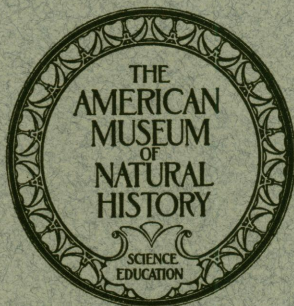


RESULTS OF THE ARCHBOLD
EXPEDITIONS. No. 39

REVIEW OF *MYOTIS* OF EURASIA

BY G. H. H. TATE



BULLETIN
OF
THE AMERICAN MUSEUM OF NATURAL HISTORY
VOL. LXXVIII, ART. VIII, pp. 537-565

New York

Issued December 29, 1941

Article VIII.—RESULTS OF THE ARCHBOLD EXPEDITIONS. NO. 39¹

A REVIEW OF THE GENUS *MYOTIS* (CHIROPTERA) OF EURASIA, WITH
SPECIAL REFERENCE TO SPECIES OCCURRING IN THE EAST INDIES

By G. H. H. TATE

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INTRODUCTION AND ACKNOWLEDGMENTS

This paper represents the first of several planned to deal with the vespertilionid bats in the collections made in the Orient by Richard Archbold for The American Museum of Natural History, New York. I am indebted to the Curators of Mammals at the museums at Chicago, Cambridge and Washington for generously making available for study certain species of *Myotis* and other bats not contained in the general collections in New York.

The present treatment of the subject by subgenera and groups of species may be criticized because the subgenera of *Myotis* are not in every case susceptible of clean-cut definition, and certain species occupy the "no-man's-lands" between subgenera. That objection to such grouping is outweighed, I believe, by the usefulness of such groups when comparing and coördinating the species of large genera.

TAXONOMIC HISTORY

The first important review of *Myotis* seems to have been that by von Keyserling and Blasius,² limited to European species and treated under the generic heading *Vespertilio* (not of Linnaeus, 1758). Seven species were noticed in two groups: "long-eared" and "short-eared." The views of these authors were again set forth nearly twenty years later.³

Various subgeneric names were subsequently introduced but no major revision appeared before Dobson's Monograph of the Asiatic Chiroptera.⁴ In this paper *Leuconoe* and "*Vespertilio*" were recognized as subgenera, 17 species were admitted, and definitions were given of the European *daubentonii* (p. 132), *bechsteinii* (p. 138) and *nattereri* (p. 143).

Dobson's expanded treatment, Catalogue of the Chiroptera in the Collections of the

¹ The present is the 7th paper on the bats. Earlier ones were numbers 23, 24, 35, 36, 37, 38.

² 1839, Archiv. für Naturg., V, pp. 307-312.

³ Fauna Deutschlands, p. 78.

⁴ 1876, pp. 126-145.

British Museum, published two years later,¹ included under "*Vespertilio*" a total of 43 species of *Myotis*.

Miller, dealing with North American vespertilionids,² revived the term *Myotis* for North American species and restricted the use of *Vespertilio* to the Linnaean concept. The same author, in "Families and Genera of Bats,"³ reviewed *Myotis* from the generic aspect.

Jentink⁴ proposed the name *Chrysopteron* for *weberi*, one of the species with wing membranes orange-red where they adjoin the fingers.

Miller treated *Myotis* extensively in his Catalogue of the Mammals of Western Europe.⁵

Thomas⁷ reviewed the Indian species of *Myotis*, making *Leuconoe* a full genus.

Bianchi⁸ proposed *Dichromyotis* for *formosus*, a species closely allied to *weberi*. He separated *bechsteinii* subgenerically as *Paramyotis*.

Miller and Allen⁹ fully revised the species found in the Americas. At the same time Ognev¹⁰ reviewed the Russian species in detail.

The foregoing citations represent merely major papers dealing with the genus. Contributions have been made by many other authors: Sody on the Dutch East Indies, Chasen on Borneo and the Malay area, a number of other Russian writers, etc.

CRITERIA USED IN CLASSIFICATION

Most of the characters employed in classification of *Myotis* are variable. Examples of such fluctuating characters are: dorsal profile of the skull; point of attachment of the wing membrane to the foot; length of thumb; degree of reduction in size and degree of inward displacement of p_3 ,⁶ degree of approximation of p^2 and p^4 to each other. The same character may vary to much the same extent within different species-groups. Thus, both in *Leuconoe* and in *Selysius*, p^3 may be wholly in the tooththrow or wholly displaced.

On the other hand, attachment of the wing membrane to the ankle instead of to the base of the toe is, so far as I am aware, unknown in the subgenus *Selysius*, even though both conditions (extremes and intermediates also) are to be seen in *Leuconoe*. In other groups—*Myotis* (s.s.), *Chrysopteron*, and the large-eared *Paramyotis* and *Isotus* attachment of the membrane is invariably to the base of the toe. It may rea-

sonably be assumed that this type of attachment represents the primitive condition for the genus and that the instances in *Leuconoe* where the membrane arises from the ankle are of secondary origin. This view is strengthened by the fact that attachment of the wing membrane to the toe is a common feature in other Vespertilionine genera. In some *Murina* it is even attached to the claw-bearing phalanx.

An interesting distinction appears in the arrangement of the hairs of the lower surface of the interfemoral membrane. In most species transverse striae (containing blood-vessels ?) are visible and most hairs are gathered along them. In *Selysius* (*mystacinus*) the hairs are grouped in small aggregates of two, three or four along the course of each stria, leaving spaces between each group. In *siligorensis*, *daubentonii*, *formosus*, *myotis* the hairs, though tending to keep to the striae, are scattered without obvious pattern singly over the membrane.

The form of the rostrum and braincase and the dorsal profile are sometimes significant. In typical *Myotis* (*myotis*) the profile rises gradually, with but little indication of frontal depression from rostrum to

¹ 1878, Cat. Chiroptera Brit. Mus., pp. 284-330.

² 1897, Ann. Mag. Nat. Hist., (6) XX, pp. 379-383; 1897, North America Fauna, No. 13, pp. 55-85.

³ 1907, Bull. U. S. Nat. Mus., LVII, pp. 200-202.

⁴ 1910, Notes Leyden Mus., XXXII, p. 74.

⁵ 1912, pp. 166-202.

⁶ The nomenclature used here for the premolars are those used by Miller (Bull. U. S. Nat. Mus., LVII, p. 23), i.e., p_2^2 , $\frac{3}{3}$, $\frac{4}{2}$; although Thomas (Ann. Mag. Nat. Hist., 1908, VII, 1, pp. 347-348) brought forward evidence to show that the teeth are in reality p_1^1 , $\frac{3}{3}$, $\frac{4}{4}$.

⁷ 1914, Jour. Bombay Nat. Hist. Soc., XXIII, pp. 607-612.

⁸ 1916, Annuaire Mus. Zool. Acad. Sci., XXI, pp. lxxii-lxxxii.

⁹ 1928, Bull. U. S. Nat. Mus., 144.

¹⁰ 1928, The Mammals of Eastern Europe and Northern Asia, I, pp. 418-480.

crown and turns slightly downwards at the occipital region. A sagittal crest and weak lambdoidal crests are developed. The braincase is lower than broad. The zygomatics are well expanded behind. Much the same profile is seen in *daubentonii* (*Leuconoe*) but the crests are weaker or undeveloped. In *Chrysopteron* there is greater rise at the front of the braincase and the rostral depression is more pronounced. *Nattereri* (*Selysius*) has the rostrum depressed, the profile rising rather sharply at the frons and continuing gradually to the occiput. Braincase narrow. In the *sili-gorensis* section of *Selysius* this abrupt ascent at the frons becomes more conspicuous on account of the height of the braincase behind it.

In *Myotis* (subgenus) and *Chrysopteron* the condition of the inner and middle lower incisors becomes modified from trilobate to quadrilobate. Indications that the outer of the three lobes may become divided are not wanting in some species of *Selysius* and *Leuconoe*. The four-lobed condition becomes optimum in *Chrysopteron*.

Antero-posterior reduction of m^3 is scarcely noticeable except in *myotis*, subgenus. In *Chrysopteron* no more than a suggestion of such reduction appears. But in *Myotis myotis* the tooth is so much shortened that length:width = 1:2.7 (in *mystacinus*, 0.8:1.5).

A protoconule (on the commissure connecting paracone and protocone) is found only in *Leuconoe*, a group showing several specializations in process of development (foot, wing insertion, etc.). The protoconule is therefore also to be regarded as a specialization. It is present in all *Leuconoe* seen by me and in the American species *lucifugus*, *grisescens* and *albescens* (weakly).

Other characters bearing upon the classification of the genus will become apparent during the course of the discussion.

The list of species shown later in the paper is little more than a set of references with remarks. It is not intended to take the place of original and supplementary descriptions.

GENUS MYOTIS KAUP

Myotis KAUP, 1829, Entwickl.-gesch. u. Natürl. Syst. Europ. Thierwelt, I, p. 106.

GENOTYPE.—*Vespertilio myotis* Borkhausen.

Myotis is distinguished from other Vespertilionidae by possession of a rather elongated muzzle, by the retention of three premolar teeth in each jaw, by the great dis-

parity in size between the first two and the third of these premolars, and by the fact that in many species p^3 , the middle one of the three premolars, tends to be displaced inwards, while p^2 and p^4 become approximated. In the lower jaw p_3 is more rarely displaced from the toothrow.

SUBGENERA OF MYOTIS

The Eurasian species of *Myotis* can be grouped into seven fairly distinct aggregates:

- 1.—*Selysius* Bonaparte (type species *mystacinus*) with small feet, length about 50 per cent of tibia, wing to base of toe, calcar usually with lobe, ear small, rostrum low, frontal region rising rather abruptly. Numerous forms. Distribution world-wide (Fig. 1).
- 2.—*Isotus* Kolenati (type *nattereri*), with small feet, wing to toe, calcar unlobed, ear large—elongate and narrow, braincase full. Distribution apparently limited to the north temperate zone.
- 3.—*Paramyotis* Bianchi (type *bechsteinii*) some-

what as *Isotus* but with longer, much broader ear and braincase low and broad. Distribution: North temperate zone.

- 4.—*Myotis* Kaup (type *myotis*). Very large species with feet not enlarged, wing to toe, ear broad but not much elongated, braincase low, dorsal profile from rostrum to braincase gradual. Lower i_1 and i_2 with four weakly separated lobes. Chiefly north temperate of Old World.
- 5.—*Chrysopteron* Jentink (type *weberi*). Near *Myotis*, but distinguished by peculiar dichromatic wing-pattern, somewhat like that of *Kerivoula picta*, and by the presence of four well-developed lobes on i_1

and i_2 . Braincase rather higher and rostrum lower than in *Myotis*. Old World tropics and subtropics, Korea to Africa.

- 6.—*Leuconoe* Boie. Distinguished by the enlarged feet, which measure considerably more than 50 per cent of tibia, enlarged thumb, small ears (as in *Selysius*); raised rostrum and braincase with but slight depression in frontal profile, a protoconule on m^{1-3} . Like *Selysius*, *Leuconoe* includes a large number of species. Distribution: Chiefly Old World tropics (Fig. 2), but with one or two representatives in America. It is the only one of the subgenera recorded (by Phillips) from Ceylon.
- 7.—*Rickettia* Bianchi. A progressive offshoot of *Leuconoe*, with relatively enormous feet, foot about equal to tibia, wing from middle of tibia, protoconule undeveloped, i^2 with conspicuous inner cusp.

Selysius appears to be the most generalized of the subgenera. Distinctive specializations of the ears appear in *Isotus* and *Paramyotis*, of size and color in *Myotis* and *Chrysopteron*, of the feet in *Leuconoe* and *Rickettia*.

With possible exception in the case of *M. oreias*, neither of the subgenera *Isotus* nor *Paramyotis* enters the Oriental tropics. Both extend into America: *Isotus* (type *nattereri*) includes the American species *thysanodes* and allies with elongate, narrow ears; and *Paramyotis* (type *bechsteinii*) is represented by the broad-eared *evotis* of America and related forms, in which the skull is tapered in front, the premolars spaced, the incisors extended forwards and the symphysis is narrowly V-shaped.

It is open to question whether both of these subgenera can be maintained. The interfemoral membrane has the free border between calcar and tip of tail fringed in both. In both also, the foot is unlengthened, the calcar unlobed, the wing membrane attached at the base of the toe, and the posterior cusp of i^1 is considerably exceeded by the principal cusp of i^2 . There is almost no trace of reduction of m^3 or displacement of p_3^2 in these large-eared *Myotis*. On the contrary a small diastema is observable in *chrysonotus* between p_3 and p_4 . Differences reside in the greatly broadened ear of *Paramyotis*, accompanied by enlargement of the bulla, less thickened i_3 —twice the thickness of i_1 , instead of three times in *Isotus*.

The distributional range of both groups seems to be wholly northern. The only long-eared species of *Myotis* in the Oriental tropics is *oreias* Temminck from Singapore and it is known to me only imperfectly by the much damaged type specimen at Leyden. It has been left provisionally in *Selysius*.

The remaining subgenera of *Myotis* are perhaps more specialized than are the long-eared groups. *Leuconoe*, which has been treated as a full genus,¹ and in certain ways is similar to *Pizonyx* of western America, seems in Asia to reach a climax in *ricketti*, type of *Rickettia* Bianchi. *Myotis* (subgenus), although it includes the type species of the genus, is by no means central structurally; and *Chrysopteron*,² distinguished by the brilliant bi-colored pattern on the wings, much like that of *Kerivoula picta*, and by the four lobes instead of three on each lower inner and central incisor. No representative of either of the last named groups occurs in America.

In both *Myotis* (subgenus) and *Chrysopteron* the interfemoral membrane is virtually naked both above and below, a few excessively small hairs are however present, grouped along the transverse striae of the membrane. In *Chrysopteron* (*chofukusei*) longer hairs are found on a narrow strip of the membrane between the tip of the calcar and tip of tail. They are not arranged as a fringe, however. In *Myotis* (*myotis*) I have found no such hairs. Nor are they present in *chinensis* or *luctuosus*. In *rufopictus* (a *Chrysopteron*) they are present. In both groups a weakly developed lobe sets off the extreme tip of the calcar from the membrane. The wing, both in *Myotis* and in *Chrysopteron* from side of metacarpal almost at its junction with phalanx. Thumb rather large in both; foot:tibia ratio about 55 per cent. *Chrysopteron* is set off sharply from *Myotis* by its remarkable color pattern.

The skulls in both subgenera are distinguished by the closeness of the ante-orbital foramen to the orbit. Diameter of foramen in *Myotis myotis*, 1.1 mm.; distance from lacrimal foramen, only 0.7.

¹ Thomas, 1914, Jour. Bombay Nat. Soc., XXIII, pp. 607-612.

