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Results of the Archbold Expeditions. No. 107. A New Genus of Arboreal Rat from Luzon Island in the Philippines

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ABSTRACT

The taxon *latidens* Sanborn, 1952 originally named and described as a species of *Rattus* is taken out of that genus and placed in *Abditomys*, new genus. Some of its distinctive features, such as nails instead of claws on the halluces, wide upper incisors, and large molars with simple and lami-

nar-like occlusal surfaces are not characteristic of *Rattus*. The species is known by two specimens from the island of Luzon in the Philippines. The relationship of *latidens* to other Murinae with nails on the halluces is discussed. Aspects of its natural history are presented.

INTRODUCTION

I propose a new genus for a native Philippine rat originally described as *Rattus latidens* (Sanborn, 1952), endemic to the island of Luzon in the Philippines. This report is one of several already published (Musser, 1977a, 1977b, 1979, 1981a; Musser and Freeman, 1981; Musser and Gordon, 1981) or in manuscript dealing with the taxonomy and geographic distribution of Philippine murids. With this and future papers, I intend to document the morphological limits of certain species and provide information about their insular distributions and natural histories. Possible phylogenetic relationships of

the fauna will be analyzed in a separate report.

There is an impression among mammalogists and biogeographers that the native Philippine rats are well known, especially that spectacular segment of the fauna that lives on the western highlands in northern Luzon (Thomas, 1898). This is not so. We know less about the Philippine rats than most other murid groups in the Far East. The natural history of nearly all the native species is either unknown or encapsulated in sketchy descriptions made by collectors. Many of the native genera were thought to be restricted

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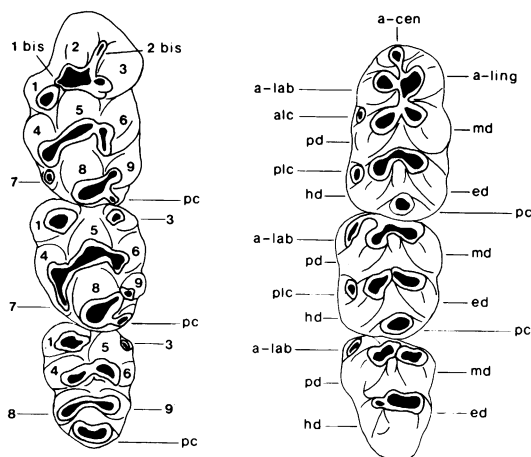


FIG. 1. Nomenclature of dental structures using right upper and lower molars of *Lenothrix canus*. Upper molars: cusps are numbered according to Miller's (1912) scheme and are referred to in the text with the prefix *t*; *pc*, posterior cingulum. Lower molars: *a-cen*, anteroventral cusp; *a-lab*, anterolabial cusp; *a-ling*, anterolingual cusp; *pd*, protoconid; *hd*, hypoconid; *md*, metaconid; *ed*, entoconid; *pc*, posterior cingulum; *alc*, anterior labial cusplet; *plc*, posterior labial cusplet.

to Luzon or Mindanao but actually have more extensive distributions over the archipelago. The diversity of the fauna, at the level of genera and species, is greater than generally realized. There are specimens hidden under misidentifications in museum collections that represent new taxa, there are samples of new species obtained from various islands during recent exploration, and there are many species now placed in *Rattus* that really do not belong there. The species, *latidens*, is one of these. To separate it from *Rattus*, to contrast it to other species that have nails instead of claws on their halluces, and to provide notes and speculations about its natural history are my intentions here.

I am grateful to the curators who allowed me access to collections under their care; to Ms. Fran Stiles, Ms. Marjorie Shepatin, and Mr. Helmut Sommer for the artwork; to Messrs. Arthur Singer, Peter Goldberg, and Jim Coxe for the photographs; and to Mr. Robert J. Koestler and Mr. Richard Sheryll

for their work with the Scanning Electron Microscope and the resulting micrographs. Mrs. Frances A. Hufty, of Archbold Expeditions, Inc., contributed part of the financial support for my work.

ABBREVIATIONS AND METHODS

Specimens referred to here are in collections of the American Museum of Natural History, New York (AMNH); the British Museum (Natural History), London (BMNH); the Field Museum of Natural History, Chicago (FMNH); the Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); and the National Museum of Natural History of the Smithsonian Institution, Washington, D.C. (USNM).

Values for lengths of head and body, tail, hind foot, and ear are from the labels attached to study skins. Cranial and dental measurements were taken with dial calipers graduated to tenths of millimeters; limits of those measurements are explained in Musser (1970, 1979). The nomenclature I use for cusps and cusplets on the molars is diagrammed in figure 1.

DIAGNOSIS AND DESCRIPTION

Named and described by Sanborn (1952) as a species of *Rattus*, the characteristics of *latidens* are known from an adult female (the holotype) and an adult male, both from the island of Luzon in the Philippines. Sanborn (1952, p. 125) diagnosed *latidens* as "A large dark species with tail slightly longer than head and body; skull short, with thick rostrum, large bullae and short palate ending between last molars; molar pattern like that of *Rattus*, but incisors nearly twice the width found in most species of *Rattus* and wider than in the largest species." Those wide incisors should have prompted Sanborn to look closer at the holotype. The configuration of the cranium and the occlusal patterns of the molars are unlike species of *Rattus*; furthermore, each hallux has a nail instead of a claw, a specialization not found in any *Rattus*. The two specimens of *latidens* represent a species outside of the morphological radiation characterizing not only *Rattus* but all other known

genera of murids and requires its own genus, which is named and diagnosed below.

ABDITOMYS, NEW GENUS

TYPE SPECIES: *Rattus latidens* Sanborn (1952, p. 125); based on the holotype, an adult female (FMNH 62347), collected April 29, 1946, from Mount Data, 7500 feet, Mountain Province, Luzon, the Philippines. An adult male (USNM 357244) obtained on March 14, 1967 from Los Baños, Laguna Province, Luzon (Barbehenn, Sumangil, and Libay, 1972–1973) is the only other known specimen of the species.

KNOWN DISTRIBUTION: The island of Luzon in the Philippine Islands (fig. 2).

ETYMOLOGY: *Abditomys* is formed by combining the Latin, *abditus*, meaning hidden or concealed, with the Greek, *mys*, for mouse or rat. I allude to the past concealment of *latidens*—so distinctive in features of skin, skull, and teeth—within the morphological confines of the genus *Rattus*, to which it is not closely related.

DIAGNOSIS: A genus of arboreal murid distinguished from all other species by the following combination of features: large body size, long, monocolored tail; four pairs of mammae; a large nail instead of a claw on each hallux; squamosal roots of the zygomatic arches situated high on sides of the braincase; squarish interparietal, its anterior one-third between the parietals, the posterior two-thirds roofing the occipital bulge; no strut of alisphenoid bone covering lateral part of the alisphenoid canal; masticatory-buccinator foramina merged with foramen ovale accessorius; incisive foramina long and thin; palatal bridge short, ending well before backs of third molars; deep mesopterygoid and pterygoid fossae; sphenopalatine and sphenopterygoid vacuities large; bullae large and inflated; upper incisors very wide, absolutely and relative to breadth of rostrum; molars long and wide, gleaming white, the uppers large relative to area of palatal bridge; high cusps that slant back with appreciable overlap between first and second molars, and between second and third, especially in the upper molars; first upper molars five-rooted,

first lower molars four-rooted; each third upper molar squarish in occlusal outline, only a little smaller than the second; upper molars with simple occlusal surfaces, no cusps t7, no posterior cingula, no cusps t3 on second and third molars; cusp t9 broadly merged with cusp t8 on first and second molars; front two rows of cusps form thin and gently arcuate laminae on each first upper molar and on the front row of each second and third upper molar; last row of cusps on each upper molar laminar, nearly transverse; occlusal surfaces of lower molars consisting of transverse laminae formed from two elongate cusps; posterior cingulum a wide flat-topped cone in center of posterior margin on first and second lower molars; small anterolabial cusps on second and third molars; no anteroventral cusp at front of first lower molar; no labial cusplets on any lower molars.

DESCRIPTION: *Abditomys latidens* is a large-bodied rat with a tail longer than the combined lengths of head and body (table 1, fig. 3). The upperparts of the head and body are brown with tawny highlights. The underparts are buffy yellow with gray suffused through the base of the coat. Color of the venter is indistinctly demarcated from that of the dorsum. The pelage covering the head and body is long (30–35 mm. over the back) and coarse, but not spinous. Long (up to 50 mm.) and conspicuous guard hairs emerge from the coat everywhere over the top and sides of the body, and are especially prominent over the rump. The ears are large and brown. The tail is brown everywhere, appears naked, but is covered with short, stiff, inconspicuous hairs. The feet are dark or pale brown over the entire dorsal surfaces down to the base of the claws. The claws on the front feet are sharp and small, especially relative to the large digital pads all textured with transverse and semicircular striations. There is a prominent pointed nail on each hallux; the other digits terminate in large, elongate, sharp claws (fig. 4). The female has four pairs of mammae: a pectoral pair, postaxillary pair, and two inguinal pairs. The male (testes were abdominal) has a prominent midventral cutaneous glandular area, 70 mm. long and 6 mm.

