

ANIMALS IN ARCHAEOLOGY

HPAR 6002

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ASSIGNMENT TWO - AGEING ANIMAL BONES: KEY CONCEPTS.

The age of death of animals represents the most important within-species variation in respect of zooarchaeology.¹ Different patterns of expected natural animal mortality may indicate human decision making.² Sex data and mortality profiles reveal information around the economy, domestication and how livestock were exploited,³ hunting capability⁴ and seasonality⁵, and social behaviour.⁶ This summary deals with three techniques commonly used for estimating age at death for mammals within archaeological practice; cementum increments, dental eruption and attrition and epiphyseal fusion.⁷

Cementum Increments

Histological analysis of the cementum layer on an animal's teeth⁸ can be an effective ageing indicator.⁹ Cementum is mineralised tissue that is deposited as thin layers on the outside of the tooth below the gum line.¹⁰ The deposition is seasonally related and appears as light and dark rings when sectioned and examined under a microscope. This results in deposition of annual layers which are akin to tree rings. This allows the age of

¹ S.J.M. Davis, *'The Archaeology of Animals'* (London: Routledge, 1987, 1987), p.39.

² T. O'Connor, *'The Archaeology of Animal Bones,'* (Stroud: Sutton Publishing, 2000), p.80

³ T. O'Connor in P. Baker and F. Worley, *'Animal Bones and Archaeology: Recovery to Archive'* (Historic England, 2014), p.47. See cattle mortality profile in appendix one.

⁴ Davis, *'The Archaeology of Animals'*, p.39.

⁵ D. E. Liberman, 'Seasonality and Gazelle Hunting at Hayonim Cave: New Evidence for 'Sedentism' during the Natufian', *Paleorient*. Vol.17.No.1. (1991), pp. 47-57.

⁶ P. Baker and F. Worley, *'Animal Bones and Archaeology: Recovery to Archive'* (Historic England, 2014), p.46.

⁷ O'Connor, *'The Archaeology of Animal Bones,'* p.80.

⁸ Davis, *'The Archaeology of Animals'* p.57-59; O'Connor *'The Archaeology of Animal Bones'*, p.80-83; and Baker and Worley, *'Animal Bones and Archaeology: Recovery to Archive'* p.48.

⁹ K. Dammers in D. Ruscillo *'Recent advances in Ageing and Sexing Animal Bones'* (Oxford:Oxbow Books, 2006), p.29.

¹⁰ A. Spiess, 'Determining season of death of archaeological fauna by analysis of teeth', *Arctic*. Vol.29, No.1 (Mar.1976), pp.53-55.

the animal to be determined together with the season of death.¹¹ The technique was originally developed by animal game biologists. The technique is laboratory based, destructive and has cost implications¹² and may be difficult to carry out on archaeological material due to its fragility¹³ but may be valuable in certain circumstances.¹⁴

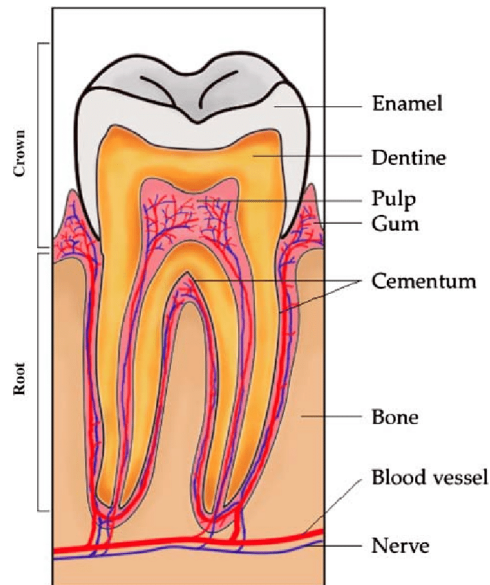


Fig.1. Diagram of tooth showing cementum layer. (Dorozhkin 2007)