² For use of this subgeneric term see beyond.

The profile of rostrum and braincase in *Myotis* low and flat; in *Chrysopteron* the braincase is slightly fuller and the rostrum a little more depressed.

Dentition heavier in *Myotis* than in *Chrysopteron*. Third upper molars showing reduction in *Myotis*, not in *Chrysopteron*. Premolars still well developed, p^2 ; p^3 displaced inwards from toothrow, somewhat more so in *Myotis* than in *Chrysopteron*. In the lower jaw *Chrysopteron* has p_3 scarcely reduced and fully in the toothrow, its crown dimensions (*chofukusei*) 0.7×0.6 , or longer than broad. In *Myotis* p_3 is much compressed in the toothrow, its length only 0.7 against 1.1.

This condition is less evident in *rufopictus*, 0.5×0.7 .

The 4-cusped condition of i_1 and i_2 , mentioned by Jentink and by Troughton for *Chrysopteron weberi*, is present also in true *Myotis*, though the degree of completeness of the fissure in the outer (third lobe) is slightly less. Nevertheless, *Myotis myotis* may be said to have 4-lobed lower first and second incisors. All of the fissures dividing the lobes in *Chrysopteron* are deeper.

It is evident that the subgenera *Chrysopteron* and *Myotis* have descended from common ancestry. Each manifests a few specializations which the other lacks but the majority of their characteristics are shared.

PROVISIONAL ARRANGEMENT OF THE EURASIAN SPECIES AND NAMED FORMS OF *MYOTIS* UNDER SUBGENERA

Subgenus *Selysius*

mystacinus section

mystacinus Kuhl

m. brandtii Eversmann

m. gracilis Ognev

m. sibiricus Kastschenko

m. ikonnikovi Ognev

m. sogdianus Kuzjakin

m. przewalskii Bobrinskoi

m. pamirensis Kuzjakin

m. transcaspicus Ognev and Heptner

m. kukunorensis Bobrinskoi

m. nipalensis Dobson

m. meinertzhageni Thomas

m. montivagus Dobson

m. muricola Gray

m. moupinensis Milne-Edwards

m. orii Kuroda

m. caliginosus Tomes

m. blanfordi Dobson

latirostris Kishida

lobipes Peters

niasensis Lyon

browni Taylor

insularum Dobson

herrei Taylor

ater Peters

amboinensis Peters

nugax Allen and Coolidge

federatus Thomas

emarginatus section

emarginatus Geoffroy

e. turcomanicus Bobrinskoi

longicaudatus Ognev (?)

desertorum Dobson

lanaceus Thomas

saturatus Kuzjakin

peytoni Wroughton and Riley

altarium Thomas

siligorensis section

siligorensis (Tomes) Horsfield

alticraniiatus Osgood

sowerbyi Howell

Incertae sedis

patriciae Taylor

oreias Temminck

australis Dobson

frater G. M. Allen

Subgenus *Isotus*

nattereri Kuhl

n. tschuliensis Kuzjakin

n. amurensis Ognev

n. bombinus Thomas

Subgenus *Paramyotis*

bechsteinii Kuhl

b. favonicus Thomas

Subgenus *Myotis*

myotis Kaup

m. oxygnathus Monticelli

m. omari Thomas

m. risorius Cheeseman

m. chinensis Tomes

m. luctuosus G. M. Allen

m. ancilla Thomas

m. blythii Tomes

*dobsoni*¹ Trouessart

sicarius Thomas

primula Thomas

Subgenus *Chrysopteron* = *Dichromyotis*

formosus Hodgson

pallidus Blyth

auratus Dobson

rufoniger Tomes

chofukusei Mori

watasei Kishida

rufopictus Waterhouse

¹ This animal was named originally *murinoides* Dobson, 1873. Trouessart, 1879, showed it as homonym of *murinoides* Lartet, 1851, and renamed it *dobsoni*.

- andersoni*¹ Trouessart
hermani Thomas
bartelsi Jentink
weberi Jentink
 also two african forms:
welwitschii
venustus
 Subgenus *Leuconoe*
daubentonii section
daubentonii Kuhl
d. volgensis Eversmann
d. petax Hollister
d. ussuriensis Ognev
laniger Peters
capaccinii section
capaccinii Bonaparte
c. bureschi Heinrich
fimbriatus Peters
hirsutus Howell
pequinius Thomas
longipes Dobson
dauidii section
dauidii Peters
adversus section
adversus Horsfield
horsfieldii Temminck
carinatae Miller
abbotti Lyon
lepidus Thomas
dryas Andersen
taiwanensis Arnback-Christie-Linde
jeannei Taylor
peshwa Thomas
dogalensis Monticelli
moluccarum Thomas
macropus Gould
hasseltii Temminck
macellus Temminck
macroductylus Temminck
dasycneme section
dasycneme Boie
d. major Ognev and Worobiev
macrotrarsus Waterhouse
stalkerii Thomas
 Subgenus *Rickettia*
ricketti Thomas

SUBGENUS SELYSIUS BONAPARTE

Selysius BONAPARTE, 1841, Iconogr. Fauna Ital., I, Introd. Mammalia, p. 3.

TYPE SPECIES.—*Vespertilio mystacinus* Kuhl.

The Eurasian named forms referable to this subgenus number about forty. As will be shown beyond, a number of them are either pure synonyms or geographically representative races (Fig. 1).

The subgenus can be resolved into a few fairly obvious though weakly definable groups:

- A.—*mystacinus* section. Relatively unspecialized, of quite small size. Numerous representative forms.
 B.—Specialized members of *mystacinus* section as regards dentition, which may be called the *ater* section. Moluccas and Sunda region.
 C.—*emarginatus-desertorum* section. Larger species comprising a few forms only. Europe to China.
 D.—*siligorensis* section. Reduced canines and enlarged braincase. India to China.
 E.—A few imperfectly known species, unplaced.

Solution of the inter-relationship of the forms belonging to the subgenus *Selysius*, depends in some measure upon an understanding of those forms which occur in Nepal. Five forms have been named from that general region: *blanfordi*, *meinertzhageni*, *muricola*, *nipalensis* and *siligorensis*. The last named, of whose skull I have a photograph, is readily distinguished by its high cranium, elongate thumbs and very short canines. With *alticraniatus* and *sowerbyi* it represents a small group which extends eastwards to Fukien.

Dobson placed *siligorensis* in the synonymy of *mystacinus*. His remarks about *nipalensis*, "canines very short," suggests a fourth member of the group, but *nipalensis* has white-tipped ventral hairs (which *siligorensis* lacks) and has been suggested by Thomas as a relative of the larger *meinertzhageni* (photograph of type skull).

The identity with *muricola* (photograph of skull of co-type) of material in American museums presents difficulties. Discrepancies exist between Gray's and Dobson's descriptions. The latter synonymized *blanfordi* with *muricola*, also *ater* from Amboina, *caliginosus*, "India," *lobipes*, West Coast of Burma and *moupinensis*, Szechwan. Of these bats we have photographs of the type of *caliginosus* only.

Scully² reviewed the bats of Nepal. Of the *Myotis* of the present subgenus he recognized three forms: *muricola*; *nipalensis* (with pure white underparts); "*mystacinus*," remarking "one of the commonest bats of the Nepal Valley . . . Mr. Hodgson . . . procured it at Siligori, in the Sikkim Tarai, and named it *Vespertilio siligorensis*."

Thus there appear to be only three forms

¹ Described originally as *dobsoni* Anderson, 1881, a homonym of *dobsoni* Trouessart, 1879.

² 1887, Jour. Asiatic Soc. Bengal, LVI, 2, pp. 233-259.

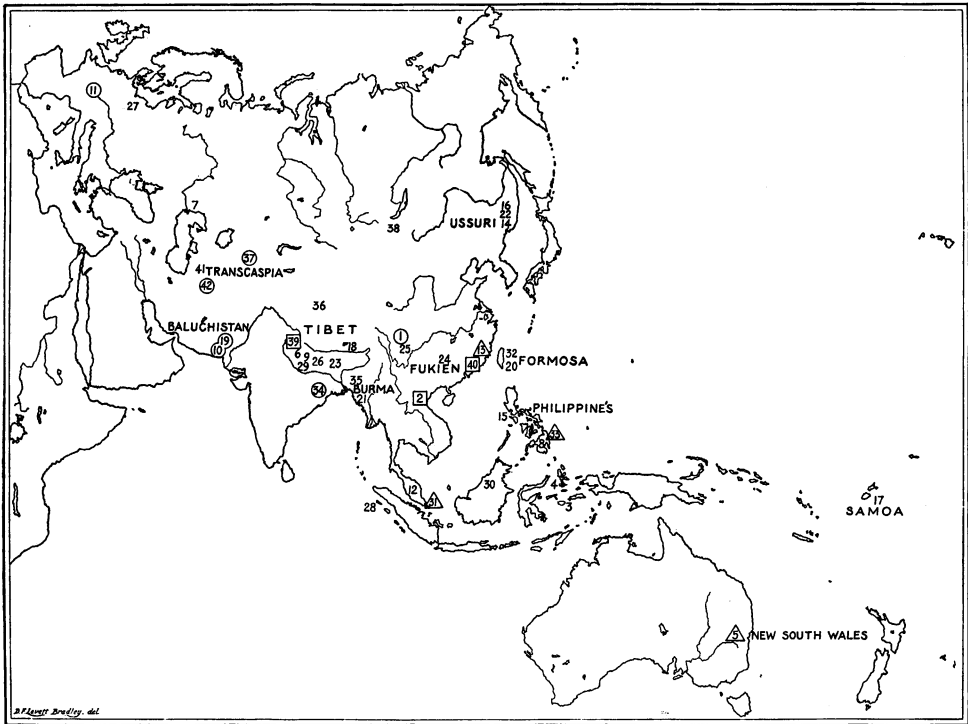


Fig. 1. Type localities of the named forms of *Myotis* (*Selysius*).

Less specialized: 3, *amboinensis*; 4, *ater*; 6, *blanfordi*; 7, *brandtii*; 8, *browni*; 9, *caliginosus*; 12, *federatus*; 14, *gracilis*; 15, *herrei*; 16, *ikonnikovi*; 17, *insularum*; 18, *kukunorensis*; 20, *latirostris*; 21, *lobipes*; 22, *longicaudatus*; 23, *meinertzhageni*; 24, *montivagus*; 25, *moupinensis*; 26, *muricola*; 27, *mystacinus*; 28, *niasensis*; 29, *nipalensis*; 30, *nugax*; 32, *orii*; 36, *przewalskii*; 38, *sibiricus*; 41, *transcaspicus*.

M. emarginatus section, in circles: 1, *altarium*; 10, *desertorum*; 11, *emarginatus*; 19, *lanaceus*; 34, *peytoni*; 37, *saturatus*; 42, *turcomanicus*.

M. siligorensis section, in squares: 2, *alticraniatus*; 39, *siligorensis*; 40, *sowerbyi*.

Miscellaneous unrelated species, in triangles: 5, *australis*; 13, *frater*; 31, *oreias*; 33, *patriciae*.

in Nepal: *siligorensis* which Scully, probably on Dobson's authority, calls "*mystacinus*"; *nipalensis*, perhaps equal to *meinertzhageni*, and *muricola*. By elimination, *muricola* must apply to the dark-colored, short-thumbed bats of Nepal with hairs tipped with coppery brown and forearms 34-35 mm.

Tentatively, in northern India the following relationships appear to exist:

- 1.—*M. mystacinus muricola* (dark) = *moupinensis*
- 2.—*M. mystacinus caliginosus* (smaller) = *blanfordi*
- 3.—*M. mystacinus nipalensis* (larger and paler) = *meinertzhageni* = *kukunorensis*
- 4.—*M. siligorensis* (short canines; domed skull)

It is to be noted that Allen and Coolidge¹

¹ 1940, Bull. Mus. Comp. Zool., LXXXVII, p. 138.

remark upon the distinctness of the Himalayan *muricola* "having long shiny ochraceous tips to the hairs of the upperside" compared with the East Indian forms "without noticeably long burnished tips, and with a yellowish wash below instead of whitish."

A.—*Mystacinus* Section.

Unspecialized forms extending across Eurasia to America and south to the Sunda Islands and Philippines.

The type species of *Selysius*, *mystacinus* may first be defined: *Mystacinus* is a small species of *Myotis* with forearm 31.5 to 35 mm.; thumb short; ear short, 7.6; tibia, 15; calcar slender, with mere trace of keel and terminal lobe. Wing membrane to base

of phalanx. Skull with low braincase (its height above base of skull exclusive of bullae, in proportion to mastoid width = $\frac{4.4}{7.1}$ or 62 per cent); rostral and palatal sinuses shallow and broad; diameter of anteorbital foramen, 0.6 mm.; muzzle low, and measured almost as broad as braincase $\frac{5.4}{6.9}$ or 78 per cent.

Upper incisors subequal in height, each with internal supplementary cusps; the outer tooth nearly twice as thick at cingulum as the inner. Lower incisors becoming progressively thicker outwards in tooth-row, slightly imbricated, trilobate, the outer lobes of the inner and middle teeth not broadened as in *M. myotis*; the outer tooth, bearing four cusps, only moderately thickened, its crown dimensions: $\frac{\text{thickness}}{\text{width}}$,

63 per cent. Anterior two upper premolars subequal in form, the posterior (p^3) very slightly or not at all moved inward, and with only about half the height and crown area of p^2 , both with cingulum complete, subterete, conical. Last upper premolar large and molariform. Lower premolars, p_2 - a_3 , essentially like the upper but less reduced. The last molar unreduced.

The numerous named races or faintly differentiated species related to *mystacinus* have been set forth already in the list of forms. Some of these will be commented upon briefly:

The skulls and skins of *M. mystacinus mystacinus* (A.M. 36697 from England) and *M. mystacinus gracilis* (F.M. 47798 from Saghalien) are virtually indistinguishable except that the latter is very slightly the smaller. An additional race, *brandtii* Eversmann from European Russia was said by Ognev¹ to be larger than the typical race of *mystacinus*.

G. M. Allen² treated *montivagus* Dobson, 1874, type locality Yunnan, as a synonym of *mystacinus* of Europe, but admitted it might have to be revived as a subspecies. Like *brandtii* it was larger (forearm 38

mm.) than *mystacinus* proper. Allen allowed the desert race *przewalskii* Bobrinskoj, 1926, type locality in S. Kashgar to stand.

Remaining northern races are *aurascens* Kuszakin, 1935, from Caucasus, *sogdianus* Kuszakin, 1934, from Tashkent, Central Asia; *pamirensis* Kuszakin, 1935 from Pamir; *kukunorensis* Bobrinskoj, 1929, from S. of Lake Kukunor, Tibet, and *transcaspicus* Ognev and Heptner, 1928, from Transcaspia. We have no specimens.

