

SIX NEW BATS (MICROCHIROPTERA) FROM THE AUSTRALASIAN REGION.

By E. LE G. TROUGHTON, C.M.Z.S.*

Although their age-old mastery of the air resulted in bats becoming probably the most widely distributed order of non-aquatic furred animals, they are possibly the least known members of the mammalian class, owing to the difficulty of observing flying creatures of mainly nocturnal habits, and extremely secretive ways resulting from their acutely sensitive nervous organization.

The smaller kinds are usually just glimpsed in flight, but when killed accidentally in falling trees, or purposely under the mistaken idea that there is a risk of entanglement in people's hair, when they are actually engaged in ridding houses of mosquitoes and other flying pests, casual examination generally dismisses them as "just a common little bat".

Even regarding size, the most elastic feature of wing-spread is made the criterion, rather than the body or the more reliable forearm-length, while the less striking but more diagnostic characters are naturally overlooked. It is not generally realized, therefore, that many interesting genera occur in Australia, embracing about forty species, while many more are listed from New Guinea and adjacent groups of the south Pacific.

In some kinds, such as the leaf-nosed species described below, remarkable elaborations of the nose and facial skin provide striking diagnostic features. Identification of the considerable number of less specialized genera and species of the family Vespertilionidae, however, necessitates close comparison of cranial and minute dental characters, so that careful examination of large spirit collections may yield many interesting discoveries. Re-examination of collections in association with recent acquisitions has resulted in the discovery of unique specimens amongst the large chiropteran "old collection" of the Australian Museum, some of which have been supplemented by new material owing to the encouragement of voluntary collectors or the field activities of the Museum staff.

A striking example of how the less conspicuous kinds of small bats may remain unnoticed even in the most populous areas is provided by the broad-nosed species now described from the Sydney district. Although bats had been sent abroad since the earliest days of settlement, and lodged in the Australian Museum since its inception in 1827, this well-defined species was apparently overlooked for more than a hundred years until in 1926 the author and Museum taxidermists, Messrs. H. S. Grant and J. H. Wright, visited All Saints' Church, Hunter's Hill, at the request of the Rev. M. G. Hinsby to advise him regarding an infestation of small bats.

During the united effort to dislodge a colony, including an impromptu storm fantasia on the organ, a series of a well known species was obtained amongst which an unfamiliar kind was discovered. As a result of further efforts by Messrs. Grant and Wright, including considerable climbing and setting of nets, a second example was secured. The next specimen was brought to the Museum by Mr. Ronald Kaye of Mosman in September, 1931, who had observed it fall from a tree near Taronga Park. Finally, in May, 1936, through the forethought of Mr. J. H. Hinchliffe, Senior, of Hunter's Hill, an excellent series of eleven specimens,

*Contribution from the Australian Museum.

including the only female obtained, was secured from the Church, where he had been carrying out some work during the Museum visitation.

The source of old collection material used in this paper is acknowledged in the descriptions, with a grateful thought for the enthusiastic interest of such naturalists and collectors as the late Dr. E. Pierson Ramsay, past Curator of the Australian Museum, the late George Masters, and many others who built up the basis of fine collections.

More recent material of the new forms includes a broad-nosed bat collected by the late Dr. Herbert Basedow in the Kimberley district of Western Australia in 1917, and specimens of a striking new race of large leaf-nosed bat collected by Mr. A. J. Vogan, F.R.G.S., in the Trobriand Islands a few years ago, when he kindly burdened himself with a can of preservative while engaged upon archaeological research in the region of south-eastern New Guinea.

The two new forms of leaf-nosed bats belong to the large typical species of the *Hipposideros diadema* group, which is already represented by a number of closely allied species and races over a wide range extending through the Indo- and Austro-Malayan Subregions to San Christoval, south-easternmost island of the Solomons. The north Queensland race now described, includes this striking species in the Australian fauna for the first time, which is not surprising in view of its apparent rarity.

Hipposideros diadema reginae subsp. nov.

Diagnosis.—Length of forearm, 3rd metacarpal, skull, and cheek-teeth according with the maximum for *pullatus* of Papua, but distinguished by the decidedly smaller ear, and relatively shorter adult tibia and tail, more slender skull, and brighter coloration. Forearm 79.5–82 mm. *Habitat*.—Cape York to Cardwell district, north-east Queensland.