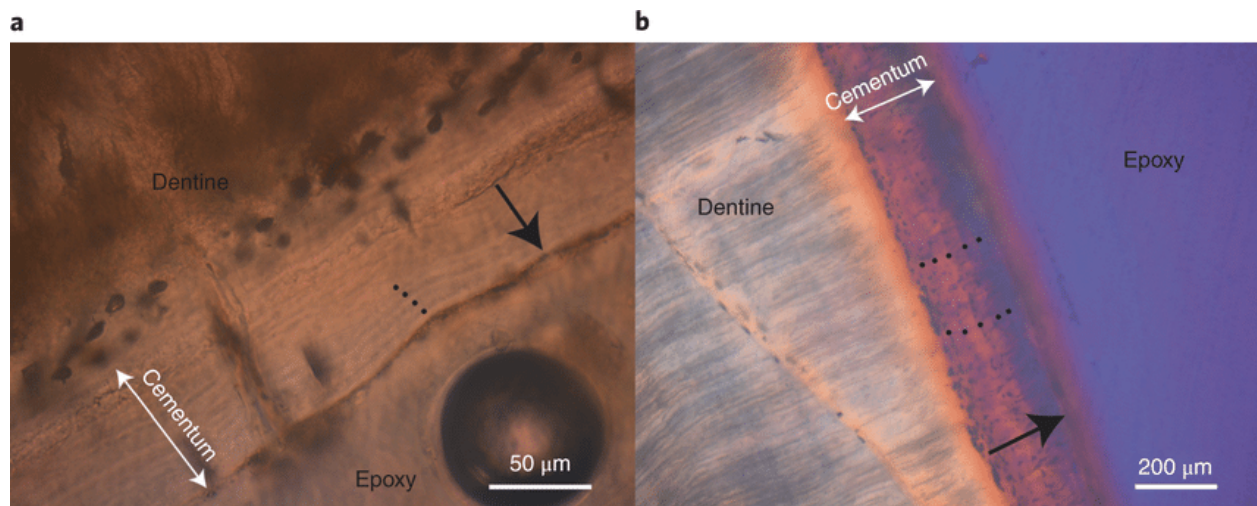


Fig.2. Images of sheep and goat cementum lines from Obishir V. (Taylor et al 2021)

¹¹ D.E. Lieberman, " Seasonality and Gazelle Hunting at Hayonim Cave: New Evidence for 'Sedentism' during the Natufian', *Paleotient*. Vol.17.No.1. (1991).

¹² O'Connor 'The Archaeology of Animal Bones' p.83 and Baker and Worley 'Animal Bones and Archaeology: Recovery to Archive' p. 48.

¹³ Davis, 'The Archaeology of Animal Bones', p.57.

¹⁴ O'Connor, 'the Archaeology of Animal Bones' p.82.

Dental eruption and attrition.

One of the oldest techniques for estimating age is by analysing dental eruption and attrition. Eruption can be used as a guide to an animal's age up to an age when permanent dentition is fully erupted¹⁵. Eruption rates have been tabulated for a range of domesticated and other animals by Lesbre¹⁶, Wenham and Fowler¹⁷, Brown and Chapman¹⁸ and others. After eruption teeth become progressively worn down and form distinctive patterns of wear. Rate of wear is dependent on a range of factors including, coarseness of forage¹⁹ and environment.²⁰ A number of methodologies have been developed assigning a mandible to an age class based on eruption and pattern of wear, including Deniz-Payne²¹ whose method is based on eruption sequence, replacement and patterns of dental wear in respect of sheep and goats. Another method is utilising dental dimensions of crown heights which changes with age which can be used for herbivorous animals.

