

population living in a restricted area of the Central Apennines. Therefore the low morphological variability of such a population probably does not allow a good knowledge of the features of the original *ornata* subspecies. The data relevant to the morphology of the fossil representatives of *ornata* would help to evaluate better the taxonomic significance of the osteologic features of this subspecies.

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CHAPTER 3

Reclassification of the Serows and Gorals (*Nemorhaedus*: Bovidae)

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Abstract

Studies of museum specimens of serows and gorals suggest that the two groups should be assigned to one genus, *Nemorhaedus*. Of serows, there are three species, *N. sumatraensis*, *N. swinhoei*, and *N. crispus*. The more specialised gorals include three species provisionally, *N. baileyi*, *N. caudatus*, and *N. goral*.

Introduction

The serows and gorals are probably the most primitive living caprine bovids. Their classification has been summarised most recently by Haltenorth (1963) and Dolan (1963). We here present conclusions from our own revisionary studies, based on the examination of skins and skulls in American and European museums.

Generic Status

Serows and gorals are usually assigned to separate genera, *Capricornis* Ogilby, 1837, and *Nemorhaedus* (*Naemorhaedus* Hamilton Smith, 1827 — but this is a misspelling). Gorals and serows differ consistently in some characters, particularly features

of the skull (Pocock, 1910). These differences are somewhat obscured by the contrasting proportions of the small and large-sized serows. Some of the apparent resemblances between the small serows and gorals (Pocock, 1908) may be regarded as superficial, for they relate to similarity in size.

Compared with serows, gorals have the facial part of the skull more flexed relative to the cranial part. The crista facialis (upper edge of masseter muscle origin) is more marked and extends further up on the face, pinching in the skull below the orbits, and ending in a prominent masseteric knob. The premaxillae are more robust and are parallel rather than converging distally. Most strikingly, the nasals are usually quite separate from the lacrimals and maxillae, producing a deep nasal notch; the nasofrontal suture takes a different form; and the nasal branches of the premaxillae are much longer. These cranial differences probably reflect feeding specialisations. In addition, the lacrimal in gorals is narrowed dorsoventrally and shows little sign of a fossa, and the frontals form short, stout, tapering pedicles, so that the horn core bases are further from the orbital rim. All these differences appear to be derivative, and so are characteristics of the skin (reduced rhinarium, reduced preorbital glands, specialised interdigital glands).

Phylogenetic Problems

Gorals could have evolved from a species of serow, or the two groups of species could have evolved from a common ancestral taxon. The first hypothesis seems preferable, for some suggestive resemblances between the small serows and gorals remain when size similarities are taken into account. There is evidently a case for merging the genera *Capricornis* and *Nemorhaedus*, the latter name having priority.

Species of *Nemorhaedus*

N. (C.) sumatraensis (Figure 3.1)

The serow is the largest species of the genus, with very long ears, long limbs, a prominent neck mane, very coarse pelage, and a long prognathous skull. Subspecies are *sumatraensis* (synonym

