

Article XXVIII.—MAMMALS FROM THE ISLAND OF HAINAN, CHINA.

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PLATE LXIX.

Recently the Museum purchased a collection of mammals from Mr. Alan Owston of Yokohama, collected by his agents in the island of Hainan, China, in 1903 and 1904 (Dec. 20, 1902—July 4, 1904). The collection numbers 238 specimens, representing 31 species, and is noteworthy as being the first considerable collection of mammals received by any museum from Hainan.

In 1868 the island was visited by the late Robert Swinhoe, but he appears to have brought away very few specimens of mammals, and these were mainly flat skins, without skulls, purchased of the natives. He, however, published two papers on the mammals of Hainan, one on the 'Cervine Animals' (P. Z. S., 1869, pp. 652–660), and the other a general paper 'On the Mammals of Hainan' (P. Z. S., 1870, pp. 224–239), the two papers containing an enumeration of all the species of mammals he "saw or heard of during my [his] visit to that island." The species "actually seen or procured in whole or in part" by him numbered 24, with references to others, domestic and wild, taken from the 'Hainan Gazetteer.' His field notes on many of the species are extended and valuable, and he described a single species (*Lepus hainanus*) as new to science. These two papers constitute almost the entire sum of our published knowledge of the mammals of Hainan. Although quite a number of the species were provisionally determined without direct reference to specimens, or merely to imperfect skins, his records have gone into literature as the sole basis for the occurrence of a number of mainland species on the island of Hainan.

In 1892, Mr. Oldfield Thomas described the *Hylobates* of Hainan as *H. hainanus*, from a specimen received at the British Museum from Mr. W. T. Lay; this species was again referred to at length by Mr. R. I. Pocock, in 1905, his observations being based on a specimen living in the Gardens of the London Zoological Society. In 1892, Dr. A. B. Meyer referred to a specimen of *Semnopithecus* received at the Dresden Museum from Hainan, which he identified as *S. nemæus*.

The above-cited five papers comprise all the literature I have been able to find, after much search, relating directly to the mammalian fauna of Hainan, which has remained till now very little known.

The island of Hainan is separated from the mainland of southern China by the narrow Strait of Hainan, only some 15 to 20 miles wide. It is situated in N. Lat. 18° – 20° , E. Long. 108° $30'$ – 111° , and has a length of about 160 miles, with a breadth of about 90 miles, the longer axis running in a northeast-southwest direction. The area is given as 12,000 to 14,000 square miles. The surface is diversified, rising in the interior to mountains of 6,000 to 7,000 feet altitude, which protect the southern part from the monsoon; this part is subtropical, and is hence climatically quite different from the adjoining mainland of southern China.

The specimens constituting this collection consist of dry skins and skulls, the skulls being left inside the skins. The skins are well prepared, and are accompanied with data as to sex, date, and place of collection, and sometimes with measurements, but as these seem untrustworthy they have been discarded. The skulls prove to have been opened at the base for the removal of the brain, and are thus in nearly all cases more or less imperfect. Frequently, as among the bats and squirrels, each form is represented by a considerable series of specimens, in the case of the bats the young specimens having evidently been mistaken by the collectors for distinct species.

An attempt is here made to include all the species of mammals hitherto definitely recorded from the island of Hainan. They number 41 species and subspecies, of which 9 rest, with two exceptions, wholly on the observations recorded by Mr. Swinhoe, these species being the following:

<i>Rusa unicolor equinus</i> ,	<i>Lutra cinerea</i> ,
<i>Panolia eldi platyceros</i> ,	<i>Ursus</i> sp. incog.,
<i>Hystrix</i> sp. incog	<i>Myotis abramus</i> ,
<i>Mus norvegicus</i> ,	<i>Semnopithecus nemæus</i> , ¹
<i>Felis macrocelis</i> ,	<i>Hylobates hainanus</i> . ²

One genus (*Tamiops*) and 13 species and subspecies are described as new in the present paper, namely:

<i>Manis pusilla</i> ,	<i>Tupaia modesta</i> ,
<i>Atherurus hainanus</i> ,	<i>Rhinolophus hainanus</i> ,
<i>Ratufa gigantea hainana</i> ,	<i>Hipposideros poutensis</i> ,
<i>Funambulus riudonensis</i> ,	<i>Scotophilus kuhlii insularis</i> ,
<i>Sciurus erythræus insularis</i> ,	<i>Scotophilus castaneus consobrinus</i> ,
<i>Tamiops macclellandi hainanus</i> ,	<i>Pipistrellus portensis</i> .
<i>Tamiops macclellandi riudoni</i> .	

¹ Included on the authority of Dr. A. B. Meyer.

² Later made known as a new species by Oldfield Thomas.

Regarding the localities at which the specimens were collected, unfortunately satisfactory information is at present lacking, as few of them are given on maps of the island, and thus far efforts to secure the desired information as to their location have failed. If received later it will be given in another connection.¹ The names of the localities are in many cases printed on the labels with a rubber stamp, and are thus clearly legible; in other cases they are so clearly written that every letter is distinct, and the intended orthography unquestionably determinable. The localities, in alphabetic order, with the number of specimens and date of collecting at each, are as follows:

Cheteriang, Jan. 5-29, 1904; 7 specimens.

Henron, May 10, 1904; 1 specimen.

Hoi-how, Dec. 25, 1902, and Jan. 4, 1903; 2 specimens.

Lei-Mui-Mon, Dec. 19, 1902, Jan. 14, 1903; 41 specimens.

Liudon, March 5 and May 8, 1903; 3 specimens.

Manrin, June 10, 1903, and June 11, 1904; 3 specimens.

Manrun, June 20, 1904; 1 specimen.

Mount Wuchi, April 6, 1903; 1 specimen.

Porten, July 2-4, 1904; 43 specimens.

Pouten, July 2-4, 1904; 55 specimens.

The specimens from Porten and Pouten are all bats; the names on the labels are in different handwriting for the two localities, and may refer to the same place, or may be merely names of different neighboring caves.

Rinsui, July 1 and 2, 1904; 33 specimens.

Rintoi, July 1 and 2, 1904; 28 specimens.

The specimens from Rinsui and Rintoi are also all bats, and these localities are doubtless close to Porten and Pouten, and may be merely names of caves, all situated within a small area. Nearly all the bats collected are labeled with one or the other of these four names.

Riudon, March 3-11, 1903; 9 specimens.

Taipin, June 1, 1905; 1 specimen.

Utoshi, March 20, 1903; 2 specimens.

Youboi, June 21, 1904; 1 specimen.

A few specimens are without definite localities, owing to the loss of labels.

The island of Hainan has evidently a rich mammal fauna, and doubtless future collections from the island will greatly extend the present list, which is very deficient in Muridæ.

1. *Manis pusilla* sp. nov.

PLATE LXIX, FIGS. 1-3.

Manis dalmanni SWINHOE (not of Sundevall), P. Z. S., 1870, pp. 236, 652 (the Hainan reference only).

¹ See below, p. 490.

Type, No. 26635, an old adult, Hainan, September, 1902.

Size very small; skull like that of *M. aurita* in general contour, but with long, pointed nasals and short postpalatal fossa.

Color of scales in adult uniform dark brown, in the young adults darker, blackish brown; ventral surface flesh-color, slightly clothed with very short, fine, light-colored bristly hair; nails yellowish white.

Rows of scales on median dorsal line in three specimens: head (type), 9, 10, 11; body (type), 21, 21, 19; tail (type), 18, 19, 15; total on median line (type), 48, 50, 45.

Total length (type), 670; head and body, 420; tail, 250; hind foot without claws, 56; longest fore claw, 21; longest hind claw, 43 mm.

Skull.—The general contour of the skull is nearly as in *M. aurita*, except that the rostral portion is as in *M. pentadactyla*, while the nasals are nearly as in *M. javanica*—much extended posteriorly and gradually narrowing to a point, instead of being short and more or less abruptly truncated on the posterior border. The orbit in the oldest specimen is closed by the malar bone. Below, the conspicuous feature of difference is the shortness of the postpalatal fossa, which is only .17 of the length of the skull, instead of .22 to .24 as in *M. aurita* and *M. javanica*, and .21 in *M. pentadactyla*. The pterygoids terminate opposite the middle of the auditai bullæ, instead of opposite their posterior border as in *M. aurita*. The ascending arm of the intermaxillary terminates just behind the emargination of the nasals.

The principal measurements of the type skull are as follows: Total length, 82; basal length, 76; greatest width of braincase, 57; least interorbital breadth, 27; length of intermaxillaries on palatal border, 7; length of maxillaries (palatal surface) on median line, 27; length of palatines (on median line), 20; length of pterygoids, 13; length of postpalatal fossa, 14; greatest length of frontals, 33; greatest length of parietals, 25; length of malar, 6; length of nasals, 30.5; greatest width of nasals (at fronto-maxillary suture), 12; least width of nasals (midway between frontals and intermaxillaries), 8 mm.