In 1937 when in London, I examined the skull of "type" of *muricola*, B.M. 45.1.8.143 ♀, but did not see the skin (in alcohol?). The skull is relatively low, with a rather abrupt frontal elevation and raised supra-occipital area: $c-m^3$, 5.3; condylocanine length, 12.5; zygomatic width, 8.5; least interorbital width, 3.3; width between m^3 - a^3 , 3.1. The canine is distinctly longer than the long cusp of p^4 , both in the upper and in the lower jaw.

The nearest approach to a topotype of this species in America seems to be F.M. 35830 from Lachung, Sikkim. In it the forearm measures 35 mm., basal phalanx of thumb only 2.3, the inner edge of the tragus straight, a moderately developed keel on calcar,³ wing membrane from base of toe. The skull greatly resembles that of *mystacinus*: rostrum low, with well-developed longitudinal sulcus, anteorbital foramen small (diameter, 0.6 mm.); braincase not greatly elevated, contrary to *sikigorensis*; outer width of canines (3.2) less than least intertemporal width (3.5), as in *mystacinus*; p_3^3 completely in toothrow, not crowded; main cusp of i^2 longer than posterior cusp of i^1 ; mandibular rami and symphysis narrowly V-shaped. This bat, whose name ought probably to stand *Myotis mystacinus muricola* extends into Szechwan (*moupinensis*, forearm, 34 mm.) and Li-Chiang (A.M. 44563 is indistinguishable from it).

From East Kumaon, United Provinces (just west of Nepal), a smaller race (forearm, 30.5 mm.) but with all attributes of

¹ 1927, Jour. Mamm., VIII, p. 145.

² 1938, The Mammals of China and Mongolia, I, pp. 215-218.

³ Although Dobson distinguished it from *mystacinus* by the presence of the calcaneal lobe, Miller, Mammals of Western Europe, p. 170, wrote of *mystacinus*: "a barely indicated rudiment of keel and terminal lobe."

muricola as defined above, is found; outer width of canines 2.8, least intertemporal width, 3.0; c-m³, 4.9 (in F.M. 35830, 5.25). This race apparently represents *caliginosus* Tomes from "India."

M. blanfordi (forearm, 31-32 mm.) from "Sikkim, Simla, Dalhousie" is probably identical to this smaller race.

Meinertzhageni (forearm, 37 mm.) from Ladak and *nipalensis* (forearm, ?) are probably synonymous and represent (?) a large pale phase of *mystacinus*. Possibly they equal *M. m. kukunorensis* Bobrinskoy from south of Lake Kukunor, Tibet (forearm, 38, "fur of undersurface whitish") or *M. m. przwalskii*. The position of p₃² cannot be clearly ascertained from photographs of the type of *meinertzhageni*.

M. orii Kuroda from Formosa is not improbably the same as *muricola* of Nepal. The larger size of the second incisor, mentioned by Kuroda, has just been pointed out in true *muricola*. The forearm length is identical. However, until shown to be the same, *orii* must stand as a Formosan race. *M. latirostris* Kishida, "the broad-muzzled whiskered-bat," also from Formosa is presumed also related to *mystacinus*. *M. insularum* of Samoa is yet another form seemingly allied to the *mystacinus* assemblage.

Niasensis is far more characteristic of *mystacinus*. Diameter of anteorbital foramen, 0.6 mm.; and its distance from lacrimal foramen, 1.0 mm.; p₃ only very slightly displaced inwards; braincase low; p₃ more compressed than in *mystacinus* and moved slightly inwards; p₂ and depth of mandible as in *mystacinus*. The ear is about as in *mystacinus* and much smaller than that of *abbotti*. There is a small calcaneal lobe. *Niasensis* should be listed as a race of *mystacinus*.

Herrei and *browni*, both described by Taylor from Philippines will probably be found related to *niasensis*. I have not seen them.

M. lobipes (Peters), with well-developed lobe on calcar, as have *muricola* and *moupinensis*, agrees with them closely in size (its forearm, 34; tibia, 14; foot, 7) and may well be a representative of *mystacinus*.

B.—*Ater* Section

Distinguished from *mystacinus* section chiefly by less reduction of p₂ and by slightly greater size. Malay region to Moluccas.

Ater Peters from Ternate was regarded by Dobson as a synonym of *muricola*. No measurements were offered by Peters. Its first lower premolar was stated to be larger than that of *V. tralatitoides* Gray, *nomen nudum*.

Amboinensis Peters, described the same year as *ater* from Amboina, is probably synonymous. Its foot/tibia ratio, 7.5:16, proves that it is not a subspecies of *adversus*, as described.

If the blackish brown colored U.S.N.M. 217521 from Temboan, Celebes, really represents *ater*, then *ater* is very close, if not identical to *nugax* of North Borneo. Forearm of Celebes specimen 38 (Peters gave no dimensions); basal phalanx of thumb 2.3; tibia, 15.5; foot (c.u.), 7.5; a distinct calcaneal lobe developed; wing to base of fingers. Braincase low, diameter of anteorbital foramen, 0.7, its distance from lacrimal foramen, 0.9; p₂ and p₄ in contact, p₃ wholly internal; p₂ larger (mentioned by Peters); p₃ much reduced and displaced inwards. Foramina of mandible small. It appears as though *ater*, *nugax* and *federatus* were very closely allied.

Federatus from Selangor appears closely related to *nugax* from Borneo. It has the same external dimensions, and the rather heavy skull in which p₃³ is displaced inwards.

Nugax, described as subspecies of *abbotti* (a *Leuconoe*), of which I have examined specimens, is an aberrant form of *Selysius*. The wing is attached at the base of the finger, the basal phalanx of the thumb measures only 2.5 mm., a small calcaneal lobe is present. But the skull is quite as heavily built as that of *abbotti*; p₂ and p₄ are in contact and p₂ and p₄ nearly so. There is no protoconule to m¹⁻³. *Nugax* differs strongly from *abbotti* also by the facts that its braincase is really quite low and that the anteorbital foramen is small (diameter 0.6 mm.) and remote from the orbit. In true *abbotti*, which is not a *Selysius* but a *Leu-*

conoe, with thumb, feet and claws, much larger and heavier than in *nugax*, the braincase is much higher and fuller and the foramen 0.8 mm. in diameter and only 0.7 mm. from the lacrimal foramen; and protoconules are present. In both *abbotti* and *nugax* p_2 is relatively large and their mandibles can be distinguished only by the much larger foramina in the former. From *mystacinus* and *muricola*, *nugax* diverges by its greater size, large teeth, heavy skull, p_3^3 displaced, enlarged p_3 , outer width of canines (3.9 mm.) exceeds least intertemporal width.

C.—*Emarginatus-desertorum* Section

The bats *desertorum* (= *lanaceus*), *altarium*, *peytoni* (but perhaps not *peytoni federatus*), *primula* and *saturatus* apparently form a compact group to which is perhaps allied *emarginatus*.

Dobson proposed *desertorum* originally as a variety of *emarginatus*. We have no specimens—only photographs of the type skulls of *altarium*, *peytoni*, *lanaceus* and *primula*. All appear to have p_3^3 in the axis of the tooththrow.

D.—*Siligorensis* Section

The characteristic species came from Siligori, Nepal. It is distinguished by its small size, high braincase and quite small canines, the lower teeth equal in height to p_4 . Other forms allied to it are *alticranialis* Osgood and *sowerbyi* Howell.

E.—*Selysius* species, unplaced

Oreias Temminck is the oldest known form in the East. I quote notes made from the type "ears quite long: p^3 retained in the tooththrow. The forearm measures 38 mm." The only species of corresponding size are *federatus* and *nugax*. The forearm of *federatus* (which is probably not a race of *peytoni*) measured 39.5; that of *nugax*, 38.5. Thomas gave the basi-sinual length of *federatus* as 12.6. That of *nugax* is just 11.0. *Oreias* was a species with large ears (height about 17 mm., according to Temminck). The photograph of its skull shows the premolars in both jaws quite small, and p_3^3 in the tooththrow. There is a possibility that *oreias* may be a southern member of

the *bechsteinii* or *nattereri* groups. The point cannot now be cleared up, as the skull of the type was in fragments and my photographs of it are poor.

M. australis, referred to by Thomas as aberrant, was compared by Dobson to *muricola*. The length of the forearm however is 39 mm. It is probably distinct.

The last species of all referable to *Selysius* is the extremely small cinnamon-colored *patriciae* Taylor from Philippines. Its assignment to the present subgenus is tentative, for I have not examined the type. It is so much smaller than other species that it may well represent a distinct group. Forearm only 27 mm. The teeth p_3^3 slightly out of alignment.

M. frater Allen, 1923, from Fukien appears to be really separable from other Asiatic species through its long tibia in combination with a short tooththrow. *M. longicaudatus* Ognev, 1927, from Siberia and the North American *volans* and *longicrus* seem to be allied to *frater*. Forearm of *frater*, 39 mm.; tibia, 19–20; foot (c.u.), 8; $c-m^3$, 5.0–5.2.

SUBGENUS ISOTUS KOLENATI

Isotus KOLENATI, 1856, Allg. deutsch. Naturh. Zeit., Dresden, (N.F.) II, p. 131.

TYPE SPECIES.—*Isotus* originally contained *V. nattereri* Kuhl and *V. emarginatus* Geoffroy. Bianchi referred *desertorum* Dobson and *nipalensis* Dobson to this subgenus. I suggest fixing *nattereri* as type species of *Isotus*, in case Bianchi should be said not to have done so.

M. (Isotus) nattereri, like *bechsteinii*, is of moderate size (forearm about 38 mm.).

Compared with *mystacinus* (type of *Selysius*) the ear is long and narrow, extending 5 mm. beyond tip of muzzle, and the tragus relatively long. Foot length 50 per cent of tibia. Wing to base of tarsus.

Skull low, especially its posterior portion. Bullae small, their width less than distance apart (in *mystacinus* more).

Teeth essentially as *mystacinus*, but crown area of outer upper incisor increased; p^3 retained in tooththrow; area of p^4 decreased; m^3 reduced slightly.

Myotis emarginatus, the second species included by Kolenati in *Isotus* has the ear relatively thick, only moderately long, exceeding tip of muzzle by 2 mm., with ex-

ternal margin strongly emarginate. Teeth said to be much as in *nattereri*. Cusp of p^3 greatly reduced, scarcely passing height of cingulum of p^2 .

In this paper *emarginatus* and allies are treated as a section of *Selysius*. Miller in 1912 arranged his species in the order: *mystacinus*, *nattereri*, *emarginatus*, *bechsteinii*; but in his key brought *mystacinus* and *emarginatus* together as short-eared species.

SUBGENUS PARAMYOTIS BIANCHI

Nystactes KAUP, 1829, Entwickl.-gesch. u. Natürl. Syst. Europ. Thierwelt, I, p. 108 (type, *bechsteinii*), a homonym of *Nystactes* Gloger, 1827.

Paramyotis BIANCHI, 1916, Annuaire Mus. Zool. Acad. Sci., XXI, pp. xxiii-xxxii, new name for *Nystactes* Kaup, preoccupied.

TYPE SPECIES.—*V. bechsteinii* Kuhl.

Myotis bechsteinii is a species of moderate size (forearm about 40 mm.), very large and broad ears, wing as in *Selysius* (*mystacinus*) from base of phalanx, small foot (length of foot : length of tibia = 9.8:19.6 or 50 per cent). Skull slender and braincase low (its depth 75 per cent of width); rostrum slender (lacrimal width 62 per cent of braincase). Narial sinus narrow and deep. Palate long and narrow. Incisors much as in *Selysius* (*mystacinus*). Upper premolars completely in toothrow, not crowded; p^4 with crown area large, as in *Selysius*; m^3 slightly reduced.

SUBGENUS CHRYSOPTERON JENTINK

Chrysopteron JENTINK, 1910, Notes Leyden Mus., XXXII, p. 74.

Dichromyotis BIANCHI, 1916, Annuaire Mus. Zool. Acad. Sci., XXI, pp. lxiii-lxxxii.

GENOTYPES.—*Kerivoula weberi* Jentink (*Chrysopteron*): *Vespertilio formosus* Hodgson (*Dichromyotis*).

In placing *weberi* in the genus *Kerivoula*, Jentink (1890) was apparently deceived by the similarity of its dichromatic pattern to that of *Kerivoula picta*. Later he recognized its distinctness, when he described *bartelsii* (1910) and separated *weberi* and *bartelsii* under the generic term *Chrysopteron*. He apparently did not then observe the rather close relationship between *Chrysopteron*, and *M. chinensis*, both of which have the first and second premolars reduced in the

manner characteristic of all *Myotis* and both of which have four cusps developed on the inner and middle pairs of lower incisors. Both possess the low braincase of *Myotis myotis*.

Thomas, when he described *hermani* (1923), pointed out the relationship of *Chrysopteron* to *Myotis*.

Troughton, reviewing the Kerivoulinae (1929), included *Chrysopteron*. But to do so he made a separate division with much reduced p^2_{2-3} , in which he placed *Chrysopteron* and his new genus *Anamygdon* (the latter with ribs and sternum as in *Kerivoula*). He apparently did not consider the possibility of *Chrysopteron* being truly allied to *Myotis*, and discussing *Anamygdon*, wrote "external features and dentition, with the skull *in situ*, suggested affinity with the genus *Myotis* (Vespertilioninae), but the specific characters were not reconcilable with *moluccarum* Thomas, the only species of that genus said to extend to the Solomons . . . dissection to expose the sternum and its five attached ribs proves conclusively that the Roviana specimen [*Anamygdon*] belongs to the following subfamily, as defined by Miller [Kerivoulinae]."

The last point is not here contested—probably *Anamygdon* belongs in the Kerivoulinae. But *Chrysopteron*, I believe, is nearer to *Myotis* of the Vespertilioninae.

A number of forms of these strikingly patterned bats have been described from type localities extending from Korea and Celebes to Africa:

<i>chofukusei</i> Mori	Korea
<i>formosus</i> Hodgson	C. Nepal
<i>watasei</i> Kishida	Formosa
<i>rufoniger</i> Tomes	Shanghai
<i>auratus</i> Dobson	Darjiling
<i>andersoni</i> Trouessart	Bengal
<i>rufopictus</i> Waterhouse	Philippines
<i>pallidus</i> Blyth	?
<i>hermani</i> Thomas	Sumatra
<i>bartelsi</i> Jentink	Java
<i>weberi</i> Jentink	Celebes
<i>venustus</i> Matschie	Tanganyika
<i>welwitschii</i> Gray	Angola

SUBGENUS MYOTIS KAUP¹

The characteristics of this subgenus have been indicated, as well as its close relationship to the subgenus *Chrysopteron* (= *Di-*

¹ For reference and type species see under full genus.

chromyotis). The following named forms are here referred to it, most of them probably representing races of *M. myotis* of Europe. The subgenus seems to be unrepresented in America.

