A TAPIR MANDIBLE FROM A NORTHWEST GEORGIA CAVE*

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Of the large mammals which roamed the southeastern Pleistocene forests, the tapirs are among the most unusual and among the least represented fossils. This may be due to the fact that they were forest browsers, a type of existence which is not conducive to fossilization. Hence, any new occurrence, such as this one, is of interest.

The specimen comes from Anderson Spring Cave, in Walker County. It was found by Mr. Gerald Kemper in 1955 (Hitchcock, 1957). The original is deposited in the Harvard Museum of Comparative Zoology, and a cast is at Emory University.

PALEONTOLOGY

The Specimen

The specimen is a portion of the left mandible of a tapir. Only the mid-portion of the mandible, including the beginning of the ascending ramus and five cheek teeth, is present (Fig. 1). The teeth are all of the permanent dentition, the last two molors being little worn.

FIG. 1. *Lateral aspect of portion of left mandible of Tapir from Anderson Spring Cave, Ga.*

The fragment is 168 mm. long and the depth of the mandible at the level of the first molar is 54 mm.

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TABLE 1

Measurements of Grinding Teeth of Tapir Mandible from Anderson Springs Cave, Georgia

	Length (mm.)	*Width of Anterior Lobe* (mm.)	*Width of Posterior Lobe* (mm.)
M_3	23.5	19.5	17.5
M_2	21.5	18.5	17.5
M_1	20.5	17.5	15.5
PM_4	20.0	16.0	16.0
PM_3	18.5	13.0	14.0
PM_2	missing		

An X-ray of the jaw (Fig. 2), shows no unerupted teeth, and shows complete root formations of the erupted teeth. The animal was fully adult but not senescent.

The specimen is closest to *Tapirus veroensis* Sellards 1918, which

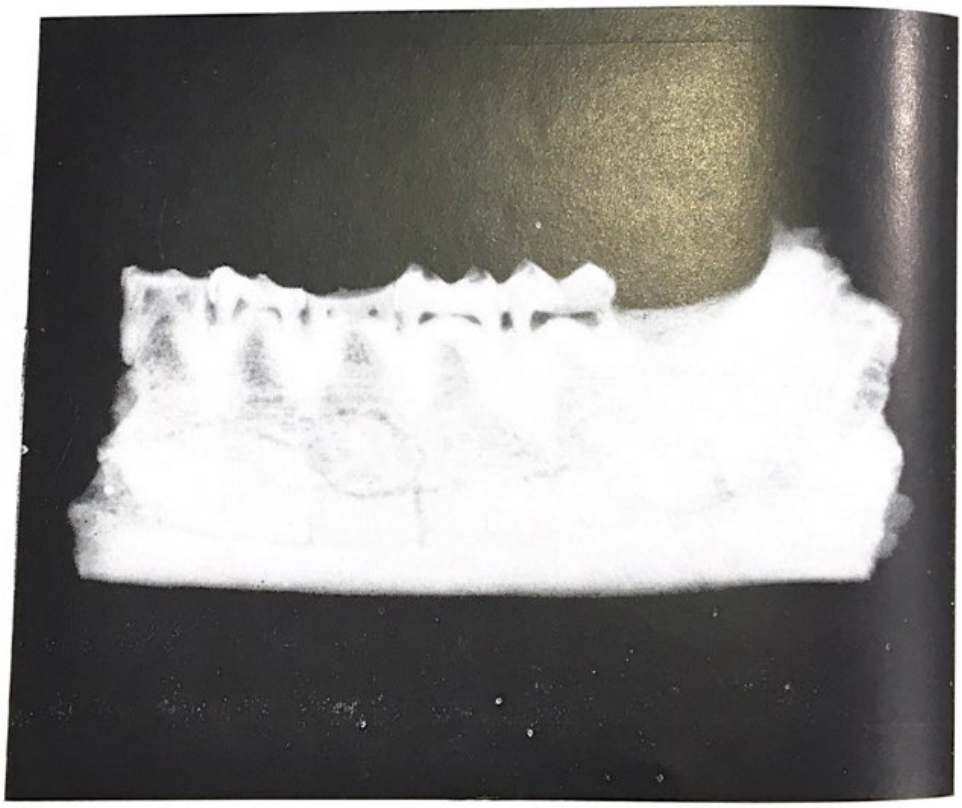

FIG. 2. *Radiograph of Tapir mandible. Note that permanent dentition is fully developed.*

is known from several Pleistocene localities in Florida and perhaps from Tennessee (Simpson, 1945). Identification was made by Dr.