Description.—Colour bleached but evidently, according to Ridgway's "Standards", a brighter brown originally than the dark "approaching seal-brown" coloration given for the back of *pullatus*, and lacking its strongly marked white dorsal patches and stripes, represented only by pale buffy spots behind the shoulders. Back now between ochraceous-tawny and cinnamon-brown, without marked posterior contrast, the dorsal coloration continuing around the neck and across the chest and contrasting with the palish ochraceous-tawny tinge of the rest of the undersurface; large pale-buffy areas under the shoulders further define the continuation of the dorsal colour over the chest.

Nose-leaf of the normal type, the hind section definitely wider than the front and its upper margin without a strong median projection; the projection on the sella is not unusually developed, and there is no trace of a fourth supplementary leaflet, the third in the female 3 mm. long and well developed, shorter and rather obsolete in the male. Forearm length as in *pullatus*, but ear decidedly shorter and narrower, and tibia and tail relatively shorter than in the Papuan race.

Skull of similar length but relatively narrower, as indicated by the zygomatic, anteorbital, and maxillar width. Upper and lower cheek-teeth length as in *pullatus*, but the mandible definitely shorter.

Dimensions.—In alcohol: Holotype male, allotype in brackets; forearm 82 (79.5); head and body 87 (81); tail 48 (48); tibia 30.5 (30); pes 14.5 (14); ear, length 26 (25), breadth 24 (22); 3rd metacarpal 60.5 (59) mm.

Skull of holotype: Total length, 31.1; zygomatic width, 17.1; braincase, 11.9; anteorbital width, 9; mastoid width, 14.6; maxillar width, 11.2; across

cingula of canines, 8.2; mandible, condylus to incisors, 21.9; cheek-teeth, upper row, 12.5, lower, 13.7 mm.

Specimens and habitat.—The holotype male, No. M1243, from the Bloomfield River in the Cooktown area, purchased from Mr. George Hislop in 1897; allotype entered No. 140, and mounted paratype 139, in Palmer's early register, as presented by the late Dr. E. Pierson Ramsay in 1875, from Cardwell, north-east Queensland.

Remarks.—This race, which provides the first record of the species occurrence in Australia, is distinguished from the nearest geographical ally, *pullatus*, of Papua, by the much smaller ear, which is actually smaller than in the Trobriand form, with a smaller forearm range, described below. The brighter colouring appears to be richer than usual for the species and to have approached the russet or yellowish mars-brown of the typical form of Java and Timor, rather than the darkish seal-brown of the adjacent race.

Hipposideros diadema trobrius subsp. nov.

Diagnosis.—Forearm range definitely smaller but 3rd metacarpal relatively much longer, and the skull stouter, but the anteorbital width distinctly less than in the adjacent geographical race, *pullatus*. Forearm 73.8-76.8. *Habitat*: Kiriwina Island, Trobriand Group, north-east of Papua.

Description.—Lower back lightish mummy-brown, the dark tipping repeated on the shoulders and nape so that there is no marked contrast with the anterior region; the dark colour of the back of an olivaceous brown, rather than the purplish shade of the seal-brown given for *pullatus* (according to Ridgway), and lacking the contrasting dorsal spots and stripes of that race, possibly due to a darker underfur which is nearest avellaneous, and therefore not so pallid as the "ecru-drab with a silvery tinge" given by Anderson as broadly typical of the species. A light line extends along the sides of the body owing to a lack of dark tipping. There is a light cinnamon-brown wash around the face and ear-bases, and the undersurface is drabby avellaneous.

Nose-leaf of more extreme type, a strongly marked median projection on the hind leaf imparting a trilobate effect regarded as peculiar to the Ceylonese species of the *diadema* group (*lankadiva*); the sella and its projection are very prominent, and the 3rd supplementary leaflets are short but deep. Size of forearm, tibia, and ear relatively smaller, and 3rd metacarpal much longer, than in *pullatus*.

Skull relatively wider and more inflated than in *pullatus*, the zygomatic width being distinctly greater and the arches remarkably heavy and strongly inflected posteriorly. In contrast, the anteorbital width is decidedly narrower, possibly not exceeding that of the smallest members of the *diadema* group. Size of cheek-teeth apparently much as in *pullatus*.

