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PHILIPPINE ZOOLOGICAL EXPEDITION

1946-1947

MAMMALS

COLIN CAMPBELL SANBORN

FIELDIANA: ZOOLOGY

VOLUME 33, NUMBER 2

Published by

CHICAGO NATURAL HISTORY MUSEUM

NOVEMBER 28, 1952

NAT.
HIST.

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COLIN CAMPBELL SANBORN

Curator, Division of Mammals

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The Philippine Expedition: Mammals

INTRODUCTION

The Philippine Zoological Expedition, 1946-47, collected mammals in Mountain and Abra provinces, Luzon; Davao and Cotabato provinces, Mindanao; and Palawan and the adjacent islands of Culion, Busuanga, and Cuyo. The itinerary and a description of collecting localities have been set forth in detail by Mr. Harry Hoogstraal (1951), the leader of the expedition. Dr. Dioscoro S. Rabor, of Silliman University, Dumaguete, Negros Island, continued collecting on Negros and made one trip to Zamboanga Province, Mindanao. His collections are included in this report.

The expedition visited many localities hitherto unworked for mammals and made more comprehensive collections in better known areas, so that in addition to new forms, series of mammals heretofore rather imperfectly known are represented. The collections, including the material from Dr. Rabor, total 3,486 specimens. There are 106 species and subspecies represented, of which fifteen have been described as new. Taylor (1934) listed 213 for the Philippines, including domesticated mammals; so this collection represents about one half of those known from the islands.

The work on Luzon was limited to two northern provinces, and but twenty species are represented. The collection gives evidence of the great numbers of different types of rodents living on Mount Data. Collecting on the mountain yielded fourteen species, seven of the genus *Rattus* alone and seven of other genera. The life histories and interrelations of the mammals of this community would make a fascinating study.

A greater area was covered in Mindanao, and Mount Apo and Mount McKinley were carefully explored. On these peaks, however, only seven rodents were found, two squirrels and seven species of *Rattus*—all these not entirely confined to Mount Apo. The shrew *Podogymnura* and a small deer are endemic to this area, however. Dr. Rabor's collection from Zamboanga Province further points out the differences between that region and the rest of the island. In all, forty-five species and subspecies of mammals were collected.

The collections made by Dr. Rabor on Negros, hitherto an almost unworked island, are rich in bats. There are nineteen species, of which fourteen are new to the island; one fruit bat is new to the Philippines and new to science. He also discovered a new *Crocidura*. So far but two *Rattus*, aside from introduced ones, are known from the island. He has taken in all twenty-nine different species of mammals.

The survey of Palawan, Culion, Busuanga, and Cuyo added fifteen species and subspecies to the group, six of them being described as new. The discovery of *Rattus jalorensis* and races of *R. mülleri* is further evidence of the group's relationship to Borneo. The fauna is apparently richer than that of other Philippine islands, forty-two different forms being taken there.

The new forms described from this collection are:

<i>Pteropus leucotis leucotis</i> Sanborn 1950	<i>Rattus culionensis</i> (p. 131)
<i>Pteropus leucotis obscurus</i> Sanborn 1950	<i>Rattus mülleri balabagensis</i> (p. 131)
<i>Dobsonia viridis chapmani</i> Rabor 1951	<i>Rattus rabori</i> (p. 130)
<i>Crocidura negrina</i> Rabor 1951	<i>Rattus (Apomys) littoralis</i> (p. 134)
<i>Tupaia palawanensis busuanga</i> (p. 112)	<i>Rattus (Apomys) abrae</i> (p. 133)
<i>Callosciurus hoogstraali</i> (p. 115)	<i>Sus celebensis negrinus</i> (p. 145)
<i>Callosciurus davensis</i> (p. 117)	<i>Cervus (Rusa) nigellus apoensis</i> (p. 155)
<i>Rattus latidens</i> (p. 125)	

The expedition would not have been possible without the cooperation of the Philippine Government, which, among other things, paid the salaries of nine collectors from the Philippine Museum, who worked with the expedition at various times. These were Messrs. Dioscoro S. Rabor, Manuel Celestino, Arturo Castro, Gregorio Edaña, Godofredo Alcasid, Herminio R. Rabanal, Pascual Convocar, Prudencio Añonuevo, and Telesforo Oañe. The collection will be divided with the Philippine Museum.

I wish to express my appreciation to Sir John Ellerman, of the British Museum (Natural History), for examining and identifying various species of *Rattus*, and to Dr. David H. Johnson, of the United States National Museum, for the loan of valuable topotypic material under his care. Dr. George H. H. Tate, of the American Museum of Natural History, lent me the available material from that museum's collections and aided in identifying species of the genus *Rattus*.

All capitalized names of colors refer to Ridgway (1912).

INSECTIVORA

Suncus occultidens Hollister

Pachyura occultidens Hollister, 1913, Proc. U. S. Nat. Mus., 46: 303.

Specimens examined.—Total 2. NEGROS ISLAND: Pontevedra, 2 females (alc.).

Remarks.—These specimens conform to the description and measurements given in the original description of this species. They were caught "under a house."

Crocidura palawanensis Taylor

Crocidura palawanensis Taylor, 1934, Bur. Sci. Manila, Monog. no. 30: 88.

Specimens examined.—Total 1. PALAWAN: Babuyan, Puerto Princesa, 1 female.

Measurements.—Total length 161 mm.; tail 71; hind foot 18; ear 10. Skull: condylo-basal length to tip of incisors 24.8; palatal length 11.5; interorbital width 4.9; mastoid width 10.7; width of brain case 9.5; upper tooth row 10.9; greatest width across outer edges of molars 8.0.

Remarks.—This is the only shrew collected by the expedition and represents the second specimen of this species. It agrees well with the original description in color but is slightly larger. The collector's notes state that it had a "strong skunk-like odor."

Crocidura negrina Rabor

Crocidura negrina Rabor, 1952, Nat. Hist. Misc., no. 96: 6.

Specimens examined.—Total 1. NEGROS ISLAND: Dayongan (4,500 feet), Cuernos de Negros, 1 female (type).

Measurements.—Total length 156 mm.; tail 68; hind foot 16. Skull: condylo-basal length 22.6; palatal length 10.3; brain case 10.3; upper tooth row, entire 9.8.

Remarks.—This *Crocidura* is about the size of *mindorus* but in color is more like *halconus*. Both are from Mount Halcon, Mindoro Island. The upper parts of *negrina* are Blackish Brown 3 and the under parts between Fuscous and Hair Brown.

Podogymnura truei Mearns. Figure 8.

Podogymnura truei Mearns, 1905, Proc. U. S. Nat. Mus., 28: 437; Lyon, 1909, Proc. U. S. Nat. Mus., 36: 449-456, pls. 36 and 37 (skull and skin of type).

Type locality.—Mount Apo, Davao, Mindanao. Type 125286 in the United States National Museum.

Specimens examined.—Total 64. MINDANAO: Mount Apo: Baclayan (5,400 feet), Meran (5,750 feet), Lake Linau (6,900 feet),

October 30–November 15, 1946, 15 males, 20 females; Mount McKinley: east slope (5,800 to 7,400 feet), September 2–30, 1946, 10 males, 22 females (3 alc.).

Remarks.—The Mount McKinley series agrees in color and size with the topotypes from Mount Apo.

Skull and teeth (fig. 8).—In general shape the skull is very much like the elongated skull of *Echinosorex*, with the same pronounced lambdoidal crest and low sagittal crest. The crests are little developed in the shorter, rounder skulls of *Hylomys* and *Neotetracus*.

The skull of *Podogymnura* differs from that of *Echinosorex* in the more open, less slanting, infraorbital foramen, which is situated over the first molar, while in *Echinosorex* it is over the last premolar and a short section of the first molar. In *Hylomys* and *Neotetracus* this foramen opens forward and is over the last premolar. In *Podogymnura* and *Echinosorex* the bulla is long, while in the other two genera it is round.

The last molar is wholly within the opening formed by the zygomatic arch except in *Podogymnura*, in which only the posterior half of the molar is included.

The original description of *Podogymnura* states, and it is shown in Lyon's (1909) plate of the skull, that the second upper incisor is smaller than the third. This is not the case in any of the skulls in the large series. The third incisor is either a trifle smaller or about equal in size to the second.

Both *Podogymnura* and *Echinosorex* have long, slender, well-developed canines. Between the third upper incisor and the canine is a pit, the outer edge of which is worn away in old individuals, for the reception of the tip of the lower canine. The other genera do not have this pit, as the canines are not developed.

Podogymnura and *Echinosorex* have in common long, narrow skulls with prominent lambdoidal crests, long well-developed canines and long narrow bullae. *Podogymnura* has three premolars and *Echinosorex* four. On the other hand, *Hylomys* and *Neotetracus* have short rounded skulls, round bullae, undeveloped canines, and very low lambdoidal crests. The same difference appears in the number of premolars, for *Neotetracus* has three and *Hylomys* four.

Habitat.—The specimens from Mount Apo were caught "near hole at base of large tree;" "under grass on edge of lake;" "near log along creek in dense forest with fern undergrowth;" "near boulders in valley covered by ferns." The Mount McKinley specimens were taken "with peanut butter among roots of trees;" "among tangled



FIG. 8. *Podogymnura truei*; $\times 1\frac{1}{2}$.

MEASUREMENTS

MOUNT APO

C.N.H.M.
No. 61453

C.N.H.M.
No. 61449

C.N.H.M.
No. 61439

C.N.H.M.
No. 61465

C.N.H.M.
No. 56192

C.N.H.M.
No. 56190

C.N.H.M.
No. 56189

C.N.H.M.
No. 56182

Greatest length..... 44.7
 Condylø-basal length..... 42.2
 Palatal length..... 23.4
 Interorbital breadth..... 9.3
 Zygomatic breadth..... 21.5
 Breadth of brain case..... 16.7
 Length of upper tooth row... 21.5

adult ♂ 42.2 41.3 22.3 9.0 19.6 16.4 20.6
 adult ♂ 41.3 41.6 22.8 9.0 19.6 16.4 20.6
 subad. ♀ 42.9 41.6 22.8 10.0 20.0 16.5 20.6
 subad. ♀ 43.9 42.0 23.5 9.7 19.8 16.7 21.0

42.3 40.9 23.0 9.6 19.9 16.4 20.8
 44.0 41.7 23.4 9.9 20.3 17.1 21.4
 41.0 39.6 22.0 10.0 19.9 16.4 20.1
 42.3 40.4 22.5 9.5 19.1 15.9 20.4
 40.9 38.6 22.0 9.6 19.7 16.5 19.7

MOUNT MCKINLEY

roots in thick moss." Many were caught in traps baited with bird meat. One stomach examined contained "insects and worms."

Measurements (collector's measurements on sixty specimens).—Total length 185–219 mm.; tail 47–70; hind foot 31–38; ear 18–24. The majority (44) measured more than 200 mm. in total length and more than half (34) measured more than 60 mm. in length of tail.

CHIROPTERA

The collection of bats of the Philippine Zoological Expedition totals 870 specimens, of which 253 are skins with skulls and 617 are preserved in alcohol. There are 21 genera and 39 species and subspecies represented.

Much of this material was collected in six caves, four on Mindanao Island, one on Samal Island (near Mindanao), and one on Palawan. The following species were collected in these various caves:

MINDANAO: SITIO TEGATO, LUANGBAY CAVE

<i>Rousettus amplexicaudatus</i>	<i>Rhinolophus rufus</i>
<i>Eonycteris spelaea glandifera</i>	<i>Hipposideros galeritus galeritus</i>
<i>Rhinolophus arcuatus exiguus</i>	<i>Miniopterus schreibersii eschscholtzii</i>
	<i>Miniopterus australis australis</i>

MINDANAO: COTABATO CITY CAVE

<i>Eonycteris robusta</i>	<i>Hipposideros diadema griseus</i>
<i>Hipposideros galeritus galeritus</i>	<i>Miniopterus tristis</i>
	<i>Miniopterus australis</i>

MINDANAO: CAPILIT CAVE

<i>Rhinolophus arcuatus exiguus</i>	<i>Hipposideros diadema griseus</i>
<i>Rhinolophus rufus</i>	<i>Miniopterus australis australis</i>

MINDANAO: MALABUTUAN (cave in cliff over ocean)

<i>Taphozous philippinensis</i>	<i>Hipposideros bicolor antricola</i>
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SAMAL ISLAND: TAWANG CAVE

<i>Rousettus amplexicaudatus</i>	<i>Miniopterus australis australis</i>
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PALAWAN: CAVE NEAR TANABOG

<i>Eonycteris spelaea glandifera</i>	<i>Rhinolophus virgo</i>
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DISTRIBUTION OF SPECIES BY ISLANDS

MINDANAO

<i>Cynopterus brachyotis luzoniensis</i>	<i>Rhinolophus rufus</i>
<i>Ptenochirus jagori</i>	<i>Hipposideros bicolor antricola</i>
<i>Rousettus amplexicaudatus</i>	<i>Hipposideros diadema griseus</i>
<i>Pteropus vampyrus lanensis</i>	<i>Hipposideros galeritus galeritus</i>
<i>Acerodon jubatus mindanensis</i>	<i>Hipposideros obscurus</i>
<i>Eonycteris spelaea glandifera</i>	<i>Pipistrellus abramus</i>
<i>Eonycteris robusta</i>	<i>Scotophilus temminckii</i>
<i>Macroglossus lagochilus lagochilus</i>	<i>Miniopterus schreibersii eschscholtzii</i>
<i>Emballonura alecto alecto</i>	<i>Miniopterus australis australis</i>
<i>Taphozous philippinensis</i>	<i>Miniopterus tristis</i>
<i>Megaderma spasma spasma</i>	<i>Kerivoula pusilla</i>
<i>Rhinolophus arcuatus exiguus</i>	<i>Kerivoula pellucida</i>

PALAWAN

<i>Cynopterus brachyotis luzoniensis</i>	<i>Rhinolophus acuminatus acuminatus</i>
<i>Pteropus leucotis obscurus</i>	<i>Hipposideros bicolor antricola</i>
<i>Pteropus vampyrus lanensis</i>	<i>Pipistrellus imbricatus</i>
<i>Eonycteris spelaea glandifera</i>	<i>Scotophilus temminckii</i>
<i>Taphozous philippinensis</i>	<i>Cheiromeles torquatus</i>
<i>Rhinolophus virgo</i>	

BUSUANGA

<i>Cynopterus brachyotis luzoniensis</i>	<i>Pteropus leucotis leucotis</i>
--	-----------------------------------

CULION

<i>Cynopterus brachyotis luzoniensis</i>	<i>Tylonycteris pachypus meyeri</i>
	<i>Myotis abbotti nugax</i>

BALABAC

Cynopterus brachyotis luzoniensis

CUYO

<i>Cynopterus brachyotis luzoniensis</i>	<i>Pteropus hypomelanus cagayanus</i>
	<i>Scotophilus temminckii</i>

LUZON

<i>Ptenochirus jagori</i>	<i>Pteropus vampyrus lanensis</i>
	<i>Taphozous philippinensis</i>

CANON ISLAND

Pteropus vampyrus lanensis

NEGROS ISLAND

<i>Rousettus amplexicaudatus</i>	<i>Emballonura alecto alecto</i>
<i>Pteropus speciosus</i>	<i>Megaderma spasma spasma</i>
<i>Pteropus vampyrus lanensis</i>	<i>Rhinolophus virgo</i>
<i>Acerodon jubatus jubatus</i>	<i>Rhinolophus arcuatus exiguus</i>
<i>Dobsonia viridis chapmani</i>	<i>Rhinolophus subrufus</i>
<i>Ptenochirus jagori</i>	<i>Hipposideros diadema griseus</i>
<i>Eonycteris spelaea glandifera</i>	<i>Hipposideros pygmaeus</i>
<i>Macroglossus lagochilus lagochilus</i>	<i>Pipistrellus imbricatus</i>
<i>Harpionycteris whiteheadi</i>	<i>Scotophilus temminckii temminckii</i>
	<i>Miniopterus australis australis</i>

Cynopterus brachyotis luzoniensis Peters

Pachysoma luzoniense Peters, 1862, Monatsber. Akad. Wiss. Berlin, 1862: 708.

Cynopterus brachyotis luzoniensis Lawrence, 1939, Bull. Mus. Comp. Zool., 86: 28.

Specimens examined.—Total 65. MINDANAO: Lacaron, 1 male (alc.); Maco, 1 (alc.); Malabutuan, 1 (alc.). PALAWAN: Tanabog, 4 males (2 alc.), 17 females (15 alc.); Canigaran, 2 females; Puerto Princesa, 2 males, 3 females (1 alc.), 6 juveniles; Libertad, 2 males (1 alc.), 1 female; Brooke's Point, 6 males, 1 female; Kabelnekan, 1 male (alc.), 1 female (alc.). BUSUANGA: Singay, 2 males. CULION: San Pedro, 6 males (4 alc.), 3 females (1 alc.). BALABAC: Balabac, 1 male, 2 females. CUYO: Centro, 2 females (alc.).

