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Taxonomic Notes on *Chalinolobus* and *Glauconycteris* (Chiroptera, Vespertilionidae)

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In connection with a joint paper (Van Deusen and Koopman, MS) on the *Chalinolobus picatus* complex, I have also examined the other species of Australasian *Chalinolobus*. At the same time, new information has emerged on the status of two species of African *Glauconycteris*. Because these two genera were recently combined by Ryan (1966), it seemed desirable to combine the two discussions and also to consider whether this generic lumping is justified. First, I will discuss the generic and then the species problems in *Chalinolobus* and *Glauconycteris*.

The following abbreviations are used:

A.M.N.H., the American Museum of Natural History
B.M., British Museum (Natural History)
F.M.N.H., Field Museum of Natural History
S.M.F., Senckenberg Museum

THE GENERIC PROBLEM

Miller (1907, p. 221) mentioned four characters by which *Glauconycteris* may be distinguished from *Chalinolobus*: Greater degree of graduation of metacarpals; outer incisor crowded between canine and inner incisor; small anterior upper premolar absent; third upper molar relatively larger. Ryan (1966) has shown quite convincingly that the small anterior

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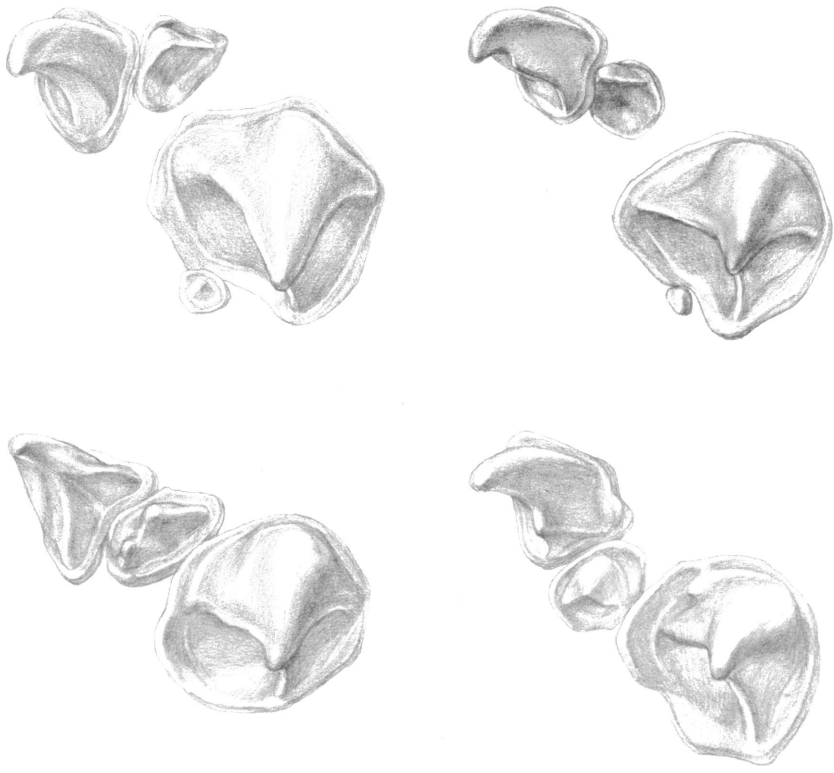

FIG. 1. Left upper incisors, canine, and anterior premolar (where present) in *Chalinolobus*. Upper left, *C.* (*Chalinolobus*) *gouldi venatoris* (A.M.N.H. No. 107765) from Pentland, Queensland, Australia. Upper right, *C.* (*Chalinolobus*) *morio* (A.M.N.H. No. 162677) from Bunya Mountains, Queensland, Australia. Lower left, *C.* (*Glauconycteris*) *variegata papilio* (A.M.N.H. No. 49195) from Faradje, Oriental, Congo (K.). Lower right, *C.* (*Glauconycteris*) *beatrix humeralis* (A.M.N.H. No. 49312) from Medje, Oriental, Congo (K.).

upper premolar is in many cases absent in *Chalinolobus* (which I can readily confirm) and on this basis he has combined *Glauconycteris* with *Chalinolobus*. However, he made no mention of the other three characters. I cannot see any significant difference between the relative sizes of the last upper molars in the two genera, but the other two characters require discussion.

