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PALEOENVIRONMENTAL SIGNIFICANCE OF A NONMARINE PLEISTOCENE MOLLUSCAN FAUNA FROM SOUTHERN TEXAS

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ABSTRACT

Examination of a non-marine molluscan fauna from the Beaumont Formation in Kleberg County, Texas, suggests that during Sangamon time a substantial water course existed in an area that presently has only intermittent drainages. During Sangamon time the general area received either greater effective precipitation that at present or inflow of water from more mesic areas.

INTRODUCTION

Recent excavation at a Pleistocene mammoth site in south Texas has produced a noteworthy non-marine molluscan fauna. Species recovered include freshwater mussels in addition to terrestrial and freshwater snails. The purpose of this report is twofold: 1) to provide paleoenvironmental interpretation of the fossil locality, and 2) to interpret the significance of this locality in relation to the present unionid clam fauna.

Few records of non-marine invertebrates of Pleistocene age have been reported from south Texas. Trowbridge (1932:219) reported several species of nonmarine molluscs from lower Rio Grande terraces. Richards (in Price 1958) reported a list of gastropods from the Ingleside Site; only modern species characteristic of shallow freshwater environments were recovered. Hubricht (1962) reported a fossil molluscan fauna from silt of Palo Blanco Creek in Brooks County, about 40 kilometers west of the Taylor Ranch Site. The terrestrial and aquatic gastropod fauna at Palo Blanco Creek consisted of species with both boreal and austral affinities indicating either an "ecologically incompatible" fauna (Holman 1976) or quite possibly a mixing of discrete depositional units. Neck (in Suhm 1978) reported only extant species characteristic of "reduced water currents and varying water quality" from the La Paloma Mammoth Site (8,000-10,000 years B.P.). Richards (1939) described several fossil localities in southern Texas but was concerned

