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The exploitation of Sus scrofa (Linné, 1758) on the Crimean Peninsula and in southern Scandinavia in the Early and Middle Holocene

Two regions, two strategies

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RÉSUMÉ

Pendant longtemps, on a considéré la péninsule de Crimée comme une ancienne région de domestication de *Sus scrofa*. Mais un réexamen des trouvailles le concernant (Fat'ma-Koba, Shan-Koba, Tash-Air I et Zamil'-Koba) a pu montrer que le sanglier avait été uniquement exploité par la chasse. La structure d'âges des cochons, avec sa forte proportion d'individus de 10-13 mois (par exemple 63-75 % dans les couches de Shan-Koba), indique que le printemps était la principale saison de chasse au sanglier. Ce mode d'exploitation est démontré jusqu'au Néolithique récent. En contraste, la domestication autochtone de *Sus scrofa* est apparue en Suède centrale et méridionale dans la « Pitted Ware Culture » du Néolithique moyen (vers 2900-2400 BC). Les données ostéométriques documentent donc l'éclatement de ce qui était à l'origine une population de Suidés uniforme en deux populations partielles, morphologiquement différenciables (porcs et sangliers). Les trouvailles concernant la composition d'âges et de sexes indiquent des schémas d'exploitation domestique en ce qui concerne les Suidés de la « Pitted Ware Culture ».

ABSTRACT

A re-examination of pig bones from southern Crimea indicates specialised exploitation of wild boar through hunting from the Early Mesolithic to the Late Neolithic. On the other hand, an autochtonic domestication of *Sus scrofa* is probable in the case of the Pitted Ware Culture of central and southern Sweden.

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Introduction

Over much of Europe, wild boar (*Sus scrofa*) was one of the most intensively hunted species of game during the Early Holocene, in addition to red deer (*Cervus elaphus*), aurochs (*Bos primigenius*), and roe deer (*Capreolus capreolus*). As a compilation drawn up by M.R. Jarman (1972, fig. 2) shows, it is present at 83 % of the Upper Paleolithic and Mesolithic sites (n = 165). The frequency of evidence relating hereto is surpassed only by red deer, with a figure of about 95 %. Data provided for example by M.R. Jarman *et al.* (1982, tab. 9) give information on its subsistence value as food at that time. Accordingly, between 36 and 67 % of the energy requirements of human groups living in the Danish settlements of the Ertebølle Culture were covered by the consumption of wild boar meat, in terms of consumption of terrestrial animal resources. These figures indicate the great importance of Sus scrofa for the subsistence of pre-Neolithic human populations in Europe.

Occasionally, expression has been given to the view that the hunt for wild boar had led to specialisation in the provision of this wild animal mainly, and hence to the domestic utilization of it, and finally to its local domestication. Views of this kind have been proposed, inter alia, for the Iron Gate area (Bolomey, 1973), for the Crimean Peninsula (Krajnov, 1957 ; Stoljar, 1959), and for central Sweden (Pira, 1909 ; J. Lepiksaar, 1984). Notwithstanding individual criticism, *e.g.* of the Crimean findings by R. Tringham (1969) and of those relating to central Sweden by J. Ekman (1974), discussion of these views has so far been superficial for a variety of reasons.

Based on a revision of the relevant finds, and being able to include some later discoveries, I once more make my case with regard to the question of the exploitation pattern affecting Sus scrofa on the Crimean Peninsula during the Mesolithic/Neolithic periods and with regard to the Pitted Ware Culture of southern and central Sweden.

The Crimean Peninsula

A theory of local pig domestication during the Mesolithic period was developed on the basis of bone finds obtained from excavations in rock shelters and grottos of the valleys in the southern Crimean mountains, during the 1930' s (cf. Krajnov, 1957 ; Stoljar, 1959). This is based primarily on the following findings :

1. the partially exceptional frequency of occurrence of pigs among the mammal remains from Mesolithic and Neolithic layers ;

2. the predominance of young animal bones among the pig bones discovered here ;

3. the evidence of osteometrically differentiated populations of wild boar and domestic pigs in the transitional period from Tardenoisian to Early Neolithic.