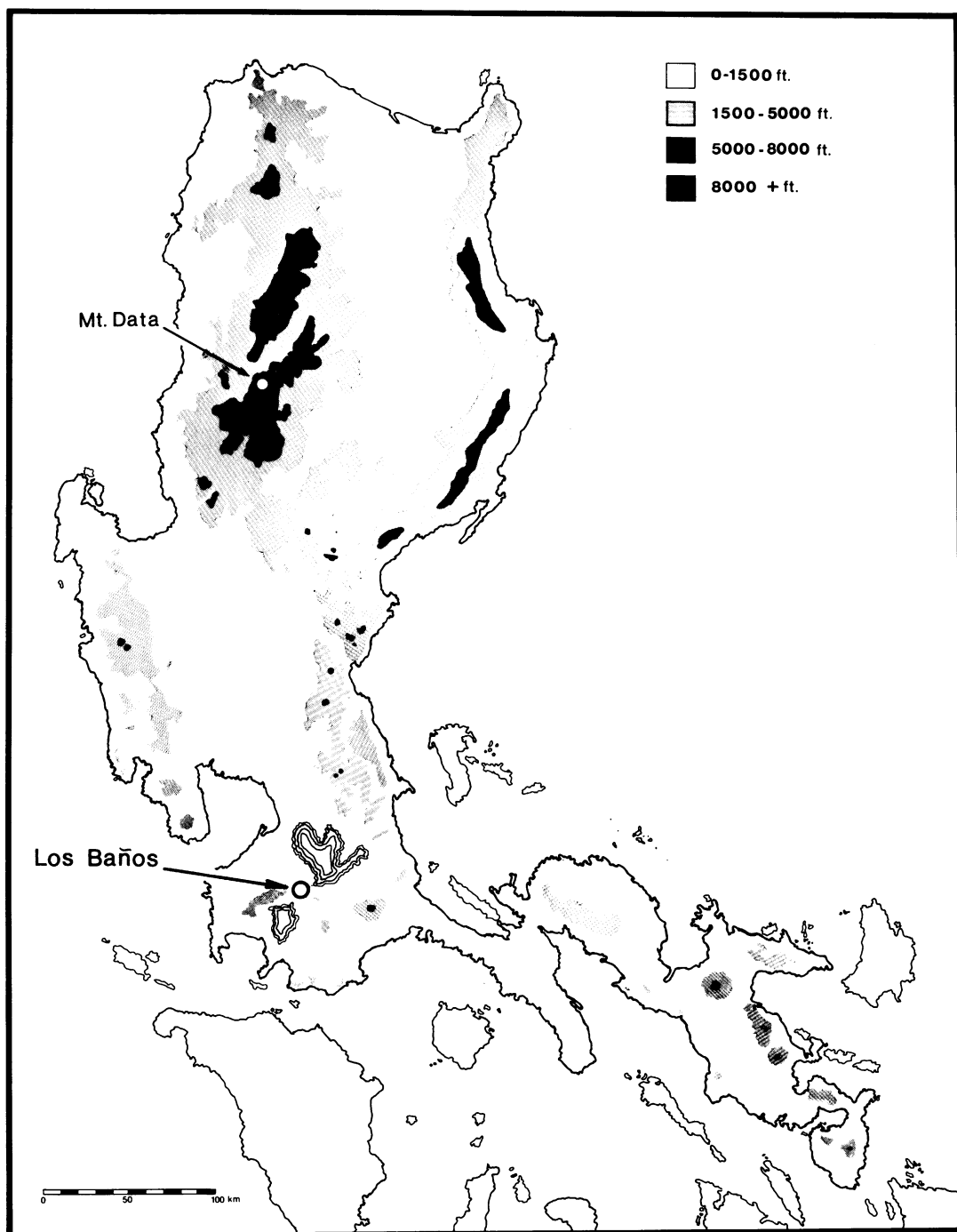


FIG. 2. Map of Luzon Island in the Philippines. Specimens of *Abitomys latidens* are from Mount Data and Los Baños.



FIG. 3. *Abditomys latidens*. Dorsal and ventral views of USNM 357244, the adult male from Los Baños. Its measurements are listed in table 1.

across its widest place (partially seen in fig. 3).

The cranium of *A. latidens* is large, high, stocky, and roughly rectangular from a dorsal view (table 1, fig. 5; Sanborn, 1952, fig. 10).

TABLE 1
Measurements (in Millimeters) of Adult *Abditomys latidens* from Luzon Island in the Philippines

Measurement	FMNH 62347 ^a female	USNM 357244 male
Length of head and body	232	216
Length of tail	242	271
Scale rows/cm on tail	7	9
Length of hind foot	45	47
Length of ear	21	24
Weight (g)	—	269
Greatest length of skull	50.6	49.5
Zygomatic breadth	25.9	24.2
Interorbital breadth	6.0	5.7
Length of nasals	19.4	18.9
Length of rostrum	16.6	15.3
Breadth of rostrum	9.6	8.6
Breadth of braincase	18.7	18.0
Height of braincase	14.1	13.5
Breadth of incisor tips	5.4	3.9
Breadth of zygomatic plate	6.0	5.4
Depth of zygomatic notch	3.1	3.1
Length of diastema	13.4	13.0
Palatilar length	22.5	22.1
Palatal length	26.3	25.3
Postpalatal length	19.4	18.3
Length of incisive foramina	9.0	9.3
Breadth of incisive foramina	2.9	2.8
Length of palatal bridge	9.2	9.1
Breadth of bridge at M ¹	3.4	3.4
Breadth of bridge at M ³	4.7	3.9
Breadth of mesopterygoid fossa	2.7	3.1
Length of bulla	9.0	9.5
Height of bulla	7.8	8.2
Alveolar length of M ¹⁻³	9.7	9.9
Breadth of M ¹	3.4	3.1
Breadth of M ²	3.5	3.0
Breadth of M ³	2.6	2.6
Actual length of M ₁₋₃	10.4	9.8
Breadth of M ₁	2.9	2.9
Breadth of M ₂	3.2	3.0
Breadth of M ₃	3.0	2.8

^a Holotype.

Strong and nearly parallel zygomatic arches, together with a short and broad rostrum and squarish braincase provide the rectangular appearance. Nasals, which are narrow proximally but expand to become wide distally, enhance the broadness of a squarish rostrum.



FIG. 4. The hind foot of *Abitomys latidens*. Drawn from USNM 357244. Note the nail on the hallux.

The nasals are nearly flat for about three-fourths of their lengths, which gives the rostrum a broad, flat dorsal surface. The interorbital region is pinched in, narrower than the rostral breadth. High, thick ridges define the dorsolateral margins of the interorbital region and extend back along the postorbital area to the dorsolateral margins of the braincase where they become reduced in size and prominence and nearly disappear near the occiput. The interparietal is about as long as it is wide; the front one-third is between the parietals, the posterior two-thirds forms the top of the deep occipital region. High, thin ridges mark the sides of the braincase where the occipital and squamosal bones join. The walls of the braincase above the squamosal roots of the zygomatic arches slope toward the midline of the cranium.

In side view, the zygomatic plates are wide, appear robust, and their anterior borders project well in front of the dorsal roots of the zygomatic arches. The squamosal roots of the zygomatic arches are set high on the braincase.

The configuration of each alisphenoid region at the base of the braincase just above each pterygoid ridge is like that in *Rattus* (Musser, 1981a). A strutlike wall of alisphenoid bone, present in many murids (Musser, 1981a), is gone from the lateral side of the alisphenoid canal, which is now an open channel. Above the channel is a large foramen ovale and anterior to that a small

opening where the contents of the canal enter the sphenoidal fissure (fig. 7A). When a strut of alisphenoid bone is present, it separates the masticatory-buccinator foramina, anterior to the strut, from the foramen ovale accessorius, posterior to the strut (as in *Crateromys*, for example; see Musser and Gordon, 1981). With the strut of bone missing, the masticatory-buccinator foramina have merged with the foramen ovale accessorius and appear functionally absent. The foramen ovale and opening of the alisphenoid canal into the sphenoidal fissure are now seen where they would be hidden if a strut were present (fig. 7A).

The inflated bullae, large absolutely and relative to size of the cranium, are evident in side view. Each bulla is separated from the squamosal bone by a wide postglenoid vacuity. Above each bulla, the squamosal bone is complete, not perforated or notched by a squamoso-mastoid vacuity that would separate the bone into a dorsal part and a ventral tympanic hook (fig. 7A).

In ventral view (fig. 5, fig. 7B), the incisive foramina are narrow, long, and slightly constricted posteriorly; their back margins penetrate between the anterior margins of the first molars by 0.5 mm. in FMNH 62347 and 0.4 mm. in USNM 357244. The palatal bridge is narrow, thick, scored by deep palatine grooves, and short; its posterior edge is situated 1.0 mm. before the ends of the toothrows in FMNH and 0.8 mm. in USNM

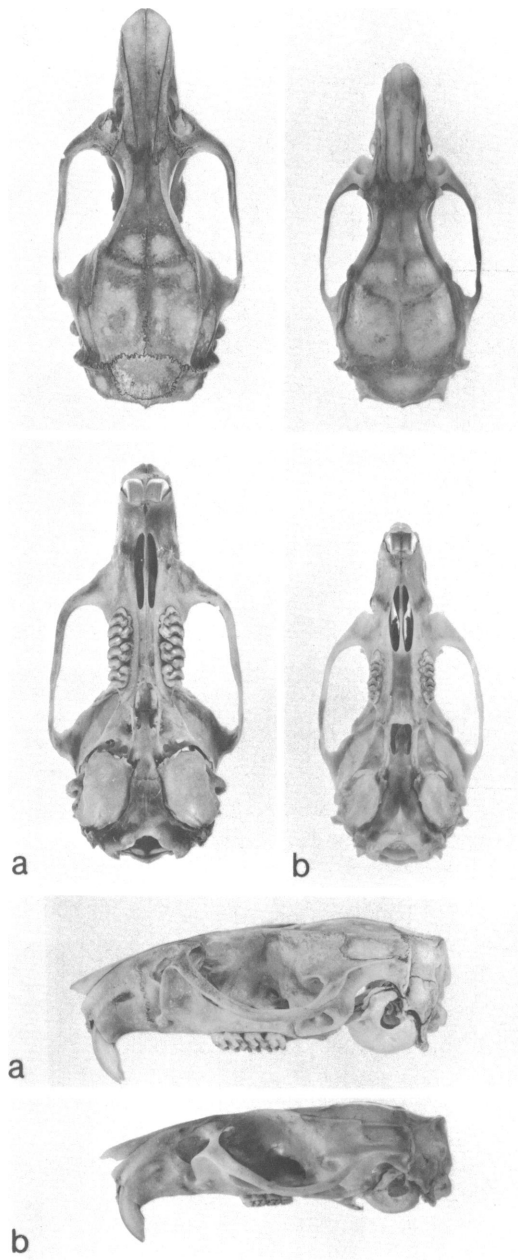


FIG. 5. Views of adult crania: a, *Abditomys latidens* (USNM 357244) is contrasted with b, an example of *Rattus rattus diardii* from West Java (AMNH 250104). Approximately $\times 1$.