It has been generally customary since Anderson's revision of the group in 1878,¹ to recognize only three species of the genus *Manis* in the Oriental Region, *M. pentadactyla*, *M. aurita*, and *M. javanica*, with neither of which has the present species from Hainan any very close relationship. In size, coloration, number of rows of scales, and number of scales on the median line of the back, it is nearest to *M. aurita*, from which it differs mainly in considerably smaller size, and in important cranial characters, as especially in the form of the nasal bones and postpalatal fossa. In *M. aurita* the nasals are short, abruptly truncated posteriorly, and of nearly uniform width throughout; in *M. pusilla* they are relatively much longer, widest at the fronto-maxillary suture, from which point they taper evenly posteriorly and terminate in a point; in front of the fronto-maxillary suture they

¹ Zool. and Anatom. Researches, Yunnan Expedition, 1878, pp. 341-353, pl. xxiv.

are much narrowed, expanding again apically. In other words, they are the nasals of *M. javanica* on a skull essentially of the type of *M. aurita*. In *M. aurita*, however, the pterygoids are long, about as long as the palatines, and enclose a long postpalatal fossa, as is the case also in *M. pentadactyla* and *M. javanica*; in *M. pusilla* the pterygoids are short, or only about half as long as the palatines, with a correspondingly short postpalatal fossa. These differential features are not such as could be accounted for by any probable amount of individual variation in either *M. aurita* or *M. javanica*, its nearest geographical allies.

The species is based upon three specimens, which agree in all essential characters, though differing considerably in age. The older specimen is without any more definite locality than "Hainan, China," but as it is a very old individual, with the skull perfect and heavily ossified, it has been taken for the type in preference to the others, which are younger, with the bones of the skull less dense and the sutures more open, collected as follows: a young adult, Manrin, June 11, 1904; a still younger specimen, Manrin, June 10, 1903.

Mr. Swinhoe (P. Z. S., 1870, p. 236) "procured the skins of an adult and of a young Scaly Anteater at Hainan," which, he says, "have much in common with the South-China species." He referred the specimens to *Manis dalmanni* Sundevall, which is now currently recognized as a synonym of *M. aurita*.

2. *Rusa unicolor equinus* (Cuvier).

Hainan Sambar, SWINHOE, P. Z. S., 1869, pp. 656-660, figs. 1-3, antlers. (Referred to *Cervus equinus* Cuv. in text, p. 659.)

Cervus hippelaphus SWINHOE, P. Z. S., 1870, p. 647, in text.

Not represented in the present collection.

Swinhoe says: "The Sambar is an abundant species on the jungly mountains of the southern half of Hainan; and large numbers are yearly slaughtered by the independent *Le* tribes, and the skins and horns bartered to the Chinese" (*l. c.*, p. 659). Mr. Swinhoe obtained the skins of a male and a female, both adult, in winter coat, and three pairs of antlers of animals from two to five years old. These specimens are carefully described and the antlers are figured. The species was at first believed "to be identical with the *Cervus equinus* Cuv., of Sumatra and Borneo," but a year later (*op. cit.*, 1870, p. 647) he refers to it as "*C. hippelaphus*." Lydekker, in his 'Deer of All Lands' (p. 153), includes the Hainan Sambar under his *Cervus unicolor equinus*, "as suggested by Mr. W. L. Sclater."

The Hainan race of the Sambar apparently requires further examination in order to fully settle its relationships. Swinhoe states that it "approaches the *C. rusa* of Java in the whiteness of the under parts," in which respect it is quite unlike either the Indian Sambar or the Malayan Sambar. Doubtless a good series of specimens would show it to be readily separable as an insular race from either of the mainland forms.

3. *Panolia eldi platyceros* Gray.

Panolia eldi SWINHOE, P. Z. S., 1869, pp. 653-656, figs. 1-5, antlers.

"*Panolia frontalis* (Hodgson) *Cervus eldi* (Guthrie)" SWINHOE, P. Z. S., 1870, p. 644 (in text).

Panolia platyceros BLYTH (in Swinhoe), P. Z. S., 1869, p. 656, in text.

Not represented in the present collection.

Mr. Swinhoe obtained skins of a female and a fawn, and five pairs of antlers and two odd ones, which are here referred without question to *Cervus eldi* Guthrie. He cites Mr. Blyth as being of the opinion that "the Hainan *Panolia* is identical with that of Siam (*P. platyceros* of Gray), the distinction from the other, or western form, being apparent as the horns increase in size." Lydekker (*Deer of All Lands*, 1898, p. 201) places the Hainan form under the subspecies *platyceros*.

4. *Cervulus muntjac* (Zimmermann).

Cervulus vaginalis SWINHOE, P. Z. S., 1869, p. 652; *ibid.*, 1870, p. 644; *ibid.*, 1872, p. 813, in text.

One specimen, skin and skull of a young female, Taipin, Hainan, June 1, 1905.

The only original authority for the occurrence of the Muntjac in Hainan appears to be Swinhoe's record, as given above, which has been cited also by various later authors. Swinhoe states that he obtained a number of imperfect skins and two pairs of antlers, both from rather young animals. From a study of this material he was convinced that the Hainan species was referable to *C. vaginalis* (Boddaert=*muntjac* Zimm.) "and not to the *C. reevesi* of China as one would rather have expected it to be." He also states that Mr. Blyth agrees with him in this identification. Later authors, doubtless on this basis, have commonly assigned Hainan to the range of *C. muntjac*.

5. *Lepus hainanus* Swinhoe.

Lepus hainanus SWINHOE, P. Z. S., 1870, pp. 233, 639, pl. xviii, text-figs. 1-4; FORSYTH-MAJOR, Trans. Linn. Soc. Lond. (2), Zool., VII, pp. 466-468 (passim), fig. xix, upper incisors.

Two specimens: a skin and skull of an old animal, Jan. 10, 1903.

without indication of sex or definite locality; a young female, skin and skull, Liudon, May 18, 1903.

A species of *Lepus* was described by Swinhoe from a single specimen taken in the neighborhood of the capital city of Hainan. The description is detailed, and there is a colored plate of the animal and four text figures illustrating the skull. The colored plate agrees rather poorly with the description and with the present specimens, being much too rufous. The description of the coloration and external characters agrees satisfactorily, except as to size, the measurements being too small. The total length is given as 14 inches, while the collector's labels on the present specimens give the length in each as "16 $\frac{1}{2}$ " inches. The length of the skull as given by Swinhoe is 10 mm. less than in the older of the specimens, with the other measurements proportionally less. Judging by the distinctness of the sutures in Swinhoe's figures of the skull, his specimen was probably rather young, which may in part account for the difference in size. But there are other discrepancies, not so easily explained, in respect to the characters of the skull. Swinhoe says: "Incisive opening above palate narrower at base." This is hard to interpret, as a palatal view of the skull is not included in the four text figures. "Posterior edge of palate with rounded nasal spine, the same part being smoothly convex in *L. sinensis*." In the present specimens the posterior border of the palate is smoothly transverse, with a short, pointed spine on the anterior border. "Anterior upper incisors without the deep groove which characterizes these teeth in the genus *Lepus*, but marked by several narrow indistinct ridges." Fig. 2 in the text appears to represent the incisors as evenly convex, with several slight striæ. In the older of my specimens the upper incisors are strongly ridged or ribbed on the inner edge, with the rest of the surface smooth. The antero-posterior thickness of the tooth at the cutting edge is thus about one third greater on the inner border than elsewhere. In the younger specimen, in which the teeth are much less worn, the inner third of each tooth is occupied by a deep sulcus, divided in the middle by a slight, very narrow ridge. The incisors are thus very unlike those described and figured by Swinhoe.

Swinhoe's measurements (his "breadth from molar to molar" should read, of course, malar to malar) of the skull are intermediate between those of the two before me, one of which is very old and the other not fully adult, showing Swinhoe's specimen to have been middle-aged. Reducing his measurements to millimeters, the two skulls (Am. Mus. No. 26640, old, and Swinhoe's) compare as follows: Total

length, 80 and 72; zygomatic breadth, 38.5 and 36.8; interorbital breadth, 18 and 15.5; width of braincase, 27 and 25; front of incisors to first molariform tooth, 25 and 21.6; height of skull with lower jaw, 51 and 45.7 mm. The young skull measures considerably less than the Swinhoe skull.

The discrepancies between Swinhoe's description of *Lepus hainanus* and the present specimens may be in part due to faults of description, yet it is hard to believe that he could have overlooked the deep groove on the inner third of the incisors, although he may have written posterior for anterior in describing the palatal spine. In the present specimens there is a broad white eyering, which extends forward as a broad band nearly to the nose. Swinhoe says: "Anterior edge of eyelids and a patch in front of it white." The plate, however, shows a distinct, rather broad light eyering. There may be, of course, two small species of *Lepus* on the island of Hainan, but in the present connection it seems better to recognize but one.

Since writing the above I have examined Dr. C. J. Forsyth-Major's memoir (*l. c.*) 'On Fossil and Recent Lagomorpha,' where he figures (text fig. xix, p. 468) the anterior end of the upper incisors of *Lepus hainanus* (doubtless from the type specimen, although it is not so stated). The enamel pattern as here shown agrees perfectly with that of the adult specimen here described; which seems to show conclusively that the apparent discrepancies between my specimens and Swinhoe's description of *L. hainanus* are due to the inaccuracy of the description.

***Atherurus hainanus* sp. nov.**

Type, and only specimen, No. 26641, old adult (sex?), Hainan, September, 1902.

