

Cats from Viking Age Odense

by TOVE HATTING

INTRODUCTION

During the excavation of two late medieval houses in the centre of Odense on Funen, Denmark in 1970, a pit was found immediately to the east of the house foundations which contained the remains of at least 68 domesticated cats (*Felis catus L.*). As a consequence the excavation, which was begun by Odense Town Museum (Møntergården), was handed over to the Zoological Museum in Copenhagen. Further analysis revealed the find was both zoologically and cultural-historically unique.

DATING

The position of the pit under the late medieval foundation gave a preliminary dating. A more precise dating was however desirable as bones of domesticated cats are known, albeit infrequently, from Denmark as early as the Roman Iron Age. Radiocarbon analysis of the bones carried out by the Copenhagen laboratory gave a date of 1070 ± 100 AD (K-1887), which means that the pit was in use in the Viking Age. Even though domesticated cats are known from the Nordic countries as early as the Roman Iron Age (Jacobsen 1972), this dating is remarkable, because it is normally first in medieval deposits that cat bones are found in such quantity. In Viking times cats were relatively rare, a much prized animal kept more for its fur than for its ability as a mouse catcher. At least this is the picture which emerges from a judgement in a Welsh legal document from 948 AD (Chadwick 1970). The punishment for the theft of the Prince's cat was a fine amounting to a sheep plus enough corn to cover the cat when it was held by the tail, with its head touching the ground. In medieval time cats became more common and their value decreased accordingly.

EXCAVATION OF THE PIT

The pit was discovered when a trial trench, running east-west, struck its southern edge. As a consequence a field 1

× 1 m (Field I) was excavated to the north of the trench and this was found to contain the remainder of the pit together with its great concentration of cat bones. The pit was almost circular with a diameter of over a metre, of which 30 cm lay in the trial trench to the south. It was about 80 cm deep, narrowing towards the base, and had a volume of just less than 0,7 m³ (fig. 2).

The layers in the pit were distinguished on the basis of colour differences which are probably due to their varying contents of organic material and chalk; an analysis of this relationship was unfortunately not carried out.

The uppermost layers comprised sandy clay and a c. 20 cm thick layer composed almost exclusively of charcoal. The latter was the remains of a fire which had been set on top of the actual pit fill. Under the "fire layer" there were a further two layers of clay and sand and under these lay a c. 30 cm thick clay layer which was rich in cat bones. The latter was labelled "the cat layer". At the base of the pit there was a c. 15 cm thick layer of very greasy, slightly reddish clay in which the cat bones were even more concentrated and also slightly better preserved than in



Fig. 1. Photograph of cat with forelimb bones: One of the best preserved skulls was found together with a complete forelimb in a clump of fly puparia at the base of the pit.

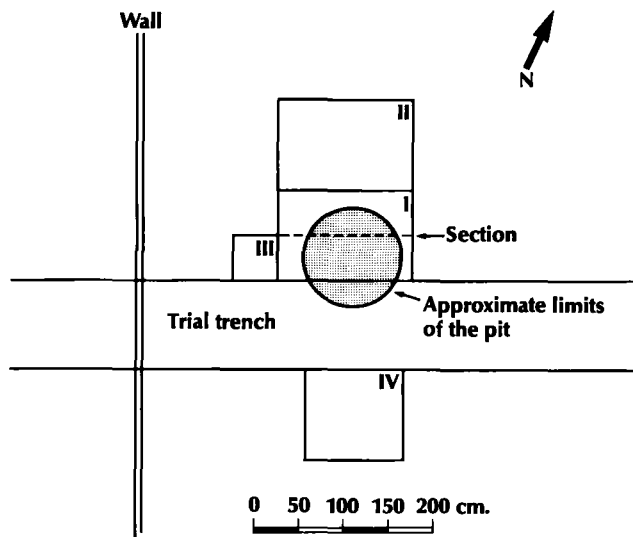


Fig. 2. Excavation Plan: The trial trench was excavated by Odense Museum, whereas areas I-IV were excavated by the Zoological Museum.

the other layers. This layer was given the name “red layer” (fig. 3).

Clumps of chalk were found spread throughout the pit. These were of various sizes, ranging from a few millimetres up to 10 cm in diameter. They were not analysed, but were thought at the time to be composed of pure slaked lime.

Similarly, small concentrations of fly puparia were found throughout the pit, although these were most abundant in the “red layer”. Precise identification was not possible, but the majority of the puparia belong to the genus *Musca* (fig. 4).

In the area around the pit, there were scattered bone finds, mostly of cat. It was decided therefore to extend the area of the excavation and another 1 × 1 m field (Field II) was laid out to the north of Field I, a further smaller field (Field III) was opened up to the west and yet another field (Field IV) to the south of the trench. However, as can be seen from the find lists, cat bones from outside the pit were few in number.

THE FINDS SPECIES LIST (FIG. 5.).

Domesticated cat (Felis catus L.)

The pit contained a total of 1783 bone fragments of cat, which, on the basis of a count of the singly-occurring bone

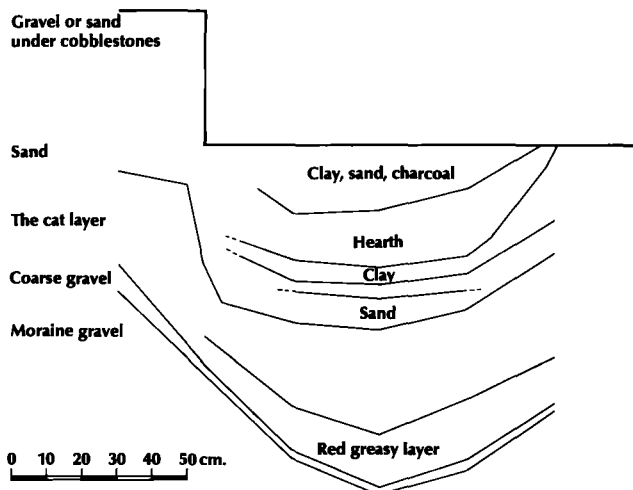


Fig. 3. The pit in section.

in the roof of the cranium, *parietale dextra*, must represent a minimum of 68 individuals. Cranial bones were on the whole the most abundant, but the large bones of the forelimbs were also well-represented. There were 56 left elbows, *ulna sinistra*, and 56 left upper forearm bones, *humerus sinistra*. Rear limbs were somewhat less abundant. There were for example 40 right thigh bones, *femur dextra*, and 46 left shin-bones, *tibia sinistra*, whilst bones from the torso, such as vertebrae and ribs were remarkably few in number (fig. 6).

