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# SEX-RELATED CHARACTERS IN THE PELVIC BONE OF DOMESTIC SHEEP (*OVIS ARIES* L.)

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**ABSTRACT:** The os pelvis, in particular the thickness of the symphyses, the caudal angle between the ossa ischiae and the morphology of the os ilium from a collection of sheep with known age and sex has been examined. In ewes the os pubis develops the pecten ossis pubis as the animals become older. In rams and wethers this bone will increase in thickness although in the latter such development will be more moderate than in rams. In females the angle between the ossa ischiae will become larger with age whereas in males it will become smaller. These characters will prove of use in the analysis of sheep remains from archaeological sites.

**KEYWORDS:** SHEEP, PELVIS, DIMORPHISM, MORPHOLOGY, CASTRATION

**RESUMEN:** El trabajo analiza, en una serie de ovejas de edad y sexo conocido, la morfología de la pelvis especialmente en lo referido al grosor de la sínfisis, el ángulo caudal entre los huesos isquiáticos y la forma del ilion. En las hembras el pubis desarrolla el pecten ossis pubis a medida que el animal crece. En moruecos y carneros este hueso aumentará su grosor si bien en los segundos tal desarrollo será más moderado que en los primeros. En las hembras el ángulo inter-isquiático aumenta con la edad mientras que en los machos se opera el proceso inverso. Estos caracteres resultarán de utilidad al analizar muestras de ovino en yacimientos arqueológicos.

**PALABRAS CLAVE:** OVEJA, PELVIS, DIMORFISMO, MORFOLOGÍA, CASTRACIÓN

## INTRODUCTION

For more than ten years a flock of gotlandic sheep has been kept at the Historical-Archaeological Research Center in Lejre, Denmark. Although the main purpose for keeping these animals was for the outdoor museum to resemble a real Iron Age farm, the sheep were also raised to become the basis of a comparative skeleton collection housed at the Zoological Museum of Copenhagen. A number of young males were castrated at different ages in order to monitor possible morphological changes on their skeleton. Up until now, 66 specimens of known sex and age from this breed have been collected. Of these 31 are males, 22 females and 13 wethers.

Partial results concerning tooth eruption, closure of epiphyses and the influence of castration on horncores have been reported elsewhere (Hatting, 1975, 1983). In this paper we will comment briefly on a series of morphological changes recorded on the pelvic bones as they relate to the castration of the specimens.

## RESULTS AND DISCUSSION

A series of morphological features of the pelvis of sheep, on top of size, is known to be greatly influenced by both age and sex of the specimen as has been pointed out in studies such as those of Boessneck, Müller & Teichert (1964). Though the aim of this study was to focus on interspecific differences it did stress that the difficulties implicit in finding measurable characters were considerable so that a reliable assignal must take into account more than a single trait.

**A. The os pubis**

Sexual dimorphism in the os pubis is quite ample. Its thickness, for example, as recently evidenced by Barbara West (1988) is of variable magnitude, being thin in females, very thick in males and with an intermediate development in wethers.

These differences become more obvious when measurements are set up according to ontogenetical stages. In young individuals from both sexes this bone has a moderate size. With age in females the bone will become thinner and more so if the animal has been lambing. Eventually the female pelvis develops a "pecten" (Figure 1b, 1). In rams the os pubis will become progressively more robust and will develop a heavy ridge on its ventral margin (Figure 1c, 2). In wethers the bone will not be so robust and will not develop such rigde on its ventral margin (Figure 1d, 2). As a result of this the pelves of rams and ewes will progressively differ with increasing age whereas the wethers will lie between them (Figure 2).

