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SPERMOPHILUS FROM THE "CITELLUS ZONE"
OF THE LATE QUATERNARY OF THE CENTRAL GREAT PLAINS

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There is an abundance of the fossilized remains of the genus *Spermophilus* in the "Citellus Zone" of the Late Quaternary of the Central Great Plains and adjacent regions. Many of these fossils have been identified as belonging to the *S. richardsonii* complex, and appear to differ morphologically from their Recent descendants. The forms from the "Citellus Zone" appear to date back at least 28,000 years before present and may represent a new species. Among the specimens studied is a single complete skeleton including the baculum. The baculum seems typical of members of the complex. A close comparison of the baculum of the fossil specimen with the bacula of the Recent *S. r. elegans* and *S. r. richardsonii* suggests that the Recent forms are somewhat derived from the more primitive fossil form.

† † †

INTRODUCTION

Fossil big-eared ground squirrels of the *Spermophilus richardsonii* complex (Nadler, et al., 1971) are known from Wyoming, South Dakota, Nebraska, Kansas, and Oklahoma as well as from southern Alberta (Harrington, 1978). Recently such fossils have been reported from west of the Continental Divide in Power County, Idaho (McDonald and Anderson, 1975). The Pleistocene record of these ground squirrels seems quite complete. Extensive studies have been conducted of Middle and Late Pleistocene deposits in Oklahoma, Texas, eastern Kansas, Missouri, Iowa, and eastern and northern South Dakota. None of these areas, though yielding ground squirrels of other species, have produced members of this complex. In addition, the area to the north of this range was

heavily glaciated throughout much of the Middle and Late Pleistocene, making it uninhabitable for ground squirrels. To the west, the fossil record is much less complete and it is conceivable that the range of these squirrels extended westward to the mountains of Colorado. The evidence indicates that the fossil members of the *S. richardsonii* complex occupied a range considerably different from the range the complex occupies today. Neuner (in manuscript) demonstrates that the Pleistocene members of this complex differ morphologically from their Recent descendants and are, in fact, a separate species which gave rise to the Recent forms at the end of the Pleistocene (11,000 years B.P.).

MORPHOLOGIC EVIDENCE

Among the fossil specimens studied was a single complete skeleton (UNSM 47610) including the baculum* (Fig. 1) collected from the "Citellus Zone" (Schultz, 1934) of Lincoln County, Nebraska. Burt (1960) states of the bacula of *S. r. richardsonii* and *S. r. elegans*, "... we have a rather unusual situation in regard to the structural differences in the bacula—differences greater than normally found between species." On the fossil baculum (Fig. 1) there are nine tooth-like projections on

*Baculum (from *Latin*, meaning "staff" or "stick"—a slender bone that supports the rigidity of the penis in certain mammals, including insectivores, bats, rodents, and primates except man).

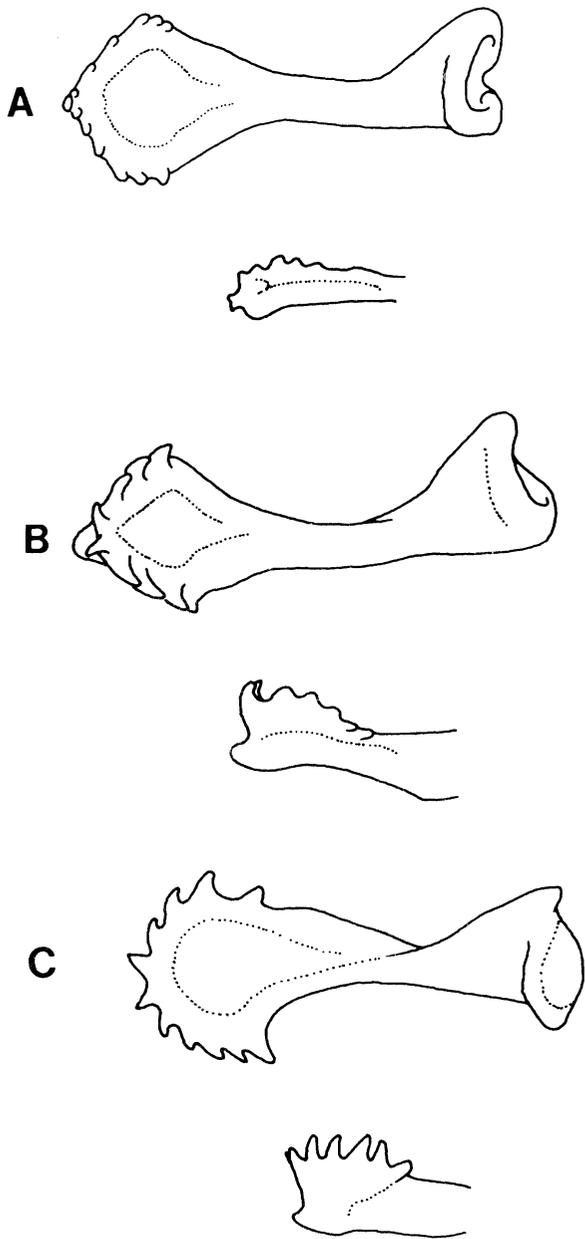


Figure 1. Bacula of *S. richardsonii* and *S. elegans* (Burt, 1960), and fossil baculum from "Citellus Zone". (A—*S. richardsonii*; B—fossil; C—*S. elegans*.)

the expanded, spoon-shaped distal end with a terminal ventral keel below the bowl of the "spoon." It has a length of 3.11 mm; the expanded distal end is 1.25 mm in width and the expanded base, 1.00 mm.

