

SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 61, NUMBER 21

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BY

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(PUBLICATION 2252)

CITY OF WASHINGTON  
PUBLISHED BY THE SMITHSONIAN INSTITUTION  
DECEMBER 29, 1913

The Lord Baltimore Press  
BALTIMORE, MD., U. S. A.

## FIFTY-ONE NEW MALAYAN MAMMALS

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Under the auspices of the Smithsonian Institution Mr. H. C. Raven has been engaged, during the past eighteen months, in collecting specimens of the vertebrates of Dutch Southeast Borneo. His explorations are made possible by the generosity of Dr. W. L. Abbott. Identification of the mammals included in the first shipment of material has led me to the re-examination of the related parts of the collections previously made by Dr. Abbott himself elsewhere in the Malay region. This work has resulted in the detection of the fifty-one new forms here described.

### PARADOXURUS PARVUS, new species

1903. *Paradoxurus hermaphroditus* MILLER, Proc. U. S. Nat. Mus., vol. 26, p. 471. February 3, 1903. (Not of Pallas.)

*Type*.—Adult male (skin and skull), No. 114175, United States National Museum. Collected on Simalur Island, off coast of west Sumatra, December 15, 1901, by Dr. W. L. Abbott. Original No. 1385.

*Diagnosis*.—Like *Paradoxurus hermaphroditus hermaphroditus* of the Sumatran mainland, but smaller; condylobasal length of skull in male with well developed sagittal crest 100.2 mm., as compared with 106.2 and 106.4 in two males of similar age from Aru Bay; condylobasal length of skull in female with basal suture closed 96.0, as compared with 107.3 and 107.5 in two of similar age from Aru Bay, and 104 and 108.6 in two from Siak River.

*Measurements*.—Type: head and body, 485 mm.; tail, 390; hind foot (dry), 71 (70); condylobasal length of skull (basal suture visible, teeth moderately worn), 100.2 (96.0);<sup>1</sup> zygomatic breadth, 59.6 (53.8); breadth of braincase, 31.6 (32.0); interorbital breadth, 16.5 (15.2); breadth of rostrum over canines, 19.5 (17.8); mandible, 74.0 (70.9); maxillary tooththrow exclusive of incisors, 37.6 (37.8); mandibular tooththrow exclusive of incisors, 42.3 (42.0).

*Specimens examined*.—Six, all from Simalur Island.

<sup>1</sup> Cranial measurements in parenthesis are those of a female *P. hermaphroditus* (No. 114172) of same age as the type.

*Remarks.*—On re-examining the specimens of *Paradoxurus* from Simalur I find that Dr. Abbott was right in considering the island form distinct from that of Sumatra.<sup>1</sup> In color the two animals appear to be indistinguishable, but in size the differences are very noticeable, as shown by the following table of maxima and minima:

	Head and body	Tail	Weight (kg.)	Condylbasal length of skull	Number of specimens
<i>hermaphroditus</i> . . . . .	490 to 595	420 to 520	2.25 to 3	104 to 108.6	6
<i>parvus</i> . . . . .	465 to 483	380 to 420	1.5 to 2	96 to 100.2	5

#### PARADOXURUS HERMAPHRODITUS RAVUS, new subspecies

*Type.*—Adult female (skin and skull), No. 84429, United States National Museum. Collected at Trong, Lower Siam, March 5, 1897, by Dr. W. L. Abbott.

*Diagnosis.*—Like *Paradoxurus hermaphroditus hermaphroditus* of Sumatra and the southern portion of the Malay Peninsula,<sup>2</sup> but ground color of upperparts noticeably paler (about pale-ecru-drab) instead of a brownish ochraceous-tawny), so that the black spots and hair-tips are thrown into greater contrast.

*Measurements.*—Type: head and body, 580 mm.; tail, 470; hind foot (dry), 83 (81); condylbasal length of skull (basal suture closed, teeth slightly worn), 104.5 (108.0);<sup>3</sup> zygomatic breadth, 58.2 (58.3); breadth of braincase, 35.4 (35.0); interorbital breadth, 18.0 (18.2); breadth of rostrum over canines, 18.6 (20.0); mandible, 76.8 (81.4); maxillary tooththrow exclusive of incisors, 38.1 (42.0); mandibular tooththrow exclusive of incisors, 41.2 (47.0).

*Specimens examined.*—Two, both from the type locality.

*Remarks.*—This animal is readily distinguishable from true *Paradoxurus hermaphroditus* by the gray, not brown, ground color of the upperparts and sides. As in the typical form the black markings are well developed, and the tail has no conspicuous light area on basal third. From *P. minor*, represented in Dr. Abbott's collections

<sup>1</sup> See Proc. U. S. Nat. Mus., vol. 26, p. 471. February 3, 1903.

<sup>2</sup> The United States National Museum contains specimens of true *hermaphroditus* from the following localities:

Sumatra: Little Siak River, 3; Aru Bay, 9; Tarussan Bay, 2; Engano Island, 1.

Malay Peninsula: The Dindings, 1; Rumpin River, Pahang, 2; Endau River, Johore, 1; Jambu Luang, Johore, 1.

<sup>3</sup> Cranial measurements in parenthesis are those of a male topotype with basal suture visible and teeth unworn.

by specimens from Trong and Tenasserim, it differs in its paler color, more sharply defined black markings, larger skull, and much more robust teeth.

**PARADOXURUS HERMAPRODITUS SENEX**, new subspecies

*Type*.—Immature male (skin and skull), No. 124171, United States National Museum. Collected on Domel Island, Mergui Archipelago, January 26, 1904, by Dr. W. L. Abbott. Original No. 3074.

*Diagnosis*.—Like *Paradoxurus hermaphroditus ravus*, but ground color of upperparts and sides with less distinct trace of yellow; auditory bullæ more reduced than in any other known race.

*Measurements*.—Head and body, 525 mm.; tail, 465; hind foot, 77.4 (77.4); condylobasal length of skull (basal suture open, teeth slightly worn), 99.0; zygomatic breadth, 58.9; breadth of braincase, 54.6; interorbital breadth, 17.2; breadth of rostrum over canines, 20.0; mandible, 75.2; maxillary tooththrow exclusive of incisors, 38.6; mandibular tooththrow exclusive of incisors, 44.0.

*Specimen examined*.—The type.

*Remarks*.—In color the Domel Island race is probably not always distinguishable from that of Trong, though the ground color in the type more nearly approaches a clear grizzle of black and white. The auditory bullæ are slightly inflated, and only 10.5 mm. in length from border of paroccipital process to front of bullæ proper.

**PARADOXURUS HERMAPHRODITUS FUSCUS**, new subspecies

*Type*.—Adult female (skin and skull), No. 124075, United States National Museum. Collected on James Island, Mergui Archipelago, January 2, 1904, by Dr. W. L. Abbott. Original No. 2982.

*Diagnosis*.—Ground color as in *Paradoxurus hermaphroditus senex*, but black markings on head, neck and shoulders more extensive, and entire underparts suffused with sooty brown, darkest on throat, chest and inner surface of legs.

*Measurements*.—Head and body, 500 mm.; tail (imperfect), 370; hind foot (dry), 77 (73); condylobasal length of skull (basal suture closed, teeth moderately worn), 101.2; zygomatic breadth, 53.6; breadth of braincase, 34.6; interorbital breadth, 16.8; breadth of rostrum over canines, 17.8; mandible, 73.2; maxillary tooththrow exclusive of incisors, 37.4; mandibular tooththrow exclusive of incisors, 41.6.

*Specimen examined*.—The type.

**PARADOXURUS HERMAPHRODITUS PALLENS**, new subspecies

*Type*.—Adult female (skin and skull), No. 124201, United States National Museum. Collected on Kisseraing Island, Mergui Archipelago, February 4, 1904. Original No. 3106.

*Diagnosis*.—Like *Paradoxurus hermaphroditus ravus* but tail distinctly brownish instead of essentially black, its basal third, both above and below, concolor with corresponding surfaces of body in conspicuous contrast with uniformly dark terminal portion.

*Measurements*.—Head and body, 538 mm.; tail, 425; hind foot (dry), 84.5 (79); condylobasal length of skull (basal suture closed, teeth much worn), 103.2; zygomatic breadth, 58.4; breadth of braincase, 33.7; interorbital breadth, 18.0; breadth of rostrum over canines, 19.4; mandible, 76.2; maxillary tooththrow exclusive of incisors, 39.0; mandibular tooththrow exclusive of incisors, 42.6.

*Specimen examined*.—The type.

**PARADOXURUS HERMAPHRODITUS PUGNAX**, new subspecies

*Type*.—Adult female (skin and skull), No. 124100, United States National Museum. Collected on Sullivan Island, Mergui Archipelago, January 5, 1904, by Dr. W. L. Abbott. Original No. 2999.

*Diagnosis*.—Like *Paradoxurus hermaphroditus pallens* but size slightly less and dark markings slightly more extensive, particularly on thighs, upperarms, nape and cheeks.

