A HEMPHILLIAN LOCAL FAUNA CONTAINING A NEW GENUS OF ANTILOCAPRID FROM SOUTHERN CALIFORNIA¹ WADE E. MILLER² and Theodore Downs³

ABSTRACT: The Kinsey Ranch local fauna was collected from fluviatile deposits (upper Peace Valley beds and lower Hungry Valley Formation) of middle Pliocene (Hemphillian) age, located in the northwest corner of Los Angeles County, California. Faunal components, mostly ungulates, indicate a predominantly grassland condition in the studied area.

A new genus and species of antilocaprid, Ottoceros peacevalleyensis Miller and Downs, is described and is the most significant and well represented constituent of the local fauna. Although the exact position of this new taxon in the antilocaprid phylogeny is not known, its closest affinity appears to be with Sphenophalos.

The structural grade of the Pliohippus and the rhinocerotid together with cf. *Tanupolama* suggest a Hemphillian age for the Kinsey Ranch local fauna.

INTRODUCTION

A relatively small local fauna has been recovered from the Hungry Valley-Peace Valley area of southern California, and can be dated as Hemphillian (traditionally Middle Pliocene).

Fossil vertebrates were first recorded from Hungry Valley by Chester Stock (in Crowell 1950:1638). This area is located in the northwestern corner of Los Angeles County, California (Fig. 1).

In August of 1952, Howard T. Anderson of Standard Oil Company of California brought to the Natural History Museum of Los Angeles County, the original slab of sandstone containing the diagnostic parts of the new genus of Antilocapridae to be described in this paper. This material was discovered by William P. Davidson of the above mentioned company on the G. E. Kinsey Ranch in the Hungry Valley area. Further investigations were made at the site in 1952, and 1953, by Theodore Downs with Howard Anderson, Steven Anderson and Jon Szati all of Standard Oil Company, resulting in the discovery of more material representing the new genus. Collections of other vertebrates from this area were made previously by personnel from the California Institute of Technology (CIT). These collections are now in the

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FIGURE 1. Generalized locality map, Hungry Valley-Peace Valley area (Kinsey Ranch local fauna shown in shaded portion of map).

Natural History Museum of Los Angeles County (LACM). From March, 1970, to June, 1971, Wade E. Miller made several field trips with students and associates to the area in an attempt to recover more faunal material (with moderate success) and to relocate previous CIT sites.

Acknowledgements

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The unusual skill of William J. P. Otto is especially appreciated; all the preparation of the highly indurated matrix enclosing *Ottoceros* and the restorations were successfully accomplished by Mr. Otto while he was associated with the California Institute of Technology and the Natural History Museum of Los Angeles County. The illustrations were prepared by Mary Butler and the photography was done by Howard K. Johnson and the late George Brauer. The several drafts of the manuscript were typed by Carolyn Chadburn of Brigham Young University and by Linda L. Wilson and Marjorie Travis of the Natural History Museum of Los Angeles County. Assistance in curation of the material from Kinsey Ranch was done by Richard L. Reynolds and Paul Langenwalter, both of the Natural History Museum of Los Angeles County. Part of the financial assistance was made possible through funds from the National Science Foundation (GB 33585X).

GEOGRAPHIC AND STRATIGRAPHIC SETTING

The Kinsey Ranch local fauna was collected from the northwest corner of Los Angeles County about seven miles south of the town of Gorman (Black Mtn quadrangle, California, 1958). The fossil sites comprising this locality trend north-south along a low mountainous ridge of the Transverse Ranges just west of Peace Valley and Interstate Highway 5 (Fig. 1). Elevations of these sites vary from about 3,000 to 3,300 feet. This area is drained by numerous intermittent streams which trend roughly northwest to southeast. The climate is semiarid with vegetation consisting largely of chaparral, sage and scattered oak trees. Numerous ravines are sparsely vegetated, resulting in widespread areas of exposed rock.

Pleistocene disturbances largely responsible for the present structure of the Transverse Ranges are evidenced in this area by incised stream beds with accompanying elevated floodplains and open folding of rock units. Beds yielding the fossils strike roughly north-south and dip westward from 20° to 45° . Although faults are known in the general area, none were detected with-in the area of the present study.

Two geological units are exposed in the area of study, the Peace Valley beds and the conformably overlying Hungry Valley Formation, both of which yield vertebrate fossils. These Pliocene beds were described in detail by Crowell (1950). He stated that the Peace Valley beds in this area are probably underlain by a quartz monzonite of unknown age. They are reported to be about 4,000 feet thick (Crowell, 1950). They vary from shales to coarse sandstones in exposed areas, with colors grading through gray, to brown. Subrounding of the larger clasts, relatively poor sorting and arkosic sediments are suggestive of limited stream transport. Occasional cross-bedding and asymmetrical ripple marks also support a fluviatile origin of the sediments. The site yielding the majority of antilocaprid specimens (LACM locality 1092) is located in the Peace Valley beds in the southernmost part of the study area adjacent to Coyote Canyon. The bones were found justoposed in a steeply dipping flaggy sandstone unit which rests on a sandy, silty, shale. The remainder of fossil sites in the Peace Valley beds are north of Hungry Valley.

In thickness the Hungry Valley Formation is roughly equivalent to the Peace Valley beds (Crowell, 1950); the mode of accumulation is probably similar also. Although some of the sediments are coarser in the Hungry Valley Formation, varying from shaly silts to pebbly sands, a fluviatile origin is indicated by cross-bedding, scour marks and rounded to subrounded clasts. Only the lower portion of this unit, that conformably overlies the Peace Valley beds, is present in the area of investigation.

SYSTEMATIC DISCUSSION

Class Reptilia

Family Testudinidae

Clemmys cf. C. marmorata

Material—shell and carapace fragments (LACM 27956, 27976, 27961, 27965, 28469).

The above specimens show great similarity to the living western pond turtle, *Clemmys marmorata*. However, the fossil specimens do not seem sufficiently diagnostic to allow a positive identification at the species level.

cf. Geochelone

Material—carapace fragments (LACM 27933, 27994, 27975, 27963 28470).

A large tortoise is included in the present collection as indicated by the size and configuration of the carapace fragments (they are heavier and thicker than in *Gopherus*). The material most closely approximates *Geochelone*.

Class Mammalia

Order Carnivora

Family? Felidae

Figure 2

Material-questionable P³ of a felid (LACM 28340).

A nearly complete tooth (the anterior root is missing) of a moderately large carnivore is the only evidence for this order in the present local fauna (Fig. 2). This tooth resembles both a right P^3 of a moderately large (pumasized) felid and a left P_4 of a large canid. The similarity between these teeth in certain felids (P^3) and canids (P_4) is striking. We (Miller and Downs, 1971) previously identified this tooth questionably as *Osteoborus* Stirton and Vanderhoof but further study and review indicate it could be felid.

 P^3 in the jaguar appears different than the tooth from the present carnivore by possessing an accessory cusp anterolingual to the principal cusp and by lacking a well-developed posterior cingulum which is evident on the tooth from Kinsey Ranch. In the latter form this cingulum is strongly upturned posteriorly and is developed into a third cusp. In several Pleistocene and Recent mountain lions observed, this cingular cusp is present but not as dis-



10mm

FIGURE 2. ?Felidae, right P³, LACM 28340; a. lateral view, b. occlusal view.

tinct. However, it is distinct in *Felis studeri* from Cita Canyon in Texas (Savage, 1960). *F. studeri* evinces a P^3 that strongly resembles the Kinsey Ranch tooth in many respects. It does differ, though, by possessing a flattening or shelf on the lower half of the anterior edge of the principal cusp which the present specimen does not show. Several Recent and fossil *Felis concolor* specimens also have this shelflike structure. The Kinsey Ranch tooth also differs from *Felis studeri* in the configuration of the posterolateral border. This border is slightly concave in the first-named form and convex in the latter. The tooth from the present local fauna has a distinct ridge trending dorsoventrally along the anterior edge of the principal cusp which is similar to that in canids. In cats, including *Felis studeri*, this ridge is present but is directed more medially.