357244. The mesopterygoid fossa is deep and conspicuously narrower than the palatal bridge; its walls are breached by spacious

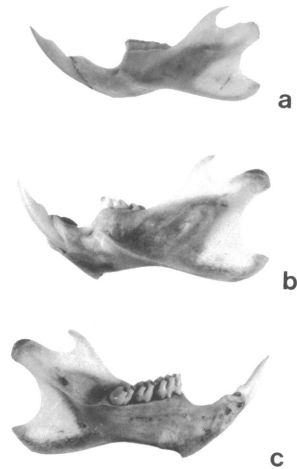


FIG. 6. Dentaries from the same specimens shown in figure 5: a, labial view of *R. r. diardii*; b, labial view of *A. latidens*; c, lingual view of *A. latidens*. Approximately $\times 1$.

sphenopalatine vacuities that extend to the back of the orbits (fig. 8). Each pterygoid fossa is deep, its floor slanted down toward the midline of the cranium and its anterior two-thirds perforated by a large sphenopterygoid vacuity. The posterolateral edge of the pterygoid platform behind each foramen ovale is a definite, high ridge. In ventral view the bullae are large and inflated; the eustachian tubes are short and inconspicuous.

Shapes and positions of some foramina in each orbit are of interest. The sphenopalatine foramen is very large and conspicuous. It is set well anterior to the much smaller and nearly hidden dorsal palatine foramen (fig. 8). The optic foramen is also large. It is separated from the anterior end of the large and elongate sphenopalatine vacuity by a narrow bony strut.

Each dentary is large and stocky (fig. 6). That part of the ramus anterior to the tooth-row is short and deep. The coronoid process is large. A deep concavity forms the back margin of the dentary. The masseteric ridge is thick and prominent. On the inner side of the mandible, a shelf extends from the back of the toothrow diagonally past the mandibular foramen onto the bottom of the condyloid process.

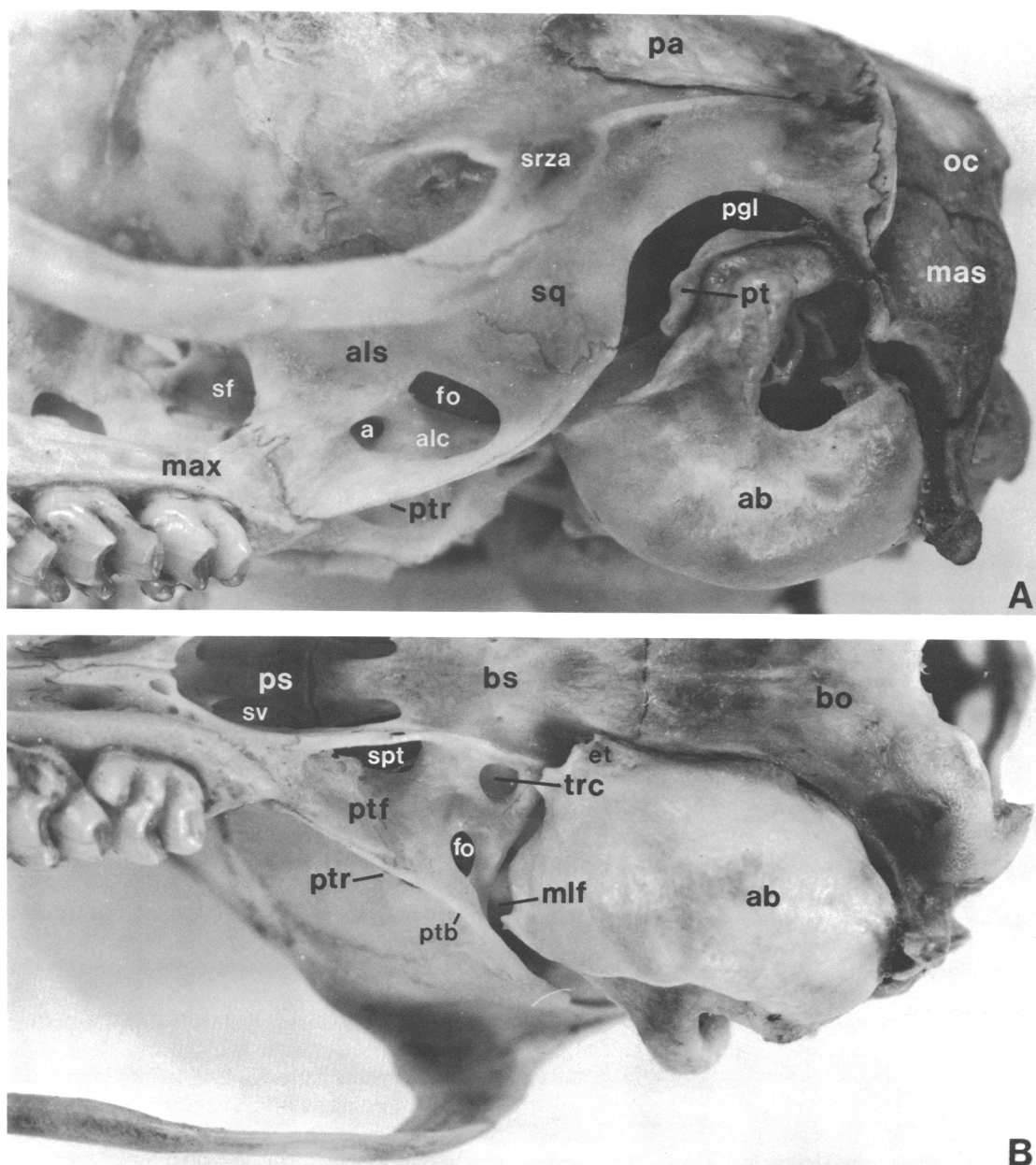


FIG. 7. The back part of the cranium in *Abitomys latidens* (USNM 357244): A, lateral view; B, ventral view. Abbreviations: a, anterior opening of the alisphenoid, where it empties into the sphenoidal fissure; ab, auditory bulla; alc, alisphenoid canal, which is an open channel; als, alisphenoid bone; bo, basioccipital bone; bs, basisphenoid bone; et, bony eustachian tube; fo, foramen ovale; mas, mastoid portion of the petromastoid; max, maxillary bone; mlf, middle lacerate foramen; oc, occiput; pa, parietal bone; pgl, postglenoid vacuity; ps, presphenoid bone; pt, periotic portion of the petrosal; ptb, pterygoid bridge, which is a definite ridge; ptf, pterygoid fossa; ptr, pterygoid ridge; sf, sphenoidal fissure; spt, sphenopterygoid vacuity; sq, squamosal bone; srza, squamosal root of the zygomatic arch; sv, sphenopalatine vacuity; trc, transverse canal. Hill (1935), Wahlert (1974), and Musser (1981a) discuss the foramina and significance of some configurations.

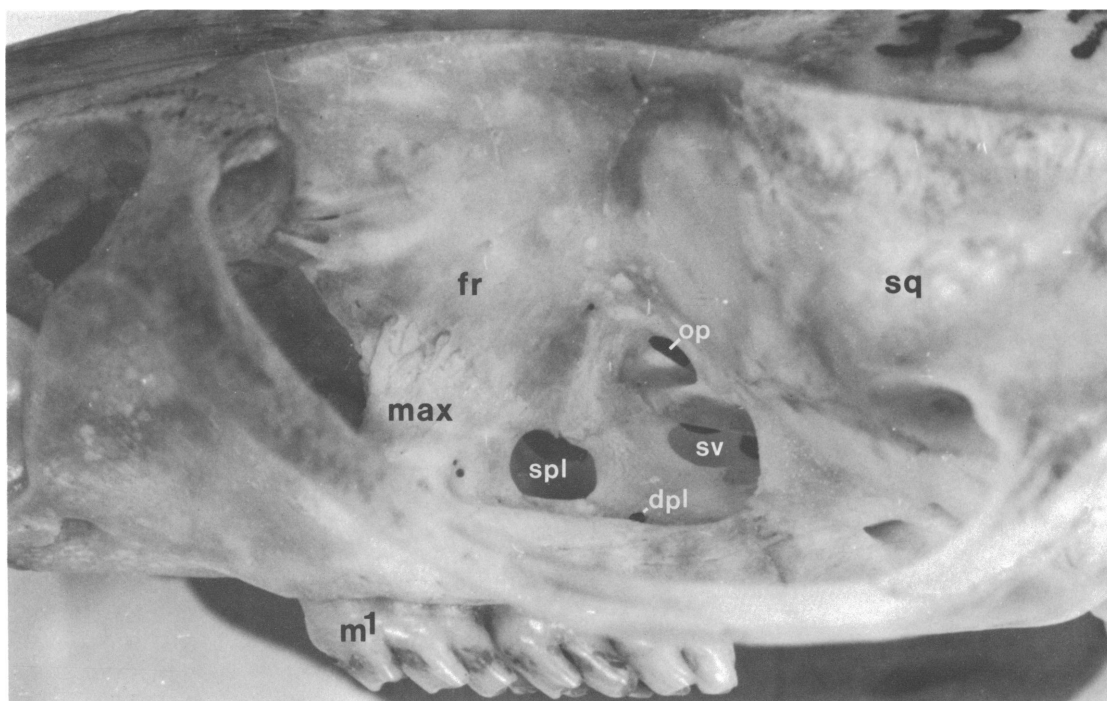


FIG. 8. The orbital and postorbital region in *Abditomys latidens* (USNM 357244). Abbreviations: **dpl**, dorsal palatine foramen; **fr**, frontal bone; **max**, maxillary bone; **m¹**, first upper molar; **op**, optic foramen; **spl**, sphenopalatine foramen; **sq**, squamosal bone; **sv**, sphenopalatine vacuity. Note the slant to the high cusps and the way one molar overlaps another.

The incisors of *A. latidens* are large and smooth, the enamel layers of the uppers are orange, those of the lowers yellowish orange. The uppers emerge from the rostrum at a right angle (opisthodont) and are very wide (56% of the rostral breadth in FMNH 62347 and 45% in USNM 357244).

Abditomys latidens has big, chunky hypodont molars that are ivory-colored, glisten, and without the brown or blackish tarry encrustations often found in other murids. Each first upper molar is anchored by five roots (large anterior and posterior, two lingual, and a labial), the second by four roots, and the third by three. Each first lower molar has four roots (large anterior and posterior, small labial, and small lingual), each second and third lower molar is anchored by three roots (two small anterior and a large posterior).