Only one animal, a six-month old kitten, lay virtually



Fig. 4. Photograph of fly puparia: The best preserved fly puparia were identified as House Fly (*Musca domestica*). 1:1.

undisturbed in the pit (fig. 7), although a number of crania were found intact. Some of the forelimb bones retained their natural relative positions, but the majority of the limb bones lay randomly scattered.

Other species

Apart from cat bones, the pit also contained bones of the usual domesticated animals – cattle, pig, and sheep and poultry such as domesticated goose, hens, and a single thighbone of the long-tailed field-mouse *Apodemus flavicollis*. There were furthermore, a pair of almost complete skeletons of fox *Vulpes vulpes* (fig. 8), as well as a fragment of the upper jaw of a fox cub. The pit also produced most of the skeleton, plus a few loose bones, of raven *Corvus corax* (fig. 9).

Both foxes had complete sets of teeth, but one of them was a younger individual in which the proximal epiphyses of the upper forelimb had not yet fused (fig. 8). As was the case with the cat remains, there were numerous cutmarks both on the skulls and the lower jaws; the animals had clearly been skinned (fig. 8).

The bones of the ravens on the other hand, revealed nothing which might explain their presence in the cat pit. It is tempting to speculate that they were of cultic significance in association with one of Nordic mythology's main characters – Odin. Odin's companions were two ravens – Hugin and Munin. This possibility and the fact that the bones were found in Odense, which also brings Odin to mind, could mean that the ravens were not just ordinary refuse. Like all members of the crow family, ravens are easy to tame, and the possibility that these birds belonged to a flock of sacred ravens similar to that at the Tower of London is obvious (fig. 9).

In the lower levels of the pit there were several concentrations of fly puparia which in most cases were too degraded to permit identification. The few well-preserved examples proved to belong to the common house-fly *Musca domestica* L. (Werner Michelsen det.).

COMPARATIVE MATERIAL

Modern reference material

In order to gain a qualified picture of the cats from Viking Age Odense, it was necessary to obtain and examine skeletal material from modern cats of known age, sex, weight, and size (figs. 10 a-b). To date 23 individuals have

SPECIES OF ANIMALS FOUND IN THE DITCH		
WILD SPECIES		NUMBERS
<u>Insecta</u>	<u>Insects</u>	
<i>Musca domestica</i>	House-fly	?
<u>Pisces</u>	<u>Fish</u>	
<i>Gadus callarias</i>	Cod	6
<i>Melanogrammus aeglefinus</i>	Kuller	1
<i>Pleuronectidae</i>	Flatfish	2
<u>Aves</u>	<u>Birds</u>	
<i>Corvus corax</i>	Raven	31
<u>Mammalia</u>	<u>Mammals</u>	
<i>Apodemus flavicollis</i>	Field-mouse	1
<i>Vulpes vulpes</i>	Red Fox	149
DOMESTICATED SPECIES		NUMBERS
<u>Aves</u>	<u>Birds</u>	
<i>Anser anser</i>	Geese	23
<i>Gallus domesticus</i>	Hens	22
<u>Mammalia</u>	<u>Mammals</u>	
<i>Canis familiaris</i>	Dog	24
<i>Felis catus</i>	Cat	1783
<i>Sus domesticus</i>	Pig	46
<i>Ovis aries</i>	Sheep	141
<i>Bos taurus</i>	Cattle	140
<i>Equus caballus</i>	Horse	2

Fig. 5. Species represented in the pit.

been collected with the following age and sex distribution: 4 adult males, 6 adult females, 9 juvenile males, and 4 juvenile females.

These cats are all ordinary Danish domestic cats. These are presumed to represent the original form introduced to the country, and have not been exposed to special selection. Pedigree cats such as Angora and Siamese have undergone changes, at least with respect to the proportions of the cranium. Body configuration is also different in these refined forms from that in the original domesticated cat and for this reason they have not been included in the reference collection.

Medieval material

Finds of cat bones are known from medieval layers in the majority of Danish market towns. As an aid in working

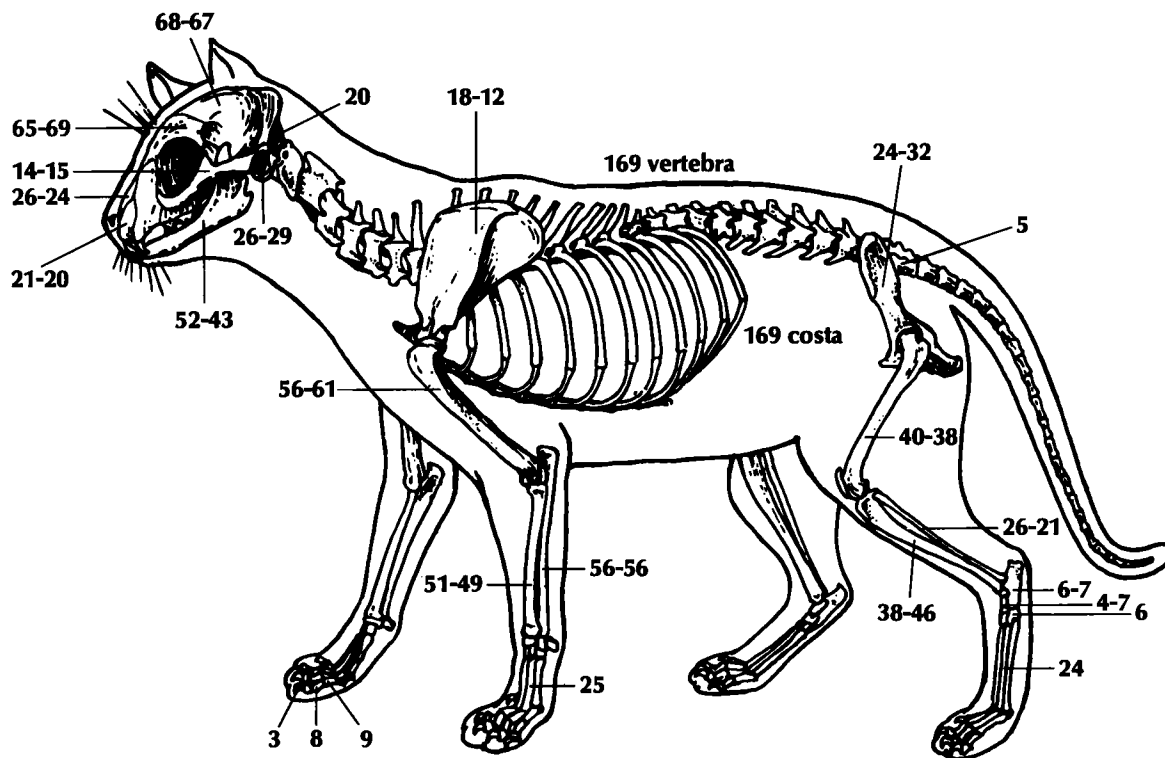


Fig. 6. Diagram of cat skeleton showing the number of fragments found.

