THE PLIOCENE HORSE *NANNIPPUS MINOR* IN GEORGIA: GEOLOGIC IMPLICATIONS

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I. ABSTRACT

Two upper cheek teeth of the diminutive horse *Nannippus minor* (Sellards) were collected from "upland gravel" deposits of previously unknown age in eastern Taylor County, Georgia. The known geographic and geologic range of the species is restricted to the Hemphillian (middle Pliocene on the North American land mammal time scale) of the southeastern United States, all previous specimens having been collected from the Bone Valley Gravels in Florida. Major downcutting of Piedmont and Coastal Plain streams, at least in the vicinity of the fossiliferous exposure, began no earlier than 10 million years ago. The fossils provide the first definite evidence of Pliocene rocks in Georgia.

II. INTRODUCTION

In the long-continued debate about the erosional history of eastern North America during the Cenozoic, much controversy has arisen over the correlation of specific geomorphic events in the Appalichians with dated deposits on the Gulf and Atlantic coastal plains. Various "peneplains" and "erosional surfaces" have been dated, usually on conjectural grounds, as old as Cretaceous or as young as Pleistocene (see review in Thornbury, 1965). Especially problematical have been the various "upland gravels" that occupy interfluvial areas in the mountains, piedmont, and upper coastal plain. Precise dating of these notoriously unfossiliferous deposits would contribute in an important way to our understanding of the origin of the present topography. The present note records the occurrence of chronostratigraphically useful fossil mammals in upland gravels in west central Georgia and discusses their stratigraphic significance.

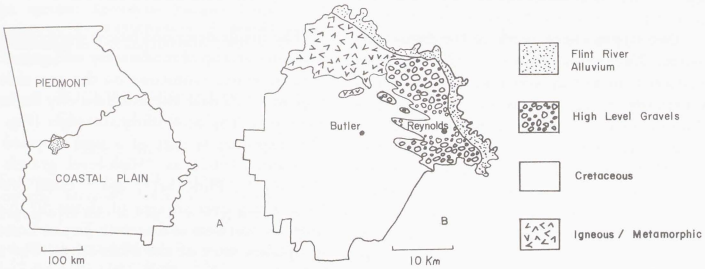
I wish to thank my wife, Jane, for help in collecting the fossils and in preparing the illustrations.

III. GEOLOGIC SETTING

The fossils described below were collected from an outcrop of moderately well cemented conglomeratic sandstone on the east side of Highway 128 near the southern city limits of Reynolds, Taylor County, Georgia (Fig. 1). The exposure is part of a unit mapped by LeGrand (1962) as "High-level gravels of Tertiary(?), Pliocene(?) age." these gravels form a cap over an area of about 50 square miles in northern and eastern Taylor County, in uplands west of the Flint River. The unit overlaps the Fall Line and rests unconformably on both crystalline rocks of the Piedmont and Cretaceous sedimentary strata of the Coastal Plain. No fossils have previously been reported from it.

At the productive exposure the strata may be described as a poorly sorted sandstone interbedded with lenses of polymictic conglomerate, the clasts in which are composed of quartz, chert, and claystone. It was in one of these lenses that the vertebrate fossils were found. Some of the bone fragments were badly abraded but the two horse teeth were fairly well preserved.

The high topographic postion of the upland gravels in Taylor County suggests that they once covered a considerably larger area, having been "dissected by erosion to such an extent that only in some interstream areas are they still preserved" (LeGrand, 1962). The deposition of the gravel thus predates much of the regional topography. As will be shown below, the age of the gravels near Reynolds is Pliocene. These Taylor County upland gravels are the first demonstrably Pliocene beds to be reported in Georgia. Marine or estuarine(?) sediments in extreme southeastern Georgia (Charlton Formation) are of suspected Pliocene age (Herrick, 1963, 1965), but the biostratigraphic evidence on this point has never been presented in detail. If indeed the Pliocene was a time of widespread erosion in Georgia, with deposition being limited to sheets of coarse gravel, then the scarcity of datable Pliocene marine strata is to be expected.



