

Bacula of Some Old World Leaf-nosed Bats (*Rhinolophidae* and *Hipposideridae*, *Chiroptera: Mammalia*)

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ABSTRACT: Descriptions and figures of bacula of 26 bat species and subspecies of *Rhinolophidae* and *Hipposideridae* in the collections of the Hungarian Natural History Museum from the Old World (except Africa and Europe) with taxonomic notes and considerations.

INTRODUCTION

The importance of the morphology of bacula in the taxonomy of *Chiroptera* is well known, and already discussed in works dealing with bacula of European (MATTHEWS, 1937; LANZA, 1959, 1960) and North American (HAMILTON, 1950; KRUTZSCH and VAUGHAN, 1955) bats. Our knowledge is, however, very limited about the bacula of bats in the greater part of the Old World. This holds especially for microchiropteran species (TOPÁL, 1970). In this paper, I propose to submit the results on the species of the most difficult families (or "genera") of the *Hipposideridae* and *Rhinolophidae*. I used the collections of the Hungarian Natural History Museum and the material I collected in Vietnam and India. The study covers mostly Asiatic species, and for comparisons I included a few other bats from New Guinea and Australia available in the Budapest collection. At present, the African species are fully omitted. I used the alizarin-red staining method (TOPÁL, 1958). Due to the state of preservation, a proper study of the soft parts could not be carried out. This would need a more adequate, fresh material.

DESCRIPTIONS AND RESULTS

Rhinolophidae

Rhinolophus ferrumequinum proximus ANDERSEN, 1905

I have studied one specimen collected in the Bumzov Cave, Kashmir, India. Total length of baculum 4,94, width of basal cone 1,72, height of basal cone 1,27, width of lancet 1,00 mm. The bone is very similar to that of the nominate subspecies, however, considerably bigger, with a less bent shaft, with a longer and dorsoventrally more flattened basal cone and with a longer lancet when viewed from above. There is a longitudinal ridge on the dorsal surface of the basal cone. The dorsal side of the lancet is flat, and a main median ridge runs on its ventral surface. The

very tip of the lancet is slightly bent ventrally. The emarginations of the basal cone are as in the nominate subspecies. (Plate I., figs. 1, 2).

Rhinolophus affinis himalayanus ANDERSEN, 1905

I have studied one specimen of this big-bodied subspecies from Darjeeling. A certain degree of relationship with Rh. rouxi is clearly visible in the morphology of the baculum, and none at all with that of Rh. ferrumequinum. Measurements: total length 2,45, basal width 0,86, basal height 0,81, length of terminal lobe 0,86 mm. The penis bone shows a presumed specialization from the less specialized bone of Rh. rouxi, or rather from that of Rh. sinicus. At the same time, one cannot imagine an evolution of this type of baculum towards that of Rh. ferrumequinum. Such an evolution was suggested by K. ANDERSEN (1905/b) on the basis of cranial and dental characters in Rh. affinis and Rh. ferrumequinum. The basal cone is deeply emarginate in the ventral margin, but less so in the dorsal one. There are still smaller emarginations on the lateral sides. The shaft is roughly circular in cross sections, and slightly bends towards the ventral side. From the level of the terminal dorsal lobe (at about two-thirds of the total length) the bone turns sharply ventrally, and at the very tip dorsally (Plate I., figs. 6, 7, 8).

Rhinolophus affinis macrurus ANDERSEN, 1905

There has been studied one of a small series (three males) collected in Muong son, Vietnam. The baculum is shorter, with a terminal lobe absolutely longer than in Rh. a. himalayanus (Plate I., figs. 3, 4, 5). Measurements: total length 1,90, width of base 0,72, length of base 0,77, length of terminal lobe 1,00 mm. The basal cone is dorsoventrally higher than wide, in contrast to the specimen of the other subspecies studied. Its dorsal margin is apparently without an emargination, the ventral edge with a very deep and comparatively narrow incision, however, the lateral emargination appears on each side of the basal cone, as in the former subspecies. The shaft is considerably shorter and more expressedly bent towards the ventral side than in Rh. a. himalayanus. The terminal dorsal lobe begins at about half length of the bone. There is no dorsal curve at the tip.

Rhinolophus rouxi rouxi TEMMINCK, 1835

I studied a small series of this animal (5 specimens), collected at Udaygiri Caves, Orissa, India, and at Mahableshwar, western part of the Indian Peninsula. Measurements: total length (measurements of subadults in parentheses) 2,41-2,50 (1,63-1,81), width of basal cone 0,81-0,95 (0,45-0,55), height of basal cone 0,77 (0,45), width of tip 0,18-0,22 mm. The heavily built bone has a simple curvature, that is, ventrally bent in the last third to fourth length (Plate II., figs. 4-12). The basal portion is less developed in young animals. In grown up specimens it is slightly pressed dorsoventrally. It has a double dorsal incision on its proximal edge, and with a protruding dorsal knob. The simple ventral emargination is wide and deeper than the dorsal one. The ventral surface of the basal cone shows a wide median depression. The shaft is somewhat higher than wide, that is, laterally compressed. The

tip has a lateral widening, rather flat dorsoventrally. It is acutely pointed in most cases, when viewed laterally. The morphology of the penis bone in this species can be regarded as more primordial than that of Rh. affinis. The two species stand close to each other in this respect.

Rhinolophus (sinicus) ^{2 + ~~Thomasi~~} ANDERSEN, 1905

I have studied two specimens from Ta phinh (extreme North of Vietnam) and another one from Cuc phuong, south of Hanoi. All specimens were collected by me. There is a certain degree of similarity in the morphology of the baculum to that of Rh. rouxi (Plate I., figs. 9-14, Plate II., figs. 1-3), but with well established differences. Measurements: total length 2.31-2.45, width of basal cone 0.59-0.72, dorsoventral height of basal cone 0.55-0.59 mm. The bone is a rather lightly built structure with a double curvature, and is slightly shorter than in Rh. rouxi. The dorsoventrally flattened basal cone is evidently smaller than in the former species, still, the emarginations on the proximal edge are the same, nor are the outer surfaces with a dorsal knob and a ventral depression different. The shaft is laterally compressed. Its proximal ventral constriction is immediately at the basal cone. In the distal portion of the bone, there is another bend, at two-thirds length, and thus the bone shows an elongated S shape (more pronounced in the Cuc phuong specimen) from right lateral view. The ventrally bent tip is with a dorsal sagittal widening and with a double ventral point in the Ta phinh specimens, while it is without such in the Cuc phuong animal. In the dorsal view, the tip is narrowly rounded. All these differences, along with those in the cranial and dental characters, permit a differentiation from Rh. rouxi at the species level, while there is no full explanation for the differences between the animals of the two populations studied.

Rhinolophus (midas) ANDERSEN, 1905

A solidly ^{new}
R. hipposideros

I have studied a single specimen collected in the Bumzov Cave, Kashmir, India. Total length of the bone 3.52, width of base 0.50, height of base 0.63 mm. The morphology of the baculum shows a certain similarity to that of Rh. hipposideros, however, the differences suggest a distinctness at species level (Plate III., figs. 1-3). The baculum is somewhat longer than the maximum size in Rh. hipposideros studied previously (TOPÁL, 1958). The basal cone is much smaller, higher than wide, with slight and narrow incision on its ventral margin, and a longitudinal median concavity on the ventral surface, with two slight ridges. The proximal margins of the basal cone are thickened. The distal portion of the base is shorter than the ventral one and bulging into a ridge on the dorsal surface. This continues on the dorsal surface of the shaft up to its half length. The distal half of the shaft shows a flat ventral surface. The whole shaft has a lateral compression and a much stronger ventral curvature than in Rh. hipposideros. The tip is with a longish, laterally flattened knob and a slight terminal up-turn at the very end of the bone.

Rhinolophus cornutus sechwanus ANDERSEN, 1918

There was studied one specimen each from Muong son, North Vietnam (Plate, III., figs. 4-6), and from Cherrapunjee, Assam, India (Plate III., figs. 7-9), both collected by the author. Measurements: total length 3,36-3,52, basal width 0,88-0,92, basal height, 0,92-0,95, height of terminal knob 0,18 mm. The baculum of this species is relatively very large among the bacula of the other horseshoe bats. It has a distinct, but not very strong dorsal bend as in European Rh. hipposideros. The two specimens show a certain kind of difference, especially in the morphology of the basal cone. It is elongated and conical, with a smooth rounded-off dorsal surface, and flat on the ventral one in the Cherrapunjee specimen, while it displays flat dorsal and ventral surfaces in the Muong son animal. The dorso-proximal edge of the base is shorter than the ventral margin, with a wide and deep emargination in the Vietnamese specimen. There is a wide emargination also in the ventral edge, but the Cherrapunjee animal has a narrow incision. The shaft is roughly cylindrical with a slight thickening in the middle, when viewed from above. The tip is a laterally widened knob, wider in the Vietnamese specimen, and also has a dorsal bulge.

Rhinolophus calypso ANDERSEN, 1905

One specimen of the paratypes has been examined. Measurements: total length 3,77, width of base 1,00, dorsoventral height of base 1,04, height of tip 0,27 mm. This relatively small or middle-sized baculum has a certain degree of similarity to that of both Rh. cornutus sechwanus and (regarding the ventral margin of the basal cone) Rh. affinis. The basal cone is dorsoventrally higher than wide. Its dorsal knob strongly protrudes also proximally. The ventral emargination on the proximal margin of the base is extremely deep, narrow and distally diverging. On its each lateral side the basal cone has a proximally protruding portion of the edge, well discernible laterally. The shaft slightly bends dorsally, however, its ventral profile is almost straight when viewed laterally. There is a distally lowering ridge on its dorsal surface, while the ventral surface is rather flat with a proximal depression. In dorsal view, there is a slight constriction at the middle of the bone and at its very tip. The tip is with a longish and dorsally bulging knob. (Plate IV., figs. 1-3).