Dimensions.—In alcohol: Holotype male, paratype male in brackets; forearm 76.8 (73.8); head and body 84 (84.5); tail 47 (45.5); tibia 29.5 (28.5); pes 13.8 (14); ear, length 26.8 (25.5), breadth 25 (26); 3rd metacarpal 60 (57) mm.

Skull of holotype: Total length, 30.4; zygomatic width, 18.2; brain-case, 12.5; anteorbital width, 8.2; mastoid width, 14.5; maxillar width, 11.4; across cingula of canines, 8.6; mandible, condylus to incisors, 21.4; cheek-teeth, upper, 11.9, lower, 13.2.

Specimens and habitat.—Holotype and paratype males, Nos. M5181-2 respectively, in the Australian Museum collection from Kiriwina Island, Trobriand Group, collected and presented by Mr. A. J. Vogan, F.R.G.S.

Remarks.—One is indebted to the donor's efforts on behalf of the Museum for the opportunity of describing this interesting and very distinct race which appears to have developed characteristic features associated with its isolated habitat. It is readily distinguished from the geographically intermediate Papuan *pullatus* by the contrasted shorter forearm and longer 3rd metacarpal, and the wider and heavier zygomatic arches and narrower anteorbital width.

The forearm, 3rd metacarpal, and skull are larger than in *mirandus* of the Admiralty Group, and, although the forearm averages somewhat nearer that of *oceanitis* of the Solomons, the range is actually smaller, while the 3rd metacarpal is relatively longer, the tibia much shorter, and the ear decidedly smaller.

Broad-nosed Bats from Australia and New Guinea.

The following species and races of bats belong to a less spectacular family, the Vespertilionidae, characterized by a lack of nose-leaf ornamentation, and the simple or unspecialized tail structure in which the inter-thigh membrane extends to the tail-tip. The species of *Scoteinus* are distinguished by the peculiar glandular almost hairless expansion of the nasal region, and the marked dental distinction of having only a single pair of upper incisors, which are situated close to the canines and therefore separated by a wide interval.

The genus has a wide distribution, occurring in India, Africa, and throughout Australia, but not so far recorded from Tasmania. The small species now described from New Guinea was first recorded in 1897, but has hitherto been confused with the smallest Australian form, *S. greyi*, which appears to be restricted to the central region from Darwin to Adelaide.

On the mainland also occurs the very large *S. ruppellii* of New South Wales, the medium-sized *S. influatus* of central north Queensland, and the somewhat smaller *S. balstoni* of Western and South Australia, of which a new north-western race is now described. A new and well differentiated species is now added to the list from the eastern coast, which, like its western ally, is represented by a distinct race in the north.

Scoteinus orion sp. nov.

Diagnosis.—Allied to *balstoni* in size and cranial features, but with darker less markedly bicoloured fur, smaller ear, and shorter tibia and 3rd metacarpal, broader and more inflated skull, and relatively narrower upper molars. Forearm 34.5-36.3. *Habitat.*—Eastern New South Wales.

Colour.—Richer brown above than in *balstoni*, a light shade of brussels-brown when smoothed out, owing to the basal fur being about Prout's brown and the tips washed with cinnamon to clay colour, the dorsal fur therefore toning and less markedly bicoloured. Head of a clearer tone, approaching tawny-olive, with a faint ochraceous wash on the cheeks and ears. Basal fur of undersurface a paler shade of Prout's brown washed with pinkish-buff, producing a general colour of about the shade of "mole" (not given by Ridgway), and apparently of a darker buffy tone than in *balstoni*. No notable variation in twelve fresh specimens of both sexes except that younger animals may be somewhat brighter dorsally.

External characters.—Ear definitely smaller than in *balstoni*, narrower and less pointed or broadly convex in posterior outline or inner angle, the contour more as in the smaller *greyi* but relatively narrower; tragus more

broadly convex posteriorly and of thicker texture than in either allied species. Forearm range similar to *balstoni*, but 3rd metacarpal and tibia shorter, and calcaneal lobe decidedly wider and more conspicuous.