Text figure 1. A. Outline map of Georgia showing the location of Taylor County. B. Areal geology of Taylor County showing relationship of High-Level Gravels to underlying Piedmont crystalline rocks and Coastal Plain sedimentary strata. *Nannippus* teeth were collected at Reynolds in the east-central part of the county. Geology from LeGrand (1962). Gravels were previously of unknown age; now known to be Pliocene (Hemphillian), at least in part.

IV. SYSTEMATIC DESCRIPTION

Besides non-diagnostic fragments of turtle bone, the only fossils so far collected at the Reynolds exposure are horse teeth. The specimens are catalogued in the fossil collections of the Geology Department, University of Georgia.

Class MAMMALIA
Family EQUIDAE
NANNIPPUS MINOR (Sellards)
Text figure 2

Type—Florida Geological Survey no. 5867, an upper left premolar(?) from "a pit of the Amalgamated Phosphate Company at Brewster [Florida]." (Sellards, 1916, p. 96, plates 11 and 13.) Collected from the Bone Valley Gravel. Age: Hemphillian (middle Pliocene), see Webb and Tessman (1968).

Previously reported distribution—Bone Valley Gravel and equivalents in Florida.

Referred specimens—UGV-55, upper right P^4(?); UGV-56, upper right M^1 or M^2, from "High-level gravels" exposed along east side of Highway 128 at southern city limits of Reynolds, Taylor County, Georgia.

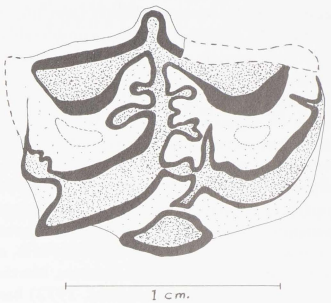
Description: UGV-55 (Fig. 2) is very similar to the holotype illustrated by Sellards (1916) but is at a slightly earlier stage of wear. At the occlusal surface the crown measures 15 mm anteroposteriorly and 13 mm transversly, compared with occlusal dimensions of 13.5 and 13 mm respectively in the holotype. 15 mm below the grinding surface (at a distance above the roots approximately equivalent to the height of the type specimen) the Georgia tooth measures 14 mm by 13 mm, almost exactly duplicating the size of the holotype. The basal portion of the mesostyle is damaged but its original height may be estimated as 38 to 40 mm at the present stage of wear; an unworn crown height between 50 and 60 mm may be estimated by assuming that the tooth is between 1/5 and 1/3 worn down.

The protocone is lenticular but would become oval with later wear as the ends become blunter. The lingual flattening of the protocone shown by the holotype would be duplicated by the Georgia specimen at a middle stage of wear. The protocone is completely free to the base of the tooth. The complexity of the fossette borders is slightly

less pronounced than that of the type (the fossettes are described as "very much complicated" by Sellards but, compared with other hipparionines, they are perhaps better characterized as moderately complex). Differences in detail are (terminology after Osborn, 1918): plipostfossette[1] triple in holotype, single in Georgia specimen; pli protoconule triple in holotype, single in referred specimen; pli caballin weak (wider than long) in holotype, twice as long as wide in Georgia specimen; and a tiny isolated enamel lake in the prefossette of the type is not present in the referred example. I consider all of these distinctions to reflect individual and/or ontogenetic variation which can be observed in any adequate sample of living or fossil equids and therefore of no taxonomic significance.

The hypoconal groove, as in the holotype, is completely open to the base of the tooth. The tooth is moderately curved with a radius of approximately 35 mm.

