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A New Late Miocene Herpetofauna from Franklin County, Nebraska

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A NEW LATE MIOCENE HERPETOFAUNA FROM FRANKLIN COUNTY, NEBRASKA.—Miocene deposits of Franklin County, Nebraska consist of opaline and carbonate-cemented sandstones, unconsolidated sands, and calcareous silts unconformably overlying limestones of the Niobrara Formation (Cretaceous). At its contact with Miocene deposits the Niobrara is weathered to a depth of 0.5-1 m; Miocene soil development under warm, humid conditions may be responsible for this phenomenon. Miocene-age unconsolidated sands exposed in small valleys approximately perpendicular to the Republican River produce vertebrate remains and appear to be deposits filling broad fluvial channels incised through slightly older opaline sandstones.

The fossils were wet-screened from unconsolidated, structureless and planar cross-stratified sands in the NW ¼ NE ¼ NW ¼ section 13 T1N R15 W; approx. 3.5 km south-southwest of Franklin, Franklin County, Nebraska. Approximately 14 m of medium to coarse sand with lenses of very coarse pebbly sand overlie the Niobrara at the locality. Green and brown clay pebbles are concentrated in horizons throughout the sands from about 7.5 m above the basal contact upward; these horizons produced the micro-vertebrate remains and bone fragments reported here.

Associated macrovertebrate remains allow a late Miocene (Barstovian) age assignment. *Aelurodon*, *Calippus*, *Carpocyon*, *Merycodus*, *Pseudo-*

parablastomeryx, two undetermined camelids, a rhinocerotid, and a large amphicyonid are represented. Small equid remains, relatively un-abraded, are most characteristic of the large mammal fauna. *Copemys*, *Cupidinimus*, *Domni-noides*, *Hypolagus*, a castorid, a soricid, a talpid, and an erinaceid compose the mammalian microfauna.

The only other documented late Miocene herpetofauna from south-central Nebraska is the late Barstovian Myers Farm fauna from adjacent Webster County, Nebraska (Corner, 1976). Previous to my report, *Pterygoboa miocenica* had been reported from only two other localities: Black Bear Quarry II in South Dakota, and Myers Farm (Holman, 1976, 1977). Documentation of this taxon in the Franklin County fauna provides a geographic range extension.

Unabraded remains of small, grazing equids suggests proximity of the depositional environment to an open grassland. *Geochelone* and the terrestrial lizards present in the fauna are also probable indicators of nearby grasslands. Nonetheless, some of the mammalian species (e.g., the camelids) were probably mixed feeders living in part on browse. Abundant small ictalurid pectoral spines, a *Pylodictis olivaris* pectoral spine, *Lepisosteus* scales, *Amia* and *Aplodinotus* teeth, *Trionyx* plates, and *Rana* ilia record a permanent body of water, presumably a large, sandy, low-sinuosity stream with multiple channels and gravel bars.

The following is a brief systematic account of the Franklin County herpetofauna; specimens are in the collections of the University of Nebraska State Museum (UN).

Family Ambystomatidae: *Ambystoma minshalli* Tihen and Chantell.—Material: UN 96102, two trunk vertebrae. Representing a small salamander, these vertebrae are virtually identical to the holotype of *A. minshalli* described by Tihen and Chantell (1963) from the upper Miocene of northeastern Nebraska. The Franklin County specimens have complete centra and zygopophyses, but the parapophyses have been broken off. *Ambystoma minshalli* has also been reported from Myers Farm (late Barstovian) in adjacent Webster County, Nebraska (Corner, 1976).

Family Ranidae: *Rana* sp.—Material: UN 96115, three left ilia; UN 96114, right astragalus-calcaneum. The ilia are assigned to *Rana* on the basis of the presence of an ilial blade (Holman, 1985). The astragalus-calcaneum is intermedi-

ate in slenderness between *Hyla* and *Bufo*, and is nearly identical in size and form to those of extant *R. pipiens* in comparative collections at the UN.