<i>myotis</i> Borkhausen	Germany	forearm 62–64 mm.
<i>oxygnathus</i> Monticelli	Italy	forearm 52–57
<i>risorius</i> Thomas	Persia	forearm 62
<i>omari</i> Thomas	Persia	forearm 60
<i>africanus</i> Dobson	?	forearm 53
<i>blythii</i> Tomes	"India, Nassenabad"	forearm 55
<i>dobsoni</i> Trouessart	Himalaya	forearm 52
<i>sicarius</i> Thomas	Sikkim	forearm 53
<i>luctuosus</i> G. M. Allen	Szechwan	forearm 64
<i>ancilla</i> Thomas	Shen-si	forearm 61
<i>chinensis</i> Tomes	China	forearm 64
<i>tsuenensis</i> Kuroda	Liu Kiu Islands	forearm 50

The *Myotis myotis* group includes the largest bats of the genus, with forearm usually more than 60 mm. Skull and mandible heavily built. Braincase relatively low, with a low posterior sagittal crest.

Miller,¹ writing of the lower incisors, says "cutting edge of i_1 and i_2 trifid, but decidedly oblique. . ." But the two inner incisors have their outer lobes considerably broadened and show incipient division. This large lobe is well seen in Miller's figure 33 (*loc. cit.*). In *chinensis* and its subspecies *c. luctuosus* the large external lobe is already subdivided in two, making a total of four lobes along the cutting edges of the central and middle lower incisors.

It seems probable that the relatively small Himalayan forms *dobsoni* (= *murinoides*) and *sicarius* (possibly synonymous) with forearms respectively 52 mm. and 53 mm. represent a somewhat specialized offshoot from true *myotis*, *chinensis*, etc. The dentition of *sicarius* is specialized from the fact that p_3^2 are strongly reduced and displaced, just as Thomas described it. But m^3 is less modified than in *myotis* proper (1.0×2.1).

F.M. 35419 from Sikkim is apparently equal to *sicarius*. The pelage is peculiarly crisp, dark brown, the tips pale, underparts lighter; membrane to toe; a calcaneal lobe; ear of moderate length; tragus round-tipped; forearm 51 mm.; thumb elongate, its basal phalanx, 4.5; skull with profile nearly as low and flat as in *myotis* but much

smaller; anteorbital foramen narrowly elliptic, diameters 0.6×1.2 , its distance from lacrimal foramen 1.1; p_2^2 small, crown heights above cingula $\frac{0.5}{0.6}$; p_3^2 much reduced

both displaced internally from toothrow; $c-m^3$, 7.3. I have neither photograph nor notes on *dobsoni*.

Possibly *tsuenensis* from Liu Kiu (forearm, 50 mm.) may belong with *sicarius*. *Primula* appears to be even further specialized than *sicarius* in degree of reduction of p_3^2 .

SUBGENUS *LEUCONOE* BOIE

Leuconoe BOIE, 1830, Isis, p. 256.

TYPE SPECIES.—*Vespertilio daubentonii* Kuhl.

The bats of the subgenus *Leuconoe* are generally more heavily built than those referable to *Selysius*. Ears moderate; thumb strikingly enlarged in most species, its metatarsal (in *daubentonii*) 2.3 mm. and basal phalanx 4.0. Corresponding dimensions in *Selysius (mystacinus)* are 1.7 and 2.8 mm. Feet enlarged; ratio of foot length to length of tibia, about 10:16; the peculiar aspect of the foot partly produced by lengthening of the toes at the expense of the metatarsi and small bones. In *daubentonii* the three tarsal phalanges of the first digit measure (s.u.) 4.8 mm., the metatarsus only 2.5, whereas in *mystacinus* they are 3.0 and 2.0. The calcar is long. There is no calcaneal lobe, as in *Selysius*. But the tip of the spur is set off slightly from the remainder of the membrane. The attachment of the wing membrane of the wing to the foot varies in *Leuconoe* according to species. In *Myotis daubentonii* it is connected to the side of the foot just below the toe. In many tropical species it is attached to the ankle.

¹ 1912, Cat. Mamm. W. Europe, p. 195.

The profile of the skull differs considerably from that of *Selysius*. It rises rather uniformly and steeply from the front of the muzzle to the braincase, in contrast to *Selysius* in which the muzzle, anteriorly low and flat, rises abruptly at the frons to a low braincase whose highest part is usually its occiput. In *Leuconoe* the inflation of the occiput is less pronounced.

The size and position of the anteorbital foramen is rather different in *Leuconoe* from that of members of *Selysius*. Usually the foramen is considerably larger and proportionately closer to the lacrimal foramen. In *daubentonii* the diameter of the anteorbital foramen is 0.5 mm., its distance from the lacrimal pore is 0.5. These figures are increased in the forms present in the Sunda

Islands and Borneo to 0.8 or 0.9. They are in any case different from *Selysius* in which (e.g., *mystacinus*) the anteorbital pore is smaller, and its distance from the lacrimal opening proportionately greater.

An important character in the subgenus *Leuconoe* is the development of a protoconule on m^{1-2} , it is less evident on m^3 .¹ No such structure can be seen in *Selysius*. The protoconule is present in every form of *Leuconoe* examined by me, including the American species *griseus*. In *Pizonyx* it is indicated but incomplete. The presence of the protoconule appears to be a good subgeneric character in *Leuconoe*.

¹ Miller, 1912, Mammals of Western Europe, p. 186, Fig. 31.

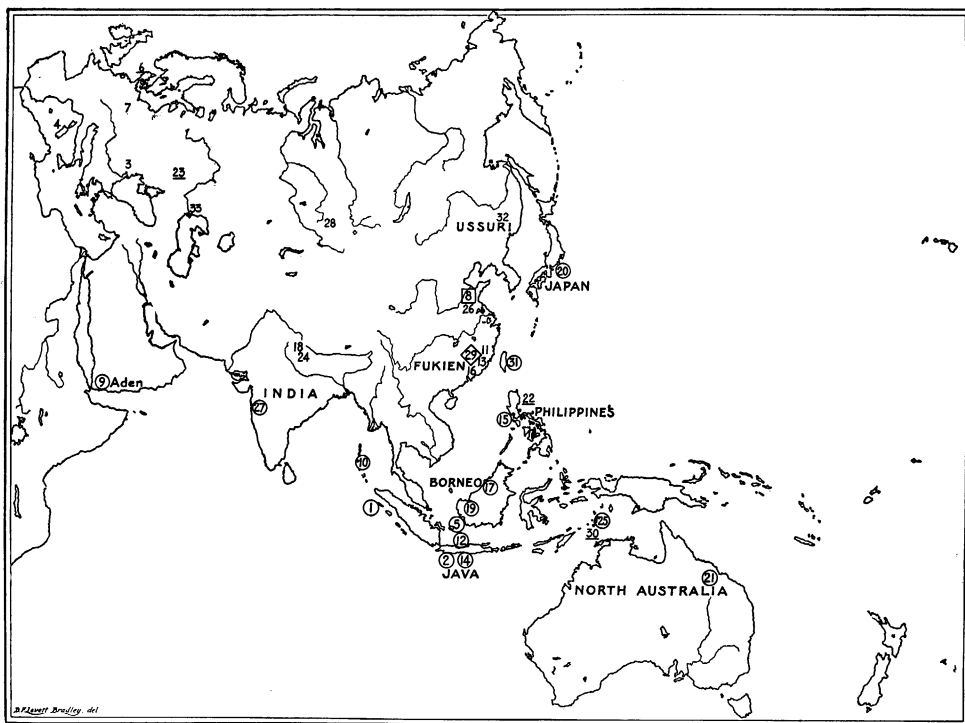


Fig. 2. Type localities of the named forms of *Myotis* (*Leuconoe*).

Less specialized: 3, *bureschi*; 4, *capaccinii*; 7, *daubentonii*; 11, *fimbriatus*; 13, *hirsutus*; 16, *laniger*; 18, *longipes*; 24, *megalopus*; 26, *pequinius*; 28, *petax*; 32, *ussuriensis*; 33, *volgensis*.

M. adversus section, in circles: 2, *adversus*; 5, *carinatae*; 9, *dogalensis*; 10, *dryas*; 12, *hasseltii*; 14, *horsfieldii*; 15, *jeannei*; 17, *lepidus*; 19, *macellus*; 20, *macroactylus*; 21, *macropus*; 25, *molucarcum*; 27, *peshwa*; 31, *taiwanensis*.

M. davidii, in square.

M. (Rickettia) ricketti, in diamond.

Miscellaneous large species, underlined: 6, *dasycneme*; 22, *macroartarsus*; 23, *major*; 30, *stalkeri*.

The positions of p_3^2 are not significant from the subgeneric viewpoint, but are useful in determining species. Those premolars in general tend to retain their primitive alignment in *daubentonii* and other temperate-zone species but p^3 is frequently and p_3 occasionally displaced, and sometimes reduced in size, in species inhabiting the tropics.

The degree of diversification within *Leuconoe* is rather limited. More than thirty forms have been named, many of which are scarcely distinguishable from one another (Fig. 2).

The species referable to *Leuconoe* may perhaps be grouped under a few headings:

- A.—The *daubentonii* section. Wing to side of metatarsus, p^3 for the most part in the tooththrow; chiefly northern. *Daubentonii*, *volgensis*, *petax*, *ussuriensis*, *laniger*; possibly *griseus*, to be treated as full species.
- B.—The *capaccinii* section. Wing to ankle, p^3 usually in tooththrow; uropatagium more or less hairy; chiefly northern. *Capaccinii*, *bureschi* (Bulgaria), *fimbriatus* = ? *hirsutus*, *pequinius*, *longipes* (?).
- C.—The *dauidii* section. Much like *daubentonii*, but extreme shortening of face and palate and maximum displacement of premolars.
- D.—The *adversus* section. Wing usually to side of foot; foot large; p^3 usually excluded; uropatagium naked, without fringes; chiefly tropical: *adversus* = *horsfieldii*, *carinatae*, *abbotti*, *lepidus*, *moluccarum*, *macropus* Gould, *jeannei*, *taiwanensis*, *peshwa*.
- E.—The *dasycneme* section. Large species with naked, unfringed membranes, large feet, p^3 decidedly out of dental alignment; *dasycneme*, *major*, *macrolarsus*, *stalkerii*. The first two are subspecies.

A.—*Daubentonii* Section

The type species of subgenus *Leuconoe*, *daubentonii*, is one of its less progressive members and may be employed with advantage as a basis of comparison. Its range extends across the whole width of temperate Eurasia from England and France to Japan and the Kurile Islands. The American *lucifugus* may represent it. Few races have been named: typical *daubentonii* from Germany; *volgensis* from north of the Caspian Sea; *petax* from Central Asia; *ussuriensis* from Eastern Asia, north of Vladivostok.

The first and last are distinguished by being smaller and having smaller teeth ($c-m^3$, 5.1–5.4 mm.) than southern species, and they show little or no indication of that tendency present in *Myotis* for p^2 and p^3 to move inwards from the tooththrows.

Three forms of *Leuconoe* have been described from Fukien, China, one of which is a geographical representative of *daubentonii*, the others of *capaccinii*. They are *laniger* Peters, forearm 35 mm.; *fimbriatus* Peters, forearm 40; and *hirsutus* Howell, forearm 40. Excerpt from the original description of *laniger* follows:

Laniger, "woolly-faced bat," was compared by its describer to *mystacinus*. "Wings . . . to middle of metatarsus [as *daubentonii*] . . . third lower incisor larger, and lower canines with much shorter points." An undoubted *Leuconoe*, as proved by its enlarged foot, it has still the wing attached to the middle of the metatarsus, as in *daubentonii*. In true *daubentonii* the lower canines are short teeth, as stated for *laniger*. It may well be the eastern representative of *daubentonii*.

B.—*Capaccinii* Section

Capaccinii Bonaparte, on the other hand, differs conspicuously from both of its European allies (*dasycneme* and *daubentonii*) by the densely pilose condition of the uropatagium, whose free margin from the foot to the tip of the calcar is fringed with short hairs. The foot is free from the wing membrane, which attaches at the ankle. In the skull the frontal profile is more depressed than in *daubentonii* (thus approaching the condition of *Selysius*). Diameter of anteorbital foramen, 0.7; its distance from lacrimal pore, 0.8. No lacrimal notch as described in *dasycneme*. The two anterior premolars are uncrowded, and only very slightly displaced inwards, much as in *daubentonii*.

In the Fukien region two bats, apparently related to *capaccinii* have been named respectively *fimbriatus* and *laniger*.

Fimbriatus, described on the same page as *laniger*, was compared to *emarginatus* "Wings to the middle of metatarsus; margins of interfemoral and lumbar membranes ciliated . . . third lower incisor horizontally

half as long as the canine. Upper canine and third premolar [p^4] closer together than in *V. daubentonii*, the second small premolar [p^3] being situated at the inner side of the third."

Hirsutus, "General type of . . . *capaccinii* . . . ventral surface of interfemoral membrane quite heavily (relatively) haired. . . . Dorsad the interfemoral membrane well haired . . . wing membrane arises from tarsus or ankle . . . foot relatively large . . . second small premolar at least half and usually two-thirds as large as the first and is always in the tooththrow."

There is little room for doubt that *fimbriatus* and *hirsutus*, both with fringed interfemoral membranes and both from Fukien are relatives of *capaccinii*. G. M. Allen (1938, p. 214) believed them identical to each other. There exists a size discrepancy however: *fimbriatus*, forearm 34-35 mm.; *hirsutus*, forearm 40. And both have p^3 moved out of the tooththrow, a condition only incipient in *capaccinii*.

C.—*Davidii* Section

Myotis davidii Peters from Peking was described as a quite small species with forearm only 31.5 mm. The foot/tibia ratio was 8:12.5 or 62 per cent—a characteristic proportion in *Leuconoe*. A specimen, U.S.N.M. 219175 from Chi-li, has the forearm 33, thumbs and wing attachment as in true *daubentonii*, the skull with full braincase, large anteorbital foramen of *Leuconoe*, but with the muzzle and palate so much shortened that p^3 is wholly excluded and contact is established between p^4 and p^2 . Is this *davidii*?