The upper molars form wide, prominent rows in the bony palate. The second upper molar is about as wide as the first, and the

third, which is squarish in occlusal outline, is only a little smaller than the second. The high cusps slant back so that the first molar appreciably overlaps the front part of the second and the second overlaps the third (figs. 8 and 9). The occlusal surfaces of the uppers are simple in configuration: no cusp t1bis, t2bis, t7, accessory labial cusp behind cusp t6, or posterior cingulum occurs in any of the teeth; and cusp t3 is absent from the second and third molars. The cusps on all the teeth form either gently arcuate rows—such as the first and second laminae on the first molar, and the first lamina of the second and third molars—or nearly transverse laminae, those at the back of each tooth. Cusp t1 on all three teeth, and cusp t4 on each first and second molar are round and discrete—especially cusp t4 on the first molar, which is nearly separate from cusp t5—but the labial cusps are elongate and merged with the central cusps to form most of the surface of each

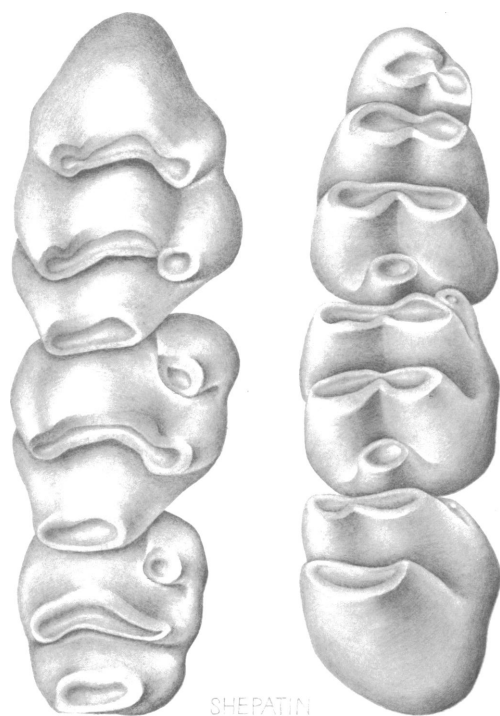


FIG. 9. Occlusal views of right molar rows of *Abitomys latidens* (USNM 357244). M^{1-3} is on the left, M_{1-3} on the right. See table 1 for measurements.

lamina. Cusp t9, for example, is large but poorly defined because it is broadly merged with cusp t8 on the first and second molars.

The stocky lower molars also have high, slanting cusps, and are simple in occlusal topography (fig. 9). There are three transverse rows of cusps (two in each row) on the first molar and two rows on each second and third molar. The laminae are separated from each other and lean forward. A large and discrete posterior cingulum sits at the back of each first and second molar, distinctly separate from the lamina in front of it. The first molar is oblong in occlusal outline, the second and third squarish. The front lamina on each first lower molar is formed of a large anterolingual cusp and a smaller anterolabial cusp merged to form a lamina distinctly set apart from the one behind; there is no antero-central cusp. No anterior or posterior cusplets occur along

the labial margins of the first molars, and no posterior labial cusplets occur on either the second or third molars in the two specimens I examined. There is a small anterolabial cusp on each second and third molar.

COMPARISONS WITH *RATTUS*

I compare *Abitomys latidens* with *Rattus* because *latidens* was originally described as a species in that genus. The Asian forms of *R. rattus*, *R. r. diardii* (Java) and *R. r. flavipectus* (China), are the examples I use; specimens of them are compared with that of *A. latidens* in figure 5 (crania), figure 6 (dentaries), and figure 10 (molar rows). *Abitomys latidens* possesses the following characteristics that contrast with those of *Rattus*.

1. A nail (or scalelike claw) is on each hallux. Every species of *Rattus* has claws on the halluces.

2. The dorsal surfaces of the nasals are nearly flat for most of their lengths and only gently convex near their tips. In *Rattus*, the nasals are not flat but rounded on top along their lengths.

3. Squamosal roots of the zygomatic arches are set higher on sides of the braincase.

4. The sides of the braincase slope outward from the temporal ridges to the squamosal roots. In *Rattus* (certainly *R. rattus*), the sides of the braincase are vertical or nearly so.

5. The interparietal is narrow, the anterior one-third sits between the parietals, the posterior two-thirds roofs part of the occipital region. *Rattus* has a short, wide interparietal that is farther posteriorly, forming nearly the entire roof of the occipital region.

6. Each zygomatic plate is taller, joining the dorsal root of the zygomatic arch nearly at a level with the top of the cranium. The plate is relatively shorter in *Rattus*, meeting the dorsal root of the zygomatic plate about one-third of the way down from the top of the cranium.

7. The bullae are much more inflated and appreciably larger relative to size of the cranium.

8. The cranium is relatively deeper, especially between the interorbital area and the bony palate.

9. The palatal bridge sits well above the floor of the basisphenoid (as seen from a ven-

tral view), is deeply scored by palatine grooves, is narrow, and ends anterior to the posterior margins of the toothrows. In *Rattus*, the bridge is much lower relative to the basisphenoid, very wide, with either shallow or faint palatine grooves, and projects beyond the posterior margins of the toothrows to form a wide and long shelf.

10. The mesopterygoid and pterygoid fossae are relatively much deeper, a reflection of the raised bony palate.

11. The upper incisors are orthodont and very wide, about half the width of the rostrum. The uppers are either orthodont or opisthodont and much narrower, about a third the width of the rostrum (an average of 33% of the rostral breadth in a series of 20 *R. r. diardii* from Java).

12. The upper molars are big and chunky, the toothrows occupy about two-thirds of the bony palate. *Rattus* has small molars, the toothrows are short and narrow relative to the wide and long expanse of bony palate.

13. Each third upper molar is squarish and only a little smaller than the second. Each third molar is round or oblong in *Rattus* and much smaller than the second.

14. Occlusal surfaces of the uppers consist of wide and gently bowed laminae in which only some of the lingual cusps are still discrete. The lamina at the back of each molar is transverse or nearly so, a configuration due to an elongate cusp t9 merged on the same axis with an elongate cusp t8. The laminae in *Rattus* are arcuate and conspicuously cuspidate. Cusp t9 on each first and second molar is discrete and directed anterolabially; those posterior laminae are not transverse.

15. No cusp t3 occurs on either the second or third upper molars. Cusp t3 is often present, although small, on the second and third molars of *Rattus*.

16. Each dentary is more robust and higher; the portion anterior to the molar row is relatively shorter and deeper.

17. The lower molars are large and chunky, especially relative to the dentary. *Rattus* has much smaller molars.

18. Each third lower molar is squarish in occlusal outline and nearly as large as the second molar. Each third molar is triangular in outline in *Rattus*.

19. Occlusal surfaces of the lower molars consist of wide, transverse laminae, each composed of two elongate cusps. The laminae are set apart from each other. The laminae are close together in *Rattus*, most are chevron-shaped rather than transverse.

20. The front lamina of each first lower molar is slightly angled to the posterolateral side, distinctly separated from the lamina behind, and consists of discrete anterolingual and anterolabial cusps set on about the same axis. In *Rattus*, the front lamina is formed of a large anterolingual cusp and a smaller anterolabial cusp set at nearly a right angle to the other; the backs of the cusps are pressed tightly against the anterior surface of the second lamina.

21. The lamina at the back of each third lower molar is nearly as wide as the front lamina and transverse. In *Rattus*, the posterior lamina is narrower relative to the one in front, and slanted anterolabially.

22. Each posterior cingulum on the first and second lower molars is round or slightly elliptical in cross-section and distinctly separated from the lamina in front of it. The posterior cingula are elliptical in *Rattus* and set closer to the laminae, often merging with them at places.

23. There are no anterior or posterior labial cusplets on the first lower molars, and no posterior labial cusplets on the second molars. There is an anterior labial cusplet on each first molar in some examples of *Rattus*; posterior labial cusplets occur on both the first and second molars in most specimens.

COMPARISONS WITH MURINES HAVING NAILS

In having nails on its halluces, *Abditomys latidens* is unique among rats native to the Philippine Islands. The character is rare even within muroid rodents and is found in only two groups. One consists of *Dendromus*, *Megadendromus*, and *Prionomys*, which are in the Dendromurinae, a small assemblage of species native to Africa.

The other group is the Murinae. Among the hundreds of species in that group, only the following seven genera and 14 species have nails on halluces.

