5 The faunal remains

5.1 Results

Investigations concerning the animal bone remains found in Iron Age contexts on Voorne-Putten have been conducted by Dr. W. Prummel (*Biologisch Archaeologisch Instituut, Rijksuniversiteit Groningen*). She kindly offered me the text of a Dutch manuscript (Prummel *in press*). An English publication appeared recently (Prummel 1991). In these publications, she reviews the results of nineteen Iron Age sites:

Early Iron Age:	Spijkenisse 17-35.
Middle Iron Age:	Geervliet 10-74; 17-40; 17-55; Spijkenisse 17-34; 17-35; 17-51; 18-06; 18-28; 18-29; 18-30; Simonshaven 17-56.
Late Iron Age:	Rockanje 08-06; Nieuwenhoorn 09-08; Geervliet 10-110; 17-41; 17-44; Spijkenisse 17-23.
Middle/Late Iron Age:	Spijkenisse 17-33; Geervliet 17-36.

She also summarized unpublished data from another seven Iron Age sites and three Roman ones on Voorne-Putten, which were collected by Drs. P.J.A. van Mensch:

Early Iron Age:	Rotterdam-Hartelkanaal 10-69
Middle Iron Age:	Spijkenisse 10-28; 18-30; 18-50; Simonshaven 17-14; 17-18.
Late Iron Age:	Abbenbroek 17-22.
Roman Period:	Oudenhoorn 25-3; Spijkenisse 17-07, 10-45.

Prummel counted and weighed the bones per species, whereas Van Mensch only counted them. According to Prummel, the proportions in counted numbers reflect the proportions in numbers of slaughtered animals. The bone weight proportions indicate the relative amount of meat of the respective species consumed. In her thesis, Prummel (1980) discussed the different methods used to quantify faunal remains. The number of remains (N.R.) is assessed by simply counting the numbers of (fragments of) bones per species/taxon. This method favours those animals of which bones are often fragmented, since each (identifiable) fragment is counted. As a result, a bias in favour of large animals, such as cattle, should be kept in mind. The weighing of bones rectifies this problem, since two halves of the same bone weigh about the same as an unfragmented one. The contribution of larger species to the diet is more pronounced in this method. Prummel (*in press*) did not calculate meat weights, since this would only introduce additional uncertainties.

Prummel (1980) further stated that differences in soil conditions may cause different changes in weights of bones. In fact, this also plays a role in the N.R.-method, since differential decay of smaller bones introduces a bias in favour of large bones (cf. Brandt *et al.* 1984). Van Wijngaarden-Bakker (1988) indicated that taphonomic processes result in clayey sediments preserving much more bone than peat. This might play a role in the comparison between the Early and Middle Iron Age sites in a peaty environment on the one hand and the Late Iron Age and Roman sites on clay on the other.

Owing to the unfavourable conditions for preservation of bone in the peaty matrix present on most sites, the amount of bones found is rather small. Prummel concluded that the quantities of faunal remains per site were too low for an inter-site comparison. She combined the results per period, which still yielded rather small numbers for the Early and Late Iron Age (see *table 31*). For the data per site, the reader is referred to Prummel's original publication.

5.2 The Iron Age

5.2.1 Domesticates

In all but one period, the bones from domesticates exceed 90%, both in numbers and in weight. Prummel's results concerning the Late Iron Age are different. The high amounts of sturgeon (*Acipenser sturio*) disturb the picture. However, as Prummel indicates, this may be due to distortion because of the low total amount of remains in this period. This seems to be confirmed by Van Mensch' data. He found 97.4% domesticates among the Late Iron Age bones in the site he studied. The domesticates were the dominant meat suppliers in all periods concerned.

Cattle are by far the most important domesticates. Prummel observed that the bones of cattle, sheep and pigs were badly fragmentated, in contrast to those of horses and dogs. From these data she inferred that horses and dogs were not eaten. Prummel (1991) mentioned one horse bone with a cut mark, but this may be an exception.