D.—*Adversus* Section

After Fukien, the most important territory relating to *Leuconoe* is Java. Four forms, *adversus*, *hasseltii*, *horsfieldii* and *macellus* have been described from the island—all by Horsfield or by Temminck more than 100 years ago. They may be compared as follows:

		Fore-arm	c-m ³	p ³
B.M. 79.11.-				
21.123	<i>adversus</i>	41.5	6.0	displaced
specimen "a"	<i>hasseltii</i>	32	5.6	"
skull "j"	<i>horsfieldii</i>	39	5.9	"
skin "a" with skull "g"	<i>macellus</i>	34-35	5.1	"

It appears that *adversus* = *horsfieldii*¹ and *macellus* = *hasseltii*, and there are but two species of *Leuconoe* in Sunda area—a larger and a smaller.

In connection with this view several other forms from neighboring islands must be examined: *M. carinatae* Miller from Karimata Island, forearm 38.6; *M. abbotti* Lyon from Pagi, forearm 38; *M. lepidus* Thomas from Sarawak, forearm 37.5; *M. moluccarum* Thomas from Kei, forearm 40; *macropus* Gould, Australia; and *M. jeannei*, Taylor, Philippines, forearm 36.5—all of these forms in which, apparently, p^3 is displaced and p^4 and p^2 come into virtual or total contact may well represent a single species (*adversus*) with a number of geographical races. Another bat from regions much more remote, *dogalensis* Monticelli from Aden, forearm 38, may also fit into this concept; as well as *peshwa* Thomas in western India, forearm 40.

The Japanese *macrodytylus* Temminck, forearm 32 mm., may well belong with *hasseltii* and *macellus*.

In the Himalaya country *macropus* Dobson, homonym of *macropus* Gould, and renamed *longipes* Dobson, forearm 36 mm., and *megalopus* Dobson occur.

Longipes seems to be a somewhat anomalous species. Its color is "black," the underparts with white tips. The proximal parts of the wings and proximal half of the uropatagium are haired. No mention is made of the state of the free edges. Wing from ankle. The large foot measures $\frac{2}{3}$ of the tibia. Crown rising rather abruptly (not as *daubentonii*). Anterior premolars very small; p^3 only slightly out of alignment. It seems that *longipes* may best be associated with *capaccinii* for the present.

Megalopus, according to Dobson, is African. The type and another specimen

¹ Noted by Dobson as early as 1876.

were listed by him as coming from Gaboon. Yet the type label in our photograph of the type specimen (B.M. 73.4.16.13) is marked "Kashmir. E. Gerrard." The label is old. "*Vespertilio*" *megalopus* was the generic name originally written in and changed in a different hand writing to *Leuconoe*. The species, if really from Kashmir, will probably prove to be near *peshwa*. Forearm 37 mm. (Dobson). Feet and tibiae as *longipes*. Allen (1940, p. 91), however, lists *megalopus* as African.

E.—*Dasycneme* Section

There remain for consideration a few exceptionally large forms: *pequinius* Thomas, Peking, forearm 49–50 mm.; *macrotarsus* Waterhouse, Philippines, forearm 45; and *stalkerii* Thomas, from Kei Island, forearm 48. These relatively large members of *Leuconoe* are comparable with the large-sized *dasycneme* of Denmark, forearm 47, and with medium sized *capaccinii* from Sardinia, forearm 40.

Dasycneme Boie is described by Miller (1912, p. 189) as having the "tibia and adjacent membrane naked" as in *daubentonii*, and the free edge of the interfemoral membrane without a fringe of hairs, length of tragus less than half that of pinna. Skull broad and robust, rostrum short, crowding the small premolars, lacrimal ridge separated

from lacrimal foramen by a distinct notch, c-m³, 6–7 mm.

Pequinius, though large, resembles *capaccinii* more than *dasycneme*, because of its fringed membrane and wing attachment to ankle. Thomas mentions the small size of p₃² but says nothing of their positions in the tooth rows. Our photograph of the type skull shows p³ markedly and p₃ slightly displaced.

Macrotarsus resembles *dasycneme*. The general structure of interfemoral and feet, and the attachment of the wing to the ankle are the same. In the skull p₃² are reduced in size, and p³ is moved inwards so that p² and p⁴ almost touch.

Stalkerii has the interfemoral unfringed as in *macrotarsus* and *dasycneme*; membranes naked; p³ half size of p², displaced; p₃ also small but in toothrow.

SUBGENUS *RIKETTIA* BIANCHI

Rickettia BIANCHI, 1916, Annuaire Mus. Zool. Acad. Sci., Petrograd, XXI, p. xxviii (as subgenus of *Capaccinius*).

TYPE SPECIES.—*Vespertilio* (*Leuconoe*) *ricketti* Thomas.

Distinguished by the foot-length almost equalling length of tibia; protoconule undeveloped; i² with distinct inner cusp.

Treated by Allen² as a full genus. Allen showed that the single species *ricketti* Thomas might equal *pilosus* Peters,³ which was supposed to have come from Montevideo, Uruguay.

NOTES ON AFRICAN SPECIES OF *MYOTIS*

Allen¹ listed ten African species of *Myotis*, several of which have already been noticed. *Africanus* is related to *M. myotis*. *Capaccinii* and *oxygnathus* are European species referable, respectively, to the subgenera *Leuconoe* and *Myotis*. *Venustus* and *welwitschii* are referable to *Chrysopteron*. The remaining forms include *bocagii* with its subspecies; and *goudotii*, *megalopus*, *scotti* and *tricolor*.

Bocagii Peters is a small, reddish bat with forearm 33 mm., tibia 17.5 and foot 10 mm. *Goudotii* A. Smith was described by Tomes as "of a deep ferruginous hue." Forearm

36. *Megalopus* Dobson is undoubtedly a *Leuconoe*. *Scotti* Thomas is another rufescent species, larger than *bocagii*, with forearm 38 mm., which Thomas at first confused with *dogalensis*. Tibia = 18 mm., foot (s.u.) 6.8. [These measurements appear unreliable.] *Tricolor* Temminck had the tips of the hairs red, underparts yellowish white, forearm 46.

In summarizing, one is struck with the relative paucity of this *Myotis* fauna of Africa. The small red species are apparently referable to *Selysius*.

Selysius: *bocagii*, *goudotii*, *scotti* and the

¹ 1940, Bull. Mus. Comp. Zool., XXXIII, pp. 90–91.

² 1938, Mamm. China Mongolia, I, pp. 224–226.

³ 1869, Monatsber. Akad. Wiss., Berlin, p. 403.

decidedly larger *tricolor*—all have reddish pelage. The only red species of *Selysius* outside of Africa and America is the little Philippine species *patriciae*.

Leuconoe: *capaccinii*, *megalopus*.

Myotis (subgenus): *africanus*, *oxygnathus*.

Chrysopleron: *welwitschii*, *venustus*.

Cistugo appears to be a specialized offshoot of *Myotis*, in Africa, analogous to *Pizonyx* in America and *Rickettia* in Asia.

NOTES ON AMERICAN SPECIES OF *MYOTIS*

In their excellent monograph on American *Myotis* Miller and Allen¹ listed fourteen full species from North America and five from South America.

North America:

lucifugus LeConte
yumanensis H. Allen
austroriparius Rhoads
griseus A. H. Howell
velifer J. A. Allen
occultus Hollister
keenii Merriam
evotis H. Allen
milleri Elliot
thysanodes Miller
sodalis Miller and Allen
volans H. Allen
californicus Audubon and Bachman
subulatus Say

South America:

nigricans Wied
chiloensis Waterhouse
ruber E. Geoffroy
albescens E. Geoffroy
simus Thomas

Their remarks upon the values of subgenera and the relationships of American *Myotis* to Old World species are quoted: (p. 9) "Were the extreme types of cusp development isolated they might well be considered as furnishing characters of generic or subgeneric importance . . . (p. 12) the long-eared American *Myotis keenii*, *M. evotis*, and *M. thysanodes* are not distantly related to the Old World *M. nattereri* . . . and *M. emarginatus*. The Palearctic *Myotis daubentonii* has characters allying it to *M. lucifugus*, while a Chinese species, *M. frater*, seems to be the Old World counterpart of *M. volans*. Similarly the Chinese *M. moupinensis* may be regarded as the Old World representative of *M. californicus* . . . no obvious explanation of the fact that . . . *Myotis myotis* and *M. chinensis* have no representatives in the New World. . . . Of the five species definitely known to inhabit South America, three, *chiloensis*, *nigricans* and *ruber*, . . . are not strongly dif-

ferentiated from each other. Their nearest relatives to the north appear to be *M. lucifugus* and *M. yumanensis* . . . more highly specialized *albescens* . . . *M. simus*, one of the most strikingly characterized American members of the group. . . ."

Miller and Allen concluded that subgenera could not be maintained because of the fluctuating nature of the characters and the presence of transitional forms. Though their boundaries may not be wholly susceptible of delimitation, these somewhat nebulous groups serve a useful purpose in helping to bring order into the mass of species.

Several of the species appear to be plainly assignable to the groups already set up for the Old World *Myotis*; others cannot now be certainly placed.

californicus is small in size and has a low rostrum, uncrowded premolars, of which p_2^2 and p_3^3 are slightly compressed, and agrees very closely indeed with true *mystacinus*. Forearm, 32 mm.

yumanensis has the wing to side of metatarsus, skull a little more heavily built, braincase and muzzle wider, and longer thumb but is nevertheless a *Selysius*. Forearm, 34.

subulatus lacks the abrupt frontal elevation of *mystacinus* and has p^3 slightly displaced. Undoubtedly near *mystacinus*. Forearm, 32.

chiloensis has the slightly heavier build and shorter, higher muzzle of *yumanensis*, and p^3 slightly displaced. *Selysius*. Forearm, 32.

nigricans is larger, but without doubt is a member of *Selysius*. Forearm, 36; braincase low; p_3^3 reduced slightly and p^3 displaced.

sodalis, though larger, also appears to be a *Selysius*. The toothrows are unshortened, the braincase rather full. Forearm, 38. Calcar lobed.

Probably *ruber* should be classed also with *Selysius*. With *patriciae* of the Philippines and the African *bocagii*, *goudotii*, etc., it forms a little group of distinctively red *Myotis*, which however may well prove to be but distantly related.

M. volans, with long tibia and short foot,

¹ 1928, Bull. U. S. Nat. Mus., 144.

has been shown by G. M. Allen to be related to *frater* of China.

M. lucifugus is a species in which the rostrum rises gradually as in *daubentonii*. The pattern of the premolars and incisors is likewise very similar. The wing however is attached to the base of the toe. Perhaps *lucifugus* may be treated as transitional between *Selysius* and *Leuconoe*.

M. keeni has moderately large ears; wing to base of toe; foot (c.u.): tibia, 9:16; skull with full braincase, strong lambdoidal crest, long palate and rostrum and unshortened tooththrows. This species may also be transitional, between *Selysius* and the large-eared *Isotus*.

M. velifer is important as possibly representing the specialized line of *Selysius* which led to *amboinensis*. It shows similarly increased size (forearm, 43), strengthening of the skull with shortened muzzle, reduction of p_3 . The upper third p is often lost; p_3 is greatly reduced in size; through p_2 does not show the increase in size seen in *amboinensis*. *Velifer* ought also to be compared with the *emarginatus-desertorum* group, of which we have no specimens.

Evotis, *milleri*, *thysanodes* appear to be the American representatives of the large-eared groups *Isotus* and *Paramyotis*. *M. keeni*, as said above, may also be allied.

Grisescens appears to be the only North American representative of the more specialized *adversus* section of *Leuconoe*.

Albescens has a rather large foot, the ratio of foot to tibia about 9:15; long calcar with narrow basal lobe; wing to base of toe; almost naked interfemoral membrane; skull with short muzzle; high braincase; p_3 displaced but p_2 and p_4 not in contact; p_3 in tooththrow. It should be included in *Leuconoe*, perhaps near *dauidii*.

I have not seen *austroriparius*, *occultus*, *ruber* or *simus*.

Thus, of the six main subgenera, employed in the body of this paper, one, *Selysius* is dominant in America. Three others, *Isotus*, *Paramyotis* and *Leuconoe*, are weakly represented. *Frater* and *volans*, perhaps including *occultus*, form a north Pacific group, reasonably distinct. *Chrysopteron* and *Myotis* (s.s.) are not known to exist in the western Hemisphere.

ALPHABETICAL ANNOTATED LIST OF THE NAMED FORMS OF MYOTIS IN EURASIA AND AUSTRALIA

abbotti LYON, 1916, Proc. U. S. Nat. Mus., LII, p. 441.

TYPE REGION.—Pagi, west of Sumatra.

Type in Washington, D. C.

Subgenus, *Leuconoe*, allied to *adversus*.

"Forearm, 38 mm.; tibia with foot, 27; tibia, 16; c-m³, 5.5."

adversus HORSFIELD, 1824, Zool. Res. Java.

TYPE REGION.—Java.

Type: photo. B.M. 79.11.21.123.

Subgenus, *Leuconoe*.

Measurements (of type) from Anderson (1906): forearm, 41.5; foot (c.u.), 11.8; c-m³, 6.3.

altarium THOMAS, 1911, Proc. Zool. Soc. London, p. 161.

TYPE REGION.—Szechwan.

Type: photo. B.M. 11.2.1.9, adult ♀.

Subgenus, *Selysius*, *emarginatus-desertorum* section.

Forearm, 45; tibia and foot (c.u.), 29;

c-m³, 6.5. "Ear long, nearly as long as *bechsteini*, but rather narrow . . . no fringe on interfemoral . . . middle upper premolar about half size of anterior, both in tooththrow. . . ." Provisionally placed with *desertorum*.

Although this species is placed here with *desertorum* it may in reality belong elsewhere. Thomas compared it to *pequinius*.

alticranianus OSGOOD, 1932, Field Mus. N.

H. Zool., XVIII, p. 232.

TYPE REGION.—Tonkin.

Type in Field Mus. Nat. Hist.

Subgenus *Selysius*, *siligorensis* section.

Forearm, 33-35; foot (c.u.), 7-8; c-m³, 5.3.

Slightly larger than *siligorensis*.

amboinensis PETERS, 1866, Monatsber.

Akad. Wiss. Berlin, p. 400.

TYPE LOCALITY.—Amboina.

Subgenus, *Selysius*.