*Measurements*.—Type: head and body, 520 mm.; tail, 420; hind foot (dry), 83.5 (81); condylobasal length of skull (basal suture closed, teeth much worn), 99.5; zygomatic breadth, 56.8; breadth of braincase, 33.5; interorbital breadth, 17.5; breadth of rostrum over canines, 18.6; mandible, 74.1; maxillary tooththrow exclusive of incisors, 39.1; mandibular tooththrow exclusive of incisors, 41.8.

*Specimens examined*.—Two, both from Sullivan Island.

**PARADOXURUS HERMAPHRODITUS SACER**, new subspecies

*Type*.—Adult female (skin and skull), No. 124032, United States National Museum. Collected on Saint Matthew Island, Mergui Archipelago, December 27, 1903, by Dr. W. L. Abbott. Original No. 2934.

*Diagnosis*.—Like *Paradoxurus hermaphroditus pallens* but black markings so reduced that dorsal stripes are broken up into lines of spots; skull smaller than in any of the other known Mergui forms, scarcely exceeding that of *Paradoxurus minor*.

*Measurements.*—Type: head and body, 520 mm.; tail, 420; hind foot (dry), 75.8 (71.4); condylobasal length of skull (basal suture closed, teeth much worn), 99.3 (101.0);<sup>1</sup> zygomatic breadth, 56.8 (60.0); breadth of braincase, 33.3 (33.7); interorbital breadth, 17.6 (17.2); breadth of rostrum over canines, 18.8 (19.2); mandible, 75.1 (73.2); maxillary tooththrow exclusive of incisors, 39.0 (37.9); mandibular tooththrow exclusive of incisors, 42.1 (41.6).

*Specimens examined.*—Three from Saint Matthew Island and two from St. Luke Island.

#### PARADOXURUS HERMAPHRODITUS PULCHER, new subspecies

*Type.*—Adult female (skin and skull), No. 124142, United States National Museum. Collected on Clara Island, Mergui Archipelago, January 11, 1904, by Dr. W. L. Abbott. Original No. 3033.

*Diagnosis.*—Like *Paradoxurus hermaphroditus pallens* but ground color both above and below between cartridge-buff and cream-buff, more yellowish than in any of the other known races.

*Measurements.*—Type: head and body, 485 mm.; tail, 460; hind foot (dry), 83.5 (80.5); condylobasal length of skull (basal suture closed, teeth much worn), 101.3 (103.2);<sup>2</sup> zygomatic breadth, 56.6 (61.2); breadth of braincase, 34.8 (33.0); interorbital breadth, 16.5 (16.8); breadth of rostrum over canines, 18.8 (20.2); mandible, 75.3 (78.3); maxillary tooththrow exclusive of incisors, 38.0 (38.3); mandibular tooththrow exclusive of incisors, 42.2 (43.4).

*Specimens examined.*—Two, both from Clara Island.

*Remarks.*—The peculiar yellowish hue of the pale areas in this animal is unique among the members of the genus that I have seen.

#### PARADOXURUS HERMAPHRODITUS CANUS, new subspecies

*Type.*—Adult female (skin and skull), No. 123976, United States National Museum. Collected on Pulo Terutau, off west coast of Lower Siam, April 7, 1904, by Dr. W. L. Abbott. Original No. 3209.

*Diagnosis.*—Like *Paradoxurus hermaphroditus pallens* but light element in markings faintly though perceptibly less yellowish than in *P. h. ravus*; throat blotched with buffy white; size somewhat less than in *pallens* or *ravus*.

*Measurements.*—Type: head and body, 510 mm.; tail, 440; hind

<sup>1</sup> Measurements in parenthesis are those of a male (basal suture closed but visible, teeth moderately worn) from the type locality (No. 124033).

<sup>2</sup> Measurements in parenthesis are those of a male (No. 124141) of same age as the type.

foot (dry), 80.6 (76.6); condylobasal length of skull (basal suture closed, teeth moderately worn), 99.3 (103.1);<sup>1</sup> zygomatic breadth, 54.0 (61.5); breadth of braincase, 31.8 (31.4) interorbital breadth, 18.6 (18.8); breadth of rostrum over canines, 18.0 (20.0); mandible, 73.5 (77.0); maxillary tooththrow exclusive of incisors, 35.7 (38.3); mandibular tooththrow exclusive of incisors, 40.3 (43.5).

*Specimens examined*.—Six, all from Pulo Terutau.

*Remarks*.—The white blotch on throat, though variable in size, is present in each of the six individuals. In other members of the genus it is indicated in less than ten per cent of the specimens that I have seen.

**PARADOXURUS HERMAPHRODITUS SIMPLEX, new subspecies**

1906. *Paradoxurus hermaphroditus* LYON, Proc. U. S. Nat. Mus., vol. 31, p. 597. December 18, 1906. (Not of Pallas.)

*Type*.—Adult male (skin and skull), No. 124902, United States National Museum. Collected at Klabat Bay, Banka, June 26, 1904, by Dr. W. L. Abbott. Original No. 3443.

*Diagnosis*.—Size and general appearance as in *Paradoxurus hermaphroditus hermaphroditus* of the Sumatran mainland, but dark markings reduced to a minimum, one specimen like the least spotted individual among twenty of the typical race, the other (type) with no spots whatever and with the dorsal stripe barely indicated.

*Measurements*.—Type: head and body, 540 mm.; tail, 450; hind foot, 88; hind foot, dry, 85.5 (81.5); condylobasal length of skull (basal suture closed, teeth much worn), 105.8; zygomatic breadth, 65.4; breadth of braincase, 35.5; interorbital breadth, 18.8; breadth of rostrum over canines, 20.8; mandible, 78.4; maxillary tooththrow exclusive of incisors, 39.2; mandibular tooththrow exclusive of incisors, 43.8.

*Specimens examined*.—Two, both from Banka.

**ARCTOGALIDIA MACRA, new species**

*Type*.—Adult female (skin and skull), No. 124172, United States National Museum. Collected on Domel Island, Mergui Archipelago, January 26, 1904, by Dr. W. L. Abbott. Original No. 3075.

*Diagnosis*.—Like *Arctogalidia leucotis* from Tenasserim but condylobasal length of skull about 10 mm. less than in the mainland form.

<sup>1</sup> Cranial measurements in parenthesis are those of a male (No. 123972) with excessively worn teeth.



*Measurements.*—Type: head and body, 475 mm.; tail, 545; hind foot (dry), 81 (76.5); condylobasal length of skull (basal suture closed, teeth slightly worn), 96.6 (104.2);<sup>1</sup> zygomatic breadth, 55.6 (58.5); breadth of braincase, 33.8 (35.1); interorbital breadth, 17.1 (20.0); breadth of rostrum over canines, 19.2 (19.3); mandible, 75.4 (80.0); maxillary tooththrow exclusive of incisors, 36.0 (38.0); mandibular tooththrow exclusive of incisors, 40.5 (42.5).

*Specimen examined.*—The type.

#### ARCTOGALIDIA BICOLOR, new species

1911. *Arctogalidia stigmatica* LYON, Proc. U. S. Nat. Mus., vol. 40, p. 116. April 25, 1911. (Part.)

*Type.*—Adult female (skin and skull), No. 151875, United States National Museum. Collected at Klumpang Bay, Dutch Southeast Borneo, January 1, 1908, by Dr. W. L. Abbott. Original No. 3745.

*Diagnosis.*—A small species related to *Arctogalidia simplex* of Linga and Singkep, and *A. inornata* of the Natuna Islands; upperparts, as in *A. simplex*, grayish brown with faint median dark stripe; underparts clear buff, even paler than in *A. inornata* (near the cartridge-buff of Ridgway but with less yellow); contrast between color of dorsal and ventral surfaces more noticeable than in any other known member of the genus; skull as in *A. inornata*, the rostrum and palate narrower than in *A. simplex*.

*Measurements.*—Head and body, 473 mm.; tail, 495; hind foot (dry), 78 (73.5); condylobasal length of skull (basal suture closed, teeth slightly worn), 94.1; zygomatic breadth, 51.0; breadth of braincase, 32.9; interorbital breadth, 14.8; breadth of rostrum over canines, 17.4; mandible, 70.9; maxillary tooththrow exclusive of incisors, 35.1; mandibular tooththrow exclusive of incisors, 38.4.

*Specimen examined.*—The type.

#### ARCTOGALIDIA MIMA, new species

1907. *Arctogalidia simplex* LYON, Proc. U. S. Nat. Mus., vol. 31, p. 655. January 16, 1907. (Not of Miller.)

*Type.*—Adult female (skin and skull), No. 142153, United States National Museum. Collected at Semimba Bay, Battam Island, Rhio Archipelago, September 16, 1905, by C. Boden Kloss. Original No. 10. Presented by Dr. W. L. Abbott.

<sup>1</sup> Cranial measurements in parenthesis are those of a female *A. leucotis* (No. 124228), with moderately worn teeth, from Red Point, Tenasserim.

*Diagnosis.*—Like *Arctogalidia simplex* of Linga and Singkep but skull not so large, auditory bullæ more reduced, and posterior lower molar smaller than in any of the other known species, *A. minor* not excepted.

