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Remarks on some types of the genus Rhinolophus (Mammalia, Chiroptera)

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Abstract – Detailed morphological investigation of the type specimens of *Rhinolophus pusillus*, *R. lepidus shortridgei*, *R. borneensis*, *R. affinis*, *R. thomasi septentrionalis* and *R. philippinensis montanus* have resulted in designation of lectotype specimens, taxonomical revisions and better understanding of specific characters. With 19 figures.

Key words – *Rhinolophus*, taxonomy, lectotype designation.

INTRODUCTION

Investigation of the type specimens is essential for taxonomical and systematic studies, which – by definitions of specific-subspecific limits – provide the identification basis for other disciplines as ecology, physiology or biogeography. This is especially true in the case of groups with several hardly separable species such as the family of horseshoe bats, Rhinolophidae. According to our knowledge, the family comprises 71 recent species all belonging to the single genus *Rhinolophus*. Several of them are known by few specimens only and their original descriptions are frequently not detailed enough for sure indentification. For these reasons, in the last four years I visited several collections in order to study the available type specimens of the majority of the species, and made drawings, detailed descriptions and took measurements. Furthermore, the study has resulted in some lectotype designations and taxonomical revisions which are (in the case of southeast Asian species) presented here.

Abbreviations of measurements are: FA – forearm length; SL – greatest length of skull from front of canine to occiput; CM^3 – crown length of maxillary toothrow. All measurements are given in mm; forearm lengths were taken from dry and alcohol-preserved specimens to the nearest 0.1 mm, craniodental measurements were collected by digimatic caliper of 0.01 mm accuracy.

Museum acronyms used in this paper are as follows: AMNH – American Museum of Natural History, New York; BM(NH) – The Natural History Museum, London, formerly British Museum (Natural History); FMNH – Field Museum of Natural History, Chicago; HNHM – Hungarian Natural

History Museum, Budapest; HZM – Harrison Institute, Sevenoaks, formerly Harrison Zoological Museum; MNB – Museum für Naturkunde, Berlin; RMNH – National Museum of Natural History, Leiden, formerly Rijksmuseum van Natuurlijke Historie; USNM – United States National Museum of Natural History, Washington.

In the case of RMNH specimens, beside the recently used inventory numbers of that Museum the JENTINK's catalogue numbers (JENTINK 1887, 1888) are also given. Every species listed by JENTINK starts with a letter 'a'; the osteological (referred to as "cat. ost.") and systematic (skin) catalogues (referred to as "cat. syst.") have independent letterings.

