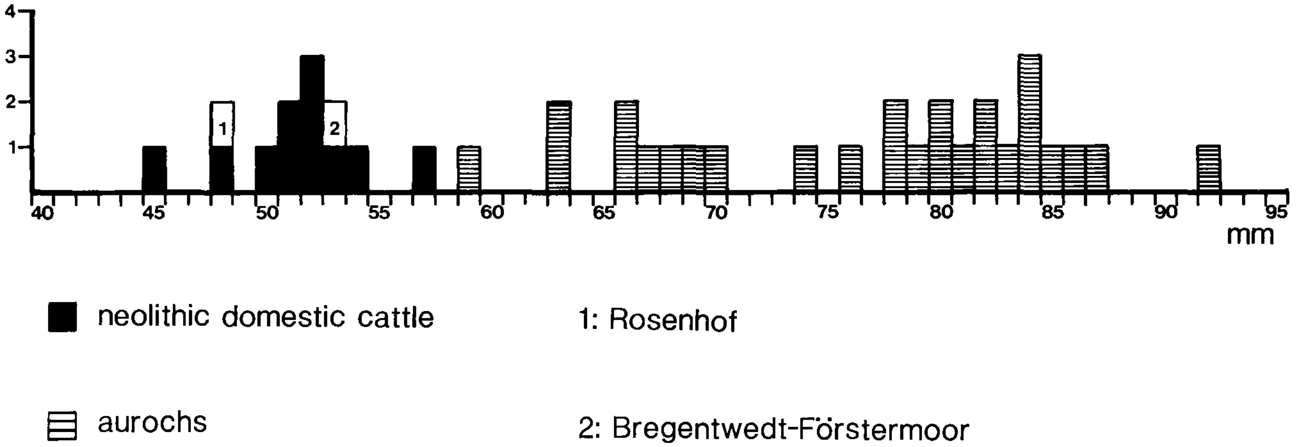

Fig. 5. Histogram of collum widths of cattle scapulae. Measurements from Degerbøl and Fredskild 1970, except the numbered specimens, from Nobis 1962, 1975.

mented history of the stages through which any one group has passed. The basic linking of population density and intensity of agriculture will surely be relevant to prehistory. The over-precise application of the tropical scheme to Europe may not be so justifiable.

The most extensive end of Boserup's scheme comprises shifting cultivation. Application of the scheme to Europe harmonises with Iversen's (1941) argument (based on pollen) that shifting cultivation was the type of agriculture practised by the first farmers in Denmark. The use of shifting cultivation in early neolithic Europe forms the basis for the best and most clear discussion of the colonisation process. D.L. Clarke (1972, 20–24) puts forward a model for central Europe. He points out that the movement of a swidden-based settlement to a new clearance may, all other things being equal, be in any direction at random. He continues:

> "However, this process will be intensified because every two or three moves each Danubian village will have generated enough surplus population both to continue itself and give rise to an additional new village unit... The multiplication of settlement units and their constant mutual readjustments will also ensure that over a long period of time the many derivative village units will become widely dispersed in an expanding mass of hunt-and-seek pathways." (op. cit., 22).

Frequent settlement shifts and population expansion are the essential ingredients of this model. The notion of shifting cultivation in temperate Europe has, however, been criticised (Rowley-Conwy 1981, Sherratt 1980). Anthropological studies suggest that colonisation by swidden farmers may be a more complex process than Clarke's random walk/unit multiplication model envisages. Chagnon (1974) describes the Shamatari group of the Yanomamo, who in about 100 years have multiplied from a single small village to 12 villages, containing about 2000 people. This has been accompanied by a major colonisation of the Venezuelan rain forest (op. cit., fig. 4.1). The enormous area taken up in this colonisation is caused not by the need for new swidden fields, however, but by the ceaseless warfare which causes villages to be very widely spaced – on average 80 km from each other. Consequently, "enormous tracts of land, most of it cultivable and abounding with game, is found between villages... Whatever else might be cited as a "cause" of warfare between villages, *competition for ressources is not a very convincing one* (ibid., 127, original emphasis).