Ptenochirus jagori Peters

Pachysoma (Ptenochirus) jagori Peters, 1861, Monatsber. Akad. Wiss. Berlin, 1861: 707, July 25.

Ptenochirus jagori Peters, 1867, Monatsber. Akad. Wiss. Berlin, 1867: 867.

Specimens examined.—Total 7. LUZON: Massisiat, 1 male. MINDANAO: Madaum, 2 males (1 alc.), 1 female (alc.); Mount Apo, Todaya, 1 female. NEGROS ISLAND: Inubungan, Santa Catherina, 2 females (alc.).

Measurements (adult male, alc.).—Forearm 82.4 mm., tail 11.8, foot 17, tibia 31.6, calcar 11.5. Third metacarpal 54.6, first phalanx 34.7, second phalanx 44.6; fourth metacarpal 49.6, first phalanx 27.5, second phalanx 29.8; fifth metacarpal 52.9, first phalanx 24.3, second phalanx 25.7. Skull: greatest length 38.8, condylo-basal length 36, palatal length 15.5; interorbital width 7.2; intertemporal width 6.4; zygomatic width 24.6; mastoid width 14.6; brain case at zygomata 14.5; upper tooth row 13.1; across canines 8.1; across M1-M1 11.6; lower tooth row 14.6; coronoid height 17.2.

Remarks.—These seven specimens show a great variation in size, which is probably due to age. In the largest skull there is a

strong lambdoidal crest that is absent in the smallest skull. The backward slope of the ascending ramus of the coronoid process also varies with age, becoming less sloping in older specimens.

The one from Luzon was found "in small cave in soil wall of road covered by moss." The Negros specimens were "feeding on the fruit of the Kapok (*Cebia pentandra*)."

Rousettus amplexicaudatus E. Geoffroy

Pteropus amplexicaudatus E. Geoffroy, 1810, Ann. Mus. d'Hist. Nat., 15: 96, pl. 4.

Rousettus amplexicaudatus Trouessart, 1904, Cat. Mamm. Suppl., p. 60 (in part).

Specimens examined.—Total 55. MINDANAO: Sitio Tegato, Luangbay Cave, 15 males (11 alc.), 33 females (31 alc.); Madaum, 1 male; Samal Island, Tawang Cave, 2 males, 2 females. NEGROS ISLAND: Himamaylan, 1 female (alc.); Siaton, 2 males (alc.).

Pteropus hypomelanus cagayanus Mearns

Pteropus cagayanus Mearns, 1905, Proc. U. S. Nat. Mus., 28: 433.

Pteropus hypomelanus cagayanus Andersen, 1912, Cat. Chirop., p. 121.

Specimens examined.—Total 7. CUYO ISLAND: Centro, 4 males, 3 females.

Collector's notes.—"Hanging in crown of coconut tree;" "shot at dusk in coconut grove while in flight."

Pteropus vampyrus lanensis Mearns

Pteropus lanensis Mearns, 1905, Proc. U. S. Nat. Mus., 28: 432.

Pteropus vampyrus lanensis Andersen, 1908, Ann. Mag. Nat. Hist., (8), 2: 368.

Specimens examined.—Total 51. LUZON: Massisiat, 1 male, 1 female. MINDANAO: Malita, 4 males, 3 females; Cotabato City, 1 female; Madaum, 3 males; Tuganay, 5 males, 1 female. CANON ISLAND: 8 males, 8 females. PALAWAN: Puerto Princesa, 2 females; Canigaran, 2 males. NEGROS ISLAND: Amio, 2 males; Bais, Pagyabunan, 3 males, 7 females.

Pteropus leucotis leucotis Sanborn

Pteropus leucotis Sanborn, 1950, Proc. Biol. Soc. Washington, 63: 189.

Specimens examined.—Total 4. BUSUANGA ISLAND: Singay, type and three female paratypes.

Pteropus leucotis obscurus Sanborn

Pteropus leucotis obscurus Sanborn, 1950, Proc. Biol. Soc. Washington, 63: 190.

Specimens examined.—Total 2. PALAWAN: Santiago, Iwahig, type and one paratype.

Pteropus speciosus Andersen

Pteropus speciosus Andersen, 1908, Ann. Mag. Nat. Hist., (8), 2: 364.

Specimens examined.—Total 1. NEGROS ISLAND: Dumaguete, 1 subadult female.

Remarks.—This species was described from Malanipa Island, off Zamboanga, Mindanao Island. It is also known from Zamboanga, and from Sibutu, Solombo, and Mata Siri Islands off Borneo. Chicago Natural History Museum has one specimen from Mactan Island, off Cebu.

Acerodon jubatus jubatus Eschscholtz

Pteropus jubatus Eschscholtz, 1831, Zool. Atl., pt. 4, p. 1, pl. 16.

Specimens examined.—Total 10. NEGROS ISLAND: Pamo-at, Amio, 1 male, 1 female; Pagyabunan, Bais, 4 males, 4 females.

Acerodon jubatus mindanensis K. Andersen

Acerodon jubatus mindanensis K. Andersen, 1909, Ann. Mag. Nat. Hist., (8), 3: 24, 26–29.

Specimens examined.—Total 23. MINDANAO: Madaum, 4 males, 1 female; Tuganay, 2 males, 7 females; Sinaksakan, east slope of Mount Apo, 2 males; Lacaron, 1 male, 5 females; Parang, 1 female.

Dobsonia viridis chapmani Rabor

Dobsonia viridis chapmani Rabor, 1952, Nat. Hist. Misc., no. 96: 2.

Specimens examined.—Total 19. NEGROS: Mambaho Cave, Pagyabunan, Bais, 17 males (8 alc.); Amio, 2 females.

Remarks.—This race is larger than *viridis*, about the size of *crenulata* but averages larger. The skull is longer and broader, with much heavier canines. A colony of about 300 was discovered in the Mambaho Cave by Dr. Rabor. All specimens taken here were males. At Amio two females were collected, roosting under coconut fronds.

Harpionycteris whiteheadi Thomas. Figure 9.

Harpionycteris whiteheadi Thomas, 1896, Ann. Mag. Nat. Hist., (6), 18: 244;
Thomas, 1898, Trans. Zool. Soc. London, 14, pt. 6: 384, pl. 30 (animal),
pl. 35, figs. 1-4 (skull and teeth).

Specimens examined.—Total 1. NEGROS: Mambaho Cave, Pagyabunan, Bais, 1 subadult female (alc., skull cleaned).

Measurements.—Forearm 81.4 mm.; pollux (c.u.) 37.0; second metacarpal 41.1, first phalanx 10.3, second phalanx 11.7; third metacarpal 58.5, first phalanx 42.8, second phalanx 54.5; fourth

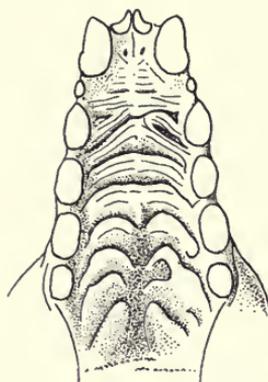


FIG. 9. Palate of *Harpionycteris whiteheadi*; $\times 2$.

metacarpal 57.0, first phalanx 34.9, second phalanx 35.5; fifth metacarpal 58.5, first phalanx 37.5, second phalanx 30.1; tibia 27.5; ear from meatus 28.8. Skull: greatest length 42.2; condylo-basal length 40.4; palatal length 20.4; interorbital width 5.8; intertemporal width 6.6; zygomatic width 21.4; mastoid width 15.6; width of brain case 15.4; upper tooth row C-M2 17.0; width across canines 7.5; across M2-M2 10.7; lower tooth row 18.9.

Remarks.—The type of this species was collected on Mindoro Island at an altitude of 5,000 feet, in December, 1895. The present specimen is the second one known. Another species, *H. celebensis* Miller and Hollister, has been described from one specimen from Celebes.

Eonycteris spelaea glandifera Lawrence

Eonycteris spelaea glandifera Lawrence, 1939, Bull. Mus. Comp. Zool., 86: 38—
Montalban Caves, Royal Province, Luzon Island, Philippines.

Specimens examined.—Total 44. PALAWAN: Tanabog, 2 males, 2 females; 6 males, 13 females, 14 juveniles (alc.). MINDANAO:

Luangbay Cave, Sitio Tegato, 2 males, 4 females. NEGROS ISLAND: Siaton, 1 male (alc.).

Collector's notes.—Palawan: "Taken from a series of caves in an outcrop of limestone above Tanabog near the coast. This particular outcrop stands out as a bare knob on the first hill. Extremely abundant in two large caverns just back from the entrance, but in the dark."

Eonycteris robusta Miller

Eonycteris robusta Miller, 1913, Proc. Biol. Soc. Washington, 26: 73.

Eonycteris longicauda Taylor, 1934, Bur. Sci. Manila, Monog. no. 30: 131.

Specimens examined.—Total 51. MINDANAO: Cotabato City (cave), 15 males (10 alc.), 36 females (30 alc.).

Macroglossus lagochilus lagochilus Matschie

Macroglossus lagochilus Matschie, 1899, Megachir. Berlin Mus. Naturk., p. 96.

Specimens examined.—Total 6. MINDANAO: Mount McKinley, Ugis-Aya plantation, 2 males (1 alc.); Madaum, 2 males (1 alc.), 1 female (alc.). NEGROS ISLAND: Amio, Santa Catalina, 1 male (alc.).

Remarks.—The only member of this genus recorded from Mindanao is *M. fructivorus* Taylor, known from one immature specimen. The individuals examined do not agree with the description of that species; they are typical of *lagochilus*.

Emballonura alecto alecto Eydoux and Gervais

Vespertilio (Nycticeus) alecto Eydoux and Gervais, 1839, Voy. autour du Monde, 5, pt. 2: 7.

Specimens examined.—Total 13. MINDANAO: Tindog-Bato, 2 males, 5 females (alc.). NEGROS ISLAND: Naliong, Tolong, 1 male, 5 females (alc.).

Taphozous philippinensis Waterhouse

Taphozous philippinensis Waterhouse, 1845, Proc. Zool. Soc. London, 1845: 9.

Specimens examined.—Total 12. LUZON: Manila, 2 males, 2 females. MINDANAO: Caburan, 2 males, 2 females; Malabutuan, 3 males (alc.), 1 female (alc.).

Remarks.—The Malabutuan specimens were taken from a "cave in cliff over ocean."

Megaderma spasma spasma Linnaeus

Vespertilio spasma Linnaeus, 1758, Syst. Nat., 10th ed., p. 32.

Megaderma spasma Geoffroy, 1810, Ann. Mus. d'Hist. Nat., 15: 195.

Specimens examined.—Total 18. MINDANAO: Mati, 1 male (no skull); Sputon, 1 female (alc.). NEGROS ISLAND: Camboay, Siaton, 6 males (alc.), 10 females (alc.).

Remarks.—Specimens collected "in vacant house" and from "hole inside dried standing tree."

Rhinolophus virgo Andersen

Rhinolophus virgo Andersen, 1905, Proc. Zool. Soc. London, 2: 88.

Specimens examined.—Total 23. PALAWAN: Tanabog, 6 males (5 alc.), 13 females (10 alc.). NEGROS ISLAND: Siaton, 1 male (alc.), 3 females (alc.).

Measurements (one male, three females, skins with skulls).—Forearm 39.7–42.1 mm. Skull: greatest length 17.3–17.8; condylo-basal length 14.5–15.4; palatal length 1.5–2; width across nasal swellings 4.5–4.7; interorbital width 2.1–2.5; zygomatic width 7.9–8.8; mastoid width 8.4; width of brain case 6.5–7.2; upper tooth row 6.4–6.7; across canines 3.9–4.6; across last molars 5.9–6.5. Forearm (fifteen specimens in alc.) 39.5–43.1. Wings (five specimens): third metacarpal 29.6–33, first phalanx 11.5–12.6, second phalanx 15.6–17; fourth metacarpal 31.5–33.9, first phalanx 8–8.9, second phalanx 9.7–10.9; fifth metacarpal 30.4–32.5, first phalanx 8.9–9.0, second phalanx 10.4–11. Tail 17.5–24.5; tibia 15.8–17.5; ear from meatus 15.5–17.5.

Remarks.—These specimens are larger than the type and two topotypes in alcohol. The forearms are longer than the two from Mindanao and Jolo recorded by Taylor but the tooth rows are about the same. The differences seem to be no greater than can be expected in a species found throughout the Philippines. These specimens represent the first record from Palawan.

Rhinolophus arcuatus exiguus Andersen

Rhinolophus arcuatus exiguus Andersen, 1905, Ann. Mag. Nat. Hist., (7), 16: 283.

Specimens examined.—Total 102. MINDANAO: Luangbay Cave, 47 males (44 alc.), 51 females (49 alc.); Capilit Cave, near Upi, 1 male (alc.), 1 female (alc.). NEGROS ISLAND: Mambaho Cave, Pagyabunan, Bais, 1 male, 1 female (alc.).

Measurements.—This race has a narrower horseshoe than *arcuatus* and a shorter forearm. The forearm measurement for 45 males is 42.5–45.8 mm., 50 females 42.4–46.2. Ten measured between 45–45.4, five between 45.5–45.9, and but one over 46.0. Even in these larger specimens the horseshoe is narrower than in *arcuatus* from Luzon.

Rhinolophus subrufus subrufus Andersen

Rhinolophus subrufus Andersen, 1905, Ann. Mag. Nat. Hist., (7), 16: 283.

Specimens examined.—Total 1. NEGROS ISLAND: Naliong, Tolong, 1 male (alc.).

Rhinolophus rufus Eydoux and Gervais

Rhinolophus luctus var. *rufa* Eydoux and Gervais, 1836, Zool., Voy. "Favorite," p. 9.

Specimens examined.—Total 10. MINDANAO: Sitio Tegato, Luangbay Cave, 4 males (3 alc.), 5 females (3 alc.); Capilit Cave, near Upi, 1 male (alc.).

Measurements (six alc., three males, three females).—Forearm 66.5–68.6 mm.; third metacarpal 49.1–50.5, first phalanx 19.3–20.4, second phalanx 26.7–28.5; fourth metacarpal 50.3–52, first phalanx 13.1–14.9, second phalanx 16.3–18.5; fifth metacarpal 50.7–52.8, first phalanx 12.8–15.6, second phalanx 16.8–18.5. Tail 29–31.2; tibia 32.3–34.6; ear from meatus 29.5–32.3. Skull (one male, two females): greatest length (to in front of canines) 28.6–29.5 mm.; condylo-basal length (to in front of canines) 25.6–26.2; palatal length 3.6–3.7; width across nasal swellings 7.1–7.5; interorbital width 2.5–2.9; zygomatic width 14.2–14.4; mastoid width 12.7–12.8; width of brain case 10.7–11.5; upper tooth row 11.8–12.2; across canines 7.7–8.2; across M1–M1 11.1–11.5.

Rhinolophus acuminatus acuminatus Peters

Rhinolophus acuminatus Peters, 1871, Monatsber. Akad. Wiss. Berlin, 1871: 308.

Specimens examined.—Total 1. PALAWAN: Tigoplan River, 1 male.

Remarks.—The type locality of *acuminatus* is Java and it has been recorded from Borneo and Sumatra. There are closely related forms described from Lombok (*acuminatus audax*), Sumatra (*sumatrensis*), Engano Island (*calypso*), and Nias Island (*circe*). These are based on size and the shape of the horseshoe and sella.

This one specimen from Palawan is a little small for typical *acuminatus* (forearm 47 mm. compared to 48.7–49). In color it compares fairly well with one skin from Java and one from British North Borneo. This specimen is the first record for the Philippines.

Hipposideros bicolor antricola Peters

Phyllorhina antricola Peters, 1861, Monatsber. Akad. Wiss. Berlin, 1861: 709.

Specimens examined.—Total 38. MINDANAO: Malabutuan, 29 (alc.). PALAWAN: Tigoplan River, 9 (alc.).

Hipposideros pygmaeus Waterhouse

Rhinolophus pygmaeus Waterhouse, 1843, Proc. Zool. Soc. London, 1843: 67.

Specimens examined.—Total 5. NEGROS ISLAND: Mambaho Cave, Pagyabunan, Bais, 2 males, 3 females (alc.).

Remarks.—Previous records of this bat are from Luzon Island. The forearms of this series range from 38.5–40.2 mm.

Hipposideros diadema griseus Meyen

Rhinolophus griseus Meyen, 1833, Nov. Acta Acad. Caes. Leop.-Carol., 16, pt. 2: 608.

Specimens examined.—Total 57. MINDANAO: Cotabato, 14 males (9 alc.), 5 females (3 alc.); Capilit Cave, near Upi, 13 males (alc.); Katipunan, Zamboanga, Sigayan, 1 female. NEGROS: Camboay, Siaton, 17 males (15 alc.); Naliong, Tolong, 6 males, 1 female (alc.).

Hipposideros obscurus Peters

Phyllorhina obscura Peters, 1861, Monatsber. Akad. Wiss. Berlin, 1861: 707.