*Measurements.*—Head and body, 448 mm.; tail, 502; hind foot, 77 (dry, 76.5, 72.5); condylobasal length of skull (basal suture closed, teeth moderately worn), 91.7 (97.8);<sup>1</sup> zygomatic breadth, 51.2 (53.1); breadth of braincase, 31.1 (33.3); interorbital breadth, 17.2 (16.6); breadth of rostrum over canines, 18.2 (18.3); mandible, 68.0 (73.7); maxillary tooththrow exclusive of incisors, 33.8 (36±); front of canine to back of m<sup>1</sup>, 30.6 (33.4); mandibular tooththrow exclusive of incisors, 34.5 (40.6); antero-posterior diameter of m<sub>2</sub> at base of crown, 2.5 (4.1).

*Specimen examined.*—The type.

#### ARCTOGALIDIA DEPRESSA, new species

1909. *Arctogalidia fusca* LYON, Proc. U. S. Nat. Mus., vol. 36, p. 490. June 1, 1909. (Part.)

*Type.*—Adult female (skull only), No. 115600, United States National Museum. Collected on Pulo Bintang, Rhio Archipelago, August 18, 1902, by Dr. W. L. Abbott. Original No. 1896.

*Diagnosis.*—Skull like that of *Arctogalidia fusca* but larger (that of female slightly exceeding the largest of four males of the Kundur animal); frontal region more depressed (depth immediately behind last molar, 23.6 as compared with 28.1 in a male *A. fusca* with condylobasal length of 96.4), so that orbits are directed more upward; auditory bullæ larger and broader but less elevated. External characters not known.

*Measurements.*—Condylobasal length of skull (basal suture closed, teeth slightly worn), 97.6; zygomatic breadth, 52.8; breadth of braincase, 33.2; interorbital breadth, 17.3; breadth of rostrum over canines, 17.8; mandible, 73.5; maxillary tooththrow exclusive of incisors, 35.6; mandibular tooththrow exclusive of incisors, 39.3.

*Specimen examined.*—The type.

#### EPIMYS PANNELLUS, new species

1900. *Mus pannosus* MILLER, Proc. Biol. Soc. Washington, vol. 13, p. 190. December 21, 1900. (Part.)

*Type.*—Adult male (skin and skull), No. 104121, United States National Museum. Collected on Pulo Rawi, Butang Islands, December 19, 1899, by Dr. W. L. Abbott. Original No. 175.

<sup>1</sup> Cranial measurements in parenthesis are those of a slightly older female (No. 123103) *A. simplex* from Singkep.

*Diagnosis.*—A member of the *rattus*-group similar to *Epimys pannosus* of Pulo Adang, Butang Islands, but skull less robust, incisive foramina distinctly narrowed anteriorly, and teeth usually not so large.

*Measurements.*—Type: head and body, 205 mm.; tail, 175; hind foot (dry), 38 (36); condylobasal length of skull (teeth much worn), 42.3; zygomatic breadth, 20.2; interorbital constriction, 6.7; mastoid breadth, 16.9; depth of braincase, 10.9; nasal, 16.6; diastema, 12.1; mandible, 26.5; maxillary toothrow (alveoli), 8.0; mandibular toothrow (alveoli), 7.2.

*Specimens examined.*—Five (three skulls without skins), all from Pulo Rawi.

*Remarks.*—Though in external appearance not appreciably different from *Epimys pannosus*, this species is distinguishable from its ally by the cranial characters shown in the series of five skulls.

#### EPIMYS TINGIUS, new species

*Type.*—Adult male (skin and skull), No. 112723, United States National Museum. Collected on Pulo Tinggi, off east coast of Johore, August 5, 1901, by Dr. W. L. Abbott. Original No. 1201.

*Diagnosis.*—A member of the *rattus*-group similar to *Epimys tambelanicus* of the Tambelan Islands and *E. pannosus* of the Butang Islands, but skull more slender than in the latter and auditory bullæ smaller than in the former.

*Measurements.*—Type: head and body, 217 mm.; tail, 204; hind foot (dry), 40.5 (38); condylobasal length of skull (teeth moderately worn), 44.1; zygomatic breadth, 21.9; interorbital constriction, 7.2; occipital breadth, 18.0; depth of braincase, 12±; nasal, 17.0; diastema, 12.2; mandible, 27.2; maxillary toothrow (alveoli), 7.2; mandibular toothrow (alveoli), 7.1.

*Specimens examined.*—One skin and six skulls, all from Pulo Tinggi.

#### EPIMYS FULMINEUS, new species

*Type.*—Adult female (skin and skull), No. 112349, United States National Museum. Collected on St. Barbe Island, South China Sea, May 27, 1901, by Dr. W. L. Abbott. Original No. 950.

*Diagnosis.*—A member of the *rattus*-group, in general like *Epimys tingius*, but skull still more slender, with braincase both narrower and less deep.

*Measurements.*—Type: head and body, 205 mm.; tail, 220; hind foot (dry), 37 (35); condylobasal length of skull (teeth much worn),

42.7 (43.2);<sup>1</sup> zygomatic breadth, 19.6 (21.5); interorbital constriction, 7.2 (7.4); occipital breadth, 15.8 (17.6); depth of braincase, 10.1 (11.3); nasal, 17.0 (17.4); diastema, 13.3 (13.0); mandible, 26.0 (27.4); maxillary toothrow (alveoli), 6.7 (7.4); mandibular toothrow (alveoli), 6.5 (7.2).

*Specimens examined*.—Three, all from St. Barbe Island.

#### EPIMYS ROA, new species

*Type*.—Adult female (skin and skull), No. 112444, United States National Museum. Collected on Pulo Aor, off east coast of Johore, June 8, 1901, by Dr. W. L. Abbott. Original No. 1025.

*Diagnosis*.—A member of the *rattus*-group resembling *Epimys pannosus*, but color paler and with a decided tinge of drab; skull with rostral portion more robust than in the Butang animal.

*Measurements*.—Head and body, 203 mm.; tail, 187; hind foot (dry), 37.5 (36); condylobasal length of skull (teeth much worn), 42.8; zygomatic breadth, 21.2; interorbital constriction, 6.8; occipital breadth, 7.2; depth of braincase, 11.1; nasal, 16.5; diastema, 12.8; mandible, 26.0; maxillary toothrow (alveoli), 7.1; mandibular toothrow (alveoli), 6.6.

*Specimens examined*.—The type and an immature individual, both from Pulo Aor.

*Remarks*.—Though nearly related to the form occurring on Pulo Tinggi this animal is easily distinguishable by the lighter, drab-tinged color of the upperparts. In the dry state the ears appear to be smaller than the Tinggi form.

#### EPIMYS MARA, new species

*Type*.—Adult female (skin and skull), No. 196751, United States National Museum. Collected on Maratua Island, Dutch Southeast Borneo, August 28, 1912, by H. C. Raven. Original No. 187. Presented by Dr. W. L. Abbott.

*Diagnosis*.—A large member of the *rattus*-group resembling *Epimys pannosus* of the Butang Islands, but color darker, skull larger, and teeth smaller; nasals distinctly spatulate anteriorly.

*Color*.—Upperparts seal-brown mixed with isabella-color, the mixture inconspicuous along median region but gradually increasing laterally until the lighter element predominates on sides of body and outer surface of legs. Underparts and inner surface of legs vinal.

<sup>1</sup> Cranial measurements in parenthesis are those of a female *Epimys tingius* of about the same age (No. 112728).

ceous-buff dulled by the light-neutral-gray bases of the hairs, the contrast between belly and sides not conspicuous. Ears and feet sprinkled with fine hairs of an indefinite brownish color. Tail uniform dark brown, the minute blackish hairs not producing any effect of color.

*Skull and teeth.*—The skull is larger than in *Epimys neglectus*, closely agreeing with that of *E. pannosus* in size and general appearance. It differs from that of the Butang form in more depressed braincase, larger interparietal (area about equal to that of one parietal instead of decidedly less than that of parietal), narrower interorbital region, smaller auditory bullæ, and in the spatulate form of the nasals caused by the very abrupt narrowing at middle.

Teeth as in *Epimys pannosus* but noticeably smaller, the transverse diameter of  $m^1$  about 1.8 mm. instead of 2.4 mm.

*Measurements.*—Head and body, 208 (212) mm.;<sup>1</sup> tail, 215 (228); hind foot, 42 (42); hind foot without claws, 40.8 (40.5); condylo-basal length of skull (teeth much worn), 46.1 (45.0); zygomatic breadth, 23.0 (22.3); interorbital constriction, 7.1 (6.9); mastoid breadth, 17.1 (16.9); depth of braincase, 11.0 (11.8); nasal, 17.5 (17.0); diastema, 13.7 (13.6); mandible, 27.1 (27.1); maxillary toothrow (alveoli), 6.8 (6.8); mandibular toothrow (alveoli), 6.9 (6.4).

*Specimens examined.*—Two, both from Maratua Island.

