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DESCRIPTIONS OF SIXTEEN NEW MURINE RODENTS  
FROM CELEBES.

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Among the mammals which the generosity of Dr. W. L. Abbott enabled Mr. H. C. Raven to collect in Celebes for the United States National Museum we have found the following sixteen forms which appear to have been not previously described.

*Echiothrix centrosa*, sp. nov.

Type from Winatoc (between Koelawi and Gimpoe), Middle Celebes. No. 218,706, U. S. National Museum; skin and skull of adult ♂ (teeth moderately worn); collected January 9, 1917, by H. C. Raven; original number 3077.

*Diagnosis*.—Like *Echiothrix leucura* Gray, of North Celebes; but more grayish, less buffy, in color; with more cream-buff, less yellowish, underparts and inner surfaces of limbs. Ears smaller; teeth smaller, the length of entire upper tooth row about equal to that of first and second molars of *leucura*.

*Measurements*.—Type: Head and body, 215 mm.; tail, 265; hind foot, 53; ear from notch, dry, 29.4. Skull of type: Condylbasal length, 52.0; zygomatic breadth, 23.6; palatal length, 29.5; breadth of braincase, 19.6; interorbital breadth, 7.7; orbit to end of nasals, 25.2; mandible, 30.8; upper tooth row, 6.4; lower tooth row, 6.7.

*Specimens examined*.—Five, all from the interior of Middle Celebes; Besoa, 1; Gimpoe, 2; Toware, Bada, 1; Winatoc, 1, the type.

*Remarks*.—This form is like *Echiothrix leucura* of North Celebes in size and proportions of the skin and skull; except that it has smaller ears and smaller teeth. In color it is conspicuously different from a series of *leucura* from Temboan, North Celebes; the yellowish-buff tints of *leucura* are replaced by vinaceous-gray, especially noticeable on the flanks; and the belly is a whitish cream-buff rather than deep yellowish-buff.

*Echiothrix brevicula*, sp. nov.

Type from Pinedapa (about 5 miles inland from the Gulf of Tomini, near Mapane), Middle Celebes. No. 219,744, U. S. National Museum; skin and skull of adult ♂ (teeth much worn); collected January 29, 1918, by H. C. Raven; original number 3467.

*Diagnosis.*—Differs from *Echiothrix leucura* and *E. centrosa* in smaller size; smaller hind feet; much more vinaceous, less buffy or yellowish, coloration; darker underparts, buff or reddish-buff rather than yellowish or whitish; and smaller, less narrowed skull. Ears and teeth small, as in *centrosa*.

*Measurements.*—Type: Head and body, 198 mm.; tail, 240; hind foot, 48; ear from notch, dry, 28.1. Skull of type: Condylbasal length, 48.7; zygomatic breadth, 23.7; palatal length, 27.8; breadth of braincase, 19.0; interorbital breadth, 6.9; orbit to end of nasals, 23.1; mandible, 28.2; upper tooth row, 6.5; lower tooth row, 6.5.

*Specimens examined.*—Thirteen from the type locality.

*Remarks.*—This species is easily separated from *E. leucura* and *E. centrosa* by its small size, peculiar coloration, and the less narrowed skull. It has small ears and small teeth as in *E. centrosa*.

#### ***Rattus musschenbroekii tetricus*, subsp. nov.**

Type from Gimpoe (southwest from Lake Lindoe), Middle Celebes. No. 219,613, U. S. National Museum; skin and skull of adult ♂ (teeth moderately worn); collected August 27, 1917, by H. C. Raven; original number 3184.

*Diagnosis.*—Like *Rattus musschenbroekii musschenbroekii* Jentink from North Celebes (Menado); but larger, with longer tail and hind foot; general color of upperparts much more reddish, less buffy; skull larger, with more robust teeth.

*Measurements.*—Type: Head and body, 160 mm.; tail, 145; hind foot, 34. Skull of type: Condylbasal length, 35.0; zygomatic breadth, 16.7; breadth of braincase, 15.1; interorbital breadth, 5.9; mandible, 20.8; maxillary tooth row, 6.1; mandibular tooth row, 6.1.