As early as 1969, R. Tringham made a critical review of the theory on the autochthonic domestication of pigs in Crimea and came to the conclusion that the pig bone finds from Crimean mountain sites were more likely to be the remains of a variable wild boar population. Because of the inadequacy of the data published about the finds under question, as well as the lack of knowledge about the materials involved, this discussion has remained insufficient and has not been able to deal with every theoretical argument. For a critical discussion of the above-mentioned arguments I have re-examined the pig

bone collections from Crimean sites like Fat'ma Koba, Shan-Koba, Tash-Air and Zamil'-Koba (table 1).

Fat'ma Koba Site : Abri, excavations 1927, 1956-1959 Layers : VI-V Azilian, IV-II Tardenoisian Fauna : 1462 determined bones, cf. V.I. Bibikova (1959)
Shan-Koba Site : Abri, excavations 1928, 1935-1937 Layers : VI-IV Azilian, III-II Tardenoisian, I Neolithic-Bronze Age Fauna : 1142 determined bones, cf. E.A. Vekilova (1971)
Tash-Air I Site : Abri, excavations 1937-1940 Layers : IX Early Azilian, VIII Azilian, VII Tardenoisian, VI Early Neolithic, Va Middle Neolithic and layers from younger periods. Fauna : 2318 determined bones, cf. E.L. Dmitrieva (1960)
Zamil'-Koba II Site : Cave, excavations 1937-1938 Layers : VIII Azilian, VII Tardenoisian, VI Early Neolithic, V Middle Neolithic and layers from younger periods. Fauna : 1688 determined bones, cf. E.L. Dmitrieva (1960)

Table 1. Sites on the Crimean Peninsula from where Sus bones were analyzed for this study (data from D.Ja. Telegin 1985).

There is no controversy at all regarding the observations that pig remains are frequently represented among mammal remains in the Mesolithic and Neolithic layers of rock shelters and grottos in the valleys of the southern Crimean mountains, in addition to those of red deer and roe deer, and that these partly predominate (fig. 1). The highest percentages of *Sus scrofa* exhibit bone materials from Fat'ma-Koba (Early Mesolithic, layer 6) with 80,9 %, from Tash-Air I (Late Mesolithic) with 75,5 %, and from Shan-Koba (Late Mesolithic, layers 3-2) with 73,3 % - to give three examples (cf. D.Ja. Telegin, 1985, table 3). If one considers the frequency of pig remains within individual sites over a long period of time, then it becomes apparent that their proportion has remained relatively constant from the earliest occupation levels in Azilian up to the Early Bronze Age (*e.g.* Dmitrieva, 1960, tables 1 and 2, as well as fig. 1). The fauna spectrum alters only inasmuch as cattle, sheep and goats are individually evidenced in bone remains from the Early Neolithic. One may conclude from these data that pigs were of great importance for the subsistence of people living there during the entire period of occupation.

Important information can be obtained about the exploitation pattern of Sus scrofa in the southern Crimean region during the Mesolithic and Neolithic periods, from data about age structure as well as sex ratio. As early as 1937, V. Gromova and V.I. Gromov pointed out that up to 75 % of pig bones originated from young animals. This observation has been basically confirmed following a detailed age structure analysis of pig bones from Shan-Koba, according to the tooth development on the maxilla and mandibula bones (table 2). However, it becomes apparent at the same time that young animals are