Rhinolophus lepidus lepidus BLYTH, 1844

Six specimens have been examined from different places of the Indian Peninsula. Measurements: (those of young individuals in parentheses) total length 3,28-3,77 (2,59), width of base 0,90-1,13 (0,55-0,72), height of base 0,63-0,81 (0,41-0,50), width of tip 0,19-0,27 (0,20-0,22) mm. The baculum has an elongated S shape with a dorsal bend near the basal cone and a ventral turn near the tip, (this double turn is well discernible in younger specimens, while rather obliterated in adults). The young bone is with a proximal bifurcation, instead of the normal, dorsoventrally flattened basal cone of the adult (Plate IV., figs. 4-6; plate V., figs. 1-2). The dorsal edge of the basal cone is shorter than the ventral one and with a proximally bulging dorsal knob, otherwise with a wide emargination, just as in the ventral margin. The ventral surface of the base shows a depression. The dorsal knob of the basal cone continues on the dorsal surface of the shaft, as a ridge diminishing in height. The shaft is nearly

cylindrical in cross sections and tapering towards the tip. The latter is broadly rounded off and generally wide from the dorsal view, and with a longish dorsal bulge, well visible from the lateral aspect. All in all, the baculum of this species resembles that of Rh. hipposideros; however, it is stronger, slightly bigger, with a double bend and with a smaller basal cone.

Rhinolophus pearsoni pearsoni HORSFIELD, 1851

One specimen has been studied, collected by the author at Lopchu, near Darjeeling, NE India. This big-bodied horseshoe bat has a relatively small and extremely specialized baculum, widely different from that of all other species studied (Plate V., figs. 3-5). Measurements: total length 2,68, width of base 1,09, height of base 1,09, height of blade 0,52 mm. The basal cone is big, equal of width and height. The dorso-proximal margin is deeply emarginate, as if doubly emarginated owing to the strongly protruding dorsal knob. The ventral incision of the base has the form of an equilateral triangle, with a widely rounded-off distal portion. The dorsal knob of the base is very high and well separated from the other parts of the base. The ventral surface of the basal cone exhibits a wide median depression with an emerging ridge on each side of it. The shaft is dorsoventrally expanded, laterally flattened blade-like structure with its highest point at about 3/4 length of the bone. At this point it bends 150° in the dorsal profile, while the major part of the ventral profile remains straight. The whole shaft is as if it were slightly ventrally bent to the base. The tip is nearly rounded off in the dorsal view, but with multiple breakings in outline in the lateral view.

Rhinolophus macrotis episcopus ALLEN, 1923

The specimen studied came from Cherrapunjee, Assam, India, and was collected by the author. Measurements: total length 3,32, width of base 0,59, width of tip 0,18, height of tip 0,22 mm. Regarding the morphology of the baculum, this form clearly belongs to the lepidus-cornutus-hipposideros group, as it reveals primary characters (Plate V., figs. 6-8). The bone is relatively smaller (as compared to the body-size) than in cornutus. It has an absolutely smaller basal cone, slightly compressed dorsoventrally. The dorsal and ventral emarginations on the corresponding proximal margins are slight and wide (the ventral margin is more proximal) as compared to those in Rh. cornutus there is a dorso-proximal knob and an expanded ventral depression on the outer wall of the basal cone. The ventral depression extends on the shaft as a ventral flat surface up to its middle length. The shaft has a thickening at the middle, well discernible both superiorly and laterally. It has a very slight dorsal bent near the base cone, while it is more pronounced immediately beyond the thickening. The tip has a narrowly rounded off point, with a lateral widening and a longish dorsal knob.

Rhinolophus ^{*marshalli*} ~~macrotis caldwelli~~ ALLEN, 1923/

A single specimen was collected for this study in Vietnam. Measurements: total length 2,54, width of basal cone 0,57, height of basal cone 0,50, width of tip 0,13

mm. The morphology of the baculum evidently shows differences, as compared to the baculum of the Assamese subspecies (Plate V., figs. 9-11). The difference in size alone substantiates the existence of two different subspecies. The bone has a more pronounced upward bend and a smaller basal cone with deeper emarginations than in the former subspecies. The rather wide ventral emargination is deeper than the dorsal one. The dorsal knob is low, the ventral depression is small in extension. The shaft and tip are roughly as in the preceding subspecies.

Hipposideridae

Hipposideros speoris speoris SCHNEIDER, 1800

There have been studied one specimen from the Elephanta Caves, near Bombay, India, and two from Kala Wewa, Sri Lanka. Measurements: total length 0,45-0,50, width of base 0,09 mm. The bone is extremely small in relation to the body-size and clearly a rudimentary structure (Plate VI., figs. 1-4). I have found slight differences between the two populations studied. The Ceylonese bones are slightly longer and narrower than that of the Indian specimen. Moreover, the tip of the Indian specimen shows a tendency to being forked instead of the simple knob in the Sri Lanka animal. Common for all studied specimens is the basal widening, when viewed from above. It has a dorsally emerging portion and a backwards and downwards pointing one, when viewed laterally. The shaft is tapering towards the tip and in the lateral view it displays a continuous upward bend.

Hipposideros larvatus larvatus HORSFIELD, 1823

A small series of this species was used for the present study (three specimens), collected in Tuong linh, North Vietnam. Measurements: total length 1,86-2,10, basal width 0,63-0,77, basal height 0,52-0,59, height of terminal hook 0,59-0,65 mm. The morphology of the baculum is basically different from that of all members of the bicolor and galeritus groups, as well as from the baculum of H. speoris, in having an enlarged and specialized terminal fork and a relatively small basal portion (Plate VI., figs. 5-13). The results of this study query the homogeneity of the conventional speoris group too. The basal portion is the widest one of the bone, yet proximally somewhat narrower than distally. It resembles the basal cone, with undulating dorsal and ventral edges (the latter is more proximal) and with deep emarginations laterally. Its dorsal portion is heavy with a distally lowering profile, while the ventral one slender and thin with a median depression. The forks constitute the distal two-thirds of the total length. The right side branch of the fork is always larger with a bigger surface, and by a bent portion it always extends below the leaf of the left side one. The branches also converge distally. The lateral view of the forks shows a dorso-distal extension, that is, a hatchet-like shape with a widely rounded off tip. The whole portion bends upwards to the base.

Hipposideros bicolor sinensis ANDERSEN, 1918

There have been studied 3 specimens of this middle-sized Hipposideros collected at Tuong linh, North Vietnam. Its baculum is a very simple, small and most probably rudimentary structure, resembling that of H. galeritus (Plate VI., figs. 14-20). Total length 0,50-0,61, width of base 0,09-0,15. The proximal end is a more or less simplex knob with a slight ventral cavity. The shaft is ventrally bent, parallel-sided or with convergent margins towards the tip and with a faint flatness or cavity on the ventral surface. The end portion has a rounded tip. The bone is situated in the very tip of the glans penis, thus mostly protruded during preparation and the drying of the skins, and very likely lost in some cases - a probable cause of its absence in a few other specimens studied - despite the use of the alizarin red staining method.

Hipposideros ater ater TEMPLETON, 1848

There was collected a small series of this species from Konarak, Orissa, India. Two of them were dissected for this work. Another specimens were studied from Gwarighat, Central India, and Hingolgadh, South India. Measurements: total length for Konarak specimens 1,68-1,72, for the others 1,50-1,54, basal width 0,31 and 0,25-0,27, respectively. Height of basal cone 0,22-0,25 and 0,25-0,27. In general the bone well agrees with that of some other species in the bicolor group (Plate VII., figs. 1-7). It has a more or less developed basal cone (as usual, it is less developed in younger animals) and a simple, not bifurcating end portion. Among the species studied, the bone is most similar to that of H. fulvus, still it can easily be distinguished. It has a more developed basal cone, its shaft is dorsoventrally flattened instead of being laterally flat, and its tip is rounded when viewed dorsally instead of being pointed as in H. fulvus. The ventral bend of the bone is less pronounced as in H. fulvus. The dorsal flatness of the tip is well discernible also from the lateral view. The size differences in the bacula from the three localities are not well explained, and a study of a greater series may show them to be individual deviations.

Hipposideros gilberti JOHNSON, 1959

One specimen was secured in exchange from Australia, collected in the Cutta Cave, Katherine, N.T. by T.L. MCKEAN & W. WALSH, and identified as H. ater. Over the differences in the dental characters as shown by H. ater, the morphology of the baculum certainly indicates a quite different and good species. Pending a thorough study of its taxonomic position, I apply JOHNSON's denomination as geographically the nearest one. Measurements: total length 0,86, basal width 0,37 mm. The baculum, disregarding its small size, clearly shows the bifurcating type of the Asiatic species of great body-size, with no relation to the true H. ater, or to any other species of the bicolor group (Plate VII., figs. 8-10). The basal portion of the bone is relatively small and narrow, but wider than high dorsoventrally. Its proximal surface is moderately carved out. It is dorsally flat, or rather, with a slight concavity at the median line. Ventrally, it displays a concave surface in the median line, the concavity extending to the middle portion of the shaft. The latter is extremely short and its length together with that of the basal portion is less than half of the total

length of the bone. The longest portion of the baculum is the terminal fork, with deviating and then converging and acute branches. In the dorsal view, the branches are gradually tapering towards the tip. In the lateral view, however, their maximum height is at the middle. Beginning with this portion, the branches are strongly curved upwards, that is, in a dorsal direction.

Hipposideros fulvus fulvus GRAY, 1838

The morphology of the baculum of this species resembles that of H. ater. (Plate VII., figs. 11-17). I have studied two specimens from Mahableshwar, and one from Bhaja Caves, all from Maharashtra, India. Measurements: total length 1,56-1,81, width of base 0,23, height of base 0,29 mm. The bone is more or less expressedly ventrally bent, a sword-like structure with a small basal cone and with a simple, pointed tip. It has a slight left side turn, when viewed from above. The base shows lateral emarginations on each side and a slight but well established proximo-dorsal lobe. The shaft is subequal in width when viewed from above, with a faint narrowing near base and at tip. In the lateral view, however, it is high at base, tapering gradually towards the tip. The shape of the baculum is clearly distinct from that of H. ater, having a more pronounced ventral curvature, a more expressed lateral compression, and a pointed tip with no flatness on its dorsal surface.