After cattle, sheep/goats were the second important slaughtered animal species. Only parts of the skeletal ele-

Table 31. Numbers and weights of animal bones found on Iron Age and Roman sites on Voorne-Putten (after Prummel in press).

	Early I.A. Prummel				v. Mensch		Middle I.A. Prummel				v. Mensch		Early/Middle I.A. Prummel				Late Iron Age Prummel				v. Mensch		Middle/Late I.A. Prummel				Roman Period v. Mensch		
	n	%-id	w(g)	w-%	n	%-id	n	%-id	w(g)	w-%	n	%-id	n	%-id	w(g)	w-%	n	%-id	w(g)	w-%	n	%-id	n	%-id	w(g)	w-%	n	%-id	
Domesticates:																													
dog	—	—	—	—	—	—	12	1.3	469	3.0	3	0.9	1	1.0	37	1.8	—	—	—	—	—	—	1	0.8	16	0.4	20	1.6	Canis familiaris
horse	—	—	—	—	3	37.5	5	0.5	530	3.4	7	2.0	18	17.8	75	3.7	—	—	—	—	5	6.6	2	1.7	364	10.2	36	2.8	Equus caballus
pig	—	—	—	—	—	—	69	7.4	795	5.0	30	8.7	—	—	—	—	—	—	—	—	2	2.6	3	2.5	29	0.8	139	10.8	Sus domesticus
cattle	19	79.2	277	92.6	5	62.5	683	73.1	13129	83.0	280	81.4	58	57.4	1786	89.0	10	35.7	107	69.9	56	73.7	90	76.3	2981	83.2	706	54.6	Bos taurus
sheep	1	4.2	6	2.0	—	—	12	1.3	102	0.6	—	—	2	2.0	7	0.3	—	—	—	—	—	—	6	5.1	51	1.4	2	0.2	Ovis aries
sheep/goat	2	8.3	13	4.3	—	—	143	15.3	708	4.5	21	6.1	18	17.8	74	3.7	4	14.3	9	5.9	11	14.5	14	11.9	136	3.8	332	25.7	Ovis/Capra
total	22	91.7	296	99.0	8	100	924	98.9	15733	99.5	341	99.1	97	96.0	1979	98.6	14	50.0	116	75.8	74	97.4	116	98.3	3577	99.8	1235	95.6	Sum domesticates
Wild Mammals:																													
beaver	—	—	—	—	—	—	3	0.3	35	0.2	—	—	1	1.0	9	0.4	—	—	—	—	—	—	—	—	—	—	8	0.6	Castor fiber
fox	—	—	—	—	—	—	1	0.1	20	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Vulpes vulpes
otter	—	—	—	—	—	—	—	—	—	—	—	—	1	1.0	5	0.2	—	—	—	—	—	—	—	—	—	—	—	—	Lutra lutra
red deer	—	—	—	—	—	—	1	0.1	18	0.1	2	0.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	0.5	Cervus elaphus
roe deer	—	—	—	—	—	—	—	—	—	—	1	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	0.2	Capreolus capreolus
elk	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0.1	Alces alces
Birds:																													
grey heron	—	—	—	—	—	—	1	0.1	2	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ardea cinerea
mute swan	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	3.6	2	1.3	—	—	—	—	—	—	—	—	Cygnus olor
mallard	1	4.2	1	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Anas platyrhynchos
bird indet.	—	—	—	—	—	—	3	0.3	1	0.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11	0.9	Aves indet.
Fishes:																													
sturgeon	1	4.2	2	0.7	—	—	1	0.1	4	0.0	—	—	2	2.0	14	0.7	13	46.4	35	22.9	—	—	1	0.8	7	0.2	28	2.2	Acipenser sturio
mullet	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0.8	1	0.0	—	—	Liza/Chelon spec.
bream	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2.6	—	—	—	—	—	—	Abramis brama
total ident.	24		299		8		934		15813		344		101		2007		28		153		76		118		3585		1292		total ident.
Not identified:																													
cattle size	9		32		—		435		1381		—		31		131		4		16		—		33		141		—		
sheep size	9		8		—		183		190		—		2		2		8		8		—		9		15		—		
unknown size	—		—		32		152		110		675		1		1		1		1		35		3		3		1100		