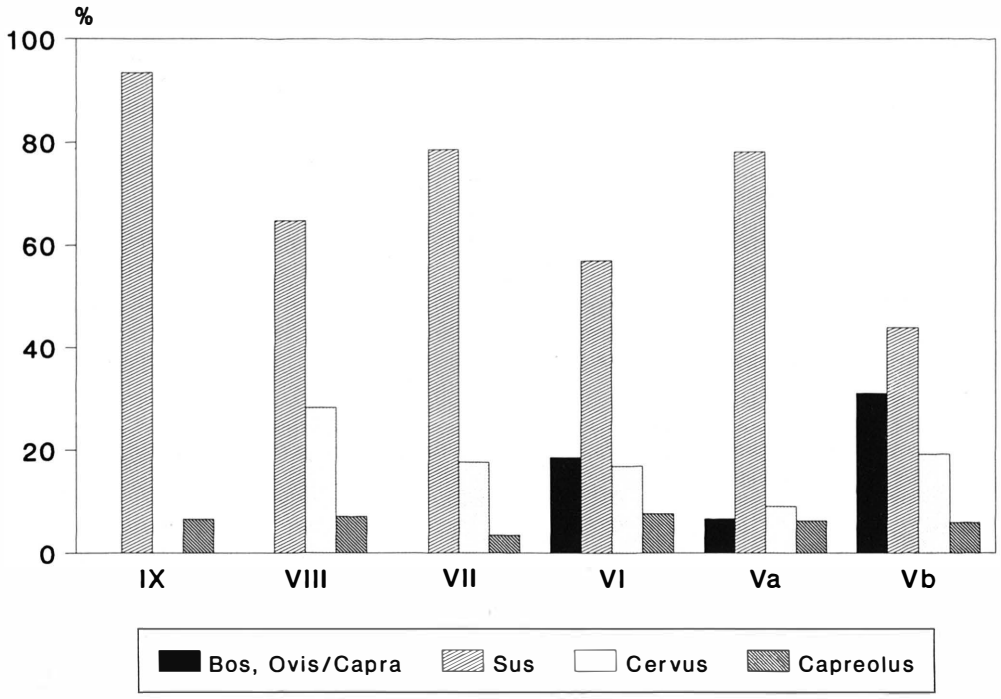


Fig. 1. Frequency of the main mammal species in the Tash Air I rock shelter, according to layers. IX Early Azilian, VIII Late Azilian, VII Tardenoisian, VI Early Neolithic, Va Late Neolithic, Vb Early Bronze Age (data from E.L. Dmitrieva, 1960, table 2).

Layers/ Criterion	7-4		3-2		1a		1	
	n	%	n	%	n	%	n	%
Pd4 erupting	-	-	1	1,5	-	-	1	0,8
M1 erupting	-	-	1	1,5	4	4,7	8	6,2
M2 erupting	26	70,3	43	63,2	64	75,3	93	72,1
P4 erupting	2	5,4	-	-	1	1,2	5	3,9
M3 erupting	-	-	8	11,8	4	4,7	7	5,4
M3 in wearfrom those :	9	24,3	15	22,0	12	14,1	15	11,6
M3 moderately worn	2	-	6	7				
M3 distinctly worn	3	1	2	3				
M3 extremely worn	2	1	1	2				
Sum	37		68		85		129	
Male	6	75,0	11	50,0	8	47,1	20	38,5
Female	2	25,0	11	50,0	9	52,9	32	61,5
Sum	8		22		17		52	

Table 2. Age structure and sex ratio of *Sus* populations from Mesolithic and Neolithic layers in the abri Shan-Koba (Crimea), according to results on maxilla and mandibula bones. Dating of the layers : 7-4 Early Mesolithic (Azilien), 3-2 Late Mesolithic (Tardenoisien), 1a Early Neolithic, 1 Late Neolithic.

represented by one age group. The animals in question are those in which the M2 was erupting. Using the information on tooth development in recent wild boar (cf. Wagenknecht, 1972, 88 ff.), the jaws are from pigs aged 10-13 months. Individual pieces of maxilla and mandibula as well as some postcranial skeleton bones document the presence of newly-born pigs as well as those just a few days to a few weeks old. As figure 2 shows, the age composition remains relatively constant from the oldest to the youngest layers of Shan-Koba, *i.e.* the exploitation pattern of pigs does not show any significant changes from the Azilian to the Late Neolithic periods. Differences in sex ratio, particularly in comparison with the Early Mesolithic layers, are principally due to finds which are of different representativeness (table 2). A comparison of the findings from the Shan-Koba area with corresponding data for pigs from the Neolithic settlements in central and northern Europe does not indicate a concurrence in age structure or sex ratio distribution, either with pigs that were properly kept or with wild pigs that were hunted (fig. 2). A meaningful explanation of the population structure of Shan-Koba, which is reflected in a nearly identical manner in the findings of other stations, such as Fat'ma-Koba, Tash-Air I and Zamil'-Koba, suggests a seasonally limited hunting of wild boar in the valleys of the southern Crimean mountains. The high proportion of bones of animals just 10-13 months old among the pigs killed, as well as the appearance of bones of individuals only a few days or a few weeks old, could indicate that spring was the main season for hunters to go on hunting expeditions there. All in all, the results of studies on pig population structure at rock shelters and grottos in southern Crimea, therefore, are more in favour of a specialised exploitation of wild boar by hunting than controlled keeping and exploitation of pigs as domestic animals.