Comparisons of the fossil tooth with numerous specimens and illustrations of *Osteoborus* P_{4s} show that the configuration of the crown bears strong similarities. It was noted, however, that the shape of *Osteoborus* P_{4} crowns is quite variable. The major difference between the crown of the Kinsey Ranch specimen and that in the P_{4} of *Osteoborus* is the slightly narrower posterior than anterior width of the tooth. The posterior width of P_{4} in *Osteoborus* is almost always greater than the anterior width (however, a few specimens seen had a posterior width about equal to the anterior one).

The root of the Kinsey Ranch tooth resembles a felid more than Osteoborus in being laterally rather than anteroposteriorly compressed. An exception to this condition was observed in a specimen of Osteoborus, O. orc, from Florida (University of Florida, UF 14781) in which the P₄ root was elongate anteroposteriorly rather than transversely. The tooth row was not characteristically crowded in this individual. It seems that the typically anteroposteriorly compressed roots of P₄ and other teeth in Osteoborus is a result of tooth crowding. If a tooth is not crowded, it evidently develops a laterally compressed root. Another characteristically felid trait of the carnivore from the present local fauna is the distinctly larger posterior than anterior root. Although the anterior root is missing in the studied tooth, it could not have been as large as the posterior one. The two roots are generally subequal in canid P₄s.

Until or unless additional material of this carnivore is found that can help resolve the present uncertainties, the familial as well as generic designation will be in doubt.

Order Proboscidea

Material—A mastodont tooth fragment, LACM 28339; a tusk fragment, LACM 27955; a cuboid, LACM (CIT) 4010; and limb fragments, LACM 28000.

The nature of the collected material is not sufficiently diagnostic to allow even a positive familial identification with available reference specimens and illustrations. The cuboid, however, might be identified to family when sufficiently complete and positively identified carpal material representing Gomphotheriidae and Mammutidae becomes available.

Order Perissodactyla

Family Equidae

Pliohippus Marsh

Figures 3-4

Material—P₃ and P⁴, LACM (CIT) 3924; P², LACM 27978; M², LACM 27951 and LACM (CIT) 2925; incomplete upper cheek teeth, LACM 27959, 28341, 27982, 27990, 27977, and 27962; jaw symphysis, LACM (CIT) 4009; jaw fragment, LACM 28344; P², LACM 28346; lower molars, LACM 27966 and 28342; incomplete lower cheek teeth, LACM 27989, 27968 and 28453; incisor, LACM 27952; incisor fragments, LACM 28455 and 28546; distal radius epiphysis, LACM 27967, radii fragments, LACM 27949 and 27974; patella, LACM 27964; distal portion of tibia, LACM 27991; incomplete calcanei, LACM 27988 and 28345; external cuneiform, LACM 28349; distal end of metapodial, LACM 27957; two incomplete phalanges (1st), LACM 28347 and 27972; 2nd phalanx, LACM 28468; sesamoid, LACM 28464; and splint bone, LACM 28465.

Stock (*in* Crowell, 1950) commented on the few specimens of equid from the Hungry Valley area known at that time. Since then several additional specimens have been collected. It appeared to Stock that two species of horse were represented as based on size of the teeth. The present study shows that all existing dental material is within the size limits of one species.

Stock's comparisons were made with Plesippus francescana (Frick) from the Coso Mountains of California (Blancan age) and with Pliohippus cf. P. spectans (Cope) from the Kern River fauna of California (Hemphillian age). He noted that the Kinsey Ranch horse was slightly smaller than the former and larger than the latter. His description implies that it was intermediate between the two named species based on dental characteristics. Although he stated that the Kinsey Ranch equid was slightly smaller than P. francescana, we have found that it coincides in size of teeth with smaller individuals of that species. However, the present species is markedly smaller in all its represented postcranial elements. While dental characters do show some similarities between the Kinsey Ranch horse and P. francescana, the former exhibits characters more like Pliohippus (Figs. 3 and 4). These characters include lack of a protoconal heel, distinct curvature of cheek teeth, moderate degree of hypsodonty and well rounded, subequal metaconid and metastylid. The Kinsey Ranch Pliohippus has teeth that are distinctly larger and less curved than Pliohippus cf. P. spectans from the Kern River fauna and, as Stock observed, the protocone of the former horse is flatter along its lingual border. Surprisingly, all postcranial material of the present form is somewhat smaller than P. cf. spectans. The very simple enamel pat-



FIGURE 3. Pliohippus sp., right P³, LACM (CIT) 3924; a. anterior view, b. occlusal view.

terns in the teeth, the nearly equal size of the metaconid and metastylid, and the unrestricted opening of the metastylid are indicative of *Pliohippus* rather than *Dinohippus* as described and figured by Quinn (1955). Also, the metastylid has an unrestricted opening as opposed to the restricted opening in *Dinohippus*. Although it is possible that two species of equid exist in the Kinsey Ranch local fauna, one known only from dental and the other from postcranial material, it seems unlikely.

The stage of dental development suggests that the Kinsey Ranch horse is a slightly more advanced form than the one from the Kern River fauna. It compares closely with the *Pliohippus* from the Mt Eden fauna (Hemphillian age) of California. The only differences are the slightly smaller tooth size and very slightly greater tooth curvature of the Mt Eden species. Frick (1921) named two new species of *Pliohippus* from the Mt Eden fauna; the type of each was a single upper cheek tooth. *Pliohippus osborni* Frick is a supposed larger species with an incipient protoconal heel, and *P. edensis* a smaller





species without a protoconal heel. However, the intraspecific variation known in equid teeth could reasonably include the known Mt Eden specimens in one species. Illustrations in Frick's (1921) paper show a gradation from teeth with no protoconal heel to ones showing a modest development of one. It does not appear that *P. osborni* and *P. edensis* represent two distinct species.

Family Tapiridae Tapirus Brünnish

Material—scaphoid, LACM (CIT) 4005; lunar, LACM (CIT) 4006; and two median phalanges, LACM (CIT) 4007 and 4008.

The above listed specimens were found in close association and probably represent one individual. Bone density and complete epiphyseal fusion of the phalanges indicate the represented tapir was either mature or nearly so. Examination of large numbers of Pleistocene *Equus* median phalanges revealed that the proximal epiphysis does not completely fuse to the diaphysis until a nearly adult size is reached. It is postulated that this condition is possibly similar in the tapir.

The tapir in the Kinsey Ranch local fauna is about one-third the size of the extant *Tapirus terrestris* (Linnaeus) and one-half that of *T. pinchaque* Roulin. Both carpals and phalanges from the fossil tapir resemble the modern *Tapirus* available for study and specimens figured by Radinsky (1965). Apparently only one genus, *Tapirus*, is recognized for all North American Pliocene through Recent tapirs.

Family Rhinocerotidae ? Aphelops Cope

Material-tooth fragment, LACM (CIT) 4012.