Rhinolophus pusillus TEMMINCK, 1834

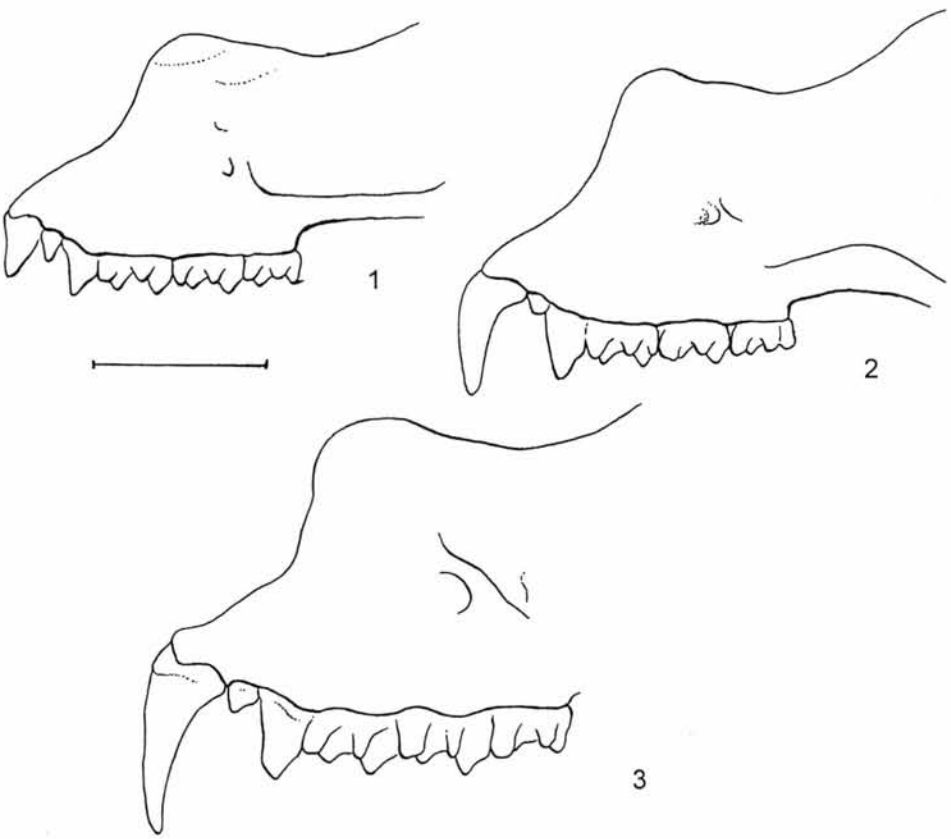
The types of *R. pusillus* in the RMNH, Leiden caused a lot of mental labour. DOBSON (1878) investigated the types and concluded that they were "undoubtedly specimens of *R. hipposiderus*" which led to the statement that *R. hipposideros* should occur in Java. ANDERSEN (1905) later speculated that "an interchange of labels has taken place in that Museum". The small specimens in the Leiden Museum were always kept in glass vials from the very beginning, with a little round label glued on the cork cover (C. SMEENK pers. comm.). Needless to say, these labels may have come off, so there was always the danger of specimens becoming mislabelled or interchanged. In fact, the type series in Leiden consists of five syntypes (RMNH 35177–35181), of which three represent *R. hipposideros* (RMNH 35178 [= *Rh. hipposideros* cat. syst. b] and 35179 [= *Rh. hipposideros* cat. syst. c] mounted specimens, skulls intact; RMNH 35181 [= *Rh. hipposideros* cat. ost. a] separate skull). One of the remaining two specimens (RMNH 35177 [= *Rh. hipposideros* cat. syst a, cat. ost. b]) consists of a skull of *R. pusillus* and a mounted skin of *R. hipposideros*; the another one (RMNH 35180 [= *Rh. hipposideros* cat. syst. d] mounted with skull intact) is with no doubt *R. pusillus*. These facts explain why DOBSON (1878) and JENTINK (1887) referred *R. pusillus* as a synonym of *R. hipposideros,* and make it clear that ANDERSEN (1905) was right when accepted TEMMINCK's statement that the types of *R. pusillus* were brought back from Java. Since the cranial characters are widely used features in the group, from the syntypes representing genuine *R. pusillus* the RMNH 35177 specimen (a cleaned skull) is designated herein as lectotype; the skin of *R. hipposideros* bearing the same number is regarded as mis-labelled. The RMNH 35180 mounted specimen is the paralectotype of *R. pusillus*.

The shape of the rostral profile of *R. pusillus* was desribed by CORBET and HILL (1992) as being nearly straight, almost horizontal (contrary to the up-

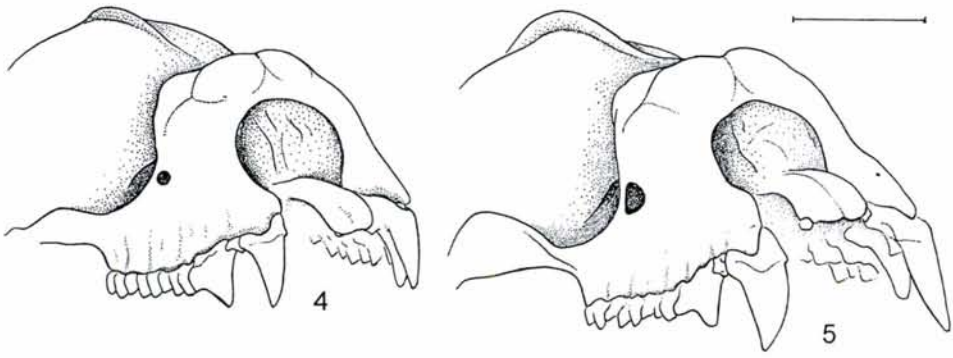
ward-curving rostral profile of *R. lepidus*). Taking into consideration of the lectotype specimen of the former and the variability of both species, this character is not typical or uniform, and cannot be used for distinction of the two species. The development of the posterior median swellings (which affects the shape of the rostral profil) is either a variable feature of both species or it has a taxonomical significance not fully understood as yet.