Specimens examined.—Total 2. MINDANAO: Conel, 1 male (alc.), 1 female (alc.).

Remarks.—These specimens agree with those recorded by Taylor (1934, p. 232) under this name. The forearms measure: male 43.8 mm., female 41.9. They also measure smaller than the type, which had a forearm of 46 mm. They were "smoked from hollow tree in recently cut over original forest, one escaped."

Hipposideros galeritus galeritus Cantor

Hipposideros galeritus Cantor, 1846, Journ. Asia. Soc. Bengal, 1846: 183.

Specimens examined.—Total 3. MINDANAO: Central Cave, Cotabato, 1 male (alc.); Sitio Tegato, Luangbay Cave, 1 male (alc.), 1 female (alc.).

Remarks.—This is the first record of this species for the Philippines. The specimens agree externally with descriptions of *galeritus* and with measurements given by Lyon (1911) for a series from Borneo.

Myotis abbotti nugax Allen and Coolidge

Myotis abbotti nugax Allen and Coolidge, 1940, Bull. Mus. Comp. Zool., 83: 137—Mount Kinabulu, North Borneo.

Specimens examined.—Total 5. CULION: San Pedro, 5 females (3 alc.).

Remarks.—Miss Barbara Lawrence of the Museum of Comparative Zoology has kindly compared these specimens with the type of *nugax* and has found them practically identical. They were collected “in banana leaf roll about one meter from ground.” The forearms on the skins are broken; the specimens in alcohol have forearms measuring 35.4, 36.1, and 36.5 mm., respectively.

Pipistrellus abramus Temminck

Vespertilio abramus Temminck, 1835, Monogr. Mamm., 2: 232.

Specimens examined.—Total 2. MINDANAO: Baclayan, east slope of Mount Apo (5,400 feet), 2 males (1 alc., skull cleaned).

Remarks.—These two specimens are referred to *abramus*, as the forearms measure 34.5, 34.9 mm.; the skulls are higher, with more domed brain cases, than in skulls of *abramus* from Indo-China. The teeth are the same and upper tooth rows C–M3 measure 5.1, 5.2 mm. The tragus is almost straight on the inner margin and slightly convex on the outer, with a very blunt, almost square tip.

Pipistrellus imbricatus Horsfield

Vespertilio imbricatus Horsfield, 1824, Zoological Researches in Java.

Pipistrellus imbricatus Thomas, 1898, Trans. Zool. Soc. London, 14: 385—Luzon; Allen, 1922, Occ. Pap., Mus. Zool., Univ. of Michigan, no. 110: 168—Palawan.

Specimens examined.—Total 6. PALAWAN: Puerto Princesa, 1 male (alc.), 3 females (2 alc.). NEGROS: Lake Balinsasayao, 1 female, 1 juvenile (alc.).

Remarks.—Thomas and Allen both referred their single specimens to this species, in one case a young one, in the other a damaged specimen. The present series agrees well with a topotype from Java. The crowded P2, not visible from without, seems to be a constant character. The forearms measure 33.8 to 34.5 mm. in the three alcoholic specimens.

Tylonycteris pachypus meyeri Peters

Tylonycteris meyeri Peters, 1872, Monatsber. Akad. Wiss. Berlin, 1872: 705.

Tylonycteris pachypus meyeri Tate, 1942, Bull. Amer. Mus. Nat. Hist., 80: 268, 293 (meas. co-type).

Specimens examined.—Total 21. CULION: San Pedro, 14 males (12 alc.), 7 females (5 alc.).

Remarks.—Described from south Luzon Island, this race has been either rarely recorded or else placed in the synonymy of *T. pachypus*. Wroughton recorded it from Burma and Bengal on Thomas' identification, and Tate has recently recognized it because of its smaller size. These specimens from Culion are smaller than typical *pachypus*, the measurement of the forearms ranging from 21.5 to 23.8 mm. Compared with two specimens from Java, *meyeri* is lighter-colored, though this may be partly due to the wearing off of the dark tips of the hairs and the resulting exposure of more of the light-colored bases.

Scotophilus temminckii Horsfield

Vespertilio temminckii Horsfield, 1824, Zoological researches in Java.

Specimens examined.—Total 94. MINDANAO: Davao City, 3 males; Bankarohan, 1 male, 2 females (1 alc.); Calian, 2 males, 2 females; Parang, 2 females. PALAWAN: Brooke's Point, 2 males, 7 females. CUYO: Cuyo, 5 males (3 alc.), 13 females (9 alc.), 30 juveniles (alc.). NEGROS ISLAND: Dumaguete, 8 males (alc.), 17 females (15 alc.).

Miniopterus australis australis Tomes

Miniopterus australis Tomes, 1858, Proc. Zool. Soc. London, 1858: 125—Loyalty Islands.

Miniopterus tibialis Tomes, 1858, Proc. Zool. Soc. London, 1858: 126—Amboina.

Miniopterus paululus Hollister, 1913, Proc. U. S. Nat. Mus., 46: 311—Guimaras Island, Philippines.

Specimens examined.—Total 73. MINDANAO: Sitio Tegato, Luangbay Cave, 1 male, 1 female, 68 (alc.); Upi, Capilit Cave, 1 male (alc.); Samal Island, Tawang Cave, 1 male (alc.). NEGROS ISLAND: Himangpangon Cave, 1 female (alc.).

Remarks.—This series has been compared with other large series from New Caledonia (which are near topotypes) and New Hebrides, and with two topotypes of *paululus* and two specimens from Java labeled *tibialis* by Sody.

The forearms of these series (all in alcohol) measure: New Caledonia, 36.3–39.2 mm.; New Hebrides, 35.7–38.9; Mindanao, 34.1–37.7. The brain case width of all the skulls is less than 7 mm.

When Tomes described *tibialis*, he said, concerning the attachment of the calcar to the tibia: "If this peculiarity is persistent, and not due to the state of preservation, it would mark out a very distinct and good species; but it is very desirable that other specimens be examined that have been preserved in spirit, in which state they show these parts in a more natural condition."

In many specimens of *Miniopterus* the calcar is attached to the tibia, in some more than in others. When the interfemoral membrane is not pinned out when making a skin, it curls up along the tibia, giving the appearance, as Tomes said, of "a slender shank." It is safe to assume that Tomes' specimens were so prepared and that *tibialis* is an older name for *paululus*, which is here treated as a synonym of *australis*.

Miniopterus schreibersii eschscholtzii Waterhouse

Vespertilio eschscholtzii Waterhouse, 1845, Proc. Zool. Soc. London, 1845: 121.

Specimens examined.—Total 84. MINDANAO: Sitio Tegato, Luangbay Cave, 2 males, 7 females, 75 (alc.).

Remarks.—The forearms in this series range from 43.4 to 46.5 mm. The darker color of this race appears to be all that separates it from *schreibersii* of Europe.

Miniopterus tristis Waterhouse

Vespertilio tristis Waterhouse, 1845, Proc. Zool. Soc. London, 1845: 3; idem, 1845, Ann. Mag. Nat. Hist., (1), 16: 50; Gray, 1850, Zool. Voy. Samarang, p. 31 (listed); Wagner, 1855, Suppl. Schreb. Säugeth., 5: 743 (abst. of orig. desc.).

Miniopterus tristis Tomes, 1858, Proc. Zool. Soc. London, 1858: 124 (meas. of type); Peters, 1861, Monatsber. Akad. Wiss. Berlin, 1861: 711 (Luzon); Dobson, 1876, Cat. Asia. Chiroptera, p. 163 (meas. of type); idem, 1878, Cat. Chiroptera, p. 352 (meas. of type); Elera, 1895, Cat. Sist. Fauna Filipinas, 1: 14 (Cebu and Samar); Hollister, 1912, Philippine Journ. Sci., 7: 19 (Cebu and Samar from Elera, Luzon from Peters); idem, 1914, Proc. U. S. Nat. Mus., 46: 311 (Lubang Island, meas.); Taylor, 1934, Philippine Land Mamm., p. 275 (meas. of type); Lawrence, 1939, Bull. Mus. Comp. Zool., 86: 61 (Mindoro); Tate, 1941, Bull. Amer. Mus. Nat. Hist., 78: 571, 575, 597 (Papua; desc. meas.).

Specimens examined.—Total 1. MINDANAO: Central Cave, Cotabato City, 1 female (alc., skull cleaned).

Measurements.—Forearm 53.8 mm.; third metacarpal 49.9, first phalanx 13.8, second phalanx 41.5; fourth metacarpal 47.9, first phalanx 11, second phalanx 17.5; fifth metacarpal 40.8, first phalanx 10.5, second phalanx 10.5. Ear 15.8. Tail 61.5; tibia 22.5. Skull: greatest length (to front of incisor) 19.5; condylo-basal length 19.1; palatal length 7.7; interorbital breadth 4; zygomatic width 10.9; mastoid width 9.9; breadth of brain case 8.8; upper tooth row 7.8; width across canines 6, across molars 8.5; lower tooth row 8.5.

Remarks.—The references to this species record six specimens from the Philippines and thirteen from Papua and Dutch New Guinea. Three of the Philippine specimens were in Manila and probably have been destroyed; the type is in the British Museum; one is in Germany; one in the Museum of Comparative Zoology. The thirteen from Papua and Dutch New Guinea are in the American Museum of Natural History.

The species has been recorded from Luzon, Lubang, Cebu, Samar, and Mindoro, and, with the present specimen, from Mindanao.

The first measurements of the skull were given by Hollister (1913) for the specimen from Lubang and Tate recorded skull measurements for the M.C.Z. specimen from Mindoro. Taylor transposed Dobson's measurements of the type from inches to millimeters and republished Hollister's measurements.

Kerivoula pusilla Thomas

Kerivoula pusilla Thomas, 1894, Ann. Mag. Nat. Hist., (6), 14: 461.

Specimens examined.—Total 2. MINDANAO: Madaum, 1 female; Lacaron, 1 male (alc.).

Remarks.—This bat was collected "resting at daytime under dried Abaca leaves." The forearms measure 29.2 and 29.4 mm. The upper inner incisor has two cusps as described by Thomas but this character has not been mentioned by other authors in describing related forms. The lower and middle incisors are four-lobed, the outer pair trilobed, as described by Thomas. The points of the upper canines extend below the bases of the lower canines.

The same condition—found also in the next species, *K. pellucida*—should place both species in the genus *Phoniscus*. The anterior groove in the upper canine does not appear to be present in these specimens, however.

Kerivoula pellucida Waterhouse

Vespertilio pellucidus Waterhouse, 1845, Proc. Zool. Soc. London, 1845: 6.

Specimens examined.—Total 1. MINDANAO: Maco, 1 female.

Remarks.—This one specimen agrees in general with the original description and that given by Taylor for his specimens. The under parts are not, however, "ashy white," as stated by Waterhouse, whose specimens were in alcohol. They are also darker than the base of the hairs of the back but, as the hair is short and much worn, this color would probably be lighter in a specimen in fresh pelage. The forearm measures 35.5 mm., a little longer than that given by Taylor for his largest specimen.

The canines are heavy and long, the points of the uppers extending below the base of the lowers when the jaws are closed. The inner and middle lower incisors are four-lobed, the outer pair trilobed.

Cheiromeles torquatus Horsfield

Cheiromeles torquatus Horsfield, 1824, Zoological Researches in Java.

Specimens examined.—Total 1. PALAWAN: Babuyan, 1 male (alc.).

Measurements.—Forearm 74.5 mm.; third finger metacarpal 77, first phalanx 44.4, second phalanx 35.1, third phalanx 16.5; fourth finger metacarpal 76, first phalanx 36.2, second phalanx 23.9, tip 2.8; fifth finger metacarpal 39.2, first phalanx 29, second phalanx 8.5. Tail 56; tibia 30.6; ear from meatus 25.9. Skull: greatest length 29.8 (broken); interorbital width 8.8; mastoid width 17; upper tooth row 10.9; width across canines 9; across molars 12.9; lower tooth row 12.8.

Remarks.—The genus is known in the Philippines from four specimens from Mindanao (Taylor, 1934) and one specimen from Mindoro (Lawrence, 1939). This specimen from Palawan adds a third island to its distribution. The skull shows it to be not fully adult. The teeth are slightly smaller than in one skull from Borneo but not small enough to identify this specimen as *parvidens*.

DERMOPTERA

Cynocephalus volans Linnaeus

Lemur volans Linnaeus, 1758, Syst. Nat., 10th ed., 1: 30.

Specimens examined.—Total 39. MINDANAO: Cotabato, Conel, 1 juvenile male, 1 female; Sputon, 1 male, 1 female; Mallu, 1 male;

Akbul, 1 female; Klaja, 1 male; Davao, Maco, 2 males, 3 females; Calian, 2 males, 1 female; Caburan, 2 females; Lapuan, 1 female; Madaum, 2 males; Lacion, 8 males, 9 females, 1 young female; Gubat, Katipunan, Zamboanga, 1 male.

PRIMATES

Tree shrews of the genus *Tupaia* are known only from Palawan, Culion, Busuanga and Cuyo. They are very closely related and are here considered subspecies of the earliest-named species, *palawanensis* Thomas 1894. Lyon (1913) referred to them as the *mollendorffi* group, but it is preferable to call them the *palawanensis* group.

The darkest race, *palawanensis*, is found on Palawan Island and is characterized by its slightly larger size and darker color, especially a very blackish tail, described in the type as wholly black. Lyon found none with pure black tails and there are none in this series. If the tail is compressed—not flattened or spread out—it appears blacker.

The other three races are lighter than *palawanensis* and have the same body color, but differ in the color of the tail. In *cuyonis* from Cuyo Island the color of the tail is very close to that of the upper parts of the body. The color of the tail in *mollendorffi* from Culion Island is grayer, and thus lighter than the body. The race described below from Busuanga Island has a blackish tail, darker than the body, approaching the color of the tail of *palawanensis*.

Tupaia palawanensis palawanensis Thomas

Tupaia ferruginea palawanensis Thomas, 1894, Ann. Mag. Nat. Hist., (6), 13: 367.

Tupaia palawanensis Lyon, 1913, Proc. U. S. Nat. Mus., 45: 78–80; Taylor, 1934, Bur. Sci., Manila, Monog. no. 30: 103.

Type locality.—Palawan. Type in British Museum (Nat. Hist.), no. 94.2.1.3.

Specimens examined.—Total 59. PALAWAN (1947): Puerto Princesa (April 3–May 18), 29 males, 26 females; Iwahig Penal Colony (March 5), 1 female; Brooke's Point (April 26–May 2), 2 females; south slope of Mount Balabag (May 13), 1 female.

Measurements (24 males, 22 females).—Total length, males 322–354 mm., females 323–362; tail, males 146–176, females 150–182; hind foot, males 42–46, females 41–46; ear, males 14–19, females 13–19. Skull (extremes of 15 males and 13 females): Greatest

length 46.8–49.5 mm., 46.5–49.4; condylo-basal length 42.5–45.7, 43.1–45.4; palatal length 23.8–26.4, 24.9–26.0; interorbital width 12.6–14.7, 12.3–14.5; zygomatic width 23.5–25.4, 22.9–24.7; width of brain case above roots of zygoma 17.5–19, 17.5–18.2; upper tooth row I1–M3 23.7–25.7, 24.1–26.0, C–M3 16.0–17.5, 15.9–17.7.

Remarks.—All specimens were taken in dense second growth forest, on coconut bait.

***Tupaia palawanensis cuyonis* Miller**

Tupaia cuyonis Miller, 1910, Proc. U. S. Nat. Mus., 38: 393; Lyon, 1905, op. cit., 45: 82–83.

Type locality.—Cuyo Island. Type was in Philippine Museum, Manila, no. 26; doubtless destroyed.

Specimens examined.—Total 8. CUYO ISLAND (May 26–29, 1947): Lungsod, 2 males, 1 female; Centro, 1 female; San Carlos, 1 female; Balaguen, 1 female; Cuyo, 1 male, 1 female.

Measurements (three males, four females).—Total length 318–325 mm.; tail 145–158; hind foot 39–43; ear 15–16. Skull (male, female): Greatest length 47.5, 45.2; condylo-basal length 43.3, 42.4; palatal length 24.8, 24.0; interorbital width 13.4, 13.1; zygomatic width 24.4, 23.7; width of brain case 17.5, 17.9; upper tooth row 23.8–23.7; C–M3 16.1, 16.3.

Remarks.—This series is about the same color as the two specimens of *T. mollendorffi* with the exception of the tail, which is closer in general color to the back than it is in *mollendorffi*. The difference is very small and excellent light on the specimens is needed to show it.

***Tupaia palawanensis mollendorffi* Matschie**

Tupaia mollendorffi Matschie, 1898, Sitz.-Ber. Ges. Naturfr., Berlin, 1898: 39.

Tupaia mollendorffi Lyon, 1905, Proc. U. S. Nat. Mus., 45: 81.

Type locality.—Culion Island. Type in Zoological Museum, Berlin, no. 9858.

Specimens examined.—Total 2. CULION (April 6, 1947): Suik, 1 male, 1 female.