- Probably synonym of *ater*, and related to *nugax* and possibly *federatus*.
Forearm, 37.5.
amurensis OGNEV, 1927, Jour. Mamm., VIII, p. 144.
TYPE REGION.—Amur River.
Subgenus *Isotus*, subspecies of *nattereri*.
ancilla THOMAS, 1910, Proc. Zool. Soc. London, p. 636.
TYPE REGION.—Shen-si, China.
Type: photo. B.M. 10.5.2.4., adult ♂.
Subgenus *Myotis*, subspecies of *myotis*.
Forearm, 61.
andersoni TROUESSART, 1899, Cat. Mamm. viv. foss., p. 129. New name for *dobsoni* Anderson, 1881, not *dobsoni* Trouessart, 1879.
ater PETERS, 1866, Monatsber. Akad. Wiss. Berlin, p. 18.
TYPE REGION.—Ternate.
Subgenus, *Selysius*, near *nugax*.
“... distinguished ... by the considerably larger first under molar. . . .”
No measurements were given. Dobson (1878) treated *ater* as a synonym of “*muricola*.” Probably *ater* and *amboinensis* are synonymous.
aurascens KUSJAKIN, 1935, Bull. Soc. Nat. Moscou, XLIV, pp. 432, 437.
TYPE REGION.—North Caucasus Mountains.
Subgenus, *Selysius*.
Described as subspecies of *mystacinus*.
“Forearm, 32–36 . . . c-m³, 5–5.3.”
auratus DOBSON, 1871, Jour. Asiatic Soc. Bengal, XL, p. 186.
TYPE LOCALITY.—Darjiling, India.
Subgenus, *Chrysopteron*.
Forearm, 44.5.
Dobson (1878) synonymized *auratus* with *formosus*.
australis DOBSON, 1878, Cat. Chiropt. Brit. Mus., p. 317.
TYPE REGION.—New South Wales.
Subgenus, *Selysius*, aberrant according to Thomas.
“... shortness of fur . . . post calcaneal lobe . . . first and second premolars in the tooththrow, the second [p³] very small but quite visible from without . . . forearm, 1".55 [39], tibia 0".6, foot, 0".32 [i.e., small-footed].” Dobson placed it next to “*muricola*.”
bartelsi JENTINK, 1910, Notes Leyden Mus., XXXII, p. 74.
TYPE REGION.—Java.
Subgenus, *Chrysopteron*.
“Forearm, 53; tibia, 27; foot, 12.”
Larger than *weberi* but closely related to it and to *hermani*.
bechsteinii KÜHL, 1818, Ann. Wetterau. Ges. Naturk., IV, pt. 1, p. 30.
TYPE REGION.—Germany.
Subgenus, *Paramyotis* (its genotype).
A species with long, broad ears, long legs, low skull with gradually rising dorsal profile, wide braincase, small teeth, premolars uncrowded, in tooththrow; m³ somewhat reduced. Forearm, 40, c-m³, 6.8–7.0.
blanfordi DOBSON, 1871, Proc. Asiatic Soc. Bengal, p. 214.
TYPE REGION.—Himalayas (“Sikkim; Simla; Dalhousie”).
Subgenus, *Selysius*, near *caliginosus*.
Forearm, 1".28 [31–32]; tibia, 0".5% [12.7].
Dobson regarded *blanfordi* as a synonym of “*mystacinus*.”
blythii TOMES, 1857, Proc. Zool. Soc. London, p. 53.
TYPE REGION.—Kashmir ? (see below).
Type: B.M. 73.4.16.15, adult ♂ (Gerard), marked “type” *blythii*, but back of label marked “*V. africanus* Dobson”;¹ also B.M. 49.8.16.22, marked “*blythii* type, India.”
Subgenus, *Myotis*.
Dobson synonymized *blythii* with *murinus* Dobson (= *Myotis myotis*, fide Miller, 1912).
bombinus THOMAS, 1905, Proc. Zool. Soc. London, II, p. 337.
TYPE REGION.—Japan.
Type: Photo. B.M. 6.1.4.14., adult ♀.
Subgenus, *Isotus*; apparently a geographical race of *nattereri*.
brandtii EVERS-MANN, 1845, Bull. Soc. Nat. Moscou, II, p. 505.
TYPE REGION.—Foothills of Ural Mountains.

¹ Dobson, 1875, Ann. Mag. Nat. Hist., (4) XVI, p. 260.

- Subgenus, *Selysius*, subspecies of *mystacinus*.
browni TAYLOR, 1934, Philippine Land Mammals, p. 288.
 TYPE REGION.—Mindanao, Philippines.
 Subgenus, *Selysius* (provisionally referred).
 "Wing membranes attached at base of . . . toe . . . second premolar [upper] almost directly in toothrow . . . forearm, 30; tibia, 12; foot (c.u.), 6.1; c-m³, 5.1."
buerschii HEINRICH, 1936, Mitt. k. Naturw. Inst. Sofia, IX, p. 38.
 TYPE REGION.—Bulgaria.
 Subgenus, *Leuconoe*; race of *capacini*.
caliginosus TOMES, 1859, Proc. Zool. Soc. London, p. 73.
 TYPE REGION.—"India."
 Subgenus, *Selysius*.
 "... one of the smallest species of the genus . . . less than *mystacinus* of Europe . . . top of head rather elevated . . . feet small . . . thumb much smaller [than *Pipistrellus t. tenuis*] . . . wing to base of toe . . . forearm, 1"2½'" [30 mm.]; tibia, 0"6'" [12.7]."
 Dobson synonymized *caliginosus* with *muricola*. It is here regarded as a small-sized representative of *muricola* (*sensu stricto*).
carinatae MILLER, 1906, Proc. U. S. Nat. Mus., XXXI, p. 62.
 TYPE REGION.—Karimata Isles.
 Subgenus, *Leuconoe*, near *adversus*.
 "Like *M. megalopus*," but with larger and heavier teeth.
 Forearm, 38.6.
chinensis TOMES, 1857, Proc. Zool. Soc. London, p. 52.
 TYPE REGION.—China.
 Subgenus, *Myotis*, a race of *myotis*.
 Forearm, 64.
chofusukei MORI, 1928, Annot. Zool. Jap., 11, No. 4, p. 389.
 TYPE REGION.—Korea.
 Subgenus, *Chrysopteron*.
 "Looks like *rufoniger*."
 Forearm, 45.
dasygneme BOIE, 1825, Isis, p. 1200.
 TYPE REGION.—Denmark.
 Subgenus, *Leuconoe*.
 One of the larger species of the group.
 Forearm, 45 mm.
dauidii PETERS, 1869, Monatsber. Akad. Wiss. Berlin, p. 402.
 TYPE LOCALITY.—Peking.
 Subgenus, *Leuconoe*.
 "Very like *mystacinus* . . . rostral width narrower . . . shorter ear . . . upper and lower premolars quite out of row and very small . . . forearm, 31.5; tibia, 12.5; foot, 8." The position of *dauidii* has been discussed on a previous page.
desertorum DOBSON, 1878, Cat. Chiropt. Brit Mus., p. 304.
 TYPE REGION.—Baluchistan.
 Subgenus, *Selysius*, near *emarginatus*.
 Forearm, 44; tibia, 21; foot, 11.
dobsoni TROUESSART, 1879, Revue Mag. Zool., p. 88.
 TYPE REGION.—Himalaya.
 Subgenus, *Myotis*.
 New name for *murinoides* Dobson, preoccupied by *murinoides* Lartet.
dobsoni ANDERSON, 1881, Cat. Mamm. Ind. Mus., p. 143.
 TYPE LOCALITY.—Purneah, Bengal, India.
 Subgenus, *Chrysopteron*.
 "Feet large, with rather powerful toes . . . wing to base of toes . . . wing membrane brownish, profusely spotted with yellow; forearm and fingers yellow . . . forearm, 2".15 [52 mm.]; tibia, 1"; foot, 0".6."
 Preoccupied by *dobsoni* Trouessart, in 1899 renamed *andersoni* Trouessart.
dogalensis MONTICELLI, 1887, Ann. Mus. Genova, (2) V, p. 518.
 TYPE LOCALITY.—Aden.
 Subgenus, *Leuconoe*.
 Forearm, 38.
dryas ANDERSON, 1907, Ann. Mus. Civ. S. N. Genova, (3) III, p. 37.
 TYPE REGION.—Andemans.
 Type: Photo. B.M. 6.12.1.31 ("co-type").
 Subgenus, *Leuconoe*, near *adversus*.
 "Forearm, 38–39; tibia, 16.8–17.7; foot (c.u.), 9.8–10; c-m³, 5.9–6.0."
emarginatus GEOFFROY, 1806, Ann. Mus. N. H., VIII, p. 198.
 TYPE REGION.—France.
 Subgenus, *Selysius*.

- Probably the western representative of *desertorum* and allies. I have not seen a specimen.
- favonicus* THOMAS, 1906, Ann. Mag. Nat. Hist., (7) XVIII, p. 220.
TYPE REGION.—Spain.
Subgenus, *Paramyotis*.
Synonymized with *bechsteinii* by Miller, 1912.
- federatus* THOMAS, 1916, Jour. Bombay Nat. Hist. Soc., VII, p. 3.
TYPE REGION.—Selangor.
Type: Photo. B.M. 16.4.20.5.
Subgenus, *Selysius*.
Federatus was described as a race of *peytoni*, but may be nearer to *nugax* or *ater*. Forearm, 39.5.
- fimbriatus* PETERS, 1870, Proc. Zool. Soc. London, p. 617.
TYPE LOCALITY.—Amoy, Fukien.
Subgenus, *Leuconoe*.
Forearm, 34.4. The large foot and short tibia, combined with the fringed uropatagium suggest relationship to *capaccinii*.
- formosus* HODGSON, 1835, Jour. Asiatic Soc. Bengal, IV, p. 700.
TYPE REGION.—Central Nepal.
Subgenus, *Chrysopteron* (genotype of *Dichromyotis*).
- frater* G. M. ALLEN, 1923, Amer. Mus. Novit., No. 85, p. 6; 1938, Mammals of Mongolia, p. 220.
TYPE REGION.—Fukien.
Subgenus, *Selysius* (?).
Forearm, 39; tibia, 20; foot, 8; c-m³, 5.0. Allen found these bats related to "*volans*, the long-legged bat of western North America." P³ much reduced, displaced; p₃ slightly displaced. The *frater-volans-longicrus* bats probably represent a distinct circum-Pacific type of distribution. The extremely short foot (in relation to the length of the tibia) may require their separation into a distinct group.
- gracilis* OGNEV, 1927, Jour. Mamm., VIII, p. 145.
TYPE REGION.—Vladivostok, Siberia.
Subgenus, *Selysius*.
Described as a race of *mystacinus*. Forearm, "32-36."
- hasseltii* TEMMINCK, 1835, Monogr. Mamm., II, p. 225.
TYPE REGION.—Java.
Type: photo. Leyden, skull "a"¹ [co-type], young adult ♀, from Bantam, Java.
Subgenus, *Leuconoe* (see large foot in Temminck's illustration).
"Forearm, 1"3'" [32]; wing to ankle." Skull of "Spec. a" with p² half height of p⁴; p³ minute, placed between inner edges of p² and p⁴; p₃ displaced to inner side of toothrow, half height of p₂; c-m³, 5.6. The forearm of this specimen measured 34 mm.
- hermani* THOMAS, 1923, Ann. Mag. Nat. Hist., (9) XI, p. 252.
TYPE REGION.—Sumatra.
Subgenus, *Chrysopteron*.
"Forearm, 61; lower leg and hind foot (c.u.), 42.5; c-m³, 9.0."
- herrei* TAYLOR, 1934, Philippine Land Mammals, p. 290.
TYPE REGION.—Philippines.
Subgenus, *Selysius*.
"Blackish brown . . . membrane with small angle at tip of calcar . . . first premolar at least two and a half times diameter of second premolar, latter pushed out of toothrow . . . second [lower] premolar about half diameter of first, not or only slightly . . . out of line . . . forearm, 31.3; tibia, 14; foot (c.u.), 7; c-m³, 5.7."
- Herrei* and *browni* seem both to be referable to *Selysius*.
- hirsutus* HOWELL, 1926, Proc. Biol. Soc. Washington, XXXIX, p. 139.
TYPE REGION.—Fukien.
Subgenus, *Leuconoe*.
"General type of . . . *capaccinii*."
This is a species with fringed inter-femoral membrane, and forearm, 40; tibia, 15.2; foot, 10.1; maxillary tooth-row, 6.7. It is probably equal to *fimbriatus* Peters.
- horsfieldii* TEMMINCK, 1841, Monogr. Mamm., II, p. 226.
TYPE LOCALITY.—Buitenzorg, Java.

¹ Letters taken from Jentink, 1887, Cat. Osteologique, Mus. d'Hist. Nat. des Pays-Bas, IX; 1888, Cat. Systematique, op. cit., XII.

Type: photo. Leyden, skull "i" [co-type].

Subgenus, *Leuconoe*.

"Forearm, 1"4'" [34 mm.]. "Spec. e" with skull "i" examined in Leyden. Its forearm 39 mm.; p³ minute, concealed on inner side of p² and p⁴; c-m³, 5.9.

It seems probable that the larger bats (forearm 39) are referable to *adversus*, and the smaller ones (forearm 32-34) to *macellus*. All are "big-footed."

ikonnikovi OGNEV, 1912, Ann. Mus. Z. Acad. Imp. Sci. Nat. St. Petersburg, XVI, p. 477; 1928, "Mammals of Eastern Europe and Northern Asia," I, p. 455.

TYPE REGION.—Priamur Gov't., Siberia.

Subgenus, *Selysius*.

No skull characters were given. "Externally very like *mystacinus* . . . forearm, 30-31.2." Ognev (1928) compared it to *gracilis*.

insularum DOBSON, 1878, Cat. Chiropt. Brit. Mus., p. 313.

TYPE LOCALITY.—Navigators Island, Samoa.

Subgenus, *Selysius*.

" . . . it resembles *mystacinus* perhaps more closely than any other species . . . first and second upper molars very small and internal to the tooththrow; the second lower premolar about three-fourths the size of the first . . . forearm, 1"4 [34 mm.]; tibia, 0"65; foot, 0"3."

jeannei TAYLOR, 1934, Philippine Land Mammals, p. 284.

TYPE LOCALITY.—Zamboanga, Philippines.

Subgenus, *Leuconoe*.

"Forearm, 36.5; tibia, 16.5; foot (c.u.), 10; c-m³, 6.4 . . . the species belongs to the large-footed group of the genus represented in the Philippines by *Myotis macrotarsus* Waterhouse."

kukunorensis BOBRINSKOJ, 1929, Ann. Mus. Z. Acad. Sci., U. R. S. S., XXX, p. 221.

TYPE REGION.—Tibet.

Subgenus, *Selysius*.

A race of *mystacinus* possibly equal to *nipalensis* and *meinertzhageni*.

Forearm, 38 mm.

*lanaceus*¹ THOMAS, 1920, Jour. Bombay Nat. Hist. Soc., XXVI, p. 933.

TYPE REGION.—Baluchistan.

Type: photo. B.M. 19.11.8.2, adult ♀.

Subgenus, *Selysius*.