Bryan Patterson of the Museum of Comparative Zoology at Harvard, based on the dental measurements in Simpson's review.

Preservation

Mineralization is extensive but not complete (Fig. 2). The inner surface shows cracks indicative of weathering for a short time before preservation. There are no tooth marks of gnawing rodents, and it is the authors' feeling that the fractures at either end occurred prior to mineralization. There are no indications of tooth marks, but this does not prevent the possibility that the tapir was dragged into the cave by a large predator. Other possibilities include accidentally falling into the cave from a hole at the surface and secondary erosion and transportation of the specimen by subsurface water after initial deposition. No great distance or time could have been involved in the latter case, as no water wearing is evident.

The conditions under which the specimen was found are nebulous. The specimen was found "strewn on the floor of the cave" (Hitchcock, 1957). No other vertebrate fragments are reported associated with it. The cave is now used as a source of water for the owner's farm and is closed to further exploration.

Age of the specimen

While one cannot be certain, the age of the mandible is most likely to be Pleistocene. Brown (1938) and Hurst (1957) report tapir fragments from Pleistocene beds in Louisiana and Georgia, and Sellards (1918) reports this particular species from the Pleistocene sediments at Vero, Florida. This species is not known from the Pliocene, and had become extinct by recent time.

Climatological data

Brown (1938) and Berry (1907a and b, 1926) both conclude from paleobotanical evidence that the Pleistocene temperatures and flora were much the same as they are now. Berry (1907a) lists the following species from a Pleistocene peat bog on the Chattahoochee River, 165 miles south of the cave.

Carpinus caroliniana Walter
Betula nigra Linnaeus
Fagus americana Sweet
Quercus nigra Linnaeus
Q. virginiana Mill
Q. primus Linnaeus
Quercus phellos Linnaeus
Ulmus alata Michaux
Liriodendron tulipifera Linnaeus
Platanus occidentalis Linnaeus
Ilex opaca Ait.
Xolisma ligustrina DC.

These are interpreted by Berry as being representative of "climatic conditions not appreciably different from those which exist at the present time in this region, although the grouping of the species was quite different from that which obtains in the present Gulf coast." If these interpretations are correct, it would seem that this Georgia tapir lived in a forest environment such as exists in the area today. According to Harper (1918) the forests of Alabama, only a few miles away, were originally "splendid forests of long-leaf pine, intermingled with various oaks and a small proportion of short-leaf pine."

The mammalian fauna would not be so familiar. A number of now extinct large animals shared the southeastern forests with the tapir in the Pleistocene. Mastodons, Columbian Elephants (*Paralephas*) and giant ground sloths browsed in the forests with the shyer, and probably even then, nocturnal tapirs. Peccaries competed for bulbs and roots. Chief among the tapir's enemies were probably bears, wolves, the direwolves (*Canis ayersi*), and a number of large cats. Bison, camels and horses grazed where grassland existed. Hurst (1957) gives an interesting account of the southeastern fauna with illustrations of many of the larger mammals.

FOSSIL TAPIR DISTRIBUTION IN THE UNITED STATES

Simpson (1945) gives a splendid summary of Pleistocene and recent tapirs and includes a map showing all of the then known locations. They range from Pennsylvania to Florida, west to Missouri, Arkansas and east Texas. There are two localities known near the Mexican border and a number in California. Most of the greater number of finds have been in the eastern states, however, associated with the mixed mesophytic forests of the same.