*Remarks.*—The section of the *Epimys rattus* group containing this species and the four just described is characterized by large size, coarse fur, and heavy skull, features which cause its members to have a superficial resemblance to the rats allied to *Epimys validus* and *E. firmus*. Two forms, *E. bullatus* (Lyon) from eastern Sumatra and *E. villosus* (Kloss)<sup>2</sup> from Singapore, have in fact been described as small members of the *validus-firmus* series, though in each instance the main character by which the two groups are distinguished—the large normal auditory bullæ of the smaller animal as compared with the much reduced bullæ of the larger species—was made the principal feature of the new race. In addition to the forms already mentioned, the section contains *E. tambelanicus* of the Tambelan Islands, and

<sup>1</sup> Measurements in parenthesis are those of an adult male (No. 196754) of same age as type.

<sup>2</sup> Mr. Kloss now considers the Singapore animal as identical with *E. bullatus* (Journ. Fed. Malay States Mus., vol. 4, p. 245, 1911). A topotype in the U. S. National Museum (No. 105076, adult female) differs from the five adults of the Sumatran form in less yellowish underparts and in the shorter, deeper rostrum. Until more material can be compared I prefer to regard the two as distinct.

*E. simalurensis* and *E. lugens* of the Barussan Archipelago. The Sumatran *Mus mülleri* of Jentink, usually supposed to be a member of the *firmus* group, is probably related to *E. pannosus*. Unfortunately the absence of the auditory bullæ in the type specimen makes exact determination for the present impossible.

#### EPIMYS TUA, new species

*Type*.—Adult female (skin and skull), No. 196752, United States National Museum. Collected on Maratua Island, Dutch southeast Borneo, August 28, 1912, by H. C. Raven. Original No. 188. Presented by Dr. W. L. Abbott.

*Diagnosis*.—Like *Epimys rattus neglectus* of the Bornean mainland but upperparts blackish brown and underparts slaty.

*Color*.—The color in one adult and one young is essentially like that of *Epimys mara*. In the other two adults it is similar, except that there is less of the isabella on back and sides and of the vinaceous-buff on underparts.

*Skull and teeth*.—The skull resembles that of *Epimys neglectus*. It consequently differs from that of *E. mara* in its much smaller size and normally formed nasals. Teeth as in *E. neglectus*.

*Measurements*.—Type: head and body, 185 mm.; tail, 170; hind foot, 39 (dry, 36, 35); condylobasal length of skull (teeth moderately worn), 40.1; zygomatic breadth, 19.8; interorbital constriction, 6.1; mastoid breadth, 16.1; depth of braincase, 11.0; nasal, 14.5; diastema, 11.6; mandible, 6.7; maxillary tooththrow (alveoli), 25.3; mandibular tooththrow (alveoli), 6.8.

*Specimens examined*.—Four, all from Maratua Island.

*Remarks*.—The dark color of the upperparts and the dull, slightly contrasted underparts immediately distinguish the Maratua form from the other local races of the *neglectus*-group represented in Dr. Abbott's and Mr. Raven's Bornean collections.

#### EPIMYS RATTUS TURBIDUS, new subspecies

*Type*.—Young adult female (skin and skull), No. 196746, United States National Museum. Collected at Tanggarung, south bank of Mahakam River, Dutch Southeast Borneo, June 21, 1912, by H. C. Raven. Original No. 81. Presented by Dr. W. L. Abbott.

*Diagnosis*.—Like *Epimys rattus neglectus* from southern Borneo but color of underparts a dull drabby gray; inconspicuously contrasted with that of sides.

*Measurements.*—Type: head and body, 189 mm.; tail, 233; hind foot, 40 (dry, 39, 37.5); condylobasal length of skull (teeth slightly worn), 40.7; zygomatic breadth, 19.6; interorbital constriction, 6.8; mastoid breadth, 16.4; depth of braincase, 11.2; nasal, 15.8; diastema, 11.4; mandible, 25.3; maxillary tooththrow (alveoli), 6.8; mandibular tooththrow (alveoli), 6.4.

*Specimens examined.*—Thirteen, from the following localities in Dutch Southeast Borneo: Lo Bon Bon, 3; Samarinda, 4; Tanggarung, 2; Tanjong Batu, 1; Talisaian Mountain, 1.

*Remarks.*—The thirteen specimens on which this form is based differ conspicuously from the south Bornean races in the dull color of their underparts. In this feature they resemble *Epimys tua*, but they show no tendency toward darkening of the back.

#### EPIMYS RATTUS PAUPER, new subspecies

1901. *Mus neglectus* MILLER, Proc. Washington Acad. Sci., vol. 3, p. 121. March 26, 1901. (Part. Not of Jentink.)

*Type.*—Adult male (skin and skull), No. 104828, United States National Museum. Collected on Sirhassen Island, South Natuna Islands, June 4, 1900, by Dr. W. L. Abbott. Original No. 433.

*Diagnosis.*—Like *Epimys rattus neglectus* from southern Borneo but smaller.

*Measurements.*—Type: head and body, 170 mm.; tail, 155; hind foot (dry), 33.5 (32); condylobasal length of skull (teeth much worn), 36.9; zygomatic breadth, 17.2; interorbital constriction, 6.2; occipital breadth, 14.4; depth of braincase, 10.2; nasal, 14.0; diastema, 10.8; mandible, 23.0; maxillary tooththrow (alveoli), 6.4; mandibular tooththrow (alveoli), 6.1.

*Specimens examined.*—Five, all from Sirhassen Island.

#### EPIMYS RATTUS VICLANA, new subspecies

*Type.*—Adult male (skin and skull), No. 123861, United States National Museum. Collected on Pulo Lankawi, off west coast of Malay Peninsula, November 3, 1903, by Dr. W. L. Abbott. Original No. 2800.

*Diagnosis.*—Like the form of *Epimys rattus* occurring in Trong and southern Tenasserim but color of back and sides duller and more finely blended (grizzled rather than "lined"); cheek teeth slightly though evidently larger than in the mainland race.

*Measurements.*—Type: head and body, 180 mm.; tail, 167; hind foot (dry), 34.5 (33.5); condylobasal length of skull (teeth much

worn), 38.6; zygomatic breadth, 19.9; interorbital constriction, 6.2; occipital breadth, 15.6; depth of braincase, 10.4; nasal, 15.3; diastema, 11.0; mandible, 24.5; maxillary tooththrow (alveoli), 7.2; mandibular tooththrow (alveoli), 6.7.

*Specimens examined*.—Six, all from Pulo Lankawi.

**EPIMYS RATTUS DENTATUS, new subspecies**

*Type*.—Adult male (skin and skull), No. 111929, United States National Museum. Collected on Hastings Island, Mergui Archipelago, December 13, 1900, by Dr. W. L. Abbott. Original No. 783.

*Diagnosis*.—Like the form of *Epimys rattus* occurring in Trong and southern Tenasserim but cheek teeth decidedly larger, exceeding those of *E. rattus viclana*.

*Measurements*.—Type: head and body, 180 mm.; tail, 190; hind foot (dry), 36 (34); condylobasal length of skull (teeth much worn), 39.0; zygomatic breadth, 19.8; interorbital constriction, 6.0; occipital breadth, 15.8; depth of braincase, 11.2; nasal, 15.2; diastema, 11.7; mandible, 24.1; maxillary tooththrow (alveoli), 7.0; mandibular tooththrow (alveoli), 7.0; mandibular tooththrow (alveoli), 6.6.

*Specimens examined*.—Eight (one odd skull), all from Hastings Island.

*Remarks*.—The large size of the cheek teeth in this form, as in all those now known from the Mergui Archipelago, is immediately evident on comparison with specimens from the adjoining mainland. In the insular races the width of  $m^1$  usually equals and often exceeds half the least palatal width, while in the mainland animals it is usually less than half.

**EPIMYS RATTUS INSULANUS, new subspecies**

*Type*.—Adult male (skin and skull), No. 104147, United States National Museum. Collected on Helfer Island, Mergui Archipelago, March 7, 1900, by Dr. W. L. Abbott. Original No. 334.

*Diagnosis*.—Like *Epimys rattus dentatus* but general outline of skull narrowed.

*Measurements*.—Type: head and body, 185 mm.; tail, 185; hind foot (dry), 36.5 (35.5); condylobasal length of skull (teeth moderately worn), 40.6; zygomatic breadth, 18.6; interorbital constriction, 6.3; occipital breadth, 16.1; depth of braincase, 11.2; nasal, 15.4; diastema, 11.3; mandible, 24.1; maxillary tooththrow (alveoli), 7.6; mandibular tooththrow (alveoli), 6.9.

*Specimens examined*.—Six, all from Helfer Island.



*Remarks.*—The narrow, elongate form of the skull in this race as compared with the normal outline in the other members of the group occurring in the Archipelago and on the neighboring mainland is at once appreciable on comparison of series of specimens.

**EPIMYS RATTUS EXSUL**, new subspecies

*Type.*—Adult male (skin and skull), No. 124046, United States National Museum. Collected on James Island, Mergui Archipelago, December 31, 1903, by Dr. W. L. Abbott. Original No. 2958.

*Diagnosis.*—Like *Epimys rattus dentatus* but with auditory bullæ appreciably reduced in size.