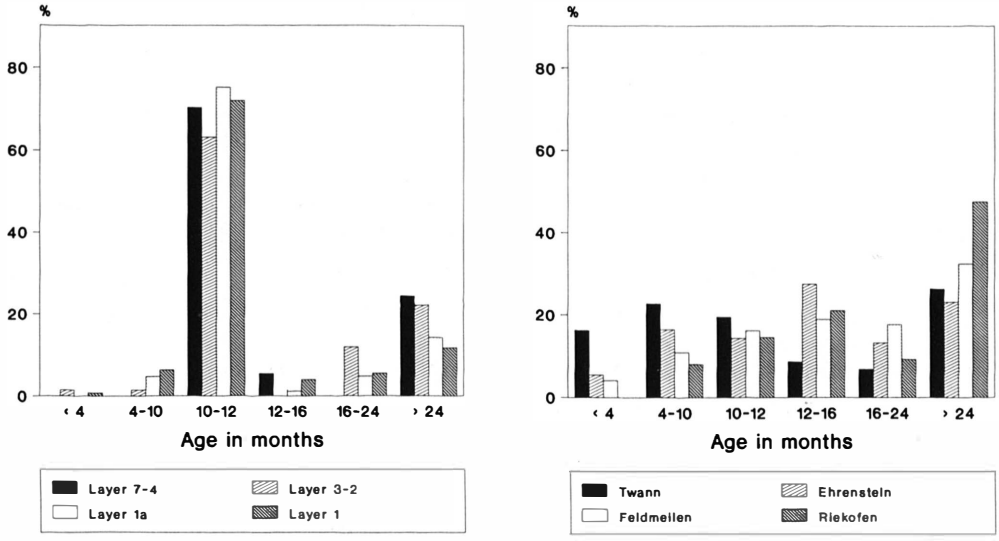


Fig. 2. Left : Age structure of the Shan-Koba *Sus* populations (cf. table 2). Right : Age composition of domestic pigs from four Neolithic settlements of central Europe (references : Twann - C. Becker, 1981, C. Becker and F. Johansson, 1981 ; Ehrenstein - K. Scheck, 1977 ; Feldmeilen - F. Eibl, 1974 ; Riekofen - A. Busch, 1985).

Now, however, E.L. Dmitrieva (1960, tables 5 and 9) has presented evidence according to which osteometrically distinguishable domestic pigs and wild boar occur side by side in Azilian layers and then to a greater extent in Tardenoisan and Early Neolithic layers. Precisely, this finding came to be regarded as the real evidence of pig domestication on the Crimean Peninsula (*e.g.* Stoljar, 1959). However, the question of local domestication of wild boar can be principally affirmed only if it can be shown that the older, autochthonic wild boar population split up over a longer period of time into two size groups (wild boar and domestic pigs), as a result of a shift in the lower size variation limit towards that of the smaller animals.

The recent wild boar of Ukraine, including the coastal areas of the Black Sea, belongs to the large subspecies *Susscrofa attila* (Heptner *et al.*, 1966 ; W. Herre, 1986). Wild boar became extinct in the mountainous region of Crimea as early as the middle of the 19th century (V.G. Heptner *et al.*, 1966, 43). Consequently, nothing is known about its size variability in this region. As osteometric findings at the Crimean stations shows, the overall picture is that of a comparably small wild boar occurring here during the Early Holocene Period (table 3).