The position of the outer upper incisor in relation to the inner incisor and canine is a real difference, although partly bridged. The condition in *C. gouldi* with the outer incisor directly lateral to the inner incisor and

well removed from the canine is certainly different from that in *G. beatrix* in which the outer incisor is as much behind as lateral to the inner incisor and directly between it and the canine. However, the differences are by no means as great when certain specimens of *C. morio* (e.g. A.M.N.H. No. 162677 from Bunya Mountains, Queensland) and *G. variegata* (e.g. A.M.N.H. No. 49195 from Faradje, Congo) are compared (see fig. 1). In both cases, the outer incisor is lateral and posterior to the inner incisor and more or less between it and the canine, and the only difference is in the extent to which the outer incisor protrudes peripherally.

The degree of graduation in the lengths of metacarpals 3, 4, and 5 reveals a similar pattern. This character differs markedly between the *C. picatus* group and *G. argentatus*, but the difference between some *C. gouldi* (e.g. A.M.N.H. No. 199275 from Pentland, Queensland) and some *G. variegatus* (e.g. A.M.N.H. No. 49070 from Aba, Congo) is virtually nonexistent. Miller expressed this difference as a fraction: third metacarpal length minus fifth metacarpal length/forearm length. This was stated as 1/8 to 1/10 in *Chalinolobus*, 1/5 to 1/6 in *Glauconycteris*. Although I am not certain that I took these measurements exactly as Miller did, I believe the essential character should be evident, if present. My measurements for the above-mentioned specimen of *C. gouldi* are forearm (39), third metacarpal (39), fifth metacarpal (36). This is a difference of 3, which is about 1/13 the forearm length. My measurements of the above-mentioned *G. variegatus* are forearm (41), third metacarpal (39), fifth metacarpal (37), a difference of 2, which is 1/20 of the forearm length. It is evident that there is some overlap between *Chalinolobus* and *Glauconycteris* in this character.

Mr. J. E. Hill kindly gave me (*in. litt.*) a number of other external, cranial, and dental characters which, as he pointed out, are not always absolute, but may be of value in separating *Chalinolobus* and *Glauconycteris*. The American Museum material shows two of these to be really diagnostic, namely the relative width of the postpalatal spine (relatively narrow and pointed in *Chalinolobus*, broader and blunter in *Glauconycteris*), and the shape (as opposed to position) of the posterior upper incisor. In the latter character (hollowed posteriorly versus with wide cingulum and simple central cusp, see fig. 1), although the two groups of species can be clearly distinguished, there is some approach when some individuals of *C. gouldi* (e.g. A.M.N.H. No. 135948 from New Caledonia) are compared with some individuals of *G. argentata* (e.g. A.M.N.H. No. 81387) from Mount Rungwe, Tanzania.

As I can see no other consistent differences between *Chalinolobus* and *Glauconycteris*, and as the characters mentioned by Miller either do not distinguish the two genera or tend to be quite subtle in some species, I am

inclined to agree with Ryan (1966) that they be combined. On the other hand, Hill, (*in. litt.*) pointed out two valid characters by which the two groups of species may be distinguished, although these are somewhat vitiated by other characters that tend to group species across the boundary. To me, the best solution is to regard *Glauconycteris* as a subgenus of *Chalinolobus*. In spite of its fewer number of species, *C. (Chalinolobus)* seems more diversified than *C. (Glauconycteris)*.

The Species of the Subgenus *Chalinolobus*

The greatest species problem within the subgenus *Chalinolobus* lies in the *picatus* complex (Van Deusen and Koopman, MS). This includes the named forms *picatus, nigrogriseus, rogersi*, and *dyweri*. Outside this complex, as seems now universally agreed, there are only two Australian species, *C. gouldi* and *C. morio*. There is no doubt that they are quite distinct from any member of the *picatus* complex and from each other. Two additional species have been described, however, from Pacific islands east of Australia. These are *C. tuberculatus* Forster (1844) from New Zealand and *C. neocaledonicus* Revilliod (1914) from New Caledonia. The American Museum is fortunate in having single specimens of both species. Both are preserved in alcohol, but the skull of each has been extracted and cleaned. I have also studied specimens of both species in the British Museum (Natural History).