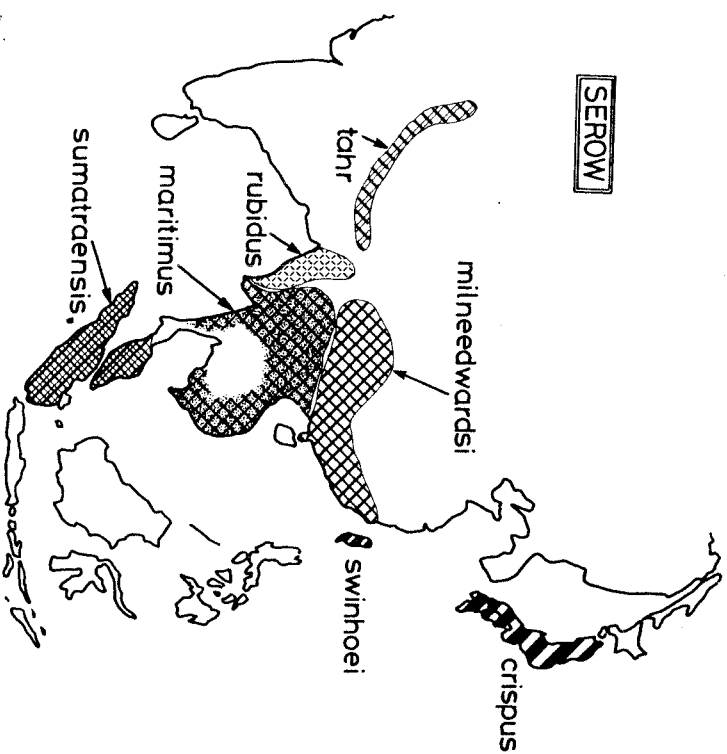


Figure 3.1: Distribution of the Serows *Nemorhaedus crispus*, *N. swinhoei* and *N. sumatraensis* with its Subspecies

swetenhami) of Malaya and Sumatra; *maritimus* (*annectens*), Indo-China, Thailand, and Burma; *milneedwardsi* (*argyrochaetes*, *montinus*), China; *rubidus*, southern Burma; and *tchr* (*rodoni*, *humei*, *janrachi*), Himalayas. Synonyms given in this paper are for subspecies which were still regarded as valid by Haltenorth (1963). Distribution and geographic variation are fairly continuous and the subspecies intergrade. They differ in size, colour of the mane, and intensity of pigmentation. (Figure 3.1)

N. (C.) swinhoei (Figure 3.1)

The Formosan serow, endemic to Taiwan, is one of the two smaller and monotypic species of serow. Its pelage is much softer than that of *N. sumatraensis*, it does not have a mane, and the

ears are relatively shorter. A characteristic of this species is that even in relatively young adults, the upper edge of the lacrimal fossa usually forms a much more trenchant ridge than in other serows. The structure of the foot glands is not known.

N. (C.) crispus (Figure 3.1)

The Japanese serow of Honshu, Shikoku, and Kyushu is about the same size as *N. swinhoei*, but has much longer, softer hair, which forms a ruff on the neck, and still shorter ears. The narial notch is deeper than in other serows, with a longer nasal process of the premaxilla. The pedal glands are more specialised than in *N. sumatraensis*. These characters all suggest resemblances to the gorals. *N. crispus* is however unique in the large size of its cheek teeth.

N. (Nemorhaedus) baileyi (Figure 3.2)

The red goral is restricted to a small area of Burma, India, and China where these countries meet. The skin of the type specimen of *baileyi* is very similar to the specimens used for the description of another nominal species, *N. cranbrooki*, by Hayman (1961a) and was obtained just to the north of where *cranbrooki* has been observed. We believe that there is little doubt that the two taxa are conspecific. The skull of the type *baileyi* (Hayman, 1961b) resembles that of the other goral, except in the nasal region, where the nasal bones make a broad transverse suture with the frontals (as in serows), and are broadened proximally where they make extensive contact with the lacrimals. On one side, there is a trace of a suture separating this lateral flange of the nasal from the nasal bone proper, suggesting a separate centre of ossification in the formation of the bone. The condition appears to be intermediate between that of the serow *N. crispus* and the Chinese goral. Only a single skull assigned to *cranbrooki* has been described, and although fragmentary, the sutures appear to be more like the condition in other gorals (Hayman, 1961b).

Until the range of variation in skull characters of red gorals is known, two subspecies are recognised, *baileyi*, known so far only from Chinese Tibet, and *cranbrooki* of Assam and Upper Burma. *N. baileyi* separates other populations of gorals into a western Himalayan group, and an eastern Chinese group. No intergradation between these three is known and their morphological variation is greater than in the equally widespread *N.*