Settlement movement and population growth are clearly not very well understood. As far as neolithic Europe is concerned, a general model of population growth and settlement expansion does not account for the spread of farming as revealed by radiocarbon. Population growth was presumably rapid during the LBK expansion. For the next 1000 years, the frontier of farming spread little further north (fig. 1). Either there was no population increase, or any increase was absorbed by internal intensification. The spread of agriculture in other well-studied areas such as Japan also shows a series of rapid spreads interspersed with pauses (Rowley-Conwy 1984b). The background population increase model does not account for such pauses in the process; nor does it account for the resurgence of colonising dynamism which would have had to occur at c. 3200 bc if farming is to arrive in Denmark with colonising farmers (of course, such a resurgence cannot necessarily be ruled out). The model in both its forms is too vague to be very relevant to the particular case discussed here.

TWO EVOLUTIONARY MODELS

(a) the theories. One of the most common evolutionary theories in archaeology is cultural evolution. This view groups present human societies into a series of types – such as bands, tribes, chiefdoms and states (Service 1971), or egalitarian, ranked, stratified and state (Fried 1967). This is then assumed to represent an evolutionary sequence and applied to the past (e.g. Jensen 1982).

At one level these models come quite close to the progress models discussed above. It has indeed been argued that these

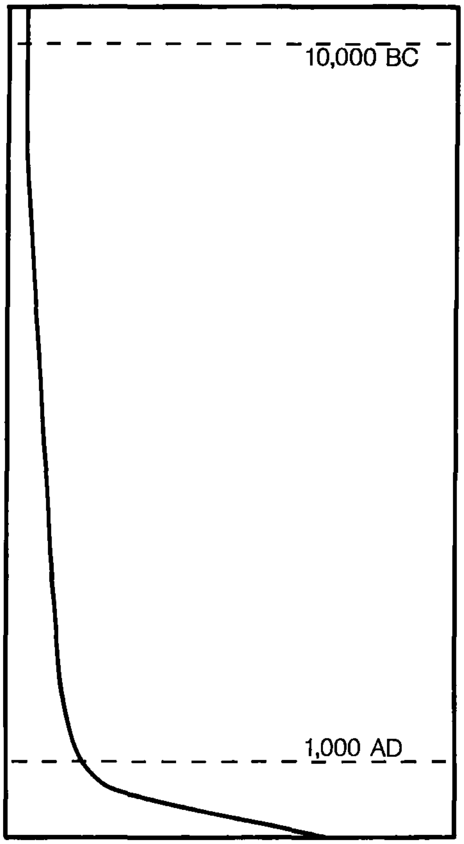

Fig. 6. Model of population increase on a world-wide scale (after Bronson 1977, fig. 1).

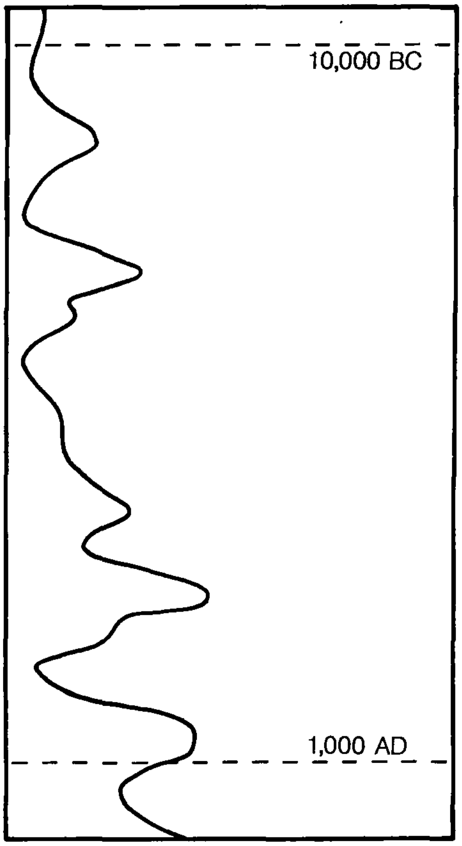

Fig. 7. Model of population increase on a local scale (after Bronson 1977, fig. 2).

models are not actually evolutionary in the strict sense of the word, because they rely too heavily on notions of progress from stage to stage (Blute 1979, Dunnell 1980). "Even if one grants the observational validity of "bands," "tribes," "chiefdoms," etc. in some statistical sense, this reality does not establish their significance in evolutionary or any other explanatory framework" (Dunnell op.cit., 47).