Measurements.—(Male and female): Total length 288–305 mm.; tail 132–152; hind foot 42–42; ear 17–17. Skull (male): Greatest length 46.0; condylo-basal length 42.5; palatal length 23.7; interorbital width 12.2; zygomatic width 23.5; width of brain case 17.4; upper tooth row 23.8; C–M3 16.

Remarks.—Both specimens taken “in very dense bamboo jungle beside small stream.”

The specimens at hand agree fairly well with the descriptions of the species as given by Lyon. The upper side of the tail, when held in the right position, does appear lighter than the back.

***Tupaia palawanensis busuangae* subsp. nov.**

Type.—No. 62969 Chicago Natural History Museum, from Dimaniang, Busuanga Island, Calamianes group, Philippine Islands. Skin and skull. Adult female. Collected March 29, 1947, by D. S. Rabor. Original number 2629.

Characters.—General body color above grizzled ochraceous and black as in *cuyonis* and *mollendorffi*. Under parts as in *cuyonis*. Tail blackish, much darker than back. Skull longer and narrower than in the related species. The middle upper premolar with but two roots is oval in shape and not triangular.

Measurements (type; extremes of four paratypes in parentheses).—Total length 326 mm. (329–352); tail 162 (160–193); hind foot 46 (42–45); ear 16 (14–16.5). Skull (type): Greatest length 49.3; condylo-basal length 45.2; interorbital width 13.8; zygomatic width 23.5; width of brain case 18.2; orbital notch to tip of premaxillae 20; upper tooth row 25.6; width of rostrum at second incisor 6.1.

Remarks.—This series represents another slightly different insular race separated by the color of the tail, which is darker than the back. The only skull available is longer and with a longer tooth row than *mollendorffi* and *cuyonis*, but slightly smaller than some specimens of *palawanensis*. The two-rooted second premolar is found in *Dendrogale* but not in any skull of *Tupaia* examined. It may be an abnormality.

The collector's labels carry these notations: “Trapped with coco-[nut] bait in dense undergrowth close to stream;” “in dense second growth and bamboo jungle;” “snared in snare set for quail; thick patch of second growth at side of stream;” “mixed bush and bamboo jungle near stream.”

Specimens examined.—Type and four topotypes without skulls.

***Urogale everetti* Thomas**

Tupaia everetti Thomas, 1892, Ann. Mag. Nat. Hist., (6), 9: 250.

Urogale everetti Mearns, 1905, Proc. U. S. Nat. Mus., 28: 435; Lyon, 1913, Proc. U. S. Nat. Mus., 45: 157.

Urogale cylindrura Mearns, 1905, Proc. U. S. Nat. Mus., 28: 435.

Type locality.—Zamboanga, Mindanao Island. Type in British Museum (Natural History), no. 79-5-3-11.

Specimens examined.—Total 36. MINDANAO: east slope of Mount McKinley (3,150 feet) (August 15–30, 1946), 1 male, 1 female; Todaya (2,500 feet), Mount Apo (October 31–November 24, 1946), 23 males, 11 females (17 with skulls, 14 with body in alcohol, 5 with skeletons).

***Macaca philippinensis philippinensis* Geoffroy**

Macacus philippinensis Geoffroy, 1843, Archiv. Mus. d'Hist. Nat., 2: 568, pl. 33.

Specimens examined.—Total 4. LUZON: Massisiat, Abra Province, 3 males, 1 female (skeletons only).

Remarks.—The following skins from Palawan, Busuanga, and Culion are, in the adult males, darker than skins from Negros and Mindanao. I do not know how they differ from typical *philippinensis* from Luzon, so they are here referred to that form.

Specimens examined.—Total 16. PALAWAN: Puerto Princesa, 5 males (3 with skeletons); Iwahig, 1 male (with skeleton); Brooke's Point, 1 female, 2 juvenile males (1 in alcohol). BUSUANGA: Dimaniang, 1 male (no skull). CULION: San Pedro, 2 males, 3 juveniles.

***Macaca philippinensis mindanensis* Mearns**

Cynomolgus mindanensis Mearns, 1905, Proc. U. S. Nat. Mus., 28: 428.

Specimens examined.—Total 90. MINDANAO: east slope of Mount McKinley (2,500 feet), Davao, 2 males, 1 female, 1 no sex (all with skeletons); Tagabuli, Davao, 1 male, 2 females; Mati, Davao, 2 males; Mount Apo, Davao, 1 male (with skeleton); Parang, Cotabato, 1 female; Upi, Cotabato, 2 males, 1 female; Caburan, Caburan, 2 females; Mount Busaw, Caburan, 1 male, 1 female; Pagadian, Bucong, 2 males, 1 female, 2 juveniles; Katipunan, Zamboanga, 9 males, 17 females. NEGROS ISLAND: Amio, 5 males (1 with skeleton), 3 females, 1 skin only (no sex); Inubungan, 1 male, 5 females; Mabaha, Bais, 3 males, 2 juveniles; Pagyabunan, Bais, 1 (skull only); Lake Balinasayao, Bais, 6 males, 3 females, 1 juvenile; Tolong, 3 males, 6 females, 1 no sex; Santa Catalina, 1 male.

Remarks.—There appear to be no differences, either in the skins or the skulls, between the series from the two islands.

***Tarsius philippensis* Meyer**

Tarsius philippensis Meyer, 1894–95, Abh. Mus. Dresden, no. 1: 1.

Specimens examined.—Total 78. MINDANAO: Buayan Municipality, Cotabato Province, 7 males, 8 females; Caburan Municipality, Davao Province, 27 males, 27 females, 1 no sex; Malita Municipality, Davao Province, 3 males, 4 females; Sigayan, Katipunan, Zamboanga, 1 female.

Remarks.—This species was described by Meyer from two mounted specimens from Samar and an adult and young in alcohol from Mindanao. Samar has been regarded by recent authors as the type locality. *Tarsius carbonarius* Heude 1898 came from the Gulf of Davao, Mindanao Island, but there is nothing in the very meager description by which it can be identified as different from *philippensis*, and no material is available from Samar for comparison with this large series from Mindanao. Therefore the older name is used.

The color ranges from an almost uniform dark gray to an almost uniform reddish brown.

Measurements (six adult males and six adult females).—Greatest length 366–401 mm., 346–370; tail 255–275, 230–241; hind foot 64–67, 62–65. Skull: greatest length 39.2–40.5, 38.0–40.5; condylo-basal length 31.1–33.0, 30.9–32.0; palatal length 15.6–16.9, 15.1–15.6; greatest orbital width 32.4–33.6, 31.8–32.6; interorbital width 1.7–2.4, 1.6–2.2; zygomatic width 28.0–29.5, 27.3–28.8; width of brain case 22.7–23.6, 22.0–23.5; depth of brain case 18.5–19.8, 18.3–19.7; upper tooth row, entire 16.0–16.8, 16.1–16.9; width across base of canines 6.2–6.5, 5.9–6.5, across outer edges of last molar 15.6–17.1, 15.7–16.8; lower tooth row, entire 13.9–15.1, 14.4–14.9.

PHOLIDOTA

Paramanis culionensis Elera

Pholidotus culionensis Elera, 1915, Contr. Fauna Filipina, p. 274.

Paramanis culionensis Lawrence, 1939, Bull. Mus. Comp. Zool., 86: 70.

Specimens examined.—Total 5. PALAWAN: Iwahig, 2 males, 2 females (1 juvenile); Brooke's Point, 1 male.

Remarks.—The adult specimens agree with Miss Lawrence's description of the species. The younger ones have more keeled scales, particularly on the under side of the tail.

RODENTIA

Callosciurus steeri Gunther

Sciurus steeri Gunther, 1876, Proc. Zool. Soc. London, 1876: 375.

Specimens examined.—PALAWAN: Brooke's Point, 8 males, 6 females; Mount Balabag, 1 male.

Remarks.—The type locality of this species is Balabac Island, but this series agrees with the description of *steeri*. None of these specimens show any indication of intergrading with *juvencus* from Puerto Princesa.

Callosciurus juvencus Thomas

Sciurus steeri (in part) Günther, 1876, Proc. Zool. Soc. London, 1876: 736, pl. 69.

Sciurus juvencus Thomas, 1908, Ann. Mag. Nat. Hist., (8), 2: 498.

Specimens examined.—Total 43. PALAWAN: Puerto Princesa, 27 males, 13 females; Iwahig, 3 males.

Remarks.—In the majority of this series the under parts are white on the chest and rufous from the center of the belly to the tail, but five are wholly rufous with a few white hairs and one is nearly pure white.

Callosciurus mollendorffi Matschie

Sciurus mollendorffi Matschie, 1898, Sitz.-Ber. Ges. Naturfr. Berlin, no. 5: 41.

Specimens examined.—Total 11. CULION ISLAND: 8 males, 3 females.

Remarks.—There are three color patterns represented in this series. The upper parts are dark gray, brownish gray, or reddish brown. The under parts of all are pure white.

Callosciurus hoogstraali sp. nov.

Type.—No. 63080 Chicago Natural History Museum, from Dimaniang, Busuanga Island, Calamianes group, Philippine Islands. Skin and skull. Adult male. Collected March 17, 1947, by Dioscoro S. Rabor. Original number 2613.

Characters.—Hairs of posterior two-thirds of tail black with long white tips; base of tail like back; sides between Clay Color and Tawny Olive (Ridgway, 1912), darkened on back by many black hairs and dark bases of hairs; face grayish; hands and feet dark brown; under parts lighter with many long gray-white hairs.

Measurements (type).—Total length 400 mm.; tail 192; hind foot 52; ear 21. Skull: greatest length 53.9; condylo-basal length 48.5; palatal length 26.1; length of nasals 15.5; interorbital width 18.1; intertemporal width 17.5; zygomatic width 31.4; mastoid width 23.6;

width of brain case $23.5 \pm$; upper tooth row 11.1; width across outer edge of molars 13.2.

Remarks.—The color pattern of the tail suggests an affinity to *S. albicauda* Matschie from an unknown locality, but the face is not white nor the back lined, as Matschie described for *albicauda*. The squirrel is named for Mr. Hoogstraal, the director and leader of the Philippine Zoological Expedition.

CALLOSCIURUS

There are eleven specimens of *Callosciurus* from Mindanao, collected at three widely separated localities: Upi, Cotabato; Todaya, Mount Apo, Davao; and Caburan, Davao. These have been compared with a lectotype and a topotype of *C. mindanensis* collected by Steere, one from San Ramon, twelve miles northwest of Zamboanga, and six from Katipunán, Zamboanga Province. The general color of this series of *mindanensis* is brown, darkened on the back by black hairs; the thighs and sides are lighter, the feet and nose are rufous, the center of the tail is reddish brown, the under parts are ashy gray.

Compared with *mindanensis*, the specimens from Mount Apo are darker on the back, but the colored hair rings are more buffy and less brown, so that the animal is less intensely colored. The under parts are not uniform ashy gray but buffy gray and the lower belly and the base of the tail have a tinge of reddish. The Cotabato specimens are slightly lighter, more yellowish, than the Mount Apo series. Two specimens from Caburan are a tinge darker than those from Mount Apo, but they have much less buff on the under parts. All of these have been considered as representing *Callosciurus philippinensis* Waterhouse.

The pattern of the hairs of the tail consists of black and light-colored rings. Starting with black there are usually three pairs of narrow black and light-colored rings of about equal breadth followed by either a wide black tip or a wide black ring and a white ring, sometimes with a narrow black ring at the tip. Most of the hairs have four black and three light-colored sections or five black and four light sections. The growth of the hair may determine the number of rings. *C. mindanensis*, *philippinensis*, and a specimen of *samarensis* all agree in this pattern.

Whether *mindanensis* and *philippinensis* represent full species or subspecies or are synonymous, present material is not adequate

to determine. There are records of both taken from the same locality. The Philippine Expedition, however, did not collect any squirrels that are like the specimens of *mindanensis* mentioned above, with the exception of those taken in Zamboanga by Dr. Rabor. A specimen of *samarensis* collected by Steere differs but slightly from *mindanensis* and perhaps should be considered a subspecies of it.

Squirrels from Madaum are strikingly different in color from the other Mindanao specimens and have fewer but wider rings on the tail hairs. These are described below as a new species.

Callosciurus mindanensis Steere

Sciurus mindanensis Steere, 1890, List of Birds and Mammals, Steere Expedition to Philippines, p. 29.

Specimens examined.—Total 6. MINDANAO: Mamara, Katipunan, Zamboanga Province, 1 male, 5 females.

Remarks.—These agree perfectly with a lectotype and a topotype of *mindanensis*, collected by Steere.

Callosciurus philippinensis Waterhouse

Sciurus philippinensis Waterhouse, 1839, Proc. Zool. Soc. London, 1839: 117.

Specimens examined.—Total 11. MINDANAO: Burungkôt, 1,000 feet, Upi, Cotabato, 2 males, 2 females; Todaya, Mount Apo, Davao, 3 males, 2 females; Lapuan, Malita, Davao, 1 female; Mount Busaw, Caburan, Davao, 1 female.

Callosciurus davensis sp. nov.

Type.—No. 61386 Chicago Natural History Museum, from Madaum, 25 feet altitude, Tagum Municipality, Davao Province, Mindanao Island, Philippine Islands. Adult male. Skin and skull. Collected October 12, 1946, by Srs. Godofredo Alcasid and Arturo Castro. Original number H. H. 751.

Color.—On a broad line from the nose between eyes and ears, down the back to the base of the tail the bases of the hairs are black and the tips near Hay's Russet (Ridgway, 1912). This color is clearer on the face to between the eyes but from there backward is much darkened by the broader black hair bases. The hands and feet are little darker than the face. The cheeks are buffy. The bases of the hair on the sides are nearer Slate-Black and the tips buffy, so the sides are much lighter than the back. The under parts are close to Apricot Buff. The sides are clearly marked off from the dark

back and lighter under parts. The hairs of the tail are of two patterns. In one there are long red, black, and white rings with a narrow black tip, and in the other there are three pairs of narrow red and black rings followed by a white ring and a black tip. The black rings are often faint so that the general appearance of the tail is near Hay's Russet in the center, bordered with black and an outer border of white. The tail is less russet below than above.

Skull.—The skull shows no marked difference from skulls of *mindanensis* and *philippinensis*.

Measurements (type).—Total length 380 mm.; tail 182; hind foot 49. Skull: greatest length 51.7; condylo-basal length 46.6; palatal length 25.8; interorbital width 17.6; intertemporal width 16.4; zygomatic width 30; mastoid width 21.8; width of brain case 21.9; upper tooth row 9.7; width across outer edge of molars 11.1.

Nanosciurus surrutilus Hollister

Nanosciurus surrutilus Hollister, 1913, Proc. U. S. Nat. Mus., 46: 313.

Specimens examined.—Total 19. MINDANAO: east slope of Mount McKinley (3,000–5,800 feet), Davao, 3 males, 1 female; Baclayan (5,400 feet), Mount Apo, Davao, 1 female; Todaya (2,500 feet), Mount Apo, Davao, 1 male; Burungkôt (1,500 feet), Cotabato, 7 males, 2 females; Gubat (2,500 feet), Katipunan, Zamboanga, 1 male, 2 females; Mamara (2,500 feet), Katipunan, Zamboanga, 1 male.

Remarks.—This large series agrees with the description given for the species. All are darker, some much darker, than a specimen of *N. concinnus* from Basilan. The Zamboanga specimens are practically topotypes.

Hylopetes nigripes nigripes Thomas

Sciuropterus nigripes Thomas, 1893, Ann. Mag. Nat. Hist., (6), 12: 30.

Specimens examined.—Total 9. PALAWAN: Puerto Princesa, 1 male, 1 female; Iwahig, 1 female; Brooke's Point, 1 juvenile male, 1 juvenile female; Balabag, 2 males, 2 females.

Measurements (male and female skulls).—Greatest length 50.0, 53.9 mm.; condylo-basal length 46.2, 49.2; palatal length 26.0, 28.1; length of nasals 15.9, 17.2, width 8.8, 8.9; interorbital width 9.9, 10.4; intertemporal width 10.5, 10.7; zygomatic width 32.2, 33.6; mastoid width 25.3, 26.0; width of brain case at base of zygomata 22.3, 22.5; upper tooth row 12.2, 12.7; width across outer edges of molars 13.5, 14.3.

Remarks.—This, the first large series to be taken, extends the known range of this species on Palawan south to Brooke's Point and Balabag.

Chiropodomys calamianensis Taylor

Insulaemus calamianensis Taylor, 1934, Bur. Sci. Manila, Monog. no. 30: 470.

Specimens examined.—Total 10. PALAWAN: Puerto Princesa, 5 males, 4 females; Brooke's Point, 1 female.

Measurements (five adults).—Total length 235–278 mm., tail 133–162; hind foot 22–26; ear 15–19. Skull: greatest length 26.8–28.5; condylo-basal length 25.0–26.6; palatal length 13.3–14.6; inter-orbital width 4.9–5.5; zygomatic width 16.0; mastoid width 12.7–13.9; upper tooth row 4.3–4.5; width across outer edges of molars 5.8–6.2.