*Measurements.*—Type: head and body, 175 mm.; tail, 183; hind foot (dry), 36.5 (34); condylobasal length of skull (teeth moderately worn), 37.4; zygomatic breadth, 18.5; interorbital constriction, 6.0; occipital breadth, 14.7; depth of braincase, 11.1; nasal, 14.0; diastema, 10.7; mandible, 23.1; maxillary tooththrow (alveoli), 6.9; mandibular tooththrow (alveoli), 7.0.

*Specimens examined.*—Twelve, from the following islands of the Mergui Archipelago: Sullivan, 1; James, 5; Loughborough, 6.

**EPIMYS RATTUS FORTUNATUS**, new subspecies

*Type.*—Adult male (skin and skull), No. 104148, United States National Museum. Collected on Chance Island, Mergui Archipelago, December 29, 1899, by Dr. W. L. Abbott. Original No. 191.

*Diagnosis.*—Size somewhat larger and color more yellowish (ground color a clearer chamois and blackish hairs less abundant) than in the other races of *Epimys rattus* known to occur in the Mergui Archipelago. Skull normal, with well developed auditory bullæ.

*Measurements.*—Type: head and body, 205 mm.; tail, 215; hind foot (dry), 38 (36); condylobasal length of skull (teeth much worn), 41.5; zygomatic breadth, 21.2; interorbital constriction, 6.6; occipital breadth, 16.6; depth of braincase, 11.2; nasal, 17.0; diastema, 12.9; mandible, 16.3; maxillary tooththrow (alveoli), 7.2; mandibular tooththrow (alveoli), 6.7.

*Specimens examined.*—Three, all from Chance Island.

**EPIMYS BORNEANUS**, new species

*Type.*—Adult female (skin and skull), No. 196749, United States National Museum. Collected at Telok Karang Tigau, Dutch South-

east Borneo, August 12, 1912, by H. C. Raven. Original No. 157. Presented by Dr. W. L. Abbott.

*Diagnosis.*—A member of the *firmus*-group resembling *Epimys integer* of the Natuna Islands but color of underparts and cheeks less yellowish (between cream-buff and cartridge-buff instead of chamis), and skull with more slender rostrum.

*Measurements.*—Type: head and body, 207 mm.; tail, 262; hind foot, 44 (dry, 43.5, 41); condylobasal length of skull (teeth moderately worn), 46.0; zygomatic breadth, 24.1; interorbital constriction, 6.9; mastoid breadth, 18.5; depth of braincase, 13.1; nasal, 18.9; diastema, 13.2; mandible, 29.2; maxillary tooththrow (alveoli), 8.5; mandibular tooththrow (alveoli), 8.5.

*Specimens examined.*—Four, from the following localities in Dutch Southeast Borneo: Birang River, 1; Karang Tigau, 1; Lo Bon Bon, 1; Segah River, 1.

*Remarks.*—The slenderness of the rostrum is a character not shared by other parts of the skull. In the type and a female of about the same age from Birang River the breadth of rostrum at middle of nasal is 8.4 mm.; zygomatic breadth, 24.1 and 23.9 respectively. In two similar females of *E. integer* the breadth of rostrum is 9.6, zygomatic breadth 24.0 and 24.2.

#### EPIMYS VICTOR, new species

*Type.*—Adult female (skin and skull), No. 115422, United States National Museum. Collected near mouth of Rumpin River, Pahang, May 25, 1902, by Dr. W. L. Abbott. Original No. 1706.

*Diagnosis.*—Largest known member of the *firmus*-group, the skull attaining a total length of about 60 mm., as compared with about 55 mm. in *Epimys firmus* and *E. validus*; color as in *E. firmus*; teeth like those of *E. firmus*, therefore relatively smaller than in *E. validus* and with the elements of anterior crescent in  $m^2$  and  $m^3$  less developed.

*Measurements.*—Type: head and body, 265 mm.; tail, 291; hind foot (dry), 50 (48.5); condylobasal length of skull (teeth moderately worn), 57.0; greatest length, 59.6; zygomatic breadth, 29.2; interorbital constriction, 8.3; occipital breadth, 20.2; depth of braincase, 14.5; nasal, 23.7; diastema, 17.0; mandible, 35.2; maxillary tooththrow (alveoli), 10.4; mandibular tooththrow (alveoli), 10.0.

*Specimens examined.*—Seven, from the following localities: Pahang, Rumpin River, 4; Johore, Sembrong River, 1; Ka Kuli, 1 skin and 1 skull.

*Remarks.*—This is a large, south-Peninsular representative of *Epimys firmus*. It is readily distinguishable from *E. validus* of Trong by the relatively smaller teeth with less developed enamel folds. The *Mus muelleri faderis* of Robinson and Kloss, from Selangor, is described as a much smaller animal with greatest length of skull in adult female only 48 mm.

#### EPIMYS POLLENS, new species

1906. *Mus firmus* LYON, Proc. U. S. Nat. Mus., vol. 31, p. 594. December 18, 1906. (Not of Miller.)

*Type.*—Adult male (skin and skull), No. 124691, United States National Museum. Collected at Tanjong Rengsam, Banka, May 22, 1904, by Dr. W. L. Abbott. Original No. 3250.

*Diagnosis.*—Like *Epimys firmus* of the Rhio-Linga Archipelago, but tail longer and skull differing from that of all the other known members of the group in the very abruptly constricted interorbital region and weak anterior portion of zygoma.

*Measurements.*—Type: head and body, 247 mm.; tail, 307; hind foot (dry), 48.7 (46.2); condylobasal length of skull (teeth moderately worn), 51.7; zygomatic breadth, 26.0; interorbital constriction, 7.7; occipital breadth, 19.9; depth of braincase, 14.4; nasal, 21.0; diastema, 15.0; mandible, 33.3; maxillary toothrow (alveoli), 9.1; mandibular toothrow (alveoli), 9.0.

*Specimens examined.*—Four, all from Banka.

#### EPIMYS POTENS, new species

*Type.*—Adult female (skin and skull), No. 114384, United States National Museum. Collected on Pulo Tuangku, Banjak Islands, February 5, 1902, by Dr. W. L. Abbott. Original No. 1516.

*Diagnosis.*—Like *Epimys firmus* but tail shorter (about equal to head and body instead of distinctly longer) and cheek teeth smaller.

*Measurements.*—Type: head and body, 245 mm.; tail, 240; hind foot (dry), 46.5 (43.5); condylobasal length of skull (teeth moderately worn), 48.8; zygomatic breadth, 25.8; interorbital constriction, 7.9; occipital breadth, 18.8; depth of braincase, 14.6; nasal, 19.7; diastema, 14.6; length of incisive foramina, 8.9; mandible, 32.3; maxillary toothrow (alveoli), 8.6; mandibular toothrow (alveoli), 8.2.

*Specimens examined.*—Five, all from Pulo Tuangku.

*Remarks.*—The average length of head and body in the five specimens is 232 mm., that of tail 231 mm. The tail decidedly exceeds the head and body in only one individual (17 mm.). In thirteen adults of

*Epimys firmus* the average excess of tail over head and body is 14.6 mm., while in only one does the head and body decidedly exceed the tail (10 mm.).

**EPIMYS VALENS, new species**

*Type*.—Adult female (skin and skull), No. 114285, United States National Museum. Collected on Pulo Bangkaru, Banjak Islands, January 19, 1902, by Dr. W. L. Abbott. Original No. 1430.

*Diagnosis*.—Like *Epimys potens* of Pulo Tuangku but tail decidedly shorter than head and body, skull with noticeably shortened incisive foramina, and teeth more nearly as large as in *E. firmus*.

*Measurements*.—Type: head and body, 232 mm.; tail, 203; hind foot (dry), 34.5 (32); condylobasal length of skull (teeth moderately worn), 48.8; zygomatic breadth, 25.1; interorbital constriction, 7.3; occipital breadth, 18.8; depth of braincase, 13.2; nasal, 21.2; diastema, 14.7; length of incisive foramina, 7.9; mandible, 32.5; maxillary tooththrow (alveoli), 8.7; mandibular tooththrow (alveoli), 9.0.

*Specimens examined*.—Six, all from Pulo Bangkaru.

*Remarks*.—In all of the specimens the tail is shorter than head and body, the average difference 22 mm. The color of the back and sides in the skins of *Epimys valens* and in those of *E. potens* is more yellowish than in the series of *E. firmus*. They are, however, in fresher coat, so that the difference may be purely seasonal.

**EPIMYS LUTA, new species**

1911. *Epimys sabanus* LYON, Proc. U. S. Nat. Mus., vol. 40, p. 104. April 25, 1911. (Part.)

*Type*.—Adult female (skin and skull), No. 151917, United States National Museum. Collected on Pulo Laut, Dutch Southeast Borneo, December 24, 1907, by Dr. W. L. Abbott. Original No. 5682.

*Diagnosis*.—A member of the *sabanus-vociferans* group much smaller than *Epimys sabanus* or than any of the forms of *E. vociferans* except *E. vociferans stridulus*. Differs from *E. vociferans stridulus* in darker ground color of back and sides (about ochraceous-tawny instead of about pale-ochraceous-buff), paler underparts (buffy white instead of cream-buff), and less robust skull with conspicuously weaker anterior base of zygoma, narrower antorbital plate, and longer incisive foramina.