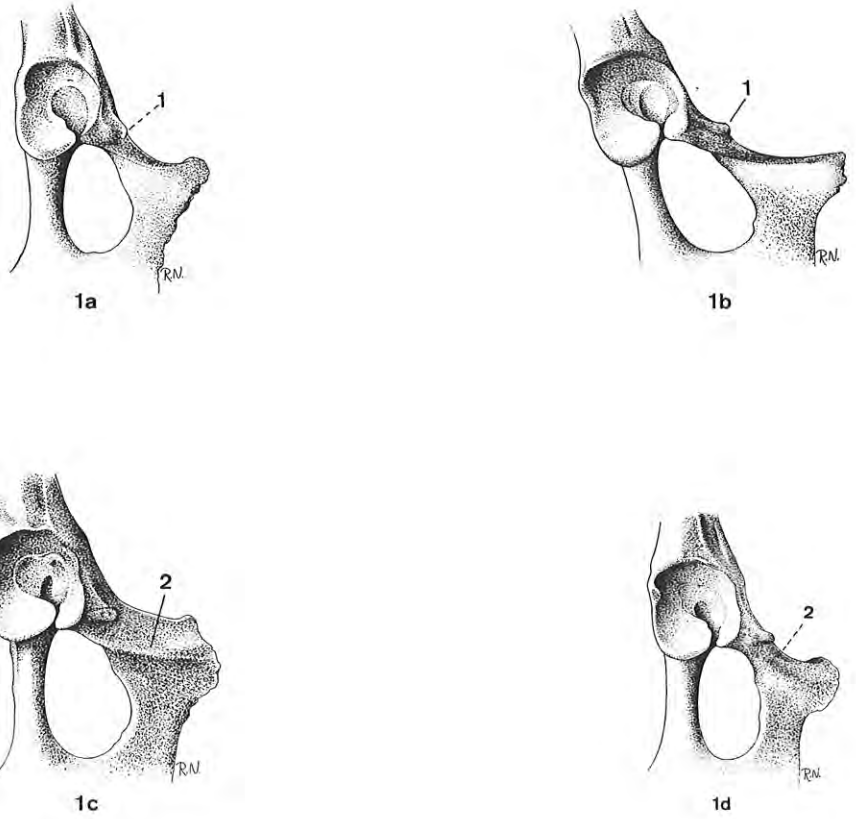


**FIGURE 1.** Central part of the pelvis (caudal view) [1, the pecten (a flat bony plate); 2, ventral ridge]. **a.** Young female, 1½ year old (dotted line indicates an incipient pecten). **b.** Old female, 2½ years old. **c.** Ram, 4 years old. **d.** Wether, 3 years old, castrated around the age of 3 weeks (dotted line indicates a poorly developed ventral ridge).

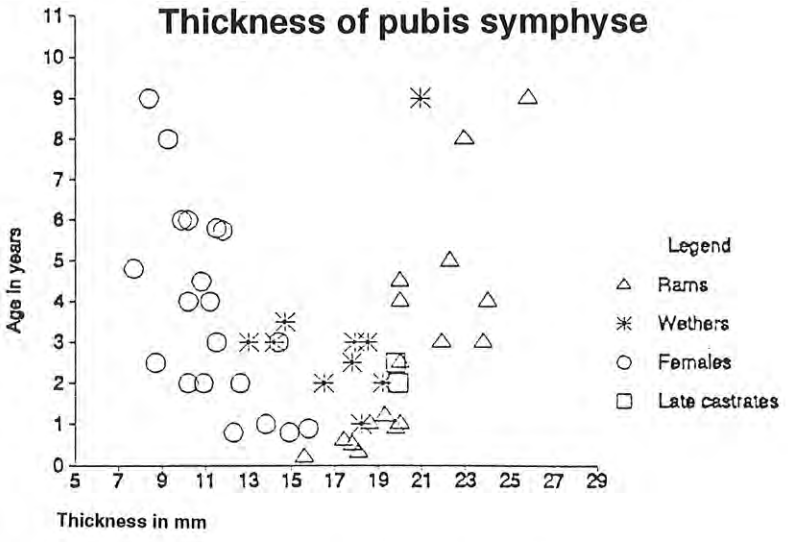


**FIGURE 2.** Thickness of the pubic symphysis plotted against age.

**B. Interischiatic angle** (Figure 4)

In young individuals (less than 1 year) the caudal angle between both ischium bones reaches about 85°. This angle will become larger in females with increasing age and oscillates between 85° and 110°. In contrast, in rams the angle will become smaller oscillating between 80° and 45°. In castrates the angle will become acute as in rams but never quite as small (Figures 3 and 4).