Hipposideros cineraceus cineraceus BLYTH, 1853

I have studied a small series (5) of this species from Tuong linh, North Vietnam. Measurements: total length 1,68-1,90, basal width 0,41-0,50, basal height 0,27-0,32, terminal span 0,36 mm. The proximal end of the bone is a well developed, dorso-ventrally flattened basal core with a dorsal portion sharply separated by lateral constrictions from the lower one. Its proximo-dorsal margin projects backwards and has a median emargination. Laterally there is an emargination on both sides. The ventral portion of the basal cone is shorter than the dorsal one and has a concave margin. Both dorsal and ventral surfaces of the basal core display a slight concavity. The shaft shows a continuous ventral curve from base to tip, and it is gradually tapering to the tip, both in the dorsal and lateral views. The shaft is not fully cylindrical in cross-sections, as it has ventral impressions near the base and the tip, and lateral flat surfaces near the base and in the middle. The tip is a dorsoventrally flattened fork with a wide base, a further ventral bend, a slightly concave dorsal surface and a more pronounced concavity on the ventral one. The branches of the fork are widely truncate (Plate VIII., figs. 1-7). On the base of the available material of the different species in Hipposideri, I consider this type of baculum as the most complicated and primary one in the Old World Leaf-nosed bats. On the one hand, the presence of the basal cone indicates a relationship with the Rhinolophidae, on the other, the existence of a bifurcated tip separates H. cineraceus from them and suggests a possibility of a common ancestral form in the past from which both H. cineraceus and the species with an enlarged end portion of the bacula might have descended. Finally, the cineraceus type of baculum might also have been the predecessor of numerous apparently rudimentary bacula with no terminal fork (H. bicolor sinensis, H. galeritus brachyotis, ect.).

Hipposideros durgadasi KHAJURIA, 1970

This recently described form has a very characteristic, strongly bent bone, which is quite different from that of H. cineraceus (Plate VII., figs. 18-20). So we have to treat H. durgadasi not as a subspecies of H. cineraceus but a distinct and good species. I have studied one specimen from near the type-locality, Gwarighat, Jabalpur, Central India. Measurements: distance between tip and basal end 1,27, width of base 0,18, width of shaft 0,09 mm. The bone can be regarded as a very much specialized derivate of the cineraceus type. The basal portion is a simple, ventrally carved widening, instead of a double basal cone with emarginations. The bending of the shaft is towards the ventral side, and reaches an extreme degree: it describes a semicircle. The shaft itself is a dorsoventrally flattened, rather ribbon-like structure with a pointed tip and a ventral longitudinal depression.

Hipposideros calcaratus (DOBSON, 1877)

A single New Guinean specimen was studied. Measurements: total length 1,86, width of base 0,45, spread of the terminal fork 0,95 mm. On the basis of the morphology of the baculum, this species is related to the Asiatic species of the speoris and armiger groups with an enlarged terminal fork (Plate VIII., figs. 8-10). It seems as if it were a transitional form between a basic type (cineraceus-like) and the larvatus stage. The bone has a bulky, shovel-shaped basal portion with no trace of a basal cone. The thickest and narrowest part of it is proximally situated and dorsally bulges out. The shaft is distally diverging to the terminal fork. It is dorsoventrally flattened and dorsally bent to the basal portion. At the transitional point it has a constriction and a ventral depression. The terminal fork expands with widely round-tipped branches which are pointing dorsally.

Hipposideros armiger armiger HODGSON, 1835

There have been studied three specimens of a small series collected at Lopchu near Darjeeling, India. Measurements: total length 1,86-2,08, width of base 0,55-0,63, height of base 0,41-0,50, span of tip 0,72-0,83 mm. The relatively small, short and stout baculum has a terminal fork. (Plate VIII., figs. 11-16). However it is straight with a strong ventral bent at the terminal bifurcation. The basal portion is a moderately wide, thick, dorsoventrally flattened structure with a proximally directed strong ventral lobe. A faint emargination is on the proximo-ventral margin of the bone. The dorsal surface of the base is definitely convex, while there is a concavity on the ventral one. The shaft is extremely short. Its narrowest portion, both from the dorsal and lateral views, is at the middle length of the bone. It is dorsoventrally flattened with a convex dorsal surface and a definite longitudinal depression on the ventral side. The terminal fork shows a wide, ventrally carved-out base; the ventrally directed as well as laterally flattened tapering branches enfold the urethra from above.

~~turpis~~
Hipposideros valongensis BOURRET, 1942

There have been studied two specimens from a series of 21 males collected in Cuc phuong, Vietnam. The baculum resembles that of H. armiger and H. gilberti, and shows no close relation to the penis bone of H. larvatus (Plate IX., figs. 1-9). Thus, BOURRET's original assumption has no ground regarding the taxonomic status of the present animal. Measurements: total length 1,50-1,63, basal width 0,45-0,52, height of basal portion 0,36-0,40, greatest span of terminal fork 0,55-0,57 mm. The relatively small bone is situated in the terminal half of the glans penis, with its narrowest portion at the middle length (just as in H. armiger) but with a shorter shaft and a longer terminal fork as well as basal portion. It displays a weaker ventral bent than H. armiger, but at middle length (lateral view). The incision on the proximo-ventral margin is stronger than in the preceding species. The dorsal surface of the basal portion and that of the terminal fork at the bifurcation reveal a definite concavity. The ventral median depression reaches its deepest section on the ventral surface of the base. The branches of the terminal fork are roughly cylindrical and tapering towards the bluntly pointed tip. They are deviating distally, then converging from the middle length, as in H. gilberti. The main difference between these two species is in the direction of the terminal fork.

Hipposidros galeritus brachyotus (DOBSON, 1874)

I have studied one specimen from Ajanta, India. The baculum of this animal is a trifle bigger than that of H. bicolor sinensis, with a resemblance to the latter (Plate IX., figs. 10-12). Measurements: total length 0,40, width of base 0,13 mm. Its proximal portion is wide but very low. It shows a trace of a basal conical cavity, and it is slightly two-lobed when viewed from above. There is a faint asymmetry in the shaft, having sharp margins both on the upper right side and on the lower left one. A flat surface can be seen from the base up to the middle height of the shaft on ventral side. From the lateral view, the bone is almost quite straight. The end portion exhibits a dorsoventrally flattened, slightly up-turned, knob-like tip.

Aselliscus tricuspidatus (TEMMINCK, 1835)

One specimen, collected in New Guinea, was used for this study. Measurements: total length 0,95, width of base 0,22, width of tip 0,20 mm. A strong asymmetry appears in the shape of the baculum unique among the Old World Leaf-nosed Bats studied, as the bone is S-shaped in the right lateral view while the ventrally projecting apical lappet turns sharply to the left (Plate IX., figs. 13-14). The basal portion is dorsoventrally flattened and with a dorsal knob. The shaft is distally tapering to the widening base of the strongly flattened, truncate apical lappet.

Coelops frithii inflatus MILLER, 1928

A single specimen was studied from a small series collected at Gia phu, North Vietnam. The baculum is similar in some respects to those of H. fulvus and H. ater (Plate IX., figs. 15-17). Measurements: length 1,95, greatest width 0,13, width of

tip 0,09 mm. The bone shows a continuous bend (arcuate) with its tip towards the ventral side. From above the base is narrower than the widest portion of the shaft. There is a constriction between the base and the shaft. The base has a strongly protruding proximo-dorsal lobe and a small ventral one. The shaft is slightly flattened dorsoventrally. Distally it is widening from the base, then, from about one-third length of the bone, tapering towards the tip which makes a small knob (as seen from above and also in the lateral view). The ventral surface of the bone exhibits a longitudinal median depression, except at the ventral lobe of the base, and at the junction of the shaft and the tip.

CONCLUSIONS

While in the Hipposideridae there is present a terminal fork or some trace of it in the majority of species studied, it is always lacking in every Rhinolophus. On the contrary, the basal cone is a typical feature of all species of Rhinolophi, and a rare phenomenon in Hipposideridae. The grouping of Rhinolophus is possible by the ventral or dorsal bend of shaft and tip, the flattening of the shaft, that is, by the attached wings. Hipposiderids seem more diverse. The probable basic type of baculum is that of H. cineraceus. From this, at least four more groups can be deduced. The first is a simplified shape with no sharp reduction in measurements. Here belong some members of the conventional bicolor group and Coelops. The second group contains bats with a rudimentary baculum with mostly reduced measurements as of H. bicolor, H. speoris, and H. galeritus. The third group made of middle or big-sized species of the formerly established speoris and armiger groups and a small species of the bicolor group (H. gilberti). In these the baculum displays a pronounced and enlarged terminal portion and an apical fork modified as lappets, hooks, etc. Aselliscus is probably in a separate, fourth group with its strongly asymmetrical bone, as if representing a transitional stage between the basic (cineraceus) type and the forkless (bicolor-fulvus) type. All these characters provide proof for a more progressed evolution of Hipposideridae as compared to that of Rhinolophidae.

The present study, in many cases, support to accept different subspecies described earlier. In these there are differences mostly in size. In other cases, however, such as in Rh. midas, Rh. sinicus, H. gilberti, H. durgadasi, H. alongensis, there are enormous morphological differences, so we have to regard them distinct at a species level.

The author would suggest the extension of this kind of studies on all species of these two families, both on the bone and on the soft parts of the penis. The future results might shed a new light on the sophisticated systematics of Hipposideridae, and offer better basis for the long ago wanted, up-to-date revision of Rhinolophidae.

TOPÁL Gy.: Az óvilági patkósrú denevérek (*Rhinolophidae* és *Hipposideridae*)
péniszcsontjának vizsgálata

A szerző ismerteti ázsiai kutatóútjain begyűjtött, valamint a Természettudományi Múzeum gyűjteményében meglévő egyéb ázsiai, óceániai és ausztráliai *Rhinolophidák* és *Hipposideridák* péniszcsontjának (os penis) alaktani vizsgálatát, de nem foglalkozik e családok európai és afrikai tagjaival. Összesen 26 fajt és alfajt tanulmányozott.