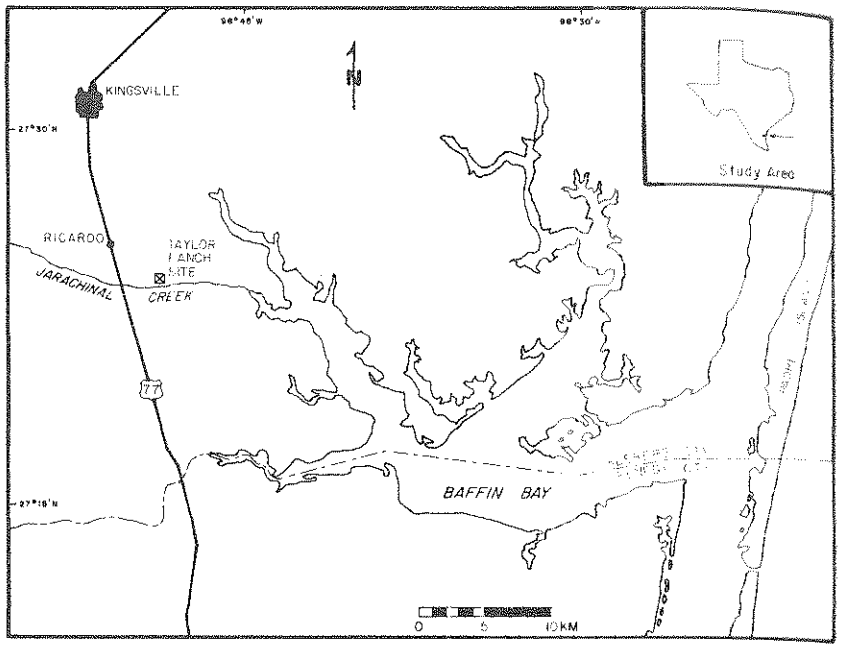


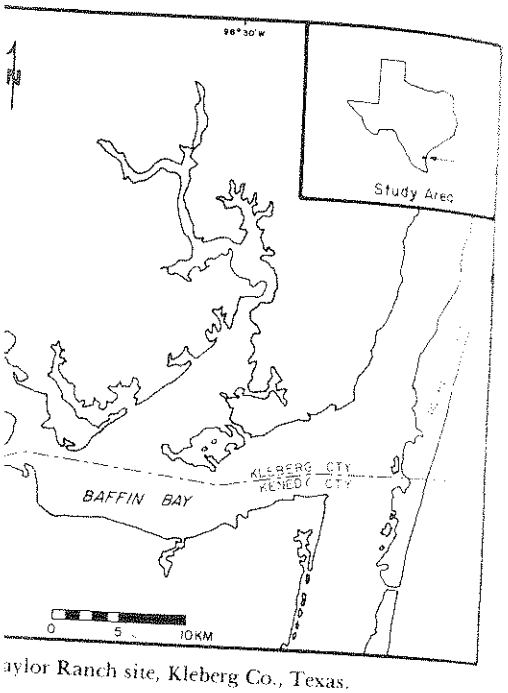
FIGURE 1. Location of Taylor Ranch site, Kleberg Co., Texas.

more with regional geological phenomena than with local environmental reconstruction.

Several Pleistocene fossil faunas are known from south central Texas. Nonmarine fossils of the Berclair Terrace (believed to be of Sangamon age) from Bee and Goliad Counties include species present in the area today (Conkin and Conkin 1962; Sellards 1940). Somewhat older (Pliocene) fossils from the Goliad Formation of DeWitt County do not represent living species although they may be immediately ancestral to present day forms (Marshall 1929).

FOSSIL LOCALITY

The Taylor Ranch Mammoth Site is located on a small tributary of Jarachinal Creek about three kilometers southeast of Ricardo, Kleberg County, Texas (Fig. 1). The skeleton of a mammoth, approximately fifty percent complete, has been excavated by Suhm (1980). Lack of dentition has prevented specific identification of the mammoth, but it is believed to be *Mammuthus imperator*. The mammoth appears to have died in a stream course. Although the bones have been somewhat disarticulated, probably by scavengers and/or moving water, rapid burial is suggested by partially natural orientation of the skeletal elements. Parts of the skeleton have been worn away by modern erosional events.



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The fossils occur in deposits identified as belonging to the Beaumont Formation (Late Pleistocene) by Suhm (1980). The age of this formation in south Texas has not been well established. Brown et al. (1977) pointed out the difficulty in differentiating between the Sangamon Interglacial and the Peorian (an interglacial interlude during Mid-Wisconsin time). However, the Taylor Ranch fauna is probably Sangamon, given that the more recent dates from the Beaumont of Texas are non-typical (Aronow 1971). The Sangamon Interglacial Stage has been dated approximately 125,000 B.P. to 250,000 B.P. while the Peorian Interglacial Stage has been dated 60,000 B.P. to 80,000 B.P. (Bernard and LeBlanc 1965).

The Beaumont is lithologically somewhat variable in this portion of South Texas (Plummer 1932; Price 1933; Aronow 1971). The following description of the Taylor Ranch site is taken from Suhm (1980). Most sediment in the exposed section consists of sandy clays or clayey sands with gypsum granules. Modern bioturbation of upper layers due to burrowing activity by fiddler crabs has occurred. The bone/shell level also contains several lenses (up to 5 cm thick) of siliceous and calcareous fragments of granule-to-pebble size. The bone/shell bed is approximately 30 cm below the top of the floodplain deposit and 90 cm below the top of the modern soil. Above the bone/shell bed level is a layer of clayey sand with well-sorted, very fine quartz grains. An undated paleosol topped by modern wind-blown sand occurs at the top of the section.

The present environment is cattle-impacted grassland now dominated by weedy brush species. Most abundant are honey mesquite (*Prosopis glandulosa*), prickly pear (*Opuntia lindheimeri*), tasajillo (*Opuntia leptocaulis*) and lotebush (*Ziziphus obtusifolia*). Jarachinal Creek is an intermittent saline stream (see Russell and Wood 1976). No aquatic molluscs have been located in Jarachinal Creek during an ongoing survey of this portion of southern Texas. No survey of modern terrestrial gastropods has covered the area of the fossil site.

MOLLUSCAN FAUNA

Associated with the mammoth bones were a number of individuals of several molluscan species. Molluscan remains were recovered by R. W. Suhm from materials immediately adjacent to the mammoth skeleton. Also, shells were visually detected in nearby sediments and collected by the author. No microfossil remains were recovered from the screened material, probably due to the coarseness of screen utilized. Discussed below are the species present and descriptions of the individual fossils.