Although the tooth fragment, an ectoloph from M^2 , cannot be identified with certainty, its size and configuration most closely approximate *Aphelops*. LACM (CIT) 4012 is a hypsodont tooth (slightly worn) and for that reason *Peraceras* Cope can probably be eliminated from serious consideration. Matthew (1931) observed that *Peraceras* remained subbrachyodont whereas *Aphelops* tended toward hypsodonty in Pliocene time. The dentitions of *Teleoceras* Hatcher studied exhibit a greater degree of hypsodonty than does the Kinsey Ranch specimen. In his review of the rhinoceroses, Matthew (1932) noted that *Teleoceras* by Middle Pliocene time was very high-crowned, while *Aphelops* was only moderately so. A study of sufficient amount of comparative material may show the present specimen to be definitely outside the variable limits of *Teleoceras*. However, until such a comparative study can be made, the Kinsey Ranch rhinocerotid will questionably be assigned to *Aphelops*.

Order Artiodactyla

Family Camelidae cf. *Tanupolama Stock* Figure 5

Material—P⁴, LACM (CIT) 3957; M₂, LACM (CIT) 3958 and LACM 28459; metapodial fragments, LACM (CIT) 3961 and LACM 2857; astragalus, LACM (CIT) 2962; astragalus fragments, LACM 28343 and 28458; and a navicular, LACM (CIT) 3960.

The above material is representative of a slenderly built camel. Of the smaller Pliocene camelids the present specimens appear more closely allied to Tanupolama than to either Procamelus or Protolabis. According to Webb (1969), the mandible, and in particular the length and width of the cheek teeth, is most widely used in taxonomic identifications of Procamelus. This might also apply to other genera such as Protolabis. In the above paper Webb gave dental and other measurements of eight specimens of Procamelus grandis. The variation in anteroposterior basal length of M₂ was 26.5 to 31.4 mm and the maximum width 18.8 to 20.9 mm. The Kinsey Ranch camel M₂ (LACM 3958, Fig. 5) which shows only a modest amount of wear, measures 22.7 mm and 14.3 mm in basal length and maximum width respectively (greatest anteroposterior length 27.5 mm). Both measurements on this last specimen are significantly less than any measurements seen for species of Procamelus or Protolabis. An unworn M₂ from the present local fauna (LACM 28459) is also smaller than corresponding teeth in these two genera. This tooth has a basal anteroposterior length of 22.8 mm and a transverse



FIGURE 5. cf. Tanupolama, left M₂, LACM (CIT) 3958; a. lingual view, b. occlusal view. width of approximately 14 mm (greatest anteroposterior length, 26 mm). Average larger size, poorly developed (if at all) llama buttresses and flatter lingual molar walls characterize *Pliauchenia* in contrast with the present camelid.

Comparison of the Kinsey Ranch slender camelid to Tanupolama was made and a close correspondence was noted. Although the present fossil form has cheek teeth narrower in transverse width than Tanupolama stevensi (Merriam and Stock) from McKittrick, California, the disparity is not as great as when compared to Procamelus or Protolabis and probably falls within the variable limits of the first-named genus. The basal anteroposterior length of the known cheek teeth, while a little less than the average for Tanupolama stevensi specimens, does apparently fall within the limits of that species. LACM (CIT) 3958 (M₂) while closely approaching the same tooth in the above species, does differ by possessing more distinct ribs and a less pronounced llama buttress. LACM (CIT) 3957 (P4-basal length is 13.5 mm, maximum width is 14.0 mm), and LACM 28459 (M₂) also evidence more distinct ribs than do corresponding teeth from the McKittrick Tanupolama, and the P₄ shows development of an anterior and posterior cingulum, discontinuous along the lingual border. No cingula are present on the two specimens of Tanupolama possessing P4 from McKittrick, California. However, two Pliocene specimens of Tanupolama from the University of Florida (unnumbered) show cingular development somewhat similar to the Kinsey Ranch specimens. The lingual surface of both the present M₂s is not as flat as in Procamelus or Protalabis but is similar in this regard to Tanupolama, where there is a distinct step between tooth moieties. Although the llama buttress is better developed in Tanupolama stevensi, it is distinct in the present species and essentially lacking in the other two named genera.

The relatively small and slender limb bones and other postcranial specimens from Kinsey Ranch, tentatively referred to *Tanupolama*, are essentially indistinguishable from *T. stevensi* except for a slightly smaller size. While there is insufficient evidence to establish a definite relationship, the possibility exists that the Kinsey Ranch species of *Tanupolama* is ancestral to *T. stevensi*. A new species may be represented here but the present limited material and the existing confusion in camelid taxonomy would seemingly make the naming of a new species unwise.

cf. *Megatylopus* Matthew and Cook Figure 6

Material—A jaw fragment, LACM 28348; and a median phalanx, LACM (CIT) 2959.

The jaw fragment (Fig. 6) contains an M_2 (noticeable wear is indicated) and the anterior lobe of M_3 (erupted but not in occlusion). This camel is significantly larger than any described species of *Tanupolama*, *Protolabis*, or *Procamelus*. The M_2 has an anteroposterior basal length of



FIGURE 6. cf. *Megatylopus*, fragment of left dentary showing M_2 and anterior lobe of M_3 , LACM 28348; a. labial view, b. occlusal view.

35 mm (greatest anteroposterior length, 42.3 mm) and is 34.1 mm in greatest transverse width.

The present specimen fits more closely within the range of variation of *Megatylopus* than any other genus seen. In the M_2 a relatively deep mediolingual groove is evident which is partly enclosed superiorly by the metastylid. The anterior lobe of M_3 is directed slightly labially so that the posterolingual margin of the tooth is not appressed. Later wear stages would alter this condition slightly, however.

The median phalanx is no longer than that of an adult *Tanupolama* but is noticeably broader. Since the proximal epiphysis is missing, a juvenile is indicated, and the ultimate possible length of the phalanx is unknown. Its distal configuration differs significantly from specimens of *Tanupolama*. The lateral sulci are much less distinct (this character may in part be due to the juvenile stage) and the articular surface is markedly different, especially in much greater width of its superior expanse.

Family Antilocapridae Subfamily Antilocaprinae

Ottoceros peacevalleyensis new genus and species Figures 7-13

Holotype—LACM 1372, incomplete skull including left horn core and upper dentition, P³-M³, of a mature male from the Kinsey Ranch local fauna, Peace Valley, Los Angeles County, California (LACM Loc. 1092, Fig. 7).

Referred material—All numbers refer to the Natural History Museum (LACM). An asterisk (*) after numbers refers to specimens in addition to the holotype that were used in the composite skeletal restoration (Fig. 8). Cranial measurements are given in Table 1 and postcranial measurements in Table 2. The slabs of sandstone containing the mass of antilocaprid specimens were found on strike within 30 meters of each other. There were two major slabs which yielded the type and referred material (Figs. 9 and 10) and two lesser slabs. All slabs averaged 5 to 10 centimeters in thickness. Before the fossils were extracted from the matrix of the two larger pieces, casts were made in order to preserve the original association of deposition. William P. Otto meticulously prepared the remains with a small motor-driven grinding wheel and hard, pointed needles. On the basis of mandibles recovered, there were at least five individuals preserved.