Above brown, blackish on the back, lighter, dusky brown on the head, the flanks varied dark brown and whitish; underparts light brown much varied with whitish; upper surface of feet and limbs brown, the latter proximally lighter and tinged with lavender gray. The spines over the mid-dorsal region are apically blackish, the basal half lighter, gradually passing into whitish at extreme base; some of the shorter ones are tipped with white, but only a few of these are visible at the surface. On the sides of the body the exposed portion of a few of the longest spines is wholly dusky, but the greater number are white with a broad indistinctly defined dusky band of variable extent on different spines. On the ventral surface the prevailing pale brown color is due to the tips of the spines, the basal three fourths or more being whitish or white.

The spines are flat on the lower surface and strongly grooved on the upper, and very sharp pointed; the transverse diameter is much greater than the

antero-posterior. On the nape the spines are about 20-25 mm. long, increasing in length on the more posterior parts of the mid-dorsal region to about 40 mm., and on the lumbar region from 45 to 55 mm. Mixed sparsely with the flattened spines are a few slender bristly spines, round and tapering, usually dusky or broadly banded with dusky proximally and whitish for their apical third; the longest, situated on the posterior third of the body, have a length of 70 to 90 mm. Between the spines is a very sparse coat of fine yellowish white hair, visible only on separating the spines.

The muzzle is wholly covered with short hair, and a broad eyering is similarly clothed; soles and palms naked; the nails on the fore feet are short, thick, and subconical, 5-7 mm. long; those on the hind feet are of similar form, but of course stouter. The tail, except at the extreme base, is scaly, the middle portion nearly naked, the only covering being short, thick blackish spines, 5 to 15 mm. in length, interspersed with longer bristly hairs, there being usually either a bristle or a spine at the apical border of each scale. These become longer and assume the character of thick spiny bristles over the subapical fifth of the tail, while on the apical fifth they are replaced by flattened foliaceous bristles, nearly 2 mm. wide and 50 to 60 mm. long. The ears are high and narrow, rounded on the antero-upper border, nearly straight on the posterior border, with a distinct emargination at the base.

Measurements.—The following external measurements are from a well-made dry skin: Total length, 520; head and body, 381; tail, 139; hind foot, 64; ear from notch, 30; width of ear, 18 mm.

Skull.—The skull in general form is quite similar to that of *E. macroura*, but the malar has less anterior extension. The palatal fossa is nearly v-shaped and extends forward to the middle of the penultimate molar. The present skull is that of an old individual, of unknown sex, with the teeth much worn. It measures, condylo-basal length, 89; basal length, 82; basilar length, 74; palatal length, 45; palatilar length, 37; least interorbital breadth, 27; greatest breadth (at posterior end of zygomata), 45; mastoid breadth, 32.3; length of nasals, 27; width of nasals anteriorly, 20.5, posteriorly, 11; length of upper diastema, 25.6; length of upper tooththrow (crown surface), 15; length of mandible (front border of symphysis to posterior border of condyle), 55; height of lower jaw at condyle, 22; length of lower tooththrow, 16.5 mm.

This species is nearly related to *Atherurus macrourus* (Linn.) of the neighboring mainland (Malay Peninsula, Cochin China, Burma, Assam), but is smaller and darker in color, with shorter spines and a much shorter tail. It more nearly agrees in size with the insular *Atherurus zygomaticus* Miller, from Pulo Aor, from which it differs in the narrower zygoma and larger lachrymal.

The only previous record I have met with of a porcupine in Hainan is Swinhoe's statement (P. Z. S., 1870, pp. 233, 638) that one of his party "picked up a Porcupine's quill in the jungle at Nychow (S. Hainan)," which was evidently a quill of some species of *Hystrix* and not of an *Atherura*. He referred it first to *Hystrix hodgsoni* Gray (l. c., p. 233), and later (l. c., p. 638) to his *H. subcristata*. It is on

this record that Hainan is still included within the range of *H. subcristata*.

7. *Hystrix* sp.

Hystrix hodgsoni SWINHOE, P. Z. S., 1870, p. 233.

Hystrix subcristatus SWINHOE, P. Z. S., 1870, p. 638.

It is inferred that a species of true *Hystrix* occurs in Hainan, but the evidence is not satisfactory, resting on a porcupine quill found at Nychow by Mr. Swinhoe, and by him referred as indicated above.

8. *Mus* sp.

One specimen, about half grown, and hence not readily determinable, from Riudon, March, 1903.

9. *Mus norvegicus* *Erxleben*

Mus decumanus SWINHOE, P. Z. S., 1870, 233

Mr. Swinhoe says: "Common at Kiungchow city, and in all the large towns visited." Not represented in the present collection.

10. *Ratufa gigantea hainana* subsp. nov.

Type and only specimen, No. 26638, ♂ ad., Cheteriang, Hainan, without date or external measurements.

Whole upper parts, outside of limbs, and the tail uniform intense black; ventral surface and inside of limbs rusty yellow, the basal half of the pelage over the chest and belly brownish black, showing more or less at the surface over the central part of the abdominal area; a broad black cheek stripe, and two small spots of black on the chin. Ears tufted. Hind foot, 80, with claws 85 mm. Skull, total length, 74; basilar length, 57; zygomatic breadth, 46; across postorbital processes, 42.5; interorbital breadth, 29; length of nasals, 25 mm.

The Hainan *Ratufa* agrees more nearly in color and size with *R. gigantea* than with *R. bicolor*. It has the uniform intense black color above of *R. gigantea* with, in the present specimen, the under parts orange yellow, the hair basally blackish over a broad central area of the ventral surface. It is about intermediate in size between *gigantea* and *bicolor*, with, however, relatively much longer nasals.

There appears to be no previous record of this genus from Hainan.

11. *Funambulus riudonensis* sp. nov.

Type, No. 26651, ♀ ad., Riudon, island of Hainan, March 11, 1903.

Pelage of upper parts short and soft, mixed with many long, bristly, shining black hairs; of under parts soft and more or less woolly.

Dorsal region, from occiput to base of tail, and flanks dark olivaceous brown, without a median stripe; the hairs individually are black, narrowly annulated near the middle with yellow, and with a short yellow tip, mixed with a few hairs black-tipped or wholly black; whole upper aspect of head reddish chestnut finely punctuated with black; sides of the head, from the nose pos-

teriorly, uniform deep chestnut red; mystacial bristles deep black; ventral surface superficially white or faintly yellowish white, with the basal portion of the fur dusky; sides of neck, shoulders, and outer surface of fore limbs reddish, varied slightly with black-tipped hairs; front of thighs and inside of hind limbs deep reddish chestnut, the outside reddish brown varied with black-tipped hairs; feet dark tinged with reddish brown, the hind feet a little darker and redder than the front feet; ears thinly clothed, dark brown tinged slightly with reddish, with a large fluffy spot of soft white fur at the outer base; tail above blackish, the hairs tipped and annulated basally with dull white; lower surface of tail deep chestnut, bordered narrowly with black and slightly fringed with white. The red on the sides of the head and neck, the large deep red area on the front of the thighs, and the red under surface of the tail are the conspicuous features of the coloration, to which may be added the red head in striking contrast with the dark olive brown back.

Measurements (from a well-prepared skin).—Total length, 305; head and body, 170; tail vertebrae, 135; tail to end of hairs, 180; hind foot without claws, 40, with claws, 45; ear from crown, 15 mm. The skull is long and narrow, the rostral portion greatly elongated and attenuated, with very long, narrow nasals. It is, however, decidedly broader and less elongated than in the extreme development reached in this respect in *Rhinosciurus laticaudatus*. Length (occiput imperfect) from incisors to posterior border of audital bullae, 45; zygomatic breadth, 30; interorbital breadth, 16; greatest width of braincase, 24; length of nasals, 19; width of nasals posteriorly, 6, anteriorly, 6.5; palatal length, 30; palatilar length, 23.5; maxillary toothrow, 10; diastema, 25; mandibular ramus, front border of symphysis to tip of condyle, 24; height at coronoids 12.6; toothrow, 10 mm.

Represented by 5 specimens, all taken at Riudon, March 3, 10, and 11, 1903, and quite uniform in coloration.

This species seems to find a near ally in *Funambulus pyrrhomerus* (Thomas), from Ichang, Yang-tse-kiang, from which, however, it differs in the sides of the head being rich red, and in the red of the tail extending over the anal region. The postauricular patch of soft fur is clear white instead of yellow. In size, in general coloration, and in the form of the skull the two species are quite similar.

12. *Sciurus erythræus insularis* subsp. nov.

Sciurus casianeiventris SWINHOE, P. Z. S., 1870, p. 231.

Type, No. 26609, ♀ ad., Lei-Mui-Mon, Hainan, Jan. 5, 1903.

Above olivaceous gray, the hairs individually dusky plumbeous at extreme base, then ringed alternately with narrow bands of yellowish olive and broad bands of black, about three of each, the tip of the hair being usually yellowish but frequently black; outside of limbs like the back, becoming darker on the upper surface of the feet, the hind feet often blackish; whole head like the back, with the sides of nose, cheeks, chin, and throat rather lighter and grayer; ventral surface, from the chest to the base of the tail, and inside of limbs, vinaceous rufous, mixed with gray on the foreneck; posterior surface of ears yellowish, faintly tinged with rusty on the margin, and rusty yellow on the inner surface; tail

above for the basal half like the back, apical half blackish strongly washed with yellowish white; the hairs individually, for the basal two-thirds of the tail, are olivaceous yellow ringed with black, the black annulations becoming broader from the base of the hairs toward the tip; on the apical third of the tail the yellowish annulations are limited to the basal half of the hairs, the subapical portion being black broadly tipped with yellowish white; lower surface of tail olivaceous yellow (a little more yellowish than the back), finely grizzled with black, bordered laterally on the apical half by a band of black and an outer fringe of yellowish white, the black band widening gradually towards the tip of the tail, where the hairs become wholly black to the base, with conspicuous yellowish white tips.