Rhinolophus lepidus shortridgei ANDERSEN, 1918

The description of this taxon as a subspecies of *R. lepidus* from Upper Burma (Myanmar) was published by OLDFIELD THOMAS on behalf of ANDERSEN (1918),



Figs 1–3. Lateral views of rostral parts of skulls from the original type series of *R. pusillus*: 1 = RMNH 35181, 2 = RMNH 35177 lectotype. 3 = *R. borneensis* (MNB 2533.1, holotype). Scale = 3 mm



Figs 4–5. Antero-lateral views of skulls: 3 = *R. lepidus refulgens* (BMNH 98.11.29.2, holotype), 4 = *R. shortridgei* (BMNH 18.8.3.1, holotype). Scale = 3 mm

based on the short notes of the latter. The diagnostic characters of *shortridgei* ("skull and teeth averaging larger") appeared only in the key given for the species and subspecies of the *pusillus*-group but even without comparison of the measurements with the other named forms. According to SINHA (1973) *shortridgei* differs from *R. lepidus lepidus* in having a longer hind foot (55–63% of the tibia, against 45.8–47.5%) and longer mandible.

However, investigation of the type skull (BM(NH) 18.8.3.1) and other specimens (housed in the collection of USNM, FMNH, HNHM) revealed well-defined differences as compared with the other subspecies of *R. lepidus*; upper canines are strong, wide-based; sagittal crest extending posteriorly to the lambda and skull length is over 17 mm. Consequently, the taxon *shortridgei* is considered as a full species.

Rhinolophus borneensis PETERS, 1861

The confusing history of the name *borneensis* was reviewed in detail by ANDERSEN (1905) who described it as "accumulation of errors and wrong identifications" which resulted in the fact that "*Rh. borneensis* has for many years been completely confused not only with several more or less closely related species, but also with the widely different *Rh. minor*" (= *R. pusillus*). One of the possible reason of the confusion should be the mis-matching of labels and/or skulls in the Museum für Naturkunde, Berlin (MNB). There are two skulls (in very bad condition) in the type collection of MNB (2533.1 and 2533.2) which certainly represent specimens of *R. borneensis*, although both labelled as "*Rhinolophus minor*, type, Labuan, Java". On the other hand, the type of *R. minor* is in the BM(NH). Since the type lo-

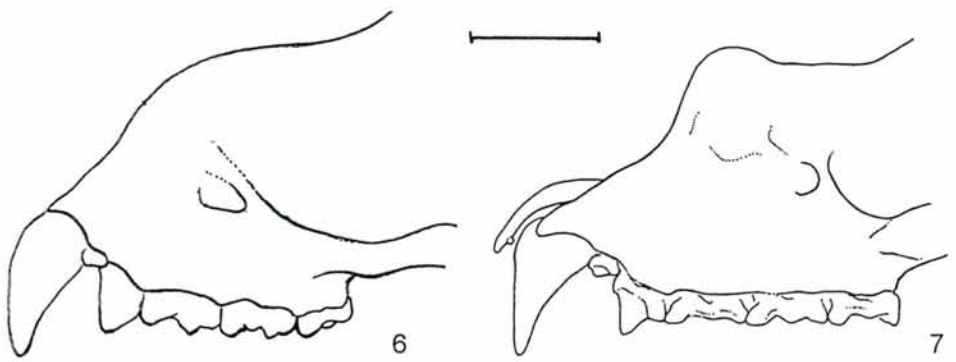
cality of *R. borneensis* is also Labuan (the Malayan island off Borneo, not in Java), and according to PETERS (1871) its type is deposited in the Berlin Museum, the MNB 2533.1 and 2533.2 specimens are undoubtedly the mis-labelled types of *R. borneensis*.