Right orbital-maxillary region, 29722; occipital condyles, 29366*; auditory bullae, 29367*, 29702; palate with P⁴, M¹⁻³ (right and left side), 29041; right horn core with orbital area, 1374*; left maxillary region with P₄ (part), M¹⁻³, 1375*, right mandible with P₄, M₁₋₃, 29043*; right mandible with P₃₋₄, M₁ and partial M₂, 29045*; right posterior mandible portion with ramus and alveolus for M₃, 29365*; right mandibular condyle, 29550; right mandibular symphyseal fragment with ?I₃, 29734; right mandibular fragment with P₄ and M₁, 29736; right mandibular fragment with part of P₄, 29737*; left mandible with P₄, M₁₋₃, and alveolae for P₂ and P₃, 29042*; left mandibular condyle, 29551; left mandible with parts of P₄ and an M₁, 29738; cheek tooth fragments, 29739-29743; incisors, 29744-29747.



FIGURE 7. Ottoceros peacevalleyensis, new genus and species. Holotype, LACM 1372, incomplete skull (white on horn core represents plaster restoration); lateral view, left side.

Axial skeleton—atlas, 29233* and 29234*; atlas fragments, 29588-29589; axis fragment, 29235*; cervical vertebrae (3rd), 29236*; (4th), 29237*, (5th), 29238*; (6th), 29239*; (7th), 29240*; cervical fragments, 29552-29553; thoracic vertebrae (1st), 29241*; (2nd), 29242*; (3rd), 29243*; (4th), 29244*; (5th), 29245*; (6th), 29246*; (7th), 29247*; (8th), 29248*; (9th), 29249*; (12th), 29250*; (13th), 29251*, thoracic vertebrae fragments, 29709-29718, 29554-29557; lumbar vertebrae (1st), 29252*; (2nd), 29253*; (3rd), 29254*; (4th), 29255*; (5th), 29256*; (6th), 29257*; lumbars, 29558-29559 and 29703; lumbar fragments, 29560, 29561, 29594-29598, 29704-29708; sacrum, 29258*; 29440; sacral fragments, 29592-29593; caudal vertebrae (1st), 29296*; (4th), 29297*; vertebral fragments, 29719-29721; right ribs (1st-10th), 29271*-29279*; (12th), 29280*; (13th), 29281*; left ribs (1st-9th), 29259*-29267*; (11th-13th), 29268*; 29270*; rib fragments, 29539-29733; manubrium, 29282* and 29723; sternebrae, 29283*-29286*, 29294* and 29428-29431- xiphoid, 29295*.



FIGURE 8. Composite skeletal mount of *Ottoceros peacevalleyensis*, new genus and species. Darker areas represent original bone, lighter ones plaster restoration. This is a cast based on at least five individuals in the reference collection and stands approximately 56 cm at the shoulder.

Appendicular skeleton—right scapula, 29048*, 29441, 29567; left scapula, 29364*, 29422, 29565, 29566; right innominate, 29358*, 29426, 29590, 29591; left innominate, 29359*, 29427; right humerus, 29047*, 29436; right humerus proximal fragment, 29579 and distal fragment, 29574; left humerus, 29363*; left humerus proximal fragments, 29562, 29578, and distal fragment, 29580 and 29581; right femur, 29575; left femur proximal portion, 29053*; right patella, 29357*, 29724; left patella, 29356*; right radius-ulna, 29049*; right radius, 29573; right radius proximal fragment, 29583 and distal fragment, 29582; right ulna, 29571, 29572; left radius proximal fragment, 29583 and distal fragment, 29582; right ulna, 29435, 29568, 29576, 29577; left ulna, 29362*, 29439, 29569; right tibia, 29054*, and distal fragments, 29585, 59586; left tibia distal fragment, 29587; right fibula, 29312*, 29530, 29534; right scaphoid, 29298*, 29523, 29525, 29511; left scaphoid, 29304*, 29510, 29524; right lunar 29299*, 29516; left lunar, 29305*,



FIGURE 9. Photograph of sandstone block containing the type specimen of *Otto*ceros peacevalleyensis, LACM 1372. Medial view of incomplete skull with horn core in lower center.

29515; right cuneiform, 29300*, 29532, 29537; left cuneiform, 29306*, 29531, 29533, 29535; right pisiform, 29301*, 29514, 29529; left pisiform, 29307*, 29538; right trapezoid-magnum, 29302*, 29508, 29520, 29527; left trapezoid-magnum, 29308*, 29513, 29519, 29522, 29526; right unciform, 29303*, 29509; left unciform, 29507; right astragalus, 29058*, 29060, 29728; left astragalus, 29059*, 29521; right calcaneum, 29062, 29063*; left calcaneum, 29061*, and fragments, 29725, 29727; right navicular-cuboid, 29309*, 29518; left navicular-cuboid, 29313*, 29517; right entocuneiform, 29311*; left entocuneiform, 29315*, 29538; right meso-ectocuneiform, 29310*; 29512; left meso-ectocuneiform, 29314*; right metacarpal, 29051, 29432, 29437; right metatarsal, 29055, 29057*, 29434; left metatarsal, 29056*, 29433, sesamoid of manus, 29328*-29335*; sesamoid of pes, 29348*-29355*; sesamoid, 29748-29765; first phalanges of manus, 29316*-29319*; first phalanges of pes, 29336*-29339*; incomplete first phalanges of pes, 29340*-29343*; incomplete second phalanges, 29386-29380, 29402-29412; ungual phalanges of manus, 29324*-29327*; ungual phalanges of manus, 29324*-29327*; ungual phalanges of manus, 29344*-29347*; incomplete ungual phalanges, 29413-29425.

Age and formation—Hemphillian (Middle Pliocene) Peace Valley beds.



FIGURE 10. Photograph of sandstone block containing portion of skull, LACM 1374 (encircled area).

Diagnosis of genus-Ottoceros is distinguished from other Antilocaprinae as follows. It has a distinct lateral flange on the horn core which arises just above the orbit and terminates well below the bifurcation. The horn core slopes posteriorly approximately 30° from a line perpendicular to the palatal plane as determined by the restored skull (Fig. 11), and is situated on the posterior region of the orbit. There is a high horn core base with a bifurcation at the distal end which separates into two short prongs; the anterior one being slightly shorter. The height of the horn core base is three times the least anteroposterior diameter of the horn core. A slight constriction of the horn core base is present immediately above the orbit, with the maximum anteroposterior width being slightly below the point of bifurcation. Ottoceros has a less massive horn core than described species of Sphenophalos Merriam and it is relatively longer than the horn core in the extant genus, Antilocapra Ord. The horn core twists slightly counter clockwise and is slightly arcuate, presenting a shallow-medial concavity and lateral convexity. The horn core is also flattened transversly and a section at the midpoint of the vertical height presents a roughly triangular outline, the apex at the lateral flange (Fig. 12). There is less protuberance of the orbit in Ottoceros than in Antilocapra.



10mm

FIGURE 11. Ottoceros peacevalleyensis, new genus and species. Outline drawing of restoration (cast) of skull, based on LACM 1372, 29366, 29367, 29041, 1374, 1375, 29043, 29045, 29365 and 29042. Restoration by W. J. P. Otto.

Diagnosis of species: peacevalleyensis, is as for the genus.

Etymology—Otto, in honor of William J. P. Otto; *ceros*, Gr. *Keros*, horn: *peacevalleyensis* toponymic for the area of discovery, Peace Valley, California.

Description and discussion—Genera of antilocaprids have been erected primarily on differences in horn cores (e.g., see Stirton, 1932:46 and Webb, 1969:171 and Webb, 1973). However, the type specimen of Ottoceros peacevalleyensis contains both dentition and horn core. The relationship of Ottoceros to Antilocaprinae is indicated in: absence of burrs on the pedicel, non-deciduous horn cores, probable sheathed horn cores and horn cores straight compared to those in Merycodontinae (see Webb, 1973:203-204).