Remarks.—This series agrees with the description of the type from Busuanga Island. The skin measurements are larger but the skull measurements are about the same as those of the type.

These were trapped on the beach in a coconut grove, some near the trees and some in a building. One was caught by hand in bamboo.

Carpomys phaeurus Thomas

Carpomys phaeurus Thomas, 1895, Ann. Mag. Nat. Hist., (6), 16: 162; Thomas, 1898, Trans. Zool. Soc. London, 14: 408, pl. 34, fig. 1 (animal), pl. 36, fig. 7 (skull).

Specimens examined.—Total 1. LUZON: Mount Kapilingan, 7,000 feet, May 2, 1946, 1 female.

Measurements.—Total length 336 mm.; tail 161; hind foot 32. Skull: greatest length 38.8; condylo-basal length 36.7; palatal length 18.1; length of incisive foramen 7.3; length of nasals 14.4; inter-orbital width 5.9; zygomatic width 21.5; mastoid width 15.6; width of brain case 16.4; upper tooth row 6.6; width across outer edges of molars 8.1.

Remarks.—This is the first specimen to be taken since the capture of the type and two others on Mount Data. Collected in "mossy forest."

Batomys grantii Thomas

Batomys grantii Thomas, 1895, Ann. Mag. Nat. Hist., (6), 16: 162; Thomas, 1898, Trans. Zool. Soc. London, 14: 405, pl. 33, fig. 2 (animal), pl. 36, fig. 5 (teeth), fig. 8 (skull).

Specimens examined.—Total 2. LUZON: Mount Data, April 23 and May 3, 1946, 2 males.

Measurements.—Total length 287 mm.; hind foot 39. Skull: greatest length 45.3; condylo-basal length 40.5; palatal length 21.0; length of incisive foramen 8.9; length of nasals 18.9; interorbital width 6.5; zygomatic width 22.1; mastoid width 15.6; width of brain case 16.6; upper tooth row 7.9; width across outer edges of molars 8.8.

Remarks.—This species was not collected by either Mearns or Taylor, and these specimens are the first recorded since the original three collected by Whitehead in 1895. The collector's notes state that the present specimens were collected among "thick bushes, mossy forest in gully."

Crateromys schadenbergi Meyer

Phloeomys(?) schadenbergi Meyer, 1895, Abh. Mus. Dresden, 6: 1.

Crateromys schadenbergi Thomas, 1895, Ann. Mag. Nat. Hist., (6), 16: 163.

Specimens examined.—Total 5. LUZON: Mount Kapilingan, Mountain Province, 2 males, 3 females.

Measurements (two males and two females).—Total length 684–765 mm., tail 359–407; hind foot 67.5–75.5. Skull: greatest length 66.1–75.5; condylo-basal length 63.4–73.7; palatal length 34.2–39.8; length of palatal foramen 10.9–14.8; interorbital width 7.8–8.5; zygomatic width 35.8–40.5; mastoid width 22.2–23.1; width of brain case 24.0–26.0; upper tooth row 15.2–17.1; width across molars 13.0–13.7; length of nasals 24.0–28.2.

Remarks.—These were collected between 8,000 and 8,200 feet, in "mossy forest."

Rattus rattus jalorensis Bonhote

Mus jalorensis Bonhote, 1903, Fasciculi Malayensis, 1: 28, pl. 2, figs. 1 and 2 (animal), pl. 4, fig. 4 (skull).

Specimens examined.—Total 8. PALAWAN: Aborlan Municipality, Arena Island, 2 males, 2 females, 4 juvenile females. BUSUANGA: Coron, 2 males.

Remarks.—These specimens agree in color with series from Kuala Lumpur, Malay States, and Sumatra. The skulls differ only in the shape of the palatal foramina, which are long and narrower than in typical *jalorensis*. One male from Busuanga has gray instead of white under parts. Both specimens from Busuanga have bobbed tails, one with badly broken skull and one without skull. This race

was not taken on Palawan or other islands. It is a widespread form, and this series differs so slightly that it is here referred to *jalorensis*.

Rattus rattus mindanensis Mearns

Mus mindanensis Mearns, 1915, Proc. U. S. Nat. Mus., 28: 442.

Specimens examined.—Total 493. Mindanao, 199; Negros, 221; Palawan, 22; Culion, 1; Cuyo, 7; Luzon, 43.

Remarks.—This rat is so common and widespread on all the islands visited that each separate locality where it was taken has not been listed. It was found from the sea coast to over 6,000 feet in Luzon and Mindanao.

The general color of this series is fairly uniform on the upper parts. The under sides, however, are subject to great variation not only in specimens found between islands but in those on the same island and in the same locality.

Of the topotypes from Todaya, Mount Apo, Mindanao, taken on two consecutive days, one has the under parts yellowish white, another light gray, and the third brownish gray, and the same variation is seen in the series from other islands. Specimens from Mount Data, Luzon, have the tails averaging blacker than any others but otherwise agree with the topotypes.

Rattus norvegicus norvegicus Erxleben

[*Mus*] *norvegicus* Erxleben, 1777, Syst. Regni. Anim., 1: 381.

Specimens examined.—Total 10. NEGROS: Dumaguete, 6 males, 4 females.

Remarks.—These rats were all taken in buildings of the seaport, many with coconut bait.

Rattus benguetensis Hollister

Epimys benguetensis Hollister, 1913, Proc. U. S. Nat. Mus., 46: 323.

Epimys datae Hollister (not Meyer), 1912, Philippine Jour. Sci., D 7: 28; Hollister, 1913, Proc. U. S. Nat. Mus., 46: 323.

Specimens examined.—Total 71. LUZON: Mount Data (5,300–6,500 feet). Taken in rice and camote fields.

Measurements (two males, two females).—Total length 358–392 mm.; tail 172–180; hind foot 39.5–42. Skull (one male, three females): greatest length 41.4–43.6; condylo-basal length 39.1–41.7; palatal length 22.0–23.7; interorbital width 6.0–6.5; zygomatic width 20.7–21.6; width of brain case at parietal ridges 14.7–15.7; length

of bullae 6.5–6.5; upper molar series 6.5–6.5; length of nasals 16.3–18.5; diastema 11.5–12.5; palatal foramina 8.0–8.8.

Remarks.—The type of *R. benguetensis* came from Camp John Hay, Baguio, Benguet Province, Luzon. The specimens referred to *datae* by Hollister were taken at Hights-in-the-Oaks, also in Benguet Province, and all are immature. The type of *benguetensis* is more immature than the series that Hollister mistakenly called *datae*.

The specimens collected on Mount Data by the Philippine Zoological Expedition are all adult. Direct comparison of this material, unsatisfactory as it is, leads to the conclusion that all these specimens must be referred to *benguetensis*. This can not be fully settled until adult topotypes of *benguetensis* are available.

The general color of the adult specimens from Mount Data is a dark blackish brown. The dark gray bases of the dorsal hairs are followed by a narrow ring of light brown, dark brown or reddish brown; the tips are black. The sides are lighter where there are no black tips to the hairs. On the under parts the hairs are gray at the bases, with dull white tips. The tails are very dark brown, faintly lighter on the under side.

In color, *benguetensis* is very close to many specimens of the Luzon *mindanensis*, but the under parts are usually a little darker and the upper parts blacker with less brown. It is a smaller animal and has a shorter tail than *mindanensis*. Few of this series were measured in the flesh but the tail is probably less than 200 mm. in length and longer than that in *mindanensis*.

The outstanding character of the skull is the small bullae, whose length is about 6.5 mm. The skull is like that of *mindanensis*, in which the bullae measure about 7.5 mm., but averages smaller. The length of the palate from the posterior end of the palatal foramina is less than 9.0 mm. and more than that in *mindanensis*. Most of the skulls were badly broken by the traps, so it is not possible to give many complete measurements.

***Rattus exulans querceti* Hollister**

Epimys querceti Hollister, 1911, Proc. Biol. Soc. Washington, 24: 90.

Specimens examined.—Total 154. LUZON: Mount Data (5,300–7,500 feet), Mountain Province, 75 males, 74 females; Tipunan, Mountain Province, 3 males, 2 females.

Remarks.—While most of this series agrees in color with eight topotypes of *querceti* from the original series from Hights-in-the-

Oaks, Benguet Province, a few from 5,300 feet altitude are as light-colored as specimens of *calcis*. There is a tendency towards melanism but not so strongly marked as in *negrinus*. Two are quite black on the dorsal surface and four others are grading into black.

Rattus exulans calcis Hollister

Epimys calcis Hollister, 1911, Proc. Biol. Soc. Washington, 24: 90.

Specimens examined.—Total 5. LUZON: Massisiat (3,500 feet), Abra Province, 5 females.

Remarks.—These specimens are much lighter, both above and below, than *querceti* and are very close in color to topotypes of *calcis*. The skulls are all slightly larger (greatest length 31–33 mm. against 29.1 mm.) than two topotypes of *calcis* and the measurements of the type. They are here referred to *calcis*, however, until the range in individual variation in this form is better understood.

Rattus exulans todayensis Mearns

Mus todayensis Mearns, 1905, Proc. U. S. Nat. Mus., 28: 445—type locality, Todaya (4,000 feet), Mount Apo, Mindanao.

Mus vulcani Mearns, 1905, Proc. U. S. Nat. Mus., 28: 446—type locality, Mount Apo (7,600 feet), Mindanao.

Mus vulcani apicis Mearns, 1905, Proc. U. S. Nat. Mus., 28: 447—type locality, Mount Apo (9,700 feet), Mindanao.

Specimens examined.—Total 62. MINDANAO: Todaya, Mount Apo (2,500 feet), 6 males, 3 females; Mount Apo (6,900 to 7,500 feet), 3 males, 4 females; Meran, east slope of Mount Apo (5,750 feet), 2 males; Lake Linau (6,900 feet), 5 males, 1 female; Ugis-Aya Plantation (2,500 feet), 1 male; east slope of Mount McKinley (3,150–5,800 feet), 1 male, 4 females; Calian, Davao, 2 males; Lawa, Davao, 1 female; Madaum, Tagum, 1 female; Sigayan, Katipunan, Zamboanga, 17 males, 11 females.

Measurements (ten adult specimens with worn teeth, from Mount Apo and Mount McKinley, taken at altitudes of 2,500, 5,750, 6,900, and 8,900 feet).—External measurements taken by the collectors: Total length 246–285 mm.; tail 121–140; hind foot 25–33; ear 17–24. Skull: greatest length 30.0–34.1; condylo-basal length 28.1–32.3; palatal length 15.6–17.8; interorbital width 4.9–5.3; zygomatic width 15.0–16.0; width of brain case 12.5–13.4; diastema 8.1–9.1; palatal foramina 5.7–6.8; length of nasals 10.8–15.5; length of bullae 5.3–6.2; upper molar series 5.1–5.9.

Remarks.—*Rattus todayensis* was described from five specimens taken at 4,000 feet (2,500 feet by Mr. Hoogstraal's measurements)

and *R. vulcani* from eight specimens taken at 7,600 feet on Mount Apo. *R. vulcani* is smaller and darker as described when only the series of paratypes is examined. It can not be separated in the present series, which shows great individual variation in size from all altitudes, large and small being found together. Our topotypes of *todayensis* have upper parts less brightly colored than the paratypes and without the buffy wash on the under parts. They were taken at a different time of year, however, and the skins are more filled out, circumstances that would slightly influence the general color.

***Rattus exulans luteiventris* Allen**

Mus luteiventris Allen, 1910, Bull. Amer. Mus. Nat. Hist., 28: 14.

Specimens examined.—Total 226. PALAWAN: Puerta Princesa, 79 males, 89 females; Brooke's Point, 23 males, 18 females. BUSUANGA: Coron, 1 female; Dimaniang, 1 male, 1 female. CULION: San Pedro, 4 males, 5 females; Siuk, 3 males. BALABAC: Balabac, 2 males.

Measurements (five specimens from Palawan and two from Culion).—Total length 250–296 mm.; tail 122–156; hind foot 24–29; ear 16–20. Skull: greatest length 29.9–35.9; condylo-basal length 28.0–33.0; palatal length 15.8–18.5; interorbital width 4.8–5.2; zygomatic width 13.5–15.9; width of brain case 12.5–13.7; diastema 7.1–9.5; palatal foramina 5.4–6.7; nasals 10.1–13.6; length of bullae 5.5–6.2; upper molar series 5.3–6.2.

Remarks.—The color of this series is Bister above and Pale Olive-Gray below. In the Busuanga specimens the upper parts are slightly lighter and the bellies almost white, but the difference is not considered worthy of subspecific recognition.

R. luteiventris is the same size as *negrinus* but lighter on the under parts and with less tendency to black above, although some individuals approach it.

***Rattus exulans negrinus* Thomas**

Mus ephippium negrinus Thomas, 1898, Trans. Zool. Soc. London, 14: 403.

Specimens examined.—Total 54. NEGROS: Inubungan, Tolong, 10 males, 8 females; Mabaha, Bais, 3 males, 6 females; Pagyabunan, Bais, 3 males, 2 females; Lake Balinsasayao, 12 males, 9 females.

Measurements (three males, two females).—Total length 256–282 mm.; tail 122–137; hind foot 26–29; ear 16–19. Skull: greatest length 32.3–34.5; condylo-basal length 29.7–32.0; palatal length

16.6–18.0; interorbital width 5.0–6.0; zygomatic width 15.2–16.0; width of brain case 13.6–14.1; diastema 8.7–9.4; palatal foramina 5.9–6.6; length of bullae 5.9–6.5; upper tooth row 5.5–5.9.

Remarks.—*Rattus negrinus* is often melanistic on the dorsal surface and ranges in color from Brussels Brown through Mummy Brown to Black. The under side is between Pale and Light Mouse Gray. The melanistic specimens are not black on the under side. Like *R. luteiventris* and some others of the group, the skull is marked by very weak zygomatic arches that are often broken in cleaning and handling the skull.

Rattus adustus Miller

Tryphomys adustus Miller, 1910, Proc. U. S. Nat. Mus., 38: 399.

Specimens examined.—Total 7. LUZON: Mount Data, Mountain Province, 5 males, 2 females.

Measurements (five; none of the skulls perfect; type of *adustus* in parentheses).—Skull: greatest length 39.0–41.3 mm. (39.5); condylo-basal length 36.7–39.6 (37.3); palatal length 20.3–22.4 (20.8); interorbital width 4.7–5.5 (5.4); zygomatic width 19.0–21.7 (20.4); width of brain case 13.7–14.8 (13.7); upper molar series 8.6–9.0 (7.6, very worn); length of bullae 7.7–8.3 (7.1); diastema 9.7–10.8 (10.6); length of palatal foramina 9.7–10.8 (10.6).

Remarks.—Some of the characters of the genus *Tryphomys* appear to be due to age. The lump opposite the first molar is indicated in some of the skulls in this series. The condition of the palate is certainly due to age. The present skulls agree with that of the type in having the large antorbital foramen, and in size and shape. The skins are a little lighter in color than the type but agree in so many ways that they are considered as representing *adustus*. The teeth have the *Rattus* pattern. *Tryphomys* as a genus should be considered a synonym of *Rattus*.

Rattus latidens sp. nov. Figures 10–12.

Type.—No. 62347 Chicago Natural History Museum, from Mount Data, altitude 7,500 feet, Mountain Province, Luzon Island, Philippine Islands. Adult female, skin and skull. Collected April 29, 1946, by Harry Hoogstraal. Original number 385.

Diagnosis.—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



FIG. 10. *Rattus latidens*; $\times 1\frac{1}{2}$.

Rattus, but incisors nearly twice the width found in most species of *Rattus* and wider than in the largest species.

Color.—Upper parts near Saccardo's Umber darkened by black hairs on center of back; lighter on sides and not strongly divided from under parts, which are between Dark Olive-Buff and Deep Olive-Buff; tail and ears Mummy Brown.

Measurements.—Total length 474 mm.; tail 242; hind foot 45. Skull: greatest length 50.8; condylo-basal length 48.3; palatal length 26.0; interorbital width 6.0; width of zygomatic plate 6.1; zygomatic



FIG. 11. *Rattus latidens*, mandibles; about $\times 2$.



FIG. 12. *Rattus latidens*, front view of skull showing broad upper incisors; about $\times 2$.

width 25.8; width of brain case 15.2; upper tooth row 10.0; nasals 19.2 × 5.5; diastema 13.8; length of palatal foramina 9.0; bullae 9.5; width of incisors at tip 5.3.

Specimens examined.—One, the type.

Remarks.—The collector's note on the label states that this rat was taken in a "patch of heavily wooded area."

Rattus everetti Günther

Mus everetti Günther, 1879, Proc. Zool. Soc. London, 1879: 75.

Mus tagulayensis Mearns, 1905, Proc. U. S. Nat. Mus., 28: 439.

Mus albigularis Mearns, 1905, Proc. U. S. Nat. Mus., 28: 440.