Eredményei alátámasztják - azt a régebbi, de újabban némely kutató által vitatott felfogást, hogy a szoros értelemben vett patkósrú denevérek (*Rhinolophidae*) és az óvilági hártýásorrú denevérek (*Hipposideridae*) két önálló családot alkotnak. Erre utal az a tény, hogy a patkósrú denevérek - méretre általában nagy - os penise egyöntetűen a proximális kúpból, a nyélből és a különböző kifejlődésű, de sohasem villásan elágazó disztális csúcsból áll. Ezzel szemben, az óvilági hártýásorrúak péniszcsontján a proximális kúp legfeljebb csak néhány faj esetében van meg, ugyanakkor a csúcs igen gyakran villásan elágazik. Ez utóbbi családban az ismertetett alapalaktól való eltérések - több fajon tapasztalt határozott méretbeli csökkenéssel együtt - kétségtelenül a csont csökevényesedésére utalnak. Mindez biztos jele annak, hogy a *Hipposideridák* családja - fajainak nagyobb változatossága mellett - ebben a jellegben is feltétlenül evolváltabb, mint a *Rhinolophidák* csoportja.

A vizsgálatok egyes esetekben megerősítik a már ismert alfajok elkülönítésének jogosságát (itt szinte csak méretkülönbségek látszanak), más esetekben azonban, így a *Rh. midas*, a *Rh. (sinicus)* a *H. gilberti*, a *H. durgadasi* és a *H. alongensis* vonatkozásában az eddig elfogadott törzsfajtól való morfológiai eltérések olyan szembevetőek, hogy a felsorolt taxonokat önálló fajoknak kell tekintenünk.

A péniszcsont alakja és mérete a szerző szerint ezekben a denevércsaládokban talán még az orrfüggeléknél, és a - nagyon gyakran feltűnően egyöntetű - fogazatnál is megbízhatóbb rendszertani bélyeg. A vizsgálatok kiterjesztését ezért mind az os penis, mind pedig a körülötte levő lágyrészek tekintetében e két óvilági család minden fajára feltétlenül kívánatosnak tartja. A részletesebb és átfogó vizsgálatok szerinte minden bizonnyal új megvilágításba helyezik a *Hipposideridák* bonyolult, s részleteiben még mindig kialakulatlan rendszerét. Egyben pedig biztosabb alapokat szolgáltatnak majd a *Rhinolophidák* évtizedek óta hiányzó modern revíziójához.

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PLATES - TÁBLÁK

PLATE I.

I. TÁBLA

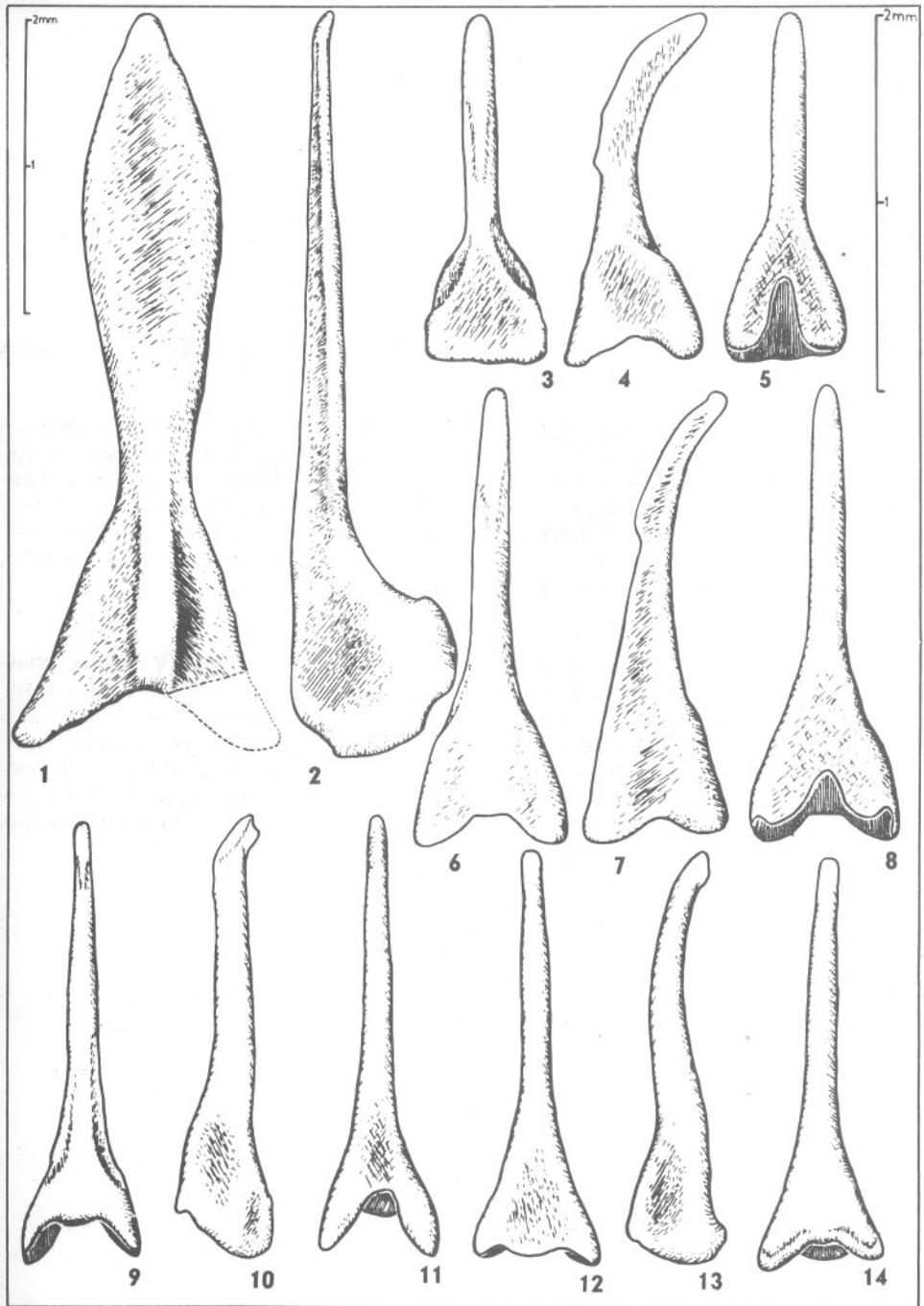
Figs. 1-2. = baculum of Rhinolophus ferrumequinum proximus (Coll. No. 445, Bumzov Cave, Kashmir, India) 1: dorsal view, 2: right lateral view. Figs. 3-5. = baculum of Rh. affinis macrurus (Coll. No. 256/71, Muong son, Vietnam) 3: dorsal view, 4: right lateral view, 5: ventral view. Figs. 6-8. = baculum of Rh. affinis himalayanus (Coll. No. 781, Darjeeling, West Bengal, India) 6: dorsal view, 7: right lateral view, 8: ventral view. Figs. 9-11. = baculum of Rh. sinicus (Coll. No. 41/71, Tha phinh, Vietnam) 9: dorsal view, 10: right lateral view, 11: ventral view. Figs. 12-14. = baculum of Rh. sinicus (Coll. No. 378, Cuc phuong, Vietnam) 12: dorsal view, 13: right lateral view, 14: ventral view.

88.19.1.

93.49.1

1-2. ábra = a Rhinolophus ferrumequinum proximus péniszcsontja (Coll. No. 445, Bumzov bg., Kashmir, India) 1: dorzális nézet, 2: oldalnézet jobbról. 3-5. ábra = a Rh. affinis macrurus péniszcsontja (Coll. No. 256/71, Muong son, Vietnam) 3: dorzális nézet, 4: oldalnézet jobbról, 5: ventrális nézet. 6-8. ábra = a Rh. affinis himalayanus péniszcsontja (Coll. No. 781, Darjeeling, West Bengal, India) 6: dorzális nézet, 7: oldalnézet jobbról, 8: ventrális nézet. 9-11. ábra = a Rh. sinicus péniszcsontja (Coll. No. 41/71, Ta phinh, Vietnam) 9: dorzális nézet, 10: oldalnézet jobbról, 11: ventrális nézet. 12-14. ábra = a Rh. sinicus péniszcsontja (Coll. No. 378, Cuc phuong, Vietnam) 12: dorzális nézet, 13: oldalnézet jobbról, 14: ventrális nézet.

dorsal ventral



49.1

PLATE II.

93.48.5. II. TÁBLA

Figs. 1-3. = baculum of Rhinolophus sinicus (Coll. No. 39/71, Ta phinh, Vietnam) 1: dorsal view, 2: right lateral view, 3: ventral view. Figs. 4-6. = baculum of Rh. rouxi (Coll. No. 176, Udaygiri Caves, Orissa, India) 4: dorsal view, 5: right lateral view, 6: ventral view. Figs. 7-9. = baculum of Rh. rouxi (Coll. No. 181, Udaygiri Caves, Orissa, India) 7: dorsal view, 8: right lateral view, 9: ventral view. Figs. 10-12. = baculum of Rh. rouxi (Coll. No. 652, Mahableshwar, Maharashtra, India) 10: dorsal view, 11: right lateral view, 12: ventral view.