The type specimen, LACM 1372 (Figs. 7 and 12), represents an individual in early maturity as evidenced by the dentition (M^3 shows a modest amount of wear). Most of the left side of the skull, somewhat lateral to the midline, is present. Some crushing and distortion are apparent, particularly along the medial side (Fig. 12). With the exception of most of the anterior



FIGURE 12. Ottoceros peacevalleyensis, new genus and species. Holotype, LACM 1372; a. lateral view of incomplete skull and outlines of horn core cross sections (stippling on horn core represents plaster restoration); b. anterior view of incomplete skull (stippling on horn core represents plaster restoration).

tine and some of the anterior edge, the horn core is complete. The posterior portion of the skull, just anterior to the auditory region, as well as the anterior part, from P^2 forward, are missing. From P^3-M^3 the dentition is complete and in good condition.

Comparison with another specimen (LACM 1374) from the same fauna indicates that the holotype is probably a male. This second specimen (Fig. 13) is a skull fragment which includes the orbit, horn core (minus the anterior tine and a small portion of the base beneath it), and the posterior part of the maxilla including fragments of M^2 and M^3 . The horn core is markedly smaller than that of the type specimen and the lateral flange is only slightly evident. A mature animal is indicated, however. This can be shown by the presence of M^3 and an orbit that is slightly larger than the restored one of the type specimen. Significant disparity exists in the horn core size of the two specimens as well as in development of the lateral flange. Therefore, the holotype reasonably represents a male and LACM 1374 a female.



FIGURE 13. Ottoceros peacevalleyensis, new genus and species. Referred specimen, LACM 1374. Skull fragment from the right side showing horn core, orbital area and posterior portion of the maxilla; a. lateral view (dashed line represents outline of anterior horn core fragment as taken from natural mold), b. anterior view.

As indicated by the above two-specimens, female Ottoceros horn cores are decidedly smaller than those of the male but the sexual dimorphism is not as extreme in this respect as is true for the modern pronghorn, Antilocapra. The smaller horn core of Ottoceros is estimated to be nearly vertical in orientation, being only slightly posteriorly directed; whereas the type specimen displays a pronounced sloping posteriorly. However, the more noticeable distortion (due to postmortem conditions) in the type may account for some of the difference. Significant variation, though, has been recorded for this character in males of the extant antilocaprid (Skinner, 1942:199) and in some extinct forms (Furlong, 1941:27).

A distinct lateral flange (Fig. 12) is noted in the type specimen which is directed outwardly at almost a right angle from the horn core. It originates immediately above the orbit, peaks about 25 mm distally and terminates approximately 20 mm below the bifurcation. Although the anterior tine is largely missing from the type specimen, it is presumed to be slightly smaller than the posterior one. This conclusion is based on LACM 1374 in which a mold was preserved in the sandstone matrix (Fig. 10). In this specimen the anterior tine is slightly smaller than its posterior counterpart. The two specimens indicate some degree of porosity of bone, especially on the external surface of the tines. Also there is suggestion of the presence of a horn core sulcus on the type, running parallel and posterior to the lateral flange. The sulcus appears to begin about 14 mm above the orbit and continues as a slightly undulating groove bifurcating near the distal-extent of the lateral spine, each branch continuing toward the anterior and posterior tines. There do not appear to be any nutrient foramina at the base of the cores, however, the nature of the preservation of the bone may prevent accurate interpretation. The presence of a sulcus and the porosity do suggest there was a sheath on cores of *Ottoceros*.

A significant quantity of additional antilocaprid material, mostly in juxtaposition (Figs. 9 and 10), was recovered from the Kinsey Ranch, LACM locality 1092. Only antilocaprid specimens are known from this site, and based on the numerous skeletal elements, at least five individuals were buried (particularly as shown by the number of mandibles). Possibly some type of minor catastrophe occurred such as being stampeded over a cliff or into quicksand, which collectively killed a small herd or partial herd of these animals. Judging from the condition of the bones, their skeletal remains were probably transported only a very short distance.

In addition to the holotype of *Ottoceros*, two other specimens, LACM 1374 and LACM 1375, have incomplete upper dentitions. Of the three $M^{1}s$ represented by these two specimens, none shows any parastyle or anterior rib, thus differing from the type. Also, the ribs in M^{2} and M^{3} of the type are more distinct than their counterparts in these two specimens. With these exceptions the configuration and size of all specimens are nearly identical.

The mandible of Ottoceros is a slender structure particularly so in depth beneath the diastema, even when compared to the other genera of antilocaprids. Although the jaws of Ottoceros are slightly larger than compared specimens of Capromeryx Matthew their thickness beneath the diastema is relatively (and in some instances absolutely) less. Current study shows antilocaprid teeth apparently are not very diagnostic in distinguishing closely related genera, let alone species. This conclusion has been reached previously by several workers (e.g., Stirton, 1932:46; Barbour and Schultz, 1934:3; Colbert and Chaffee, 1939:8; Savage, 1851:273 and others). Nevertheless, it seems desirable to list dental characters in the event future work should disclose means of differentiation. M³ has a third lobe that is a little smaller than the anterior two. No evidence exists for a fourth lobe. P4 shows no tendency toward molarization as can be seen in Antilocapra and some Pleistocene forms such as Tetrameryx Lull. In the six Ottoceros P₄'s a strong anterior lingual fold separates the paraconid from the metaconid, and shows no tendency toward closure. An incomplete jaw, presumably of Sphenophalos, from Rome, Oregon (LACM 6659), also shows an open anterior lingual fold in its P₄.

X-ray radiographs were taken of several Ottoceros mandibles. They

showed that M_2 and M_3 were very hypsodont, extending to the base of the jaw. M_2 in two specimens shows a slight bifurcation of the root; the other M_2s and M_3s show no root separation. All M_1s appear subhypsodont and have a pronounced bifurcation of the root. The M_1 root base extends down only about half the depth of the jaw. The degree of hypsodonty decreases anteriorly through the premolar series which all show definite root separation, with roots extending down to half or less the jaw depth. The degree of hypsodonty in the cheek teeth is greater in the Pleistocene *Tetrameryx* where M_1 shows little or no root separation. This trend is carried still further in the Pleistocene and recent *Antilocapra*, where all premolars show little or no root separation and are decidedly more hyposodont than *Tetrameryx* (see Skinner, 1942:203).

Sufficient antilocaprid material was collected to allow restoration of a composite skeleton by William J. P. Otto (Fig. 8). The mounted skeleton is a cast and modeled from original specimens. The latter are available for study in the LACM reference collection. Ottoceros was apparently a small, delicate creature, standing about 56 cm (22 in) at the shoulders, and as noted above, was probably similar to Capromeryx in size except that the horn cores seems to be relatively larger in Ottoceros. It should be noted that while measuring and comparing portions of the skeleton of Capromeryx (LACM No 1126, referred to as a plesiotype of Breameryx by Furlong, 1946), it was determined that the cranium, scapula, ulnae, carpals, tarsals (excluding calcaneum), phalanges (of manus and pes), ribs, vertebrae, femora and tibiae consist of plaster. This does not necessarily invalidate the interpretation of the skeleton and restoration (the latter was also done by William Otto, and figured in Furlong, 1946); but it does serve to caution workers in deriving too detailed comparisons of original material with LACM No 1126.