Bivalvia: Eulamellibranchiata: Unionacea: Unionidae

Uniomerus tetralasmus (Say, 1831), 4 specimens. This clam today is found from Lake Erie through the Mississippi River drainage eastward

to the Coosa River, Alabama, and southwestward into Northern Mexico. The taxonomic situation within the genus *Uniomerus* is not yet clear. Johnson (1970) and Burch (1973) place all members in a single variable taxon, *tetralasmus*. Frierson (1903) separates two southern taxa, *tetralasmus* and *declivus* Say, 1832, stating that *tetralasmus* occurs in small streams and ponds while *declivus* is found in rivers; exceptions to this rule were considered erroneously curated specimens. Morrison (1977) also separates the above forms as species and included Texas in the range of both forms. Atlantic slope forms are classified as *carolinianus* Bosc, 1801. Given the tendency for unionid clams to express variable height and width indices under different environmental conditions (Isley 1914; Coker et al. 1921), these forms could be ecomorphs responding to differential environmental conditions.

Lack of preserved material with posterior margin of the shell intact precludes definitive assignment of *tetralasmus-declivus* classification to the Taylor Ranch *Unionmerus*. However, the lack of shell malformations or major growth ridges indicates permanent water (or nearly so) and lack of severe winters. One of the fossil shells exhibits minor growth ridges similar to those found on contemporary shells from permanent water. Intermittent ponds tend to produce "many variations and malformed specimens" (Frierson 1903), a circumstance which I also have observed. *Uniomerus* is able to withstand periods of dessication of its habitat (Strecker 1908; Van der Schalie 1940). *Uniomerus* can survive for more than six months in a non-aqueous environment under ambient laboratory conditions (Neck unpub. data).

Fossil remains of *Uniomerus* from the Taylor Ranch site consist of internal molds or "steinkerns" of variable completeness with associated original shell material. The remnant shell material has experienced dissolution to the extent that there has been separation of individual growth layers representing discrete active periods of secretion by mantle cells. The curved umbonal ridges typical of *Uniomerus* are detectable on several of the shells. No periostracum remains have been identified. The internal molds consist of calichified concretions containing sand, silt, clay and small pebbles which have become moderately indurated. These remains represent medium-to-large (full-sized) adult individuals. Living specimens of this size in the area of the Taylor Ranch site occur only in stock tanks; individuals from the various creeks are much smaller.

Gastropoda: Prosobranchiata: Archeogastropoda: Helicinidae

Helicina orbiculata (Say, 1818), 1 specimen. This snail is the only terrestrial operculate present today in south central North America. Geographical range includes the southeastern United States from Georgia and Oklahoma south to Texas and northeastern Mexico. A variety with a heavy apertural lip has been known as the variety or subspecies

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tropica Pfeiffer, 1852. The individual recovered from the Taylor Ranch Mammoth Site (width 8.0 mm; height 7.0 mm) exhibits the expanded lip of *tropica*. Pilsbry (1948:1084) stated that although *tropica* reached its "fullest development" in the limestone area of central Texas, this form was absent in calcareous areas of Florida and Alabama. Pilsbry (1948:1084) concluded that "the modification is correlated with geographical range, therefore of subspecific significance." Considering that *tropica* is known from Tennessee and well-drained, acid sandy soils in East Texas, a phenotypic response to increased xeric conditions is likely (Fullington and Pratt 1974). This species today is found typically in woodlands and savannahs.

Gastropoda: Pulmonata: Basommatophora: Planorbidae

Helisoma trivolvis (Say, 1816),1 specimen. One large-sized individual (greatest diameter = 15.4 mm) of this aquatic snail was recovered at the Taylor Ranch site. *H. trivolvis* occurs today over a large part of North America from the southern plains and Gulf coast to New Mexico and south into Mexico. In Texas, this species has been found most commonly in shallow, slow-moving, usually permanent water, although it does occur in large floodplain pools.

Gastropoda: Pulmonata: Stylommatophora: Bulimulidae

Rabdotus alternatus alternatus (Say, 1830),2 specimen. The south Texas tree snail today is found throughout the south Texas plains from the Big Bend area to Corpus Christi (just north of the fossil locality) and south into northeastern Mexico. One of the fossil specimens appears to be an adult (only body whorl remaining; original height, 15-17 mm), although deposition of calcium carbonate as "apertural ridges" (MacMillan 1944) during periods of aestivation causes confusion in interpretation of maturity for this species. One juvenile specimen (height, 6.2 mm) was also recovered.