The specimen of *C. tuberculatus* (A.M.N.H. No. 160270, from an unknown locality in New Zealand) is clearly distinct from any of the Australian species. On the characters used by Ryan (1966) it may be described as follows: Intermediate in size (forearm 41 mm.); supraorbital swellings of skull greatly pronounced; no posterior cusp on I^1; I^2 probably about one-third the height of I^1 above the cingulum (the latter tooth is somewhat worn on the American Museum specimen, but is clear on the British Museum specimens); anterointernal cusp present on P^4; great contrast between the interorbital and intertemporal widths; low median crest on the braincase. The only modification of this character synopsis that requires change on the basis of British Museum specimens is that the posterior cusp of I^1 is present, although poorly developed, on B.M. No. 93.4.30.3. *Chalinolobus tuberculatus* appears to be a well-marked species probably most closely related to the *C. picatus* group, but showing some resemblances to *C. gouldi*. It has been treated in some detail by Dwyer (1960, 1962).

The specimen of *neocaledonicus* (A.M.N.H. No. 135948 from the mouth of the Huailu River valley on the central northeast coast) has been compared with the original description of *neocaledonicus* and with all the avail-

able species of *Chalinolobus*. The Huailu River specimen agrees reasonably well with the original description but it also shows close resemblance to *C. gouldi*, particularly with the small northern *C. g. venatoris* (as represented by specimens from Pentland and Malbon in northcentral Queensland). In fact the only skull difference I have been able to detect is the absence of P^2 (on one side) in the single specimen of *neocaledonicus* and its presence in all specimens of mainland *C. gouldi* (both subspecies). Study of a series of seven specimens of *neocaledonicus* and of paratypes of *venatoris* in the British Museum shows, however, that P^2 is normally present on both sides (in six out of seven British Museum specimens) in *neocaledonicus* and is occasionally absent on one side in *venatoris*. On the other hand, it is evident that A.M.N.H. No. 135948 is an unusually large specimen of *neocaledonicus* (condylobasal length 14.0). This measurement in the British Museum series ranges from 13.2 to 13.9, which compares with 13.7 for the smallest American Museum specimen of *venatoris*. Some of the British Museum series of *neocaledonicus* skins also show the typical "two-tone" pattern of the pelage so characteristic of Australian *gouldi*. It appears that the northern *C. g. venatoris* is almost equally distinct from the small *neocaledonicus* and the large southern Australian *C. g. gouldi* (represented by specimens from near Adelaide, South Australia). I can see no reason, therefore, to regard *neocaledonicus* as anything but a subspecies of *C. gouldi*.

Revilliod in his original description (1914, pp. 355–357) compared *neocaledonicus* chiefly with *C. nigrogriseus* (a member of the *picatus* group). His only comparison with *C. gouldi* is his statement: "On n'y distinque pas d'appendice vertical semblable à celui de *Ch. gouldi* Gray." Freely translated this reads: No vertical appendage [on the outer border of the ear], similar to that of *Ch. gouldi*, can be distinguished. The degree of development of this appendage is rather variable in the few spirit specimens of *C. gouldi* I have examined, however, and again, I can see no consistent differences between the two forms. I am therefore calling the form on New Caledonia *Chalinolobus gouldi neocaledonicus*.

The Species of the Subgenus *Glauconycteris*

The species of the subgenus *Glauconycteris* are all confined to tropical Africa, most of them more or less restricted to forested areas. Allen (1939) recognized seven species. These are (in order of their description) *poensis* Gray, 1842; *variegatus* Tomes, 1861; *argentatus* Dobson, 1875; *beatrix* Thomas, 1901; *egerius* Thomas, 1913; *humeralis* J. A. Allen (1917); and *alboguttatus* J. A. Allen (1917). Two species have been described since G. M. Allen's checklist, *superbus* Hayman (1939) and *machadoi* Hayman (1963). I have seen authentic material (in most cases types) of all these

species and regard all except *argentatus, humeralis, alboguttatus,* and *machadoi* as perfectly distinct species. These four, however, require some consideration.