The invocation of causative mechanisms for stadial change such as the resolution of internal contradictions does not alter this. We have no way of seeing "contradictions" in the archaeological record. The imposition of this mechanism on the past as an essential precursor of stadial change is thus an arbitrary device quite similar to the progress models discussed in the first secton. Viewed from this perspective, stadial evolutionary theories seem little different to the obsolete 19th century schemes of Morgan, Marx and Tylor.

The use of such stadial schemes to pigeonhole the past is a logical development of earlier schemes such as the demonstrable division into stone age, bronze age, and iron age. The kind of stadial scheme put forward by cultural evolution involves a particular kind of thinking about the socioeconomic past, which may be called *typological* thinking. An alternative, preferred here, has more in common with biological evolutionary theory and stresses *populational* thinking instead.

These two types of view are really quite different from each other, even though archaeologists have categorised them both as "evolutionary". The typological view creates for itself a problem, by dividing the human past into segments different in kind from one another: by stressing the differences between two segments, an understanding of the change from one segment to another becomes more difficult. The result is a transformational view of change.

This view is analogous to pre-Darwinian biological classification, which can be termed "Aristotelian classification" (Blute 1979). Each taxon in this scheme is regarded as embodying a distinct "essence", different from that of all other taxa. Darwin had to dispose of this notion in order to allow one taxon to develop into another, because otherwise the emergence of new taxa would have to involve a transformational leap from one essence to another (Blute op.cit.).

Populational thinking on the other hand stresses individual variability within any taxon or group; it emphasises diversity, not uniformity. The crucial mechanism is selection. Biological evolution is based on the selection of a limited part of this populational diversity – only a restricted part of a population passes on its genes to the next generation.

The variation in the behaviour of individual humans is a factor arguing that a parallel view can be taken of the human past. Change is seen as a selective pressure altering the behavioural average – not as a transformation of all behaviour. Whether a behavioural trait or activity is genetic or non-genetic in origin, it is subject to selection; it is after all the trait which is selected, not the cause of the trait. Evolution has produced organisms which respond and behave ever more flexibly, genetic control decreasing as flexibility of response increases (Bonner 1980). Non-genetic responses are inevitably quicker than genetic ones. The Arctic provides an example: humans were able to spread into this area by adopting appropriate clothing, shelter, food-getting techniques etc – a non-genetic response. Bears on the other hand had to respond genetically and evolve a completely new species, a very much slower method.

The upshot of this view is that humans may react quickly to altered selective pressures, such as new environmental opportunities or constraints. It might be objected that the adoption or rejection of a behavioural trait by a human group is dependent on the ideology of the group – it is after all the people who have to make the decision. This is, however, to slip back into typological thinking. The counter argument is that the ideology of a group does not have a separate, unitary existence. There will be as many "ideologies" as there are people in the group, each to some extent different from the other. There is thus *variability* in ideology and consequently in the resulting behaviour. Each individual may react differently, for reasons both inaccessible and unimportant. The important thing is the existence of this variability, because then selection between responses can take place.

(b) the evidence. Two major changes are visible in 4th millennium bc Denmark: firstly, the increase in site numbers, many of them shell middens, associated with the Ertebølle; and secondly, the appearance of agriculture.

In examining the first change, it is necessary to refer back to the relatively rapid, local changes in population to be expected among foragers (fig. 7). The rise in Ertebølle site numbers occurred at the same time as sea level in the western Baltic rose towards its postglacial maximum (Christensen 1981). The result of the sea level rise was to introduce many marine resources into eastern Danish seas (Rowley-Conwy 1984a). The response to this was rapid; if it is correct that Ertebølle groups were larger and socially more complex than mobile groups, then these developments demonstrate the flexibility of human settlement and society in the face of a particular environmental opportunity. In the terms used above, this represents a rapid, non-genetic behavioural response. The Ertebølle thus fits with a peak in forager density of the type shown in fig. 7.

The drop in sea level at the end of the 4th millennium bc documented by Christensen (1981) resulted in a deterioration of the resource base (Rowley-Conwy 1984a). Under normal circumstances this would have led to a decline in forager population density, and possibly to a increase in mobility – a trough in the population graph (fig. 7). The availability of farming not far away presented an alternative, however. Behavioural variability (perhaps increased by the advent of more difficult times) must have included the acquisition of elements of the farming economy. As foraging declined in attractiveness farming would become relatively more attractive. The result was the quite rapid spread of farming into the Ertebølle area around 3200–3100 bc.