Compared by Thomas with *emarginatus* and *formosus*. A synonym of *desertorum*.

laniger PETERS, 1870, Proc. Zool. Soc. London, p. 617.

TYPE LOCALITY.—Amoy, Fukien.

Subgenus, *Leuconoe*.

Forearm 35; tibia, 16; foot, 10.

Probably a relative of *daubentonii*.

latirostris KISHIDA, 1932, "Lansania,"

(4) XL, p. 153.

TYPE REGION.—Central Formosa.

Subgenus, *Selysius* (?).

My only data on this bat is the name "broad-muzzled whiskered bat."

lepidus THOMAS, 1915, Ann. Mag. Nat. Hist., (8) XV, p. 171.

TYPE REGION.—Sarawak.

Type: photo. B.M. 0.7.29.14, adult ♀.

Subgenus, *Leuconoe*.

Thomas described *lepidus* as "dark-colored . . . forearm, 37.5; tibia, 15; foot, 9.5; c-m³, 6.0." He compared it with *horsfieldii*.

lobipes PETERS, 1867, Monatsber. Akad. Wiss. Berlin, p. 706.

TYPE LOCALITY.—Akyab, Arracan, coast of Burma.

Subgenus, *Selysius*.

Lobipes, described under *Pternopterus*, was distinguished from *mystacinus* by "greater development of antitragus . . . proportions of joints of wings . . . development of a lobe on calcar . . . forearm, 34; tibia, 14; foot, 7."

Dobson synonymized it with "*muri-cola*."

longicaudatus OGNEV, 1927, Jour. Mamm., VIII, p. 145.

TYPE LOCALITY.—Vladivostok, Siberia.

Subgenus, *Selysius* (?).

¹ Originally published as "*lanaceus*." Corrected to "*lanaceus*" by Wroughton, 1920, Jour. Bombay Nat. Hist. Soc., XXVII, p. 316.

"The ear . . . has a conspicuous emargination on the median part of the posterior border . . . membrane at base of outer toe. . . . Second premolar [p^3] only one-third the length and two-fifths with width of the first . . . color dark . . . tail very long, 47 mm. . . . Skull short and very concave in occipital region . . . forearm, 38.9; $c-m^3$, 5.2."

This species appears specialized. Possibly it is allied to *frater* and *volans*, or to *emarginatus*. Ognev thought it related to *dauidii*.

longipes DOBSON, 1873, Proc. Asiatic Soc. Bengal, p. 110.

TYPE REGION.—Kashmir.

Subgenus, *Leuconoe*.

Type: photo. B.M. 76.3.10.4, adult ♂, "co-type."

New name for *macropus* Dobson, 1872, preoccupied by *macropus* Gould, 1854. *luctuosus* G. M. ALLEN, 1923, Amer. Mus. Novit., No. 85, p. 5.

TYPE REGION.—Szechwan.

Type: in Amer. Mus. Nat. Hist., New York.

Subgenus, *Myotis*, described as a race of *M. chinensis*. Forearm, 65 mm.

macellus TEMMINCK, 1835, Monogr. Mamm., II, p. 230.

TYPE REGION.—Borneo.

Type: photo. Leyden, skull "g," "co-type."

Subgenus, *Leuconoe*.

"Forearm, 1"4'" [34 mm.]." Skin "a" belongs with skull "g"; p^3 minute, placed between inner edges of p^2 and p^4 ; forearm, 35; $c-m^3$, 5.5. It has been suggested that *macellus* equals or represents *hasseltii*.

macroductylus TEMMINCK, 1839, Monogr. Mamm., II, p. 231.

TYPE REGION.—Japan.

Subgenus, *Leuconoe*.

"Forearm, 1"3'" [32 mm.]; muzzle rather long. . . . Related (?) to *hasseltii* and *macellus*, equally small forms of *Leuconoe*.

macropus GOULD, 1854, Mamm. Australia, III, Pl. 47.

TYPE AREA.—Australia.

Type: photo. B.M. 53.10.22.32.

Subgenus, *Leuconoe*.

Dobson treated *macropus* as a synonym of *adversus*.

macropus DOBSON, 1872, Proc. Asiatic Soc. Bengal, p. 209.

TYPE REGION.—Himalaya.

Preoccupied by *macropus* Gould, 1854, re-named *longipes* by Dobson.

macrotarsus WATERHOUSE, 1845, Ann. Mag. Nat. Hist., XVI, p. 51.

TYPE REGION.—Philippines.

Type: photo. B.M. 55.12.6.259, adult ♀.

Subgenus, *Leuconoe*.

"Forearm, 1" 9 $\frac{1}{2}$ " [45 mm.]; foot, 6 $\frac{1}{2}$ " [14 mm.]."

A large species, the only other large *Leuconoe* with unfringed membranes being *stalker*i and *dasycneme*. The only other recorded *Leuconoe* from Philippines is *jeannei*.

major OGNEV AND WOROBIEV, 1923, Fauna terrestr. Vest. Gov't. Woronesh., p. 98.

TYPE REGION.—Voronesh, Russia.

Subgenus, *Leuconoe*.

"Forearm, 45–48." Described as a race of *dasycneme*.

megalopus DOBSON, 1875, Ann. Mag. Nat. Hist., XVI, p. 261.

TYPE REGION.—Gaboon (Dobson) but label on type skull is marked "Kashmir."

Type: photo. B.M. 73.4.16.13 (Gerrard).

Subgenus, *Leuconoe*.

Dobson gives the forearm as 1".45 [37]; tibia 0".6; foot 0".4.

I cannot clear up the discrepancy in locality.

meinertzhageni THOMAS, 1926, Ann. Mag. Nat. Hist., (9) XVII, p. 609.

TYPE REGION.—Ladak.

Type: photo. B.M. 26.3.1.1.

Subgenus, *Selysius*.

" . . . essential characters as in *Myotis mystacinus*. General color pale buffy, with a pinkish tone in it . . . under surface superficially quite white, the bases of the hairs blackish . . . skull about as in *mystacinus* . . . p^3 not crowded, slightly drawn inward . . . forearm, 37; $c-m^3$, 5.2."

moluccarum THOMAS, 1915, Ann. Mag. Nat. Hist., (8) XV, p. 170.

TYPE LOCALITY.—Kei Islands.

Type: photo. B.M. 10.3.1.29, adult ♂.

Subgenus, *Leuconoe*.

Build of skull as in *stalkeri* but smaller throughout. Color dark gray above, beneath whitish gray with gray bases. Forearm of type, 40; basal joint of thumb, 5.4; foot (s.u.), 12; c-m³, 5.9.

montivagus DOBSON, 1874, Jour. Asiatic Soc. Bengal, XLIII, 1, p. 237.

TYPE REGION.—Yunnan, China.

Subgenus, *Selysius*.

"... in lower jaw second premolar small but distinctly visible, standing in the toothrow; in upper jaw the space between the canine the third premolar is small, and the second premolar is very minute, placed interiorly, in the angle between the first and third premolar . . . forearm, 1".5 [38 mm.]; tibia, 0".6; foot, 0".3."

G. M. Allen (1940) reduced *montivagus* to synonym of *mystacinus* but suggested it might have to be revived as geographical race.

moupinensis MILNE-EDWARDS, 1872, Mamm. Thibet, p. 253.

TYPE LOCALITY.—Moupin, Szechwan.

Subgenus, *Selysius*.

"Wings to base of finger . . . pelage blackish, silky at base and yellowish at extremities . . . forearm, 34; tibia, 12; foot, 7."

Both Dobson (1876, 1878) and Allen (1940) placed *moupinensis* in the synonymy of *muricola*. A specimen from Li-chiang (A.M.N.H. 44563) is indistinguishable from one from Sikkim (F.M. 35830).

muricola GRAY, in Gray and Gray, 1846, Cat. Hodgson Coll. Brit. Mus., p. 4.

TYPE REGION.—Nepal.

Type: photo. B.M. 45.1.8.143, ♀ (co-type).

Subgenus, *Selysius*.¹

V. *muricola* Hodgson, 1839, was a *nomen nudum*. In Gray (*loc. cit.*) it was described as "feet large, elongate, half-free [of wing membrane?] tragus elongate, lanceolate, subfalcate." This

description suggests a *Leuconoe*. No measurements were given.

But Dobson (1876 published measurements of one of Hodgson's three co-types, a male: "forearm 1".35 (34 mm.), tibia 0".6, foot and claw 0".3," showing by the foot/tibia proportion that his specimen was not *Leuconoe*.

A second co-type, B.M. 45.1.8.143, ♀ was seen by me in London in 1937 and its skull photographed: condylocanine length, 12.5; least intertemporal width, 3.5; zygomatic width, 9.0; mastoid width, 7.2; width cochlea, 2.2; distance apart of cochleae, 1.8; outer width c-c, 3.7; outer width m²⁻², 5; c-m³, 6.8; m¹⁻³, 3.1.

murinoides DOBSON, 1873, Jour. Asiatic Soc. Bengal, p. 205.

TYPE REGION.—Himalaya.

Subgenus, *Myotis*.

A homonym of *murinoides* Lartet, 1851, re-named *dobsoni* by Trouessart, 1879.

"Forearm, 2".1 [52 mm.]; first upper premolar very small, not much larger than the second."

mystacinus KÜHL, 1819, Ann. Wetterau Ges. Naturk. IV, pt. 2, p. 202.

TYPE REGION.—Germany.

Subgenus, *Selysius* (genotype).

This species has been described repeatedly. It is a relatively unspecialized member of its group, with premolars little reduced and p₃ still in alignment. Calcaneal lobe weak. Numerous subspecies. Forearm, 32-34; c-m³, 5.0-5.2.

niasensis LYON, 1916, Proc. U. S. Nat. Mus., LII, p. 441.

TYPE LOCALITY.—Nias Island.

Subgenus, *Selysius*.

"Forearm, 31.2; tibia, 14; tibia and foot, 19; c-m³, 4.6-4.8. Lyon compared *niasensis* with "*muricola*." The difference shown by the above figures which give the length of foot as 5 mm. is not accurate. In a paratype (U.S. 121877) the foot (c.u.) = 6; the tibia, 13.5.

nipalensis DOBSON, 1871, Proc. Asiatic Soc. Bengal, p. 214.

TYPE REGION.—Nepal.

¹ Conclusion based on the co-type, not on Gray's description of the feet.

Subgenus, *Selysius*.

"Fur of underparts white-tipped . . . canines very short. . . ." Tibia, 13-14; foot, 7.5.

Probably a smaller representative of *meinertzhageni*, which however may be a synonym of it.

nugax ALLEN AND COOLIDGE, 1940, Bull. Mus. Comp. Zoöl., LXXXVII, No. 3, p. 137.

TYPE LOCALITY.—Mt. Kinabalu, Borneo, 3500 feet.

Subgenus, *Selysius*.

" . . small-footed, dark-brown species . . . second premolar slightly internal to axis of tooththrow . . . in lower jaw p_2 minute and crowded inward . . . forearm, 38.5; tibia, 14.4; foot (c.u.), 7.4; upper tooththrow, 6.0 [apparently includes incisors. In M.C.Z. 36075, $c-m^3 = 5.5$; $i^1-m^3 = 6.5$]."

Described as a race of *abbotti*, which would place it in subgenus *Leuconoe*. *Nugax* is probably the geographical representative in Borneo of *ater* from Ternate and *amboinensis*.

omari THOMAS, 1905, Proc. Zool. Soc. London, II, p. 521.

TYPE REGION.—Persia.

Type: photo. B.M. 5.10.4.14, adult ♂.

Subgenus, *Myotis*.

"Forearm, 60."

A geographical race of *myotis*.

oreias TEMMINCK, 1835, Monogr. Mamm., II, p. 270.

TYPE LOCALITY.—Singapore.

Type: photo. Leyden, skull "a."

"Size small, . . . large, quite long ears and a long, filiform tragus . . . size of Pipistrelle of Europe . . . forearm, 1"5''' [36 mm.]."

From the type specimen in Leyden: p^3 slightly smaller than p^2 , retained in tooththrow; forearm, 38; $c-m^3$, 6.1; m^{1-3} , 3.1; m^1 , 1.2×1.25 ; m^2 , 1.2×1.5 ; m^3 , 0.6×1.5 . No specialization of m^3 .

Either a *Selysius* or one of the long-eared groups *Isotus* and *Paramyotis*.

orii KURODA, 1935, Jour. Mamm., XVI, No. 4, p. 290.

TYPE REGION.—Formosa.

Subgenus, *Selysius*.

Described as race of "*muricola*."

"Very similar to "*muricola*" of Java, but forearm . . . shorter (33-34 mm., instead of 36-39) . . . distinguished by the large second upper premolar, which is one-half to two-thirds the length of the first upper premolar." "Typical *muricola* [? of Java] has a very minute second upper premolar." "Measurements: forearm, 34 mm.; foot, 6.5; zygomatic breadth, 8.5; basilar length, including incisors, 11.1."

Regarded tentatively as a race of *mystacinus*, and possibly synonym of *muricola*, *sensu stricto*, not of "*muricola*" from Java.

pallidus BLYTH, 1863, Cat. Mamm. Mus. Asiatic Soc. Bengal, p. 34.

TYPE LOCALITY.—Chaibassa, Central India.

Subgenus, *Chrysopteron*.

"Much larger than *K. picta*, with the woolly hair shorter, denser, and much paler in coloring; . . . fulvous . . . the orange portion of the wings broader and less defined. Forearm, 2" [51 mm.]."

Described as a species of *Kerivoula*.

Dobson (1878) placed *pallidus* in the synonymy of *formosus*.

panirensis KUSJAKIN, 1935, Bull. Soc. Nat., Moscou, XLIV, pp. 431, 436.

TYPE REGION.—Pamir.

Subgenus, *Selysius*, described as race of *mystacinus*.

"Forearm, 36.2-38 mm.; $c-m^3$, 5.3-5.4."

patriciae TAYLOR, 1934, Philippine Land Mammals, p. 286.

TYPE REGION.—Mindanao, Philippines.

Subgenus, *Selysius* (?).

"Color cinnamon to rufous cinnamon . . . hairs on feet reddish orange . . . bullae very large, all but hiding cochleae . . . canines large . . . first premolar small, very much larger than second which is crowded partially out of tooththrow but separates first and third premolars . . . first lower premolar very much larger than second, which is pushed back slightly out of line. . . . Forearm, 27 mm.; tibia, 11.5; foot (c.u.), 6; upper tooththrow, 5.2."