Several locations are known from Florida, from which the type *Tapirus vercensis* Sellards comes. A specimen of *T. tennesseae* Hay (= *T. veroensis*) comes from eastern Tennessee. The closest known tapir find to the specimen reported here comes from Lookout Cave, Tennessee. It is reported but not described by Cope (1899).

Other tapir remains from Georgia are from the Coastal Plain, near Brunswick and Savannah. At Brunswick, bones of a number of Pleistocene mammals, including tapir fragments, were unearthed from an old lake bed during the construction of the Brunswick and Altamaha canal in 1839. Hay (1923) has described this material as well as subsequent discoveries in the same location and at Savannah. Hurst (1957) gives a popular account of the tapir and other mammals from these areas. None of the remains are of the complete animals.

DESCRIPTION AND HISTORY OF TAPIRS

Tapirs are stout animals about 6 feet in length and standing about 4 feet at the withers. American species are dark brown with pale throat and ear tips. The young are spotted and longitudinally striped like fawns. Their most striking character is the foot-long, flexible, upper lip, resembling a miniature trunk of an elephant.

Modern tapirs are solitary, nocturnal, and generally inoffensive. They take to water readily (Fig. 3). Shoots, buds, leaves and low-growing fruits form their food. The similarity of the habits of existing species suggests that their behavior has changed little since the Pleistocene. They are eaten by natives, and their thick hide makes tough leather. They are said to be easily tamed.

Anatomy

Characteristic features of tapirs are the presence of four toes with hoofs on the front and three on the hind foot. The ulna and the fibula

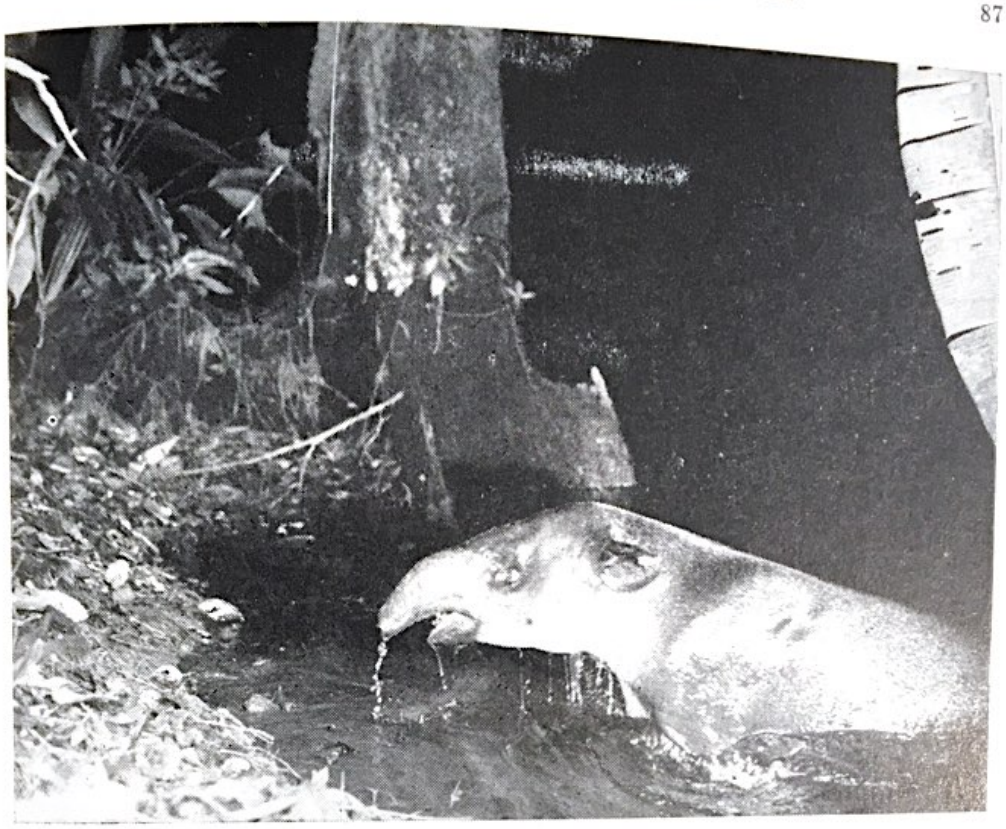

FIG. 3. *Living American Tapir, Barro Colorado, Canal Zone. Courtesy of the American Museum of Natural History.*

are complete and not fused with the radius or the tibia, unlike the condition in the Equidae. There is far less change from the primitive perissodactyl condition in their group than among the horses or rhinoceroses.