ments of sheep and goats can be distinguished from each other, the remaining bones have been listed as sheep/goat. Since only sheep have been attested with certainty, Prummel concludes that probably all the sheep/goat bones belonged to sheep. In sharp contrast to the zoological evidence is the occurrence of excrements of sheep/goats inside the farm of Nieuwenhoorn 09-89 (see *4.6.9*), which contain virtually nothing but bog myrtle (*Myrica gale*). These excrements, with similar contents were also found in Assendelft site Q, which dates from the Early Iron Age. Pals (1983) and Therkorn *et al.* (1984) stated that these excrements belonged to goats, as sheep dislike the bitter taste of bog myrtle. Tiesing observed that sheep avoid bog myrtle in Drenthe's heathlands (Edelman 1974). Corbet/ Harris (1991) also stated that bog myrtle is readily eaten by goats, but rarely by sheep. Van Wijngaarden-Bakker (*pers. comm.*) added that the oval shape of the prehistoric droppings also points to goats. Van der Bilt (*pers. comm.* with W. Prummel) also observed that sheep nowadays avoid *Myrica* in the *Gasterse Duinen* (Drenthe, the Netherlands). His suggestion that we are dealing with deer in the prehistoric situation can be dismissed, in view of the presence of quantities of droppings inside farms. Van Wijngaarden-Bakker (1988) suggested that the discrepancy in the data concerning goats might be explained by assuming that the goats were primarily kept for their milk and not for their meat, resulting in an underrepresentation of the bones.

The third domesticate in quantity of meat consumed is the pig. Prummel attributed the subordinate role of the pig to the scarcity of large deciduous forests in the surroundings of the sites that lie in peaty environments. In his studies on faunal remains from northern Germany, Reichstein (1975) also observed that cattle and sheep dominate in scarcely or non-forested areas, because they require grass. In densely forested areas, pigs predominate.

The stalls present in the Iron Age farms most probably served for housing cattle and probably some goats. Goats are the most sensitive to cold conditions in winter. Sheep can stand cold best of all domesticates. This is a further indication that the droppings inside the house in Nieuwenhoorn belong to goats and not to sheep. Only during severe colds sheep might have needed shelter, probably provided by the overhanging roof outside the building (Van Wijngaarden-Bakker 1988).

Waterbolk (1975) established the average width of bays in the course of pre- and protohistory. Partitions wider than 1.30 m are considered as "double" ones, where two head of cattle could be housed, below 1.20 m they are single. He found an average width per cow of 1.10 m in Bronze Age houses, of 1.00 m during the Iron Age and around 0.90 m during the Roman Period. Furthermore, the width of partitions in the clay district of Groningen is generally higher than in the sandy areas of Drenthe. Waterbolk attributed this to better grazing conditions on the fertile clay soils than on the acid heather soils.

For the Iron Age farmsteads on Voorne-Putten, I also established the average widths of the bays. The values range from 1.50 m in Rotterdam-Hartelkanaal to 1.80 m in Spijkenisse 17-34 and apparently housed two head of cattle. Seeing the absence of unambiguous bone remains of goats, it can safely be assumed that the bays mainly served for housing cattle. The width of the partitions per cow (0.75-0.90 m) is smallish in comparison with Waterbolk's measurements. Seemingly, cattle were small on Voorne-Putten during the Iron Age. Prummel calculated a height at the withers between 1.07 and 1.15 m for the material of Voorne-Putten.