Family Testudinidae: *Geochelone* sp.—Material: UN 96101, partial carapace with associated limb and girdle elements. The size (approx. 43 cm wide) of the specimen is the basis for referral to *Geochelone*, which is very common in many late Miocene faunas of western North America. The specimen is within the size range of *Geochelone* (*Hesperotestudo*) specimens from the Norden Bridge Quarry (Barstovian) in the UN collections. Found in a partially articulated state, the specimen could not have been transported far and may have died in a nearby ephemeral channel of the depositing fluvial system. Large testudinids, unable to burrow for hibernation, are reliable indicators of mild climates lacking periods of subfreezing temperatures (Holman, 1971).

Family Trionychidae: *Trionyx* sp.—Material: UN 96104, three costal plates. The specimens are referred to *Trionyx* on the basis of their size, morphology, and ornamentation. Extant trionychids are strictly aquatic (Conant, 1975), and the presence of one in the fauna indicates permanent water in the area during the late Miocene.

Family Scincidae: *Eumeces* sp.—Material: UN 96113, posterior end of a left dentary with four complete teeth. Blunt, closely-packed, lingually-striated teeth are characteristic of scincids (Estes, 1963). The specimen is large (slightly larger than extant *E. obsoletus* examined), has low- and unswollen-crowned, weakly striated teeth and a very thick lingual shelf of the dentary, characters used by Holman (1975) to diagnose *E. hixsonorum*. Wellstead (1977) described a similar, but complete, dentary from Norden Bridge Quarry (Barstovian).

Family Teiidae: *Cnemidophorus* sp.—Material: UN 96103, anterior end of a left dentary with two complete teeth. The teeth are bicusate, with a small anterior cusp and a large posterior cusp; this morphology is characteristic of the anterior teeth of *Cnemidophorus* (Estes, 1963). Although comparable to *C. sexlineatus* in crown height, the specimen is approximately one-fourth larger than the largest extant *C. sexlineatus* examined.

Family Boidae: Pterygoboa miocenica Holman.—Material: UN 96107, four trunk vertebrae. Winglike processes on the postzygapophyses identify the specimens as *P. miocenica* (Holman, 1976). Previous reports are from Myers Farm (Corner, 1976; Holman, 1977), and Black Bear Quarry II (early Hemingfordian) in South Dakota (Holman, 1976).

Family Colubridae: Paleoheterodon tiheni Holman.—Material: UN 96106, trunk vertebra. The specimen is referred to *P. tiheni* on the basis of a wide and indistinct hemal keel and vaulted neural arch, the latter character differentiating the species from *Heterodon* (Holman, 1964, 1979). The vertebra is very similar to referred material from Myers Farm in the UN collections. *Paleoheterodon tiheni* has also been found at late Miocene sites in northeastern and north-central Nebraska (Holman, 1964, 1981).

Nerodia sp.—Material: UN 96110, trunk vertebra. This characteristically natricine vertebra is referred to *Nerodia* because its length and width are almost equal, producing a "boxlike" overall shape (Brattstrom, 1967; Holman, 1979).

Thamnophis sp.—Material: UN 96112, two trunk vertebrae. The provisional referral of the specimens to a species of *Thamnophis* is based on their definite identification as natricine, and their elongate morphology (Brattstrom, 1967; Holman, 1979).

Salvadora paleolineata (Holman).—Material: UN 96109, trunk vertebra. Relatively large size (among colubrids) and a distinctly narrow hemal keel enable referral to *Salvadora*. *Salvadora paleolineata* is the only recognized Miocene species (Holman, 1979). The specimen is quite similar to referred specimens from Myers Farm in the UN collections. The northern range limit of extant species of *Salvadora* is the extreme southwestern United States (Conant, 1975), hence the presence of the genus in Nebraska during the late Miocene may be another indicator of mild climatic conditions.

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BEHAVIORAL OBSERVATIONS ON THE
TRANSFER OF SPERM FROM THE MALE
TO THE FEMALE RED-SPOTTED NEWT