*Specimens examined.*—Ten, all from Middle Celebes; Gimpoe, 1; Pine-dapa, 7; Rano Lindoe, 1, Rano Rano, 1.

*Remarks.*—Two well marked forms of *Rattus musschenbroekii* are included in the collection. The typical form is represented by more than 70 specimens from localities in North Celebes. Compared with these, the small series of skins and skulls from Middle Celebes is conspicuously different, the specimens averaging larger and much more reddish, with larger, especially longer, skulls and with larger teeth.

#### ***Rattus raveni*, sp. nov.**

Type from Toli Toli, North Celebes. No. 199,976, U. S. National Museum; skin and skull of adult ♂ (teeth moderately worn); collected December 16, 1914, by H. C. Raven; original number 1963.

*Diagnosis.*—A large, light colored member of the *Rattus concolor* group. Upperparts grizzled ochraceous tawny; the longer, soft hairs tipped with buckthorn brown; the spiny hairs grayish buff, with blackish tips; hind foot creamy buff, sometimes with a faint line of dark extending down from ankle. Differs further from specimens of the *concolor* group from Sempang

River, Borneo (referred to *R. ephippium*<sup>1</sup>), in having a longer tail and wider skull; the brain case, especially, less narrowed.

*Measurements.*—Type: Head and body, 123 mm.; tail, 150; hind foot, 27. Average measurements of ten adult males from type locality: Head and body, 121.7; tail, 146.7; hind foot, 26. Skull of type: Condylbasal length, 29.0; zygomatic breadth, 14.4; palatal length, 16.5; breadth of braincase, 13.2; interorbital breadth, 4.9; mandible, 16.8; maxillary tooth row, 5.6; mandibular tooth row, 5.5.

*Specimens examined.*—Eighty-nine, including 79 from the type locality, and ten from the following localities in Middle Celebes: Besoa, 2; Gimpoë, 4; Pinedapa, 1; Toware, Bada, 2; Watoetaoe, Napoe, 1.

*Remarks.*—This is the species usually listed as *ephippium* in the literature of the mammals of Celebes. It clearly needs separation from both *Rattus ephippium* and *R. concolor*. Specimens from Middle Celebes seem inseparable from those from Toli Toli; but a well marked local form of the species, described below, occurs in northeastern Celebes.

#### ***Rattus raveni eurous*, subsp. nov.**

Type from Molengkapoti, Kwandang, North Celebes. No. 199,927, U. S. National Museum; skin and skull of adult ♂ (teeth moderately worn); collected October 15, 1914, by H. C. Raven; original number 1724.

*Diagnosis.*—Differs from *Rattus raveni raveni* in smaller size and darker coloration. Upperparts grizzled Sudan brown; the color decidedly reddish brown rather than ochraceous, buffy, or tawny as in true *raveni*. Tail and hind foot shorter.

*Measurements.*—Type: Head and body, 110 mm.; tail, 135; hind foot, 24. Average measurements of ten adult males from type locality: Head and body, 114.8; tail, 131.0; hind foot, 24.2. Skull of type: Condylbasal length, 28.3; zygomatic breadth, 13.9; palatal length, 15.2; breadth of braincase, 13.2; interorbital breadth, 4.6; mandible, 16.7; maxillary tooth row, 5.3; mandibular tooth row, 4.9.

*Specimens examined.*—Thirty-five, all from North Celebes: Koala Prang, 1; Molengkapoti, 26; Pulo Paleleh, 1; Temboan, 5; Teteamoet, 2.

*Remarks.*—All specimens of *Rattus raveni* from localities between the Paleleh River and the eastern extremity of the northern peninsula are referable to the subspecies *eurous*. They are decidedly smaller and more reddish in color than specimens from the western end of the northern peninsula, at Toli Toli, and from Middle Celebes. This form approaches in appearance *Rattus buruensis* (Allen) from Bouru Island, but is somewhat lighter colored, more reddish, than that species, and has a decidedly weaker skull, with smaller teeth.