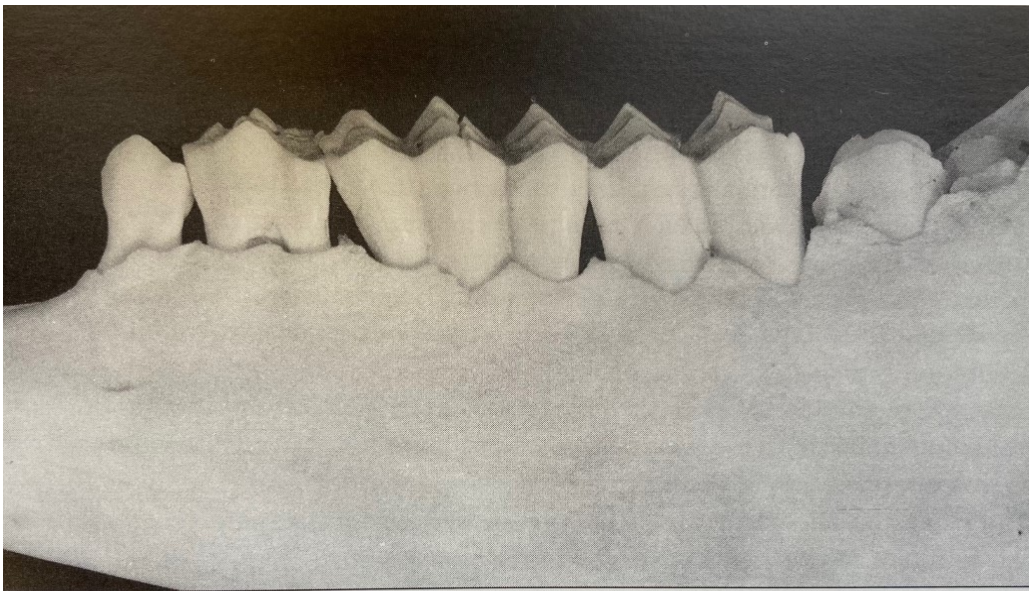


Fig. 3. Sheeps mandible showing second permanent tooth (far right) starting to erupt.
(O'Connor p.83)

¹⁵ Ibid. p. 83.

¹⁶ M. F-X. Lesbre, 'Contibution a L'etude de L'ossification du Squelette des Mammiferes Domestiques', *Annales de la Societe d'Agriculture, Sciences et Industrie de Lyon* (7th series) 5 (for 1897), 1-100 in O'Connor, 'The Archaeology of Animals' p. 84.

¹⁷ G. Wenham and V.R. Fowler in T. O'Connor, 'The Archaeology of Animal Bones', p. 85.

¹⁸ W.A.B. Brown and N.G. Chapman in T. O'Connor, 'The archaeology of Animal Bones', p.85.

¹⁹ Davis, 'The Archaeology of Animals' p.42.

²⁰ J. M. Bond and T.P. O'Connor in T. O'Connor 'The Archaeology of Animal Bones', p. 91.; P. Baker and F. Worley, 'Animal Bones and Archaeology: Recovery to Archive' (Historic England, 2014), p.47.

²¹ E. Deniz and S. Payne in Davis, 'The Archaeology of Animals', p. 42.

Epiphysial Fusion.

Bones develop from several centres of ossification. In immature animals a typical limb bone shaft is attached to proximal and distal epiphysis which are attached to the shaft by cartilage. As the animal ages this cartilage ossifies and transforms into bone. The sequence in which the epiphyses of a particular species fuse can be considered consistent and predictable. Epiphyses fusion rates were first published by Lesbre²² (1898) of common domestic animals which have been updated by later researchers particularly Silver²³ (1969) and others²⁴. This allows an estimation to be made of a typical age range for each epiphyses of individual bones and estimation of the age of death of an individual animal. However, malnourishment, castration, and thyroid removal can delay fusion.²⁵ O'Connor recommends fusion data is used in parallel with dental eruption and attrition data.²⁶ It is also noted that data is based on modern domesticated animal breeds which creates uncertainty when extrapolating back in time to extinct breeds and species. Additionally fusion cannot be used to estimate age of long lived animals who live beyond date of the last bone fusion element.

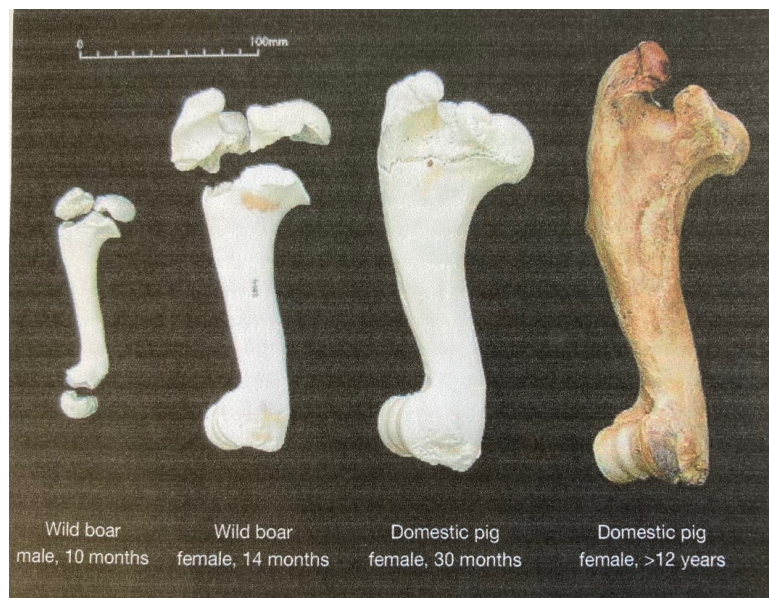


Fig.4. Wild boar and pig humeri showing fusion sequence. (Baker in Baker and Worley 2014).