Because of the absence of sufficiently large series for one and the same skeleton measurement, recourse had to be taken to the computation and presentation of size indices for a chronologically arranged comparison of sizes of Mesolithic and Neolithic pig populations in the southern part of the Crimean Peninsula (for methodology cf. Uerpmann, 1979). As can be deduced from figure 3, the bulk of bone finds belong in all phases to morphologically relatively uniform pig populations, the size variability of which has hardly changed over a period of some 4 000 years. Individual finds of significantly smaller animals occur from the Early Neolithic period, for the most part. Whether these are due to the larger, local population or not cannot be definitively

Site/Region	n	min.	max.	x	s
	Central Europe				
Slovakia (Lengyel)	32	36,0	43,5	39,5	-
Polling	18	36,0	41,5	39,2	1,48
Ehrenstein	11	36,5	41,5	38,9	1,67
Künzing-Unternberg	11	35,0	41,0	38,2	1,94
Hüde I	18	32,2	41,5	37,9	2,69
Twann, MS + OS	89	33,3	42,0	37,5	2,00
Burgäschisee-Süd	31	33,0	42,0	36,9	2,37
Egolzwil 2	21	33,0	40,0	36,4	1,99
	Southeastern Europe				
Goljamo Delcevo III	50	31,0	45,0	39,4	-
Obre I + II	31	36,0	43,0	39,0	2,22
Gomolova (Vinca)	14	35,0	41,5	38,8	1,91
Vlasac	26	32,5	44,0	38,3	2,82
Crimean Peninsula	29	30,0	39,4	33,9	2,61

Table 3. Size variability in Mesolithic and Neolithic wild boar *(Sus scrofa)*, shown on the basis of the distal breadth of the tibia (measurements in mm). Data from N. Benecke (1992, tab. 13).

decided here ; one is inclined to reject such an assumption on the basis of the distribution patterns in figure 3, which demonstrate a marked morphological gap with respect to the larger pigs. It is remarkable that the frequency of occurrence of these small individuals roughly corresponds to the proportion of cattle, sheep and goats found in the Neolithic layers of the abris. This would seem to suggest that those small pigs were among the domestic animals that occasionally made their way to the valleys of the Crimean mountains, either as a living food reserve or as « travel provisions » for human groups who went hunting there. The sporadic occurrence of smaller pigs in layers as early as the Tardenoisian period can be explained by the coincidental admixture of bones from the younger layers.

As the discussion has revealed, the present finds do not provide arguments for deducing that there was local pig domestication on the Crimean Peninsula. The data suggest rather that groups of hunters regularly visited the valleys of the southern Crimean mountains to hunt wild boar and other animal species since the Early Mesolithic period and that they used rock shelters and caves as provisional accommodation. This « Mesolithic tradition » was clearly retained up to the transition to the Bronze Age.

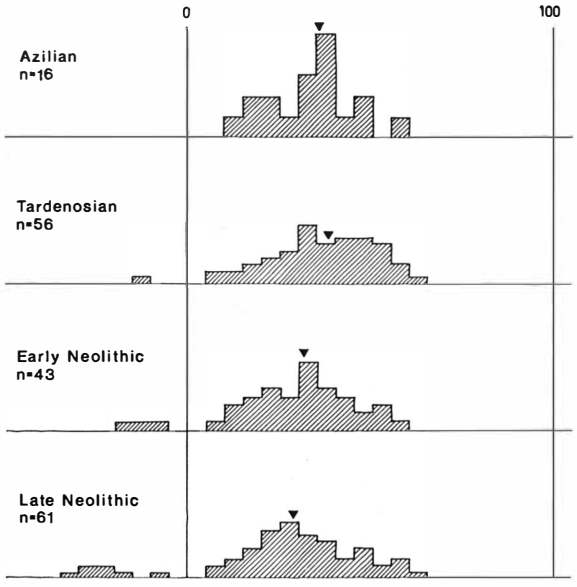


Fig. 3. Size comparison by means of the frequency distribution of size indices for Mesolithic and Neolithic *Sus* populations from the southern part of the Crimean Peninsula. The triangle indicates the position of the median.