Specimens examined.—Total 52. MINDANAO: Mount McKinley (3,150–4,800 feet), 2 males; Todaya, Mount Apo (2,500 feet), 2 males, 5 females; Madaum, 1 male; Sitio Taglawig, Tagum, 2 males, 1 female; Bugasan, Cotabato, 1 male; Sigayan, Zamboanga, 2 females. LUZON: Mount Data (5,300–8,200 feet), 14 males, 19 females; Massisiat (3,500 feet), 2 juvenile males, 2 juvenile females.

Measurements (four adults from Mindanao; four adults from Luzon in parentheses).—Total length 395–496 mm. (425–486); tail 195–254 (222–249); hind foot 42–49 (45–48). Skull: greatest length 53.8–56.9 (50.7–54.5); condylo-basal length 49.9–53.8 (47.5–52.1); palatal length 29.7–30.5 (27.5–30.4); interorbital width 6.9–8.2 (6.8–7.9); zygomatic width 25.0–27.9 (24.8–26.5); width of brain case across ridges 16.3–16.6 (14.9–16.6); length of nasals 19.5–21.8 (19.4–21.5); length of bullae 9.6–10.5 (8.9–9.6); diastema 15.2–16.0 (14.2–15.3); length of palatine foramina 9.9–11.1 (9.5–10.5); upper tooth row 9.5–10.6 (9.0–9.5).

Remarks.—The type locality of *Rattus everetti* is stated by Taylor to be either Dingat Island, just north of Mindanao, or Mindanao Island itself. Ellerman, who examined the type in the British Museum (Natural History) gives Mindanao as the type locality. In any case it is not probable that rats from the two islands would differ greatly. *Rattus albigularis* and *R. tagulayensis* were both described from Mindanao. Hollister records *everetti* from Luzon but material from Mindanao is identified as *albigularis* or *tagulayensis*. Topotypes from the original series of both of these species have been compared with the present material. There appear to be no differences not ascribable to individual variation and age, and *Rattus tagulayensis* Mearns and *Rattus albigularis* Mearns are accordingly placed in the synonymy of *Rattus everetti* Günther. The Luzon specimens show no marked differences from the Mindanao topotypes.

Rattus luzonicus Thomas

Mus luzonicus Thomas, 1895, Ann. Mag. Nat. Hist., (6), 16: 163.

Bullimus luzonicus Hollister, 1913, Proc. U. S. Nat. Mus., 46: 324.

Specimens examined.—Total 8. LUZON: Mount Data, Mountain Province, 5 males, 3 females.

Color.—Dorsally the general color is somewhat redder than Kaiser Brown. There is much less intermixture of black hairs in the coat than in *R. bagobus*. The under side is dark gray, lightened by white tips to the hairs. The tail, basally, is dark above and lighter below, and the terminal third is yellowish white all around.

Measurements.—Taylor mentions a specimen collected by Mearns in which the greatest length of the skull is 56.4 mm., which seems to be closer to normal size for adults than published measurements indicate. Unfortunately, all the skulls in the present series are broken, so that greatest length figures can not be given. Total length 424–440 mm.; tail 190–192; hind foot 52.5–50.5 (only two specimens measured in the flesh). Skull: palatal length 28.3–30.2; interorbital width 7.5–8.5; zygomatic width (2 specimens) 25.9–27.9; diastema 15.2–17.7; length of palatine foramina 9.3–10.5; length of nasals 21.8–23.5; upper tooth row 9.5–10.8.

Habitat.—Collectors' notes state that the series was collected in "Camote field;" "near summit (Mount Data) in wooded gully;" "close to top (Mount Data) in mossy forest gully;" and "dense bushes in gully."

Rattus bagobus Mearns

Bullimus bagobus Mearns, 1905, Proc. U. S. Nat. Mus., 28: 450.

Specimens examined.—Total 14. MINDANAO: east slope of Mount McKinley, Davao Province, 6 males, 6 females; Todaya, Mount Apo, Davao Province, 1 male, 1 female.

Color.—The upper parts are blackish, the individual hairs being either wholly black or banded with light brown at the end, these sometimes with a short black tip. This gives a mixed pattern of black and brown, depending on the amount of wear. The under parts are grayish, the hairs being gray basally tipped with white, and in young specimens nearly all white. The tail is black above, light-colored below.

Measurements.—(Ten adults): total length 409–535 mm.; tail 173–229; hind foot 50–62; ear 30–35. Skull (four adults): greatest length 65.1–68.3; condylo-basal length 59.5–62.1; palatal length 32.2–34.0; interorbital width 7.3–8.8; zygomatic width 29.6–31.5;

width of brain case 21.3–21.7; diastema 17.5–18.8; length of palatine foramina 10.2–12.1; length of nasals 26.7–28.9; length of bullae 10.9–11.4; upper tooth row 10.0–10.4.

Habitat.—This series was caught with baits of bird meat, cheese, and peanut butter in the following varied habitats, as noted on the labels: “under bushes among dried twigs;” “among fallen logs in Abaca plantation;” “coffee plantation;” “on ridge on mossy ground, tangled roots;” “in gully among mossy logs on the ground;” “trapped among mossy roots and under growth of ferns;” “slope of ridge with thick undergrowth;” “among tall grass;” and “vegetable patch.”

Rattus rabori sp. nov.

Type.—No. 67808 Chicago Natural History Museum, from Sigayan, altitude 2,500 feet, Katipunan Municipality, Zamboanga Province, Mindanao Island. Adult male, skin and skull. Collected June 5, 1950, by Dr. Dioscoro S. Rabor. Original number 757.

Characters.—Like *Rattus luzonicus* but lighter-colored and larger; about the size of *R. bagobus* but tail bicolored; mammary formula 1–3=8; skull and teeth as in *R. bagobus*, but skull heavier and teeth slightly wider.

Color.—The coat above is without spines and is composed of coarse hairs that are gray basally and light brown terminally. In the center of the back are many long, wholly black hairs. The female topotype is lighter, with fewer black hairs. The type is heavily stained with brown on the under side but the female is pure white below. The tail in the type has the basal three inches black above and below and the terminal five inches white. In the female the basal five inches are black and the terminal three inches are white.

Specimens examined.—Type and female topotype.

Measurements (type, followed by female topotype in parentheses).—Total length 548 mm. (504); tail 243 (230); hind foot 66 (58); ear 30 (25). Skull: greatest length 67.7 (63.5); condylo-basal length 64.1 (59.3); palatal length 36.3 (32.8); interorbital width 9.3 (8.3); zygomatic width 34.1 (30.1); diastema 20.5 (17.3); length of palatine foramina 11.4 (10.1); nasals 28.4 × 7.0 (27.0 × 6.9); length of bullae 11.4 (10.4); upper tooth row 11.5 (11.0).

Remarks.—This is a fourth member of what was once called the *Bullimus* group, with the color pattern of *luzonicus* from Luzon and the large heavy skull of *bagobus* from Mindanao. It is named for

Dr. Dioscoro S. Rabor, of Silliman University, Dumaguete, Negros Island, who collected with the Philippine Expedition and has since continued exploring the islands of Negros and Mindanao.

Rattus culionensis sp. nov.

Type.—No. 63155 Chicago Natural History Museum, from Siuk, Culion Island, Calamianes group, Philippine Islands. Adult male, skin and skull. Collected April 7, 1947, by Dioscoro S. Rabor and Manuel Celestino. Original number 2731.

Description of type.—Externally like *R. mülleri borneanus* from Sandakan, but much lighter in color, with much less admixture of black; general color dorsally dark red-brown mixed with black, lighter on sides, and sharply marked off from white under parts; the tail brown above and slightly lighter below; skull resembling that of *borneanus*, but with actually and relatively larger bullae, their length being 7.7 mm. compared with 6.9–7.1 mm. in *borneanus*; palatal foramina relatively longer; supraorbital ridges weaker in interorbital region.

The most posterior part of the skull is at the upper lip of the foramen magnum while in *mülleri* it is at the lambdoidal crest, which is not greatly developed in *culionensis*.

Measurements (type; topotype in parentheses).—Total length 50.0 mm. (50.9). Skull: condylo-basal length 46.7 (47.8); palatal length 26.3 (26.1); interorbital width 7.3 (7.2); zygomatic width 25.4 (25.1); width of brain case at parietal ridges 13.6 (13.5); upper molar series 9.0 (9.1); length of nasals 19.7 (19.3); length of bullae 7.7 (7.7); length of palatal foramina 8.9 (8.5); diastema 14.0 (13.8).

Specimens examined.—Type and one female topotype.

Remarks.—*R. culionensis* appears to be an offshoot of the *mülleri* group but differing in enough particulars that it can not be considered a subspecies.

Rattus mülleri balabagensis subsp. nov.

Type.—No. 63157 Chicago Natural History Museum, from south slope of Mount Balabag, altitude 3,000 feet, Palawan Island, Philippine Islands. Adult male, skin and skull (body in alcohol). Collected May 6, 1947, by Floyd Werner and party. Original number 3471.

Description.—Externally like *R. mülleri* from the Malay Peninsula but color lighter, gray brown mixed with black dorsally, lighter on sides where there is less of the black mixture, and sharply separated

from the white under parts; tail brown above and below and very long (350 mm.); hands and feet light brown.

The skull resembles that of *mülleri* in shape more than it does that of *culionensis*. It has larger bullae and longer palatal foramina than *borneanus*, and the wide rostrum more typical of *mülleri*. The most posterior part of the skull is the exoccipital condyle, the lambdoidal crest being little developed.

Measurements.—Total length 524 mm.; tail 350; hind foot 45; ear 21. Skull: greatest length 52.6; condylo-basal length 49.9; palatal length 28.8; interorbital width 7.6; zygomatic width 26.0; width of brain case at parietal ridges 14.9; upper molar series 9.6; length of bullae 7.4; length of nasals 20.6; diastema 14.8; length of palatal foramina 10.0.

Specimens examined.—One, the type.

Remarks.—The extremely long tail and light color distinguish *balabagensis* from all other members of the *mülleri* group. The type was collected in thick forest near the top of Mount Balabag.

Rattus panglima Robinson

Rattus panglima Robinson, 1921, Ann. Mag. Nat. Hist., (9), 7: 235.

Rattus palawanensis Taylor, 1934, Bur. Sci. Manila, Monog. no. 30: 416.

Specimens examined.—Total 54. PALAWAN: Puerto Princesa, 8 males, 8 females; Brooke's Point, 3 males, 4 females; south slope of Mount Balabag, 14 males, 6 females. BUSUANGA: Dimaniang, 2 females. CULION: San Pedro, 1 male, 2 females; Siuk, 5 males, 1 female.

Color.—The general color above is Iron Gray or slightly lighter. The coat is composed almost entirely of white, grooved spines heavily edged with Iron Gray. The under parts are pure white, sharply defined on the sides. The tail is bicolored, dark above, lighter below.

Measurements (four from Palawan and three from Culion).—Total length 369–438 mm.; tail 188–287; hind foot 38–46; ear 25–28. Skull: greatest length 44.3–49.6; condylo-basal length 40.0–43.8; palatal length 20.8–22.5; interorbital width 6.5–7.4; zygomatic width 19.5–22.0; width of brain case 16.5–17.2; upper molar series 7.0–8.0; length of nasals 17.5–19.7; length of bullae 4.9–5.9; diastema 11.8–13.0; palatal foramina 6.6–7.7.

Rattus (Apomys) datae Meyer

Mus chrysocomus Thomas, 1898, Trans. Zool. Soc. London, 14: 403.

Mus datae Meyer, 1898-99, Abhandl. Ber. Königl. Zool. Mus., Dresden, 7: 25.

Apomys major Miller, 1911, Proc. U. S. Nat. Mus., 38: 402.

Apomys datae Ellerman, 1941, Fam. Gen. Liv. Rodents, 2: 225.

Rattus (Apomys) datae Ellerman, 1949, Fam. Gen. Liv. Rodents, 3: 76.

Specimens examined.—Total 54. LUZON: Mount Data, Mountain Province, 20 males, 34 females.

Measurements (two males, one female).—Skull: greatest length 39.0–40.5 mm.; condylo-basal length 34.0–36.1; palatal length 19.5–20.1; interorbital width 6.0–6.3; zygomatic width 18.1–18.2; width of brain case 14.5–15.1; upper tooth row 6.9–7.1; palatal foramina 5.1–5.5; length of bullae 5.2–5.3; length of nasals 9.9–10.2; diastema 14.9–15.5.

Remarks.—When Thomas reported on the Whitehead collection (1898 supra cit.), he listed but one specimen of *Mus chrysocomus*, but the text refers to "the present specimens," and the catalogue of the British Museum (Natural History) shows more than one received. The type of *datae* Meyer was received from the British Museum and was undoubtedly one of the Whitehead specimens. Material identified as *Apomys major* was sent to Sir John Ellerman for his comments. He found the *Apomys major* to be the same as topotypes of *R. datae*. Since then, others from this series of *major* have been compared with Miller's type and found to be the same though more adult and slightly larger. Thus *Apomys major* Miller becomes a synonym of *Rattus (Apomys) datae* Meyer. The specimens identified as *datae* by Hollister have been discussed under *Rattus benquetensis*. I am most appreciative of Sir John Ellerman's help in getting this matter cleared up.

***Rattus (Apomys) abrae* sp. nov.**

Type.—No. 62750 Chicago Natural History Museum, from Masisiat, altitude 3,500 feet, Abra Province, Luzon Island, Philippine Islands. Adult male, skin and skull. Collected May 14, 1946, by Dioscoro S. Rabor. Original number H. H. 460.

Description.—Hairs of the back with long dark gray bases, followed by a wide ring of dark brown or buff, in many tipped with black, giving a general color near Bister; sides of face and body lighter; under parts grayish white, hairs with short dark gray bases; fore and hind feet covered with white hairs; tail dark above, much lighter below; a female topotype larger, but not differing from the type in color.

The skull is typical *Apomys* with no marked peculiarities. It is intermediate in size between skulls of *datae* and *insignis*. The skull of the female specimen is badly broken.

Measurements (type and female topotype).—Total length: 255, 278 mm.; tail 130, 139; hind foot 34, 35. Skull: greatest length 34.8, 35.7; condylo-basal length 30.5, 31.6; palatal length 16.8, 18.1; interorbital width 5.5 (in female); zygomatic width 15.6 (in male); width of brain case 14.3 (in male); upper tooth row 6.6, 6.7; palatal foramina 4.8, 5.0; length of bullae 4.9, 5.0; length of nasals 12.8, 13.4; diastema 8.3, 9.0.

Remarks.—The other *Apomys* known from Luzon are *datae*, which is larger, darker, and from a higher altitude, and *musculus*, which is much smaller and of a different color. *Apomys abrae* is from a lower elevation and a slightly warmer climate north of the other species.

Rattus (Apomys) insignis insignis Mearns

Apomys insignis insignis Mearns, 1913, Proc. U. S. Nat. Mus., 46: 327.

Specimens examined.—Total 27. MINDANAO: east slope of Mount McKinley, Davao Province, 6 males, 17 females; Linau, Meran, Baclayan, and Mainit, Mount Apo, Davao Province, 4 males.

Measurements (two adult males and two adult females).—Total length 241–257 mm.; tail 139–165; hind foot 32–33. Skull: greatest length 30.9–31.9; condylo-basal length 26.6–27.9; palatal length 15.6–15.8; interorbital width 4.9–5.0; zygomatic width 13.9–15.0; width of brain case 12.9–13.0; upper tooth row 5.9–6.0; length of palatal foramina 3.7–4.1; greatest width of nasals 3.8–4.0.

Remarks.—This mouse was taken among “mossy roots and undergrowth of ferns and rattan” and “in gully among mossy logs.” Many specimens have a spot or broad line of pure white hairs on the chest or belly.

Rattus (Apomys) littoralis sp. nov.

Type.—No. 60834 Chicago Natural History Museum, from Bugasan, altitude 50 feet, Cotabato Province, Mindanao Island, Philippine Islands. Adult female, skin and skull. Collected December 8, 1946, by Prudencio Añonuevo and Godofredo Alcasid. Original number 1606.

Description.—Intermediate in size between the small *R. musculus* and the larger *R. hyllocetes* and *R. petraeus*; under parts white, in all other known species being buff or darker; upper parts Bister,

lightening to near Snuff Brown on sides; all hairs with Dark Neutral Gray bases; hairs of under parts white to the roots; hands and feet light brown; tail uniformly dark; whiskers long, mixed black and white; skull a typical *Apomys* skull, intermediate in size between skulls of *musculus* and the two larger forms.

Measurements.—Total length 222 mm.; tail 122; hind foot 26; ear 16. Skull (badly broken): palatal length 13.5; interorbital width 4.9; zygomatic width about 12.0; upper tooth row 5.0; length of nasals 9.8; diastema 6.6; length of palatal foramina 3.6.

Specimens examined.—One, the type.

Remarks.—This is the first record of *Apomys* from near the coast; that it differs from the various mountain forms is not surprising.

Phloeomys pallidus Nehring

Phloeomys cumingi var. *pallidus* Nehring, 1890, Sitz.-Ber. Ges. Naturfr. Berlin, 1890: 106.