Future studies of the details of the postcranial material of Ottoceros should be useful in determining functional behavior of this unique antilocaprid. Preliminary observations concerning selected postcranial material indicate that the radius-ulna is moderately fused and the metacarpals are slightly shorter in proportions as compared with Antilocapra, with the longitudinal groove faintly discernible on the anterior surfaces and more distinct on the posterior surface in Ottoceros. There is no apparent evidence of the presence of side toes; the metatarsals are slightly longer in proportions as compared with Antilocapra.

Comparisons—The horn core of *Ottoceros* (Fig. 8) is quite distinct from any known genus of antilocaprid. It differs from the only existing genus, *Antilocapra*, by the forked core with a distinct lateral flange. Although both genera have subtriangular cross sections near the horn core base, they differ greatly in that the apex points laterally in *Ottoceros* and the side opposite the apex is the widest. In *Antilocapra* the apex is anteriorly directed and the side opposite is the narrowest.

Cranial n	measurement	ts (in mill (N	imeters) c Aeasurem	of Ottocerc ents in ()	os peacevall are estimat	<i>eyensis</i> , nev es	v genus and	l species		
					T'	ACM specie	nen nos.			
Element	1372	1374	1375	29041	29042	29044	29043	29735	29045	29046
Horn core:	(Holotype)									
length, from tip of orbital rim to posterior tip	115.5	73.4								
length, from tip of orbital rim to bifurcation	80.2	43.5								
anteroposterior diameter at base	24.5	19.8								
anteroposterior diameter at point of bifurcation	36.7 ^a									
transverse diameter at base	17.0 ^b	9.8 ^b								
transverse diameter at point of extreme extension of lateral flange	20.5 ^b	10.4								
transverse diameter at point of bifurcation	11.2									
transverse diameter of posterior prong (greatest)	11.6	7.7								

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Cranial measurements (in millimeters) of Ottoceros peacevalleyensis, new genus and species

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					Γ¢	CM specir	nen nos.			
Element	1372	1374	1375	29041	29042	29044	29043	29735	29045	29046
Cranium:	(Holotype)									
anteroposterior diameter of orbit	30.9 ^c	32.1								
transverse diameter of palate at base of anterior crest M ²				29.8						
Upper dentition ^d :										
left side anteroposterior diameter P ³	11.2									
transverse-diameter P ³	4.6									
anteroposterior diameter P4	5.1	•		5.5						
transverse diameter P4	4.5			5.3						
anteroposterior diameter M ¹	10.8		10.1	9.5						
transverse diameter M1	7.6		8.0	7.7						
anteroposterior diameter M ²	12.8		12.1	11.7						

nillimeters) of Ortoceros peacevalleyensis, new genus and species (Measureménts in () are estimates	LACM specimen nos.	1375 29041 29042 29044 29043 29735 29045 29046		8.3 7.6	12.5f 11.5 ^e	7.1 6.4		120.6 124.2 ^g 110.5	45.1	59.3	7.6 7.4 9.1	17.8 14.1 17.3 16.7	
easurements (in m		1372 1374	(Holotype)	T.T	11.8	6.0							
Cranial m		Element		ransverse diameter M ²	interoposterior liameter M ³	ransverse diameter M ³	Mandible:	greatest length, posterior edge of symphysis to angle	ength of diastema [₃ -P ₂ post-ant. alveoli	neight, ventral surface of angle to dorsal edge of coronoid	east depth below the 13-P2 diastema	depth below P4 (labial)	danth halow waatanian

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TABLE 1 (Continued)

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Cranial measurements (in millimeters) of Ottoceros peacevalleyensis, new genus and species

						S				
					L	ACM speci	men nos.			
Element	1372	1374	1375	29041	29042	29044	29043	29735	29045	29046
	(Holotype)	-		-			2 [
depth below third crescent of M ₃					28.2	22.5	27.3			26.3
transverse diameter M2					7.4	8.7	8.7			7.6
Lower dentitiond:										
anteroposterior diameter P ₂ (alveolus)					4.8	4.8				
transverse diameter P ₂ (alveolus)					2.3	2.5				
anteroposterior diameter P ₃ (alveolus)					5.8	6.3		6.4	6.8	
transverse diameter P ₃ (alveolus)					3.2	3.2		3.0		
anteroposterior diameter P ₄					7.7	8.1	8.0	8.6	7.8	7.7
transverse diameter P4					2.8	3.4	2.9			
anteroposterior diameter M ₁					9.7	8.6	(6.7)		9.3	9.7

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0	5)	
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Cranial measurements (in millimeters) of *Ottoceros peacevalleyensis*, new genus and species (Measurements in () are estimates

							1
		LA	ACM speci	men nos.			
Element 1372 1374 1375	29041	29042	29044	29043	29735	29045 29046	9
(Holotype)							1
transverse diameter M1		5.0	4.7	5.5			
anteroposterior diameter M2		(10.2)	1.8	11.4		(11.8)	
transverse diameter M2		(3.6)	5.4	5.7			
anteroposterior diameter M3		16.4	15.9	(15.6)		15.0	
transverse diameter M ₃		5.1	5.0	4.5			
 ^a Estimate, assuming restoration as shown in figure 7. ^bSlightly crushed internally. ^c From restoration, see figure 7. ^dGreatest diameters at occlusal surface; measurements tition; <i>Uppers</i> no. 1372 slight; no. 29043 29735, 29045, 29046, slight; no. 29042, no. 29043 moderate. ^e From right side. ^f Not completely erupted. 	in () are 6 [1, slight t , slight t	estimates: o moderat o modera	Wear on e. Lowers ie; no. 26	den- ; no.			

TABLE 2

Postcranial measurements (in millimeters) of Ottoceros peacevalleyensis, new genus and species Measurements in () are estimates

Part	a. —	axial	ske	leton
			One of	

Element	LACM specimen no.	Length of centrum at mid-point
Carvical vertebrae		
atlas	20233	22.1
avis (incl. dens	29235	(45.0)
3rd	29236	38.2
4th	29230	33.0
Sth	29238	33.8
6th	29239	27.3
7th	29240	18.6
Thoracic vertebrae		1010
1 st	29241	15.4
2nd	29242	15.4
3rd	29243	16.6
4th	29244	17.2
5th	29245	16.4
6th	29246	17.2
7th	29247	17.8
8th	29248	18.3
9th	29249	18.2
10th	(unnumbered)	(18.4)
1 1th	(unnumbered)	(19.7)
12th	29250	21.4
13th	29251	23.2
Lumbar vertebrae		
1 st	29252	22.3
2nd	29253	23.7
3 rd	29254	23.7
4th	29255	24.4
5th	29256	25.6
6th	29257	23.9
Sacrum	29258	62.5
Caudal vertebrae		
lst	29296	15.5
2 nd	(unnumbered)	(14.7)
3rd	(unnumbered)	(13.4)
4th	29297	16.4
5th	(unnumbered)	(13.5)
6th	(unnumbered)	(12.0)
/th	(unnumbered)	(11.3)
8th	(unnumbered)	(10.6)
9th	(unnumbered)	(12.2)