*Measurements*.—Head and body, 210 mm.; tail, 290; hind foot (dry), 42.5 (41); condylobasal length of skull (teeth moderately worn), 45.8; greatest length, 50.2; zygomatic breadth, 22.9; inter-

orbital constriction, 7.6; nasal, 18.8; diastema, 13.0; mandible, 38.2; maxillary tooththrow (alveoli), 9.0; mandibular tooththrow (alveoli), 9.0.

*Specimen examined.*—The type.

#### EPIMYS STENTOR, new species

*Type.*—Adult female (skin and skull), No. 124044, United States National Museum. Collected on James Island, Mergui Archipelago, January 2, 1904, by Dr. W. L. Abbott. Original No. 2983.

*Diagnosis.*—A member of the *Epimys vociferans* group with skull more robust and rostrum deeper in proportion to its length than in any of the previously known forms. Color as in *E. vociferans*.

*Measurements.*—Head and body, 262 mm.; tail, 323; hind foot (dry), 46.3 (43.5); condylobasal length of skull (teeth moderately worn), 53.6 (53.8);<sup>1</sup> greatest length, 56.8 (56.9); zygomatic breadth, 27.1 (24.4); occipital breadth, 19.8 (18.8); interorbital constriction, 9.3 (8.7); nasal, 22.7 (21.2); diastema, 15.8 (14.8); length of rostrum from posterior rim of antorbital foramen, 19.0 (19.6); least depth of rostrum, 11.3 (10.4); depth at front of anterior molar, 14.7 (13.7); mandible, 35.2 (31.6); maxillary tooththrow (alveoli), 9.7 (9.6); mandibular tooththrow (alveoli), 9.7 (9.7).

*Specimen examined.*—The type.

*Remarks.*—The skull of *Epimys stentor* differs conspicuously from that of the other members of the *vociferans*-group as represented by the large series in the U. S. National Museum.

#### EPIMYS VOCIFERANS INSULARUM, new subspecies

*Type.*—Adult female (skin and skull), No. 104167, United States National Museum. Collected on Domel Island, Mergui Archipelago, February 27, 1900, by Dr. W. L. Abbott. Original No. 329.

*Diagnosis.*—Like *Epimys vociferans lancavensis* of Pulo Lancawi but smaller, the greatest length of skull in fully adult individuals rarely exceeding 54 mm.

*Measurements.*—Type: head and body, 248 mm.; tail, 330; hind foot (dry), 45 (43); condylobasal length of skull (teeth moderately worn), 50.1; greatest length, 53.7; zygomatic breadth, 24.6; interorbital constriction, 8.3; nasal, 20.0; diastema, 14.4; mandible, 31.6; maxillary tooththrow (alveoli), 10.0; mandibular tooththrow (alveoli), 9.7.

<sup>1</sup> Cranial measurements in parenthesis are those of a male *E. vociferans* (No. 112651) from Johore. Teeth moderately worn.

*Specimens examined*.—Thirty, from the following islands of the Mergui Archipelago: Kisseraing, 6 (1 odd skull); Domèl, 12 (2 odd skulls); Helfer, 2; Sullivan, 8; Hastings, 2.

**EPIMYS VOCIFERANS CLARÆ**, new subspecies

*Type*.—Adult male (skin and skull), No. 124115, United States National Museum. Collected on Clara Island, Mergui Archipelago, January 10, 1904, by Dr. W. L. Abbott. Original No. 3019.

*Diagnosis*.—Size as in *Epimys vociferans lucas* of St. Luke, Hastings and Loughboro Islands (intermediate between that of *E. vociferans insularum* and the very small *E. vociferans stridulus* of Bentinck Island); color duller and less yellowish than in the other Mergui races, but not darkened as in *E. vociferans matthæus*.

*Measurements*.—Type: head and body, 235 mm.; tail, 316; hind foot (dry), 44 (42); condylobasal length of skull (teeth moderately worn), 48.1; greatest length, 52.1; zygomatic breadth, 24.1; inter-orbital constriction, 8.3; nasal, 20.1; diastema, 13.8; mandible, 30.6; maxillary toothrow (alveoli), 9.6; mandibular toothrow (alveoli), 8.6.

*Specimens examined*.—Five, all from Clara Island.

*Remarks*.—With the exception of *Epimys stentor*, which appears to be specifically distinct from the other members of the group, the forms of *E. vociferans* occurring in the Mergui Archipelago now seem to be best treated as subspecies. The characters on which they are based, though evident when series are compared, do not serve for the positive determination of individual specimens. In a general way the larger, less differentiated forms may be said to inhabit the islands lying nearest the coast, while the smaller races are furthest separated geographically from true *Epimys vociferans* of the mainland. The most noticeable exception to this rule is furnished by the small *E. vociferans lucas*, which occurs on one of the inner islands barely separated from that on which the large dark *E. vociferans matthæus* is found. Specimens scarcely distinguishable from *E. vociferans insularum* were obtained by Dr. Abbott on Pulo Terutau, 350 km. south of the Mergui Archipelago.

**EPIMYS LEPIDUS**, new species

1907. *Mus jerdoni* LYON, Proc. U. S. Nat. Mus., vol. 31, p. 654. January 16, 1907. (Specimen from Tenasserim. Not of Blyth.)

*Type*.—Adult female (skin and skull), No. 104127, United States National Museum. Collected at Bok Pyin, southern Tenasserim, February 19, 1900, by Dr. W. L. Abbott. Original No. 315.

*Diagnosis.*—Similar to *Epimys batamanus* (Lyon) but differing externally in the shorter foot, longer tail and more yellowish color (cheeks cream-buff and underparts cartridge-buff instead of a nearly uniform pale drabby gray); skull with shorter rostrum, narrower interorbital region and nearly parallel-sided incisive foramina.

*Measurements.*—Head and body, 140 (148) mm.;<sup>1</sup> tail, 159 (129); hind foot, 27 (32.5); hind foot without claws, 26 (31); condylo-basal length of skull (teeth moderately worn), 31.4 (32.0); zygomatic breadth, 16.3 (16.0); interorbital constriction, 5.8 (6.3); occipital breadth, 13.5 (13.7); depth of braincase, 10.0 (9.5); nasal, 13.0 (11.6); length of rostrum from upper rim of antorbital foramen, 11.4; greatest breadth of rostrum, 6.2; diastema, 8.3 (9.2); mandible, 18.8 (19.1); maxillary toothrow (alveoli), 6.0 (5.9); mandibular toothrow (alveoli), 5.7 (5.6).

*Specimens examined.*—One adult and one young, both from the type locality.

#### EPIMYS GRACILIS, new species

1892. *Mus jerdoni* THOMAS, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, vol. 10, p. 939. (Not of Blyth.)

*Type.*—Adult female (in alcohol), No. 101520, United States National Museum. Collected on summit of Mount Mooleyit, northern Tenasserim, by L. Fea. Received from Genoa Museum.

*Diagnosis.*—Like *Epimys lepidus* but tail much longer; skull with more slender rostrum. Distinguished from *Epimys jerdoni* of Sikkim, as described by Blyth, in very different size and proportions (head and body about 150 instead of 100; tail 196-220 instead of 85; hind foot about 32 instead of 22).

*Measurements.*—Type: head and body, 145 mm.; tail, 200; hind foot, 31 (30); ear from meatus, 19.5; condylo-basal length of skull (teeth moderately worn), 32.5; zygomatic breadth, 15.5; interorbital constriction, 6.0; occipital breadth, 13.5; depth of braincase, 10.6; nasal, 13.6; length of rostrum from upper rim of antorbital foramen, 12.0; greatest breadth of rostrum, 5.9; diastema, 9.4; mandible, 19.6; maxillary toothrow (alveoli), 6.1; mandibular toothrow (alveoli), 5.7.

*Specimens examined.*—Two, both from the type locality.

*Remarks.*—The relationships of this rat appear to be strictly with the group including *Epimys lepidus*, *E. batamensis* and *E. inas*.

<sup>1</sup>Measurements in parenthesis are those of the type of *Epimys bullatus* (male with slightly less worn teeth).

Blyth's description of *E. jerdoni* indicates that the Sikkim animal, if related to any species occurring on the Malay Peninsula, is like *Epimys asper*, though decidedly smaller.

**EPIMYS SOLUS**, new species

*Type*.—Adult male (skin and skull), No. 123944, United States National Museum. Collected on Pulo Terutau, west coast of Malay Peninsula, November 16, 1903, by Dr. W. L. Abbott. Original No. 2902.

*Diagnosis*.—A member of the *Epimys cremoriventer* group agreeing with *E. bukit* from Jalor in large general size, but differing in the longer tail and hind foot; color as in *Epimys gilbiventer* of Sullivan Island, Rhio Archipelago.