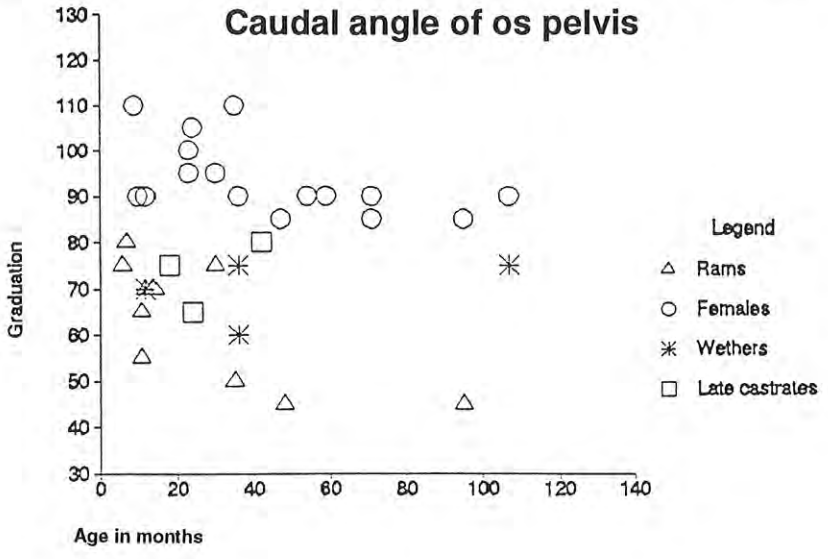


**FIGURE 3.** The interischiatic angle plotted against age. (Late castrates refers to individuals castrated more than half a year after being born).

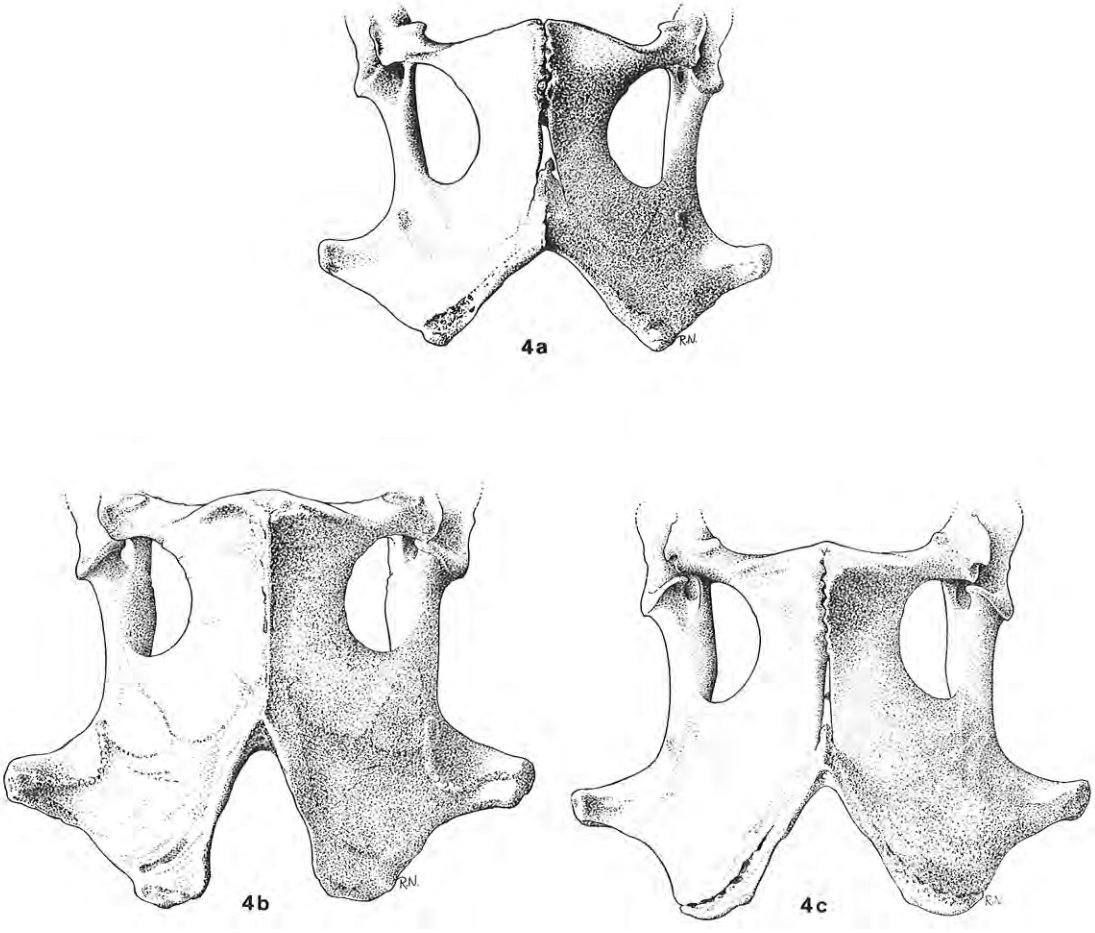


**FIGURE 4.** Caudal part of the os pelvis (caudal view). **a.** Female, 2½ years old. **b.** Ram, 4 years old. **c.** Wether, 3 years old, castrated around the age of 3 weeks.