#### ***Rattus palelae*, sp. nov.**

Type from Pulo Paleleh, north coast of Celebes. No. 200,063, U. S. National Museum; skin and skull of adult ♀ (teeth moderately worn); collected August 2, 1914, by H. C. Raven; original number 1619.

<sup>1</sup>Lyon, Proc. U. S. Nat. Mus., Vol. 40; p. 98, 1911.

*Diagnosis.*—A member of the *Rattus rattus* group differing from *Rattus hoffmanni* (Matschie), the common member of the group throughout northern Celebes, in paler coloration; longer tail; less angular, more rounded antorbital plate; and much smaller teeth.

*Measurements.*—Type: Head and body, 178 mm.; tail, 220; hind foot, 36. Skull of type: Condylbasal length, 40.6; zygomatic breadth, 19.2; palatal length, 23.3; mastoid breadth, 16.0; mandible, 23.7; maxillary tooth row, crowns, 6.2; mandibular tooth row, crowns, 6.1. (Average measurements of ten adults of *hoffmanni*: Tail, 195; maxillary tooth row, crowns 7.0.)

*Specimens examined.*—Seven; two from Pulo Paleleh; four from Toli Toli, and one from Molengkapoti, on the mainland of northern Celebes.

*Remarks.*—There is in the collection a very extensive series of specimens of *Rattus hoffmanni* from mainland localities on the northern peninsula of Celebes, from Menado west and south to Laboea Sore, just north of Parigi. The seven specimens of *Rattus palelae* are instantly separable from any specimen of *hoffmanni* by the much smaller, especially narrower, teeth. In addition to this diagnostic character, the specimens of *palelae* average distinctly lighter, less richly colored, and have longer tails. *Rattus hoffmanni* was not taken on Pulo Paleleh, but specimens with small teeth, and in no way distinguishable from the new species, were collected at two mainland localities on the northern coast where good series of *hoffmanni* were also obtained.

***Rattus hoffmanni linduensis*, subsp. nov.**

Type from Tomado, Lake Lindoe, Middle Celebes. No. 218,700, U. S. National Museum; skin and skull of adult ♀ (teeth moderately worn); collected March 28, 1917, by H. C. Raven; original number 3141.

*Diagnosis.*—Like *Rattus hoffmanni hoffmanni* (Matschie) of northern Celebes, but averaging smaller and darker; with longer, softer pelage; and smaller skull.

*Measurements.*—Type: Head and body, 170 mm.; tail, 170; hind foot, 37.

Skull of type: Condylbasal length, 38.9; palatal length, 21.9; zygomatic breadth, 20.5; mastoid breadth, 16.7; interorbital breadth, 5.8; mandible, 25.2; maxillary tooth row, crowns, 7.4; mandibular tooth row, crowns, 7.5.

*Specimens examined.*—Forty-nine, from the following localities in Middle Celebes: Bumbaroedjaba; Koelawi; Lechio; Pinedapa; Rano Rano; Tomado, Lake Lindoe.

*Remarks.*—All of these specimens of *Rattus hoffmanni* from the highlands of Middle Celebes are readily separable from specimens of the typical form from North Celebes by the long, soft, richly colored pelage. The underparts average darker also, more grayish buff; the skulls average distinctly smaller, but the teeth are large, as in the typical form. The specimens from Bumbaroedjaba are clearly referable to *linduensis* rather than to true *hoffmanni* which occurs near the coast, north of Toboli, at Laboea Sore.

***Rattus hoffmanni subditivus*, subsp. nov.**

Type from Toware, Bada, Middle Celebes. No. 219,691, U. S. National Museum; skin and skull of adult ♀ (teeth moderately worn); collected September 18, 1917, by H. C. Raven; original number 3270.

*Diagnosis*.—Larger and lighter colored than *Rattus hoffmanni hoffmanni* or *R. h. linduensis*; grayer, less rufous or rich dark brown; underparts lighter, with strong suffusion of pale yellowish rather than grayish drab. Skull larger than in *linduensis*, as large as in typical *hoffmanni*.

