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## Further information on the early neolithic economy of Vhò

### Introduction

The 1977 season of excavations at Campo Ceresole, Vhò, (BAGOLINI, BALISTA and BIAGI, 1977) recovered a faunal sample similar in size to that of the 1976 excavation described in *Preistoria Alpina* 12 (BARKER 1976a). The sample was derived from six pits, but was not equally

distributed between them: three of the pits (11, 12 and 24) each contained only one fragment of bone, whereas there were 15, 96 and 38 fragments in pits 14, 18, 22 respectively. Over three quarters of the sample (120 specimens) were identifiable and this material is listed in Table 1.

TABLE 1

VHÒ: IDENTIFIABLE FRAGMENTS IN THE 1977 FAUNAL SAMPLE

		Pit 11	Pit 12	Pit 14	Pit 18	Pit 22	Pit 24	Total
Bos taurus	Cattle	—	—	—	2	1	—	3
Capreolus capreolus	Roe deer	—	—	6	35	15	—	56
Cervus elaphus	Red deer	1	—	3	7	11	1	23
Ovis/Capra	Sheep/Goat	—	—	—	7	2	—	9
Sus scrofa	Pig	—	1	3	8	2	—	14
Testudo	Tortoise	—	—	—	15	—	—	15
TOTAL		1	1	12	74	31	1	120

The main mammalian species recorded in the 1976 report — cattle, roe deer, red deer, pig and sheep/goat — also dominate the 1977 faunal sample. Goose and hare, identified in the 1976 sample, were not found again, but an addition is the tortoise, represented by fifteen carapace fragments in pit 18. In Table 2 I have represented the proportions of the species in

three ways: first, numerical importance according to the total number of identifiable fragments in all the pits; second, the minimum number of individuals represented by the material from the six pits lumped together; and third, addition of the minimum number of individuals per pit. The second calculation assumes that remains from one animal occur in more than one pit, the third

assumes that bones of one individual are restricted to one pit. In both cases the minimum number of individuals has been assessed by taking the commonest bone, dividing the specimens into left and right fragments, then into proximal, shaft and distal fragments, and so reducing the sample to the minimum number of animals represented by the fragments. None of the three calculations in Table 2 can be treated

as an absolute guide to species frequency at Vhò, for the 'minimum numbers' method tends to exaggerate the importance of what were probably minor species, just as the straight fragments count tends to overemphasise the importance of major species. However, the figures do provide us with orders of magnitude for the relative importance of the different species at Vhò.

TABLE 2

### VHÒ: SPECIES REPRESENTATION

	F	%	M/L	%	M/S	%
<i>Bos taurus</i>	3	2.5	1	4.5	2	6.9
<i>Capreolus capreolus</i>	56	46.6	8	36.4	10	34.5
<i>Cervus elaphus</i>	23	19.2	6	27.3	7	24.1
<i>Ovis/Capra</i>	9	7.5	2	9.1	2	6.9
<i>Sus scrofa</i>	14	11.7	4	18.2	7	24.1
Testudo	15	12.5	1	4.5	1	3.5
TOTAL	120	100.0	22	100.0	29	100.0

(F = number of identifiable fragments. M/L = minimum number of individuals, according to the lumped sample. M/S = minimum number of individuals, according to the separate pits).

According to all three calculations, roe deer was the commonest animal killed at the site, followed by red deer and pig. Roe deer make up a third or even a half of the animals killed, and red deer and pig together also make up between a third and a half of the sample. Both cattle and ovicaprids (sheep/goat) were relatively unimportant. All the tortoise fragments could derive from one individual and it would seem very unlikely that animal was normally killed for food. Broadly speaking the 1977 faunal sample is similar to that of 1976, when cattle and ovicaprids together made up less than ten per cent of the fragments identified and red deer and pig together made up half of the animals killed. The one important difference is the relative position of roe deer in the species ratios: roe deer fragments comprised less than twenty per cent of the 1976 sample, whereas they are almost twice as common in the 1977 sample. Nor is this the result of one large deposit of roe deer bones: in all three pits with significant faunal samples (14, 18, 22), roe deer fragments are twice as numerous as those of other species.