*Measurements*.—Head and body, 160 (121) mm.;<sup>1</sup> tail, 220 (148); hind foot without claw, 30 (24.5); ear, 17 (17); condylobasal length of skull (teeth moderately worn), 32.8; greatest length, 36.5 (37); zygomatic breadth, 17.1 (18); interorbital constriction, 6.6 (6); breadth of braincase, 14.5 (15); depth of braincase, 10.0; nasal, 13.0 (15); diastema, 8.7 (9.5); mandible, 19.7; maxillary tooththrow (alveoli), 6.3 (6.5); mandibular tooththrow (alveoli), 6.1.

*Specimen examined*.—The type.

**SCIURUS ATRISTRIATUS**, new species

*Type*.—Half grown female (skin and skull), No. 196670, United States National Museum. Collected at Lo Bon Bon, Dutch Southeast Borneo, June 4, 1912, by H. C. Raven. Original No. 13. Presented by Dr. W. L. Abbott.

*Diagnosis*.—A member of the *notatus*-group resembling *Sciurus bilimitatus* of the Malay Peninsula, but underparts less slaty (between pallid-mouse-gray and white instead of a gray much like the paper on which the colors in Ridgway's "Standards" are mounted), throat with scarcely a trace of rusty wash, light bands on hairs of tail more yellowish, and pencil nearly clear black, its hairs without annulations.

*Measurements*.—Head and body, 127 mm.; tail, 145; hind foot, 34 (dry, 35, 32.5); condylobasal length of skull, 31.7; mandible, 21.4.

*Specimen examined*.—The type.

*Remarks*.—The slaty-bellied squirrels of the *vittatus*-group show

<sup>1</sup>Measurements in parenthesis are those of the type, an adult male, of *Epimys bukit* as given by Bonhote. (Fasc. Malayenses, Zool., pt. 1, p. 27. July, 1903.)



no appreciable differences in color between adult and young. The Bornean species more nearly resembles that of the Malay Peninsula than it does the Javan *S. nigrovittatus*.

**SCIURUS DULITENSIS DILUTUS**, new subspecies

*Type*.—Adult female (skin and skull), No. 196712, United States National Museum. Collected at Tanjong Batu, Dutch Southeast Borneo, August 24, 1912, by H. C. Raven. Original No. 177. Presented by Dr. W. L. Abbott.

*Diagnosis*.—Like *Sciurus dulitensis dulitensis* but color of underparts usually more dull and more diluted with white.

*Measurements*.—Type: head and body, 194 mm.; tail, 208; hind foot, dry, 44.5 (41); condylobasal length of skull (teeth not worn), 44.1; zygomatic breadth, 28.1; interorbital breadth, 16.0; nasal, 14.3; diastema, 11.0; mandible, 30.4; maxillary toothrow (alveoli), 8.9; mandibular toothrow (alveoli), 8.9.

*Specimens examined*.—Sixty-three, from the following localities in Dutch Southeast Borneo: Batu Panggol, 22; Birang River, 7; Mahakam River, north bank 13, south bank 11; Karong Tigau, 10.

*Remarks*.—The differences between the 63 specimens of this form and 30 skins of true *dulitensis* may be tabulated as follows:

- 35 *dilutus* show obviously more white on underparts than any *dulitensis*.
- 10 *dilutus* without noticeable white are paler than the palest *dulitensis*.
- 18 *dilutus* are similar to palest examples of *dulitensis*.
- 10 *dulitensis* are similar to brightest examples of *dilutus*.
- 20 *dulitensis* are brighter than brightest examples of *dilutus*.

On comparing the 10 *dulitensis* and 18 *dilutus* which are essentially similar it is seen that few if any individuals in either series can be exactly matched by skins from the other. In true *dulitensis* the red tends toward orange, while in *dilutus* it is more ochraceous. It would, however, be impossible to sort out the two lots with any degree of certainty if the skins were thrown together without labels.

**SCIURUS ATRICAPILLUS ATROX**, new subspecies

*Type*.—Adult female (skin and skull), No. 19669, United States National Museum. Collected on Talisaian Mountain, Dutch Southeast Borneo, February 6, 1913, by H. C. Raven. Original No. 457. Presented by Dr. W. L. Abbott.

*Diagnosis*.—Like *Sciurus atricapillus atricapillus* from southern Borneo, but dark area on face not extending behind eyes, and feet a grizzled blackish brown instead of clear black.

*Measurements.*—Type: head and body, 236 mm.; tail, 220; hind foot (dry), 52 (48); condylobasal length of skull (teeth slightly worn) 49.9; zygomatic breadth, 34.8; interorbital breadth, 22.3; nasal, 16.2; diastema, 12.5; mandible, 34.8; maxillary tooththrow (alveoli), 10.6; mandibular tooththrow (alveoli) 10.9.

*Specimens examined.*—Twelve, from the following localities in Dutch Southeast Borneo: Birang River, 5; Segah River, 6; Tali-saian Mountain, 1.

#### SCIURUS HUMILIS, new species

*Type.*—Immature female (m<sup>3</sup> in place, permanent premolars just appearing), No. 123116, United States National Museum. Collected on the Kateman River, East Sumatra, August 20, 1903, by Dr. W. L. Abbott. Original No. 2751.

*Diagnosis.*—A member of the *Sciurus lowi* group agreeing in size with *S. robinsoni* of the Malay Peninsula and *S. scimundi* of Pulo Kundur, Rhio Archipelago, but differing from the former in darker general color (essentially like that of the Bornean *S. lowi* but more dull; feet less grizzled; muzzle and eyering scarcely different from face) and from the latter in the normal extent of the light-buff of underparts and inner surface of legs.

*Measurements.*—Head and body, 114 mm.; tail imperfect; hind foot (dry), 33.5 (31.5); condylobasal length of skull, 28.1; zygomatic breadth, 18.3; interorbital breadth, 10.2; nasal, 7.8; diastema, 7.0; mandible, 19.6; maxillary tooththrow (alveoli), 5.8; mandibular tooththrow (alveoli), 6.0.

*Specimen examined.*—The type.

#### LARISCUS BERDMOREI AMOTUS, new subspecies

*Type.*—Adult male (skin and skull), No. 124152, United States National Museum. Collected on Domel Island, Mergui Archipelago, January 30, 1904, by Dr. W. L. Abbott. Original No. 3081.

*Diagnosis.*—Like *Lariscus berdmorei berdmorei* from southern Tenasserim, but skull with more slender rostrum.

*Measurements.*—Type: head and body, 200 mm.; tail, 130; hind foot (dry), 41 (40); condylobasal length of skull (teeth much worn), 48.1; zygomatic breadth, 27.6; interorbital breadth, 27.5; nasal, 16.0; diastema, 13.2; mandible, 32.3; maxillary tooththrow (alveoli), 10.5; mandibular tooththrow (alveoli), 10.0.

*Specimens examined.*—Two, both from Domel Island.

*Remarks.*—Though externally similar to *Lariscus berdmorei berdmorei*

*morei* from Tenasserim the island race is distinguishable by the slender rostrum, a character difficult to describe but readily appreciable to the eye.

**RATUFA MELANOPEPLA PENINSULÆ**, new subspecies

*Type*.—Adult male (skin and skeleton), No. 83478, United States National Museum. Collected at Lay Song Hong, Trong, Lower Siam, September 23, 1896, by Dr. W. L. Abbott.

*Diagnosis*.—Larger than *Ratufa melanopepla melanopepla* of Telibon Island, Trong, the skull with auditory bullæ normal in size, not reduced as in the island form.

*Measurements*.—Type: head and body,  $400 \pm$ ; tail,  $420 \pm$ ; condylobasal length of skull (teeth moderately worn), 67.0 (63.1);<sup>1</sup> zygomatic breadth, 45.2 (44.3); interorbital breadth, 29.5 (28.2); nasal, 23.3 (23.4); diastema, 17.4 (15.1); length of inflated portion of auditory bulla, 14.9 (13.3); mandible, 47.0 (41.6); maxillary toothrow (alveoli), 13.9 (14.0); mandibular toothrow (alveoli), 14.8 (14.4).

*Specimens examined*.—Seven, from the following localities: mainland of Trong, no exact locality, 1; Lay Song Hong, Trong, 2; Ty Ching, Trong, 2; Rumpin River, Pahang, 2.

*Remarks*.—Examination of the original records shows that the type and three other specimens of *Ratufa melanopepla* were collected on Telibon Island, not on the mainland of Trong. The four specimens from the island differ so noticeably from those taken on the neighboring mainland that it is necessary to recognize two races. From Trong to the southern limit of the group *R. melanopepla peninsulæ* appears to be very constant in its characters. Whether or not in the region north of Trong it intergrades with *R. phæopepla* is not indicated by the material that I have seen.

**RATUFA PHÆOPEPLA**, new species

*Type*.—Adult male (skin and skull), No. 124235, United States National Museum. Collected at Sungei Balik, Tenasserim, February 25, 1904, by Dr. W. L. Abbott. Original No. 3141.

*Diagnosis*.—Like *Ratufa melanopepla peninsulæ* but larger (hind foot without claws 80 to 89 mm. instead of 71 to 83 mm., greatest length of skull in individuals with distinctly worn teeth 74 to 78 mm.

