Tanner[1]

Stratigraphic Occurrences of *Teleoceras*, with a New Kimballian Species from Nebraska[2]

INTRODUCTION

Study of the evidence regarding the short-limbed rhinoceros, *Teleoceras*, from Upper Tertiary deposits of the Great Plains Area indicates that this fossil rhinoceros evolved from a relatively small animal to a large, robust form. The smallest, most primitive *Teleoceras* has been found in the Valentinian and Lower Ash Hollow sediments (Skinner, Skinner, Gooris, 1968, p. 431) and has not been adequately studied; therefore only the generic identifications are given. The largest of the species is recorded from the Kimballian (see Schultz, Schultz, and Martin, 1970, pp. 123–128 for discussion of the use of this Provincial Age name). The *Teleoceras*, as did the other rhinoceroses, became extinct on the North American continent near the close of the Kimballian. This final stage of *Teleoceras* evolution is considered to be a new species, *Teleoceras schultzi* (Fig. 1, A).

Skinner, Skinner, and Gooris (1968, p. 431) clarified a misconception of some researchers regarding the genotype material for *Teleoceras*. They pointed out that *Teleoceras major* Hatcher had priority over *Teleoceras fossiger* (Cope) and also presented evidence that the two species were collected from different stratigraphic levels. *Teleoceras major* was collected from Clarendonian, Lower Ash Hollow, deposits and *Teleoceras fossiger* was recovered from the upper portion of the Middle Ash Hollow (Hemphillian). Both *Teleoceras* and *Aphelops* are usually found in most Late Cenozoic Quarries in the Great Plains and adjacent areas, especially from the Hemphillian.

Present understanding of the stratigraphic occurrences of the Late Cenozoic succession of species for these genera is shown below:

Kimballian	*Aphelops kimballensis*	*Teleoceras schultzi* n. sp.
U. Hemphillian	*Aphelops longinaris*	*Teleoceras hicksi*
Hemphillian	*Aphelops mutilus*	*Teloceras fossiger*
Clarendonian	*Aphelops malacorhinus*	*Teleoceras major*
Valentinian	*Aphelops* sp.	*Teleoceras* sp., Skinner 1968

The interpretation used in this chart regarding the stratigraphic occurrences of *Teleoceras* is

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[2]In the present paper "Pliocene" includes the Valentinian, Clarendonian, Hemphillian, and Kimballian provincial ages, although the writers realize that the Kimballian may be equivalent to the very late Miocene of Europe. See Part 1, p. 2 of the present Bulletin for further remarks on this subject.

based mainly on the fossil evidence observed in the University of Nebraska State Museum fossil vertebrate collections.

Some objection may be raised as to the use of Hemphillian for the occurrence of *Teleoceras fossiger*. Matthew (1932, p. 435) states that *Teleoceras* is not recorded at the Coffee Ranch Locality but further indicates that it is found associated with *Aphelops* in other Pliocene deposits (Higgins Quarry B). Skinner, Skinner, and Gooris (1968, p. 431) concur that *Teleoceras fossiger* came from deposits comparable to middle Hemphillian.

The Edson Quarries of Sherman County, Kansas, have yielded *Teleoceras* remains which are comparable to *T. fossiger*. Hibbard (1934, p. 247), in his faunal assemblage from the Edson Quarries of Sherman County, Kansas, lists *Aphelops* cf. *A. mutilus* Matthew as coming from the deposits which were dated by M. K. Elias as middle Pliocene in age. More recently Frye, Leonard, and Swineford (1956, p. 30) discussed the Edson Quarry Local Fauna and its relation to the stratigraphy of the Ogallala Formation of northern Kansas. They placed the stratigraphic horizon of the Edson Local Fauna in the upper part of the Ash Hollow Member of the Ogallala Formation. They state that the Kimball–Ash Hollow contact was not present at this locality, but inferred that this contact ". . . may be only a few feet above the position of the fauna."

The faunal lists from the Edson Fossil Locality of Sherman County, Kansas, prepared by Hibbard (1935, p. 247) and reviewed by Robert W. Wilson for Frye, Leonard, and Swineford (1956, p. 30), when compared to the faunal list prepared by Matthew and Stirton (1930a, p. 172) from the Coffee Ranch Quarry, "Locality 20," indicated that there are eleven genera and species in common between these two localities.