In terms of the amount of meat it provided, roe deer is the least important of the species (excluding tortoise) killed at Vhò. In Table 3 I have converted the minimum and maximum figures for each species in Table 2 into amounts of meat and in turn into relative proportions of meat per one hundred animals. As in the case of the 1976 sample I have used normal estimates of meat weights for prehistoric cattle and sheep/goat, and I have taken the figures for roe and red deer from FRASER and KING (1954) and JOCHIM (1976: 99-100). The Vhò pigs are enormous (BARKER, 1976a: 66-7; and below) and so I have used Jochim's figure of 150 lbs for wild boar. Red deer emerges as the most important meat source by far, contributing roughly a half of the meat diet (compared to 65 per cent in the 1976 sample). Pig and cattle follow as the next major meat species, each supplying perhaps a fifth of the total meat; in the 1976 sample the proportion of pig was about the same, the proportion of cattle rather less. According to both samples sheep and goats provided hardly any meat at all for the Vhò community.

## MINIMUM AND MAXIMUM PROPORTIONS OF MEAT PROVIDED BY THE VHÒ FAUNA

	meat per animal (lbs.)	minimum species %	total meat (lbs.)	meat supply %	maximum species %	total meat (lbs.)	meat supply %
<i>Bos taurus</i>	500	2.5	1250	13.5	6.9	3450	21.8
<i>Capreolus capreolus</i>	35	34.5	1207.5	13.1	46.6	1631	10.3
<i>Cervus elaphus</i>	240	19.2	4608	49.9	27.3	6552	41.5
<i>Ovis/Capra</i>	60	6.9	414	4.5	9.1	546	3.5
<i>Sus scrofa</i>	150	11.7	1755	19.0	24.1	3615	22.9
<i>Testudo</i>	1	3.5	3.5	< 0.1	12.5	12.5	< 0.1
TOTAL	—	—	9238	100.0	—	15806.5	100.0

(The minimum and maximum percentages are taken from the three calculations in Table 2).

Mortality and size data are the two other important groups of information about palaeo-economies which can be extracted from a faunal sample. The data from the 1977 sample are extremely limited, but can be considered alongside those discussed in the previous report. The few measurements available are shown in the appendix at the end of this report. The ages of slaughter have been taken from the stages of bone fusion and tooth eruption given by SILVER (1969) for modern stock, but these have to be regarded as minimal figures because modern stock has been deliberately bred to mature fast.

### *Bos taurus*

The single measurable cattle bone from the 1976 sample fell within the size range of *Bos taurus* rather than *Bos primigenius*. A distal tibia from the 1977 collection also falls in the middle of a series of over fifty specimens from neolithic sites in Italy thought to derive from *Bos taurus* (BARKER, 1976b: 77). One cattle bone in the 1976 sample could be aged and this was from an animal certainly more than three years old when it died. The 1977 sample included two more dateable specimens: a fused first phalange (from an animal at least 18 months old) and a fused distal tibia (from an animal at least 24/30 months old). Without dentition evidence it is impossible to know the ages above these fusion stages at which the cattle were killed. As I

suggested in the 1976 report (1976: 63), the Vhò cattle could be either meat or dairy animals. Clearly cattle were not very common at Vhò and the most likely interpretation of the very limited information we have about them at the site is that a few breeding cows were kept to supply the community with dairy products and, from time to time, with surplus males which could be raised as bullocks for meat.

### *Capreolus capreolus*

Although roe deer fragments are so common in the 1977 sample, none of them was sufficiently intact to be measured and there were only three specimens that could be aged. Two mandibles contained worn deciduous premolars, and a third enclosed a second molar worn to stage g of Grant's tables of tooth wear (GRANT, 1975). Although we have little information about the maturity rates of roe deer, the three specimens are all from animals in their prime, probably two or three years old, like the 1976 examples. The roe deer of Vhò seem to have been fairly robust animals for the species (BARKER, 1976a: 64). The condition and the frequency of roe deer at Vhò both suggest that it thrived in the rich woodland environment of the Po valley in neolithic times. On the other hand, as it provides so little meat per beast, numerous kills would still not have provided a major meat supply (Table 3).

## **Cervus elaphus**

One red deer distal tibia was measurable, and this fell squarely in the middle of the size range of a large sample of red deer tibiae from various upper palaeolithic and neolithic sites in Italy (BARKER, 1976b: 73-4). The other measurable bones in the 1976 sample were also very similar in size to palaeolithic and neolithic comparative material. Red deer size in general seems to have been remarkably stable in Italy in late glacial and postglacial times despite differing environments and differing hunting pressures (BARKER, 1976b: 74).