*Measurements*.—Type: Head and body, 195 mm; tail, 165; hind foot, 45. Skull of type: Condylbasal length, 44.9; palatal length, 26.0; zygomatic breadth, 20.9; mastoid breadth, 17.5; interorbital breadth, 7.4; mandible, 26.3; maxillary tooth row, crowns, 7.0; mandibular tooth row, crowns, 6.8.

*Specimens examined*.—Six, all from southern localities in Middle Celebes: Gimpoe, 3; Toware, Bada, 1; Watoetaoe, Napoe, 2.

*Remarks*.—South of the region in Middle Celebes occupied by the small skulled, rich colored, and long furred *R. h. linduensis*, is this form of *hoffmanni* with shorter, harsher pelage; more like the typical form but with much lighter, more grayish brown, coloration. It is a large animal, with large hind feet.

#### ***Rattus mollicomus*, sp. nov.**

Type from Goenoeng Kalabat; altitude 6,500 feet, northeastern Celebes. No. 217,752, U. S. National Museum; skin and skull of adult ♂ (teeth considerably worn); collected April 10, 1916, by H. C. Raven; Original number 2433.

*Diagnosis*.—A member of the *Rattus rattus* group related to *R. hoffmanni*, but with much longer, softer pelage; skull shorter and broader, with spreading zygomata; the antorbital plates less extended forward.

*Measurements*.—Type: Head and body, 187 mm.; tail, 195; hind foot, 40. Skull of type: Condylbasal length, 42.0; zygomatic breadth, 21.7; palatal length, 23.9; interorbital breadth, 6.0; mastoid breadth, 17.5; mandible, 26.7; maxillary tooth row, crowns, 8.0; mandibular tooth row, crowns, 7.8.

*Specimens examined*.—Twelve, all from 5,600 to 6,500 feet altitude on Goenoeng Kalabat.

*Remarks*.—This high mountain species is very different from *Rattus hoffmanni* of the surrounding lowlands. There is no reason to suspect intergradation with *hoffmanni*; and the long, soft pelage and short, broad skull make *R. mollicomus* an easily recognized form.

#### ***Rattus adpersus*, sp. nov.**

Type from Pinedapa, Middle Celebes. No. 219,602, U. S. National Museum; skin and skull of adult ♂ (teeth considerably worn); collected January 22, 1918, by H. C. Raven; original number 3427.

*Diagnosis*.—Related to *Rattus chrysochomus* (Hoffmann) of North Celebes, but general coloration darker; the characteristic agouti-like flecking more brownish, less yellowish; sides and underparts especially less yellowish. Tail shorter, almost unicolor, only very slightly lighter colored on underside near base, and without light colored tip. Skull smaller.

*Measurements*.—Type: Head and body, 163; tail, 147; hind foot, 38. Skull of type: Condylbasal length, 38.8; zygomatic breadth, 19.8; inter-

orbital breadth, 6.7; mastoid breadth, 16.8; mandible, 24.0; maxillary tooth row (alveoli), 7.7; mandibular tooth row (alveoli), 7.2.

*Specimens examined.*—Twenty-three from the type locality and 2 from Toware, Bada.

*Remarks.*—These specimens have been compared with about 150 skins and skulls of *Rattus chrysocomus* (including for the present *Mus fratrorum* Thomas) from numerous localities in North Celebes. The specimens of *chrysocomus* vary considerably in size but average larger than examples of the new form from Middle Celebes, with much more distinctly yellowish flecking. The northern species always has the terminal portion and the whole underside of the tail whitish. The color of the upperparts in some specimens of *adpersus* approaches very closely to that of the type specimen of *Rattus andrewsi* (Allen) from Pulo Boeton, off the coast of southeastern Celebes, which proves to be a member of the *chrysocomus* group.

#### ***Rattus nigellus*, sp. nov.**

Type from Bumbaroedjaba (near Toboli), northern Middle Celebes. No. 218,140, U. S. National Museum; skin and skull of adult ♂ (teeth moderately worn); collected November 8, 1916, by H. C. Raven; original number 2936.