Matthew and Stirton (1930, p. 366) make the comparison of the Hemphill County, Texas, "Locality 20" local fauna with the Snake Creek assemblage, and demonstrate that there is a distinct similarity in the vertebrate fauna from these two localities.

The composite hind foot illustrated by Matthew (1932, p. 429) from the Coffee Ranch Locality 20 is nearly identical in size to a composite hind foot from the Edson Quarry (U. K. 3817).

Teleoceras hicksi, from the upper Hemphillian deposits of Wray County, Colorado, is considered to be specifically different from *Teleoceras fossiger*. *Teleoceras hicksi* appears to be the ancestral form for *Teleoceras schultzi*. Two Nebraska specimens, a skull, U.N.S.M. 62095, and lower jaw, U.N.S.M. 62099 (Fig. 1, B) from U.N.S.M. Coll. Loc. Gd–104, have been referred to *Teleoceras hicksi*.

SYSTEMATIC DESCRIPTIONS

Class:	MAMMALIA
Order:	PERISSODACTYLA
Family:	RHINOCEROTIDAE
Genus:	*Teleoceras*

Teleoceras schultzi,[3] new species

Holotype.—U.N.S.M. 5800, left mandibular ramus with I, P_3-M_3 (Fig. 1A, Table 1). Lacks portion of ascending ramus and condyle.

Type Locality.—U.N.S.M. Coll. Loc. Ft–40 = "*Amebelodon fricki* Quarry," (E. ½, SW. ¼, SE. ¼, Sec. 15, T. 5N., R. 26W.), 8 mi. N. and 5 mi. W. of Cambridge in Frontier County, Nebraska.

Stratigraphic Occurrence.—Upper Pliocene, Ogallala Group, Kimball Formation, Sidney Member from channel deposits which rest on upper part of Ash Hollow Formation.

Paratypes.—Skull, partial, lacking frontal-nasal area on both sides and dental series anterior to upper molar two, U.N.S.M. 62103; skull fragment, occipital portion with posterior half of left zygomatic arch, U.N.S.M. 62098.

Locality of Paratype Specimens.—U.N.S.M. 62103 and U.N.S.M. 62098 are from U.N.S.M. Coll. Loc. Ft–40 (E. ½, SW. ¼, SE. ¼, Sec. 15, T. 5N., R. 26W.), 8 mi. N. and 5 mi. W. of Cambridge in Frontier County, Nebraska.

[3]Named in honor of Professor C. Bertrand Schultz, Curator of Vertebrate Paleontology, University of Nebraska State Museum, and Director of the Museum, 1941–1973.