Measurements (of type from skin).—Total length, 450; head and body, 250; tail vertebræ, 200; tail to end of hairs, 215; hind foot without claws, 43, with claws, 47 mm.

Skull.—Total length, 53 (occipital region imperfect); zygomatic breadth, 31; interorbital breadth, 19; mastoid breadth, 22; length of nasals, 17; length of upper toothrow, 10; diastema, 11.5 mm.

Twenty-six specimens, 16 males and 10 females, all adult, collected as follows: Lei-Mui-Mon, 24 specimens, Dec. 20 to Jan. 12; Liudon, 1 specimen, March 5; Utoshi, 1 specimen, March 20.

There is much variation in the extension anteriorly of the red of the under parts; in a few specimens it wholly ceases at the upper border of the breast, the whole foreneck, throat, and chin being gray; in a few others it extends to the throat, wholly unmixed with gray; but in by far the greater part of the specimens the foreneck and throat are gray more or less tinged or suffused with red. The anal region is gray, and in about one specimen in three the gray extends forward as a very narrow median line to the chest. The apical half of the tail is black and whitish (often nearly clear white); in about half the specimens the color is a patternless grizzle, but in at least a third of them the outer half of the tail is distinctly annulated black and white, and a strong tendency to regular bars is obvious, when the hairs are in place, in most of the specimens of the series.

The tendency to a narrow gray mesial ventral line recalls *Sciurus gordonii* Anderson, from Upper Burma, and *S. taiwanensis* Bonhote (and subspecies) of Formosa in which latter sometimes gray and sometimes red prevails on the underparts. Swinhoe refers (*l. c.*) to a Hainan specimen in which the red of the underparts is divided by a broad band of gray.

According to Mr. Swinhoe, this squirrel is a common species in Hainan, both in the interior and along the coast.

In Mr. Bonhote's paper 'On the Squirrels of the *Sciurus erythræus* Group' (Ann. and Mag. Nat. Hist. (7), VI, Feb., 1901, pp. 163-167), the island of Hainan is not mentioned in the list of localities cited under

the various species and subspecies of the group, nor is there any reference to Swinhoe's Hainan specimens, which are hence perhaps not now in the collection of the British Museum, although two Hainan specimens were commented upon by Anderson (Anatom. and Zool. Researches, 1878, p. 240, under *Sciurus castaneiventris*), which appear to be the specimens described by Swinhoe.

Tamiops gen. nov.

PLATE LXIX, FIGS 1-4.

Type, *Sciurus maccllelandi* Horsfield (more strictly, *Tamiops maccllelandi hainanus* subsp. nov.).

In southern India and southern China, from Assam east to Foochow and Formosa, and south to the Malay Peninsula and Hainan, is found a group of small, semiterrestrial, slender-tailed squirrels which externally, including the color-pattern, seem hardly distinguishable from the little striped ground squirrels of northern Asia and North America constituting the genus *Eutamias*. The broad, short-nosed skull, however, is distinctly of the sciurine type, and not like that of *Eutamias* and the other true ground squirrels; but the teeth prove to be quite different from those of typical *Sciurus* (type, *S. vulgaris* Linn.). It was therefore a matter of surprise in working up the Hainan representatives of the *S. maccllelandi* group to find that the latest writers on the group still refer them to *Sciurus*, while recognizing such Old World sciurine genera as *Ratufa*, *Funambulus*, *Rhinosciurus*, etc. It has seemed proper, therefore, to recognize this well-marked group as of generic (or at least subgeneric) value, for which I propose the name *Tamiops*, in recognition of its external resemblance to *Tamias*, and more especially to *Eutamias*, with the following characters:

In small size, slender, narrow tail, and pattern of coloration, including not only the five dorsal stripes but in the details of the head-pattern, like *Eutamias*; general form of the skull sciurine—short and broad with short rostrum—like *Sciurus*, but with the molariform teeth structurally different. In *S. vulgaris* the outer border of p^2 , m^1 , and m^2 , is crenulated, there being in addition to the two main cusps a very low cusp between them and a fourth anterior cusp slightly larger than the very small median one, resulting in what may be termed a crenulated border. In *Tamiops* m^1 and m^2 have only the two main cusps, without the smaller median and anterior cusplets. In *Tamiops* p^2 has an additional anterior small cusp, making three on the outer border, while in *Sciurus* there is in addition to these three a minute cusplet between the posterior two. M^3 is essentially the same in both groups. In the lower jaw in *Sciurus* there is on the exterior border of the crown an incipient cusp between the two main cusps of each tooth of the series, which is entirely lacking in *Tamiops*; on the inner border the pattern is essentially similar in each. (See Pl. LXIX, Figs. 4-7.)

The characters of the teeth separate the group from *Sciurus* proper and the combination of characters here specified sufficiently characterize it as a well-marked special group of the Sciuridæ.

13. ***Tamiops macclellandi hainanus* subsp. nov.**

Sciurus m'clellandi SWINHOE, P. Z. S., 1870, p. 232.

Sciurus macclellandi BONHOTE, Ann. and Mag. Nat. Hist. (7), V, Jan., 1890, p. 52 (part).

Type, No. 26664, ♀ ad., Lei-Mui-Mon, in the mountains of central Hainan, Dec. 31, 1902.

Top of head, nape, sides of neck, shoulders, flanks, and outside of limbs yellowish gray minutely flecked with black, the hairs individually nearly black at base, then annulated narrowly with pale yellow and black and generally tipped with yellow but some of them with black; median dorsal stripe black, of variable extent, but usually extending from the shoulders to the base of the tail; on either side of this a shorter light, yellowish gray stripe, of nearly the same color as the nape and shoulders; exterior to this a darker, pale reddish brown stripe; and exterior to this an outer pale yellowish stripe, varying in different specimens from pale buff to deep buff; a short median black stripe on the nose, which soon divides, a branch passing on either side to the anterior canthus of the eye, and thence curving down below the buffy eyering runs to the base of the ear; a broader deep buff band begins at the nose, adjoins and follows the black stripe to the base of the ear and thence along the side of the neck to the shoulder; an indistinct blackish stripe below this on the side of the nose (enclosing the whiskers) descends and runs posteriorly along the lower edge of the malar region as far as a point opposite and considerably below the ear; these stripes, in specimens with disarranged fur, appear more or less indistinct, giving to the sides of the face a dingy yellowish gray effect; eyering complete, broad, deep buff; ears internally buffy yellow, externally heavily clothed with soft and fluffy black fur, broadly tipped with pure white; the rim of the ear is thus conspicuously edged with black relieved against white, the latter forming a distinct white ear tuft; whole ventral surface and inside of limbs yellowish white, the basal portion of the fur dusky; tail above mixed black and yellowish white, the hairs at extreme base narrowly ringed with black, then more broadly annulated with reddish yellow and black and tipped broadly with yellowish white; tail below with a broad median area of reddish yellow mixed slightly with black, with a narrow border of black and an outer conspicuous fringe of pale yellow; feet grizzled yellowish gray, more yellowish on the toes.

The skulls are unfortunately too imperfect to furnish satisfactory measurements. Type skull, front of nasals to parieto-occipital suture, 33; least inter-orbital breadth, 12; breadth of braincase, 17; length of nasals, 9; width anteriorly, 5; posteriorly, 3; palatal length, 18; palatilar length, 14; maxillary toothrow, 5.7 mm.

Twelve specimens, all from Lei-Mui-Mon, Dec. 19, 1902, to Jan. 14, 1903. They are for the most part very uniform in coloration. The mid-dorsal black stripe varies in length in different specimens, beginning at the shoulders and running with more or less distinctness

to the base of the tail, although in some hardly traceable beyond the hips. The outer light stripe varies from pale to deep rich buff, and runs generally only from the shoulders to the hips; in one or two specimens it is indistinctly traceable across the shoulders to the yellow neck stripe.

Mr. Swinhoe adds to his detailed description of Hainan specimens: ". . . this little Striped Squirrel is found in Formosa, the Tingchow mountains of Fokien, and in Hainan. In the latter island I first detected it in the forests of the interior; but I observed it later in most wooded places, especially where the Areca- and Coccoanut occurred. It runs with great agility along the ground and up the trunks of trees, but it descends trees slowly and awkwardly. It is, however, quite an arboreal species."

14. *Tamiops macclellandi riudoni* subsp. nov.

Type, No. 26672, ♂ ad., Riudon, (east of Lei-Mui-Mon, and at much lower elevation) Hainan, March 5, 1903.

Similar to *Tamiops macclellandi hainanus*, but larger and much brighter colored. The dorsal stripes and head markings are similar, but the color above is reddish brown instead of yellowish gray, the whole dorsal region being suffused with reddish, except the median black stripe and the outermost pale stripe; ventral surface strongly ochraceous, brightest on the chin, throat, breast, and anal region, instead of pale yellowish white.

Skull (imperfect) —Length from front border of nasals to parieto-occipital suture, 35; least interorbital breadth 13; breadth, of braincase, 17.5; length of nasals, 10; width anteriorly, 6, posteriorly, 3.2; palatal length, 19.5; palatilar length, 15; maxillary toothrow, 6 mm.