Central and southern Sweden

As regards the Pitted Ware Culture (approx. 2900-2400 BC) of central and southern Sweden, the situation relating to the exploitation of Sus scrofa can be presented as follows : the coastal sites of this Middle Neolithic Culture on the eastern coast of Sweden and on the Baltic Sea islands of Gotland and Öland exhibit an exceptional fauna composition, as is demonstrated by archaeozoological findings. In addition to seal bones and fish bones, which are regularly found here in large quantities and which verify intensive exploitation of aquatic food resources, very high proportions of pig remains are often present among animal remains, generally. In terms of mammal bones, pig bones constitute *e.g.* 45,6 % of those found in Köpingsvik (Öland), 51,8 % in Visby, 73,9 % in Västerbjers, and even 86,3 % in Hemmor (all Gotland). Similarly high percentages of Sus are not known in any other prehistoric or early historic culture of central and southern Sweden. Preliminary investigations of pig bones at Pitted Ware

Culture sites by A. Pira (1909, 1927) led to the conclusion that the great majority of pigs were animals whose size corresponded on the whole to that of the wild form, *Sus scrofa*. Some of the finds even showed signs of having been domesticated. The idea that autochthonic domestication of wild boar took place in Mid-Neolithic Sweden, which was first proposed by A. Pira (1909) on the basis of this evidence, was taken up and further developed in the following period by other researchers, such as O. Holmqvist (1912), E. Dahr (M. Stenberger et al., 1943) and J. Lepiksaar (1962). J. Ekman (1974) was critical of this point of view. After investigating animal remains from Pitted Ware Culture settlements in Gotland, he came to the conclusion that the pig bone remains discovered here were exclusively those of wild boar.

With regard to the Baltic island of Gotland, which is some 60 km from the Swedish mainland and about 230 km from the southern Baltic Sea coast, the question arises first of all whether there is a natural occurrence of *Sus scrofa* here in the Early and Middle Holocene. From the geological point of view, there could have been a direct connection via a chain of islands between Gotland and the Polish coast, in short periods from the Pleistocene to the Holocene (Munthe, 1940 ; M. Sauramo, 1958). A migration of wild boar along this line of communication at such an early time is most unlikely, for climatic and ecological reasons. Colonization by animals swimming to Gotland from the mainland at a later time, as was assumed by R. Sernander (1897), is likewise questionable. So far there is no evidence of wild boar bones at stratigraphically significant locations for Atlantic deposits, or in earlier climatic phases on Gotland (J. Lepiksaar, 1984 and 1986). All in all, the geological, paleozoological and biogeographical findings made hitherto,verify that wild boar was not in evidence during the Early and Middle Holocene. This situation regarding findings only allows one to conclude that pig migration to Gotland was artificial and that pig was brought there by men.

According to the data compiled in table 4, pigs of the Pitted Ware Culture in central Sweden and Gotland are in broad morphological agreement with autochthonic

Measurement/Group	n	min.	max.	x	s	v
Mandibula, Length of M3						
South. Sweden, Mesolithic	35	38,8	47,8	43,7	2,47	5,64
Central Sweden, Pitted Ware	14	36,5	45,0	41,5	2,42	5,84
Gotland, Pitted Ware	26	34,0	49,0	42,1	3,81	9,05
Bundsø, Funnel Beaker	26	30,0	41,0	35,7	2,68	7,51
Humerus, Distal breadth						
South. Sweden, Mesolithic	25	45,7	56,8	50,8	3,44	6,78
Gotland, Pitted Ware	17	(40)	52,7	46,8	3,22	6,88
Bundsø, Funnel Beaker	10	34,0	44,0	39,8	2,82	7,09
Tibia, Distal breadth						
South. Sweden, Mesolithic	31	33,6	41,5	36,1	2,07	5,74
Central Sweden, Pitted Ware	11	33,0	42,5	35,6	2,76	7,75
Gotland, Pitted Ware	37	27,0	37,0	33,4	2,05	6,13
Spodsbjerg, Funnel Beaker	15	28,0	34,1	30,7	1,68	5,47

Table 4. Comparison in size and variability between Mesolithic and Neolithic *Sus* populations from southern and central Sweden, Gotland and Denmark (Bundsø, Spodsbjerg), on the basis of three measurements (in mm). Data from N. Benecke (1992, table 15).