1-3. ábra = a Rhinolophus sinicus péniszcsontja (Coll. No. 39/71, Ta phinh, Vietnam) 1: dorzális nézet, 2: oldalnézet jobbról, 3: ventrális nézet. 4-6. ábra = a Rh. rouxi péniszcsontja (Coll. No. 176, Udaygiri barlangok, Orissa, India) 4: dorzális nézet, 5: oldalnézet jobbról, 6: ventrális nézet. 7-9. ábra = a Rh. rouxi péniszcsontja (Coll. No. 181, Udaygiri barlangok, Orissa, India) 7: dorzális nézet, 8: oldalnézet jobbról, 9: ventrális nézet. 10-12. ábra = a Rh. rouxi péniszcsontja (Coll. No. 652, Mahableshwar, Maharashtra, India) 10: dorzális nézet, 11: oldalnézet jobbról, 12: ventrális nézet.

dorsal \longleftrightarrow ventral

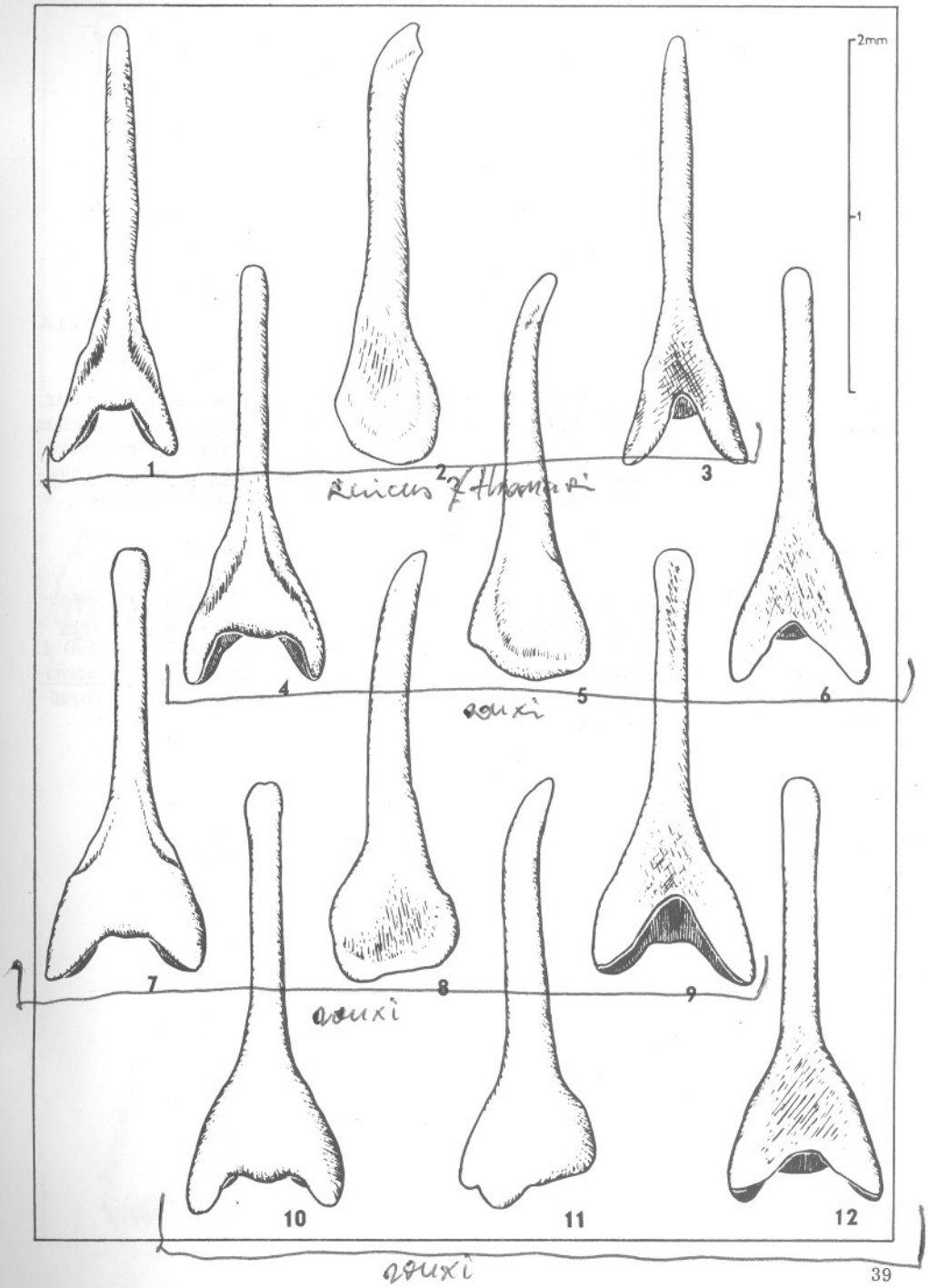


PLATE III.

III. TÁBLA

Figs. 1-3. = baculum of Rhinolophus midas (Coll. No. 448, Bumzov Cave, Kashmir, India) 1: dorsal view, 2: right lateral view, 3: ventral view. Figs. 4-6. = baculum of Rh. cornutus sechwanus (Coll. No. 264/71, Muong son, Vietnam) 4: dorsal view, 5: right lateral view, 6: ventral view. Figs. 7-9. = baculum of Rh. cornutus sechwanus (Coll. No. 908, Cherrapunjee, India) 7: dorsal view, 8: right lateral view, 9: ventral view.

1-3. ábra = a Rhinolophus midas péniszcsontja (Coll. No. 448, Bumzov bg., Kashmir, India) 1: dorzális nézet, 2: oldalnézet jobbról, 3: ventrális nézet. 4-6. ábra = a Rh. cornutus sechwanus péniszcsontja (Coll. No. 264/71, Muong son, Vietnam) 4: dorzális nézet, 5: oldalnézet jobbról, 6: ventrális nézet. 7-9. ábra = a Rh. cornutus sechwanus péniszcsontja (Coll. No. 908, Cherrapunjee, Assam, India) 7: dorzális nézet, 8: oldalnézet jobbról, 9: ventrális nézet.