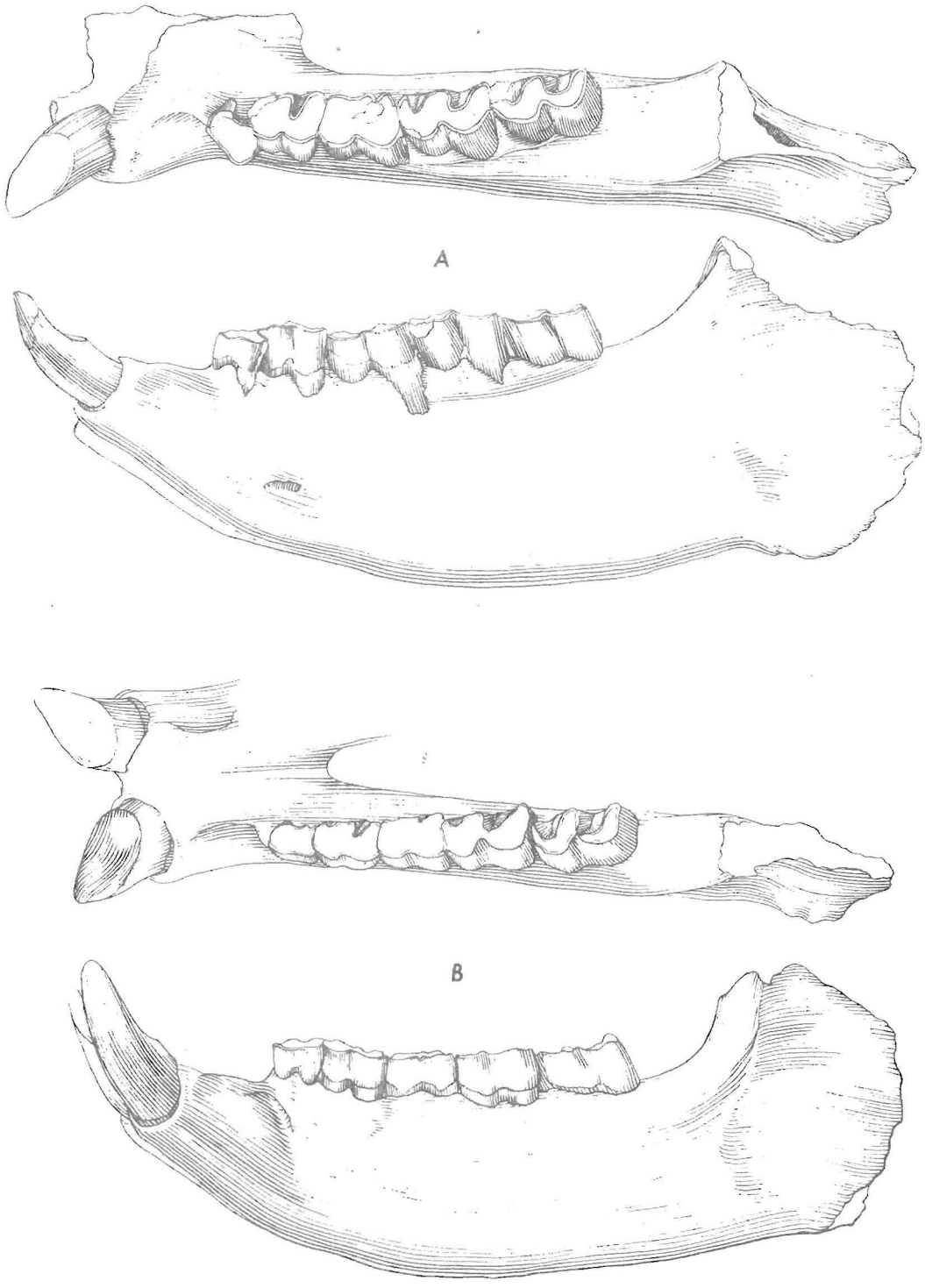

Fig. 1—Mandibular rami (occlusal and labial views): A, *Teleoceras schultzi*, new species, holotype, U.N.S.M. 5800, Kimball Formation, Ogallala Group (Pliocene), Frontier County, Nebraska; B, *Teleoceras hicksi*, referred, U.N.S.M. 62099, left mandibular ramus, upper part of Ash Hollow Formation, Ogallala Group (Pliocene), Garden County, Nebraska. X 1/4.

TABLE 1
Teleoceras
COMPARATIVE MEASUREMENTS[1] OF MANDIBULAR RAMI

MANDIBULAR RAMI	*T. schultzi* n. sp. Holotype U.N.S.M. 5800	*T. hicksi* Holotype Denver Musem Nat. History 304
Total length of lower dental series	238.0*	258.0*
Total length of lower molar series	165.0*	173.0*
Total length of diastema in front of P_3	55.0*	56.0*
Depth of jaw below M_2	145.0	98.0
Depth of jaw below P_3	128.0	78.0
P_3 greatest anteroposterior diameter	35.8	
P_3 greatest transverse diameter	23.0	
P_4 greatest anteroposterior diameter	44.5	
P_4 greatest transverse diameter	37.0	
M_1 greatest anteroposterior diameter	48.7	
M_1 greatest transverse diameter	38.4	
M_2 greatest anteroposterior diameter	60.0	
M_2 greatest transverse diameter	37.0	
M_3 greatest anteroposterior diameter	59.0	
M_3 greatest transverse diameter	40.0	

[1]The measurements are taken to the nearest millimeter except on dentition where they are measured to the nearest one-tenth of a millimeter.
*These diameters vary considerably with maturity, as interstitial wear from crowding is considerable.