Mesolithic wild boars, although they exhibit a somewhat lower mean value in all the considered dimensions. On the other hand, there is a striking difference in size when comparison is made with the Middle Neolithic domestic pigs of Denmark. Morphological or genetic links between the *Sus* populations of the Pitted Ware Culture and the domestic pigs brought to southern Scandinavia during the course of neolithisation can thereby be principally ruled out. The above-mentioned size difference in relation to Mesolithic wild boars can have two causes : one is the general reduction in size of wild boar during the transition from the Boreal to Subboreal periods ; the other is a size reduction brought about by domestic influences. The first possibility is in contradiction with K.L. Paaver's data (1965) for the east Baltic and in contradiction with those data supplied by L. Jonsson (1986) for the south-western Baltic region, whereby the body size of wild boar remained substantially constant in the considered period of time.

As size comparison by means of the frequency distribution of size indices shows, a marked extension of the original range of variation can be observed in the direction of animals of smaller size in the case of pigs belonging to the Pitted Ware Culture (cf. fig. 4). This development seems to have taken place to a greater extent in Gotland than in central Sweden, as distribution patterns and the position of the median indicate. If the Bronze Age finds from central and southern Sweden are included in this comparison, it becomes apparent that the shift in the lower range of variation continued in the ensuing period and finally led to a division into two size groups. The group with the smaller animals may well comprise domestic pigs, while the group of larger animals consists of wild boar. The finding that has been presented here, *i.e.* the separation of what has earlier been a uniform pig population into two morphologically distinguishable partial populations, within a limited geographical region, can be regarded as unmistakable proof of local pig domestication (Uerpmann, 1979 ; Meadow, 1984). Its beginning clearly coincides with the transition to the Pitted Ware Culture, according to the prevailing knowledge.

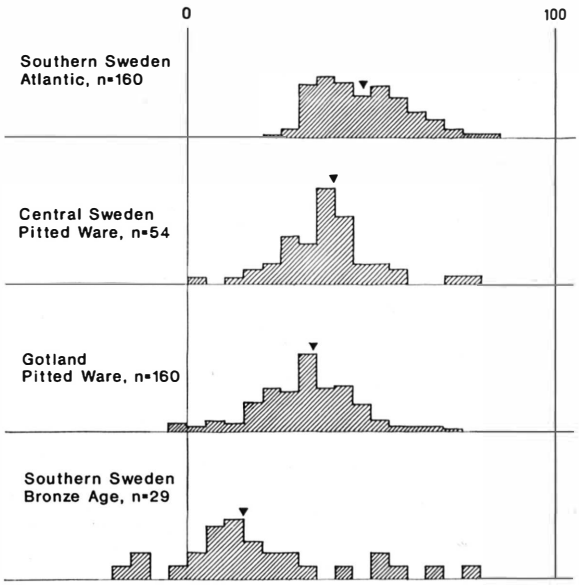


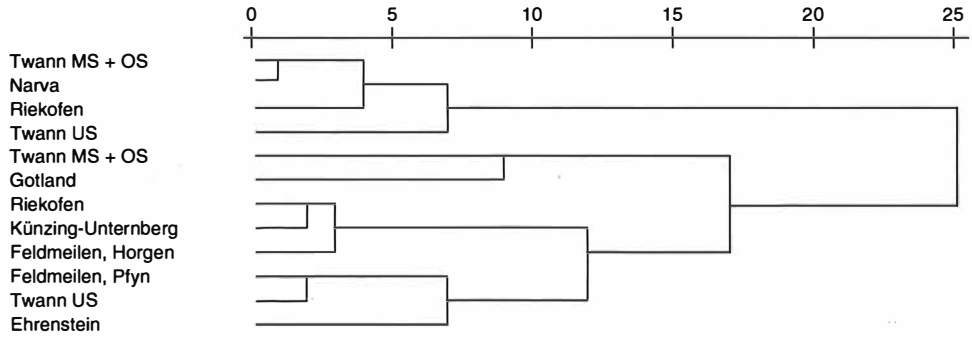
Fig. 4. Size comparison by means of the frequency distribution of size indices for Sus populations from central and southern Sweden. The triangle indicates the position of the median.