Chalinolobus machadoi was described by Hayman (1963, p. 107) from a single specimen collected in east-central Angola. In all essential characters it is similar to *C. variegatus,* which is unknown at the type locality of *machadoi* (Lac Calundo), but is known to the south in southwestern Angola, northern South-West Africa and northwestern Botswana. *Chalinolobus variegatus* also occurs to the north and east in northeastern Angola, Congo (Kinshasa), and Zambia. The only character in which the type and only known specimen of *machadoi* differs from *C. variegatus* is in its much darker color. It may be simply a melanistic mutant individual or it may represent a localized melanistic population almost surrounded by much lighter colored ones. It cannot be said on present evidence to be sympatric with *C. variegatus* as the latter is known from no closer than 200 miles (Dundo). To me the procedure that best fits the meager facts is to regard *machadoi* as a subspecies of *C. variegatus.*

The problems involved with *humeralis* and *alboguttatus* are considerably more complicated. Both are described by J. A. Allen (1917) from the northeastern Congo (Kinshasa), *humeralis* not being compared with anything, *alboguttatus* only with *humeralis* and *congicus* (=*C. argentatus*). In 1950, Hayman and Jones reported on 43 specimens of *C. poensis* from Sierra Leone. These showed great variation in color, the extremes closely resembling *humeralis* and *alboguttatus,* which had been distinguished chiefly on color pattern. The Sierra Leone series was also said to show a size variation encompassing both *humeralis* (small) and *alboguttatus* (large). On this basis, both of Allen's species were regarded as probable synonyms of *C. poensis.* In 1965, I tentatively followed Hayman and Jones in regarding both *humeralis* and *alboguttatus* as synonyms of *C. poensis.* I did mention, however, that Allen's two forms were quite different in size and that *alboguttatus* is very similar to *C. argentatus* except for color.

However, in 1966, Hayman, Misonne, and Verhayen, in discussing the *Glauconycteris* of the Congo recognized both *humeralis* and *alboguttatus* as species distinct from *C. poensis* and *C. argentatus.* This was done on the basis of one specimen of *humeralis* from the eastern Congo (considerably south of Allen's localities) and two of *alboguttatus* from the northern Congo (from localities considerably west of Allen's). No mention was made of the Sierra Leone series on the basis of which *humeralis* and *alboguttatus* had originally been synonymized with *C. poensis.* Since this material seemed to be the key to the problem, I took advantage of a trip to the British Museum (Natural History) to measure the Sierra Leone specimens and

compare them with the more meager material of *humeralis* and *alboguttatus* at the American Museum of Natural History.

The British Museum's Sierra Leone series consisted of 29 usable specimens, 15 males, 13 females, and one unsexed (probably male). As males appeared to average somewhat smaller than females, the measurements of the two sexes are kept separate. The measurements of the unsexed specimen fall within the male variability and are included there. The ranges of the three measurements are: forearm length, males (35–38), females (36–39); condylobasal length, males (11.2–11.9), females (11.5–12.2); maxillary tooth row length, males (3.9–4.4), females (4.0–4.6), width across posterior molars, males (5.7–6.0), females (5.8–6.2). I have measurements for the entire original series of *humeralis,* including the type, (two males, three females). The ranges of their measurements are: forearm length, males (34, 35), females (35–38); condylobasal length, males (10.3, 10.5), females (10.7–11.0); maxillary tooth row length, males (3.5, 3.7), females (3.7–3.9); width across posterior molars, males (4.9, 5.1), females (5.1–5.2). Allen based *alboguttatus* on a single female specimen, the type, the measurements of which follows: forearm length (40); condylobasal length (12.6), maxillary tooth row (4.7), width across posterior molars (6.3). It is evident that although there is overlap in forearm length between the Sierra Leone series of *C. poensis* and *humeralis,* there is no overlap in the three skull measurements. All four measurements of the single specimen of *alboguttatus* fall outside the range of the Sierra Leone series. It appears that Hayman and Jones (1950) were in error in stating that *humeralis* and *alboguttatus* fall within the size variation of the Sierra Leone series. I have further, measured smaller series of *poensis* from Ivory Coast (B.M.), Nigeria (F.M.N.H., B.M., including the type of *poensis*), Cameroon (S.M.F.), and Tanzania (B.M.). These slightly extend the variation for certain measurements, viz. forearm length, males (35–39), females (36–40); condylobasal length, females (11.4–12.2); width across posterior molars, males (5.7–6.2), but still do not encompass the variation of either *humeralis* or *alboguttatus*. Neither *humeralis* nor *alboguttatus* should be considered conspecific with *C. poensis*.