### C. Os ilium

Sex-related nonmetric characters can be seen in the cranial portion of the pelvic bone. In young individuals the os ilium has a triangular outline but in females the dorsal angle will become acute with increasing age. In rams this angle will be obtuse and the bone will grow heavier (Figure 5c). In wethers, although the angle tends to be more or less acute, the shape of the bone depends on the age at which the animal was castrated. In this way, males castrated at a very early age will exhibit feminine looking ilia (Figure 5e) whereas ilia from males castrated at later stages will be much more masculine in their morphology (Figure 5d).

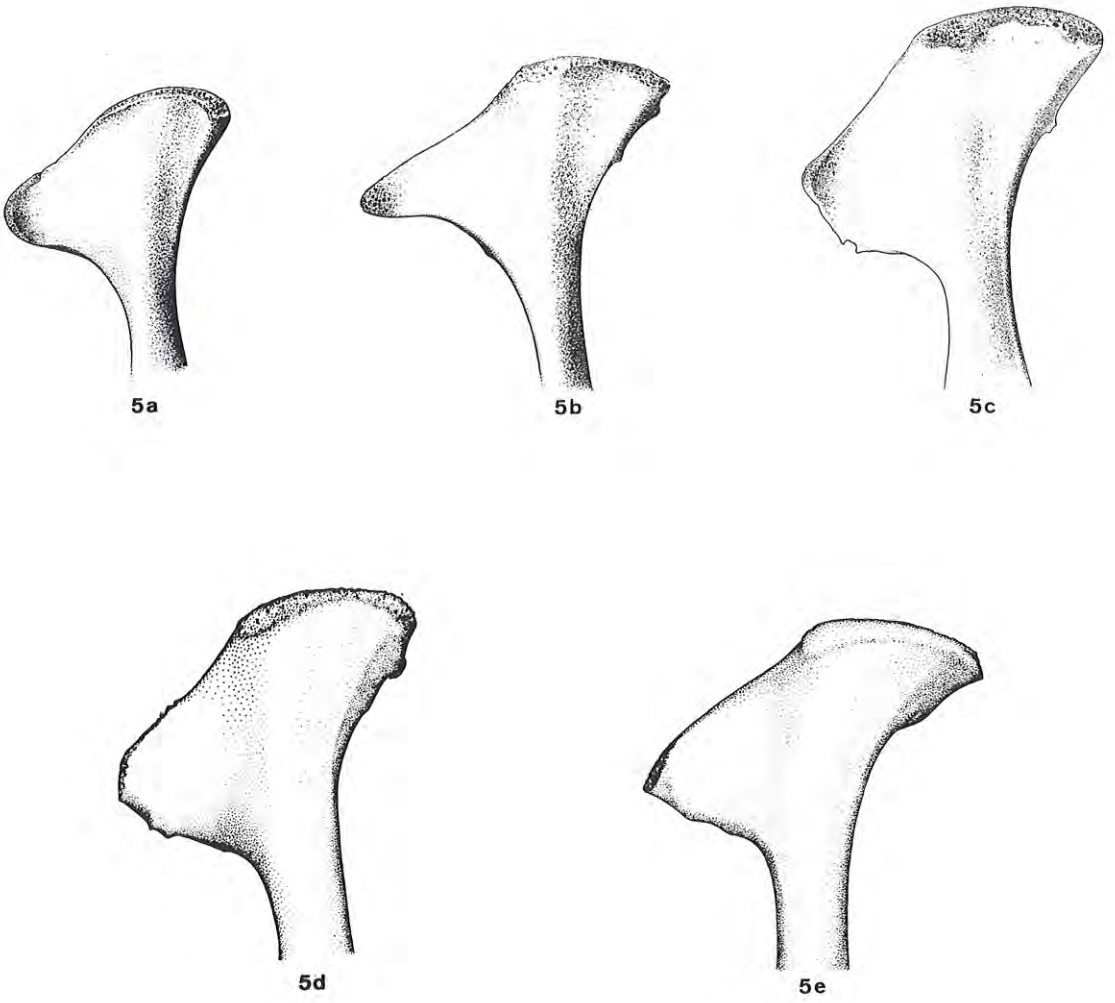


**FIGURE 5.** Os ilium (lateral view). **a.** Female, ½ year old. **b.** Female, 2½ years old. **c.** Ram, 4 years old. **d.** Wether, 3 years, castrated at the age of 1 month. **e.** Wether, 9 years old, castrated at the age of 1 week.

## CONCLUSIONS

To decide whether a particular pelvic bone derives from a castrated animal one has to rely on several characters. The shape of the os pubis, the os ischium and the os ilium show more softly outlook on the castrates than on the non-castrates. Individuals castrated too late will exhibit more masculine characters than individuals castrated early. In young individuals there will be no sexually dimorphic differences in the morphology of the pelves.

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