The upper molar (UGV-56) has been damaged by splintering although its occlusal surface is mostly intact. It appears to represent a different individual than the premolar described above because, although it is a first or second molar and therefore would have begun to wear earlier than a permanent premolar in the same animal, it is actually less worn than the previous specimen. It is smaller than the premolar as is usually true of molars; on the occlusal surface its transverse diameter is 10 mm. Breakage prevents measurement of the occlusal length. 15 mm below the grinding surface the transverse diameter has increased to 12 mm, still a remarkably tiny tooth considering its hypsodonty. As the base of the tooth is missing the original crown height cannot be measured but it must have been well over 40 mm because the preserved portion has a height of 39 mm. On the grinding surface the protocone has an elliptical shape with sharply attenuated ends; it is proportionately longer than that of the promolar. Both of these characters are strongly dependent upon the stage of wear: the protocone will become shorter and more oval in outline at later wear stages. At the occlusal surface the protocone bears a slight lingual indentation but this also fades out a few mm below the surface. At the very early wear stage exhibited by this specimen the fossette borders are simple but corrugations of the enamel wall visible externally farther down the tooth crown indicate that crenulations would arise in the fossettes with further wear. No pli caballin is visible on the occlusal surface nor can one be seen at a break 25 mm below the surface where it could readily be observed if present. The presence of a pli caballin on premolars but not on molars is not uncommon in equid lineages and need not imply that the two teeth derive from different taxa. In at least some individuals of the late Pliocene and early Pleistocene species *Nannippus phlegon* the pli caballin is lacking on premolars as well (cf. Stirton, 1940, fig. 38).



Text figure 2. Upper right 4th(?) premolar of *Nannippus minor* (Sellards), occlusal view. Specimen no. UGV-55 collected from High-Level Gravels, Taylor County, Georgia.

V. DISCUSSION

Reference of these specimens to *N. minor* can be made with some confidence. No other species has such exceedingly small yet high crowned teeth. *Nannippus* (or *Hipparion*, see Webb and Tessman, 1968) *ingenuum*, the next larger hipparionine horse known from the southeastern United States, is 20 to 25% larger (Simpson, 1930) and may differ in occlusal pattern (Webb and Tessman, 1968,

report that a pli caballin is present except in late stages of wear in the cheek teeth of this species from the Manatee County Dam Site in Florida). *N. phlegon* is also considerably larger and appears to have a simpler enamel pattern.

N. minor was originally described as a species of *Hipparion* by Sellards in 1916 at which time virtually all horses with isolated protocones were placed in that genus. Simpson (1930) suggested that the species be transferred to Matthew's then new subgenus *Nannippus*. Stirton (1940) treated *Nannippus* as a new genus and included *N. minor* in it, a usage followed by most later workers. Morris Skinner (*in* Skinner and Hibbard, 1972) has cautioned against the common practice of assigning all small hypsodont horses with isolated protocones to *Nannippus*, apparently considering the genus to include only the type species, *N. phlegon*. Although I accept Skinner's exclusion of the *"gratus"* group from the genus, I prefer to include the other small, very hypsodont horses with characteristic hipparionine features (completely isolated protocone, fully open hypoconal groove) in *Nannippus*.

VI. AGE

Nannippus, excluding the *"gratus"* group for reasons discussed by Quinn, 1955, and Webb, 1969, is confined to rocks of Hemphillian and Blancan age (respectively, middle and late Pliocene on the North American land mammal time scale proposed by Wood, *et. al.,* 1941; see Berggren, 1972, for a recent attempt to intercalibrate the marine megafossil, microfossil, and land mammal time scales).

A Hemphillian age for the Taylor County gravels is suggested by the small size and relatively complex enamel pattern of the teeth described above compared to those of *N. phlegon,* the only adequately known Blancan species. *N. minor* is known from several localities in Florida (see Goin and Auffenberg, 1955; Webb and Tessman, 1968) all in rocks of Hemphillian age. The closest correlatives of the high-level gravels at Reynolds thus appear to be the Bone Valley Gravels of peninsular Florida. The lower part, at least, of the Citronelle Formation in Alabama has recently been dated as Hemphillian also (Isphording and Lamb, 1971).

VII. CONCLUSIONS

Two fossil teeth are admittedly a slender basis for dating widespread geomorphic events but as the first concrete evidence for dating any of the upland gravels in the Georgia Piedmont or upper Coastal Plain they at least deserve careful consideration. If the Hemphillian age of the Taylor County upland gravels can be extended by further work to beds in a similar topographic position in nearby areas, then the major downcutting of such rivers as the Flint and the Chattahoochee cannot have begun until Hemphillian or later. The Hemphillian began 10 million years ago according to an extensive series of potassium-argon age determinations on Hemphillian mammal faunas in the western U.S. (Evernden *et. al,* 1964). We may tentatively conclude that the sculpting of the Fall Line hills and other important features of the Georgia landscape required less time than this.

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July 31, 1974

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