The mortality data from the 1976 sample showed that the red deer at Vhò were mature animals: most long bones were fused, and a mandible was from an animal about eight years old according to Lowe's criteria (LOWE, 1967). Although we have very little information about absolute ages for red deer, we can at least judge the relative ages of the red deer at Vhò because long bones tend to fuse in very similar sequences in the herbivores. The first group consists of bones like the distal humerus, proximal radius and distal first phalange, and in modern cattle, for example, these fuse at about 12/18 months. There is an intermediate group of bones like the distal and metapodials (fusing in cattle at 24/30 months) and a late-fusing group such as the proximal humerus, distal radius, proximal and distal femur, and proximal tibia, that fuses in cattle at three or four years. There were three red deer specimens in the first fusion group, one in the second and two in the third, and all were fused. A single tooth was from an animal about three years old. As I suggested in the 1976 report, there is some evidence for selective killing of red deer at neolithic sites in Italy just as there is clear evidence for this at late palaeolithic and epipalaeolithic sites (BARKER, 1976a: 64), and the Vhò data tend to support this hypothesis, for the red deer at this site were normally killed when they were in their prime. The absence of very old animals at Vhò, where red deer were clearly the major source of meat for the early neolithic community, probably means that hunting pressure was such that few red deer were allowed to reach old age.

## **Ovis/capra**

The ageing evidence for sheep/goat is limited to a single mandible in pit 22 from an animal killed, on the modern figures, between a year and eighteen months old. The 1976 specimens that could be aged were from animals rather older than this, which, it was suggested, could be breeding females kept for their milk and lambs. The 1977 specimen is of an age when we would expect surplus males to be killed off if they were not required for their wool. Sheep and goats are so rare in the Vhò pits that the fragments could as easily represent single animals being brought to the site occasionally rather than the kill-off from a small resident flock. Certainly the damp woodland that so favoured animals like pigs and deer would have been extremely unsuitable for both sheep and goats and their rarity at the site is not surprising.

## **Sus scrofa**

Pigs provided the best mortality evidence from the 1977 sample. Three fusion stages can be distinguished in modern pigs, as follows: stage 1 (distal humerus, proximal radius, distal first phalange) - 12 months; stage 2 (distal tibia, distal metapodials, calcaneum tuber calcis) - 24/30 months; stage 3 (proximal humerus, distal radius, ulna olecranon, proximal and distal femur, proximal tibia) - 36/42 months. At stage 1, there were six fused and one unfused bones, at stage 2 there were three fused bones and at stage 3 there were two unfused bones; in other words, the fusion data suggest that pigs at Vhò normally lived until they were two but died before they were three years old. Two mandibles were from animals a little over two years old. The 1976 samples corroborate the conclusion that pigs at Vhò were normally killed off during the course of their second year - presumably when they had fattened sufficiently.

Perhaps the most remarkable feature of the Vhò faunal sample is the size attained by some of the pigs. Many measurements taken from neolithic pig bones from Italy cluster into two groups, one as large as Pleistocene pigs, the other much smaller. The pig bones in the 1976 sample that could be measured were larger than most of the larger of the two groups (BARKER, 1976a: 66-7) and some of the 1977 specimens are clearly derived from animals which were just as massive. A measurable radius, for example, was far larger than any other neolithic or bronze

age specimens I have seen from Italian sites, as was an enormous metacarpal and an ulna (immature!) of similarly impressive proportions. However, the 1977 sample also includes bones from smaller individuals: of two measurable tibiae, one falls in the lower part of the larger group of neolithic pigs and the other lies in the middle of the smaller group illustrated in the previous report (BARKER, 1976a: 66). It has often been argued that the large and small groups of pigs represent wild and domestic species respectively, but such a thesis assumes that human influence is the sole determinant of animal size; in fact, animal size is related to a complex mesh of environmental, nutritional and demographic as well as human constraints, and size alone cannot be used as a simple criterion of domestication (JARMAN and WILKINSON, 1972). Nor is the mortality evidence a clearer guide: the age structure of the Vhò pigs is what we would expect to find both at a site where pigs were husbanded deliberately and at a site where they were hunted intensively, for in both cases the main meat supply would be obtained by killing off surplus animals (mostly males), as they reached maturity rather than from the older breeding sows. Certainly we cannot distinguish between the two from the limited mortality data available, but in either case it is clear that pigs were being cropped intensively and that they were a major source of meat. The massive size of some of the pigs probably has a great deal to do with the contemporary woodland environment around the site, which was as ideal for them as it was inhospitable for sheep and goats.