Clues about the domestic exploitation of Pitted Ware Culture pigs can also be derived from findings concerning age and sex composition, in addition to the results of metrical comparisons. 58,1 % of the lower jaws (mandibula), which are decisive in determining the ages of pigs up to 12 months old, come from materials discovered in costal sites in Gotland, while 23,9 % of finds represent sub-adult animals (12-24 months old), and only

18,0 % comprise adult pigs (over 2 years). As fig. 5 shows, Gotland pigs exhibit a composition with regard to age grouping and sex ratio similar to that found in Neolithic settlements with developed pig keeping. Exploitation of wild boar by hunting usually resulted in a different ratio of age groups and sexes (cf. table below fig. 5).

To sum up, it can be concluded that pigs discovered on residential sites belonging to the Pitted Ware Culture of central Sweden and Gotland must be regarded as domestic animals in an early stage of domestication. Here they were exploited in a similar manner to domestic pigs in the Neolithic settlements of central Europe. Their large size indicates controlled keeping even at an early stage. The coastal region of central Sweden is probably an important area of domestication. It was from here that pigs made their way to the island of Gotland.

Still less is known about the exploitation pattern for pigs in the Pitted Ware Culture sites on the western and southern coasts of Sweden. Their proportion there is clearly much lower, in relation to other mammal bone finds, than on central Sweden's eastern coast and on Gotland, for example 23,1 % in Hasslingehult near Göteburg, c. 10 % in Rörvik (Bohuslän), 5,8 % in Siretorp (Blekinge), and 3,3 % in Björkarr (Blekinge). From the few measurements that could be evaluated, it can be reasonably assumed that they would exhibit a size variability similar to that exhibited by pigs on the eastern coast and



Group	Age structure				Sex	
	n	juvenil	sub-ad.	adult	n	male
Twann MS + OS	97	18,6	14,4	67,0	23	56,5
Narva	37	21,6	10,8	67,6	17	64,7
Riekofen	22	4,6	18,2	77,3	14	50,0
Twann US	54	16,7	22,2	61,1	30	76,7
Twann MS + OS	282	58,5	15,3	26,2	37	29,7
Gotland	117	58,1	23,9	18,0	85	54,1
Riekofen	76	22,4	30,3	47,4	28	57,1
Künzing-Unternberg	61	14,8	39,3	45,9	23	47,8
Feldmeilen, Horgen	74	31,1	36,5	32,4	62	59,7
Feldmeilen, Pfyn	49	22,5	32,7	44,9	27	29,6
Twann US	55	30,9	29,1	40,0	24	41,7
Ehrenstein	91	36,3	40,7	23,1	45	22,2

Fig. 5. Cluster analysis of age and sex data for different Mesolithic and Neolithic *Sus* populations. The groups typed bold represent wild boar populations, while those typed normal represent domestic pigs (data from N. Benecke 1992, fig. 14).

on Gotland. The high proportion of young animals among the pig bones at Rörvik is remarkable at 46,1 % (Lepiksaar, 1984). Here there is a striking parallel to the finds of the sites in Gotland. Even if the data are missing in many ways, there is much to indicate that the domestication of wild boar likewise took place at Pitted Ware Culture settlements along the western and southern coasts.

Acknowledgements

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Discussions

S. Bökönyi : In the Carpathian Basin, we often find large, old wild boars. An explanation for their survival is that they were « saved » for using their lower canine as raw material of pendants worn in the neck. Do you find this phenomenon also in your study material ?

N. Benecke : No, we do not have any indications for such an exploitation of large, old wild boars. The bones of *Sus scrofa*, which we find in the mesolithic sites of the Crimean peninsula, come mainly from young animals, one or two years old.