Diagnosis.—A species of *Teleoceras* slightly larger than *T. hicksi* Cook; upper dentition more complicated; skull more brachycephalic and having a relatively wider basio-occipital region.

The holotype ramus, U.N.S.M. 5800, is more robust than *Teleoceras hicksi*. The length of the lower dental series is not a diagnostic characteristic, as crowding and interstitial wear vary with the stage of maturity. The tooth pattern is relatively simple and the cingula, as in all Late Pliocene *Teleoceras*, are very weak to absent. The lateral incisor is worn through attrition with the opposing upper incisor (see Fig. 3). The most diagnostic characteristics for the species are the

TABLE 2
Teleoceras
COMPARATIVE MEASUREMENTS OF SELECTED POST-CRANIAL MATERIAL

POST-CRANIAL MATERIAL	*T. schultzi* U.N.S.M. 62087 radius	*T. schultzi* U.N.S.M. 62088 radius	*T. fossiger*, ref. U.N.S.M. 62084 radius	*T. schultzi* U.N.S.M. 62090 tibia	*T. schultzi* U.N.S.M. 62090 fibula	*T. schultzi* U.N.S.M. 62102 tibia	*T.* sp. U.N.S.M. 62101 tibia
Length (maximum)	270	295	245	268	203	250	247
Length (articular)	245	267	228	255	224	225	218
Transverse diameter, proximal end (maximum)	104	115	90	133	47	126	118
Transverse diameter, center of shaft	60	65	41	56	30	56	54
Transverse diameter, minimum	55	61	37	56	30	56	54
Transverse diameter, distal end (maximum)	122	105	86	95	58	97	91
Anteroposterior diameter, proximal end	55	72	53	138	59	128	117
Anteroposterior diameter, center	36	40	32	67	22	52	55
Anteroposterior diameter, distal end	59	54	55	72	69	70	69