<sup>1</sup> Measurements in parenthesis are those of the type of *R. melanopepla melanopepla*, also a male with moderately worn teeth.

instead of 69 to 72 mm.) ; color of upperparts in fresh pelage a rich dark brown (near the chestnut-brown of Ridgway) instead of black.

*Measurements.*—Type: head and body, 405 mm.; tail, 500; hind foot, 91 (85); condylobasal length of skull (teeth moderately worn), 71.4; zygomatic breadth, 46.2; interorbital breadth, 28.3; nasal, 23.8; diastema, 16.0; length of inflated portion of auditory bullæ, 15.9; mandible, 48.0; maxillary toothrow (alveoli), 14.6; mandibular toothrow (alveoli), 15.0.

*Specimens examined.*—Sixteen, from the following localities in southern Tenasserim: Red Point, 2; Sungei Balik, 7; Telok Besar, 5; Victoria Point, 2.

#### RATUFA CELÆNOPEPLA, new species

*Type.*—Adult male (skin and skull), No. 124149, United States National Museum. Collected on Domel Island, Mergui Archipelago, January 26, 1904, by Dr. W. L. Abbott. Original No. 3073.

*Diagnosis.*—Like *Ratufa phæopepla* but color of upperparts in fresh pelage clear blue-black; skull with auditory bullæ more inflated.

*Measurements.*—Type: head and body, 415 mm.; tail, 487; hind foot, 95 (88.5); condylobasal length of skull (teeth moderately worn), 73.4; zygomatic breadth, 49.4; interorbital breadth, 31.2; nasal, 24.3; diastema, 17.4; length of inflated portion of auditory bulla, 16.6; mandible, 48.9; maxillary toothrow (alveoli), 14.5; mandibular toothrow (alveoli), 15.4.

*Specimens examined.*—Three, all from Domel Island.

*Remarks.*—The three forms here described increase the known members of the restricted *melanopepla*-group to nine. Their characters are indicated in the following key:

#### KEY TO THE SQUIRRELS OF THE RATUFA MELANOPEPLA GROUP

Large forms, greatest length of skull in individuals with distinctly worn teeth usually more than 72 mm.

Upperparts chestnut brown (never black) Tenasserim.....*phæopepla*  
Upperparts black when not faded.

Greatest length of skull about 71 to 74 mm. (Terutau and Lankawi) .....*fretensis*

Greatest length of skull about 74 to 78 mm. (Domel).....*celænopepla*

Small forms, greatest length of skull in individuals with distinctly worn teeth usually less than 72 mm.

Skull unusually narrowed (Natuna Islands).....*angusticeps*

Skull normal.

Auditory bullæ reduced in size (Telibon Island).....*melanopepla*

Auditory bullæ normal.

Average excess of length of tail over that of head and body about 95 mm.

Underparts approximately ochraceous-buff (Malay Peninsula from Trong to Pahang).....*peninsula*

Underparts approximately tawny (Penang).....*penangensis*

Average excess of tail over head and body less than 70 mm.

Skull usually larger with particularly heavy rostrum (Anamba Islands).....*anambensis*

Skull usually smaller with weaker rostrum (Tioman Island).....*tiomanensis*

#### PETAURISTA MIMICUS, new species

1908. *Petaurista nitidula* LYON, Proc. U. S. Nat. Mus., vol. 34, p. 634. September 14, 1908. (Not of Thomas.)

*Type*.—Adult female (skin and skull), No. 143341, United States National Museum. Collected on Pulo Rupert, eastern Sumatra, March 10, 1906, by Dr. W. L. Abbott. Original No. 4695.

*Diagnosis*.—Like *Petaurista nitidulus* of the North Natuna Islands but ear slightly larger and reddish brown of upperparts somewhat lighter.

*Measurements*.—Type: head and body, 400 mm.; tail, 405; hind foot (dry), 64 (59); condylobasal length of skull (teeth much worn), 60.4; zygomatic breadth, 42.8; interorbital constriction, 12.6; nasal, 18.0; diastema, 13.8; mandible, 42.4; maxillary tooththrow (alveoli), 14.4; mandibular tooththrow (alveoli), 11.5.

*Specimens examined*.—Four, all from Pulo Rupert.

*Remarks*.—This animal, though very different from the large *Petaurista nitidus marchio* of the Sumatran mainland, closely resembles *P. nitidulus* of Bunguran. The ears in four specimens of each of the small animals (measured in skin after relaxing) give the following extremes (those of *nitidulus* in parenthesis): height from meatus, 31 to 33 (30 to 31); height from crown, 20 to 22 (19 to 21); width, 17 to 18 (16 to 17).

#### PRESBYTIS CORVUS, new species

*Type*.—Adult male (skin and skull), No. 123993, United States National Museum. Collected on Pulo Terutan, west coast of Malay Peninsula, November 10, 1903, by Dr. W. L. Abbott. Original No. 2852.

*Diagnosis*.—Like *Presbytis carbo* of Pulo Langkawi but darker,

the difference between the two forms about as great as that between *P. carbo* and the less dark *P. obscura* of the Malay Peninsula.

*Measurements.*—Type: head and body, 520 mm.; tail, 810; hind foot (dry), 160 (155); condylobasal length of skull (teeth moderately worn), 78.5; greatest length, 96.8; zygomatic breadth, 77.4; breadth of braincase, 52.8; breadth of rostrum over canines, 30.0; mandible, 70.6; maxillary tooththrow exclusive of incisors, 33.3; mandibular tooththrow exclusive of incisors, 39.2.

*Specimens examined.*—Two, both from Pulo Langkawi.

#### PRESBYTIS AUSTRALIS, new species

*Type.*—Adult male (skin and skull), No. 112709, United States National Museum. Collected at Jambu Luang, east coast of Johore, July 31, 1901, by Dr. W. L. Abbott. Original No. 1196.

*Diagnosis.*—Like *Presbytis femoralis* of Singapore Island but size not reduced, the greatest length of skull about 95 mm. as usual in Peninsular, Sumatran and Bornean members of the group.

*Measurements.*—Type: head and body, 465 mm.; tail, 730; hind foot (dry), 160 (160); condylobasal length of skull (basal suture closed, m<sup>3</sup> slightly worn), 72.2 (66.3);<sup>1</sup> greatest length, 94.1 (88.3); zygomatic breadth, 74.2 (66.8); breadth of braincase, 57.2 (51.3); breadth of rostrum over canines, 26.7 (26.3); mandible, 65.6 (60.6); maxillary tooththrow exclusive of incisors, 30.3 (29.7); mandibular tooththrow exclusive of incisors, 33.5 (33.3).

*Specimens examined.*—Five, from the following localities: Rumpin River, Pahang, 1; Jambu Luang, Johore, 1; Sembrong River, Johore, 3.

*Remarks.*—The material in the United States National Museum shows that the Malay Peninsula is inhabited by three forms of the *Presbytis femoralis* group: (a) the very dark *keatii* at the north (specimens from southern Tenasserim), (b) the less dark *australis*; thighs showing a slight though evident grizzle on outer side; and (c) the small true *femoralis* of Singapore Island, indistinguishable from *australis* except by size. In the original description of *Presbytis femoralis*,<sup>2</sup> supposed to equal the "*Simia maura*?" of Raffles, the type-locality is said to be "Sumatra, etc." As the carefully written account of the animal's color is not appropriate to any of the known

<sup>1</sup> Cranial measurements in parenthesis are those of a male topotype (No. 86897) of *P. femoralis* with m<sup>3</sup> slightly worn.

<sup>2</sup> 1838. *S[imnopithecus] femoralis* MARTIN, Charlesworth's Mag. Nat. Hist., vol. 2, p. 436. August, 1838.

Sumatran forms of the group, while it exactly applies to the one occurring on Singapore Island, where Raffles obtained much of his material, I have no hesitation in regarding Singapore as the true type-locality. The *neglectus* of Schlegel thus becomes an exact synonym of *femoralis* Martin.

**PRESBYTIS VIGILANS, new species**

1901. *Scenopithecus cristatus* MILLER, Proc. Washington Acad. Sci., vol. 3, p. 138. March 26, 1901. (Not of Raffles.)

*Type*.—Adult female (skull only), No. 104840, United States National Museum. Collected on Sirhassen Island, South Natuna Islands, June 2, 1900, by Dr. W. L. Abbott. Original No. 422.

*Diagnosis*.—General characters of the skull and teeth as in other members of the *cristata*-group but region between narial aperture and middle of frontal more sloping, and apparent width of orbit when viewed from directly above about 17 mm. instead of about 12 mm.

*Measurements*.—Type (teeth much worn): condylobasal length, 75.0 mm.; greatest length, 93.5; zygomatic breadth, 73.6; breadth of braincase, 53.9; breadth of rostrum over canines, 23.8; mandible, 67.6; maxillary toothrow exclusive of incisors, 30.9; mandibular toothrow exclusive of incisors, 35.2.

*Specimens examined*.—Two skulls, both from Sirhassen Island.

*Remarks*.—The characters on which this species is founded are very evident on comparison with the series of 34 skulls of other members of the *Presbytis cristata* group in the National Museum collection.

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