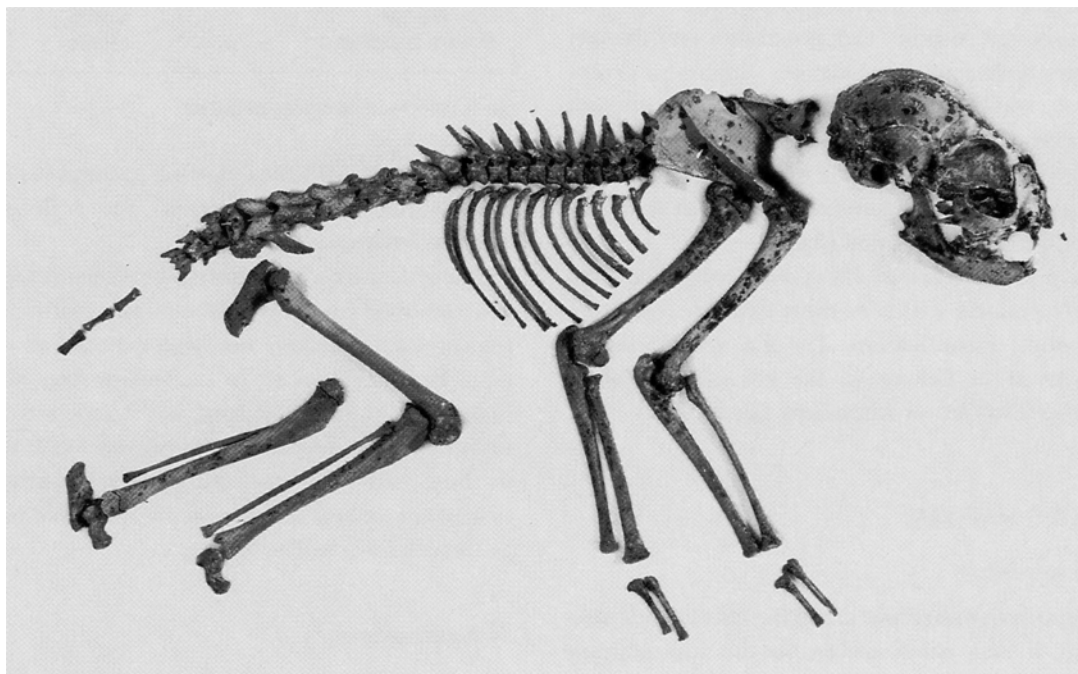


Fig. 7. Photograph of a complete skeleton of a c. six-month old kitten found deep in the red layer.



Fig. 8. Photograph of the skull of Fox (*Vulpes vulpes*).

out the bone diagrams for the Odense cats, measurements from sites in the town of Svendborg and Ørkild Castle, near Svendborg, on Funen have been used (material in UZM, excavated by H.M.Jansen, SOM). In individual cases the more extensive material from Århus in Jutland (Møhl 1971) and Gamle Lödöse (material in UZM, excavated by R. Ecre, Göteborg Museum), which is the medieval forerunner of Göteborg in Sweden, are also included in the diagrams. A more detailed treatment of these finds will however have to wait until a later publication.

As can be seen from the diagrams, cats from the Nordic Middle Ages are in general smaller than modern cats and cutmarks are evident on the skulls and lower jaw bones of nearly all of them.

DESCRIPTION OF THE SKULLS

A total of 21 virtually intact skulls were recovered from the upper layers of the pit, whereas in the lower layer, the total was 17. In addition there were the disarticulated bones from 28 skulls.

Unfortunately the majority of the skulls were incomplete in that either the skull basis *occipitale* had been broken off or the front of the jaws *premaxillare* were missing. The majority also lacked the cheek-bones *jugale*. It has not therefore been possible to measure the cheek breadth (*zygomatic breadth*) which is a much-used measurement in determining cranial form. Only 3 skulls from the upper layer (K19,21, and 24) and one from the lower layer (R1) were well enough preserved such that the

complete cranial length (*condylobasal length*) could be measured (table 1).

The fact that the *premaxillare* were missing must be due to some extent to the fact that it was not possible to sieve the soil during the excavation. These very small bones (c. 1 cm) were difficult to find in the clayey soil and it therefore likely that they were lost during excavation.

On the other hand the missing neck region is clearly due to the fact that the skulls were damaged before being thrown into the pit. In a remarkable number of cases the neck region was damaged such that the bones around the *foramen magnum* had been broken off. Ten otherwise well-preserved skulls lacked the neck bone *os occipitale* in addition to the bones in the region of the ear, *os bulla*, *petrosum* and the lower part of the *squamosum* (fig. 11).

All the skulls showed clear cutmarks concentrated around the snout, partly on the upper jaw, *maxillare*, over the canines and partly on the nose bone, *nasale*. Furthermore, cut and scrape marks, as well as holes made by the

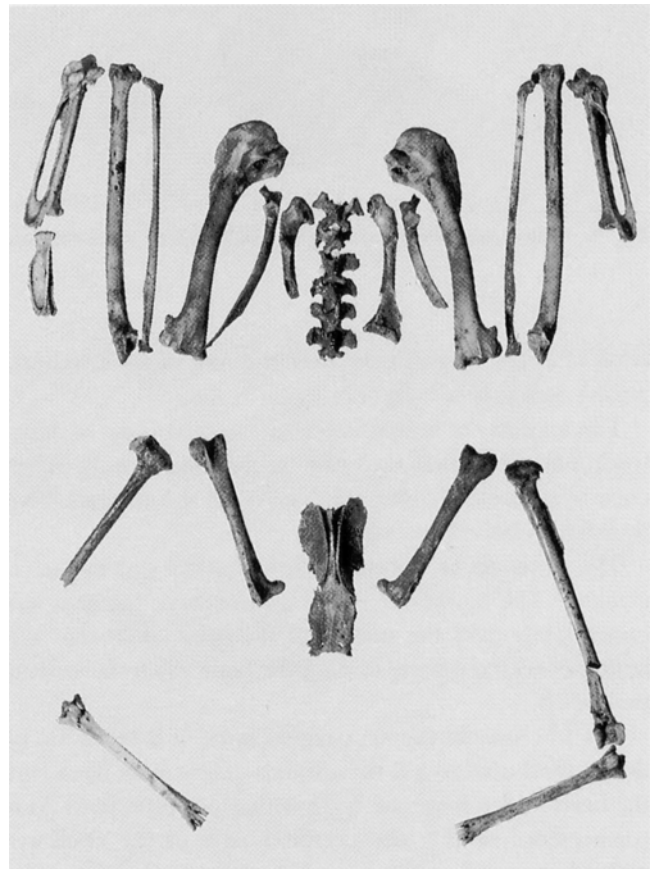


Fig. 9. Photograph of bones of a Raven (*Corvus corax*).