dorsal \longleftrightarrow ventral

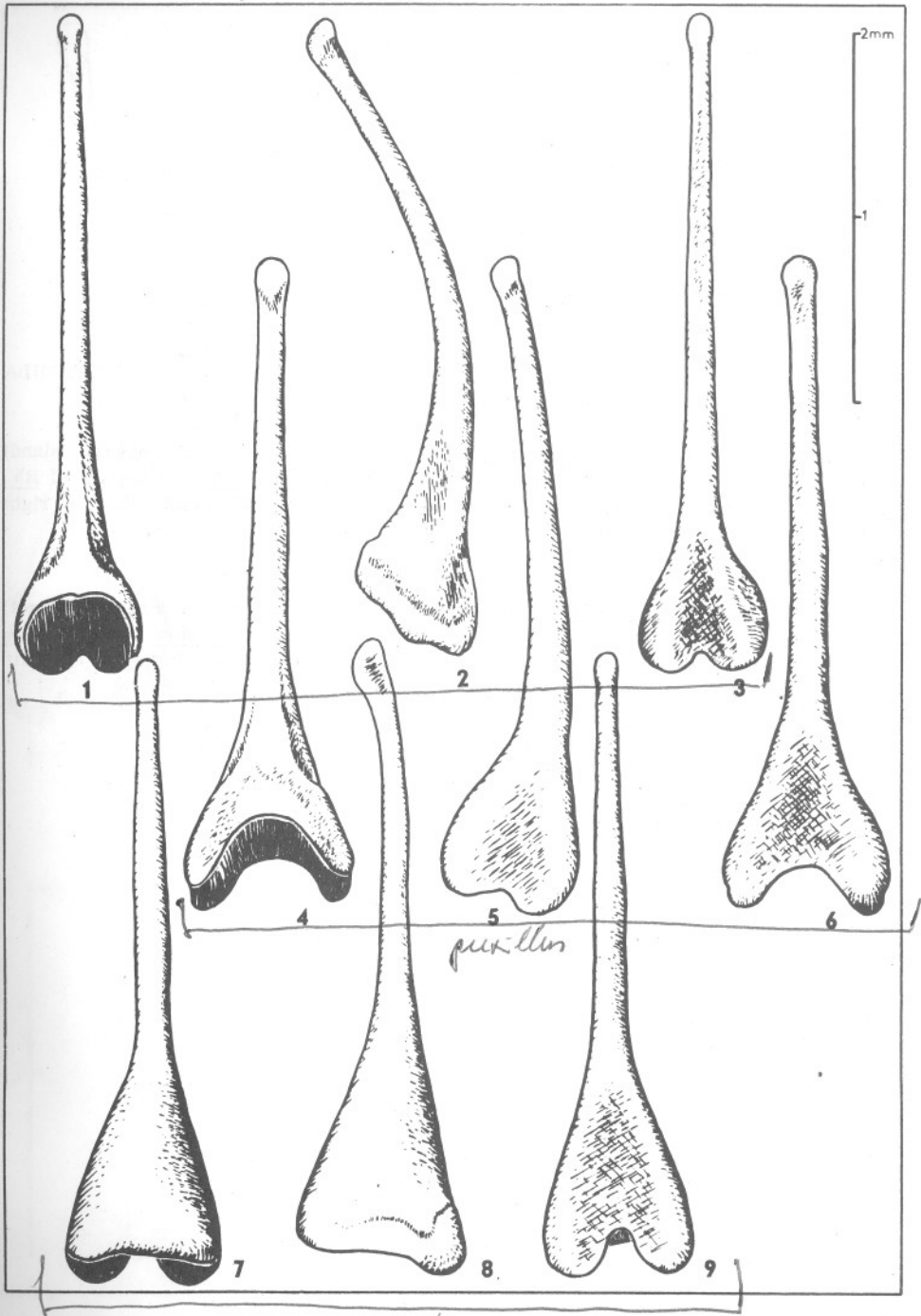


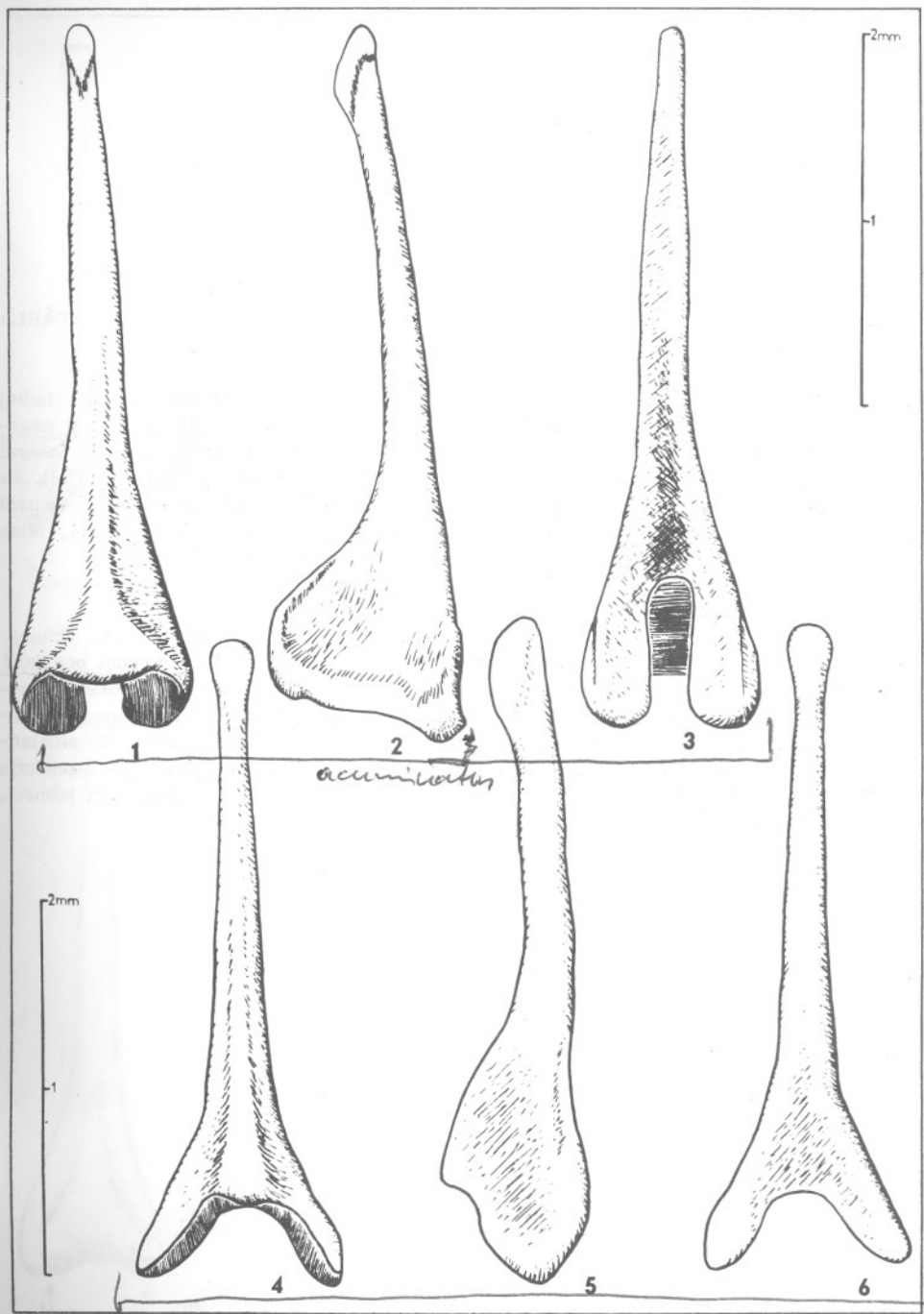
PLATE IV.

IV. TÁBLA

Figs. 1-3. = baculum of Rhinolophus calypso (Inventory No. 2871/2, Enggano Island) 1: dorsal view, 2: right lateral view, 3: ventral view. Figs. 4-6. = baculum of Rh. lepidus (Coll. No. 543, Lohogad Fort, Maharashtra, India) 4: dorsal view, 5: right lateral view, 6: ventral view.

1-3. ábra = a Rhinolophus calypso péniszcsontja (Inv. No. 2871/2, Enggano sziget) 1: dorzális nézet, 2: oldalnézet jobbról, 3: ventrális nézet. 4-6. ábra = a Rh. lepidus péniszcsontja (Coll. No. 543, Lohogad erőd, Maharashtra, India) 4: dorzális nézet, 5: oldalnézet jobbról, 6: ventrális nézet.

dorsal \longleftrightarrow ventral

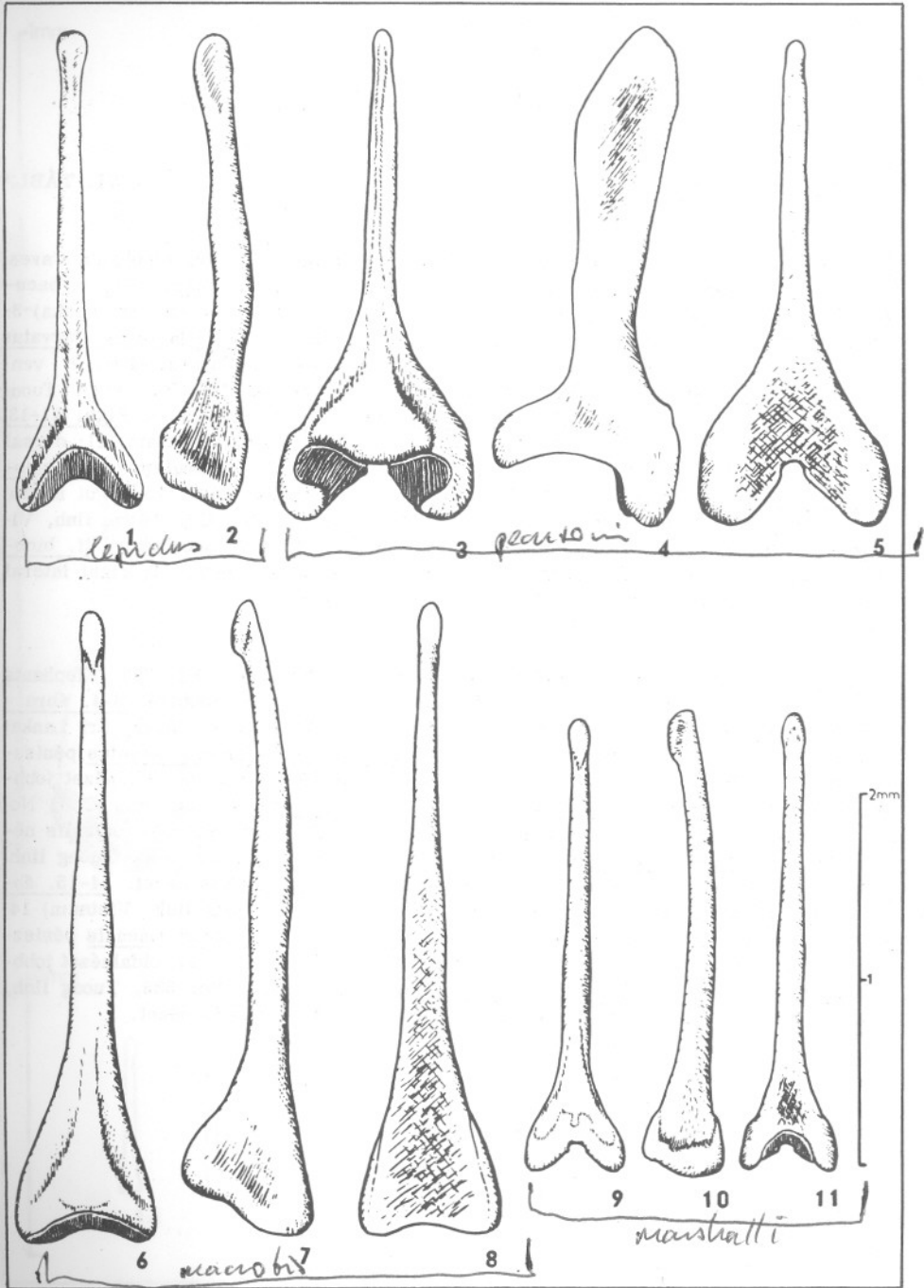


epinotus

Figs. 1-2. = baculum of Rhinolophus lepidus (Coll. No. 934, Daitari, Orissa, India) 1: dorsal view, 2: right lateral view. Figs. 3-5. = baculum of Rh. pearsoni pearsoni (Coll. No. 854, Lopchu, West Bengal, India) 3: dorsal view, 4: right lateral view, 5: ventral view. Figs. 6-8. = baculum of Rh. macrotis episcopus (Coll. No. 909, Cherrapunjee, Assam, India) 6: dorsal view, 7: right lateral view, 8: ventral view. Figs. 9-11. = baculum of Rh. macrotis caldwelli (Coll. No. 204/71, Minh xuan, Vietnam) 9: dorsal view, 10: right lateral view, 11: ventral view.

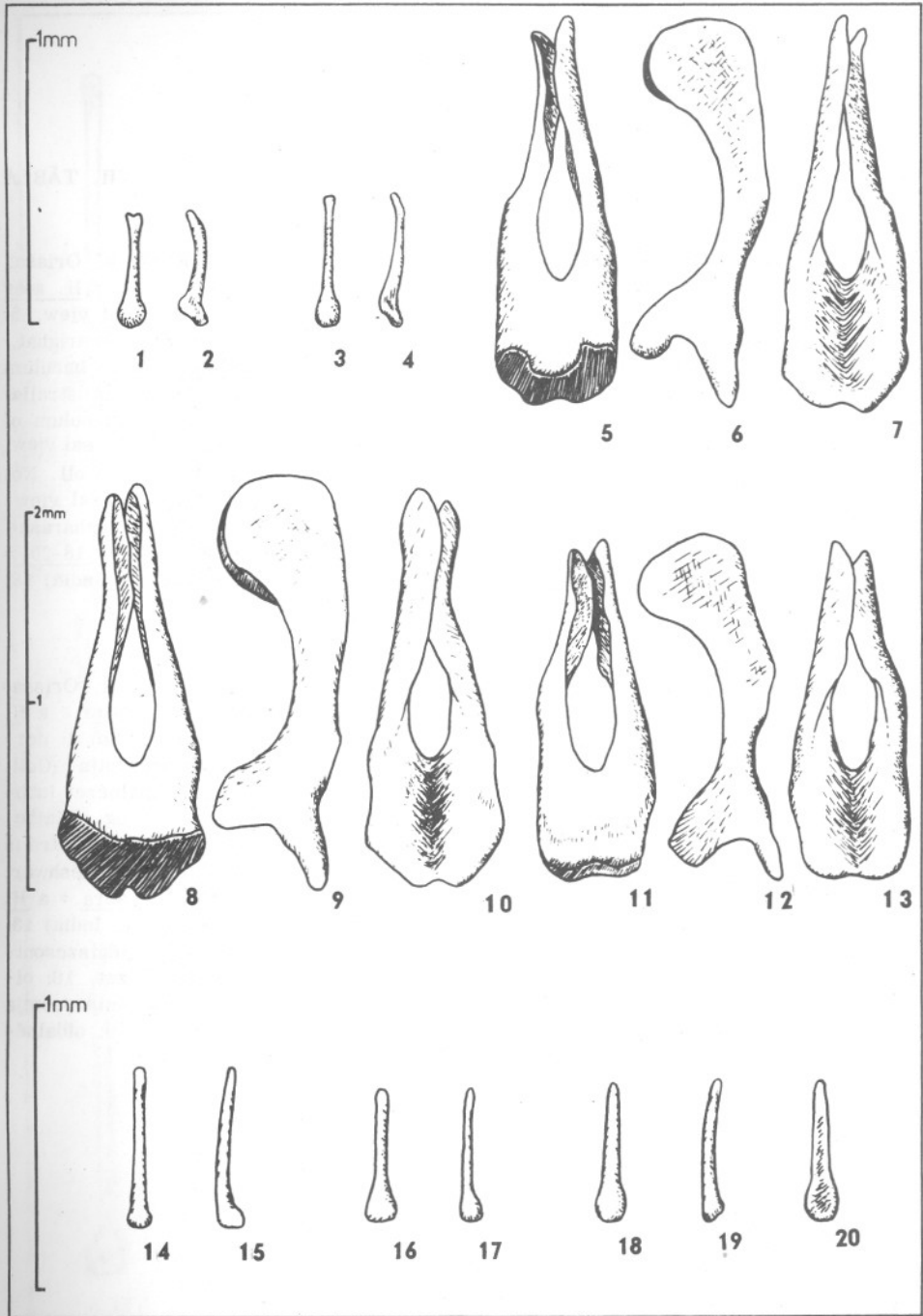
1-2. ábra = a Rhinolophus lepidus péniszcsontja (Coll. No. 934, Daitari, Orissa, India) 1: dorzális nézet, 2: oldalnézet jobbról. 3-5. ábra = a Rh. pearsoni pearsoni péniszcsontja (Coll. No. 854, Lopchu, West Bengal, India) 3: dorzális nézet, 4: oldalnézet jobbról, 5: ventrális nézet. 6-8. ábra = a Rh. macrotis episcopus péniszcsontja (Coll. No. 909, Cherrapunjee, Assam, India) 6: dorzális nézet, 7: oldalnézet jobbról, 8: ventrális nézet. 9-11. ábra = a Rh. macrotis caldwelli péniszcsontja (Coll. No. 204/71, Minh xuan, Vietnam) 9: dorzális nézet, 10: oldalnézet jobbról, 11: ventrális nézet.