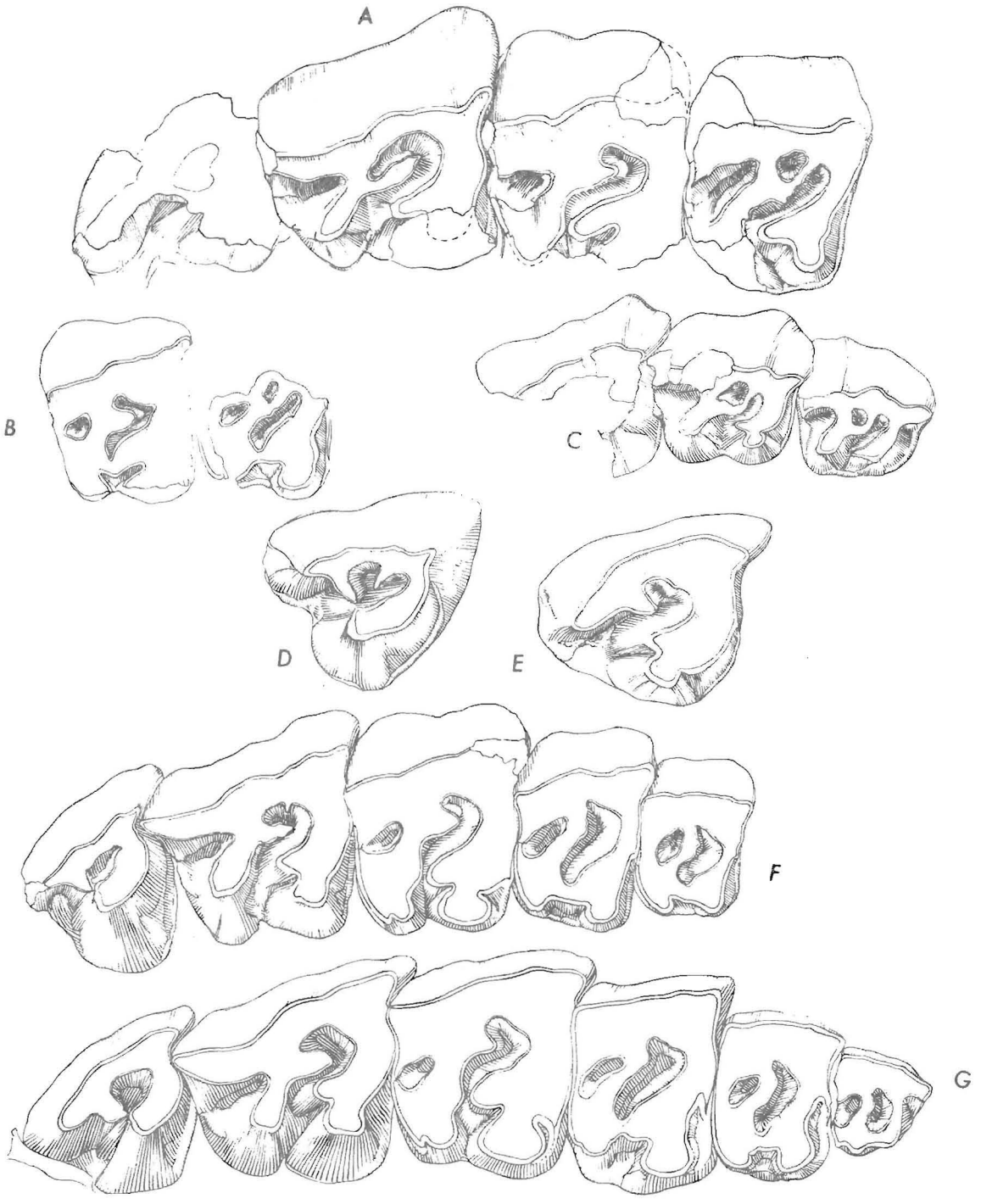

Fig. 2—Cheek teeth (occlusal views): A, *Teleoceras schultzi*, new species U.N.S.M. 62092, right partial maxillary, P^4-M^3, Kimball Formation, Ogallala Group (Pliocene), Cheyenne County, Nebraska; B, *T. schultzi*, referred, U.N.S.M. 61220, right P^4-M^1, Kimball Formation, Cheyenne County, Nebraska; C, *T. schultzi*, referred, U.N.S.M. 5817, right P^4-M^2, Kimball Formation, Frontier County, Nebraska; D, *T. schultzi*, referred, U.N.S.M. 5820, left M^3, Kimball Formation, Frontier County, Nebraska; E, *T. schultzi*, referred, U.N.S.M. 62093, right M^3, Kimball Formation, Garden County, Nebraska; F, *T. major*, referred, U.N.S.M. 62097, right P^3-M^3, basal part of Ash Hollow Formation, Brown County, Nebraska; G. *T. hicksi*, referred, U.N.S.M. 62095, right maxillary with P^2-M^3, Ash Hollow Formation, Garden County, Nebraska. X 1/2.

Fig. 3—Lateral incisors: A–C, *Teleoceras schultzi*, referred, upper lateral incisors, U.N.S.M. 62080, 5477, 62083, Kimball mation, Frontier County, Nebraska; D–E, *T. fossiger,* referred, upper lateral incisors, U.N.S.M. 62081, 62082, middle part of Ash Hollow Formation, Banner County, Nebraska; F, *Aphelops kimballensis*, referred, lower lateral incisor, U.N.S.M. 5809, Kimball Formation, Frontier County, Nebraska; G–H,*T. schultzi,* referred, lower lateral incisors, U.N.S.M. 62079, 62078, Kimball Formation, Frontier County, Nebraska; I, *Aphelops kimballensis*, referred, lower lateral incisor, U.N.S.M. 62078, Kimball Formation, Frontier County, Nebraska. X 1/2.