Fig. 10. Photographs of cat skulls: A: Recent female domesticated farm cat. B: One of the best preserved skulls from the pit.

teeth of dogs, were evident over the roof of the cranium, *frontale* and *parietale* (fig. 12).

The majority of individuals had a complete set of adult teeth, but the cranial sutures were most commonly either open or very clearly defined. Nearly all the animals were therefore relatively young.

The cutmarks on the snout show that the cats had been skinned. The marks are at the point where the skin lies immediately over the surface of the bone, such that the knife can scarcely avoid cutting the bone when the animal is skinned.

The fractures in the neck region must be a reflection of the method used to kill the animals. They must have had the head pulled from the body with a powerful jerk. As a consequence of this the occipital part of the skull remained attached to the powerful muscles which run between the base of the skull and the neck vertebrae.

As mentioned earlier, there were only 4 skulls which were sufficiently complete such that the condylobasal length could be measured. Of these four skulls, one (R1) was from a young individual which had just acquired its adult set of teeth – the root of the canine tooth on the lower jaw was still open. The same criterion shows that K21 is from an older individual.

Diagrams of the skull measurements (fig. 13) show that the Odense cats were smaller than recent cats. In particular K21 is remarkably small in the light of the fact that this is a mature individual – probably one of the breeding females. Other skull measurements, for example length and breadth and distance between the eye sockets (*interorbital breadth*) of which several are available for the Odense cats, are less than in modern cats, although the difference is not so marked as in the limb bones (see later). In the skull material both sexes are apparently

	R1	R2	R3	R4	R5	R6	R7	R8	R9
Condylbasal length (2)	76,7	-	-	-	-	-	-	-	-
Facial length (9)	32	27,1	-	31	13,6	30,1	29,2	26	-
Length of p ⁴ (14)	9,6	9,4	9,3	10,1	10,1	9,5	9,2	9,2	9,3
Gr. breadth of p ⁴	4,9	4,7	4,7	5,2	4,8	4,4	4,5	4,6	4,6
Mastoid breadth (18)	38,5	35,9	37,1	-	-	-	-	-	34,8
Breadth of condyles (19)	21,5	20,1	20,1	-	-	-	-	-	18,4
Interorbital breadth (25)	15,3	14,5	15,2	14,9	13,9	16,2	13,2	13,6	13,8
Breadth at the canines (27)	23,5	22,1	22,9	23,1	25,4	25,6	-	22,7	21,4
	R10	R11	R12	R13	R14	R15	R16	R17	
Condylbasal length (2)	-	-	-	-	-	-	-	-	
Facial length (9)	-	-	29	23	-	25,7	-	29,8	
Length of p ⁴ (14)	9,7	9,2	9,8	9,8	8,6	9,7	10,3	9,7	
Gr. breadth of p ⁴	4,9	4,4	4,7	4,7	4,6	4,9	5,4	5	
Mastoid breadth (18):	37,4	-	-	-	-	-	-	-	
Breadth of condyles (19)	18,9	-	-	-	-	-	-	-	
Interorbital breadth (25)	-	-	14,9	?	14,4	16,2	-	14,7	
Breadth at the canines (27)	-	-	-	23	21,8	24	-	23	
	K16	K19	K20	K21	K22	K23	K24	K26	K28
Condylbasal length (2)	-	79,2	-	71	-	-	75,6	-	-
Facial length (9)	29,6	32,1	28,4	30,3	29	-	32,2	-	-
Length of p ⁴ (14)	8,9	9,9	9,3	8,6	9,9	8,5	10	9,4	9,5
Gr. breadth of p ⁴	4	4,2	4,8	4,1	4,9	4,2	5	4,5	4,4
Mastoid breadth (18)	-	38,6	-	35,9	-	-	37	-	-
Breadth of condyles (19)	-	20,7	-	17,9	-	-	18,9	-	-
Interorbital breadth (25)	16,3	14,9	15	14,3	14,5	-	15,1	15,5	15,9
Breadth at the canines (27)	23,2	22,4	23	22,9	20,9	-	-	23,7	-

Table 1. Measurements of the skulls. R1–R18 are from the red, greasy layer, K16–28 are from the cat layer (see fig. 3).

represented, in contrast to the situation with the mature limb bones.

DESCRIPTION OF THE LOWER JAWS

A total of 124 lower jaw halves were found either in or around the pit – 63 right halves and 61 left halves. The great majority were intact and 19 were found together with the skulls to which they quite clearly belonged (fig. 14).

Whilst only a few of the skulls showed signs of external violence, cutmarks were found on the outer surface of the majority. These cutmarks lie most commonly immediately behind the alveolus for the canine tooth.

As was the case with the skulls, most of the lower jaws were equipped with sets of adult teeth – however X-ray photographs of the canines showed that the majority of

these had a large pulp cavity and in many cases the root was still open. This means that the individual has only very recently acquired its adult teeth.

The canines are replaced when a cat is about 6 months old and the change is normally complete at an age of about 7 months (Habermehl 1975). At first the canines are open at the root and they close in the course of the following few weeks, after which the pulp cavity also gradually closes.

One further age-determined feature should be mentioned. The two halves of the lower jaw fuse at the symphysis at the chin late in the cat's life. Apparently there is great variation as to the age at which this occurs. On the basis of the 10 recent adult skeletons (over 10 months) which were available for study, it can be concluded that an animal can be over 7 years old before the two halves of the jaw are completely fused.



Fig. 11. Diagrams of skulls seen from below: No. 1 is complete, the others lack the neck (*occipital*) region. The breaks are angled such that one earbone is partly preserved.

Of the many lower jaws found in the pit, only one was completely fused. It was found in Field II in the "cat layer" and with a sectorial tooth measuring 6,5 mm in length it must come from an old female.