dorsal ← → ventral



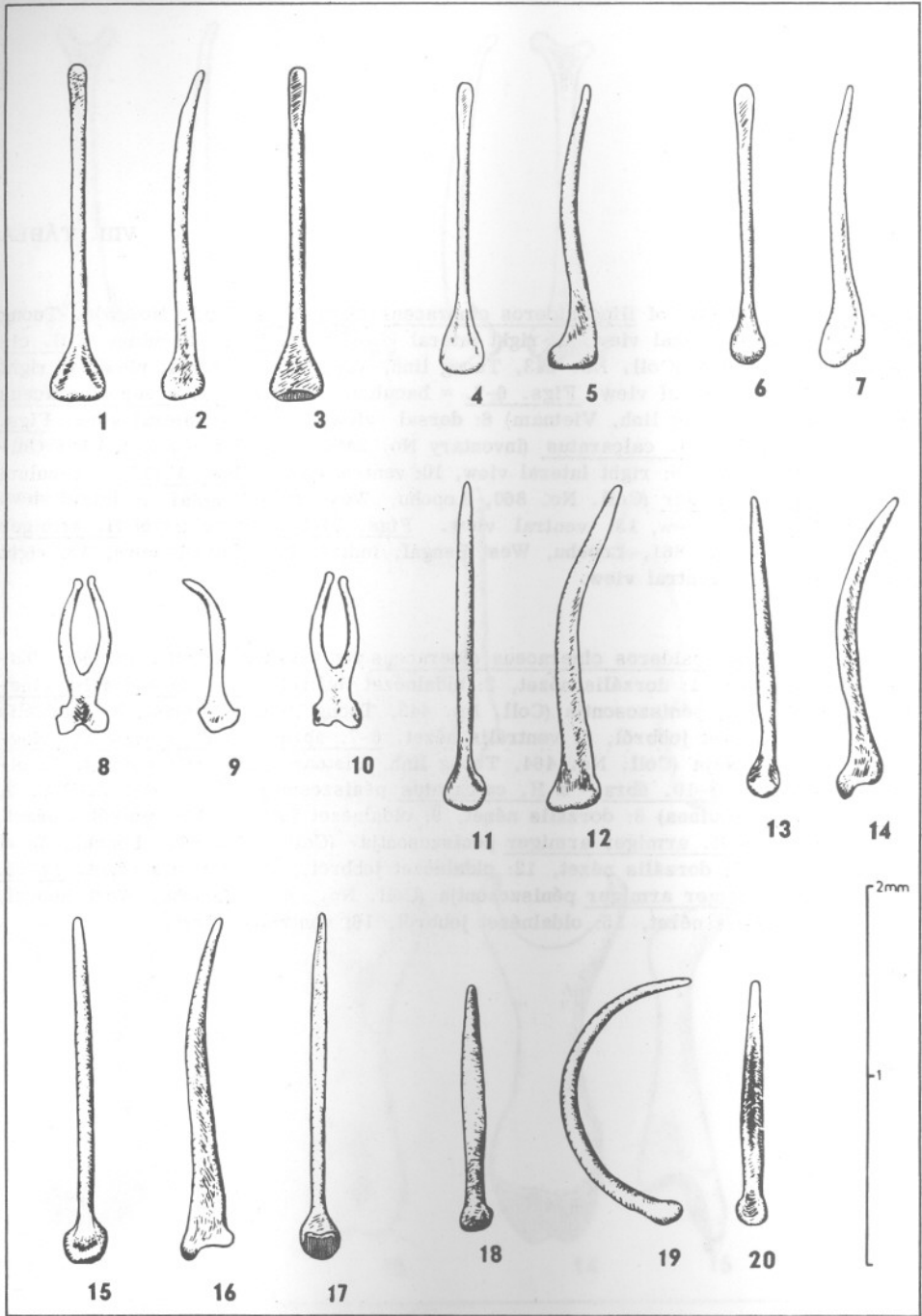
Figs. 1-2. = baculum of Hipposideros speoris speoris (Coll. No. 735, Elephanta Caves, Maharashtra, India) 1: dorsal view, 2: right lateral view. Figs. 3-4. = baculum of H. speoris speoris (Inventory No. 1972 A 12-1, Kala Wewa, Sri Lanka) 3: dorsal view, 4: right lateral view. Figs. 5-7. = baculum of H. larvatus larvatus (Coll. No. 415, Tuong linh, Vietnam) 5: dorsal view, 6: right lateral view, 7: ventral view. Figs. 8-10. = baculum of H. larvatus larvatus (Coll. No. 417, Tuong linh, Vietnam) 8: dorsal view, 9: right lateral view, 10: ventral view. Figs. 11-13. = baculum of H. larvatus larvatus (Coll. No. 445, Tuong linh, Vietnam) 11: dorsal view, 12: right lateral view, 13: ventral view. Figs. 14-15. = baculum of H. bicolor sinensis (Coll. No. 468, Tuong linh, Vietnam) 14: dorsal view, 15: right lateral view. Figs. 16-17. = baculum of H. bicolor sinensis (Coll. No. 518, Tuong linh, Vietnam) 16: dorsal view, 17: right lateral view. Figs. 18-20. = baculum of H. bicolor sinensis (Coll. No. 533, Tuong linh, Vietnam) 18: dorsal view, 19: right lateral view, 20: ventral view.

1-2. ábra = a Hipposideros speoris speoris péniszcsontja (Coll. No. 735, Elephanta barlangok, Maharashtra, India) 1: dorzális nézet, 2: oldalnézet jobbról. 3-4. ábra = a H. speoris speoris péniszcsontja (Inv. No. 1972 A 12-1, Kala Wewa, Sri Lanka) 3: dorzális nézet, 4: oldalnézet jobbról. 5-7. ábra = a H. larvatus larvatus péniszcsontja (Coll. No. 415, Tuong linh, Vietnam) 5: dorzális nézet, 6: oldalnézet jobbról, 7: ventrális nézet. 8-10. ábra = a H. larvatus larvatus péniszcsontja (Coll. No. 417, Tuong linh, Vietnam) 8: dorzális nézet, 9: oldalnézet jobbról, 10: ventrális nézet, 11-13. ábra: a H. larvatus larvatus péniszcsontja (Coll. No. 445, Tuong linh, Vietnam) 11: dorzális nézet, 12: oldalnézet jobbról, 13: ventrális nézet. 14-15. ábra = a H. bicolor sinensis péniszcsontja (Coll. No. 468, Tuong linh, Vietnam) 14: dorzális nézet, 15: oldalnézet jobbról. 16-17. ábra = a H. bicolor sinensis péniszcsontja (Coll. No. 518, Tuong linh, Vietnam) 16: dorzális nézet, 17: oldalnézet jobbról. 18-20. ábra = a H. bicolor sinensis péniszcsontja (Coll. No. 533, Tuong linh, Vietnam) 18: dorzális nézet, 19: oldalnézet jobbról, 20: ventrális nézet.