Skull and dentition.—Skull more robust and inflated than in *balstoni*, relatively broader in all but maxillar width, the latter indicative of the narrower upper molar rows; anteorbital and interorbital distinctly broader. Skull of female allotype relatively wider than male crania but interorbital narrower, though decidedly wider in both sexes than in *balstoni*. Cheek-teeth comparatively longer and narrower, the contrast most marked in females.

Dimensions.—Holotype male, allotype in brackets: Forearm 35.8 (36); head and body 61 (59); tail 33 (33); tibia 12 (12); pes 7.8 (8); ear, inner edge 9, total length 13 (13.3), width 10 (10.5); 3rd metacarpal 33.5 mm.

Skulls: Total length 15 (14.9); zygomatic width c 10.8 (11.1); brain-case 7.5 (7.8); anteorbital width 5.8 (6.1); interorbital width 4.4 (4.1); mastoid width 9 (9.2); maxillar width 6.8 (7); palate length 5.3 (5.1); cheek-teeth, upper row 5.6 (5.8), lower 6.2 (6.4) mm.

Specimens examined.—Fifteen, including the holotype male No. M6115, and allotype M6117, in the Australian Museum from suburbs of Sydney, New South Wales. Specimens collected by Messrs. Grant and Wright (taxidermists) and donations by Mr. J. H. Hinchliffe, senior, and Mr. Ronald Kaye.

Remarks.—This well defined species, so long incognito in the Sydney district, provides the first authentic record of the occurrence of a second species of the genus in New South Wales. It is evidently the eastern ally of *S. balstoni* from which it is readily distinguished by the smaller ear, 3rd metacarpal, and tibia, and cranially by the broader ante- and inter-orbital width, and relatively longer and narrower cheek-teeth rows. The much smaller size distinguishes it from its State compatriot, *S. ruppellii*, and it is separated from *S. influatus* of central north Queensland by the smaller forearm. It is represented, like the western ally, by a northern race, both of which are now described.

Scoteinus orion aquilo subsp. nov.

Diagnosis.—Size generally smaller, but tail longer, 3rd metacarpal and tibia relatively longer, and skull and teeth smaller than in the typical race. Forearm 32.5-34.5. *Habitat*.—East coastal Queensland, from Bowen to Rockhampton.

Description.—Colour, from old specimens, apparently similar to the typical race above, and somewhat lighter tipped and therefore more bicoloured below. Size of forearm, body, pes, and skull smaller, but tail longer; 3rd metacarpal and tibia equalling, and therefore relatively longer than, those of the typical race. Ear narrower and less obtusely rounded above, with a slight emargination behind the tip, and a narrower outer lobe, not concealing the base of tragus when pressed in; tragus shorter, broader, and more obtusely rounded above, the greater convexity at middle of hind margin. Narrower calcaneal lobe.

Skull of similar outline but smaller proportions and less inflated cranium; interorbital and maxillar widths decidedly narrower, the latter indicative of the narrower molars. Upper and lower cheek-teeth rows decidedly shorter.

Dimensions.—Holotype female, old spirit specimen: Forearm, 34.5; head and body, 50.5; tail, 35.5; tibia, 12.3; pes, 6.7; ear, inner edge, 9, total length, 12.3, greatest width, 8.8; 3rd metacarpal, 33.5 mm.

Skull: Total length, 13.8; zygomatic width, 10.4; braincase, 7.4; ante-orbital width, 5.3; interorbital width, 3.7; mastoid width, 8.6; maxillar width, 6.4; palate length, 4.8; cheek-teeth, upper row, 5.1, lower, 5.6 mm.

Specimens examined.—Adult female holotype, No. 209 (Nobbs), in Palmer's earliest Australian Museum register, from Bowen, and paratype adult female, A10630 (Masters and Barnard, 1881), agreeing well in external dimensions, from the Dawson River, near Rockhampton, coastal Queensland.

Remarks.—This northern race is well defined by the generally smaller external and cranial dimensions, and shorter cheek-teeth. The longer ear, larger dimensions, and more robust skull leave no doubt of its distinction from *S. greyi*, while indicating specific affinity with the typical form of *orion*.

Scoteinus balstoni caprenus subsp. nov.