The skull measurements show that the cats from Odense were small in comparison to modern cats and their lower jaws, in accordance, were also small. However if the length of the sectorial tooth in the lower jaw (first molar) is measured, it is evident that there is great variation in the size of this tooth. The largest of the Odense cats sectorial teeth are on a par with those of modern cats

although on average they are smaller. Fig. 15 shows the relationship between the total length of the jaw and the length of the lower sectorial tooth M1. It can be seen that the larger modern cats have in many cases less well-developed teeth than their smaller Viking Age counterparts. The increase in size seen in modern cats, which is apparent in the bone structure and which must be largely due to more abundant food and better living conditions, is not reflected to the same extent in the teeth. As a rule tooth structure is a very stable characteristic. The opposite is true of newly domesticated animals, in which the

jaw can be so weakly developed that the teeth are too big and are of necessity arranged in a staggered fashion in the jaw.

BONES FROM THE BODY

Of the 606 fragments of large limb bones which were recovered, 351 were forelimbs and only 255 from hindlimbs. The great majority of these bones came from immature animals in that the *epiphyses* (points of articulation) were not yet fused. At birth, all epiphyses are free and there is a growth zone linking them with the shaft of the bone itself. This allows the animal to grow, whilst also allowing the joint to function.

The few limb bones in which linear growth had ceased, i.e. those with fused epiphyses, were all, without exception, very small. There were a total of 20 from the forelimbs distributed as follows:

- 2 right and 2 left upper forelimbs (*humerus*)
- 4 right and 5 left lower forelimbs (*radius*)
- 3 right and 3 left elbow bones (*ulna*)

A total of 17 bones from hindlimbs were recovered:

- 4 right and 5 left thigh-bones (*femur*)
- 2 right and 3 left shin-bones (*tibia*)
- 1 right and 3 left fibula (*fibula*)

In all the diagrams where the greatest length of the limb bones is plotted against the midbreadth of the *diaphysis*, i.e. the boneshaft, these fully adult Odense cats lie below modern cats for both of these measurements (figs. 16–18). If the measurements from medieval finds in the town of Svendborg and Ørkild Castle on Funen and the town of Gamla Lödöse in Sweden are included, this picture is not altered, i.e. they are also smaller than present day cats. The number of bones from the medieval sites is not great, but on the basis of the available evidence, it appears that the small bones from Odense come from female cats, whereas the other sites include remains of both sexes.

The table (fig. 19) shows the breadth distribution of distal end of the *humerus* from Viking Age Odense. Only four of these bones were fully mature, i.e. with the upper epiphysis fused to the shaft. Of the others, 17 were whole but lacked the upper epiphysis, i.e. they were less than 11 months old. The age of the remainder, a total of 31, could

not be determined because the bone was broken in the middle of the shaft. The distribution shows that, whilst the undetermined and juvenile are spread over the whole range of variation, the four fully grown examples lie below the average. Accordingly it can be concluded that these four mature upper forelimb bones come from adult females, presumably breeding stock which were allowed to live for the sake of production. The young animals which were slaughtered comprised both males and females.

In many cases, the bones of the forelimb, the *humerus*, *radius*, and *ulna* had retained their natural orientation relative to each other as they lay in the pit; this was also the case for many of the skulls and lower jaws. Other bones were found less frequently in their correct positions (fig. 20).



Fig. 12. The majority of skulls show numerous cutmarks on the bones of the snout (*nasale*), upper jaw (*maxillare*) over the alveolus for the canine and over the bones forming the roof of the skull (*frontale* and *parietale*).

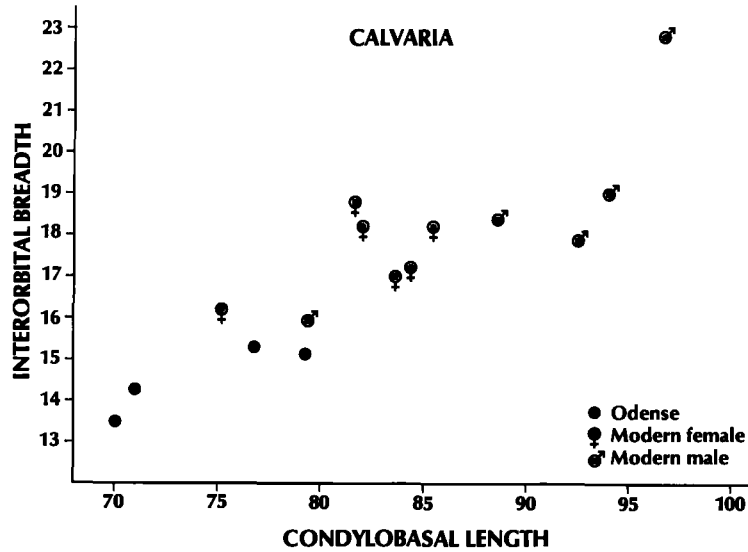


Fig. 13. Condylbasal length and interorbital breadth: The four complete skulls from the pit are all smaller than recent skulls.

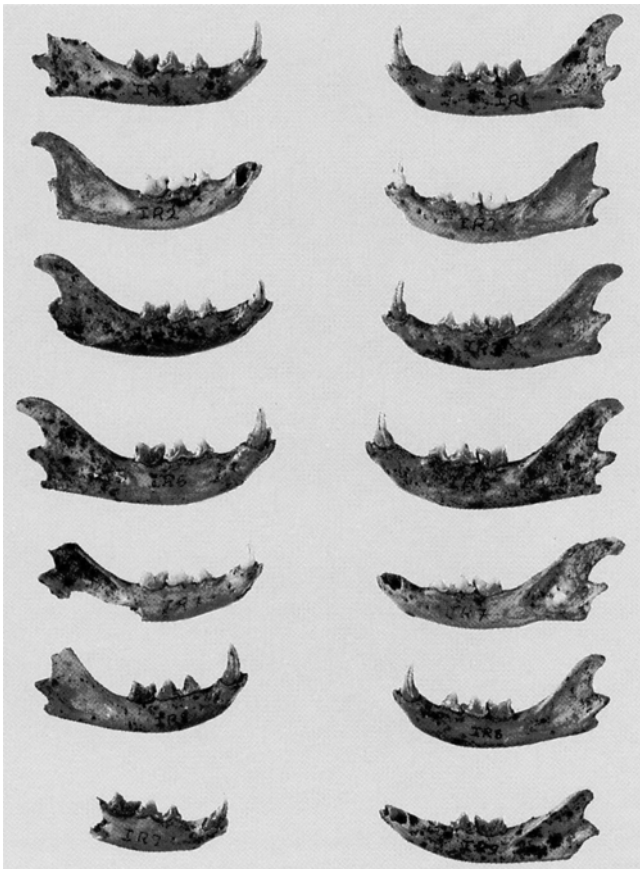


Fig. 14. Lower jaws (mandibula) from the red layer.