Rhinolophus affinis HORSFIELD, 1823

In the original description of the species HORSFIELD (1823) indicated no type specimen. Beside a specimen (labelled as holotype) stored in the BM(NH), JENTINK (1887) listed two more specimens in the RMNH, Leiden marked as types. However, the two RMNH individuals (RMNH 25236, cat. ost. b and RMNH 25237, cat. ost. c) represented by skulls only, proved to be *Hipposideros larvatus*. The possible reason of the confusion should be the fact, that HORSFIELD worked with the two species in question at the same time (the descriptions appeared in the same book). Since there was no holotype designation in HORSFIELD's work, these three specimens are regarded as syntypes; consequently, the BM(NH) specimen (No. 79.11.21.70) as the only *R. affinis* is designated herein as lectotype.

Rhinolophus thomasi septentrionalis SANBORN, 1939

The taxon *septentrionalis* once was described and later widely accepted as a subspecies of *thomasi*, differing from the nominotypical race by its larger size and slightly extruded anterior upper premolars (SANBORN 1939). The holotype of *septentrionalis* (FMNH 33291) and other specimens from Yunnan stored in the FMNH

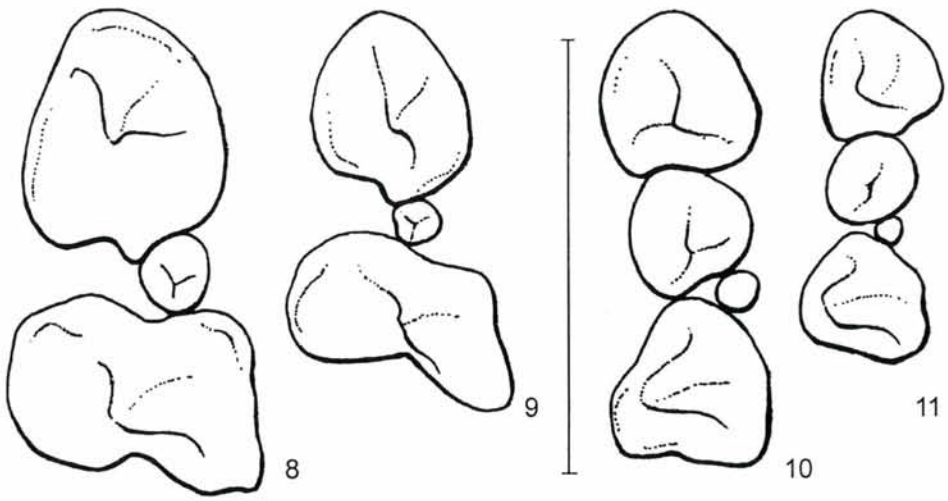


Figs 6–7. Lateral views of rostral parts of skulls from the type series of *R. affinis*: 6 = RMNH 35236 paralectotype, 7 = BMNH 79.11.21.70 lectotype. Scale = 3 mm

and USNM agree in every respect with each other. However, it is much bigger in external measurements than *thomasi* and *latifolius* (FA 51.1–55.5 against 40.5–48.0; SL 19.79–20.98 against 17.87–19.98; and CM^3 7.65–8.40 against 6.82–7.67 mm), and has strong, widely based, long canines. These differences support the view, that *septentrionalis* differs from *R. thomasi* at specific level.

The taxon *sinicus* was described as a subspecies of *R. rouxi* by ANDERSEN (1905) who separated it on the basis of its smaller skull and toothrow measurements. As ANDERSEN remarked, the general size of *sinicus* as is the smallest example of the typical form of *R. rouxi*. This taxonomical position of *sinicus* was generally accepted, but THOMAS (1997) in her detailed work, based on phenetic analysis and DNA techniques, verified that *sinicus* represents a distinct species occuring in the Himalayas, Myanmar, northern Vietnam and southern China.