Three specimens, all from Riudon, March 5-9, 1903. All have strong ochraceous suffusion below, especially strong on the throat, breast, and anal region. In all the general rufescent shade above, and the more grayish cast of the inner light dorsal stripes, are marked in comparison with the yellowish cast in *hainanus*. It seems to approach in general characters *T. c. formosanus* (Bonhote) from north Formosa.

15. *Felis chinensis Gray.*

Three specimens,—a male, Cheteriang, Jan. 20, 1904; a young kitten, Mount Wuchi, April 6, 1903; the other is without definite locality or indication of sex, owing to loss of the collector's label. Both the adults are in good condition, including the skulls.

The two specimens are alike in the general pattern of markings out differ considerably in color. In the male specimen (No. 26602), there is much black in the dorsal area, the black stripes on the head, nape, and shoulders being not only well-defined, but the whole median

area from the shoulders to the base of the tail is chiefly black, **consisting** of irregular narrow stripes and small spots of black set in a general ground color of reddish brown. The sides are paler, with the ground color pale fulvous gray mottled with small spots of black encircled with rusty brown; at the lower edge of the flanks the ground color passes into whitish, and into clear white on the ventral surface, blotched with large spots of mixed brown and black on the flanks and blackish on the median area below.

The other specimen (No. 26601) is similar on the head and nape, but from the hind neck posteriorly the amount of black is inconspicuous, consisting mainly of a grizzle of black hairs in place of stripes and distinct spots, mixed with reddish brown. The gray spots and streaks on the sides are lighter clearer gray, and the intervening spaces are dark reddish brown varied with scattered flecks of blackish. The ventral surface, the feet, tail, head, and throat markings are similar in both. The feet are yellowish finely mottled with blackish. The median third of the under surface of the tail is yellowish **gray**; the sides and dorsal surface clearer gray with narrow half rings of **black**, wider than the gray interspaces, and a blackish tip.

The young kitten was apparently only a few days old when taken, and is in the soft woolly first pelage. The general color above is dull rusty brown, strongly streaked with blackish; below grayish white, barred on the breast and spotted on the belly with blackish brown.

The adult skulls measure, respectively, as follows: Total length, 91, 87.5; basal length, 78, 75; basilar length, 76, 73; palatal length, 35, 34; zygomatic breadth, 60, 59; greatest width of braincase, 41.3, 40; least distance between carnassials, 22, 22; length of carnassial, 10, 10 mm.

These specimens seem clearly referable to *F. chinensis*, as described by Swinhoe (P. Z. S., 1870, p. 629), Milne-Edwards (Rech. Mamm., 1868-1874, pp. 216-220, pl. xxi^b, fig. 2), and Bonhote (Ann. and Mag. Nat. Hist. (7), XI, April, 1903, p. 376); and probably of Gray (Charlsworth's Mag. Nat. Hist., I, 1837, 577). *Felis ricketti* Bonhote differs in larger size and in the ground color of the upperparts. *F. scripta* Milne-Edwards is also a near ally, but differs somewhat in markings.

16. *Felis macrocelis* Horsfield.

Felis macrocelis SWINHOE, P. Z. S., 1870, p. 228.

Mr. Swinhoe (*l. c.*) states that he was shown a skin of this species in the mountains of Hainan said to have been "procured in that neigh-

borhood." He adds: "I was told that the true Leopard also occurred in Hainan."

17. *Viverra zibetha* *Linnaeus*.

Viverra zibetha SWINHOB, P. Z. S., 1870, pp. 227, 630.

One specimen, skin and skull, an adult female, Cheteriang, Hainan.

Mr. Swinhoe procured two flat skins at Ling-mun, central Hainan, and its currently recognized occurrence in Hainan appears to have heretofore been based on this record.

18. *Viverricula malaccensis* (*Gmelin*).

Viverricula malaccensis SWINHOB, P. Z. S., 1870, pp. 227, 630.

Two specimens, skins and skulls: an adult male, Hoi-how, Dec. 24, 1902, and an adult female, Cheteriang, Jan. 5, 1905.

Mr. Swinhoe obtained a skin of this animal at Ling-mun, central Hainan, which forms the only previous reference I have seen to the occurrence of this species in Hainan.

19. *Paguma larvata* (*Ham. Smith*).

One specimen, skin and skull, adult female, Cheteriang, Hainan. Jan. 10, 1904.

Apparently not previously recorded from Hainan.

20. *Herpestes griseus* (*E. Geoffroy*).

Herpestes, sp. SWINHOB, P. Z. S., 1870, p. 228.

Two specimens, an old female, Liudon, March 5, 1903, and a young male, without definite locality, May 10, 1905. The young male still retains the milk dentition.

Mr. Swinhoe states that one evening at Kiungchow he "observed a Mongoose running along a bank outside the city wall," and later saw "a skin of apparently the same species hanging up in a garden at Schuyweisz (central Hainan) to serve as a scarecrow," but obtained no specimens and was therefore unable to identify the species.

The two specimens in the present collection are apparently much redder than the ordinary type of *griseus*, the whole front and sides of the head being strongly suffused with rufous chestnut (the younger specimen more than the older one), as are also the feet.

21. *Lutra* sp.

Lutra chinensis SWINHOB, P. Z. S., 1870, pp. 228, 229.

One specimen, very young, without definite locality, August 4, 1905

This specimen is only about one-fourth grown, retaining the milk dentition, and is thus too young for satisfactory determination. It is

a bare-nosed otter with large claws, and is probably referable to *Lutra lutra* (Linn.).

Its previous Hainan record is the "skin of an animal about half grown," obtained by Swinhoe (*l. c.*).

22. *Lutra cinerea* Illiger.

Aonyx leptonyx SWINHÖE, P. Z. S., 1870, p. 229.

Mr. Swinhoe obtained three skins, without skulls, of this species, which he described at length. This seems to be at present the only record of this species for Hainan.

23. *Helictis moschata* Gray.

Helictis moschata SWINHÖE, P. Z. S., 1870, p. 228.

Three specimens, a male and a female, Cheteriang, Jan. 8 and 10, 1904, and another female, Hainan, Jan. 10, 1903.

These specimens differ very much in color, and also in age. The male is a middle-aged adult, while one of the females is very old, so old that all the sutures of the skull are completely obliterated and the teeth worn down to the roots. The male is dark grayish brown, with the usual head pattern of white spots; the stripe on the crown is continued posteriorly with only slight interruption to the shoulders; the ventral surface is of the usual strong buffy white; the hairs of the flanks and limbs are rather prominently tipped with whitish, resulting in a decided grayish effect; the tail is quite clear white for rather more than the apical half, and the hairs of the basal portion have long whitish tips.

Of the other two specimens, both females, one is like the male in coloration, but with less white on the tail; the other, although shown by the skull to be very old, is much darker brown above, with much shorter, inconspicuous light tips to the hairs on the flanks and limbs, and the tail is brown almost to the tip, with the ends of the hairs lighter, chiefly on the terminal pencil. The ventral surface and the underfur on the limbs are deep rusty ochraceous. The furred portion of the nose, almost as far back as the eyes, is gray instead of dark brown, and the white crown spot and shoulder spot are greatly reduced in size. Mr. Swinhoe's single specimen (*l. c.*) was, according to his description, about intermediate in coloration between the two phases above described, except that it lacked the white spot between the eyes. It is thus evident that there is a considerable range of apparently purely individual variation in color in even Hainan specimens.

24. *Ursus* sp.

Ursus tibetanus SWINHÖE, P. Z. S., 1870, p. 230.

Mr. Swinhoe says he was shown "a large black shaggy skin" of a bear said to have been taken in Hainan, which he judged to be *U. tibetanus* "rather than of *Ursus malayanus* Horsf."

25. *Crocidura (Pachyura) murina* Auct.

Sorex myosurus SWINHÖE, P. Z. S., 1870, p. 231. 鼠 鼯 鼠

Sorex murinus SWINHÖE, P. Z. S., 1870, p. 620 (the reference to Hainan).

One specimen, adult male, Manrin, June 11, 1903.

The proper name of the Oriental shrew commonly known as "*Sorex murinus* Linn." or "*Crocidura murina*," I have not the means at present to determine. Linnæus's *Sorex murinus* (Syst. Nat., ed. XII, 1766, p. 74) is indeterminable from the brief diagnosis beyond the point that it was some kind of a shrew, with "Habitat in Java." As this island is now known to be the home of a considerable number of species of *Crocidura*, Linnæus's diagnosis is wholly indeterminate. It therefore remains for some one to establish the correct name of the so-called *C. "murina"* of southern Asia, and to determine its geographical races, its alleged range extending from Arabia to Japan.

Swinhoe (*l. c.*) says: "The Muskrat was common in the houses in the capital city, and I was often disturbed in my room at night by its clinking note." He does not mention having taken or examined specimens.

26. *Tupaia modesta* sp. nov.

Type, No. 26654, ♂ ad., Lei-Mui-Mon, Hainan, Jan. 5, 1903.