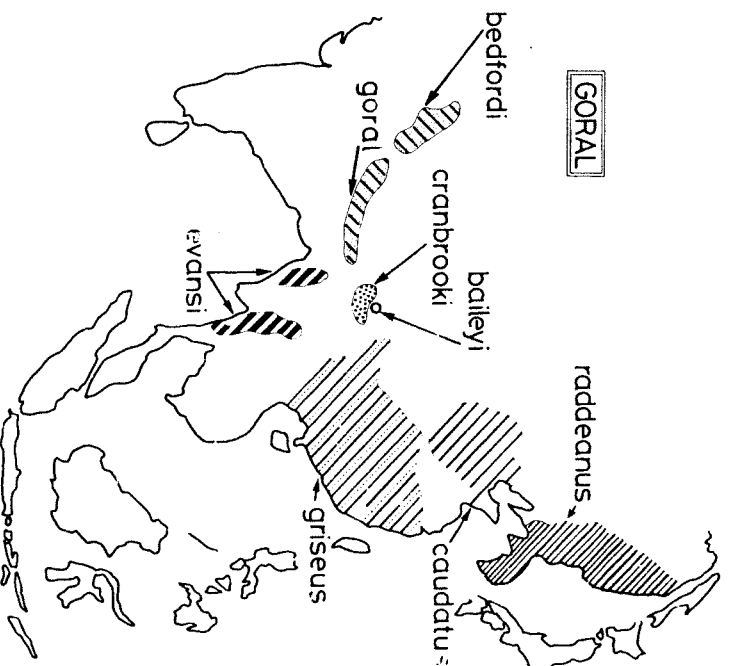


Figure 3.2: Distribution of the Gorals *Nemorhaedus caudatus*, with Subspecies *caudatus*, *griseus*, *raddaenus* and *evansi*; *N. baileyi*, with Subspecies *baileyi* and *cranbrooki*; *N. goral*, with Subspecies *goral* and *bedfordi*

sumatraensis, so provisionally three species of goral are recognised.

N. (N.) caudatus (Figure 3.2)

This is the grey Chinese goral, which differs from the Himalayan in usually having longer pelage, especially in the race *raddaenus*, and a long tufted tail. The narial notch is often partly filled with wormian bones, while the frontal region of the skull is more inflated. Subspecies are *evansi*, a small race of Burma and Thailand, and *griseus* (*arnouxianus*), *caudatus*, and *raddaenus*, all of China, the last-mentioned extending into the Soviet Far East. Wolf (1976) was unable to breed from *griseus* × *raddaenus*

hybrids and so assumed that they were sterile and that the two kinds of goral are not conspecific. But *N. c. caudatus* as far as known is intermediate in pelage between the two, so Wolf's conclusions need further investigation.

N. (N.) goral (Figure 3.2)

The Himalayan goral is if anything more specialised than *N. caudatus*. The skull is flatter, with a less convex facial region, the nasal notch is deeper and never partly filled with wormian bones, and the masseteric ridge rises further up on the face, pinching in the skull more strongly. These characters are not absolute ones, but do apply to series of specimens. Two subspecies are recognisable, *bedfordi* ('goral') in the western Himalayas, and *goral (hodgsoni)* in the east.

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CHAPTER 4

Notes on the Taxonomy of the Tatra Chamois (*Rupicapra rupicapra tatrica* Blahout)

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Abstract

Skulls and horns of 92 male and 40 female *R. r. tatrica* from the Tatra Mts (ČSSR) were analysed morphometrically to evaluate its subspecific status. Most characters showed sexual dimorphism. The shortcomings of the nasolacrimal fissure as a systematic character were demonstrated. For both sexes, most cranial dimensions of *R. r. tatrica* were significantly greater than those of the nominate subspecies, *R. r. rupicapra*.

Introduction

The chamois of the Tatra Mts, the only high mountains in Czechoslovakia, were described as a separate subspecies, *R. r. tatrica* by Blahout (1972). This is the northernmost autochthonous chamois population and the numbers of this mammal, rare in our fauna, have declined alarmingly in recent years (total population, 730 heads). Having examined more material than that available to Blahout, we obtained supplementary data and also evaluated males and females separately. Detailed results of this study have been published elsewhere (Hrabé & Kubek, 1984; Kubek & Hrabé, 1984). This is a short communication, reporting on the major results.