Methods

All bones and teeth were examined, but only certain regions of some of the bones were recorded in detail and counted. A description of the criteria applied when deciding whether or not to record a particular fragment of bone or tooth, and how they are counted, is given in Davis, (1992 and 2002). The CIPA osteological reference collection was used for identification.

The parts of the skeleton counted

These regions are similar to Watson's (1979) "diagnostic zones". For example the medial half of the articulation of the distal tibia is counted, but none of the following parts of a tibia would be counted: the lateral half of the distal articulation, diaphysis, and proximal end. These "counted parts of the skeleton" include the mandibular cheek teeth, and articular ends/epiphyses of girdle, limb and feet bones. They are the units used to calculate the frequencies of different parts of the skeleton and proportions of young (epiphysis unfused) versus adult (epiphysis fused) animals. When other parts of the skeleton such as antlers, horn cores or maxillary teeth are the only evidence for the presence of a species, these **non-countable specimens** are recorded and their presence denoted by a "+" sign, but not included in the total counts of species found. The reasons for selecting these particular parts are as follows: a) they are relatively easy to identify to species; b) some, such as the distal metacarpal in certain species of artiodactyls, when in sufficient quantity, can provide information about the sex ratio; c) many include a separate centre of ossification, or epiphysis, which fuses to the rest of the bone at a particular age and so, in sufficient quantity, provide a ratio of juveniles to adults; d) many provide useful measurements; and e) they come from most regions of the skeleton (head, girdles, limbs and feet) and their relative abundance indicates possible preferences for different parts of the body such as non-meat-bearing versus meat-bearing parts or fore-quarters versus hind-quarters.

Recovery

Many aspects of zoo-archaeological analysis rely upon quantitative data such as the frequencies of different parts of the skeleton — some small ones like isolated teeth and third phalanges, and some large ones like the main limb bones, and the frequencies of different species — some small species like the rabbit, some large ones like cattle. Hand recovery may result in some biases favouring the larger parts of the skeleton and the larger species of animals. It is therefore important to determine whether the proportions of smaller bones such as isolated teeth were recovered to a similar extent throughout the succession. In order to check for this, the ratio of *isolated incisors* to *first* and *second molar teeth* (both isolated and in mandibles) was determined as well as the proportions of the three phalanges of the artiodactyls – the *second* and *third* being small, and the *first* (or *proximal*) being largest.

Recording of age-at-death

There are two osteological methods of determining the "age-at-death" of a mammal. One method considers the state of fusion of limb-bone epiphyses. The growing ends or epiphyses of long bones do not fuse to their respective shafts (diaphyses) until the end of their growing period. The state of epiphysial fusion is recorded as follows:

"F"= fused (adult),

"UE" = unfused epiphysis (juvenile), and

"UM" = unfused metaphysis (juvenile).

(The unfused metaphysis is the end of the shaft to which the epiphysis would have been attached in life.) An epiphysis is described as "fused" once spicules of bone have formed across the epiphysial plate joining diaphysis to epiphysis.

The other method considers tooth eruption and wear. Growing mammals replace their milk teeth at well-defined ages. Mandibles may therefore contain deciduous (milk) premolars (dP_2, dP_3 and dP_4) or their replacement teeth (P_2, P_3 and P_4). Like many herbivores, bovids have high crowned teeth to counteract the wear induced by their abrasive diet of grass and the inevitable sand and grit particles. Their crowns gradually wear down. As they do so, the enamel fold pattern on their occlusal (biting) surface changes. These patterns form the basis of a series of age-related "wear stages" which have been described by various investigators. Here, caprine teeth were assigned to the eruption and wear stages of Payne (1973, 1987), *Sus* and *Bos* teeth were assigned to those of Grant (1982).

Epiphysial fusion and "milk *versus* permanent" dental data provide an estimate of the proportion of juveniles. More detailed sub-divisions into smaller age classes are provided by the different wear-stages of individual teeth. Bird bones with 'spongy' (*i.e.* incompletely ossified or growing) ends are recorded as 'juvenile'.

Measurements

Measurements were taken with vernier callipers to the nearest 0,1 mm in the manner suggested by von den Driesch (1976) and Davis (1996, Fig. 1). Equid mandibular teeth were measured as in Davis (2002, Fig. 2). Measurements of isolated pig $M_{1/2}$s were used to assign them to their position in the jaw (see below).

Modifications

Cut and gnaw marks as well as burns were recorded. Other post-mortem changes to bone were also noted such as acid corrosion (or 'partial digestion'), generally considered to have been caused by stomach juices.

Treatment of records

Although the total assemblage of faunal remains from Alcáçova de Santarém is large, for many kinds of quantitative analyses subdividing the records into the 18 recognised levels results in too few observations per level. It then becomes difficult to draw conclusions about, for example, body-part representation, bone size, and age-at-death of each taxon. In order to have reasonable samples for many of the analyses, I pooled data into four "main periods" — Iron Age (coded "5"), Roman (coded "4"), Moslem (coded "3") and post Moslem (coded "2").