Above olivaceous gray, a little darker along the middle of the back than on the flanks and limbs, and with a very slight rufescent tinge on the rump and thighs; no trace of dorsal or shoulder stripes; fur soft, mixed with stiffer, longer black-tipped hairs; basal half of fur slaty, the apical half ringed with yellowish olive and black; ventral surface yellowish gray, brighter on the breast, forenecks throat, median line, and anal region; on the foreneck the color deepens to yellowish buff; tail above like the back, below with the central line of short hair, buffy gray, the longer hairs, which are quite coarse and 22-24 mm. long, ringed alternately twice with pale yellowish gray and black, the outer bands much broader than the inner, the tips of the hairs yellowish; the tail pattern below is thus a broad central band of yellowish gray, with, on each side, a narrow band of black, then a broader one of pale grayish buff, and another still broader of black, with a buffy outer fringe; feet dull yellowish-gray brown; ears dull dark brown, thinly haired.

Measurements (type, from skin).—Total length, 328; head and body, 178; tail vertebræ, 150; tail to end of hairs, 177; hind foot, 43 (with claws 47) mm.

[Dec., 1906.]

The skull agrees in size and general form with the *T. ferruginea* group. None of the series of seven skulls is perfect enough to furnish a complete series of measurements, the occipital region in all being defective. Total length (type), 50; palatal length, 26.5; palatilar length, 24; zygomatic breadth, 26; least interorbital breadth, 24.5; width of braincase, 19; maxillary tooththrow, 18; diastema, 6; mandibular tooththrow, 6; mandible, front border of symphysis to condyle, 34 mm.

Seven specimens, collected as follows: Lei-Mui-Mon, in the mountains of central Hainan, 5 specimens, Jan. 5-11, 1903; Utoshi, 1 specimen, March 20, 1903; Hoi-how, on the northern coast of Hainan, 1 specimen, Jan. 4, 1903.

This series, with one exception, is exceedingly uniform in coloration; one or two show a little more of a rufescent tinge on the lower back than do the others. The Hoi-how specimen, however, differs from all the others in having the throat tawney ochraceous. It is the youngest of the series, although practically full-grown, and this bright color may be a feature of immaturity, or it may indicate a more richly colored coast form.

The genus *Tupaia* appears not to have before been reported from Hainan. Its Hainan representative does not appear to be closely related to any of the previously described forms, it differing very markedly in coloration from any of the species of the mainland, and is still less closely allied to any of the numerous insular forms.

27. *Nyctinomus plicatus* Buch.-Ham.

Five specimens, all adult males, Rintoi, July 1, 1904. Very uniform in coloration. Forearm, 50-51 mm.

28. *Rhinolophus hainanus* sp. nov.

Type, No. 26748, ♀ ad., Pouten, Hainan, July 2, 1904.

Ears large, broad, rather abruptly pointed, the outer margin slightly emarginate below the tip; antitragus large, separated from the outer border of the ear by a deep hollow; noseleaf rather small, pointed; sella nearly quadrate, about twice as high as broad, the basal anterior extension forming an oval cup as in *R. miratus* (as described and figured by Dobson, Mon. As. Chirop, p. 42, fig. a); lower lip with three deep grooves. Above the general effect is dark russet brown (in type), varying in different specimens to plain dark brown without rufous tinge; in detail, in the russet phase the basal three-fourths of the pelage is suffused with fulvous or golden, lightening basally; in the darker phases the basal rufous suffusion is more or less obsolete, quite disappearing in the darkest specimens, but is generally pale yellowish gray. Ventral surface similar to the dorsal but much paler. Ears and membranes dark brown. Tail much shorter than the tarsus, the extreme tip slightly projecting beyond the membrane.

Length of head and body (type), in dry skins, about 55; tail, 16; ear from crown, 18, width, 15; forearm, 50; 3d metacarpal, 35; 5th metacarpal, 37; 4th intermediate between them; tibia, 22.3; wing membrane terminates 3 mm. above the tarsal joint.

Skull, total length, 22; zygomatic breadth, 10.5; mastoid breadth, 10; width of nasal protuberance, 5.5; length of palatal bridge, 4; upper toothrow, 9; lower toothrow, 9.5; length of mandible, 15.5 mm. Skull broad; nasal protuberance broad but low; p^2 in the toothrow, very distinct; p^3 external, p^2 and p^4 in contact.

It is seemingly rash to attempt to add another species to the list of one hundred or more species and subspecies recently listed under the genus *Rhinolophus*,¹ but in the present case there seems to be no alternative; the species of the adjoining mainland, including the Malay Peninsula, and also from elsewhere, which approach it at all nearly in size are excluded by structural characters of the noseleaf or skull and dentition. It seems to agree best with *R. mitratus*, as described and figured by Dobson, in the character of the ears and nasal appendages; but this species is much larger, having a forearm of 57 mm., whereas the average of 27 specimens of *R. hainanus* is 50 mm., the extremes 49 and 51 mm.

Based on 27 skins, 20 males and 7 females, collected at Pouten, July 2 and 3, 1904. As noted above, there is a considerable range of color variation, dependent upon the amount of rufous suffusion of the pelage, particularly of the basal portion, in general effect the color of the upper parts ranging from russet brown, with the basal portion of the pelage pale golden, to plain dark brown, with the basal portion of the pelage grayish with faint yellowish tinge.

29. *Hipposideros poutensis* sp. nov.

Type, No. 26698, ♂ ad., Pouten, Hainan, July 2, 1904.

Adult.—Ears large, nearly as broad as high, thick and leathery, with 7 or 8 transverse ribs, the lower ones longest and heaviest; inner border nearly straight, becoming convex near the tip, which is short and rather obtuse; outer border slightly hollowed below the tip; upper transverse portion of the noseleaf narrow, slightly convex, the free portion about 8 mm. transversely and 2.5 mm. high, or about as wide (transverse measurement) as the horseshoe, the anterior face with three vertical ridges, most distinct basally; horseshoe with a slight notch on its free border, and with three small leaflets on either side; no frontal sac behind the noseleaf, or at least none distinguishable in even softened skins; wings from the distal fifth of the tibia; tail very pointed, most of the last vertebra exerted; thumb short, with the nail about 7 mm.; feet short, about 9 mm. without the claws.

Color above (type), at the surface russet brown, basal two-thirds of the fur pale buffy gray; below similar but much paler, the hairs slightly gray-tipped; ears brown, membranes blackish brown.

Measurements.—Type (from softened, well-filled skin), head and body, 62; tail, 28; forearm, 60; thumb, 7; 3d metacarpal, 43; 4th, 43; 5th, 41; 3d finger

¹Cf. Andersen, Ann. and Mag. Nat. Hist. (7), XVI, Dec., 1905, pp. 648, 652.

(with metacarpal), 82; 4th finger, 65; 5th, 65; tibia, 23; calcaneum, 10; foot 9 mm. The forearm averages 60.6 in a series of 27 adult specimens, ranging from 58 to 63, with 6 at 60, 15 above 60, and 6 below 60.

Skull (of type), greatest length, 24; zygomatic breadth, 13; width at nasal protuberance, 8; mastoid breadth, 11; width at outer base of canines, 6.5; upper lateral tooththrow (including canine), 9; length of lower jaw, 16.

Young.—Ears smaller, thinner, less prominently ribbed; nasal appendages as in the adult but less developed. Color above seal brown to slaty brown, without or with very slight reddish brown suffusion, the basal portion of the fur whitish gray in the darker specimens, faintly buffy gray in the seal brown specimens; below dark grayish brown to dull drab, the hairs slightly light-tipped.

Size smaller, forearm averaging 58.3, ranging from 57 to 60 mm., as against 60.6 (58–63) in the adults. Greatest length of skull 21 or more, or 2 to 3 mm. less than in adults.

Represented by 50 specimens, of which 27 were collected at Pouten and 23 at Porten, July 2 to 4, 1904. It singularly happens that all the Pouten specimens, except one, are adults and all the Porten specimens, except one, are immature.

The variation in color in the adults is considerable, ranging from golden russet to seal brown above, and correspondingly below. The young specimens vary from blackish to seal brown. Quite a number have the hairs obscurely tipped with gray, above as well as below.

This species is doubtless closely related to *Hipposideros leptophyllus* (Dobson), from the Khasia Hills, eastern Bengal, but differs from it in being considerably smaller, and in many details of structure, as in the smaller ears, relatively much shorter tail, broader transverse portion of the noseleaf, etc. It also seems quite near *H. larvatus* (Horsfield), as described by Dobson, also from the Khasia Hills, and thence southward through Burma and Siam to "Java."

30. *Hipposideros fulvus* Gray.

Thirteen specimens, collected as follows: Rintoi, 6 specimens (4 males, 1 female, 1 without indication of sex), July 1; Rinsui, 7 specimens (4 males, 3 females), July 1. All are adult except two immature examples from Rinsui.

The Rintoi specimens are all in the bright fulvous pelage, the basal portion varying, however, in different specimens from pale yellowish white to bright golden, and the surface tint from bright yellowish russet to dark brown. The Rinsui specimens are all in the mouse brown pelage, with the basal two-thirds of the pelage nearly white, except one which matches the darkest of the Rintoi series. Forearm, Rintoi series, 39 [(38.5–40); Rinsui series (the adults), 38.5 (38–39).

The Rintoi series represents Gray's *H. fulvus*; the Rinsui series his *H. murinus*. The species is evidently dichromatic.

31. **Miniopterus schreibersi** (Natterer).

Three specimens, all females, Rinsui, July 2.

Forearm, respectively, 50, 49, 48.5 mm. Color above dark reddish brown, below paler.

32. **Miniopterus pusillus** Dobson.

Thirteen specimens, 9 males, 4 females, all adult, of which 3 are from Rintoi and 10 from Rinsui, all collected July 2.