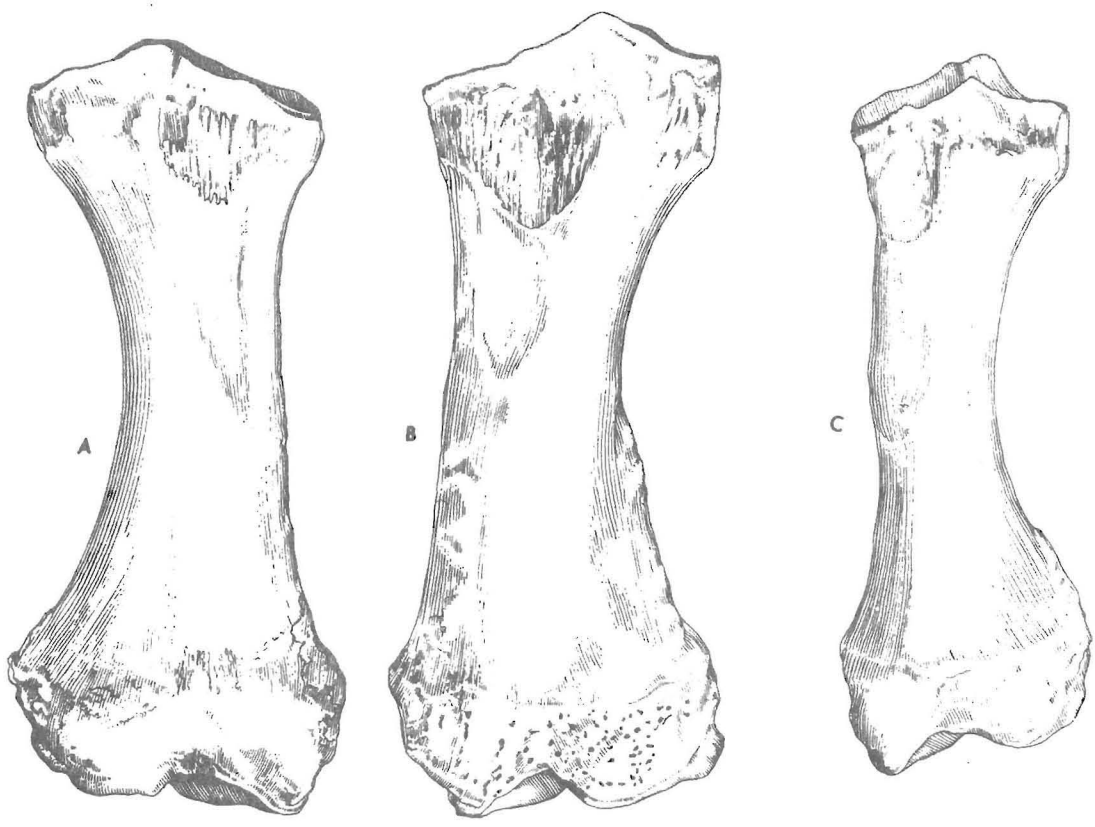

Fig. 4—Radii (anterior views): A, *Teleoceras schultzi*, new species, U.N.S.M. 62087, Kimball Formation, Ogallala Group, (Pliocene), Frontier County, Nebraska; B, *T. schultzi*, new species, U.N.S.M. 62088, Kimball Formation, Frontier County, Nebraska; C, *T. fossiger*, referred, U.N.S.M. 62084, middle part of Ash Hollow Formation, Ogallala Group, Banner County, Nebraska. X 1/3.

large, complicated upper molars shown in Fig. 2, A. This partial maxillary from the uppermost Pliocene deposits shows the fossette in the area of the protocone, and the upper dentition is relatively more hypsodont.

Teleoceras schultzi is a more specialized form and is larger than *T. hicksi* in most dimensions. The occipital portion of a skull with one zygomatic arch attached of *Teleoceras schultzi*, U.N.S.M. 62098, provides some information regarding the width of the skull of this species. The greatest transverse dimension at the zygomatic arches would be approximately 396 mm. In comparison, the like dimension of the holotype skull of *T. hicksi* (Cook, 1927) is 334 mm. (see Table 4). The type skull of *T. fossiger* measures 339 mm. across the zygomatic region. Further measurements taken on the occipital region of U.N.S.M. 62098 and U.N.S.M. 62103 indicate that this species is more brachycephalic than *T. hicksi*.