Many of the bones show evidence of gnawing by dogs and the discrepancy between the number of forelimbs and hindlimbs and the fact that many of the forelimb bones retained their correct orientation, could be due to the dog's liking for the more meaty parts of the cat carcasses. Similarly, the obvious lack of vertebrae and ribs (see bone summary) could also be explained by scavenging dogs (figs. 21 a-b).

AGE DISTRIBUTION

The majority of the cat jaw fragments, both from the upper and lower jaw, came from animals which had acquired their adult teeth. In modern cats, this transition normally begins at an age of about 7 months. It is thus relatively easy to determine the age of a kitten, but once the adult teeth have been acquired then age determination becomes more difficult.

Something which can be of assistance in this respect, is the fact that the roots of the teeth are not completely formed at emergence. The tooth is open at the root in the first few months, only then do the bases of the canines and molars close. An X-ray picture can show approximately how far advanced the tooth is in its development. X-ray pictures of the numerous lower jaw halves from the pit,

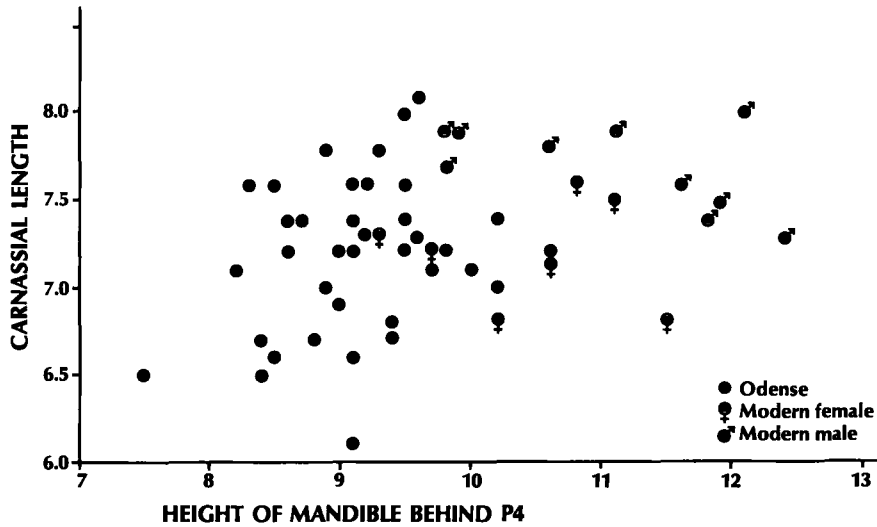


Fig. 15. Lower jaws: Jaw height and size of the 1. molar: Whereas jaw size in the Odense cats is less than that of modern cats, the size of the 1. molar is approximately the same. This means that the Odense cats had relatively larger teeth than recent cats.

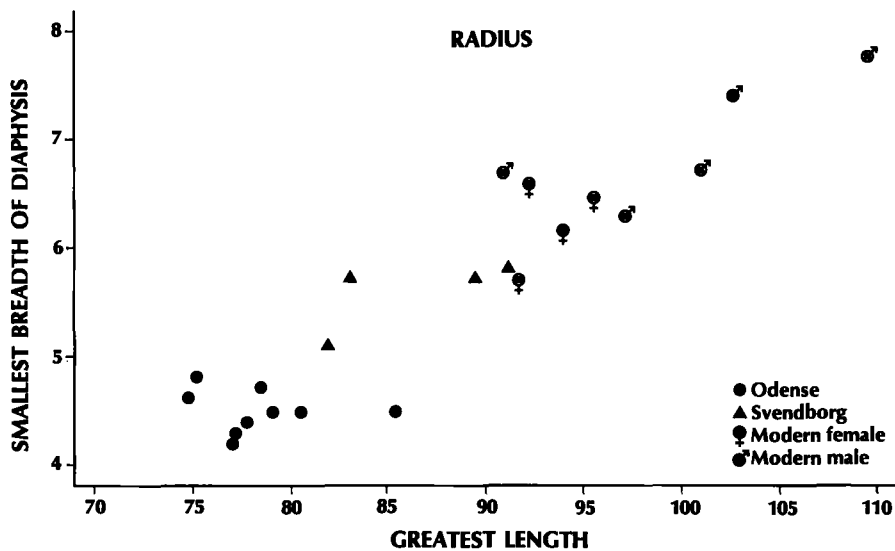


Fig. 16. Radius: Total length and breadth of the diaphysis. The few mature bones from Odense are from very small individuals, probably females.

which in the main have adult teeth, show that these have only very recently been acquired, i.e. the animals were just less than one year old at death.

From a total of 61 canines, only 4 can be said with certainty to come from mature individuals and there is some uncertainty with regard to a further 14. A total of 44 are definitely from various juvenile stages; only 4 of these individuals still have milk-teeth.

Although the material contains bones of both very

young and fully mature (even old) animals, the majority were not fully grown at death. In most cases both the lower epiphysis of upper forelimb (*humerus*) and the upper epiphysis of the lower forelimb (*radius*) were fused. In present day cats this occurs at an age of 8.5 months. The upper end of the *humerus* and the lower end of the *radius* were typically unfused. In modern cats these epiphyses fuse when a kitten is about 11.5 months old. This gives a very precise age determination for the majority of the

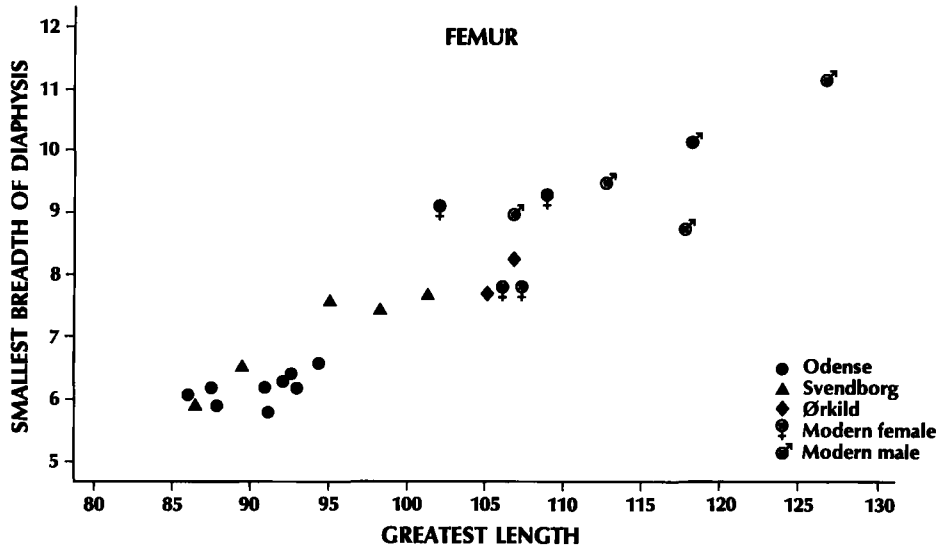


Fig. 17. Femur: Total length and breadth of the diaphysis (see fig. 16).