- This peculiarly small species may represent a specialized offshoot of the *mystacinus* group in Philippines.
- pequinius* THOMAS, 1908, Proc. Zool. Soc. London, p. 637.
- TYPE LOCALITY.—Peking, China.
- Type: photo. B.M. 8.8.7.2, adult ♂.
- Subgenus, *Leuconoe*.
- "Forearm, 49-50; interfemoral fringed. A large, specialized species perhaps related to *capaccinii*."
- peshwa* THOMAS, 1915, Jour. Bombay N. H. Soc., XXIII, p. 611.
- TYPE LOCALITY.—Poona, Bombay.
- Type: photo. B.M. 0.9.16.1, adult ♀.
- Subgenus, *Leuconoe*.
- Peshwa* was compared with "*horsfieldii*." Forearm, 40; tibia, 16; foot, 10.5; c-m³, 5.9.
- petax* HOLLISTER, 1912, Smiths. Misc. Col., LX, p. 6.
- TYPE REGION.—Siberia.
- Subgenus, *Leuconoe*.
- Hollister compared *petax* with *daubentonii*. Bianchi thought them identical.
- peytoni* WROUGHTON AND RILEY, 1913, Jour. Bombay N. H. Soc., XXII, p. 13.
- TYPE REGION.—Kanara, India.
- Type: photo. B.M. 12.8.25.1.
- Subgenus, *Selysius*.
- "Forearm, 46 mm.; much larger than *mystacinus* or *nipalensis*." Apparently related to *emarginatus* and *desertorum*.
- pilosus* PETERS, 1869, Monatsber. Akad. Wiss. Berlin, p. 403.
- TYPE LOCALITY.—Uncertain, said to be Uruguay.
- G. M. Allen (1936, Jour. Mamm., XVII, p. 168) believed it equal to *Rickettia ricketti*, and that it came from China.
- primula* THOMAS, 1920, Jour. Bombay N. H. Soc., XXVII, p. 248.
- TYPE LOCALITY.—Darjiling, India.
- Type: photo. B.M. 16.3.25.30.
- Subgenus, *Myotis*.
- "Forearm, 46." It was compared with *sicarius*. Upper and lower p³ out of tooththrow and greatly reduced; c-m³, 6.9.
- przwalskii* BOBRINSKOJ, 1926, Comptes Rendus Acad. Sci. U. R. S. S., p. 95.
- TYPE LOCALITY.—Khotan-tagh, Russia.
- Subgenus, *Selysius*.
- "Forearm, 35.5."
- A pallid race of *mystacinus*, a little smaller than *kukunorensis* of Tibet.
- ricketti* THOMAS, 1894, Ann. Mag. Nat. Hist., (6) XIV, p. 300.
- TYPE REGION.—Foo-chow, China.
- Type: photo. B.M. 94.9.1.22.
- Placed in separate subgenus, *Rickettia* Bianchi, which was made full genus by Allen, 1928. Also regarded by Allen as equal to *Ricketti*.
- "Forearm, 55; tibia, 22; foot (c.u.), 16."
- risorius* CHEESEMAN, 1920, Jour. Bombay N. H. Soc., XXVII, p. 575.
- TYPE LOCALITY.—Shiraz, Persia.
- Subgenus, *Myotis*.
- "Forearm, 62." Described as a race of *myotis* and compared with *omari*, *myotis* and *blythii*.
- rufoniger* TOMES, 1858, Proc. Zool. Soc. London, p. 79.
- TYPE LOCALITY.—Shanghai.
- Type: photo. B.M. 57.4.16.1.
- Subgenus, *Chrysopteron*.
- "Forearm, 49 (47)."
- rufopictus* WATERHOUSE, 1845, Ann. Mag. Nat. Hist., (1) XVI, p. 54.
- TYPE LOCALITY.—Philippines.
- Subgenus, *Chrysopteron*.
- Membranes to base of toe; forearm, 1"11'" [50 mm.].
- G. M. Allen has recorded it from Palawan (1922).
- saturatus* KUSJAKIN, 1934, Bull. Soc. Nat. Hist. Moscou, pp. 320, 329.
- TYPE REGION.—Central Asia.
- Subgenus, *Selysius*.
- Described as a new race of a *lanaceus* = *desertorum*. Forearm, 42.
- sibiricus* KASTSCHENKO, 1910, Ann. Zool. Mus. Acad. Sci., XV, p. 268.
- TYPE REGION.—North Mongolia.
- Subgenus, *Selysius*.
- Ognev treats this form as a synonym of *gracilis*.
- sicarius* THOMAS, 1915, Jour. Bombay N. H. Soc., XXIII, p. 608.
- TYPE REGION.—Sikkim.
- Type: photo. B.M. 91.10.7.6.

Subgenus, *Selysius*, near *desertorum*.

"Forearm, 53." The premolars, p^2 and p^4 approximated, p^3 reduced and displaced; p_3 also reduced and displaced; mandibles and symphysis a narrow V; canines short.

siligorensis HORSFIELD, 1855, Ann. Mag.

Nat. Hist., (2) XVI, p. 102.

TYPE REGION.—Siligori, Nepal.

Type: photo. B.M. 79.11.21.125.

Subgenus, *Selysius*.

"Muzzle pointed, with moustache on the upper lip. Ears oval, slightly emarginate and somewhat pointed; tragus elongate, acute. Wing membranes arising from base of toes. Fur above uniform dark brown, below dark brown tipped with pale brown. Membranes brown. Forearm, $1\frac{3}{4}$ " (= 32 mm.); tibia, $6\frac{1}{2}$ " (= 13); largest finger, $2\frac{1}{4}$ " (= 59)." "Near or identical to *mystacinus*." *M. siligorensis*, *alticranialis* and *sowerbyi* form a distinct section of *Selysius* distinguished by their high crania, very short canines and extremely delicate mandibles.

sogdianus KUZJAKIN, 1934, Bull. Soc. Nat.

Moscou, XLIII, 2, pp. 321-329.

TYPE REGION.—Central Asia.

Subgenus, *Selysius*.

Described as a race of *mystacinus*.

sowerbyi HOWELL, 1926, Proc. Biol. Soc.

Washington, XXXIX, p. 138.

TYPE REGION.—Fukien.

Subgenus, *Selysius*.

" p^3 minute; p_2 large—about as large as canine . . . c. low . . . braincase declivity gentle . . . forearm, 34; tarsus, 15.3; foot, 8.3; maxillary toothrow, 5.7."

Sowerbyi is not related to *laniger* but to *siligorensis*, as pointed out by Osgood (1932, p. 234).

stalkeri THOMAS, 1910, Ann. Mag. Nat.

Hist., (8) V, p. 384.

TYPE LOCALITY.—Kei Islands.

Type: photo. B.M. 10.3.1.28, adult ♂.

Subgenus, *Leuconoe*.

"Forearm, 48; foot (s.u.), 12; (c.u.), 15."

taiwanensis ÄRNBÄCK - CHRISTIE - LINDE, 1908, Ann. Mag. Nat. Hist., (8) II, p. 235.

TYPE REGION.—Formosa.

Type: photo. B.M. 8.12.2.1, adult ♀, "co-type."

Subgenus, *Leuconoe*.

"Related to *adversus* and *dryas* . . . tibia, 18; foot (c.u.), 11."

transcaspicus OGNEV AND HEPTNER, 1928, Zool. Anzeiger, LXXV, 11/12, p. 260.

TYPE REGION.—Transcaspia.

Subgenus, *Selysius*.

Described as a race of *mystacinus*.

tshuliensis KUSJAKIN, 1935, Bull. Soc. Nat. Moscou, XLIV, pp. 431, 437.

TYPE REGION.—Tschuli, Kopet-Dag.

Subgenus, *Isotus*

"Forearm, 41.7-42; c-m³, 6.3-6.6."

Described as a race of *nattereri*.

tsuensis KURODA, 1922, Jour. Mamm., III, p. 43.

TYPE REGION.—Liu Kiu Isles.

Subgenus, *Myotis*.

"Forearm, 50; tibia, 22-23; foot (c.u.), 12."

turcomanicus BOBRINSKOJ, 1925, Bull. Soc. Nat. Moscou, XXXIV, p. 258.

TYPE REGION.—Transcaspia.

Subgenus, *Selysius*.

Described as a race of *emarginatus*.

ussuriensis OGNEV, 1927, Jour. Mamm., VIII, p. 146.

TYPE REGION.—Usuri, Siberia.

Subgenus, *Leuconoe*.

Described as a race of *daubentonii*.

volgensis EVERSMAUN, 1840, Bull. Soc.

Imp. Nat. Moscou, No. 1, p. 24.

TYPE REGION.—Ural Mountains.

Subgenus, *Leuconoe*.

Eversmann compared *volgensis* with *daubentonii* and Ognev treated it as a subspecies of the same.

watasei KISHIDA, 1924, Dubuts Zasshi, XXXVI, pp. 30-49, 127-139.

TYPE LOCALITY.—Terson, Formosa.

Subgenus, *Chrysopteron*.

"Forearm, 53; tibia, 26.7; foot with claw, 12.2; c-m³, 7.3 . . . wing blue-black, with red-yellow marks, between the fingers black . . . ear red brown at base, edged with black . . . upper and under body fur yellow-brown . . . , feet black . . . back of legs yellow. . ."

Watasei was compared with *formosus*, *rufoniger*, *rufopictus* and *Kerivoula picta*.

weberi JENTINK, 1890, Zool. Ergebn. Reise Niederl. Ost-Indien, I, p. 129.

TYPE REGION.—S. Celebes.

Subgenus, *Chyrsopteron*.

"Forearm, 49;¹ tibia, 25; foot, 12 . . . thumb well developed . . . wing from base of toe . . . orange-colored ears

margined with black. . . ." He goes on to describe the characteristic pattern of the wings.

Weberi was described as a *Kerivoula*. In 1910 Jentink erected the special genus *Chyrsopteron* for it. He corrected his count of the cusps of i^{1-2} from three to four.

SPECIES AND SUBSPECIES OF *MYOTIS* IN THE ARCHBOLD COLLECTIONS

Representatives of only two of the six subgenera reviewed in this paper are contained in the Archbold collections (from Sumatra, Java, Bali, Borneo, Celebes, New Guinea, Australia). Those two subgenera are *Selysius* and *Leuconoe*.

Available names under *Selysius* are *lobipes*, *niasensis*, *nugax*, *ater*, *amboinensis*, *australis*. It has been suggested that *ater*, *amboinensis* and *nugax* are very closely related—perhaps identical, with forearm 37–39 mm. and large teeth, $c-m^3$, 5.5–6.0; p^3 displaced.

Lobipes, forearm 34 mm., and *niasensis*, forearm 31–32, both with tibia 14, seem also to be very close allies, perhaps equal. *Australis* from New South Wales may differ.

I do not believe that *muricola* should be applied as a sub-specific name to any East Indian bats. Possibly all should be called *mystacinus*, full species. The gradient in the premolars of these subspecies runs:

<i>mystacinus</i> , p_2 small,	
compressed	p^3 included
<i>muricola</i> , p_2 small	p^3 slightly displaced
<i>niasensis</i> , p_2 medium	p_3^3 displaced
<i>amboinensis</i> , p_2 large	p_3^3 displaced

Their probable synonymy runs:

lobipes = *niasensis*
ater = *amboinensis* = *nugax*
australis, *incertae sedis*

Neither *lobipes* nor *ater* may yet be safely used, as the synonymy of *niasensis* and *amboinensis* with them, respectively, has yet to be proved. The Archbold material is identified as follows:

niasensis: Kalianda, SE. Sumatra (20 specimens), Cheribon, Java (4); Oeboed (11), Selot (1), Karanz (4), Sauver (1), Noesa Penida (1)—

¹ Not 59, as given in original description. Corrected by Jentink in 1910, Notes Leyden Mus., XXXII, p. 75.

all at Bali;² Riam, SW. Borneo (3); NE. Borneo (9).

amboinensis: Boembalan (32), Lamksang (8), Talassa (14); Wawo (1), Bantimoereng (1), Menando (1)—all on Celebes; Vagian (29), Peleng (24)—islands adjoining Celebes; Sogeri, Papua (1).

It thus becomes apparent that *niasensis*, a small form with small p_2 occupies the greater Sunda Islands, Bali and Borneo, and the larger *amboinensis*, with larger p_2 occurs on Celebes and New Guinea and Borneo (*nugax*). One of the two Philippine species, *herrei* and *browni*, will almost certainly prove to be a close ally of *niasensis*.

Of *Myotis* referable to *Leuconoe*, the Archbold collection contains a much smaller representation from fewer geographical areas. Available names are: *adversus*, with numerous geographical races or synonyms, and the smaller *hasseltii*. The possible races or synonyms of *adversus* are: *carinatae*, *abbotti*, *lepidus*, *dryas*, *moluccarum*, *macropus*. Two much larger forms not present in the collection are *macrotarsus* and *stalkeri*.

I have compared specimens of *M.* (*L.*) *adversus* from Java (not *hasseltii*), *carinatae* from Karimata, *lepidus* from Borneo, *abbotti* from North Pagi. These bats are scarcely separable. Using *adversus* (M.C.Z. 12900) from Java for comparison, *carinatae* (U.S. 125153) has the rostrum above the canine a little deeper, p^4 and p^2 in contact, but the toothrow ($c-m^3$, 5.6), the same length as in *adversus*. *Lepidus* from Lo Bon Bon, Borneo (U.S. 196560) is in my opinion indistinguishable from *adversus* (M.C.Z.). A paratype of *abbotti* (U.S. 121610) differs from *adversus*

² These are "*muricola*" of Sody, 1933, Natuursch. Tijdschr. Ned.-Indië, XCIII, p. 73.

only as *carimatae* does, and from this last not at all. So apparently *adversus* = *lepidus*, and *carimatae* (just separable from *adversus*) = *abbotti*. *Nugax*, described as a race of *abbotti*, has the anterior half of the braincase much lower than any of the foregoing *Leuconoe* and belongs in *Selysius*.

Our two series from Menado, Celebes and Peleng Island, east of Celebes differ from both *adversus* and *carimatae* (toothrow, c-m³, 6.1 instead of 5.5-5.8), and the premolar condition is the more specialized one seen in *carimatae*. These agree with *moluccarum* Thomas, "wing membrane . . . inserted about opposite the base of the calcar . . . forearm 40; c-m³, 5.9 . . ."

Thomas referred to *adversus* as "much larger," and allied *macropus* Gould with it. Anderson (1906) gave the length of the forearm of *adversus* type as 41.5 and c-m³ as 6.3. Sody¹ treats *adversus* and *horsfieldii* as distinct species but I have studied and photographed both types and, as stated earlier, I believe they are synonyms.

Archbold material then is identified as *Myotis (Leuconoe) adversus moluccarum*:

Celebes, Menado (9 specimens); Celebes, Peleng Isl. (9); Dutch New Guinea, Hollandia (52).

¹ 1929, *Natuurk. Tijdschr.*, XXXIX, pp. 53-54.