The dominance of cattle could indicate that milk was an important element in the diet of the former inhabitants of Voorne-Putten. Sheep and goats could also have provided milk. For further investigations concerning this subject, Prummel determined the age of slaughter on the basis of jaws and epiphyses.

For cattle, only the Middle Iron Age material provided enough data (130 determinations) to produce reliable data. Circa 10% of the cattle died or were slaughtered in the first year, another 10% were between one and two years of age. The group from 2 to 3.5 years amounted to 20%, 25% were between 3.5 and 4.5 years old. The remaining 35% was older than 4.5 years. These data indicate that calves were only rarely eaten. Probably only some steer calves, which were not essential for maintaining of the herd, were slaughtered. Osteological indications for the presence of oxen have not been found. The low amount of cattle killed in the first year is an indirect indication for the use of oxen, since they apparently were not killed as younger animals. Since breeding, and thus milk production, in unimproved breeds of cattle does not occur before the age of 3.5 to 4 years (cf. Gregg 1988), relatively many animals were killed before this age. In Bronze Age Bovenkarspel, IJzereef (1981: 41) established that 64.7% of the cattle were slaughtered at an age of over four years. This high age at slaughter indicates the importance of milking on that site. Because of the earlier age at slaughter in the present material, the role of milk must not be over-emphasized for Voorne-Putten.

Prummel (1991) observed that the distribution of the identified remains of cattle over the skeleton is rather even. This indicates that complete carcasses were butchered on the sites and that no joints or partial carcasses were imported or exported. Any import or export will have occurred on the hoof.

Concerning sheep from the Middle Iron Age, Prummel observed that 35% were killed or died in the first year, ca. 25% in the second year and the remaining ca. 40% in the third and fourth year (on the basis of 39 determinations). The many sheep killed in the first year were probably mainly rams, not needed for breeding.

The pig remains only allowed age class determinations for all Iron Age material together, because of the low amounts per phase. Circa 10% of the pigs of all Iron Age periods were slaughtered in the first year, about 35% in the second and 55% after the second year. Probably, the sows could not breed before the second year, seeing the relatively advanced age at slaughter. On the other hand, as Gregg (1988) noted, pigs attain much of their body weight after the second summer.

In view of the age structures of the different domesticates and in view of the numbers of bays in the Iron Age farms, Prummel reconstructed hypothetical herds, for a farm of six and one of ten bays. She assumed that the bays were mainly filled with cattle. Prummel (1991) demonstrated that an even occurrence of cattle and sheep/pigs would definitely have been insufficient in the long run for the small farm. Besides, this does not fit in with the proportions of these species in the faunal remains. Prummel's reconstructed herds and the inferred numbers of slaughtered animals have been reproduced in table 32.

Prummel concluded that the slaughtering pattern for cattle was suitable for keeping up the livestock and for slaughtering some cattle for their own demand and probably also for exchange. The herds of sheep seems to have been stable, with probably some overproduction. She thus assumes that the ca. 100-200 grams of meat plus any milk produced exceeded the needs of the inhabitants of the farms themselves. Prummel, however, does not indicate the required daily amount of meat on which these statements were based. Furthermore, she does not explicitly state the caloric contents of the meat and milk and the role of vegetable foods. This gives these observations a provisional character. In the following chapter (*ch. 6*), these data will be included in a more general model concerning prehistoric food production and -consumption on Voorne-Putten.

Table 32. Hypothetical livestock in a small and a large Iron Age farm on Voorne-Putten (after Prummel *in press*).

number of stalls	6	10
stalls for cattle or horse	5	8
stalls for sheep or pig	1	2
estimated number of animals:		
cattle	9	14
horses	1	2
sheep	2	4
pigs	1	2
yearly number of litter:		
calves	3-4	4-7
lambs	1-2	2-3
piglets	2	4
number of slaughtered animals per year:		
cattle	2-3	3-5
sheep	1	1-2
pigs	1	2
number of milk-producing animals:		
cows	3-4	4-5
ewes	1	2-4

5.2.2 Wild animals

Hunting, fowling and fishing only played a marginal part from a dietary point of view. Thus they have not been included in Prummel's calculations. Their role was probably to provide diversity. Besides, beaver, fox and otter will have been hunted primarily for their fur, although their meat may have been eaten.

