The silty ash from which the fossils were recovered is probably the result of reworking of pure ash containing Gopherus and Geochelone, suggesting relatively mild winters during the time of the Arkalon local fauna. It follows that the Arkalon local fauna existed during the earliest Yarmouthian (second interglacial) age.

The collective weight of the 8 males and 6 females in the litter was 9.3 grams, equaling the post-partum weight of the female. Total lengths of young were as follows: females 99-111 (mean 103.0) mm, males 105-114 (mean 109.9) mm. Average percentage tail length of total length was 15.07 in females and 18.66 in males. The average total length of males falls between that reported by Bothner and Moore (1964) and Richmond (1954).

I thank my wife, Patricia, for help in collecting, and Dr. William E. Duellman and Mr. Joseph T. Collins for reading the manuscript.

LITERATURE CITED


GEORGE R. PISANI, Museum of Natural History, The University of Kansas, Lawrence, Kansas 66044.

PLEISTOCENE TURTLES FROM THE ARKALON LOCAL FAUNA OF SOUTHWESTERN KANSAS

Collecting by the University of Michigan Museum of Paleontology field parties (1952-1969) has yielded a turtle fauna consisting of 8 species from Pleistocene deposits in Seward County, Kansas. Included is a new geologic record for the genus *Emydoidea*; the presence of this turtle implies greater humidity in the region than exists at present. The presence of two tortoises, *Gopherus* and *Geochelone*, suggests relatively mild winters during the time of the Arkalon local fauna.

The fossils are from a silty ash layer in an exposure at the Arkalon gravel pit on the south side of the Cimarron River, W 1/2 sec. 35, T 33 S, R 32 W, Seward County, Kansas. The silty ash layer is termed bed No. 8 by Hibbard (1953) in his measured section and overlies sands and gravels (bed No. 7) which contain a lens of pure Pearlette volcanic ash. The Pearlette ash is thought to have been deposited during late Kansan (second) glacial time (Hibbard, 1949; Moore et al., 1951). The silty ash from which the fossils were recovered is probably the result of reworking of pure ash by streams at a later time (Hibbard, 1953). Additional evidence that the Arkalon local fauna existed later than the time of ash deposition is afforded by the presence of mild-winter elements, the tortoises, in this fauna and the absence of such climatic indicators in the Cudahy fauna (Hibbard et al., 1965). The latter fauna is always found in intimate association and directly beneath deposits of pure Pearlette volcanic ash. Thus the Arkalon local fauna, on the basis of stratigraphic and paleontologic evidence, should be considered distinct from and younger than the Cudahy fauna. It follows that the Arkalon local fauna existed during the earliest Yarmouthian (second interglacial) age.

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All of the material is in the University of Michigan Museum of Paleontology (UMMP). The taxonomy follows the suggestions of recent studies in cryptodiran systematics (McDowell, 1964; Zug, 1966). Five of the 8 species found in the Arkalon local fauna occur in present-day Seward County, Kansas, but 3 do not: *Emydoidea* and *Gopherus* occur to the northeast and to the south, respectively. *Geochelone* is extinct in North America. The known geologic ranges in the Great Plains region are given for each species (Gehlbach, 1965; Auffenberg and Milstead, 1965; and further data based on the UMMP collections under study by the author).

Family Chelydridae: *Chelydra serpentina*. Left eleventh peripheral (UMMP V57045). Geologic range: Middle Pliocene-Recent.


*Chrysemys scripta* is represented by badly-warped fragments of plastron, the anterior part of the carapace (UMMP V48000), an isolated left seventh peripheral (UMMP V56587), and a right epiplastron (UMMP V57663). Geologic range: Late Pliocene-Recent. The epiplastra of V48000 are incomplete so affinity with the eastern (*scripta*) or western (*elegans*) Recent subspecies is not determinable. The shell-thickness index (Preston, 1966) cannot be obtained. Subjectively, shell thickness is greater than the average for Recent populations in his area; otherwise the turtle is identical with Recent *C. s. elegans*. I would assign it to the temporal subspecies *C. s. bisornata*, which I intended to mean *elegans*-like turtles from the Irvingtonian (Savage, 1951, p. 289) mammalian age (Late Kansan-Yarmouth), except that the concept of temporal subspecies has been misused both by myself (Preston, 1966) and by Weaver and Robertson (1967). In using old species names for these fossil temporal subspecies, none of us took into account the existence of geographic races during these time periods. I mentioned the race *bisornata* occurring in Texas during Late Kansan as well as in Florida at an unknown (probably late Pleistocene) time. Weaver and Robertson collectively designate all Rancholabrean (Illinoian through Wisconsin time) *Chrysemys scripta* as *C. s. petrolei* regardless of their geographic origin. This scheme has convenient features and is a respectful way to preserve old species names, but it is unnatural and will undoubtedly lead to further confusion.

*Emydoidea blandingi* is represented by the nuchal, most of the peripherals, five neurals, and most of the plastron of a single individual (UMMP V56500). The carapace is approximately the same length as that estimated by Taylor (1943) for the type specimen of *E. twentei* which consists of a nearly complete carapace. In addition, two isolated peripherals (UMMP V31824), a left third and a right eleventh, are in the collection. Geologic range: Late Pliocene-Late Sangamon (Preston and McCoy, 1971).

