

# Ossification of the Pelvic Symphysis in Ruminants

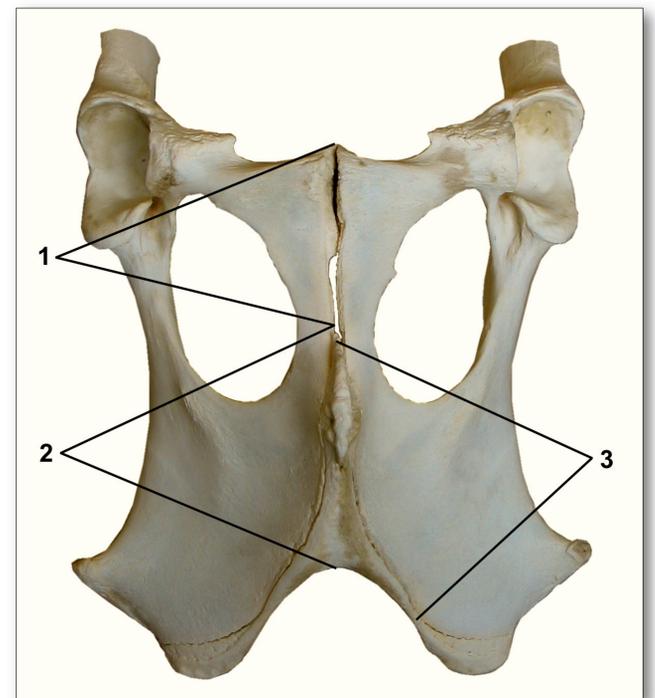
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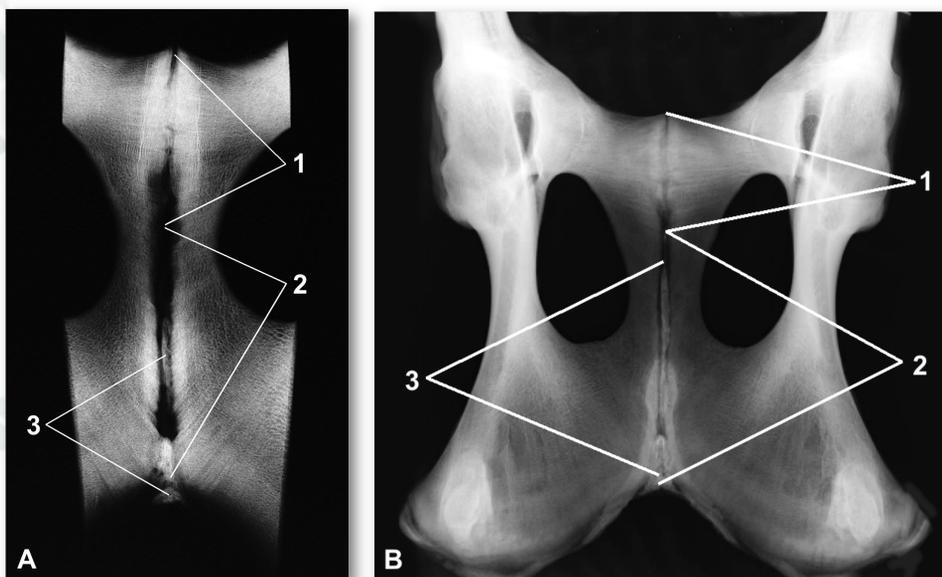
**Introduction:** From the perspective of calving, ossification of the pelvic symphysis is an important issue (Figure 1). The reports in literature on the order of ossification of the pelvic symphysis are questionable. The aim of this paper is to present the pelvic symphysis in the European elk (*Alces alces*) and in Estonian bovine breeds – Estonian Holstein Breed (EHF) and Estonian Native Breed (EN) cattle.

**Methods:** On the basis of estimated age and sex the animals were divided into four groups (juvenile and adult male; juvenile and adult female). Then the pelves have been cleaned and submitted to a biological maceration, then measured and analysed by X-ray.

**Results:** In 14-month-old bovine pelves (6) are a slightly ossified centres on the ischial arch (Figure 2A). In adult EHF bulls (3) the ischiadic symphysis and the caudal branch of the pubes are ossified (Figure 2B). In aged EHF (12) and EN (14) cows the pelvic symphysis between the caudal pubic branches is partly cartilaginous (Nahkur et al., 2011). In 5.5-year-old and older elk cows (15) the ischial bones can partially fuse. Ossification continues between the cranial pubic rami and between the ischial rami, but cartilaginous tissue is not yet ossified between the caudal pubic rami (Figure 3).