Similar in color and structurally to Hainan Island specimens of *M. schreibersi*, but much smaller. Forearm (13 specimens), 40.6, ranging from 40–41.5 mm.

33. **Scotophilus kuhlii insularis** subsp. nov.

Type, No. 26786, ♂ ad., Rintoi, Hainan, July 1, 1904.

Similar to *S. kuhlii* but much larger; forearm 66 as against 60.5 mm. in *S. kuhlii*. In three adults the forearm measures respectively, 1 ♂, 67, 2 ♀'s, 64 and 67; an immature ♂ (phalangeal epiphyses still free), 63.

Color above uniform olive brown; below pale brownish buff, darker on the sides. Ears, skull, and dentition as in *S. kuhlii*.

The skulls of all the specimens are imperfect, lacking the occipital portion. The available measurements of the type skull are as follows: Greatest orbital breadth, 10.2; least postorbital breadth, 6; breadth at outside base of canines, 8.7; length of upper tooththrow excluding incisor, 8.6; length of lower jaw, 18; height at coronoid, 7.7; length of lower lateral tooththrow, 10 mm.

Based on 4 specimens, two males and two females; the two males were taken at Rintoi and the two females at Rinsui, all on July 1, 1904. The four specimens form a very uniform series as regards coloration, both above and below. According to Bonhote (P. Z. S., 1900, p. 192), the average length of the forearm in "*S. kuhlii* is 60.5 mm., showing a variation from 58–63." The maximum thus barely equals an immature specimen of the present series in which the epiphyses of the phalanges are still free, while two of the adults have a forearm of 67 mm. Dobson gives the length of the forearm in *S. heathii* as 2.45 in. (=62.23 mm.); according to Blyth, the forearm in his *Nycticejus luteus* is still less—60.2 mm.

34. **Scotophilus castaneus consobrinus** subsp. nov.

Type, No. 26788, ♀ ad., Rintoi, Hainan, July 1, 1904.

A 'little brother' of the *S. kuhlii* group, distinguished mainly by small size;

Above (adult, type) yellowish brown; beneath similar but much paler. structure of the ear as in *S. kuhlii*, even to the presence of the obliquely transverse rib across the front base of the tragus.

Forearm (in type) 50, averaging 51 in 9 adults, and ranging from 50-52 (only 2 above 51), as against 66 (64-67) in *kuhlii insularis*. Skull (type), total length, 18.5; greatest orbital breadth, 7, as against 10.2 in *kuhlii insularis*; least postorbital breadth, 5; breadth at outside base of canines, 6.2; upper lateral tooththrow (excluding incisor), 6.3; length of lower jaw, 9; length of lower lateral tooththrow, 7 mm.

Young darker, more olive brown and less yellow; also smaller, with the forearm ranging from 46-48, with one at 50 mm. Transverse ridge on front base of tragus wanting, as it is also in immature specimens of the *kuhlii* group.

Represented by 17 specimens, of which 9 are adult and 8 are immature; 13 were collected at Rintoi, July 1, and 4 at Rinsui, July 2. The adults range in coloration of the upper parts from cinnamon brown to dark wood brown, according to the amount of yellowish suffusion; underparts yellowish buff, varying in different specimens from buff to ochraceous buff. The young of the year (smaller and with free epiphyses) darker, mostly with a decided olivaceous shade above and a brownish tinge below. Most of the young specimens are scarcely distinguishable in color of upper parts from the adults of *S. kuhlii insularis*, but the adults are much more yellowish.

There are only two species of Asiatic *Scotophilii* with which the present species needs comparison,—*S. wroughtoni* Thomas, from Surat, British India, and *S. castaneus* Horsfield, the three species having practically the same measurements (average length of forearm in all, 50-51 mm.). For *S. wroughtoni* the length of the forearm is given as 50 mm.; Bonhote (P. Z. S., 1900, p. 192), for *S. castaneus*, says "the average length of the forearm of the 5 specimens in the [British] Museum is 50.7 mm., the lengths ranging from 49-52"; in 9 adults of *S. consobrinus* the forearm averages 51, ranging from 50-52. Bonhote (*l. c.*) says the color of *S. castaneus* "is of a uniform chestnut all over, showing no tendency to become lighter below"; while Thomas says *S. wroughtoni* is "uniform brownish from above without any tinge of yellowish; the hairs white at their bases and gradually darkening to the brownish tips; . . . undersurface very pale fawn, almost white." In neither does the coloration agree with that of *S. consobrinus*, none of the 17 specimens of which approach chestnut, either above or below; in several there is a decided suffusion of yellow, especially on the under surface, which is decidedly lighter than the upper surface; the basal portion of the fur is not white, being on the upper surface only a little lighter than the tips, with rather more difference on the ventral surface between the apical and proximal portions. It seems probable that *consobrinus* is more closely allied to *castaneus* than to any other described form, of which it is doubtless the Hainan insular form.

35. *Murinus cyclotis* Dobson.

One specimen, adult female, Youboi, June 21, 1904. Forearm, 33.

This specimen agrees satisfactorily in nearly all particulars with Dobson's description and figures of *M. cyclotis*, from Darjiling, in the Himalaya. The fur, however, is not very distinctly bicolor, the bright rufous extending nearly the whole length of the hair on the dorsal surface, only the extreme base showing a darker, brownish shade; below a lighter, more yellowish brown to the base of the fur. The present specimen (dry skin) has a smaller ear (14 as against 15.3 mm.) and a shorter tragus (7.5 as against 9), a longer thumb (metacarp. 5 instead of 2.5; ph. 7 without claw, 8.5 with claw, instead of 5), and apparently a longer tibia (17 as against 15.2). As some of these discrepancies may be more apparent than real, due to the measurements being taken in the one case from an alcoholic specimen, and in the other from a skin, it seems best provisionally to refer the present specimen to *cyclotis*; there is a close agreement in dentition, size, color, the hairiness of the interfemoral membrane and feet, etc., notwithstanding the great geographical separation of the two localities, Hainan and the Himalaya. A single specimen ("♀ imm."), however, has been recorded by Dobson from Ceylon.

36. *Pipistrellus portensis* sp. nov.

Type, No. 26797, ad. ♂, Porten, Hainan, July 4, 1904.

Similar in the form of the ear and the structure of the incisors and premolars to *P. tenuis* Temminck, from "Sumatra, Java, and Borneo," as described by Dobson (Cat. Chirop., 1878, 226), but much larger.

Color above (adult, type) dark reddish brown, the short, fine fur colored uniformly to the base; underparts rather lighter and duller; membranes black; ears small, obtusely pointed, the outer margin nearly straight; tragus rather narrow, of nearly even width almost to the obtusely rounded summit, with a small lobule at the outer base; tail pointed, the greater part of the last vertebra exerted; wings from the ankles; well-developed post-calcareal lobules.

Head and body (from a well-made skin, the type), 42; tail, 27; forearm, 32; ear, 9; tragus, 4; tibia, 12; foot, 7. Forearm, 12 specimens, 32 (31-33). Greatest length of skull, 12, to tip of incisors, 13; greatest width of braincase, 6.8; length of lower jaw, 9 mm.

The species is dimorphic, having a dark reddish brown phase and a nearly black phase; rather more than one-half of the adults and about one-third of the immature specimens are in the brown phase, the remainder in the dark phase, varying from deep black to brownish black.

Represented by 28 specimens, of which 11 are adult and 17 more or less immature. The series of immature specimens, in which the phalan-

geal epiphyses are still free, have the same length of forearm as the adults—32 (31–33, with one very young one at 29) mm. The specimens were collected as follows: Porten, 21 specimens, July 4; Rinsui, 5 specimens, July 2; Rintoi, 1 specimen, July 2; Manrun, 1 specimen, June 20.

P. portensis is nearest *P. tenuis*, and is therefore quite different from *P. ridleyi* Thomas, from Selangore, [Malay Peninsula, which, according to the description, is much smaller (forearm 28 instead of 32 mm.), and has quite different ears and dentition. In the latter respects, *P. portensis* closely resembles *P. tenuis*, from which it differs in larger size (forearm 32 instead of 26.7 mm.) and in smaller ears, and doubtless in other respects. It differs from *P. abramus*, as described by Dobson, in smaller size, darker color, and in having the inner upper incisor shorter instead of longer than the inner cusp of the outer incisor.

37. *Myotis davidii* (Peters).

One specimen, Rintoi, July 2.

This specimen agrees very closely with the description by Peters and Dobson of *M. davidii* (type locality, Pekin, China), differing in being larger (forearm 34 instead of 31.5 mm.), and in the color of the upperparts, which are nearly black frosted with whitish tips, instead of fur "dark with light brown tips." It agrees with *M. davidii* in having the wing membranes from the feet and a long calcaneum, in the size and shape of the ears, and in the small size and internal position of the second premolar in both jaws. It is quite probable that comparison of suitable material from the type locality and from Hainan would show that the Hainan form is entitled to separation.

38. *Myotis abramus* (Temm.).

Vesperugo abramus SWINHOE, P. Z. S., 1870, p. 227.

Swinhoe says: "I only procured one small Bat at Hainan—the species which roosted under the eaves of the house in the city wherein I was quartered. Dr. Peters, of Berlin, has kindly determined the species. It is a common House-bat in Nagasaki, Japan."

On this basis *Myotis abramus* is here included.

39. *Macacus rhesus* (Audebert).