Part b. — appendicular skeleton

Element	LACM specimen no.	Length of centrum at mid-point
Scapula	29048	121.7
(greatest distance tip of c	oracoid	121.7
nrocess to posterior edge)	oracolu	
Humerus	29047	118.5
(greatest length)	27047	110.5
Radius-ulna	29049	186 /
(greatest length)	27047	100.4
Metacarnals	29050	131.5
(greatest length	29051	135.8
(gi catest length	29052	141.1
Femur	29053	(148.7)
(greatest length including restored distal half)	27033	(140.7)
Tibia	29054	(180.0)
(greatest length)		(100.0)
Metatarsals	29055	149.8
(greatest length)	29056	159.2
	29057	154.5
Astragalus	29058	25.5
(greatest length)	29059	25.7
	29060	22.9
Calcaneum	29061	47.2
(greatest length)	29062	55.8
	29063	51.0
Innominates	29358	154.4
(greatest length, tip of	29359	(151.3)
ilium to tip of ischium)		
(anteroposterior distance	29358	16.4
across acetabulum)	29359	(14.5)
	29426	18.5
	29427	15.2
(greatest length across	29358	33.2
obturator foramen)	29359	33.2
	29427	39.3
	Observed range	Mean
Proximal phalanges	28.3-32.8	30.0
(greatest length, involving 10 specimens)		
Median phalanges (greatest length involving	15.7-19.3	17.5
13 specimens)	PERSONAL STATISTICS	14.6
Distal phalanges	14 1-15 2	14.0
(greatest length, involving 5 specimens)	17.1°13.2	

Estimated length, right forelimb, 473.2; estimated length right hindlimb, 555.6.

Many Pliocene and Pleistocene genera of antilocaprids have been recognized. One distinguishing feature that has been used to separate them into two groups is the height of the horn core base before bifurcation ("high core-based and low core-based" forms of Skinner, 1943:176). Probably only adult males should be used in this dichotomy with present knowledge. Since Ottoceros has a most definite high core base, genera with a pronounced low core base such as Ceratomeryx Gazin, 1935, (type specimen probably a female); Tetrameryx Lull, 1921 (= Stockoceros Frick, 1937, Hayoceros ? Texoceros Frick, 1937); Capromeryx Matthew, 1902 (= Breameryx Furlong, 1946) or those without bifurcation such as Osbornoceros Frick, 1937 and Proantilocapra Barbour and Schultz, 1934; (type specimen possibly a female) will be excluded from serious consideration. Frick (1937) designated Stockoceros and Hayoceros as subgenera of Tetrameryx, but treated them as separate genera. Several authors have continued to regard them as distinct genera, including Furlong (1941:28) and Skinner (1942:177).

Of the remaining antilocaprinae, Ilingoceros (Merriam, 1909) and Hexobelomeryx (Furlong, 1941) show unique horn core development which separate them from Ottoceros. Ilingoceros shows a pronounced twisting to its nearly circular (disregarding sulci) shaft and Hexobelomeryx is peculiar by its distinct three prongs of the horn core. The remaining described genus with a high core base is Sphenophalos Merriam, 1909. This antilocaprid compares most closely to the present genus, however, significant differences do exist. Sphenophalos is a decidedly larger form; Ottoceros being a very small antilocaprid, about the size of Capromeryx. Sphenophalos has a decidedly stockier horn core whose greatest anteroposterior width is greater just a short distance above the orbit (the point of greatest width was seen to vary in the type species, S. nevadanus, but it is most always along the proximal half). In Ottoceros the horn core is a relatively slender structure and its greatest anteroposterior width is just below the bifurcation. A distinct lateral flange directed externally is present in Ottoceros, whereas in Sphenophalos no such flange exists. One specimen described by Furlong (1931, plate 1, no. 16) of S. nevadanus does indicate a small anterior flange. However, most specimens known do not show this development.

One species of Sphenophalos, from Nebraska, S. middleswarti Barbour and Schultz, 1941, exhibits a greater similarity to Ottoceros than the other described species, S. nevadanus, S. blicki (Frick, 1937) and S. floblairi (Frick, 1937). S. middleswarti has longer, more pointed tines, which are more nearly equal in size, and possesses a distinct anterior flange. S. middleswarti, although smaller than the type of S. nevadanus, is decidedly larger than Ottoceros. Two measurements given by Barbour and Schultz (1941:61) are, length of horn core from top of orbit to crotch, 109.5 mm and length of horn from top of orbit to posterior tip, 177.0 mm. Similar measurements in Ottoceros holotype are, 79 and 116 mm respectively. The purpose of the lateral flange in Ottoceros is unknown. Species of Sphenophalos have the maximum anteroposterior width nearer the orbit than the point of bifurcation of tines, in distinct contrast with Ottoceros. In a personal communication, S. David Webb (1973) has given us a very plausible explanation: "The purpose of the lateral flange may be related to the mode of shedding the horn sheath. In Ottoceros much of the widest part of the horn core is near the base of the tines, contrary to most Sphenophalos species in which the base of the pedicel is usually wider. In low-based taxa, where the prongs are more divergent, each prong was probably sheathed separately (Webb, 1973). But Ottoceros would have had special difficulty shedding a sheath, if indeed it had a deciduous horny sheath. The prominent flange on the outer convex horn wall might have helped crack the shedding sheath open in the narrowest (stickiest) part of the base."

Webb (1969:174) has tentatively divided Sphenophalos into two subgenera. The western forms from Nevada, Oregon, and California were placed in one group, S. (Sphenophalos) and those described from Nebraska and New Mexico were placed in the other, S. (Plioceros). The only species mentioned belonging to the first group was S. (Sphenophalos) nevadanus while the more eastern group included S. (Plioceros) blicki and S. (P.) floblairi. Subgeneric distinctions given were, "Horn cores of the western Sphenophalos (Sphenophlos) have relatively wider bases (greater than half of their lengths), tend to be subtriangular rather than dumbbell-shaped in cross section, are more strongly twisted, and have relatively larger more flaring tines in mature individuals than in Sphenophalos (Plioceros)." S. middleswarti from Nebraska was not mentioned by Webb. It does not seem to fit this classification as it shows greater similarity to the western group on all the above listed criteria. However, S. middleswarti is significantly distinct from S. nevadanus and possibly should be classed as a separate genus.

Teeth are rarely definitely associated with horn cores of *Sphenophalos* but at least one instance has been recorded (Stirton, 1932). No significant differences in teeth other than the smaller size of the present type, were found in comparison of the two genera.

A small portion of a horn core, LACM 28348, and an incomplete upper molar, LACM 27970, are the only antilocaprid specimens that were found at a site other than LACM locality 1092. The horn core fragment is from LACM (CIT) locality 486, which might be either in the Peace Valley beds or Hungry Valley Formation, and the incomplete molar is from LACM (CIT) locality 471, which is in the Hungry Valley Formation. The horn core fragment represents a portion of the core just ventral to the bifurcation and extends about 30 mm below that point. Both tines are missing and there is not an adequate portion of the shaft to indicate presence or absence of the lateral flange which is known in *Ottoceros*. The molar fragment represents the broken posterior selene and partial anterior selene of an upper molar. These fragments are within the size range of known *Ottoceros* specimens but they are not sufficiently diagnostic for generic identification.

KINSEY RANCH LOCAL FAUNA

The first reference to vertebrate fossils from the Kinsey Ranch area was a brief statement by Chester Stock in Crowell (1950:1638). This primarily concerned the equid material known at that time from the Hungry Valley Formation but reference was also made to the presence of camel, mastodon, and turtle. This fossil material, included with all later recovered specimens from both the Hungry Valley Formation and the Peace Valley beds, is herein named the Kinsey Ranch local fauna.