However, the fact that *humeralis* and *alboguttatus* are not synonyms of *C. poensis,* does not prove that they are good species. Other species of *C.* (*Glauconycteris*) must be considered. From the better known *humeralis,* it is evident that except for *C. poensis,* only *C. beatrix* is small enough to be considered in this connection. I have compared Allen's entire series of *humeralis* with the only specimen definitely identified as *C. beatrix* I have been able to locate in any American museum, namely F.M.N.H. No. 73840 from N'dende, Gabon (reported on by Sanborn, 1953). I have also

compared a paratype of *humeralis* (A.M.N.H. No. 49014) with the type of *beatrix* and all other specimens in the British Museum identified as *beatrix* and *humeralis* from Cameroon, Congo (Kinshasa), and Uganda. The series of *humeralis* shows considerable variation in such characters as the degree of bifidity of the inner upper incisor, the degree of concavity of the forehead, the proportions of the rostrum, and the shape of the basisphenoid pits. In each of these characters the N'dende specimen shows close similarity with at least one of the *humeralis* series, but not always the same one. The same is true of Thomas's description and my notes on the type of *C. beatrix*. Rosevear's (1965) discussion (pp. 280–281) and my own examination shows that similar variation is found among the various specimens identified as *C. beatrix*. Both forms also agree in having deeply pigmented wing and tail membranes. In any case, I cannot distinguish the two forms and therefore regard them as conspecific. In view of the small number of specimens involved and the 1000-mile distance between the type localities, however, I am inclined to retain *humeralis* as a subspecies until the patterns of geographical variation within *C. beatrix* are better known.

Previously (Koopman, 1965), I thought that *C. alboguttatus* might be specifically allied to *C. argentatus*. I still believe the two species to be closely related, but after close comparison and study of 70 adult specimens of *argentatus* from Kenya, Tanzania, Angola, Congo (Kinshasa), Congo (Brazzaville), and Rio Muni (including the types of *argentatus* and its synnym *congicus*) they seem clearly to be specifically distinct. *Chalinolobus alboguttatus* is quite different from all *argentatus* I have seen in having much darker pelage and membranes. Also, even though the forearm length and width across posterior molars of *alboguttatus* fall within the range of *argentatus,* the skull dimensions (as measured by condylobasal length and maxillary tooth row length) are somewhat larger (12.6 vs. 11.2–12.5; 4.7 vs. 3.7–4.6) for the two measurements respectively. Therefore, although I have been unable to find any skull character except size to distinguish the two species, I am now strongly of the opinion that they are indeed distinct.

One of the surprises that has come out of the present study is the very close resemblance between *poensis* and *argentatus*. These two species have been distinguished chiefly on the basis of size (smaller vs. larger) and color (darker vs. paler). Comparing two *poensis* from Nigeria with a series of *argentatus* from Tanzania, I can see no consistent color difference in either the pelage or the membranes. Comparably preserved specimens at the British Museum seem to show average differences in degree of pigmentation in the wing and tail membranes, but the difference is admittedly somewhat subtle. Likewise, the measures of size I have used (forearm length, condylobasal length, maxillary tooth row length, and

width across posterior molars) show wide overlap between the two forms. After comparing series of specimens of both species at the British Museum, I had the impression that *argentatus* has a relatively broader braincase than that of *poensis,* but I have not been able to substantiate this with measurements. I can find no other skull characters to distinguish the two supposed species. Although I believe it is premature at this time to synonymize *argentatus* with *poensis,* it is nevertheless quite possible that it will be necessary in the future after a more thorough study of both forms throughout their combined range.

SUMMARY

The African genus *Glauconycteris* is shown to be a subgenus of the Australasian genus *Chalinolobus*. The two Pacific island taxa of *Chalinolobus* are here called *Chalinolobus tuberculatus* and *Chalinolobus gouldi neocaledonicus*. Three problematical species of the subgenus *Glauconycteris* are discussed and their suggested taxonomic status are represented by the names *Chalinolobus* (*Glauconycteris*) *variegatus machadoi, Chalinolobus* (*Glauconycteris*) *beatrix humeralis,* and *Chalinolobus* (*Glauconycteris*) *alboguttatus*.

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