## Conclusion

By and large the analysis of the 1977 faunal sample from Vhò corroborates the 1976 analysis. The early neolithic community exploited a damp, riverside woodland, and conditions there clearly favoured the browsing animals rather than the grazers. As a result, sheep and goats were extremely rare at Vhò — sheep is a grazer and although goat is a browser, it is not suited to wet forestlands — and the most important animals killed for meat were, in descending order, red deer, pig, cattle and roe deer. The massive size of some of the pigs and the comparatively large size of the roe probably reflects the attractiveness of the area for these animals. The cattle were in the size range of *Bos taurus* rather than *Bos primigenius* and it is likely that

the Vhò community kept a small breeding herd of cattle. Sheep and goat bones are so few and the contribution of these animals to the Vhò economy small that, if Vhò was a permanently occupied site, we may suppose that the people either traded or rustled sheep occasionally from their neighbours at the edge of the Po plain. Whether or not the pigs were wild or domestic — for neither size nor age structure can be used as a straightforward guide to their status — they were certainly exploited intensively by the Vhò group and were an extremely important source of meat. Red deer, the principal source of meat, and roe deer, a minor source because of its small size (even though it was killed frequently) were also hunted in a non-random manner. Although we have to admit that the animal economy at Vhò may elude us, it is clear that the early neolithic community had developed a subsistence strategy that exploited those animals best adapted to the locality and rejected those that were not, such as sheep and goats.

One enigmatic feature of the Vhò faunal sample is the evidence for distinct variation in the distribution of the bones across the site. Most neolithic settlements in Italy consist of pit groups, like Vhò, and usually the faunal material from these groups is treated as one unit on the implicit or explicit assumption that the site is uniform in economic and social terms. This may not have been the case at Vhò: there were very few bones in some pits and yet many bones in others, and within the latter the bones of a particular species were sometimes distributed very unevenly. In the last few years we have seen increasing complexity in neolithic economies and societies throughout Italy at the regional scale, whereas formerly they were assumed to be much more uniform; the lateral variation in assemblage distribution at a site like Vhò suggests that now at the level of the individual site, too, the assumption of economic and social uniformity needs careful examination.

The faunal sample from the 1976 and 1977 excavations at Vhò detail the hunting and herding activities of the early neolithic community. Fishing and shellfish collection also took place (BAGOLINI and BIAGI, 1975: 116). It is unlikely that plant cultivation was important — only one cereal grain was found in flotation samples (CASTELLETTI, 1975) and the pollen evidence from the site documented the two natural plant communities — oak forests and marsh — we would expect to find along the

margins of the Po, with no evidence for agriculture (CATTANI, 1975). Cereal farmers in neolithic Italy seem normally to have selected areas of light and freely drained soil (BARKER, 1974), and the soils around Vhò were heavy and poorly drained. This environment obviously suited a hunting, fishing and plant collecting strategy, augmented by the herding of those animals suited to the forest conditions — cattle and pig. What size of community could have been supported by this mode of subsistence?

Site catchment analysis (HIGGS and VITA-FINZI, 1972) indicates that a hunter-gatherer community would normally seek its food within a radius of about ten kilometres of camp. A circular hunting territory with a ten kilometre radius from Vhò would contain over 300 square kilometres, but the Po river would effectively reduce the territory to about 200 square kilometres. We can estimate roughly the maximum numbers of red deer, roe deer and pig that

would have been living in this area from the carrying capacities which are known from similar environments. From Jochim's full discussion of the various figures available for red deer, roe deer and wild pig (JOCHIM, 1976), likely stocking rates for the Vhò territory would be as follows: red deer - 4 per square kilometre, roe deer - 12 per square kilometre, and pig - 12/20 per square kilometre. On these figures the population would have consisted of 800 red deer, 2400 roe deer, and 2400-4000 pigs. To estimate a minimum annual kill, I have used a five per cent culling rate for red deer and roe deer (which would yield 40 and 120 beasts respectively) and, as pigs can support a heavier cropping policy, a ten per cent kill of the lower stocking rate of pigs - hence 240 pigs. A maximum annual kill would be ten per cent of the red deer (80 animals), ten per cent of the roe deer (240 animals) and ten per cent of the higher pig stocking rate (400 animals).

TABLE 4

#### MEAT YIELDS AND RELATED POPULATION LEVELS IN A 200 SQUARE KILOMETRE TERRITORY AT VHÒ

family units	daily meat requirement (lbs.)	number of days' meat supply (minimum killing rate)				number of days' meat supply (maximum killing rate)			
		red deer	roe deer	pig	total	red deer	roe deer	pig	total
5	60	160	70	600	830	320	140	1000	1460
10	120	80	35	300	415	160	70	500	730
15	180	53	23	200	276	107	47	333	487
20	240	40	17	150	207	80	35	250	365
25	300	32	14	120	166	64	28	200	292

These numbers can be converted into amounts of edible meat available per year, using the figures for each animal in Table 3. According to these, a minimum kill could obtain 9600 lbs of red deer meat, 4200 lbs of roe deer meat, and 36,000 lbs of pig meat; a maximum kill could obtain 19,200 lbs, 8400 lbs and 60,000 lbs of meat from red deer, roe deer and pig respectively. CLARK (1972: 27) calculates that a hunter-gatherer family unit of two adults and three children in a forested environment would consume about 12 lbs of meat per day and on this basis I have divided the total amounts of meat

available per year by the daily requirements of 5, 10, 15, 20 and 25 family units. What is therefore shown in Table 4 is the number of days' meat supply provided by the different animals and the total game for the different numbers of family groups, at the minimum and maximum killing rates.