Study and comparison of *Teleoceras* post-cranial elements (Figs. 4, 5, 6) which have been collected from the Ogallala deposits indicates that the bones of *T. schultzi* are large and become relatively more massive. Table 2, see p. 26, is presented as evidence.

The radii, U.N.S.M. 62087 and 62088 (Fig. 4A-B), from the Kimballian deposits of U.N.S.M. Coll. Loc. Ft–40, are distinctly more robust and massive when compared to the radius U.N.S.M. 62084 (Fig. 4C) which was removed from deposits herein considered to be Hemphillian or near equivalent at U.N.S.M. Coll. Loc. Bn–10, Banner County, Nebraska. Like evidence can be observed regarding the larger size range of the tibiae of *Teleoceras schultzi* from the Kimballian (see Fig. 6). U.N.S.M. 62102 and the articulated tibia-fibula U.N.S.M. 62090 are from U.N.S.M. Coll. Loc. Ft–40. The selected tibia (listed in Kent, 1963, p. 108), U.N.S.M. 61331 from

U.N.S.M. Coll. Loc. Cn–105 (Cheyenne County) is slightly smaller in most dimensions, even though the deposits yielding this specimen are also considered to be uppermost Pliocene (Kimballian) in age. Other skeletal elements of *Teleoceras* from this locality, when compared to those from U.N.S.M. Ft–40 (Frontier County) are rather robust, but seem to indicate the possibility that a smaller tribe of *Teleoceras* may have lived at the same time as *T. schultzi.* Perhaps the sediments of the Cheyenne County locality are slightly younger than the deposits in Frontier County.

SUMMARY

The fossil remains of *Teleoceras* are now known to occur in deposits from Valentinian through Kimballian or throughout the Pliocene Epoch. Previous published records proposed that these forms became extinct during the middle portion of the Pliocene.

Further study of this group is anticipated in an effort to clarify the differences in relative sizes of certain of the Kimballian forms. Perhaps a dwarf tribe of Teleocerines may have been living at that time.

ACKNOWLEDGMENTS

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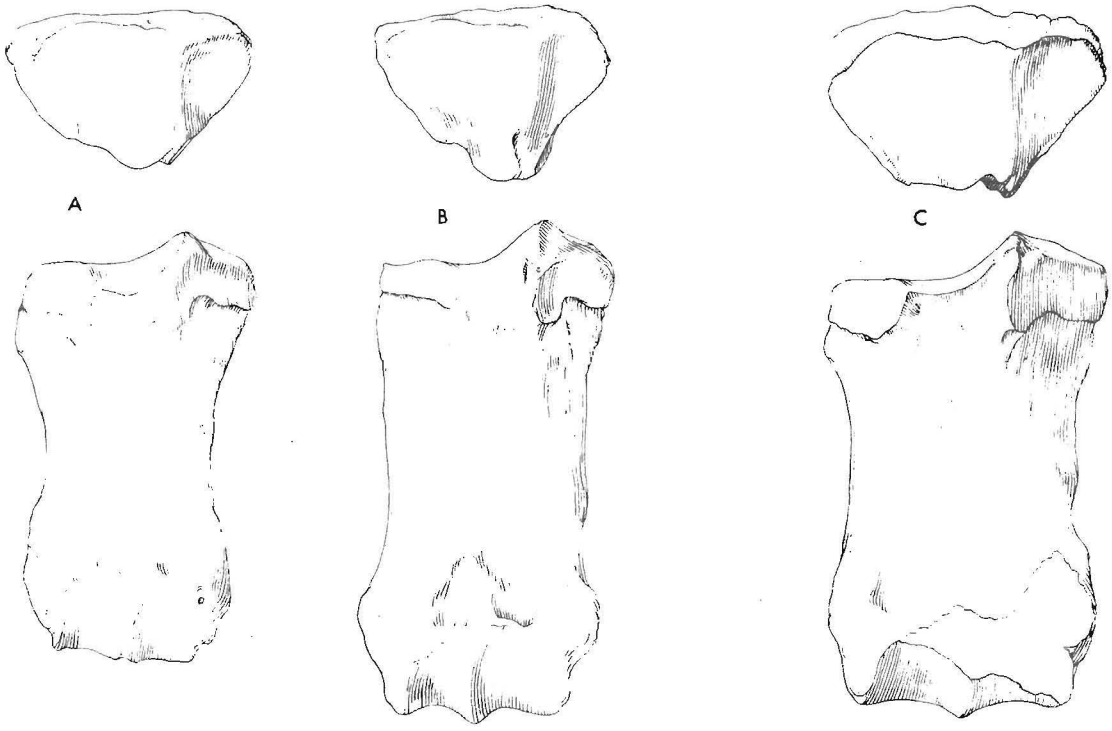