**Figure 1. The pelvic floor of a 5-year-old EN cow.**  
1 symphysis pubica; 2 symphysis ischiadica; 3 os interischiadicum.

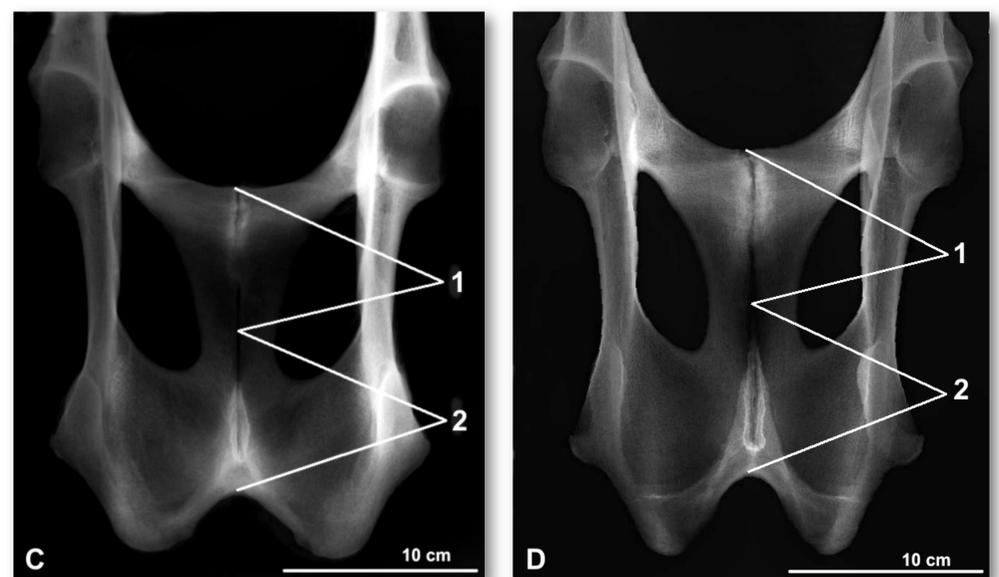


**Figure 2. X-ray image of the pelvic floor of a 14-month-old EHF heifer (A) and of the adult EHF bull (B).**  
1 symphysis pubica; 2 symphysis ischiadica; 3 ossification centres of the interischial bone.

**Conclusions:** Ossification of the pelvic symphysis begins in the ischial symphysis and continues in the cranial part of the pubic symphysis (except in EHF bulls); the space between the caudal branches of the pubes remain cartilaginous. In EHF bulls, ossification of the symphysis begins in the ischial symphysis, but continues between the caudal, not cranial branches of the pubis as in female animals. In cows, slower ossification of the cranial and middle sections of the pelvic symphysis enables widening the space between the ischial spines during calving.

## References:

Dyce, K.M., W.O. Sack, C.J.G. Wensing, 2010: Textbook of Veterinary Anatomy. Fourth Edition. Saunders. Elsevier.  
Jalakas, M., 2006: Veise tiinuse ja sünnituse patoloogia. Pathology of bovine pregnancy and parturition. Tartu: Eesti Maaülikool, pp. 124–174.



**Figure 3. X-ray images of the pelvic floor of a 7.5-year-old pluriparous elk cow (C) and a bull of the same age (D).**  
1 symphysis pubica; 2 symphysis ischiadica.

Thus the process, as reported in literature, that in ruminants the direction of ossification in the pelvic symphysis is from the pubic symphysis to the ischial symphysis (Dyce et al., 2010), is not valid for the studied species.

The ossification centres, located in the ischial symphysis, form the new structure – the interischial bone (*os interischiadicum*; Jalakas, 2006; Nahkur et al., 2013).

Nahkur, E.; E. Ernits; M. Jalakas; E. Järv, 2011: Morphological Characteristics of Pelves of Estonian Holstein and Estonian Native Breed Cows from the Perspective of Calving. Anatomia, Histologia, Embryologia: J. of Veterinary Medicine Series C, 40(5), 379–388.

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