Tedford (1970) has convincingly demonstrated the need for clarity in the application of such terms as fauna and local fauna. Following the apparent common practice of vertebrate paleontologists, the Kinsey Ranch fossil collection might be referred to as the Kinsey Ranch fauna. However, as stated by Tedford (1970:683) "The local fauna may be represented by samples from a single site or a series of closely associated sites having a limited geographic and stratigraphic distribution." In contrast, Tedford (1970:684) states that, "The concept implied by the term fauna in vertebrate paleontology involves a higher level of inference than that of local faunas. It represents the maximum geographic and temporal limits of group of organisms sharing a suite of common species." It would seem logical to designate the Kinsey Ranch as a local fauna. However, previously described collections of fossils will be designated as faunas if they were originally established as such (e.g., Mt Eden fauna).

The Kinsey Ranch local fauna has been collected from an area approximately three and one-half miles long by three-quarters of a mile wide. Recovered specimens are from section 32, T8N, R18W and sections, 5, 6, 8, 16, 17, 19 and 21, T7N, R18W, located on the Black Mtn quadrangle, California, 1958. With the possible exception of the site yielding the bulk of antilocaprid material, LACM 1092, nothing resembling a massed accumulation or a fossil quarry is known. Rather, the vertebrate fossils have been found in a disseminated condition with at least bone chips being present over most of the area. All fossils constituting the Kinsey Ranch local fauna have been recovered from the uppermost Peace Valley beds and the lowermost part of the conformably overlying Hungry Valley Formation (Miller and Downs, 1971). These fossils are tentatively being treated as a single local fauna until such time as a more detailed stratigraphic study might suggest otherwise. Fossil localities included in the Peace Valley beds and Hungry Valley Formation are shown in Table 3. The locality information is based on data from LACM records, current field observations, and the geologic map in Crowell (1950), and the localities are marked on the Black Mtn quadrangle on permanent file in the section of Vertebrate Paleontology, LACM.

TABLE 3

Kinsey Ranch local faunal list with distribution of localities in lithologic units

	Lithologic unit (with CIT and LACM locality assignments)		
Kinsey Ranch local fauna	Peace Valley beds	Peace Valley beds or Hungry Valley Fm.	Hungry Valley Formation
An and the second second			
Chelonia			
Testudinidae Clemmys cf.	CIT 435, 459	CIT 486, LACM 7248	B LACM 7050
C. marmorata		CIT 486 LACM 7248	B LACM 7049
Carnivora ?Felidae	CIT 453	CII 400, LACM 724	
Proboscidea Family indet	CIT 453		CIT 444 LACM 7049
Perissodactyla Fouidae	CII 455		CII 444, LACM 7042
Pliohippus sp.	CIT 452, 453, 459	CIT 486, 487, 488, LACM 4248	CIT 444, 466, 468, 469, 471, LACM 7049, 7050
Tapiridae			
Tapirus sp.			CIT 471
Rhinocerotidae ? Aphelops		?locality	
Artiodactyla Camelidae			
cf. Tanupolama cf. Megatylopu	a CIT 452, 453, 459 s	CIT 486	CIT 444
Antilocapridae Ottoceros			
peacevalleyens ? Ottoceros	is LACM 1092	CIT 486	CIT 471

The long axis of the fossiliferous area noted above approximates the strikes of the Peace Valley beds and Hungry Valley Formation, which is essentially north-south. The highly scattered and fragmented vertebrate fossils as well as noted abrasion on many specimens supports the interpretation of a fluviatile depositional environment.

Only one vertebrate, the pond turtle, *Clemmys* cf. *C. marmorata*, requires an aquatic habitat. Two genera of fresh water molluscs, *Anodonta* and *Lymnaea*, and some smooth-shelled ostracods have been recovered from the Peace Valley beds according to Crowell (1950:1638). These invertebrates are known from present streams and lakes. The requirement of an aquatic habitat would be met by the presumed fluviatile conditions that existed in the studied area. The western pond turtle is capable of living in

open streams and is not restricted to ponds or marshes. Neither of these latter habitats are indicated by the sedimentological record. While it is often thought that the tapir is only associated with tropical or subtropical conditions where there are excessive amounts of water, fossils are known from areas where the bulk of faunal and floral evidence indicate temperate to even semiarid climates (eg., various Pleistocene sites in western North America). Perennial streams and sufficient cover are all that many living tapirs require. A permanent stream would also satisfy all the water requirements of the remainder of the Kinsey Ranch local fauna.

A majority of the taxa from the present local fauna is indicative of grassland conditions. *Ottoceros* and *Pliohippus*, the two genera making up the bulk of known fossil specimens, have hypsodont dentition. *Pliohippus* is regarded as a grazer as are the antilocaprids in general. The camels and *Aphelops* are also compatible with grassy areas. The tapir and mastodont, both primarily browsers, possibly indulged in some grazing. This is true of modern tapirs. A significant grassland area with some woody or thicketed regions is suggested by the known local fauna. Lack of abrasion on the tapir elements as well as on the cuboid of the mastodont indicates these bones were not washed in from a more distant locale.

AGE AND CORRELATION

Crowell (1950) assigned a Middle Pliocene age to the Peace Valley beds and a Late Pliocene age to the conformably overlying Hungry Valley Formation. However, the present study area shows no faunal distinction between fossils found in the two rock units (uppermost Peace Valley beds and lowermost Hungry Valley Formation). The structural grade of the *Pliohippus* and the rhinocerotid (this family is unknown in North America after the Hemphillian which is traditionally equated with the Middle Pliocene) coupled with *cf. Tanupolama*, are indicative of a Hemphillian age. Every other taxon in the fauna has a fossil record that is in part Hemphillian in age. The evolutionary stage of *Ottoceros* also seems compatible with this age assignment.

A flora (Piru Gorge flora) from a rock unit conformably underlying the Peace Valley beds, and three to four miles south of the present area, was described by Axelrod (1950). Although he stated that it is not entirely safe to use the Piru Gorge flora for a specific age indicator, Axelrod did assign it a "middle Pliocene" (= Hemphillian) age as based on, "its cliseral relations, its climatic implications, and its floristic composition." It is his opinion that a "middle Pliocene" age applies to the Peace Valley beds also.

The limited collection representing the Kinsey Ranch local fauna, in which the best represented taxon, *Ottoceros*, is unknown elsewhere, makes correlation difficult. Greatest similarities, however, do exist between the present fauna and those recognized as Hemphillian. As mentioned previously, the Kinsey Ranch species of *Pliohippus* most resembles the form from Mt Eden, California, recognized as Hemphillian (Wood, et al., 1941). No other taxon precludes the Kinsey Ranch local fauna being the same age as the Mt Eden fauna. A new species of camel in the Mt Eden fauna identified by Frick (1921) as *Procamelus* (?) *edensis* shows great similarity to the smaller camel from Kinsey Ranch referred to as cf. *Tanupolama*. The size and configuration of teeth of the small camelid from Eden closely compares with *Tanupolama* and the Eden specimens possess llama buttresses similar in development to those of the Kinsey Ranch form.

The apparently more advanced stage of the Kinsey Ranch *Pliohippus* as compared with the one from the Kern River fauna of California, *Pliohippus* cf. *spectans*, suggests a later Hemphillian age for the former fauna than the latter.

Several Hemphillian vertebrate faunas have been described from the panhandle region of Texas by Johnston and Savage (1955). Among them are the Axtel, Christian Ranch, Currie Ranch, and Smart Ranch faunas. Each of these faunas is relatively small in numbers of taxa and specimens but the taxa of each were considered sufficiently diagnostic for a late Hemphillian age assignment. The Kinsey Ranch local fauna appears to approximate these in age based on the limited material available from both areas.

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