Fig. 5—Metacarpals (posterior and proximal views): A, *Teleoceras major*, referred, U.N.S.M. 62074, lower part of Ash Hollow Formation, Ogallala Group (Pliocene), Cherry County, Nebraska; B, *T. fossiger*, referred, U.N.S.M. 62077, middle part of Ash Hollow Formation, Ogallala Group, Banner County, Nebraska; C, *T. schultzi*, new species. U.N.S.M. 62076, Kimball Formation, Ogallala Group, Frontier County, Nebraska. X 1/2.

Fig. 6—A, *Teleoceras schultzi*, new species, U.N.S.M. 62090, tibia and fibula articulated, Kimball Formation, Ogallala Group (Pliocene), Frontier County, Nebraska; B, *Teleoceras* sp., U.N.S.M. 62101, tibia, Kimball Formation, Ogallala Group, Morrill County, Nebraska; C, *T. schultzi*, referred, U.N.S.M. 62102, tibia, Kimball Formation, Frontier County, Nebraska; D, *Teleoceras* sp., U.N.S.M. 61331, tibia, Kimball Formation, Cheyenne County, Nebraska. X 1/3.

TABLE 3
Teleoceras
COMPARATIVE MEASUREMENTS OF METACARPALS

METACARPALS	*T. schultzi* U.N.S.M. 62076 Metacarpal III	*T. fossiger* ref. U.N.S.M. 62077 Metacarpal III	*T. major* ref. U.N.S.M. 62074 Metacarpal III
Length (maximum)	126.5	134.3	115.5
Length (articular)	116.5	122.5	114.5
Transverse diameter, proximal end (maximum)	76	64.2	67
Transverse diameter, center of shaft	62	53.5	46.2
Transverse diameter, minimum	62	53.5	44.8
Transverse diameter, distal end (maximum)	72	64	56
Anteroposterior diameter, proximal end	51	64.2	44.2
Anteroposterior diameter, center	26	23.5	20.8
Anteroposterior diameter, keel (maximum)	(45)[1]	36.7	37.4
Distance from minimum diameter to distal end (maximum)	64.3	78.2	54

[1]( ) = approximate

TABLE 4
Teleoceras
COMPARATIVE MEASUREMENTS OF PARTIAL SKULLS

SKULLS	*T. schultzi* ref U.N.S.M. 62092	*T. schultzi* Paratype U.N.S.M. 62103	*T. schultzi* Paratype U.N.S.M. 62098	Denver [illegible]
Transverse diameter of palate at M^2, labial edges	---	260	---	[illegible]
Transverse diameter at zygomatic arch	---	387	(390)[1]	[illegible]
Transverse diameter at mastoids	---	263	294	[illegible]
M^2 anteroposterior diameter	---	55.7	---	[illegible]
M^2 transverse diameter	---	72.5	---	[illegible]
M^3 anteroposterior diameter	(46.5)[2]	63.2	---	[illegible]
M^3 transverse diameter	(40.0)	64.5	---	[illegible]
P^4 anteroposterior diameter	52.5	---	---	[illegible]
P^4 transverse diameter	70.8	---	---	[illegible]
M^1 Anteroposterior diameter	63.2	---	---	[illegible]
M^1 transverse diameter	(79)	---	---	[illegible]
M^2 anteroposterior diameter	70.2	---	---	[illegible]
M^2 transverse diameter	(71.2)	---	---	[illegible]

[1] approximate
[2] broken

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