Taken literally, the table suggests that at the minimum killing rate there was easily enough meat per year to feed 10 family units but not enough for 15 family units and that at the maximum killing rate there was exactly enough meat for 20 family units. I do not have to em-

phasise that each assumption behind these calculations can easily be rejected, from the size of territory and the nature of the subsistence choices (was an optimiser or a satisficer strategy practised?) to the amount of meat needed in view of other resources which were available in the same area, but at least they provide us with a general guide to the game carrying capacities around Vhò and to the size of human group that could have lived off this game. A reasonable conclusion from the figures is that the game in the Vhò area could probably have supported between 10 and 20 family units (20-40 adults and 30-60 children) if the human group lived at this site throughout the year. Given that plant foods, dairy products, fish and shellfish also contributed to the diet, we may perhaps envisage an early neolithic community at Vhò somewhere between 25 and 75 adults and their children. It may have been much smaller; it would seem unlikely that what was primarily a hunter-gatherer strategy could have supported many more people at Vhò for any number of years, particularly if the site was occupied on an all-year-round basis.

#### APPENDIX: METRIC DATA FROM THE 1977 SAMPLE

The following measurements could be taken. All are in millimetres.

**Radius:** (1) maximum width proximal epiphysis.

**Metacarpal:** (1) maximum width proximal epiphysis; (2) maximum thickness proximal epiphysis; (3) maximum width distal fusion point; (4) maximum thickness distal fusion point.

**Tibia:** (1) maximum width distal epiphysis; (2) maximum thickness distal epiphysis.

Context	Bone	(1)	(2)	(3)	(4)
	BOS TAURUS				
pit 22	tibia	61.2	40.8	—	—
	CERVUS ELAPHUS				
pit 18	metacarpal	36.8	27.1	—	—
pit 14	tibia	45.0	34.0	—	—
	SUS SCROFA				
pit 18	radius	39.7	—	—	—
pit 14	metacarpal	—	—	30.0	31.5
pit 14	tibia	32.5	27.0	—	—
pit 18	tibia	37.6	30.2	—	—

#### RIASSUNTO

Lo studio dei resti faunistici portati alla luce durante lo scavo del 1977, conferma sostanzialmente quanto già scritto sulla fauna reperita durante la campagna dell'anno prima (*Preistoria Alpina*, 12). Gli animali uccisi per scopo alimentare sono, in ordine decrescente il cervo, il maiale/cinghiale, i bovini ed il capriolo; come ci si poteva attendere dalla situazione geografica dell'insediamento, la ca-

pra/pecora è, al contrario, assai poco rappresentata. Dall'analisi delle faune rinvenute nei diversi pozzetti, distribuiti nell'insediamento, è risultato che il maiale/cinghiale era una fonte alimentare fondamentale, che il cervo veniva cacciato in base ad una selezione razionale degli individui e che, inoltre, i neolitici del Vhò allevavano una piccola mandria di bovini. In fine, in base al calcolo delle risorse alimentari provviste dalla caccia al cervo, al capriolo ed al cinghiale, si è potuto stabilire che queste risorse dovevano essere sufficienti al mantenimento di una popolazione di 25-75 individui adulti e dei loro figli, se l'insediamento veniva abitato per tutta la durata dell'anno.

#### SUMMARY

In general terms the analysis of the 1977 faunal sample from Vhò corroborates the 1976 analysis (*Preistoria Alpina*, 12): the most important animals killed for meat were, in descending order, red deer, pig, cattle and roe deer. Sheep and goats, as we would expect in the damp riverside forests of Vhò, were extremely rare at the site. Whether or not the pigs were wild or domestic, they were certainly exploited intensively, and the red deer were hunted non-randomly. The early neolithic community also kept a small herd of breeding cattle. An interesting feature about the Vhò material is the evidence for distinct variation in the distribution of animal bones from pit to pit across the site. Finally, the calculation of the amount of meat likely to have been available per year from the herds of red deer, roe deer and pigs in the hunting territory of the Vhò community suggests that we may envisage a group of between 25 and 75 adults and their children at the site at the maximum, if occupation was all-year-round.

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