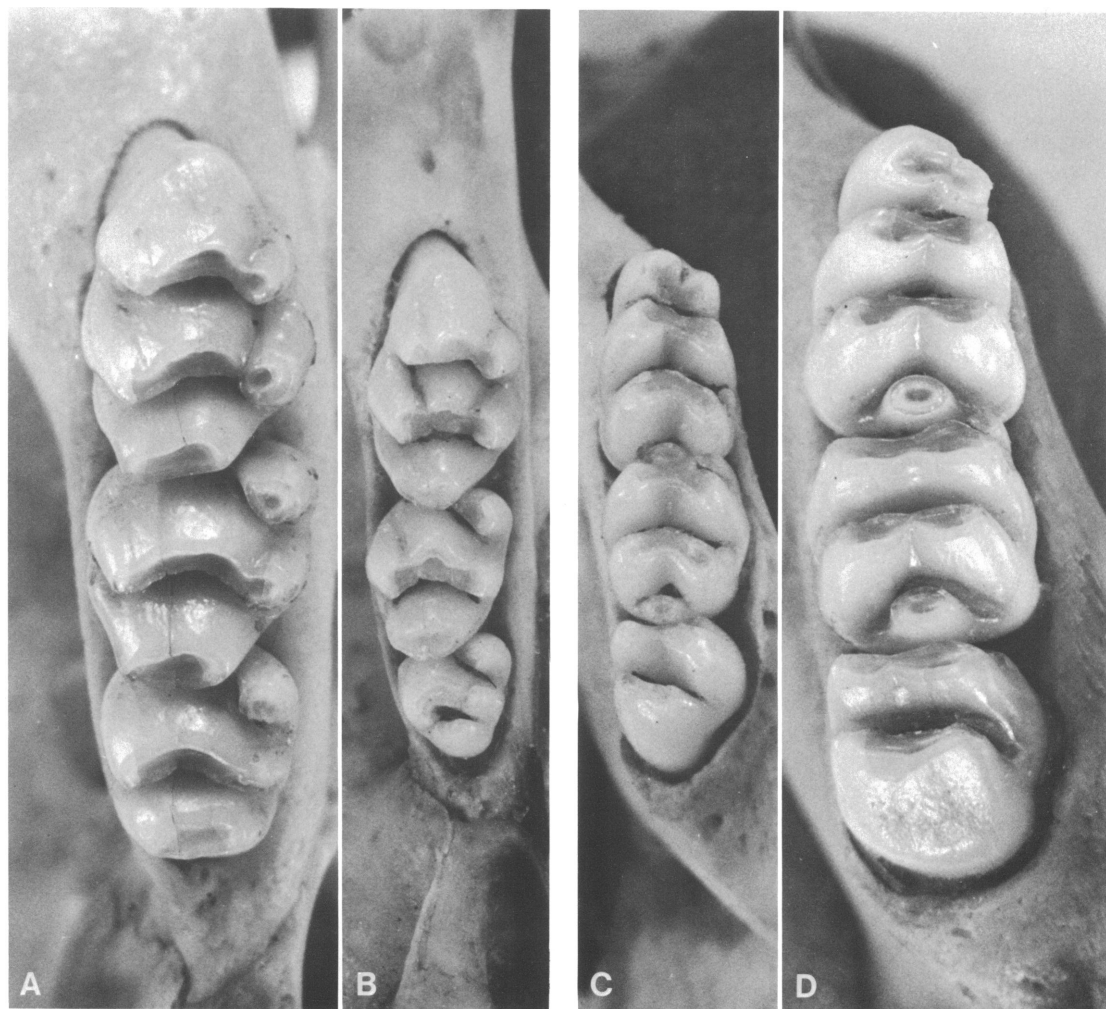


FIG. 10. Occlusal views contrasting right molar rows of *Abditomys* and *Rattus*. A and D: M^{1-3} and M_{1-3} , respectively of *A. latidens* (USNM 357244). B and C: M^{1-3} and M_{1-3} , respectively of *R. rattus flavipectus* from China (AMNH 84677). Approximately $\times 10$.

1. *Hapalomys*: *H. longicaudatus* and *H. delacouri*; the mainland of Southeast Asia and the Malay Peninsula (Musser, 1972).
2. *Chiropodomys*: *C. gliroides*, *C. muroides*, *C. calamianensis*, *C. major*, and *C. karlkoopmani*; Southeast Asia, the Sunda Shelf, and the Mentawai Islands (Musser, 1979).
3. *Vandeleuria*: *V. oleraceae* and *V. nolthenii*; India, Ceylon, and Southeast Asia (Musser, 1979).
4. *Pithecheir*: *P. melanurus* and *P. parvus*; the Malay Peninsula, Sumatra, and Java (Ellerman, 1941).
5. *Chiromyscus*: *C. chiropus*; Southeast Asia (Musser, 1981a).
6. *Kadarsanomys*: *K. sodyi*; Java (Musser, 1981c).
7. *Abditomys*: *A. latidens*; Luzon, the Philippine Islands.

Because nails on halluces is a specialization and one that occurs infrequently among muroid rodents, especially among the Murinae,

TABLE 2
Distribution of Primitive (P) or Derived (+) Expressions of 26 Traits among 7 Genera of Murine Rodents

	<i>Chiro- podomys</i>	<i>Hapalo- mys</i>	<i>Vande- leuria</i>	<i>Pithecheir</i>	<i>Chiro- myscus</i>	<i>Kadar- sanomys</i>	<i>Abdito- mys</i>
1. Dorsolateral margins of braincase	+	+	P	+	+	+	+
2. Sides of braincase	+	+	P	P	+	P	P
3. Squamosal roots of zygomatic arches	P	+	+	+	P	+	P
4. Alisphenoid complex	+	+	P	+	P	+	+
5. Size of bulla	P	+	P	+	P	+	+
6. Attachment of bulla	+	+	+	P	P	+	+
7. Incisive foramina	P	P	P	P	+	+	+
8. Mesopterygoid fossa	P	P	+	P	P	P	+
9. Pterygoid fossa	P	P	P	P	+	+	+
10. Pterygoid platform	P	+	P	+	P	+	+
11. Roots of M ¹	P	P	P	P	P	+	+
12. Roots of M ₁	P	P	P	P	+	+	+
13. Height of cusps	P	P	P	P	P	P	+
14. Size of molars	P	P	P	P	+	P	P
15. Overlap of molars	P	P	P	+	+	+	+
16. Cusps t1bis and t2bis	P	+	P	+	P	P	P
17. Cusp t7	+	+	+	+	P	P	P
18. Posterior cingulum	P	+	P	P	+	P	+
19. Cusp t9	P	P	P	P	+	P	+
20. Cusp t5	P	P	P	P	+	P	+
21. Union of cusps	P	P	P	P	+	P	+
22. Anterolabial and anterolingual cusps	P	P	P	P	+	P	P
23. Anterolabial cusp	P	P	P	P	+	P	P
24. Fifth digit	P	P	+	P	P	P	P
25. Lamina	P	P	P	P	P	P	+
26. Rows of cusps	P	+	P	P	P	P	P
Total derived traits	5	11	5	8	13	11	17

^a Numbers correspond to numbered descriptions of the traits in the text. See Musser (1981a) for more information about some of the features.

I studied species in the seven genera listed above to determine if they were closely related because they shared this derived trait. Elsewhere (Musser, 1981a), I presented hypotheses of derived and primitive conditions in 29 external, cranial, and dental features of several genera from the Indo-Australian region that were once part of *Rattus* to note their possible phylogenetic relationships relative to *Rattus*. I examined 23 of those same characteristics, as well as three new ones, in the seven genera. These traits are briefly presented below: the primitive condition is described first, followed by the derivation in parentheses. Distributions of the primitive or derived states in the 26 traits are listed in table 2.

1. Dorsolateral margins of braincase: Slight beading along dorsolateral margins of the interorbital and postorbital regions; the braincase is either smooth all over or has low beading along the dorsolateral margins of the anterior half and is smooth over the posterior half. (Medium to high ridges or shelves outline the interorbital area and sweep back along the dorsolateral margins of the braincase, all the way to the occiput in some species.)

2. Sides of braincase: Sides of the braincase slope outward from the dorsolateral margins of the cranium to the squamosal roots of the zygomatic arches. (The sides are vertical or nearly so.)

3. Squamosal roots of zygomatic arches:

The roots originate high on the upper half of the braincase, often close to the temporal ridges and well above the bullae. (The roots are set halfway down the braincase or lower, just above the bullae.)

4. Alisphenoid complex: A strut of alisphenoid bone covers the lateral part of the alisphenoid canal and separates the foramen ovale accessorius from the masticatory-buccinator foramina. (The strut is gone, the alisphenoid canal is an open channel and the foramina have merged—they appear to be functionally absent.)

5. Size of bullae: The bullae are moderately to very small relative to size of the cranium. (The bullae are large relative to cranial size, sometimes highly inflated.)

6. Attachment of bullae: Each bulla is tightly attached to the squamosal bone. The postglenoid vacuity is small and usually confined to the top of the bulla between the periotic and squamosal. (A wide, spacious vacuity separates the dorsal and anterior margins of the periotic and bulla from the squamosal.)

7. Incisive foramina: The incisive foramina are short, their posterior edges terminating well anterior to the maxillary molar rows. (The foramina are long, the posterior margins ending at the fronts of the first upper molars or beyond them.)

8. Mesopterygoid fossa: The fossa is nearly as wide as the back part of the palatal bridge. Its walls are breached by thin, short sphenopalatine vacuities or slits. (The fossa is one-third to one-half the width of the palatal bridge. The sphenopalatine vacuities are huge so that the presphenoid and anterior part of the basisphenoid appear suspended in air.)

9. Pterygoid fossae: Each fossa is nearly flat or shallowly excavated, its anterior two-thirds entire and not perforated by a large sphenopterygoid opening. (Each fossa is excavated or tilted toward the midline of the skull and perforated by a large sphenopterygoid vacuity.)

10. Pterygoid platform: The posterolateral portion of each pterygoid platform behind the foramen ovale is either nearly flat, a low mound, or a wide and smooth low ridge. (The edge is thrown up into a definite high and thin ridge.)

11. Roots of first upper molars: Each first upper molar is three-rooted (anterior, lingual, and posterior) or four-rooted (a labial root in addition to the three primary roots or a divided lingual root along with only an anterior and posterior root). (Each first upper molar is five-rooted—anterior, posterior, two lingual, and one labial.)

12. Roots of first lower molars: Each first lower molar is two-rooted (an anterior and posterior root) or three-rooted (either a labial or a lingual rootlet in addition to the two primary roots). (Each lower molar is four-rooted—anterior, posterior, labial, and lingual.)

13. Height of cusps: The molars have low to moderately high cusps, but definitely brachyodont. (The molars have high cusps, clearly hypsodont.)

14. Size of molars: The upper molars gradually decrease in size from the first to the third. (Each second upper molar is smaller than the first, but the third is reduced in size and much smaller relative to the second.)

15. Overlap of molars: Cusps on the upper molars are only slightly slanted and there is little or no overlap among the three teeth in a toothrow, each essentially abutting against the other. (The cusps slant conspicuously back, so that the first molar overlaps the second, and the second overlaps the third.)

16. Cusps t1bis and t2bis: These cusps do not occur on the first and second upper molars of most specimens. (Either t1bis, t2bis, or both are present on first upper molars in most specimens, sometimes the second molars.)

17. Cusp t7: No cusp t7 is on any of the upper molars. (A cusp t7 occurs on the first molars, usually on the second molars, and sometimes on the third.)

18. Posterior cingulum: There is a posterior cingulum at the back of each first upper molar, usually the second, and sometimes the third. (No posterior cingulum occurs on any of the upper molars, or if it occurs is indicated only by a triangular bump at the back of each first upper molar.)

19. Cusp t9: This cusp is large and discrete on each first and second upper molar. (Cusp t9 is nearly incorporated into the much larger cusp t8 and inconspicuous after wear.)

20. Cusp t3: In all or most of the samples, cusp t3 is present on the second and often on the third upper molars. (Cusp t3 is absent from the second and third molars in all or most specimens.)