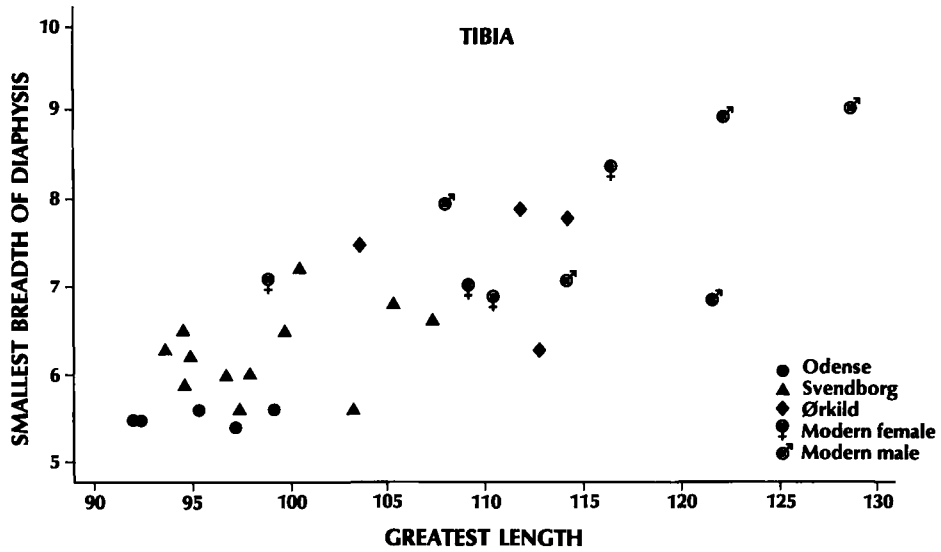


Fig. 18. Tibia: Total length and breadth of the diaphysis. (see fig. 16).

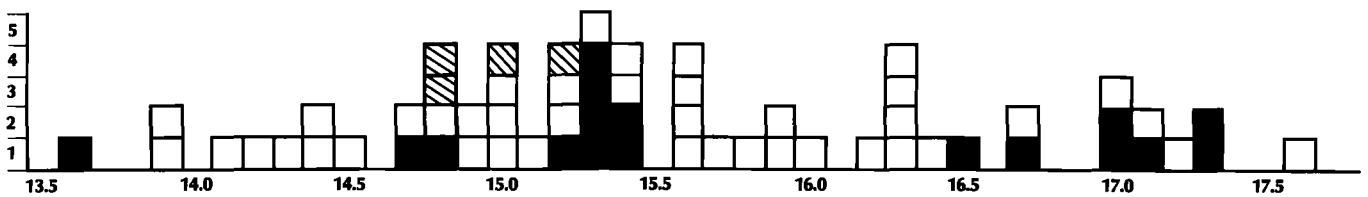


Fig. 19. Breadth of the lower end of the humerus: From a total of 62 lower ends of humerus in the pit, 4 were from adult animals and had fused epiphyses, 17 had unfused epiphyses and the remaining 41 were broken mid in the diaphysis. All the adults were relatively small and therefore probably females.

bones. By the age of c. 10 months a cat has almost reached full size.

BODY SIZE

A comparison of the Odense cats with modern cats shows clearly that there is a significant size difference. This is not remarkable in itself, as remains from the large medieval urban excavations show clearly that the first cats introduced to the country were much smaller than today's ordinary farm cat.

The height at the shoulder is typically used as a measurement of size for a domesticated animal – for example with horses and cattle and also smaller animals such as dogs. With cats it is normally the weight which is used to indicate size, but as this is heavily dependant on nutrition, it is difficult to apply to skeletal material.

Shoulder height could of course also be calculated for the cat, but only weight and body length were measured on the modern reference material. This means that in

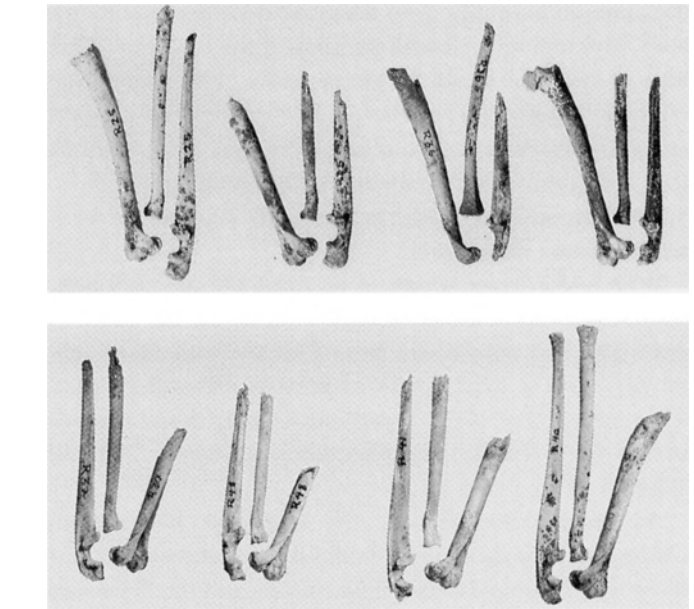
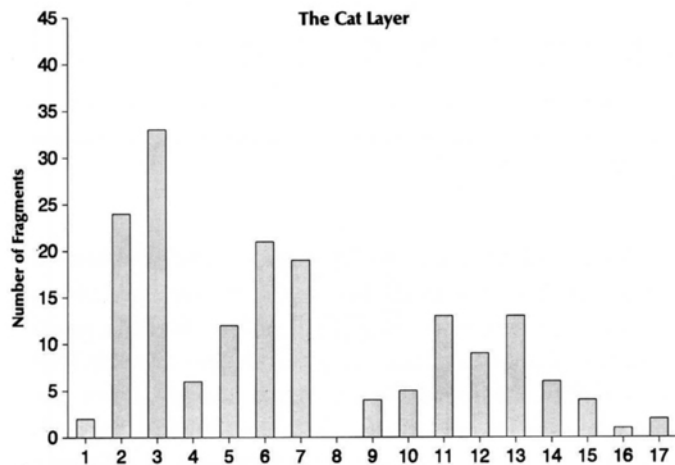


Fig. 20. Photograph of forelimb bones (*humerus*, *radius*, *ulna*): In many cases forelimb bones lay in complete sets, suggesting that the animals were thrown whole into the pit.