R. a. alternatus is known from variable habitats but generally occurs where there is significant woody vegetation. The vegetational character may vary from chaparral to open woodland. *R. a. alternatus* is characteristic of the Tamaulipan Biotic Province (see Dice 1943; Blair 1950, 1952); its presence indicates warm temperate or subtropical climatic conditions.

PALEOENVIRONMENTAL INTERPRETATION

The fossil molluscan assemblage recovered from the Taylor Ranch site suggests permanent or semi-permanent, slow-moving, shallow, non-brackish water with open woodland or chaparral present upstream or surrounding the actual site. The depositional environment of the Taylor Ranch site's fossil assemblage could have included periodic flooding, as suggested by Suhm (1980). A floodplain pool or backwater

slough is the most likely environment. Flowing water may have carried the snails to the site after they died. However, the clams lived very close to the place of deposition, because their valves were still articulated and closed when they were recovered.

In comparison to present conditions the molluscan fauna of the Taylor Ranch site indicates one of two alternatives: 1) higher effective precipitation or 2) inflow of a river from a more mesic region. Increased effective precipitation is produced by increased precipitation and/or decreased evaporation; alteration of seasonal distribution of precipitation may or may not be involved. The putative river with water originating from more mesic climes could be the Nueces River or one of several buried Pleistocene river valleys (associated with the Palo Blanco drainage to the south) known from the area.

BIOGEOGRAPHICAL SIGNIFICANCE

The Taylor Ranch site's, molluscan fauna has biogeographical significance because of the rarity of fossil sites in southern Texas. All of the molluscan species present in the Taylor Ranch fauna occur in the general area today. An ongoing survey (Neck unpub.) has revealed populations of *Uniomerus* south of the Nueces River in the drainage of Baffin Bay (which includes Jarachinal Creek), but these populations probably represent introductions. *Uniomerus* is known from the Nueces River (Taylor unpub.) but is not known from Lake Corpus Christi (Murray 1979). To the south, *Uniomerus* is known from the Rio Grande system (Strecker 1931). Age of origin of *Uniomerus* in south Texas is unknown but probably quite remote, as much of south Texas was probably suitable habitat for *Uniomerus* during the glacial maxima of the Wisconsin. Trowbridge (1932:219) reported *Uniomerus* from undated Pleistocene terraces of the lower Rio Grande. Prior to the Altithermal (a warm, dry episode of the Middle Holocene), significant water was available in the presently semi-arid Llano Mesteno southwest of the Taylor Ranch site (Suhm 1978). Quite possibly, *Uniomerus* existed in the Baffin Bay drainages until intense dessication during the Altithermal.

The Taylor Ranch Mammoth Site is peripheral or close to the Sangamon-age deposits of the migratory delta of the Nueces River (Aronow 1971). A Late Pleistocene route of the lower Nueces River to the Baffin Bay area was postulated by Bailey (1926). This hypothesis has not been widely accepted but is compatible with conclusions reached by Aronow (1971) concerning the Beaumont Nueces River deltaic deposits. Behrens (1963) reported the existence of several buried river valleys of undifferentiated Pleistocene age. One or all of these river valleys are channels of the Palo Blanco River, a broad meandering river which drained a large area of south Texas during the Wisconsin

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now without permanent water due to subsequent aridity); substantial water flow existed in this now intermittent creek as late as 8,000-10,000 years B.P. (Suhm 1978). The Taylor Ranch fauna may have lived in a floodplain pool along a water course; perhaps the Palo Blanco River existed during the Sangamon.

A number of marine molluscan Pleistocene faunas has been reported from the middle and upper portions of the Gulf coast of Texas. Pampe (1971) reported a Late Pleistocene (Sangamon or Early Wisconsin) molluscan fauna consisting of contemporary species on the Texas coast. Interglacial faunas tend to be similar or identical to present-day communities (Richards 1939; Parker 1959). Indeed, many of the present-day marine molluscs appear to have inhabited Texas waters since late Tertiary time (Parker 1959). The temporal dynamics of the freshwater molluscs of coastal Texas will remain unknown until additional interglacial and glacial period faunas have been discovered and investigated.

ACKNOWLEDGEMENTS

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