Nevertheless, the relation and the specific boundary between *R. sinicus* and *R. thomasi* is unclear. The extremely hastate, excessively shortened lancet thought to be diagnostic for *R. thomasi* (ANDERSEN 1905, CORBET & HILL 1992, KOOPMAN 1994) is not clearly expressed in all specimens of that species, while a similar shortening of lancet can be found in several *R. sinicus*. The types of both species are unusually small specimens and almost all subsequently collected individuals are larger. It means that although the type of *R. sinicus* is much larger than the type



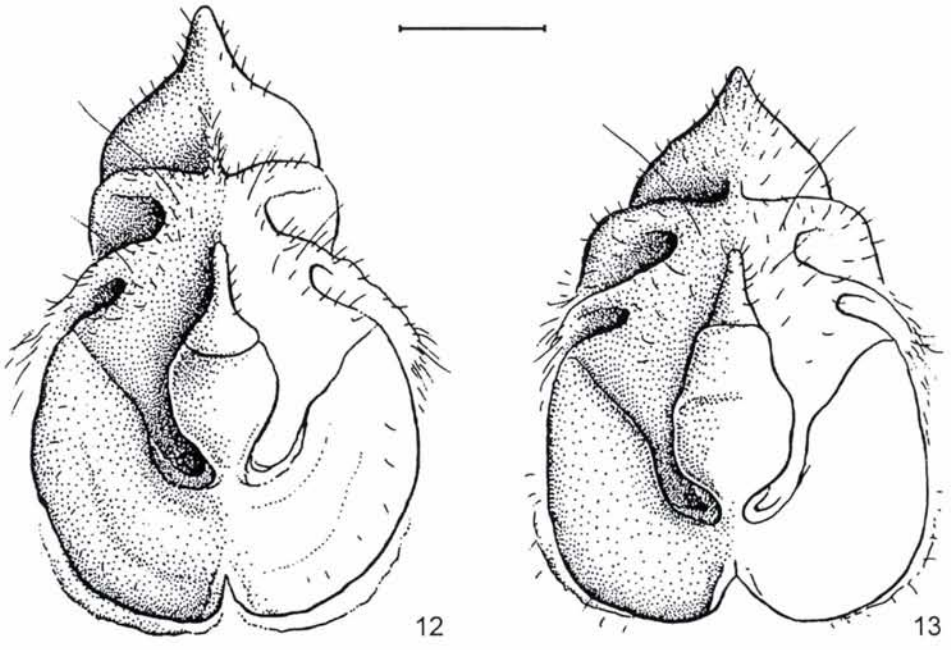
Figs 8–11. Occlusal views of left upper anterior dentitions: 8 = *R. sinicus septentrionalis* (FMNH 33291 – holotype), 9 = *R. thomasi latifolius* (FMNH 32230 – holotype); right lower anterior dentitions: 10 = *R. sinicus septentrionalis* (FMNH 33291 – holotype), 11 = *R. thomasi latifolius* (FMNH 32230 – holotype). Scale = 3 mm

of *R. thomasi* (therefore justifies the distinctness on species level), it overlaps in size with the majority of the known *R. thomasi* specimens (determined hereby the slender upper and lower canine only). On average, *R. sinicus* is much bigger than *R. thomasi*.