*Diagnosis.*—A small, dark member of the *chrysocomus* group with long, soft pelage. Flanks as dark as back, median area of underparts cinnamon drab. Flecking of upperparts brown, not yellowish; wrist and heel blackish; toes whitish. Tail short, almost entirely blackish, with only a slight indication in a few specimens of light color on underside. Skull smaller than that of *Rattus adpersus*.

*Measurements.*—Type: Head and body, 160; tail, 131; hind foot, 34. Skull of type: Condylbasal length, 35.8; zygomatic breadth, 17.5; interorbital breadth, 6.3; mastoid breadth, 15.5; mandible, 21.6; maxillary tooth row (alveoli), 6.5; mandibular tooth row (alveoli), 6.6.

*Specimens examined.*—Twelve, all from northern Middle Celebes, on east side of neck of land connecting Middle Celebes with North Celebes: Bumbaroedjaba, 11; Laboea Sore, 1.

*Remarks.*—This small species is related to *R. adpersus* rather than to *R. chrysocomus* of North Celebes. It is easily distinguished from *adpersus* by its lesser external measurements; longer, softer pelage; and small skull.

#### ***Rattus penitus*, sp. nov.**

Type from Goenoeng Lechio (southwest from Lake Lindoe), Middle Celebes; above 6,000 feet altitude. No. 218,686, U. S. National Museum; skin and skull of adult ♂ (teeth moderately worn); collected January 21, 1917, by H. C. Raven; original number 3109.

*Diagnosis.*—A mountain member of the *chrysocomus* group with long, soft, cinnamon-flecked fur; sides dark like upperparts; belly grayish buff; feet scantily haired with grayish or whitish, toes whiter. Entire underside and terminal third of tail above, whitish. Skull with extraordinarily enlarged rostrum, which is thickened throughout, and only very slightly

tapering toward end; antorbital plate weak and sloping, without squarish angle.

*Measurements.*—Type: Head and body, 172; tail, 190; hind foot, 41. Skull of type: Condylbasal length, 40.2; palatal length, 22.5; zygomatic breadth, 18.9; mastoid breadth, 15.8; interorbital breadth, 6.8; nasals, 18.1 x 5.8; width of rostrum in front of antorbital plate, 8.1; mandible, 24.0; maxillary tooth row (alveoli), 7.8; mandibular tooth row (alveoli), 8.0.

*Specimens examined.*—Five from the type locality, all collected above 6,000 feet.

*Remarks.*—This large-snouted member of the *chrysocomus* group is very different from all the related forms, with the exception of the species described next below, also a highland form, which it resembles in many features.

#### ***Rattus sericatus*, sp. nov.**

Type from Rano Rano (east of Lake Lindoe and north of Lake Poso), Middle Celebes; about 6,000 feet altitude. No. 219,627, U. S. National Museum; skin and skull of adult male (teeth considerably worn); collected December 19, 1917, by H. C. Raven; original number 3340.

*Diagnosis.*—Like *Rattus penitus*, but darker, and with still longer, softer pelage; feet more fully clothed with whitish hairs, sharply contrasted with dark brown of ankle. Skull with rostrum enlarged, but less thickened at end, more tapering, than in *penitus*.

*Measurements.*—Type: Head and body, 175; tail, 170; hind foot, 40. Skull of type: Condylbasal length, 41.4; palatal length, 23.7; zygomatic breadth, 19.5; mastoid breadth, 17.4; interorbital breadth, 6.9; nasals, 18.7 x 5.3; width of rostrum in front of antorbital plate, 8.5; mandible, 24.5; maxillary tooth row (alveoli), 8.1; mandibular tooth row (alveoli), 7.8.

*Specimens examined.*—Five from the type locality.

*Remarks.*—This species, while obviously related to *Rattus penitus*, is readily distinguished by its much longer, softer pelage and the less thickened rostrum. Both species are large, high mountain forms of the *chrysocomus* group, with white-tipped tails.

#### ***Rattus rallus*, sp. nov.**

Type from Gimpoe, Middle Celebes. No. 219,595, U. S. National Museum; skin and skull of adult ♀ (teeth considerably worn); collected September 7, 1917, by H. C. Raven; original number, 3233.