A close comparison of the baculum of the fossil specimen with the bacula of Recent *S. r. elegans* and *S. r. richardsonii* (see Fig. 1) reveals that these Recent forms are somewhat derived from the more primitive fossil specimen. Ground squirrels and prairie dogs are primitively united in having teeth on the expanded, spoon-shaped distal end of the bacu-

lum. A strongly developed ventral keel is common throughout the Sciuridae. The shaft is often twisted as if the distal end had been turned counter clockwise to the base of the baculum. The fossil specimen retains all of these primitive characters.

In *S. r. richardsonii*, the twist of the shaft has been reduced and all but eliminated. The teeth are small, relatively smooth, irregularly placed, and in some cases absent. The ventral keel is reduced to a knob on the ventral edge of the "spoon."

In *S. r. elegans*, the twist of the shaft has been increased, the teeth are much sharper and better defined; the ventral keel, while still present, has been reduced and no longer protrudes beyond the distal end of the baculum.

The derived features of the bacula of the Recent forms of the *S. richardsonii* complex are consistent with the hypothesis that the fossil member of this complex differed from the two modern forms and gave rise to both.

THE AGE OF THE "CITELLUS ZONE"

The study of vertebrate faunas associated with the Sangamon paleosol complex has long been of interest to vertebrate paleontologists. The chief fossiliferous zone, however, is on top of the Sangamon, and Schultz (1934) reported that the fossils were derived from the lower four feet of the Peorian loess directly above the soil zone in the basal part of the Peorian. The soil zone and the Peorian gradational layer are here grouped together and called the *Citellus* Faunal Zone, because of the abundance of fossil remains of the ground squirrel *Citellus* (= *Spermophilus*) found in the zone.

The "*Citellus* Faunal Zone" or "*Citellus* Zone" is widely distributed throughout the Central Great Plains wherever the lower portion of the Peorian loess of Terraces 4 and 5 is exposed. (For Terrace-4 see: Schultz, Lueninghoener, and Frankforter, 1951; Schultz and Tanner, 1957; Schultz and Martin, 1970; Schultz and Hillerud, 1977a, 1977b, 1978; Stout, et al., 1965.) Schultz and Hillerud (1978) have considered that the "*Citellus* Zone appears to equate with all of the Gilman Canyon Formation," and Dreeszen (1978) reports the age of these deposits to be at least 28,000 to 32,000 years before the present time. That would be Late Rancholabrean in age, much later than the Sangamon. The stage of evolution of *Bison antiquus barbouri* Schultz and Frankforter, and *Mammuthus (Archidiskodon) mairi* (Barbour) from the "*Citellus* Zone" would indicate that the date is much more plausible than the 70 to 90 thousand years formerly given to the age of the beginning of the Peorian.

The first fossils reported from the "*Citellus* Zone" were found some 3½ miles south of Fort McPherson by soldiers working in Cottonwood Canyon. The discoverers of some large bones and tusks showed their finds to Professor O. C. Marsh

who was outfitting his 1873 expedition (Lull, 1913) at the Fort. Professor Marsh noted the large pieces of tusks and bones buried deeply in the loess deposits and told the soldiers that the bones and tusks belonged to an elephant-like animal called the mastodon. The soldiers immediately named the area "Mastodon Canyon," and to this day it is known locally by that name, although the bones proved to be those of mammoths. It is of interest that the fossil skeleton with the baculum (UNSM 47610) was found 62 years later (in 1935) in Mastodon Canyon in the S½ of the SW¼ of Sec. 9, T.12N., R.28W. by members of a University of Nebraska State Museum field crew. The "Citellus Zone" was first noted for its abundance of fossil ground squirrels in 1930 when a U.N.S.M. field party consisting of E. L. Blue, Frank Crabill, the late Eugene Vanderpool, and C. Bertrand Schultz (party leader) noted the abundance of the small rodent bones, teeth, and skulls in the basal part of the Peorian loess where large numbers of mammoth bones were found. The discovery locality is in "Government Pocket," a small side canyon or branch of Snell Canyon in the NW¼, Sec. 26, T. 11N., R.28W., east of Cottonwood Canyon in Lincoln County. Several specimens were collected and sent to the Museum for identification. In the 1934 report by Schultz, the specimens were identified as "Citellus" cf. *elegans* (Kennicott) after the collection was compared with the bones and teeth of Recent ground squirrels in the Division of Mammals, American Museum of Natural History, New York City. Mylan Stout and Schultz extended the geographic range of the "Citellus Zone" during the summers of 1934 and 1935. Now it is known throughout the loess regions of the Great Plains.

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