21. Union of cusps: Cusps on the upper and lower molars are weakly connected so the occlusal patterns appear strongly cuspidate. (All or most cusps are strongly joined, some merged to the point where they nearly lose their identities in several species.)

22. Anterolabial and anterolingual cusps: The anterolabial and anterolingual cusps on the first lower molar are large and discrete, forming a lamina nearly as wide as the rest of the tooth. (The two cusps are smaller, pressed against each other to form a lamina narrower than the rest of the tooth. In young rats they may be separate but soon merge into an oblong lamina.)

23. Anterolabial cusp: The anterolabial cusp on each second lower molar, and often on each third molar, is present in all or most of the samples. (Anterolabial cusps are absent from the second and third molars in all or most of the samples.)

24. Fifth digit: The fifth digit on each hind foot bears a claw. (A nail is embedded in each fifth digit.)

25. Laminae: The rows of cusps on the upper and lower molars are arcuate or chevron-shaped. (The cusps form nearly straight, laminar-like rows.)

26. Rows of cusps: Cusps are weakly joined or strongly joined but form uneven rows on the molars. (Large and discrete cusps form two or three straight rows on each molar.)

Except for having nails on the halluces, *Abditomys* is unlike *Chiropodomys*, *Hapalomys*, *Vandeleuria*, *Pithecheir*, *Chiromyscus*, or *Kadarsanomys* in external, cranial, or dental characteristics. I explain below and in figure 11, where crania of the seven genera are compared, and in figures 12 and 13, which contrast tooththrows.

Vandeleuria is arboreal, small-bodied, and long-tailed. The tail is scantily haired. Digits on the front and hind feet are long and slender. Both the fifth digit and hallux of each hind foot have nails. A nail instead of a claw on the fifth digit is unique among the Mu-

rinae. The structural specializations of *Vandeleuria* are those associated with climbing among slender branches or high grass. Among living rodents, *Vandeleuria* has been allied with *Micromys*, *Vernaya*, and *Chiropodomys* (Ellerman, 1941); based on dental characters, Misonne (1969) regarded *Vandeleuria* to be a close relative of *Chiropodomys*.

Species of *Chiropodomys* are also small-bodied and long-tailed, but the tails are penicillate. The fifth digit of each hind foot bears a claw—only the halluces have nails. The crania of *Vandeleuria* and *Chiropodomys* differ strikingly from that of *Abditomys* in size and configuration (fig. 11). The dentitions of the two genera are unlike those of *A. latidens*. The molars of both *Vandeleuria* and *Chiropodomys* are anchored by fewer roots than are those of *Abditomys* (upper first molars are three-rooted, lowers are two-rooted in *Chiropodomys*; upper first molars are four-rooted, the lowers two-rooted in *Vandeleuria*); the upper molars either abut against one another without overlapping (*Chiropodomys*) or overlap slightly (*Vandeleuria*), as opposed to the extensive overlap among the teeth of *Abditomys*; and the molars of *Chiropodomys* and *Vandeleuria* have complex and highly cuspidate occlusal surfaces, unlike the simple, laminar-like chewing areas of *A. latidens*. Complexity of the occlusal surface in the upper molars is partly due to large cusps t7 and posterior cingula on all or most of the teeth, and to large cusps t3 on the second molars. Large antero-central cusps, wide anterolabial cusps on the second and third molars, and prominent labial cusplets are features of the lower molars contributing to the complex chewing surfaces. Such structures are not present in the simple molars of *Abditomys*.

Among the traits listed in table 2, *Abditomys* has many more derived features (17) than does either *Vandeleuria* (5) or *Chiropodomys* (5). No single derivation, other than nails on halluces, occurs in all three genera. Whether *Vandeleuria* and *Chiropodomys* are as closely related as some taxonomists claim remains to be tested but neither one seems phylogenetically close to *Abditomys*.

Species of *Hapalomys* are arboreal and at least one of them, *H. longicaudatus*, is specialized for living in bamboo and feeding on

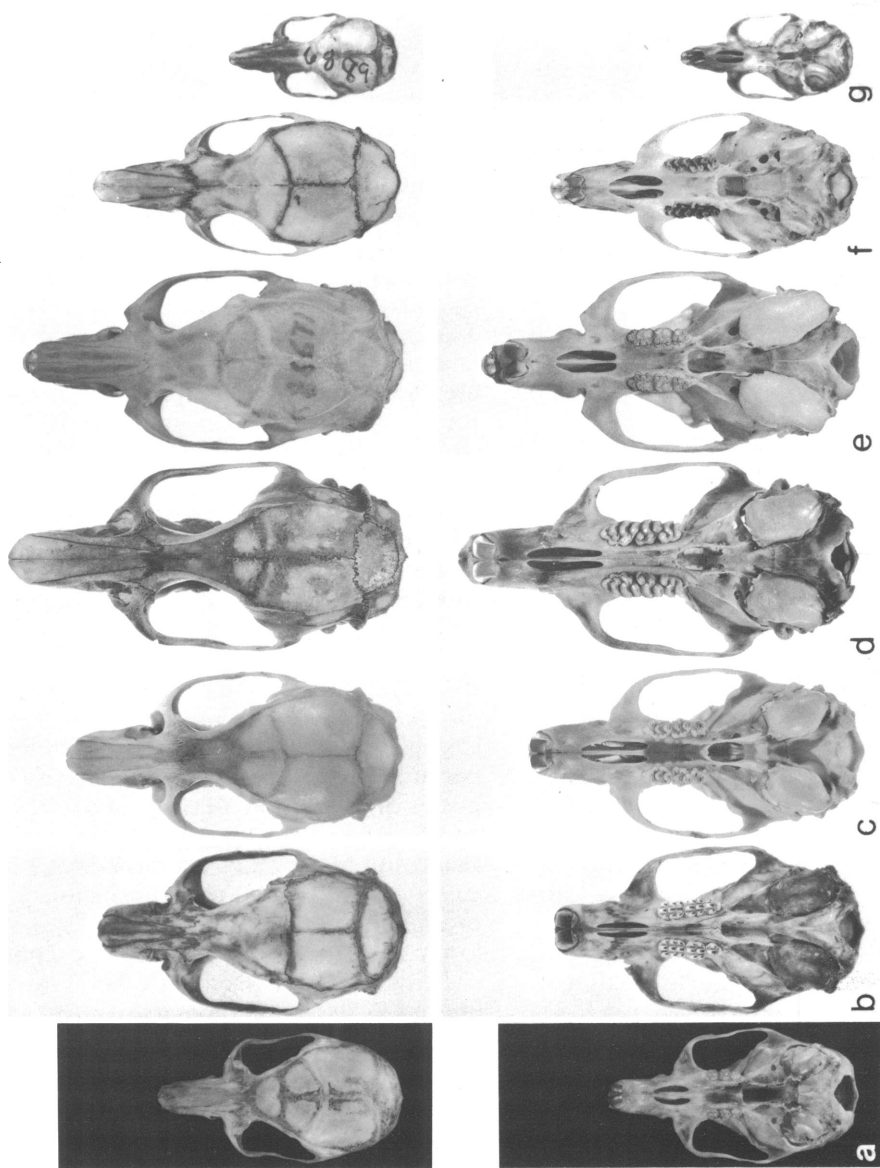


FIG. 11. Views of adult crania from genera with nails instead of claws on the halluces: a, *Chiropodomys major* (USNM 301098); b, *Hapalomys longicaudatus* (BMNH 63.1160); c, *Kadarsanomys sodyi* (RMNH 14178); d, *Abditomys latidens* (USNM 357244); e, *Pithecheir parvus* (USNM 488803); f, *Chiromyscus chiropus* (USNM 321507); and g, *Vandeleuria oleracea* (AMNH 242257). All are approximately $\times 1$.

it (Medway, 1964). In addition to being smaller in body size than *A. latidens*, and differing in coloration and texture of the fur, and in basic shape of the cranium (especially the interorbital region and braincase), the species of *Hapalomys* have different occlusal patterns on the molars. Straight rows of discrete gleaming cusps form the chewing surfaces of the upper and lower molars, a configuration not found in any of the other genera discussed here or in the rest of the Murinae in general (figs. 12 and 13). The upper molars in *Hapalomys* abut against one another without overlap. Four roots anchor the first upper molars, the first lower molars are two-rooted. The simple, laminar-like occlusal topography, strong overlap among the molars, and additional roots in *Abditomys* are unlike the complex, cuspidate occlusal surfaces in *Hapalomys*. Except for nails on the halluces, no other derived trait occurs only in *Hapalomys* and *Abditomys*. Misonne (1969) suggested that *Chiropodomys* may be the closest relative of *Hapalomys*. *Abditomys* is certainly not.

Both species of *Pithecheir* are arboreal, have prehensile tails, and the most grasping type of hind foot in any of the arboreal rats and mice noted here (Musser, 1979). Both the tail and feet are specialized for climbing on slender supports such as twigs, narrow branches, and palm and fern fronds (Bartels, 1937b). The configuration of the cranium—particularly the wide interorbital and postorbital regions bordered by wide shelves, the interparietal enclosed on both sides by the parietals, lack of occipital bulge at the back of the braincase, and the large and highly inflated bullae—is unlike that in *Abditomys* (fig. 11). The upper molars are cuspidate rather than laminar-like and have more complex occlusal surfaces due to cusps t1bis at the front of the first molars, large cusps t7 on the first and second molars, and prominent cusps t3 on the second and third teeth. The lower molars are also cuspidate: the rows of cusps are chevron-shaped rather than nearly transverse, separated farther from one another, and the antero-central cusp (absent from *Abditomys*) is bifurcate and large. Judged from characteristics of skin, skull, and teeth *Pithecheir* has no close morphological

relationship to *Abditomys*, and no derived traits are common to only those two genera, at least in the characteristics surveyed here. Although it possesses some highly specialized structures, *Pithecheir* has far fewer (8) derived traits than does *Abditomys* (17), may be part of an older group of murines, and possibly more closely related to *Lenothrix* than to anything else (Misonne, 1969). There appears to be no close phylogenetic tie between *Pithecheir* and *Abditomys*.