Diagnosis.—Size smaller generally than in southern *balstoni*, the difference specially notable in the forearm, 3rd metacarpal, tibia, and pes; skull shorter but with equal interorbital width, and narrower maxillar width indicative of the smaller molar rows. Fur not as strongly bicoloured and undersurface paler than in typical form. Forearm 32.5-34 mm.

Habitat.—Kimberley region, north Western Australia.

Description.—Colour of back, in dried spirit specimen, apparently a duller drabby or more olivaceous brown throughout, and therefore less strongly bicoloured than in the typical race; fur of undersurface paler throughout, therefore less bicoloured also, and contrasting more strongly with the back. Ear much as in typical form, the upper half somewhat shorter and more obtusely rounded; tragus decidedly shorter and more broadly rounded above. The forearm and 3rd metacarpal decidedly shorter, and the tibia and pes also smaller than in the typical race. Skull of similar outline, shorter and with narrower less inflated cranium, but equal interorbital width, and relatively heavy rostral region shown by the similar anteorbital width. The narrower maxillar width is indicative of the relatively shorter and narrower cheek-teeth rows. Lower incisors more crowded, distorted, and less distinctly trilobate than in true *balstoni* or *greyi*; 1st lower premolar smaller and more rounded than in typical race, and less crowded by the canine and 2nd premolar, which have weaker inner talons to the posterior and anterior cingula respectively.

Dimensions.—Spirit specimens, holotype old male, and paratype male in brackets: Forearm 34 (32.5); head and body 51.5 (50); tail 33.5 (34); tibia 12.8 (12.7); pes 6.5 (6.6) ear, inner edge 9.2 (8.9), total length 13 (13), greatest width 9 (9.5); 3rd metacarpal 31.5 (32) mm.

Skull of holotype: Total length, 14.2; zygomatic width (—); braincase, 6.8; anteorbital width, 5.3; interorbital width, 3.5; mastoid width, 8.5; maxillar width, 6; palate length, 4.7; cheek-teeth, upper row, 5.1, lower, 5.8 mm.

Specimens and habitat.—Holotype old male, No. M1322 from Roebuck Bay, originally collected for the Oslo Museum by Dr. Knut Dahl and received by exchange in 1898; paratype male, M2688, collected at King Sound by the late Dr. Herbert Basedow and presented in 1917. Habitat, the Kimberley region of north Western Australia.

Remarks.—This north-western race is distinguished from the typical southern race by the smaller forearm, 3rd metacarpal, and other dimensions, the smaller skull with relatively broader ante- and interorbital width, and smaller teeth. The shortness of the 3rd metacarpal is shown by its

agreement with that of *S. greyi*, which is otherwise distinguished from this and all other mainland forms by its decidedly smaller size. External dimensions generally similar to those of the north-eastern race of *orion* but the ear larger, 3rd metacarpal shorter, and the skull longer, but relatively more slender and lightly built.

Scoteinus sanborni sp. nov.

Diagnosis.—Body and tail proportions similar to *S. greyi*, but the ear decidedly smaller and 3rd metacarpal longer, and the forearm and pes longer than in the small Australian species, while the skull and dentition is decidedly more robust. Forearm 32-33.3 mm. *Habitat*:—South-eastern New Guinea.

Description.—Fur shorter and sparser above and below than in *greyi*, the colour above apparently a deeper brown, with narrower and less contrasted tipping on both surfaces, the bicolouration of the fur therefore less marked, and the undersurface a duller buffy-brown.

Forearm longer and 3rd metacarpal decidedly longer than in *greyi*, the pes larger but the ear distinctly smaller; tragus broader above, the greatest convexity in upper third of hind margin, almost straight below.

Skull definitely larger and more robust, with much more elevated upper profile owing to the greater cranial expansion and height of the occipital crest. Upper and lower incisors and cheek-teeth decidedly longer and heavier than in *greyi*, the heaviness specially marked in the proportionately much larger protoconid area and wider posterior angle of the enlarged inner flange of the upper second molar.

Dimensions.—Holotype adult female, in spirit: Forearm, 33.3; head and body about 46.5; tail about 31.5; tibia, 12; pes, 7; ear, inner edge, 7.8, total length, 10.8, greatest width, 8; 3rd metacarpal, 33 mm.