Specimens examined.—Total 1. LUZON: Baay, Abra Province, 1 male.

Measurements.—Total length 747 mm.; tail 349; hind foot 81. Skull: greatest length 88.8; condylo-basal length 83.1; palatal length 50.5; length of palatal foramen 8.5; interorbital width 15.5; zygomatic width 43.2; mastoid width 25.0; width of brain case 29.0; upper tooth row 18.5; width across molars 21.1; length of nasals 30.9.

Remarks.—The only specimen taken by the expedition was found in a rice field near a river at 2,500 feet altitude.

Rhynchomys soricoides Thomas

Rhynchomys soricoides Thomas, 1895, Ann. Mag. Nat. Hist., (6), 16: 160; Thomas, 1898, Trans. Zool. Soc. London, 14: 398, pl. 31, fig. 2 (animal), pl. 35, fig. 7 (teeth), fig. 10 (skull).

Specimens examined.—Total 2. LUZON: Mount Dana, 7,500 feet, April 22, May 3, 1946, 2 females.

Measurements.—Total length 330 mm.; tail 142; hind foot 42. Skull: greatest length 46.8, 49.4; condylo-basal length 44.5, 47.3; palatal length 24.6, 26.0; length of incisive foramen 7.0, 7.6; interorbital width 6.4, 6.6; width of brain case 16.5, 16.6; upper tooth row 2.2; width across outer edges of molars 6.9; length of nasals 18.7, 19.5.

Remarks.—The collector's notes state that these specimens were taken among "thick bushes and mossy forest in gully." Only five

specimens are known, according to Taylor. The skulls of these two females are slightly smaller than that of the type.

Chrotomys whiteheadi Thomas

Chrotomys whiteheadi Thomas, 1895, Ann. Mag. Nat. Hist., (6), 16: 161; Thomas, 1898, Trans. Zool. Soc. London, 14: 392, pl. 32 (animal), pl. 35, figs. 6-7 (skull and teeth); Hollister, 1913, Proc. U. S. Nat. Mus., 46: 315.

Specimens examined.—Total 6. LUZON: Mount Data, 7,000-8,200 feet, April 11-13, 1946, 5 males, 1 female.

Measurements.—No external measurements were taken in the field. The greater part of the skulls are broken, so that complete measurements of only one adult male and one adult female (in parentheses) can be given. Greatest length 41.7 mm. (39.6); condylo-basal length 40.7 (39.0); palatal length 21.8 (21.6); length of nasals 13.5 (12.9); length of incisive foramen 4.4 (4.4); interorbital width 6.9 (7.0), zygomatic width 22.2 (20.8); mastoid width 17.4 (16.5); width of brain case 16.3 (15.7); upper tooth row 5.3 (5.0); across outer edges of molars 7.0 (6.9).

Remarks.—These specimens were taken in "mossy forest" and "camote fields." This genus appears to be more common than other endemic genera, as Thomas recorded four specimens and Hollister four, including one from Benguet. Thomas' measurements of the type skull appear to be the only ones published.

Celaenomys silaceus Thomas

Xeromys(?) silaceus Thomas, 1895, Ann. Mag. Nat. Hist., (6), 16: 161.

Celaenomys silaceus Thomas, 1898, Trans. Zool. Soc. London, 14: 391, pl. 31, fig. 1 (animal), pl. 35, figs. 11, 12 (molars and skull); Hollister, 1913, Proc. U. S. Nat. Mus., 46: 315.

Specimens examined.—Total 3. LUZON: Mount Data, 7,000-8,000 feet, April 26, May 3, 1946, 3 males.

Measurements.—Greatest length 37.3-38.6 mm.; condylo-basal length 35.7-37.7; palatal length 18.9-19.8; interorbital width 6.4-6.5; length of palatine foramina 3.9-4.2; zygomatic width 18.2-19.0; width of brain case 14.9-15.7; upper tooth row 4.0-4.4; width across outer edge of molars 6.1-6.6; length of nasals 12.0-12.9.

Remarks.—The type, a male, and one other specimen were collected on Mount Data, at an altitude of 8,000 feet. Hollister recorded one from Hights-in-the-Oaks, Benguet, Luzon. Thomas gave measurements of the skull of the type, but Hollister did not record the sex or publish measurements.

No measurements were taken of the present specimens in the field. The skulls agree with measurements and figures as published by Thomas, with one exception. Instead of having but two upper molars there are three, the last molar being very small, smaller than in *Chrotomys*. This tooth is present on one side in two skulls and on both sides in the third. In one lower jaw a pit back of m2 may be an indication of a third lower molar.

The collectors' field catalogue states that these specimens, all males, were taken among "thick bushes and mossy forest in gully" and "thick growth of bushes and shrubs in gully."

Thecurus pumilus Günther

Hystrix pumila Günther, 1879, Ann. Mag. Nat. Hist., (5), 4: 106.

Specimens examined.—Total 10. PALAWAN: Puerto Princesa, 2 males (1 skeleton only); Iwahig, 3 males, 1 female; Brooke's Point, 1 male, 1 female; Busuanga, 1 female, 1 juvenile male (alc.).

Measurements (skin measurements taken by collectors in the field).—Total length 498–598 mm.; tail 40–101; hind foot 56–72; ear 22–38. Skull (3 males, 2 females): greatest length 91.5–95.0; condylo-basal length 86.9–87.0; palatal length 43.2–45.9; length of nasals 26.7–29.8; interorbital width 28.2–31.1; zygomatic width 48.5–52.2; mastoid width 35.7–38.7; width of brain case 36.5–38.4; upper tooth row 18.2–20.2.

Remarks.—The skin from Busuanga Island shows no differences from those taken on Palawan.

CARNIVORA

Suillotaxus marchei Huet

Mydaus marchei Huet, 1887, Le Naturaliste, II, 9: 149; Taylor, 1934, Bur. Sci. Manila, Monog. no. 30: 351 (meas.).

Mydaus schadenbergii Jentink, 1895, Notes Leyden Mus., 17: 46.

Suillotaxus marchei Lawrence, 1939, Bull. Mus. Comp. Zool., 86: 65.

Specimens examined.—Total 10. PALAWAN: Puerto Princesa, 2 males; Iwahig, 2 males, 1 female; Brooke's Point, 3 males, 1 female. BUSUANGA ISLAND: 1 male.

Measurements.—Total length 336–490 mm.; tail 17–40; hind foot 56–68; ear 19–28. Skull (three males, one female; Busuanga subadult male in parentheses): greatest length 77.5–85.1 (77.0); condylo-basal length 73.2–81.5 (72.4); palatal length 38.2–40.7 (37.0); interorbital width 19.4–20.6 (18.0); intertemporal width

19.3–20.5 (19.4); zygomatic width 38.5–40.3 (35.5); mastoid width 36.9–39.3 (35.1); width of brain case 29.9–31.7 (29.1); upper tooth row 22.1–23.9 (22.4); width across outer edges of canines 14.1–15.8 (13.2), across outer edges of molars 22.5–25.6 (23.3).

Remarks.—The white head spot in the Palawan series varies from a small, almost hidden patch of white hairs to a marking $2\frac{1}{4}$ inches long by one inch wide. The Busuanga specimen shows a well-marked streak four and a half inches long by one inch at the widest point, and heavily mixed with black hairs. The fur is long and thick on the back but the under parts are very thinly haired.

M. schadenbergii described by Jentink was not compared with *marchei* by him and from the description and present material there appear to be no characters by which it may be separated from *marchei*.

The measurements of the animals made by the collectors in the field, especially of the tail and the ear, are not borne out by the skins, and some obvious errors have been corrected.

***Amblyonyx cinerea cinerea* Illiger**

Lutra cinerea Illiger, 1815, Abhandl. Akad. Wiss. Berlin, 1815: 99.

Aonyx cinerea J. A. Allen, 1910, Bull. Amer. Mus. Nat. Hist., 28: 17; Hollister, 1913, Proc. U. S. Nat. Mus., 46: 312; Taylor, 1934, Bur. Sci. Manila, Monog. no. 30: 353.

Amblyonyx cinerea Pohle, 1919, Archiv. Naturg., 85, Heft 9: 129.

Specimens examined.—Total 5. PALAWAN: Iwahig, 1 male, 1 female; Puerto Princesa, 2 males; Brooke's Point, 1 female (alc.).

Measurements (skin measurements by collectors).—Total length 675–769 mm.; tail 247–298; hind foot 82–98; ear 22–26. Skull (one male, one female): greatest length 93.9, 89.2; condylo-basal length 88.5, 85.7; palatal length 43.3, 40.3; interorbital width 17.5, 15.8; zygomatic width 61.9, 57.0; mastoid width 55.0, 49.9; width of brain case 48.7, 45.3; upper tooth row 32.1, 29.5; width across outer edges of canines 21.7, 19.0, across outer edges of molars 34.4, 30.6; combined length of upper molars 19.7, 17.6.

Remarks.—One skin, made up in the field, agrees in color with two specimens from French Indo-China. Three other skins, salted in the field, agree with one from Borneo, also salted in the field, being gray brown instead of dark brown. Soaking the salted skins to soften them in order to make them up as study skins affects the color.

These otters were captured, according to the collectors' notes, in "Nipa swamp at night; crab and fish in stomach;" "hiding under truck body in coconut grove on beach, mid-morning;" "bank of tidewater stream;" "snared on river edge."

Felis minuta Temminck

Felis minuta Temminck, 1827, Monog. Mamm., 1: 130.

Specimens examined.—Total 18. PALAWAN: Puerto Princesa, 1 male (with skeleton), 2 females; Iwahig, 4 males (2 with skeletons), 7 females (2 with skeletons); Brooke's Point, 1 male, 1 female. NEGROS ISLAND: Amio, 1 male.

Measurements.—(Collectors' measurements of males and females from Palawan; Negros Island male in parentheses): total length 582–695 mm., 479–664 (708); tail 180–235, 145–224 (223); hind foot 100–113, 85–105 (118); ear 40–42, 38–40 (48). Skull (three adult males and three adult females from Palawan; Negros Island skull in parentheses): greatest length 84–86.8, 80.4–81.7 (89.4); condylo-basal length 78.2–80.7, 74.1–76.6 (84.8); palatal length 33.8–35.7, 31.9–33.8 (35.5); length of nasals 20.5–25.7, 20.0–20.9 (25.8); inter-orbital width 12.7–15.1, 12.2–13.2 (14.0); intertemporal width 21.8–24.9, 23.4–24.4 (24.8); zygomatic width 52.3–56.4, 52.0–52.4 (59.9); mastoid width 35.0–35.8, 33.3–34.5 (37.5); width of brain case 36.3–37.7, 35.0–36.6 (38.1); upper tooth row 27.3–28.1, 25.0–26.1 (27.6); width across outer bases of canines 19.5–19.9, 17.7–18.5 (21.6), across outer edges of molars 30.5–31.1, 28.8–31.1 (34.4).

Remarks.—The Palawan series of skins represents two color phases, a dark gray and a dull brown. The color of some skins may have been affected by tanning. The males average smaller than the females. The skin from Negros Island is a bright red-brown and is much larger than any from Palawan.

Viverra tangalunga Gray

Viverra tangalunga Gray, 1832, Proc. Zool. Soc. London, 1832: 63.

Specimens examined.—Total 9. LUZON: Massisiat, Abra Province, 1 female. MINDANAO: Davao, 1 male; Mount Apo, Davao, 1 male, 1 female; Upi, Cotabato, 1 female. BUSUANGA ISLAND: Dimaniang, 1 male, 1 female. CULION ISLAND: San Pedro, 2 females.

Paradoxurus philippinensis Jourdan

Paradoxurus philippinensis Jourdan, 1837, Compt. Rend. Acad. Sci., Paris, 5: 523.

Paradoxurus minax Thomas, 1909, Ann. Mag. Nat. Hist., (8), 3: 375.

Specimens examined.—Total 42. MINDANAO: Caburan, Davao, 1 male; Madaum, Davao, 2 males, 4 females; Mount Apo, Davao, 2 females; Upi, Cotabato, 1 male. PALAWAN: Puerto Princesa, 9 males, 8 females; Iwahig, 2 males, 2 females; Brooke's Point, 3 males, 2 females. CULION ISLAND: San Pedro, 2 males, 1 female. BUSUANGA ISLAND: Singay, 1 male; Carmelita, 1 female. NEGROS ISLAND: Amio, 2 females.

***Herpestes brachyurus parvus* Jentink**

Herpestes parvus Jentink, 1895, Notes Leyden Mus., 17: 48.

Mungos palawanus Allen, 1910, Bull. Amer. Mus. Nat. Hist., 28: 17.

Specimens examined.—Total 2. PALAWAN: Puerto Princesa, 1 male; Brooke's Point, 1 female.

Measurements.—Total length (male and female) 599, 651 mm.; tail 247, 260; hind foot 82, 76; ear 26, 25. Skull of female (type of *parvus* in parentheses): greatest length 81.0 (76.0); condylo-basal length 80.6; palatal length 43.2; interorbital width 17.0; intertemporal width 14.4; zygomatic width 44.7; mastoid width 30.0; width of brain case 32.1 (31.0); upper tooth row 29.9 (25.0); width across outer edges of bases of canines 16.5, across outer edges of upper molars 28.5; bullae 12 × 18.

Remarks.—*Mungos palawanus* was described from a skin without skull taken on Palawan. The dorsal hairs were said to be "reddish, annulated subapically with black and tipped with yellow, the black annulation more or less visible at the surface." The measurement of 56 mm. given for the hind foot of *palawanus* is thought to be an error for 86 mm.

Herpestes parvus was described from an aged specimen without sex, from the Calamianes Islands. The dorsal hairs were described as follows: "The extremities are not black, and the light rings which produce the grizzled appearance are of a reddish brown." The tail was said to be shorter than that of *H. brachyurus*, but no measurements were given.

The male from Palawan is darker than the female, the tips on the hairs being shorter, exposing more of the black portion of the hairs. The female agrees in color with the description of *palawanus*, while the darker male is closer in color to the description of *parvus*, although the tips of the hairs are not quite dark enough to be referred to as reddish brown.

Jentink stated that the tail of *parvus* was shorter than that of *brachyurus* but gave no figures. Lyon (1908) has recorded specimens

of *brachyurus* from Sumatra with a tail length of 193–240 mm., and specimens from Borneo (1911) with a tail length of 230–250 mm. The tail in the type of *palawanus* was given as 190 mm. In the two Palawan examples recorded here, the tail in the male is 247 mm. and in the female 260 mm. As there can be a considerable individual difference in tail length, as shown by the Borneo series, the short tail in the type of *parvus* might signify only individual variation.

The few measurements given for the skull of *parvus* are but little less than those of a specimen from Palawan.

It is believed that *palawanus* Allen is a synonym of *parvus* Jentink, a subspecies of *brachyurus*.

Both specimens were caught in snares.

ARTIODACTYLA

Sus barbatus ahoenobarbus Huet. Figure 13.

Sus ahoenobarbus Huet, 1888, Le Naturaliste, 2: 5.

Specimens examined.—Total 9. PALAWAN: Iwahig, 2 adult males, 1 subadult female, 2 juvenile females, 2 immature (alc.). BUSUANGA: 1 subadult male, 1 subadult female.

Measurements (two adult males from Palawan).—Skull: greatest length 361.0, 376.0 mm.; condylo-basal length 308.0, 327.0; palatal length 224.0, 245.0; interorbital width 62.0, 65.2; zygomatic width 138.0, 157.0; upper molar series 116.3, 118.6; least outside width of palate 50.6, 52.3; greatest width of palate, outside third molar 61.5, 61.6; nasals, least width 19.1, 21.0, greatest width 32.7, 32.2, length 177.0, 187.0.

Remarks.—The posterior elongation of palate, typical of *barbatus* of Borneo, distinguishes this pig from other Philippine species in which the palate is shorter. Although the skull is elongated, the nasals are little longer than in the smaller *S. mindanensis*.

The two specimens from Busuanga could possibly be referred to *calamaniensis* but they are subadult and show no marked difference from the subadult female skull from Palawan.

Sus celebensis philippensis Nehring. Figures 14, 15.

Sus celebensis philippensis Nehring, 1886, Sitz.-Ber. Ges. Naturfr. Berlin, 1886: 83.

Specimens examined.—Total 4. LUZON: Massisiat, Abra Province, 1 juvenile male; no locality, 2 skulls only; Punta Racinga, Manila Bay, 1 male (Lieutenant G. A. Wallen U.S.A., collector).