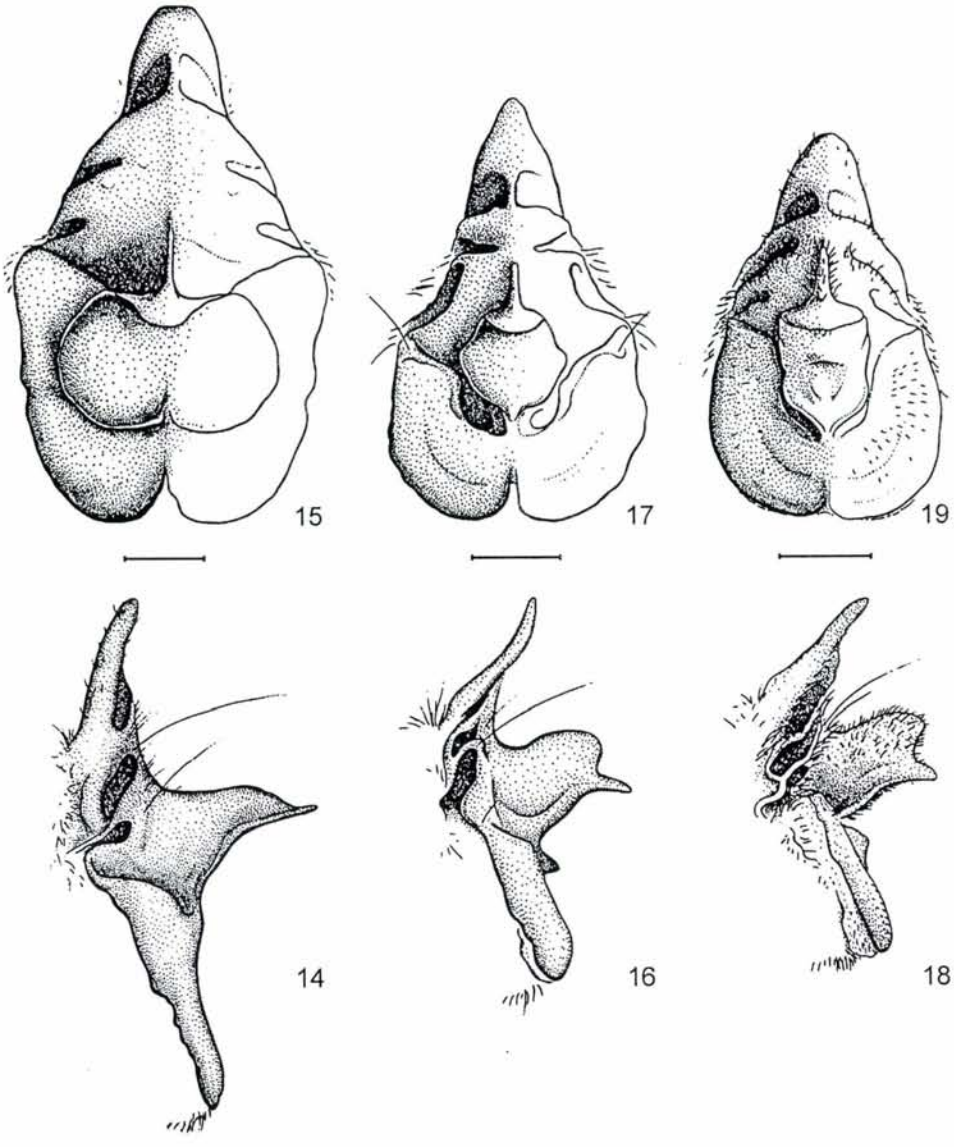
The form *septentrionalis* is therefore better referable to *R. sinicus*; the large external measurements (the forearm length is over 50 mm) validate the subspecific separation within the species.

Rhinolophus philippinensis montanus GOODWIN, 1979

GOODWIN (1979) discussed the differences between his new *montanus* and the other subspecies of *R. philippinensis*, and noted its much smaller size, differently shaped sella and connecting process, more pronounced nasal swellings and more crowded situation of the small premolars. Investigation of the known specimens (holotype, paratype and two more individuals collected together the types, AMNH 237811–237814) has shown that these differences are definitely beyond



Figs 12–13. Frontal views of noseleaves: 12 = *R. sinicus* (HZM 23.28155), 13 = *R. thomasi* (BMNH 90.4.7.10, holotype). Scale = 3 mm



Figs 14–19. Lateral and frontal views of noseleaf: 14–15 = *R. philippinensis alleni* (AMNH 206736, holotype), 16–17 = *R. montanus* (AMNH 237813), 18–19 = *R. macrotis* (HNHM 95.56.2.) (bottom). Scale = 3 mm

intraspecific variation of *R. philippinensis* and leave no doubt that *montanus* is a distinct species. The external appearence of the noseleaf of *montanus* is intermediate between *R. philippinensis* and *R. macrotis*. As already ANDERSEN (1907) noted, *R. macrotis* is an example of "a type of low level of evolution which has no closer relative than the primitive forms of the *Rh. philippinensis* group" and "the sella of *macrotis* might properly be described as that of a *philippinensis* deprived of its lateral expansions; the shape of the connecting process and lancet also point towards relationship with *philippinensis*". The noseleaf features of the much later described *R. montanus* are filling this gap.

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