Little is known about the habits of *Chiromyscus chiropus*. The rat is specialized for arboreal living (Musser, 1981a) and was thought to occur in tropical deciduous forest (Marshall, 1977). Recently, Joe T. Marshall wrote me that he has seen a new specimen of *Chiromyscus* collected in Thailand from a ravine in which bamboo densely filled the bottom and broad-leaf tropical forest covered the upper slopes. Possibly *Chiromyscus*—like *Chiropodomys*, *Hapalomys*, and *Kadarsanomys*—may be ecologically closely tied to bamboo. A small and low cranium, narrow zygomatic plates, wide interorbital region, postorbital margins and dorsolateral sides of braincase defined by shelves, wide and flat braincase, a large interparietal roofing most of the occiput, tiny bullae, small and low-crowned molars, third molars much smaller relative to others in the rows, chevron-shaped laminae, no anterolabial cusps on the second and third lower molars, and first upper molars with four roots are some of the cranial and dental features of *Chiromyscus* that contrast with those of *Abditomys* (figs. 11–13). Three derived traits (cusp t9 broadly merged with cusp t8 on the first and second upper molars, no cusp t3 on the second and third molars, and all cusps strongly connected) occur in *Chiromyscus* and *Abditomys* but not in any of the other genera in which the halluces bear nails. Judged from my own studies, all three traits have developed at different times and are widely distributed among African, Indian, and Indo-Australian murines. The three features reflect simple occlusal surfaces, simpler than those found in *Chiropodomys* or *Vandeleuria* (figs. 12 and 13), and do not indicate close phylogenetic ties between *Abditomys* and *Chiromyscus*. The latter is actually closely related to *Nivi-*

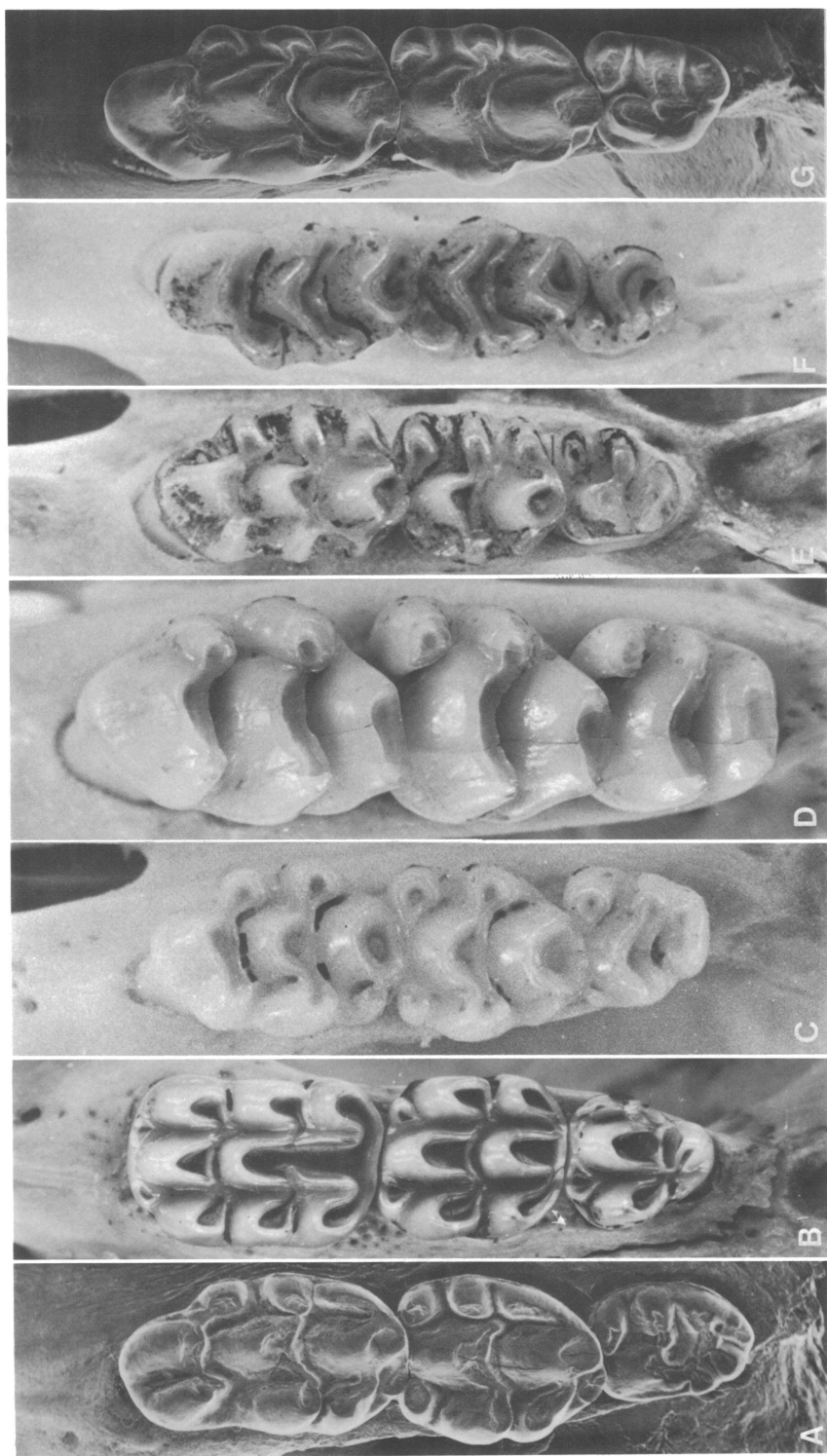


FIG. 12. Occlusal views of M^{1-3} : A, *Chiropodomys gliroides* (AMNH 113040, $\times 23$); B, *Hapalomys longicaudatus* (BMNH 63.1160, $\times 10$); C, *Kadarsanomys sodyi* (RMNH 14103, $\times 10$); D, *Abitomys latidens* (USNM 357244, $\times 10$); E, *Pithecheir parvus* (USNM 488811, $\times 10$); F, *Chiromyscus chiropus* (USNM 321507, $\times 10$); G, *Vandeleuria oleracea* (AMNH 240851, $\times 25$).

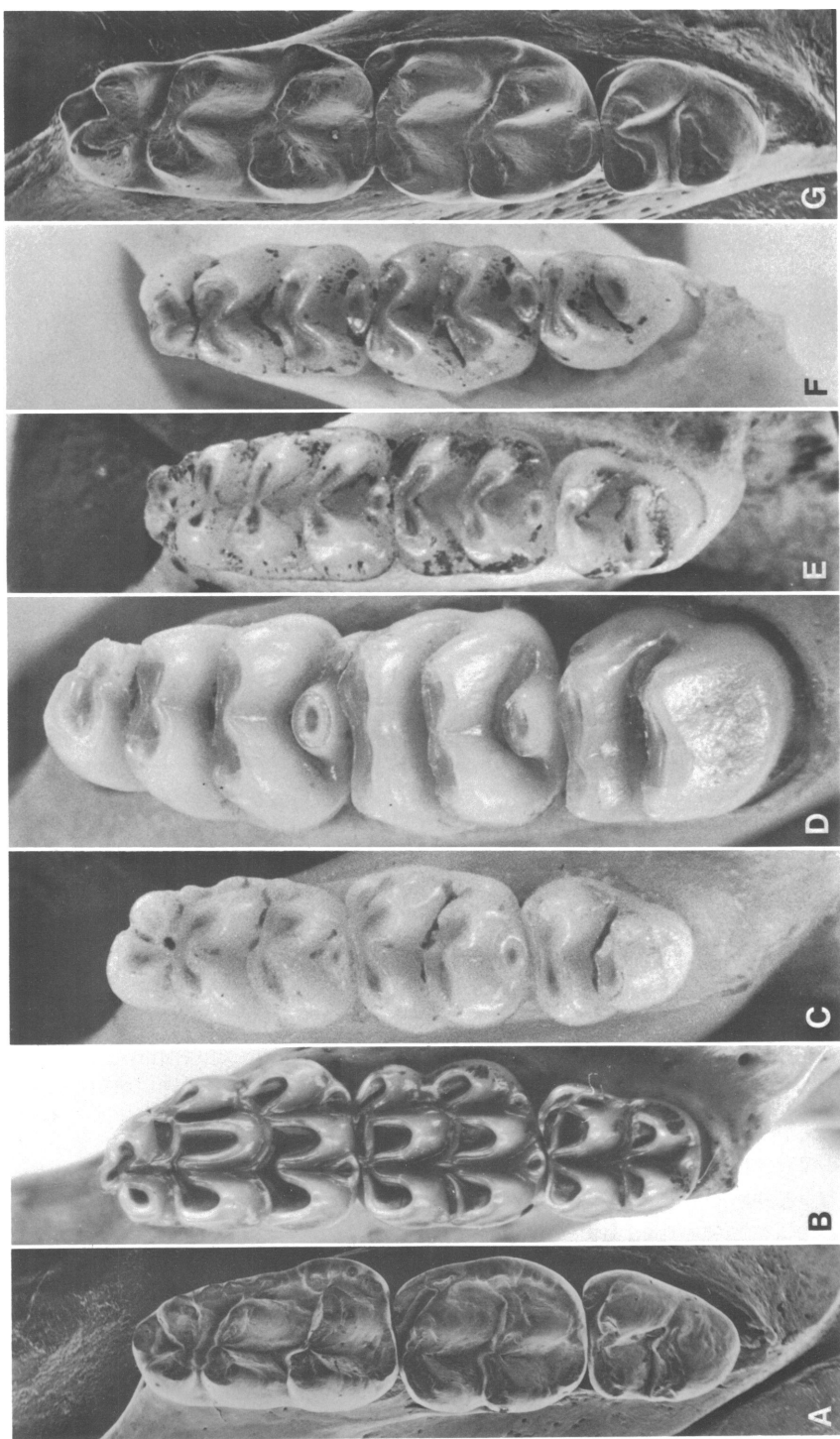


FIG. 13. Occlusal views of M_{1-3} from the same specimens shown in figure 12, and at the same magnifications: A, *Chirodomys gliroides*; B, *Hapalomys longicaudatus*; C, *Kadarsanomys sodyi*; D, *Abditomys latidens*; E, *Pithecheir parvus*; F, *Chiromyscus chiropus*; G, *Vandeleuria oleracea*.

venter of Southeast Asia and the Sunda Shelf (Musser, 1981a).