Macacus erythræus SWINHOE, P. Z. S., 1870, pp. 226, 615.

One specimen, skin and skull, adult male, Heuron, Hainan, May 10, 1904.

Swinhoe found them very common about the jungles of Nychow, southern Hainan.

40. *Semnopithecus nemæus* (Linn.).

Semnopithecus nemæus MEYER, P. Z. S., 1892, 665 (in litt.).

Dr. Meyer (*l. c.*) has reported the receipt at the Dresden Museum of a specimen of this species from the island of Hainan. He says: "Not being aware that *Semnopithecus nemæus* has been recorded from the island of Hainan, but only from Cochin China, I beg to state that the Dresden Museum has recently received a male specimen of this monkey together with other objects from there."

This is the only evidence I have for the inclusion of this species in the present list.

41. *Hylobates hainanus* Thomas.

"Great Black Ape, DU HALDE, Description de la Chine, 1735, 230."

Hylobates pileatus SWINHÖE, P. Z. S., 1870, 224 (not of Gray).

■ *Hylobates hainanus* THOMAS, Ann. and Mag. Nat. Hist. (6), IX, Feb., 1892, 146; Pocock, P. Z. S., 1905, Vol. II, pt. 1, pp. 169-180, pl. v.

Du Halde (*l. c.*) reported, in 1735, the existence of a great black ape in Hainan, but referred to it as rare, and gave of it little additional information. Swinhoe, in 1870, referred to Du Halde's account, and confirmed the occurrence of such an animal in the island, but was unable to secure specimens, and was unable even to see a living example, although the species was well known to the natives and was sometimes kept by them in confinement.

In 1892, Thomas described a gibbon from Hainan, presumed to be the species doubtfully referred by Swinhoe to *Hylobates pileatus* Gray, the description being based on a specimen presented to the British Museum by Mr. W. T. Lay, "to whom it was brought alive from the island, and in whose care it lived for about four years in China." The animal is described as wholly jet black, and while resembling *Hylobates hooleck*, differs from it, and from all other known species, "by the entire absence of the white superciliary streak."

Pocock, in 1905 (*l. c.*), published some interesting observations on a female specimen then living in the Gardens of the London Zoölogical Society, procured in the island of Hainan, on July 11, 1897.

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1892. MEYER, A. B. [*Semnopithecus nemæus* from the Island of Hainan.] *Proc. Zool. Soc. London*, 1892, p. 665.

Records, in a letter to the Secretary of the Zoölogical Society, a specimen of *Semnopithecus* received at the Dresden Museum from

Hainan, which he was unable to distinguish from "the description and figures of the continental animal, *S. nemæus*."

1905. Pocock, R. I. Observations upon a female Hainan Gibbon (*Hylobates hainanus*), now living in the Society's Gardens. *Proc. Zool. Soc. London*, 1905, Vol. II, pt. 1, Oct., 1905, pp. 169-180. pl. v.

Observations on age at maturity, menstruation, determination of sex, change of color, description of the nomenclature, species, etc.

1869. SWINHOE, ROBERT. On the Cervine Animals of the Island of Hainan (China). *Proc. Zool. Soc. London*, 1869, pp. 652-660.

Three species: *Cervulus vaginalis*, *Panolia eldi*, and another closely allied to *Cervus aristotelis*. There are remarks on other unidentified species, not seen by the author.

1870. SWINHOE, ROBERT. On the Mammals of Hainan. *Proc. Zool. Soc. London*, 1870, pp. 224-239, pl. xviii.

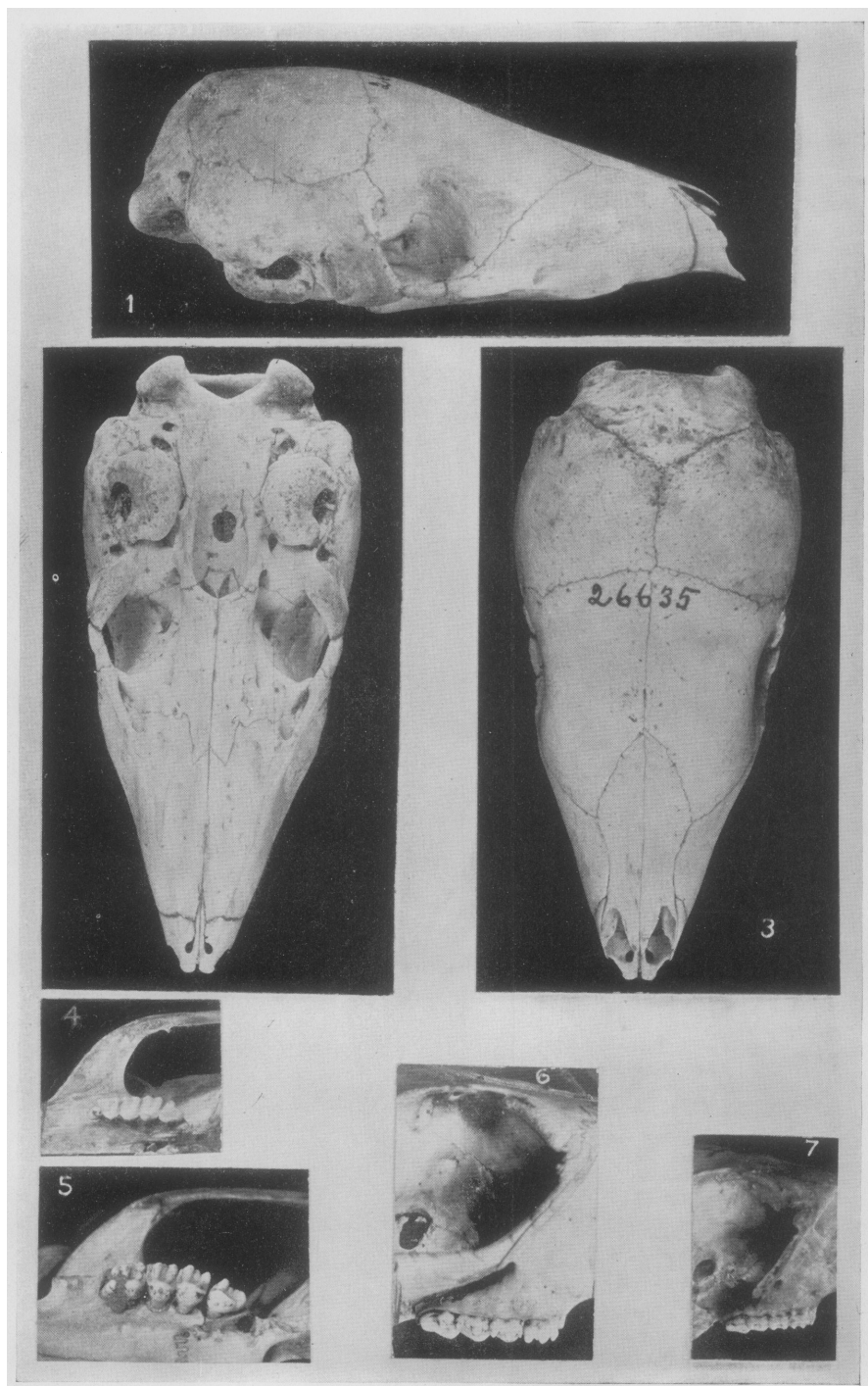
An annotated list of 21 species, "actually seen or procured in whole or in part" by the author, with notes on others, domestic and wild, taken from the 'Hainan Gazetteer.' *Lepus hainanus*, sp. nov.

1892. THOMAS, OLDFIELD. Note on the Gibbon of the Island of Hainan (*Hylobates hainanus*, sp. n.). *Ann. and Mag. Nat. Hist.* (6), IX, Feb., 1892, pp. 145, 146.

ADDENDUM.

Since the foregoing was put into page form I have received, through the kindness of Professor William Morton Wheeler of this Museum, a letter from Mr. Alan Owston of Yokohama, from whom the collection was purchased, enclosing a sketch-map of the island of Hainan on which are indicated the localities at which the collection was made, with other important information. I find that, as I had suspected (see *antea*, p. 465), **Porten** and **Pouten** are different names for the same locality; the same is also true of **Rinsui** and **Rintoi**, of **Liudon** and **Riudon**, and of **Manrin** and **Manrun**, these alternative names being transliterated from different Chinese dialects.

The principal localities are situated as follows: **Cheteriang** is in the mountains near the southern border of the island; **Porten** is near Cheteriang, but a little to the southward and at a lower elevation; **Rinsui** (or Lingsui) is on the southeast coast, a few miles inland; **Manrin** is also on the southeast coast, to the northeast of Rinsui; **Youboi** is near the coast, between Rinsui and Manrin; **Mount Wuchi** (or Uteriang) is in the south-central part of the island; **Lei-Mui-Mon** is in the mountains a little north of the center of the island; **Liudon** (or Riudon) is in the lower country northeast of Lei-Mui-Mon; **Utoshi** (or Wutoshi) and **Taipin** (or Taipinshi) are between and to the southward of Lei-Mui-Mon and Liudon; **Hoi-how** is on the northern coast, to the eastward of the middle of the island.



Figs. 1-3, *Manis pusilla*, sp. nov. ♂ Figs. 4 and 5, *Sciurus vulgaris* L. ♀ Figs. 6 and 7, *Tamioops macclellandi hainanus*, gen. et subsp. nov. ♀