Antlers from deer may have been collected, instead of having been taken from hunted animals. However, post-cranial skeletal elements from red deer (*Cervus elaphus*) have also been found, which is evidence of hunting. From roe deer (*Capreolus capreolus*) only antlers have been found, so they were not necessarily hunted.

Fowling was of minor importance, bird bones have been attested only sparsely. The grey heron (*Ardea cinerea*) and the mallard (*Anas platyrhynchos*) will have been present all the year round. The mute swan (*Cygnus olor*) was a rare winter visitor. Its presence indicates fowling in winter. All birds occur in watery environments, which will have been abundant on Voorne-Putten.

Fishing was probably more important, especially during the Late Iron Age, although the small number of data available does not justify any definite conclusions. Sturgeon (*Acipenser sturio*) was the most important fish species. The sturgeon swims up the rivers to its spawning grounds from May to the end of July and may have been caught in the Bernisse and its tributaries. The mullet also migrates into the estuaries in summer. According to Prummel, mullet was probably a by-product of sturgeon fishing.

5.3 The Roman Period

The data concerning the Roman Period, from Van Mensch' investigations, deviate to some extent. The leading role of cattle still exists, but sheep are increasingly important in the three sites concerned. The landscape changed in the period concerned from mainly peaty to an environment where clay deposits are more important. These deposits developed owing to increased marine influence. Reichstein (1975: 222) observed a dominance of sheep in Elisenhof, the site with the strongest marine influence of all the sites he investigated in northern Germany. This is reconstructed on the basis of the importance of obligate halophytic plants. According to Reichstein, sheep make lower demands upon their food quality than cattle, and as a result can feed on a vegetation rich in halophytes. Besides, Prummel (1979: 97-98) observed that liver-fluke does not occur in saline environments, because the intermediate host, a snail (*Galba truncatula*), cannot thrive under conditions of high salinity.

Unfortunately, the Roman sites which were subjected to Van Mensch' faunal studies are located on clayey soils, while the Iron Age sites in most cases were founded on peat. Thus it cannot be excluded that the increase in importance of sheep/goats is due to better preservation conditions on the Roman sites in comparison with those of the Iron Age. The relatively high share of pig bones may be the result of better preservation as well.

As has been indicated in paragraph 1.3.1.4, the plans of the excavated native Roman houses on Voorne-Putten do not show the characteristic bays that do occur in their Iron Age counterparts. Thus, the potential influence of the Roman occupation upon cattle size, as Waterbolk observed for the Roman influenced site of Wijster, cannot be assessed. Clason (1967: 103) demonstrated that the size of cattle diminished from Neolithic to Roman times and increased again in the Early and Late Middle Ages. The variation is largest during the Roman Period, probably as a result of the improved breeding methods of the Romans. Van Mensch could establish the height at the withers of cattle on one single bone. It proved to be ca. 1.18 m, which is relatively tall.

The absence of bays during the Roman Period is an important observation concerning the role of stock-breeding in these periods, as will be elaborated in the following chapter.

Comparison of the zoological data concerning the Roman Period with botanical evidence is hampered by the fact that no botanical investigations have been conducted in the years that the sites studied by Van Mensch were excavated. The sites which were investigated botanically produced only very few faunal remains. Rockanje only yielded one horse and a foal in a well (cf. Brinkkemper *et al. in press*). In Nieuwenhoorn hardly any bones were found. Moreover, these fauna remains have not yet been studied (Van Trierum *pers. comm.*).