*Terrapene ornata ornata* is represented by a nuchal (UMMP V56588) collected and identified by Thomas M. Oelrich. The specimen was compared with Recent *T. o. ornata* as well as with two specimens of *T. o. longinsulatae* (UMMP V37184, V44648), another *ornata*-like specimen (UMMP V46757) from the Gilliland local fauna (Kansan) of Texas and late Pleistocene *ornata* material to be reported in a future paper. These late Kansan and younger specimens, including the Arkalon nuchal, are indistinguishable from Recent *T. o. ornata* and probably indicate the replacement, in Kansan time, of the older Great Plains subspecies, *T. o. longinsulatae*, discussed by Milstead (1967). Geologic range: Late Kansan-Recent.

Family Testudinidae, subfamily Testudininae: *Gopherus* sp. is represented by a pleural fragment (UMMP V57043) and a pygal (UMMP V57662). This is undoubtedly the same large species that occurs in the Gilliland local fauna of Late Kansan age in north-central Texas (Preston, 1966). It most closely resembles *G. polyphemus* although much larger in average size. A complete plastron from the Gilliland local fauna is figured in my 1966 paper and demonstrates the affinity with *G. polyphemus* as opposed to the larger Recent species, *G. flavomarginatus*, from bolsons in north-central Mexico. In particular, the interhumeral seam is longer than the intergular seam in the Gilliland species. Geologic range: Early Pleistocene-Yarmouthian.

*Geochelone* (*Hesperetestudo*) cf. *G. johnstoni* is represented in the Arkalon material by two peripherals (UMMP V47999, V56589). The right third peripheral (V56589) is identical to the same element in a specimen from the Gilliland local fauna figured earlier (Preston, 1966). *G.*
Johnstoni (Auffenberg, 1962) is found associated with a very large specimen of Gopherus (Johnston, 1937; Williams, 1950). Geologic range: Early Pleistocene-Yarmouthian.

Family Trionychidae: Trionyx sp. in this local fauna is demonstrated by two shell fragments (UMMP V47997). Geologic range: Early Pleistocene-Recent.

The habitat of the aquatic Arkalon turtles must have at least included a river pool or isolated pond with aquatic vegetation, required by Chrysemys scripta. The habitat preference of Chrysemys picta is not as specific. Trionyx and Chelydra could have been found in either a silt or mud-bottomed pond or a slow-moving river with a similar silty or muddy bottom. Emydoidea shows a distinct preference for marshy environments (Conant, 1951; Cahn, 1937), although its tendency to wander into other aquatic situations precludes the necessity of a local environment of this type.

The preference of Recent Gopherus polyphemus for upland, savanna situations, taken with the marsh-inhabiting tendencies of Emydoidea, suggests a greater effective moisture in the area at the time of the Arkalon local fauna than exists in southwestern Kansas at present. The burrowing habits of the extinct small Geochelone are unknown, but it frequently occurs in association with the large, nonburrowing species of Geochelone, which undoubtedly could not endure winter temperatures below freezing. In any case, the two tortoises present in the fauna indicate somewhat milder winters than exist in the area either now or during the time of the Cudahy fauna, in which no mild-winter indicators have been found and in which boreal elements are common (Hibbard et al., 1965).

Associated with the Arkalon turtles are the mollusks listed by Leonard from his Locality 37 (Leonard, 1950) and mammals reported by Hibbard (1953), including Castoroidea, Canis, Felis, Equis (Hemionus) calobatus, Equis (Asinus) scotti, Mammutthus imperator haroldcooki and at least one species of camel. Additional collecting has added the muskrat Ondatra annectens (UMMP V44642, a right ramus plus M₁ and M₂ to the list of associated mammals. During 1966 Hibbard collected part of the left horn core of a pronghorn, Stockoceros (?) sp. (UMMP V56986). Mephitis sp. (a skunk), part of the right mandible with associated M₁ and M₂, was added to the Arkalon material in 1952 (UMMP V47489). Additional mammals from the Arkalon local fauna are currently under study. The bird remains have not been described.

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ROBERT E. PRESTON, Museum of Paleontology, University of Michigan, Ann Arbor, Michigan 48104.

BODY TEMPERATURES OF THE MINK FROG, RANA SEPTENTRIONALIS BAIRD

The effect of ambient environmental temperatures on R. septentrionalis was noted in two previous studies. Brattstrom (1963) reported that four mink frogs had a mean body temperature of 28.8 C while basking in the sun on 25.0 C rocks and in 22.0 C air. Dean (1966) concluded that 36 C is the median lethal temperature of Itasca State Park mink frogs submerged in warmed water for one hour.

During the period 25-28 May 1967 body temperatures were taken of partly submerged mink frogs caught in Itasca State Park, Minnesota. The temperatures were taken with a Schultheis quick recording thermometer calibrated in divisions of 0.2 C. The bulb of the thermometer was inserted into the cloaca immediately after a frog was caught. Body temperatures were not taken when captures involved a chase or more than 15 sec of handling. The temperatures of the air and water that immediately surrounded a frog were recorded. Light conditions were recorded as sunny, shady, or cloudy. No frogs were taken at night.

The body temperatures of 27 mink frogs varied from 16.2 to 27.1 C. The 16.2 C body temperature of a mink frog found on 26 May 1967 lowers the known minimum volun-

![Figure 1](image-url)

**Figure 1.** Body temperatures of mink frogs plotted against ambient air temperatures. Solid line indicates where body temperature equals air temperature.