Kadarsanomys sodyi is of medium body size, arboreal, and associated with bamboo in mountain forests on West Java (Bartels, 1937a; Musser, 1981c). The tail is long, brown, and monocolored, as is the tail of *A. latidens*, but the upperparts of the head and body are brown, the underparts white, and the fur short, with very short guard hairs. All these features are unlike the coloration and length of pelage in *Abditomys*. In configuration of the skull and in some dental features, *A. latidens* is more like *K. sodyi* than any of the other species discussed here. In both, the cranium is high, the interparietal is small, the incisive foramina are long, the palatal bridge is short, the pterygoid fossae and alisphenoid region are similar in shape, the bullae are large relative to size of the braincase, the upper molars are large relative to the bony palate, each third molar is only a little smaller than the second, the first upper molars are five-rooted, and the first lowers are four-rooted. The two species, however, differ in conspicuous ways: *K. sodyi* has a shorter and relatively broader rostrum with relatively narrower nasals that are convex on top rather than flat; a wider interorbital region; wider and more prominent shelves along the post-orbital margins; a more expansive braincase with straighter sides; relatively narrower zygomatic plates with much shorter anterior spines; squamosal roots of the zygomatic arches situated lower on sides of the braincase; shallower mesopterygoid fossa with much smaller sphenopalatine vacuities, molars with low cusps; less overlap among the upper and lower molars, and occlusal surfaces that are complex and cuspidate rather than simple and laminar-like (figs. 11–13).

Abditomys and *Kadarsanomys* have five-rooted first upper molars, a derived trait not found in any of the other five genera with nails instead of claws on the halluces. The character is significant because it is found in *Rattus* and many genera distantly and closely related to *Rattus* (*Arvicanthis* is an example) and usually occurs in combination with other specializations, such as the derived conditions of the alisphenoid region, incisive foramina, size of bullae, and configurations of

the mesopterygoid and pterygoid fossae (Musser, 1981a and 1981b). Five-rooted first upper molars indicate only that *A. latidens* and *K. sodyi* are more closely related to each other than to the species of *Chiropodomys*, *Vandeleuria*, *Hapalomys*, *Pithecheir*, and *Chiromyscus*. The character has no information that can be used to determine whether *Abditomys* is phylogenetically closer to *Kadarsanomys* than to other genera, such as *Rattus*, which have five-rooted first upper molars. That trait occurs widely throughout other murines from Africa, India, and the Indo-Australian region, genera with clawed halluces. Both *A. latidens* and *K. sodyi* must be compared with those forms to determine whether the two are closely related or whether they are actually more closely allied to a genus in which the halluces are clawed.

The configuration of the nail bears further study because it differs among the species and finer resolution of its structure may provide additional information with which to test hypotheses of relationships among the seven genera. In *Hapalomys*, *Chiropodomys*, *Vandeleuria*, and *Chiromyscus* each nail is small, nearly flat (slightly convex), with a straight or gently arcuate distal margin, and embedded in the top of the digital pad. The configuration is similar to that illustrated for *Chiropodomys* in Musser (1979, fig. 14). The nail of *Kadarsanomys* is very small relative to the size of the large digital pad and embedded in it, has a highly convex dorsal surface, is short, and has a truncate distal margin (Musser, 1981c, pl. 1). In *Abditomys*, the base of each nail is embedded in the top of the digital pad but the triangular distal margin is not, and the dorsal surface is moderately convex (fig. 4). It is a longer structure relative to size of the digital pad compared with the nails in the other genera, except for *Pithecheir*.

The nails in *Pithecheir* are essentially very short claws (as I called them, Musser, 1979) or scalelike claws (in Medway's, 1969, terminology) and range in size among the specimens. On some rats, each structure is short, sits on top of the digital pad, and appears to be a pointed nail with a highly convex surface. On other specimens, it is larger, overhangs the pad and resembles a much reduced claw. The configuration is unlike that in any

of the other genera and represents the most primitive state since it is the most clawlike. To me, the structures on the halluces of the other genera are good nails (Medway, 1964, described that in *Hapalomys* as a flat, nail-like scale). The nails in *Chiropodomys*, *Hapalomys*, *Vandeleuria*, and *Chiromyscus* are similar in shape and size relative to the digital pad and represent the most derived configuration. The small, highly convex, and truncate nail of *Kadarsanomys* is distinctive, highly derived, and set apart from the others. The long, pointed nail of *Abditomys* is unique. Based only on configurations of the nails, *Pithecheir* is isolated from the other genera, *Abditomys* and *Kadarsanomys* each stands by itself, and *Chiropodomys*, *Hapalomys*, *Vandeleuria*, and *Chiromyscus* cluster. That the nails of the halluces in *Abditomys* represent not close phylogenetic affinity with the other six genera but rather independent derivation seems to be the best hypothesis.

NATURAL HISTORY

Little is known about the natural history of *Abditomys latidens*. The male from Los Baños "was collected from the electric fence at the International Rice Research Institute—an area of intensive rice cultivation at an elevation no higher than 200 feet!" (Barbehenn, Sumangil, and Libay, 1972–1973). The holotype from Mount Data was obtained during the Philippine Zoological Expedition of 1946–1947. According to Rabor (1955, p. 197), a member of that expedition, the collection on Mount Data "... was made mostly on the western slope ... at elevations ranging from 2000 meters at the base, up to 2310 or more meters at the very top of the plateau. The locality was never worked previously by any collector, because Whitehead ... made his collections on the eastern and northern slopes of the mountain ..."

On Mount Data, Rabor (1955, pp. 195–196) noted that "The vegetation is mainly pine forest, consisting of pure stands of Benguet pine (*Pinus insularis* Endl.), on the sides; and mossy forest at the top, above the pine belt, consisting mainly of oaks (*Quercus* spp.) and mountain yew (*Taxus wallichiana* Zucc.). The trunks and branches

of the trees in the mossy forests are so heavily coated with moss that the observer is easily deceived as to the actual diameters of the tree trunks.

"The banks of the deep gullies, that have been cut by the descending mountain streams, are also densely vegetated with almost the same species as those found on the top; but never by pine trees. In fact, these gullies are easily traced even at a distance, because the vegetation growing in them contrasts markedly with the surrounding pine forests."

The holotype was caught in the following manner (Rabor, 1955, p. 205): "A member of the collecting party went out with a net to collect insects. Instead, he caught a big female rat in his net. He was chasing insects under the pine trees close to the bank of a well-vegetated deep gully, at about 2000 meters elevation, when he saw a large rat apparently dozing on its haunches, close to a decaying pine stump. The animal did not make any attempt to escape even when the collector was already close to it so that it was easily caught. We found out later that the animal's forefoot was badly swollen due to a bad wound. Doubtless it must have been caught in one of our traps set in the vicinity but had managed to escape with a hurt foot. The bad foot prevented it from going about its normal feeding activities, and it was very emaciated when caught; its stomach was empty when opened.

"The palage was stained with intense yellow all over when it was freshly caught, but this yellow color faded fast after the animal was skinned, especially so when the skin was thoroughly dried."

Because *Abditomys latidens* is likely arboreal and may have a special diet, it is apparently rarely encountered by collectors and unattracted to usual baits. Several external features of *A. latidens* indicate arboreal habits: a tail that is much longer than the combined lengths of head and body; long vibrissae and long guard hairs over most of the upperparts; large, fleshy, striated pads covering the palmar and much of the plantar surfaces; large digital pads; long claws with sharp, recurved tips; long and wide hind feet; a nail partially embedded in a large, grooved digital pad on each hallux; and probably

some pseudo-opposability of the hallux and fifth digit. The relative length of the tail and structure of the hind feet are adaptive for moving about on surfaces above the ground; the long tail would provide counterbalance to the body motion; the fleshy and striated palmar, plantar, and digital pads would provide good adhesion to smooth surfaces; the sharp claws would dig into the substrate and help maintain balance and position; a short, stout hallux terminating in a large fleshy pad and nail would provide the adhesion and strength to enhance the forces involved in gripping the substrate; long vibrissae and long guard hairs would help detect and distinguish among objects and surfaces in the arboreal habitat, and also gauge diameters of nest holes.

The arboreal adaptations of body, tail, and feet of *A. latidens* are complemented by the structure of the skull and teeth, configurations possibly reflecting adaptations to dealing with fibrous and siliceous substances. The cranium of *A. latidens* is compact, stocky, and robust. The upper incisors are wide, emerge from the rostrum at a right angle, and appear strong. The rostrum is short and probably stout enough to absorb the force generated as the wide incisors are used to chip away at hard substances, such as the edges around entrance holes into tree cavities, the internodes of large bamboo stems, or through the partitions between the internodes inside the stem. The high ridges bounding the frontal bones and portions of the parietals offer additional surface for the origin of temporal musculature. The high, wide, gleaming molars provide large laminar-like surface areas that suggest a predominantly herbaceous diet—leaves, buds, flowers, young twigs, for example.

Some arboreal rats that have nails instead of claws on the halluces are associated with bamboo, as either a nesting site or source of food. Species in *Hapalomys*, *Chiropodomys*, and *Kadarsanomys* are wholly or partly ecologically tied to bamboo (Medway, 1964; Rudd, 1979; Musser, 1979, 1981c). The morphological adaptations in rats and mice utilizing bamboo are special because, as I noted elsewhere (Musser, 1981c, p. 28), "a dense stand of smooth bamboo stems is not easily

negotiated. Some large dead and decaying stems will have fallen on the ground, but most of them are still erect, supported by the living stems at different angles. To move over the smooth surfaces of the stems, and to run up and down through the hollow internodes, requires feet with good adhesive qualities. To climb about in the slim twigs at the end of bamboo stems, on the other hand requires abilities to grasp and negotiate very slender supports. A nail imbedded in a very large distal pad on the hallux apparently is one of the specializations of the hind feet associated with grasping and moving over smooth round surfaces."

Abditomys latidens is probably highly arboreal and it may live in bamboo. Its morphological traits are consistent with that kind of habitat. The arboreal adaptations of *A. latidens* are similar to those of *Kadarsanomys sodyi*, which is definitely associated with bamboo, at least as a nesting site (Musser, 1981c). Neither of the two specimens of *A. latidens* were taken in bamboo but the scanty notes associated with each simply indicates they were caught where the collectors happened to find them. One was found wounded on the ground at the base of a stump, the other was picked up against an electric fence in a ricefield. Future collectors should look for the species in bamboo, as well as in conifer and broadleaf forests.

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