Teeth are the most readily preserved parts of the body, and are therefore of the greatest paleontological importance. Three incisors are present in each side of each jaw. The canine is well developed rather than being lost as in other perissodactyls. There is a short space or diastema between the canines and the battery of cheek teeth which consists of four premolors and three molars in the maxilla and three molars in the mandible. Molarization of the premolars has taken place as is usual in the Perissodactyla, and there is no functional distinction between molars and premolars.

In the mandible, the first premolar is rudimentary or lost. P_{2-4} and M_{1-3} make up the grinding battery. The upper cheek teeth are often simply lophodont, but the mandibular set have characteristic transverse crests. This pattern is in contrast to the complex arrangement of ridges found in equid teeth. Tapir molars and premolars are easily distinguished from teeth of other mammals.

The anterior premolar, canine and incisors, are missing in the present specimen, but we have indicated their appearance in Figure 4.

Taxonomy

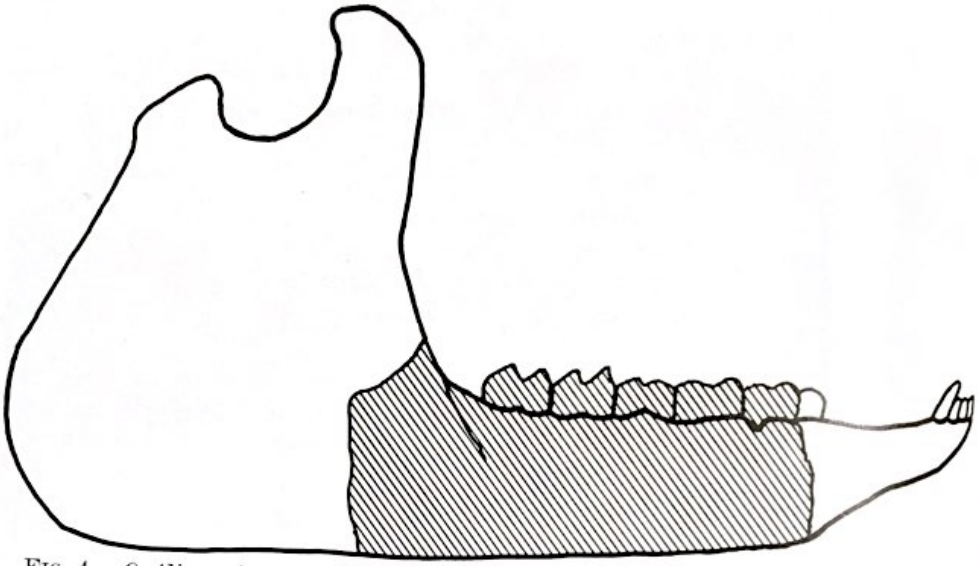

FIG. 4. *Outline of Tapir mandible, preserved portion of present specimen shaded.*

The tapirs, rhinoceroses and horses are the three living branches of the once great group of perissodactyl ungulates:

Perissodactyla
- tapiromorphs
  - tapirs
  - rhinoceroses
- hippomorphs
  - horses and their allies
  - (titaanotheres) up to Oligocene
  - (chalicotheres) up to Pleistocene

Tapirs (*Protapirus*) first appear in the Oligocene, having probably developed from a group of Eocene "lophiodonts" such as *Homogalax*, *Lophiodon*, and *Heptodon*. They occupied the North Temperate Zone of both Old and New Worlds by Pleistocene time with few anatomical changes. Despite their existence since the Oligocene over most of the Northern Hemisphere, tapirs have not shown much anatomical lability. All New World Pleistocene and recent forms may be placed in a single genus. There is little to distinguish even Miocene and Pliocene forms from Pleistocene and living species. During the late Pleistocene they became extinct over most of their great range. Either the Wisconsin or the Illinoian glacial advance drove them southward from North America, although some may have survived into the post-Pleistocene and thus been contemporary with man. They now range from southern Mexico to Paraguay. In the Old World they were forced south even earlier, and are now restricted to Malaya, Sumatra and Borneo.