*Diagnosis.*—A member of the *chrysocomus* group resembling *Rattus nigellus*, but smaller, with shorter hind foot, and much smaller teeth. Tail dark above, light below. Skull with flatter, less arched braincase, longer rostrum, and smaller auditory bullæ.

*Measurements.*—Type: Head and body, 145; tail, 130; hind foot, 32. Skull of type: Condylbasal length, 35.8; zygomatic breadth, 18.3; mastoid breadth, 15.3; interorbital breadth, 6.3; mandible, 20.3; maxillary tooth row (alveoli), 6.3; mandibular tooth row (alveoli), 6.4.

*Specimens examined.*—Eight, all from Middle Celebes: Gimpoe, 2; Goenoeng Lechio, 2; Lake Lindoe, 4.

*Remarks.*—This species differs conspicuously from the other member of the *chrysocomus* group inhabiting the same district (*Rattus penitus*), and externally resembles very closely *Rattus nigellus* from northern Middle Celebes. From *R. nigellus* it is chiefly distinguished by the smaller foot, more sharply bicolored tail; more slender skull with less inflated braincase; and smaller teeth. Two specimens out of the eight examined have the tip of the tail for 12 mm. whitish.

***Rattus hellwaldii localis*, subsp. nov.**

Type from Laboea Sore (north of Parigi), Celebes. No. 218,120, U. S. National Museum; skin and skull of adult ♂ (teeth moderately worn); collected December 1, 1916, by H. C. Raven; original number 2987.

*Diagnosis.*—Like typical *Rattus hellwaldii* (Jentink) of Menado, North Celebes, but much lighter, less richly colored; pelage shorter and harsher, mixed on back with a few spinous hairs. Skull as in true *hellwaldii* but with larger auditory bullæ.

*Measurements.*—Type: Head and body, 174; tail, 186; hind foot, 43. Skull of type: Condylbasal length, 41.2; zygomatic breadth, 19.6; interorbital breadth, 7.2; mastoid breadth, 16.5; mandible, 23.5; maxillary tooth row (alveoli), 7.0; mandibular tooth row (alveoli), 7.4.

*Specimens examined.*—Twelve from the type locality and one from Parigi.

*Remarks.*—In a series of more than 60 specimens of typical *Rattus hellwaldii* from extreme northeastern Celebes, all of the skins are intensely colored. The specimens in the series from Laboea Sore differ conspicuously in their dull, paler coloration. No spiny hairs are apparent in any specimens of typical *hellwaldii*, but they are present in small proportion in all examples of the new race. A large series of specimens of this group from the interior of Middle Celebes seems inseparable from the typical form from Menado. In many individuals from this region the auditory bullæ are abnormally swollen, a condition accompanied by the presence of a nematode parasite within the bullæ. Such distortion is not present in skulls from other parts of Celebes, nor do we recall its occurrence in any other rats.

***Rattus hellwaldii cereus*, subsp. nov.**

Type from Toli Toli, northwestern Celebes. No. 200,232, U. S. National Museum; skin and skull of adult ♂ (teeth moderately worn); collected November 30, 1914, by H. C. Raven; original number 1846.

*Diagnosis.*—Like *Rattus hellwaldii hellwaldii*, but larger, with longer hind foot; and less richly colored. Skull larger, with larger auditory bullæ.

*Measurements.*—Type: Head and body, 200; tail, 181; hind foot, 46. Skull of type: Condylbasal length, 43.2; zygomatic breadth, 20.6; inter-

orbital breadth, 6.8; mastoid breadth, 17.0; mandible, 25.2; maxillary tooth row (alveoli), 7.3; mandibular tooth row (alveoli), 7.2.

*Specimens examined.*—Thirteen from the type locality.

*Remarks.*—This large, well-marked subspecies of *hellwaldii* evidently intergrades with the typical form along the northern coast of Celebes. Specimens from Paleleh River and Molengkapota are intermediate between the two forms. The Toli Toli form is almost exactly intermediate in coloration between true *hellwaldii* and *localis*, but it averages considerably larger than either of these forms, and has a larger skull.