Both these changes represent rapid responses to new conditions. This is in accord with the evolutionary view, based on populational concepts, put forward above. In this view the two developments are comprehensible as responses to particular, local environmental conditions (including the availability of agriculture). The availability of farming in northern Germany, and the decline in marine productivity, are two unrelated factors crucial to the appearance of agriculture at 3200–3100 bc.

The need for the stadial schemes of cultural evolution therefore recedes. If the various developments can be understood as rapid responses to particular environmental constraints and opportunities, no stadial framework is needed to explain them. If the Ertebølle does indeed represent sedentary foragers with larger possibly more socially complex groups, then the reason for this is to be sought in a particular set of environmental conditions – and not because such a stage is in any way a necessary precursor to farming.

CONCLUDING REMARKS

The foregoing has compared various general views for the appearance of agriculture in Denmark, and selected one particular view as being more in accord with the facts as now known.

For this exercise to be at all worthwhile, it is essential that the facts available to us should bear some approximation to reality. Of crucial importance, therefore, is the generation of improved methods for recovering information from, and testing theories about, the past. Unless our theories are related to facts, they are of little use. Future generations of archaeologists are more likely to thank us for one suitable method to test a theory than they are for a whole series of theories with no test.

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Peter Rowley-Conwy, Dept. of Extra-Mural Studies, University of London, 31–34 Gordon Square, London WCIB 5DQ.

REFERENCES

ANDERSEN, S.H. 1973: Overgangen fra ældre til yngre stenalder i Sydskandinavien set fra en mesolitisk synsvinkel *Tromsø Museums Skrifter* 14, 26–44.

ANDERSEN, S.T. 1978: Identification of wild grass and cereal pollen. *Danmarks Geologiske Undersøgelse, Årbog* 1978, 69–92.

Blute, M. 1979: Sociocultural evolutionism: an untried theory. *Behavioural Science* 24, 46–59.

Bonner, J.T. 1980: *The Evolution of Culture in animals.* Princeton University Press.

Boserup, E. 1965: *The Conditions of Agricultural Growth.* Chicago: Aldine.

– 1981: *Population and Technology.* Oxford: Blackwell.

Bronson, B. 1977: The earliest farming: demography as cause and consequence. In (ed.) C. Reed, *Origins of Agriculture*, 23–48. The Hague: Mouton.

Chagnon, N. 1974: *Studying the Yanomamo.* London: Holt, Rinehart and Winston.

Clark, J.G.D. 1975: *The Earlier Stone Age Settlement of Scandinavia.* Cambridge University Press.

Clarke, D.L. 1972: Models and paradigms in contemporary archaeology. In (ed) D.L. Clarke, *Models in Archaeology*, 1–60. London: Methuen.

Cohen, M.N. 1977: *The Food Crisis in Prehistory.* Yale University Press.

Degerbøl, M. 1963: Prehistoric cattle in Denmark and adjacent areas. *Occasional Paper of the Royal Anthropological Institute* 18, 69–79.

Degerbøl, M. and Fredskild, B. 1970: *The Urus (Bos primigenius Bojanus) and Neolithic Domesticated Cattle (Bos taurus domesticus Linne) in Denmark.* Det Kongelige Dansk Videnskabernes Selskab, biologiske skrifter 17, 1.

Dunnell, R.C. 1980: Evolutionary theory and archaeology. In (ed.) M.B. Schiffer, *Advances in Archaeological Theory and Method* vol 3, 35–99. New York: Academic Press.

Fischer, A. 1982: Trade in Danubian shaft-hole axes and the introduction of neolithic economy in Denmark. *Journal of Danish Archaeology* 1, 7–12.

Forde, C.D. 1934: *Habitat, Economy and Society.* London: Methuen.

Fried, M.H. 1967: *The Evolution of Political Society.* New York:

Iversen, J. 1941: Land occupation in Denmark's stone age. *Danmarks Geologiske Undersøgelse* II, 66, 1–68.

Jennbert, K. 1984: *Den Produktiva Gåvan. Tradition och Innovation i Sydskandinavien för omkring 5300 år sedan.* (English summary). Acta Archaeologica Lundensia, series in 4°, 16.