Skull: Total length, 13.6; zygomatic breadth (—); braincase, 7.1; anteorbital width, 5.5; interorbital width, 3.6; mastoid width, 8.1; maxillary width, 6.1; palate length, 4.2; cheek-teeth, upper, row, 4.8, lower, 5.5 mm.

Holotype.—Adult female, No. A3176, in the early Australian Museum register, from East Cape, Papua, collected by the late Kendal Broadbent and purchased in 1878. The locality is evidently the south-eastern-most point of New Guinea and not near Port Moresby as indicated in Sanborn's list.

Remarks.—This small Papuan form is specifically distinguished from *S. greyi* of Australia, with which it has hitherto been reconciled, by the greater forearm and 3rd metacarpal length contrasted with the relatively much smaller ear, as well as by the more robust skull, larger teeth, and shorter and less strongly bicoloured fur.

As pointed out in Sanborn's comprehensive list of "Bats from Polynesia, Melanesia, and Malaysia" (Field Mus. Nat. Hist., Zool., ser. xviii., 2, 1931), Thomas recorded specimens from Aroma and near the mouth of the Kemp Welch River, in Ann. Mus. Genova, 1897. Sanborn lists two specimens from Port Moresby in the Field Museum, which were smaller in skin and skull dimensions than a specimen presumed to be *S. greyi* from "Lincoln, Northern Territory, Australia", in the U.S. National Museum collection.

Inquiry has failed to discover any place named Lincoln in the Northern Territory, whereas if the locality referred to the Lincoln, near Ingham, north-east Queensland, or Port Lincoln, South Australia, one of the larger forms, *orion aquilo* or *balstoni*, is probably represented by the "Lincoln"

specimen, thus accounting for the apparently smaller dimensions of the Port Moresby specimens. It appears that the true *greyi* inhabits the less wooded central area of Australia from north to south, and the disparity in habitat thus shown, coupled with the larger dimensions of the Papuan form, in comparison with the type dimensions of Dobson, and a specimen from north-western Queensland, leaves no doubt of its specific distinction.

The name of Colin C. Sanborn, Assistant Curator of Mammals in the Field Museum of Natural History, is associated with this species in appreciation of his careful work upon the Chiroptera of the south Pacific, and the well remembered hospitality afforded at the Field Museum and his home during a visit to Chicago at the end of 1930.

ON NEW FORMS OF THE EASTERN SWAMP RAT, AND THE RELATIONSHIP OF MASTACOMYS.

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The fact that it has been customary in the past to accord far too extensive a range to many individual forms of Australian mammals is specially emphasised by the study of coastal races of indigenous rats, which are not subject to the drastic and prolonged changes, and extensive migrations, experienced by inhabitants of the central regions.

It was quite understandable that explorer-naturalists in a vast new land should fail to appreciate the definite effect of zoo-geographical barriers, now made apparent by detailed survey and more or less continuous lines of communication. It is surprising, however, to find a present day tendency to minimise the importance of obvious geographical barriers on the mainland, as well as those represented by a considerable expanse of sea such as that of Bass Strait.

During the course of early and remarkably comprehensive work upon the smaller mammals, examination of the superficial features of colour and pelage of odd specimens taken in somewhat similar surroundings, but often over a thousand miles apart, led to the merging of forms which a study of diagnostic criteria found in their skulls and dentition now proves to be specifically distinct, or at least represented by intermediate races.

A notable instance of the above is provided by the group of dusky-footed swamp rats, the south Western Australian form of which (*fuscipes*, 1839) was originally accorded an immense coastal range extending to Tasmania and north coastal New South Wales. The fallacy of this conception was recognised when Oldfield Thomas decided to regard all eastern members of the group as representing *lutreolus* of Gray (1841). He was in error, however, in selecting as lectotype of *lutreolus* a Gouldian specimen from the Hunter River district of mid-coastal New South Wales, as the South Australian habitat of Gray's original specimen is clearly established.

Previously Thomas had described (1882), from Tasmania, a rather poorly defined soft-furred animal of the group as *velutinus*, which he then regarded as occurring coincidentally on the island with "*Mus fuscipes*" of the south-west. It is notable of the Tasmanian animals that no examples have since been recognised and recorded as *velutinus*, while examination by the author in 1930 of British Museum series, including types of *velutinus*,

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