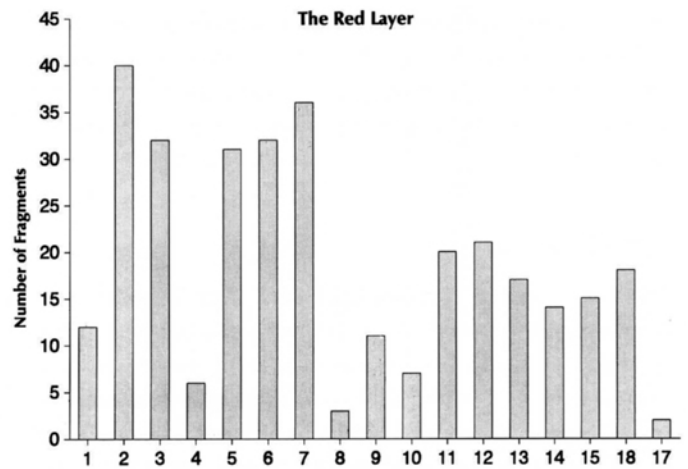


Fig. 21. Distribution of post-cranial bones in layer R and layer K. There are only a few bones from the torso, and hindlimb bones are poorly represented relative to forelimb bones.

- | | |
|-----------------------------|----------------------------|
| 1. DENS (Teeth) | 10. PELVIS (Pelvis) |
| 2. VERTEBRA (Vertebra) | 11. FEMUR (Thigh-bone) |
| 3. COSTA (Rib) | 12. TIBIA (Shin-bone) |
| 4. SCAPULA (Shoulder-blade) | 13. FIBULA (Fibula) |
| 5. HUMERUS (Upper arm) | 14. TARSUS (Ankle/heel) |
| 6. RADIUS (Radius) | 15. METATARSAL (Footbones) |
| 7. ULNA (Ulna) | 16. PHALANX (Toes) |
| 8. CARPUS (Wrist) | 17. DIVERSE |
| 9. METACARPAL (Metacarpal) | |

order to calculate shoulder height it would be first necessary to convert weight and body length to shoulder height using measurements of the limb bones. A constant would then be arrived at which could be used together with the limb measurements from the Odense cats to calculate their shoulder height. The many conversions mean however that any result arrived at by this process would have a great deal of uncertainty associated with it.

Body length (the distance from the tip of the snout to

the anus) is normally used when measuring small mammals, and it gives a clear impression of the cat's size. This measurement is known for the majority of the cats in the reference material. The relationship between body length and the maximum length of the shin-bone is so constant that it is permissible to calculate the body length of those individuals which at Odense were only represented by a single mature shin-bone.

With a shin-bone length of between 112 and 129 mm, modern cats have a body length of between 480 and 575 mm. The five shin-bones from Odense with fused epiphyses, have a total length of between 92 and 99 mm. This means that these bones must come from animals with a body length lying somewhere between 350 and 420 mm.

As already established, the complete bones from Odense come from females. It should be remembered that there is great sexual dimorphism in cats and the difference in the average body size is therefore not so great. If the material from the medieval excavations in Gl. Lødøse, Gothenburg (which contains both males and females) is combined with that from Odense, then the average difference between the Viking Age/medieval cats and the modern reference material is just less than 50 mm.

These conclusions must however be seen in the light of the fact that the sample size of the modern material available for study and comparison is small (10 individuals) (fig. 22).

CONCLUSION

The first finds of domesticated cats from Denmark are from around the birth of Christ, but from the early Middle Ages onwards they are known from the majority of market-towns. The 68 (minimum estimate) cats found in the pit under a medieval house in Odense, Funen, dated to AD 1070 \pm 100 were mostly young individuals, together with a few older females. They were killed by a powerful jerk of the head after which they were skinned. In comparison to present-day farm cats, they were small, although their teeth were relatively large.

Finds of fly puparia (*Musca sp.*) and the numerous teeth marks from scavenging dogs suggest that the pit stood open for an extended period of time. This also explains why bones from the cats' head and forelimbs are more frequent than those from the body and rear limbs. The latter are the fleshier parts of the carcass in which the dogs would be most interested.

		RADIUS									
		<u>Odense</u>									
GL		85	81	79	78	78	77	77	75	75	
SD		5	5	5	5	4	4	4	5	5	
		<u>Svendborg</u>									
GL		91	89	83	82						
SD		6	6	6	5						
		FEMUR									
		<u>Odense</u>									
GL		94	92	93	93	91	91	88	88	86	
SD		7	6	6	6	6	6	6	6	6	
		<u>Oerkild</u>									
GL		107	105								
SD		8	8								
		<u>Svendborg</u>									
GL		101	98	95	89	87					
SD		8	7	8	7	6					
		TIBIA									
		<u>Odense</u>									
GL		99	97	95	92	92					
SD		6	5	6	6	6					
		<u>Oerkild</u>									
GL		116	110	109	99						
SD		8	7	7	7						
		<u>Svendborg</u>									
GL		107	105	103	100	100	98	98			
SD		7	7	6	7	7	6	6			
GL		97	97	95	95	95	94				
SD		6	6	6	6	6	6				

Fig. 22. Measurements of longbones. GL: Greatest length. SD: Smallest breadth of diaphysis.

The age distribution of the animals in the pit shows a predominance of animals just less than one year old; a number of bones were from small mature females, probably breeding stock. This suggests that the cats were kept in captivity. Cutmarks on the skulls and the lower jaw show that the purpose of this was fur production. Parallels for this activity are unknown from Denmark or adjoining countries, either from archaeological or historical sources.

As an indication of the value of cat fur at this time, a Welsh law from 948 can be quoted. The so-called "King Hywell Dda's Law" gives the following punishment for theft of the prince's cat: as much corn as is needed to cover the cat when it is held by the tail and its head touches the ground.

Translated by David E. Robinson

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