Jensen, J. 1982: *The Prehistory of Denmark.* London: Methuen.

Meldgaard, M. 1983: Resource fluctuation and human subsistence: a zooarchaeological and ethnographical investigation of a West Greenland caribou hunting camp. In (eds) J. Clutton-Brock and C. Grigson, *Animals and Archaeology 1. Hunters and their Prey*, 259–272. British Archaeological Reports, International Series 163.

Nobis, G. 1962: Die Tierreste prähistorischer Siedlungen aus den Satrupholmer Moor. *Zeitschrift für Tierzüchtung und Züchtungsbiologie* 77, 16–30.

– 1975: Zur Fauna des Ellerbekzeitlichen Wohnplatzes Rosenhof in Ostholstein I. (Grabung 1968–1973). *Schriften des Naturwissenschaftlichen Vereins für Schleswig-Holstein* 45, 5–30.

Paludan-Müller, C. 1978: High Atlantic food gathering in northwestern Zealand, ecological conditions and spatial representation. In (eds) K. Kristiansen and C. Paludan-Müller, *New Directions in Scandinavian Archaeology*, 120–157. Copenhagen: National Museum of Denmark.

Rowley-Conwy, P. 1981: Slash and burn in the temperate European neolithic. In (ed.) R. Mercer, *Farming Practise in British Prehistory*, 85–96. Edinburgh University Press.

– 1983: Sedentary hunters: the Ertebølle example. (in (ed.) G.N. Bailey, *Hunter-Gatherer Economy in Prehistory*, 111-126. Cambridge University Press.

– 1984a: The laziness of the short-distance hunter: the origins of agriculture in western Denmark. *Journal of Anthropological Archaeology.*

– 1984b: Postglacial foraging and early farming economies in Japan and Korea: a west European perspective. *World Archaeology* 16, 28–42.

Sauer, C.O. 1952: *Seeds, Spades, Hearths and Herds.* MIT.

Schrire, C. 1980: An enquiry into the evolutionary status and apparent identity of San hunter-gatherers. *Human Ecology* 8, 9–32.

Schütrumpf, R. 1972: Stratigraphie und pollenanalytische Ergebnisse der Ausgrabung des Ellerbek-Zeitlichen Wohnplatzes Rosenhof (Ostholstein). *Archäologisches Korrespondenzblatt* 2, 9–16.

Schwabedissen, H. 1962: Die anfänge der Haustierhaltung in Schleswig-Holstein im Lichte der Archäologie. *Zeitschrift für Tierzüchtung und Züchtungsbiologie* 77, 255–262.

– 1979a: Die "Rosenhof-Gruppe". Ein neuer Fundkomplex des Frühneolitikums in Schleswig-Holstein. *Archäologisches Korrespondenzblatt* 9, 167–172.

– 1979b: Der Beginn der Neolithikums im nordwestlichen Deutschland. In (ed.) H. Schirnig, *Grosssteingräber in Niedersachsen*, 203–222. Hildesheim: August Lax.

– 1981: Ertebölle/Ellerbek – Mesolithikum oder Neolithikum? In (ed.) B. Gramsch, *Mesolithikum in Europa*, 129–142. Veroffentlichungen des Museums für Ur- und Frühgeschichte, Potsdam, 14/15.

Service, E.R. 1971: *Primitive Social organization.* New York: Random House.

Sherratt, A. 1980: Water, soil and seasonality in early cereal cultivation. *World Archaeology* 11, 313–330.

Tauber, H. 1972: Radiocarbon chronology of the Danish mesolithic and neolithic. *Antiquity* 46, 106–110.

Troels-Smith, J. 1953: Ertebølle culture – farmer culture. *Aarbøger for nordisk Oldkyndighed og Historie* 1953, 5–62.

Watanabe, H. 1972: *The Ainu Ecosystem: Environment and Group Structure.* American Ethnological Society, Monograph 54.

Waterbolk, H.T. 1968: Food production in prehistoric Europe. *Science* 162, 1093–1102.

– 1982: The spread of food production over the European continent. In (ed.) T. Sjøvold, *Introduksjon av Jordbruk i Norden*, 19–37. Oslo University Press.

Zvelebil, M. and P. Rowley-Conwy 1984: Transition to farming in northern Europe: a hunter-gatherer perspective. *Norwegian Archaeological Review* 17, 104–128.