²² Lesbre, 'Contribution a L'etude de L'ossification du Squelette des Mammiferes Domestiques', *Annales de la Societe d'Agriculture, Sciences et Industrie de Lyon* (7th series) 5 (for 1897), 1-100 in O'Connor, 'The Archaeology of Animals' p. 93.

²³ I.A. Silver in Brothwell, D.R. and Higgs, E.S. (eds) 'Science and Technology' (London: Thames and Hudson, 1969). pp. 283-302.

²⁴ O'Connor, 'The Archaeology of Animal Bones', p.93

²⁵ Ibid. p.96

²⁶ Ibid. p.96.

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APPENDIX 1

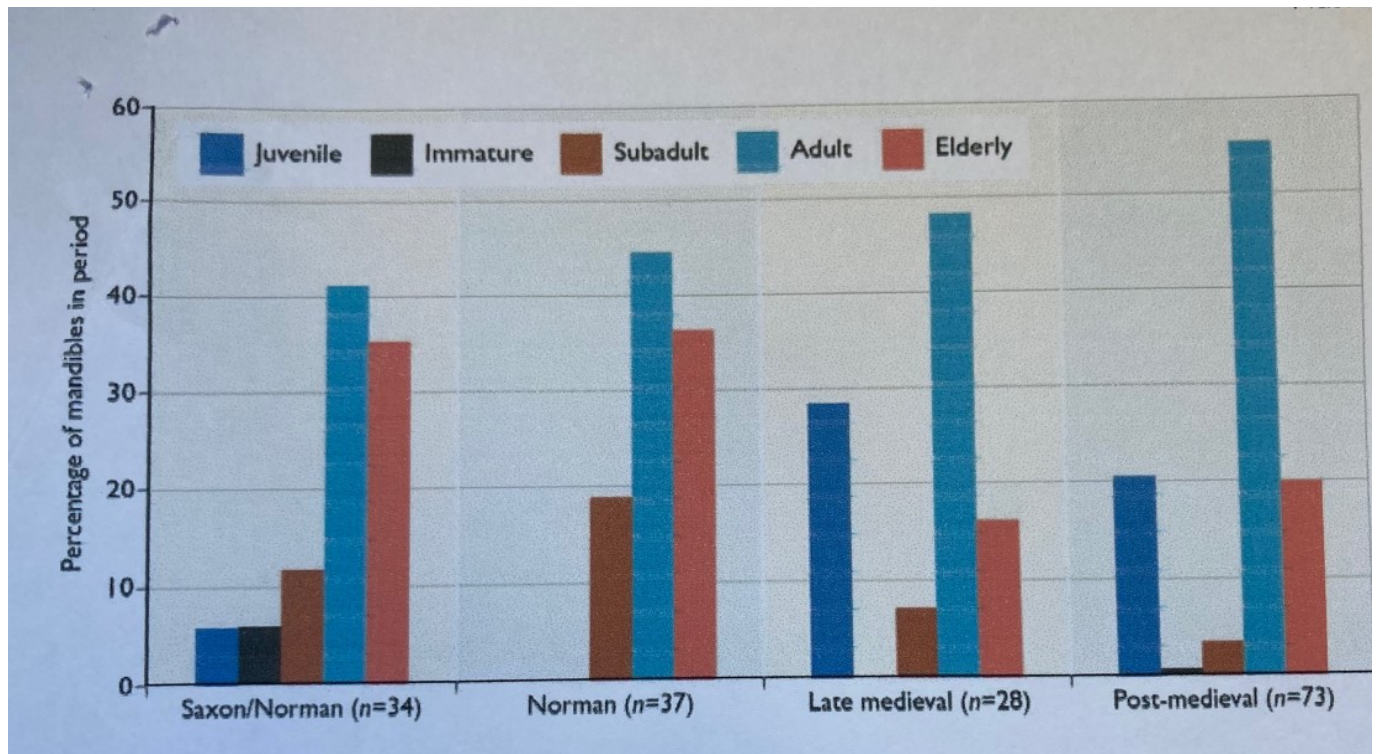


Fig. 6. Mortality profile showing mortality of calves from Saxon / Norman period to post medieval period which indicates changes in husbandry practice towards meat production. (Baker and Worley 2014).