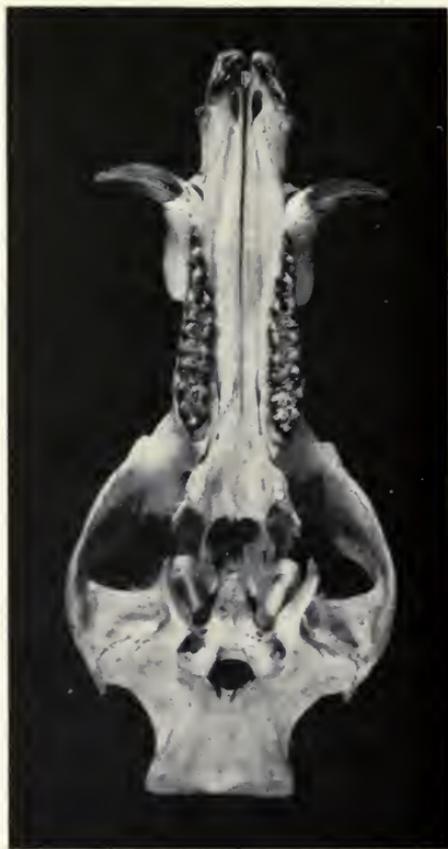


FIG. 13. *Sus barbatus ahoenobarbus*, male; Palawan.



FIG. 14. *Sus celebensis philippensis*, male; Luzon.



FIG. 15. *Sus celebensis philippensis*, female; Luzon.

Measurements.—Skull (male): greatest length 296.0 mm.; condylo-basal length 260.0; palatal length 175.0; interorbital width 57.3; zygomatic width 129.0; least outside width of palate 46.2; greatest outside width of palate 55.5; nasals, length 156.0, width 29.0; upper molar series 98.4.

Remarks.—There are no skins available for comparison with the series of *mindanensis*, and only one adult skull, so no conclusion can be reached regarding the distinctness of *mindanensis*.

***Sus celebensis mindanensis* Major.** Figures 16, 17.

Sus verrucosus mindanensis Major, 1897, Ann. Mag. Nat. Hist., (6), 19: 524.

Specimens examined.—Total 27. MINDANAO: Cotabato Province, Pikit, 2 males; Beto, 2 females; Parang, 1 male, 2 females; Burungkôt, 1 male, 1 female; Cotabato, 1 male. Davao Province, Calian, 2 males; Lapuan, 1 male, 1 female; Davao, 1 male; Mayo, 1 male; Madaum, 1 (no sex); Lacaron, 2 females; Mount Busaw, 1 male. Zamboanga Province, Mamara, 1 female.

Measurements (five adult males; five adult females in parentheses).—Skull: greatest length 314.0–334.0 mm. (254.0–285.0); condylo-basal length 270.0–284.0 (230.0–248.0); palatal length 190.0–197.0 (158.0–173.0); interorbital width 58.9–75.0 (53.3–57.5); zygomatic width 134.0–151.0 (111.0–124.0); upper molar series 95.9–102.5 (89.9–95.2); least width of palate 46.8–55.3 (37.6–42.6); greatest width of palate 50.2–58.9 (50.7–54.3); nasals, least width 19.6–22.5 (14.7–19.6), greatest width 25.5–33.5 (25.7–32.9), length 161.0–177.0 (136.0–158.0).

Remarks.—The skull of *mindanensis* is much shorter than that of *ahoenobarbus* from Palawan, and the posterior edge of the palate is either on a line with the posterior edge of the last molars or extends up to 10 mm. beyond; the nasals are very little shorter.

The skins show some variation in the white bar across the face, which is present in younger specimens, represented by two spots in older ones, and absent in very old boars. The general color is black, but in some specimens there are reddish brown patches of hair in the dorsal crest.

***Sus celebensis negrinus* subsp. nov.** Figures 18, 19.

Type.—No. 66324 Chicago Natural History Museum, from Pagyabunan, Bais, Negros Island, Philippine Islands. Adult male, skin and skull. Collected May 3, 1949, by Dioscoro S. Rabor. Original number 341.



FIG. 16. *Sus celebensis mindanensis*, male; Mindanao.

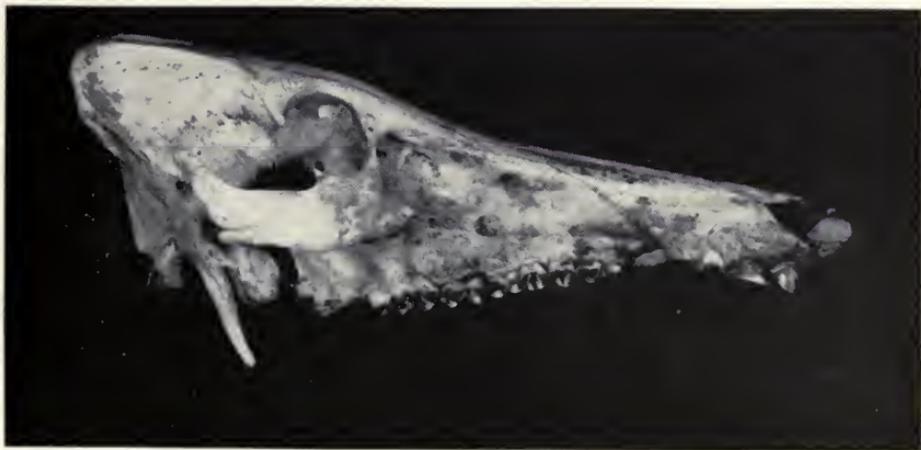


FIG. 17. *Sus celebensis mindanensis*, female; Mindanao.

Characters.—Like *mindanensis* but smaller and with white hairs on shoulders and sides.

Skull in general like *mindanensis*, but shorter in greatest length, condylo-basal length, palatal length, and length of nasals; width equaling or nearly equaling that of the skull of *mindanensis*; brain case more rounded in profile, slightly convex, instead of evenly sloping toward the rostrum.

Color.—Type in general black; center line of back with crest of long stiff black hairs; facial bar of grayish white hairs distinct; sides thinly covered with short stiff white bristles; belly black with a few white hairs mixed in; legs black; tip of tail with a tuft of long black hairs.

The type skin could not be tanned but was cleaned and dried. Younger specimens do not have any white hairs on the sides.

Measurements (type; 2 females in parentheses).—Greatest length 305.0 mm. (237.0, 246.0); condylo-basal length 253.0 (215.0, 216.0); palatal length 172.0 (146.0, 147.0); interorbital width 61.9 (49.7, 51.9); zygomatic width 138.0 (103.0, 114.0); upper molar series 90.7 (81.0, 83.0); least outside width of palate 45.1 (31.9, 35.3); greatest outside width of palate at third molar 51.1 (46.9, 51.1); nasals, least width 18.0 (14.6, 14.7), greatest width 33.0 (23.3, 24.1), length 144.0 (116.4, 118.9).

Tragulus nigricans Thomas

Tragulus nigricans Thomas, 1892, Ann. Mag. Nat. Hist., (6), 9: 250.

Specimens examined.—Total 6. BALABAC ISLAND: Balabac, 3 males, 1 immature male, 2 females.

Remarks.—Mr. Hoogstraal reported that these deer were very common on the island, which was visited for one day only, March 15. One female contained an embryo at that time.

Cervus (Rusa) alfredi Sclater. Figures 20, 21.

Cervus alfredi Sclater, 1870, Proc. Zool. Soc. London, 1870: 381, pl. 28; 1871: 478; 1872: 24.

Specimens examined.—Total 5. NEGROS ISLAND: Mabaha, Bais, 1 adult female; Naliong, Tolong, 1 immature male, 1 adult female, 1 immature female; Bubugtongon, Tolong, 1 adult male.

Measurements (adult male; two adult females in parentheses).—Total length 1420 mm. (1242, 1386); tail 125 (90, 117); hind foot 340 (298, 320); ear 105 (87, 89); height at shoulder 770 (715, 750).



FIG. 18. *Sus celebensis negrinus*, male, type; Negros Island.



FIG. 19. *Sus celebensis negrinus*, female; Negros Island.

Skull: greatest length 265 (242, 244); palatal length 150.0 (136.1, 138.4); interorbital width 63.6 (48.9, 52.1); zygomatic width 102.1 (95.2, 95.3); upper tooth row 78.3 (73.1, 75.0); length of molars 44.9 (43.5, 43.6); length of premolars 36.9 (33.6, 34.9); nasals, length 90.9 (80.7, 83.1), greatest width 41.3 (33.4, 35.3), least width 18.5 (16.4, 17.4). Horns: pedicel from orbit 58.5; greatest length of horns R. 257, L. 245; brow tine R. 68+, L. 96.5; tine on main beam R. 47.5, L. 24.9 (worn); diameter of burr R. 49.5, L. 51.0; distance across tips 241.0.

Remarks.—According to Hollister (1913) this deer has been recorded from Cebu, Guimaras, Leyte, Masbate, Negros, Panay, and Samar, but it appears to be rare in collections. It is the only spotted deer in the Philippines.

Cervus (Rusa) francianus Heude. Figures 20, 21.

Ussa francianus Heude, 1888, Mem. Hist. Nat. Emp. Chinois, 2, pt. 1: 24, pl. 19, fig. 7 (premolars).

Specimens examined.—Total 17. MINDANAO: Mati, Mati Municipality, Davao Province, 1 male, 1 female (topotypes); Buayan Municipality, southern Cotabato Province, 5 adult males, 1 subadult, 2 immature, 4 adult females, 3 immature, 2 juvenile.

Measurements (male and female topotypes).—Total length 1700, 1450 mm.; tail 110, 110; hind foot 340, 318. Skull: greatest length 263.0, 245.0; palatal length 149.0, 146.0; interorbital breadth 64.4, 55.7; zygomatic width 107.0, 102.0; upper tooth row 77.5, 73.5; length of molars 45.4, 41.8; length of premolars 33.8, 34.5. Nasals: length 95.2, 81.0, greatest width 45.6, 37.9; least width 16.4, 14.5. Horns: pedicel from orbit 71.3; diameter of burr 49.7; total horn length 260.0 (tip broken); length of brow tine from burr 127.5 (tip broken).

Remarks.—This series shows great color variation that can not be attributed to age or sex. The general color of the darkest specimens is near Carob Brown and of the lightest near Light Buff deepened by darker tips to the hairs. Intermediate color is near Pecan Brown and other shades between the extremes are represented. The topotype male is fully adult, the coat worn, poor, and light in color. The female topotype is nearly as old and the color very dark. Another variation is the presence or absence of a shoulder whorl. In two-thirds of the specimens the hair radiates from a whorl on the shoulders, growing forward to half way up the neck. In the other third the hairs point posteriorly from the head to the tail.



A



B



C



D

FIG. 20. A, *Cervus (Rusa) francianus*, topotype; Mindanao. B, *Cervus (Rusa) francianus*, topotype; Mindanao. C, *Cervus (Rusa) alfredi*; Negros Island. D, *Cervus (Rusa) calamianensis*; Busuanga.



A



B



C



D

FIG. 21. A, *Cervus (Rusa) francianus*, topotype; Mindanao. B, *Cervus (Rusa) francianus*, topotype; Mindanao. C, *Cervus (Rusa) alfredi*; Negros Island. D, *Cervus (Rusa) calamianensis*; Busuanga.

The topotypes are the oldest and largest specimens in the series but are approached in size by a few from Cotabato. One male with horns in velvet would probably have surpassed the size of the topotype.

Hollister, with 23 specimens, made no mention of color variation but did note a great difference in the length of the tooth row, giving measurements of 80.8 and 88.0 mm. in a male and a female. The greatest length in this series is 77.5 and the least 69.0.

***Cervus (Rusa) calamianensis* Heude**

Hyelaphus calamianensis Heude, 1888, Mem. Hist. Nat. Emp. Chinois, 2, pt. 1: 49.

Specimens examined.—Total 8. CULION ISLAND: 1 adult male, 1 adult female, 1 immature female. BUSUANGA ISLAND: 1 adult male, 2 immature, 1 juvenile, 1 adult female.

Measurements (Culion male; Busuanga male and female in parentheses).—Total length 1250 mm. (1298, 1151); tail — (150, 130); hind foot 274 (275, 305); ear — (116, 100); height at shoulder — (706, 570). Skull: greatest length 210.0 (226.0, 204.0); palatal length 120.8 (127.5, 119.6); interorbital width 55.0 (61.8, 45.5); zygomatic width 88.1 (95.1, 85.3); upper tooth row 57.5 (65.8, 59.9); length of molars 36.6 (42.0, 38.0); length of premolars 24.8 (28.3, 24.8). Nasals: length 66.1 (74.9, 69.0); greatest width 19.3 (21.4, 18.2); least width 11.6 (12.1, 11.4). Horns (Busuanga male in parentheses): pedicel from orbit 63.7 mm. (62.7); length of horn on outside curve 246.0 (282 R., 267 L.); length of brow tine from notch 59.0 R., 81.4 L. (71.6 R., 24.9 L.); length of point on main beam 67.7 R., 72.9 L. (65.0 R., 51.4 L.); diameter of burr 39.9 R., 39.8 L., (38.7 R., 39.1 L.); distance between points 170.0 (212.0).

Remarks.—Compared with the male type and female paratype of *culionensis* Elliott, these skins are richer and brighter in color. Elliott's specimens are barely adult, with unworn teeth, but the pelage is worn and appears faded.

There is notable color variation between specimens from the two islands but this is believed to be individual. The darkest is the adult Busuanga male, in which the general color is near Pecan Brown with a darker dorsal stripe. The neck, head, and ears are much lighter. The legs are near Carob Brown.

An adult female from Busuanga is in general color near Sayal Brown; only the legs are darker. The adult male from Culion is but little darker than the Busuanga female. All show a darker

dorsal line. It has been found very difficult to match the skins with any exact color.

The skull of the male from Culion is slightly smaller, though apparently a little older than that of the Busuanga male. The bullae of these deer are relatively larger than those of other Philippine deer. The nasals are not widely expanded posteriorly as in *francianus*.

***Cervus (Rusa) nigellus apoensis* subsp. nov.** Figure 22.

Type.—No. 61010 Chicago Natural History Museum, from Mainit, altitude 3,800 feet, Mount Apo, Davao Province, Mindanao Island, Philippine Islands. Tanned skin and skull. Adult male. Collected November 20, 1946, by Manuel Celestino and Godofredo Alcasid. Original number H. H. 1298.

Characters.—A small, dark-colored deer related to *nigricans* Brooke of Basilan Island but smaller, and to *nigellus* Hollister from Mount Malindang, western Mindanao, but differing from them in being larger and less brightly colored.

Color.—General color of type a glossy reddish brown near Chestnut but richer; top of head and forehead lighter, more golden brown; muzzle and sides of neck near Wood Brown; tips of ears dark, inside of ear dark gray; belly dark, but more gray than back and sides; tail darker than back, with a few white hairs at the base.

A female is as dark as the type but the upper third of the ear is black and the inside is covered with long white hairs. The tail shows more white on the under side at the base. There is a buffy line on the inside of the legs.

This is the general color of the series but in some specimens the head is more reddish brown and immature specimens have lighter legs. In all but one, the hair radiates from a whorl on the shoulders.

Skull.—In shape and form of horns the skull of *apoensis* is like that of *francianus*, but it is smaller throughout.

Measurements (type and two males; two females in parentheses).—Total length: 1207, —, 1125 (1007, 1045); tail 107, —, 148 (84, 89); hind foot 287, —, 307 (240, 253). Skull: greatest length 222.0, 210.0, 222.0 (204.0, 206.0); palatal length 126.5, 119.3, 126.1 (116.8, 121.5); interorbital width 47.3, 51.5, 54.0 (45.9, 46.0); zygomatic width 89, 92.6, 95.0 (87.3, 88.7); upper tooth row 72.2, 64.8, 72.2 (65.0, 67.6); length of molar series 42.2, 39.7, 42.6 (36.4, 40.1); length of premolar series 33.5, 28.5, 33.2 (28.7, 29.3);



FIG. 22. *Cervus (Rusa) nigellus apoensis*, type; Mindanao.

nasals, length 71.0, —, 71.7 (64.4, 73.3), greatest width 31.8, 30.5, 31.0 (23.8, 30.2), least width 11.7, —, 12.7 (11.7, 13.6). Horns: length of pedicel from orbit 52.5, 41.8, 66.0; length of horn on outside curve R. 185, L. 185, R. 218, L. 218, R. 183, L. 184; length of brow tines R. 76.3, L. 62.7, R. 89.8, L. 83.2, R. 65.2, L. 72.2, length of upper tines R. 39.0, L. 32.3, R. 39.8, L. 26.2, R. 29.0, L. 26.2; distance between tips of horns 180.0, 183.0, 194.0.

Specimens examined.—Total 15. Collected between October 22 and November 21, 1946. MINDANAO: Mount Apo, Davao Province, Todaya (2,500 feet), 2 immature males (1 skull only), 1 adult female, 1 juvenile female; Mainit (3,800 feet), 1 adult male (type), 2 immature males; Baclayan (5,400 feet), 1 adult female, 1 subadult female; Meran (5,750 feet), 1 adult male (skull only), 1 subadult male, 1 juvenile male, 2 immature females (skins only); Sudu (6,600 feet), 1 female.

Remarks.—This race is closely related to *nigellus* of Mount Malindang, from which it is distant between 175 to 200 miles. Mount Malindang is at the head of the Zamboanga Peninsula and separated from Mount Apo by areas of lowlands. Deer or deer sign were found on Mount Apo from 2,500 feet to the peak (9,600 feet). Deer were heard calling on Mount McKinley, but none were collected there.

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