The Old World tapirs are represented by a single species, *Tapirus indicus* Desm. It was not discovered by Europeans until 1819. Cuvier

had stated that there was no longer any chance of discovering a large mammal unknown to science. In reply, a former student named Diard sent him from Bengal a sketch of a tapir! For relationships between this and American forms, the reader should consult Simpson (1945).

American tapirs were mentioned by travelers under the name "land hippopotamus" shortly after discovery of the New World, and designated *Hippopotamus terrestris* by Linnaeus in the 10th edition of the Systema Naturae, 1758.

Of American tapirs, four species are recognized at present. The best known is *Tapirus terrestris* Linnaeus. It ranges from Colombia to Matto Grosso and from eastern Peru to British Guiana. Some local races have been given specific names. *Tapirus roulini* Fischer is the smallest and least specialized of living tapirs. It lives in the Andes at altitudes over 8,000 feet. *Tapirus bairdii* Gill, and *Tapirus dowi* Gill, have been sometimes placed in a separate genus *Elasmognathus* Gill 1865 or *Tapirella* Palmer 1903. These species have elongated nasal septum. They occur in southern Mexico and parts of Central America. The Pleistocene tapirs in the United States have been placed in five reasonably well-defined species by Simpson. Numerous other specific names have been applied to fragmentary material and some may represent valid species when more is known of them. The following species seem well established.

Tapirus veroensis Sellards. The present specimen probably belongs here.

Tapirus copei Simpson. This includes the *T. haysii* of Cope from the Port Kennedy, Pa., deposits, not the original *T. haysii* of Leidy based upon a single tooth which should be referred to *T. veroensis.*

Tapirus excelsus Simpson.

Two other species occur on the west coast:

Tapirus californicus Merriam. A nominal species based upon a single tooth.

Tapirus merriami Frick. From California, this is the largest of Pleistocene tapirs.

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AN IMPROVED CELL FOR POLAROGRAPHY

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During the investigation of certain pharmaceutically active bis-beta-haloethylamine compounds (1) a new polarographic cell has been developed. The conventional H-cell of Lingane and Laitinen (2) caused contamination of the test solution by constituents of the reference electrode (chloride ion or agar). Carritt (3) recommended a modified cell which prevents this diffusion; however, this cell was found cumbersome to handle. Pecsock and Juvet (4) made further modifications by placing a reservoir compartment in the design for flushing the cell. The cell developed (Fig. 1) was found to be superior for kinetic studies. The placing of a sintered glass disk (D) 12 mm. from the test solution portion of the cell resulted in a cell which gave no discoloration or contamination of the agar plug. The cell was used for one year with constant use and no evidence of agar plug contamination, discoloration or drying out was witnessed. Cell samples were kept in contact with the bridge as long as 48 hours for prolonged kinetic studies. The circulating fluid packet (G) of the cell provided for constant temperature control during these studies. A Sargent Thermonitor Temperature Control Bath along with an Eastern Industries Model A-1 Electric Pump circulated the water through the jacket. When temperatures were used that exceeded the usual 25°, good control was still maintained. A stopcock was provided to empty the contents of the cell quickly. All solutions were degassed in a degassing flask prior to use. A rubber stopper was fitted on top of the test cell (F) to allow a constant flow of nitrogen to blanket the solution being electrolyzed. The i correction

$$R$$

of a cell of this basic design with aqueous supporting electrolytes is reported to be less than 500 ohms by Lingane (5) and Meites (6) reports the i drop may be generally ignored. The resistance of the

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