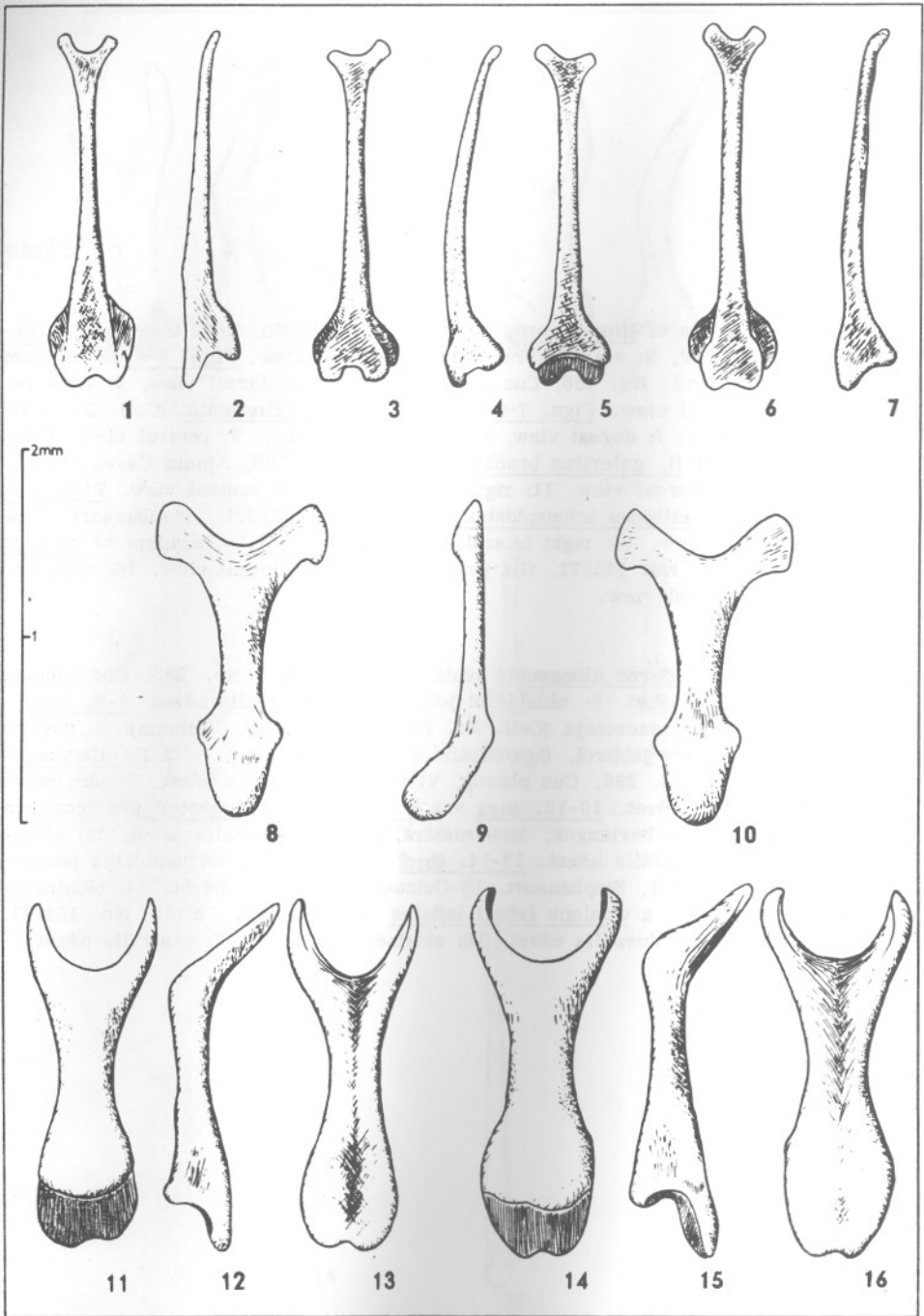
Figs. 1-3. = baculum of Hipposideros ater ater (Coll. No. 70, Konarak, Orissa, India) 1: dorsal view, 2: right lateral view, 3: ventral view. Figs. 4-5. = H. ater ater (Inventory No. 65. 22. 1., Hingolghadh, Saurashtra, India) 4: dorsal view, 5: right lateral view. Figs. 6-7. = baculum of H. ater ater (Coll. No. 282, Gwarighat, Madhya Pradesh, India) 6: dorsal view, 7: right lateral view. Figs. 8-10. = baculum of H. gilberti (Inventory No. 70. 29. 1., Cutta Cave, Katherine, N. T., Australia) 8: dorsal view, 9: right lateral view, 10: ventral view. Figs. 11-12. = baculum of H. fulvus fulvus (Coll. No. 631, Mahableshwar, Maharashtra India) 11: dorsal view, 12: right lateral view. Figs. 13-14. = baculum of H. fulvus fulvus (Coll. No. 633, Mahableshwar, Maharashtra, India) 13: dorsal view, 14: right lateral view. Figs. 15-17. = baculum of H. fulvus fulvus (Coll. No. 588, Bhaja Caves, Maharashtra, India) 15: dorsal view, 16: right lateral view, 17: ventral view. Figs. 18-20. = baculum of H. durgadasi (Coll. No. 281, Gwarighat, Madhya Pradesh, India) 18: dorsal view, 19: right lateral view, 20: ventral view.

1-3. ábra = a Hipposideros ater ater péniszcsontja (Coll. No. 70, Konarak, Orissa, India) 1: dorzális nézet, 2: oldalnézet jobbról, 3: ventrális nézet. 4-5. ábra = a H. ater ater péniszcsontja (Inv. No. 65. 22. 1., Hingolghadh, Saurashtra, India) 4: dorzális nézet, 5: oldalnézet jobbról. 6-7. ábra = a H. ater ater péniszcsontja (Coll. No. 282, Gwarighat, Madhya Pradesh, India) 6: dorzális nézet, 7: oldalnézet jobbról. 8-10. ábra = a H. gilberti péniszcsontja (Inv. No. 70. 29. 1., Cutta bg., Katherine, N. T., Ausztrália) 8: dorzális nézet, 9: oldalnézet jobbról, 10: ventrális nézet. 11-12. ábra = a H. fulvus fulvus péniszcsontja (Coll. No. 631, Mahableshwar, Maharashtra, India) 11: dorzális nézet, 12: oldalnézet jobbról. 13-14. ábra = a H. fulvus fulvus péniszcsontja (Coll. No. 633, Mahableshwar, Maharashtra, India) 13: dorzális nézet, 14: oldalnézet jobbról. 15-17. ábra = a H. fulvus fulvus péniszcsontja (Coll. No. 588, Bhaja barlangok, Maharashtra, India) 15: dorzális nézet, 16: oldalnézet jobbról, 17: ventrális nézet. 18-20. ábra = a H. durgadasi péniszcsontja (Coll. No. 281, Gwarighat, Madhya Pradesh, India) 18: dorzális nézet, 19: oldalnézet jobbról, 20: ventrális nézet.



Figs. 1-2. = baculum of Hipposideros cineraceus cineraceus (Coll. No. 500, Tuong linh, Vietnam) 1: dorsal view, 2: right lateral view. Figs. 3-5. = baculum of H. cineraceus cineraceus (Coll. No. 443, Tuong linh, Vietnam) 3: dorsal view, 4: right lateral view, 5: ventral view. Figs. 6-7. = baculum of H. cineraceus cineraceus (Coll. No. 464, Tuong linh, Vietnam) 6: dorsal view, 7: right lateral view. Figs. 8-10. = baculum of H. calcaratus (Inventory No. 2466/b. 9, Stephansort, New Guinea) 8: dorsal view, 9: right lateral view, 10: ventral view. Figs. 11-13. = baculum of H. armiger armiger (Coll. No. 860, Lopchu, West Bengal, India) 11: dorsal view, 12: right lateral view, 13: ventral view. Figs. 14-16. = baculum of H. armiger armiger (Coll. No. 861, Lopchu, West Bengal, India) 14: dorsal view, 15: right lateral view, 16: ventral view.

1-2. ábra = a Hipposideros cineraceus cineraceus péniszcsontja (Coll. No. 500, Tuong linh, Vietnam) 1: dorzális nézet, 2: oldalnézet jobbról. 3-5. ábra = a H. cineraceus cineraceus péniszcsontja (Coll. No. 443, Tuong linh, Vietnam) 3: dorzális nézet, 4: oldalnézet jobbról, 5: ventrális nézet. 6-7. ábra = a H. cineraceus cineraceus péniszcsontja (Coll. No. 464, Tuong linh, Vietnam) 6: dorzális nézet, 7: oldalnézet jobbról. 8-10. ábra = a H. calcaratus péniszcsontja (Inv. No. 2466/b. 9, Stephansort, Uj-Guinea) 8: dorzális nézet, 9: oldalnézet jobbról, 10: ventrális nézet. 11-13. ábra = a H. armiger armiger péniszcsontja (Coll. No. 860, Lopchu, West Bengal, India) 11: dorzális nézet, 12: oldalnézet jobbról, 13: ventrális nézet. 14-16. ábra = a H. armiger armiger péniszcsontja (Coll. No. 861, Lopchu, West Bengal, India) 14: dorzális nézet, 15: oldalnézet jobbról, 16: ventrális nézet.



Figs. 1-3. = baculum of Hipposideros alongensis (Coll. No. 283, Cuc phuong, Vietnam) 1: dorsal view, 2: right lateral view, 3: ventral view. Figs. 4-6. = baculum of H. alongensis (Coll. No. 286, Cuc phuong, Vietnam) 4: dorsal view, 5: right lateral view, 6: ventral view. Figs. 7-9. = baculum of H. alongensis (Coll. No. 298, Cuc phuong, Vietnam) 7: dorsal view, 8: right lateral view, 9: ventral view. Figs. 10-12. = baculum of H. galeritus brachyotus (Coll. No. 705, Ajanta Caves, Maharashtra, India) 10: dorsal view, 11: right lateral view, 12: ventral view. Figs. 13-14. = baculum of Aselliscus tricuspis (Inventory No. 2397/1, Stephansort, New Guinea) 13: dorsal view, 14: right lateral view. Figs. 15-17. = baculum of Coelops frithii inflatus (Coll. No. 151/71, Gia phu, Vietnam) 15: dorsal view, 16: right lateral view, 17: ventral view.

1-3. ábra = a Hipposideros alongensis péniszcsontja (Coll. No. 283, Cuc phuong, Vietnam) 1: dorzális nézet, 2: oldalnézet jobbról, 3: ventrális nézet. 4-6. ábra = a H. alongensis péniszcsontja (Coll. No. 286, Cuc phuong, Vietnam), 4: dorzális nézet, 5: oldalnézet jobbról, 6: ventrális nézet. 7-9. ábra = a H. alongensis péniszcsontja (Coll. No. 298, Cuc phuong, Vietnam) 7: dorzális nézet, 8: oldalnézet jobbról, 9: ventrális nézet. 10-12. ábra = a H. galeritus brachyotus péniszcsontja (Coll. No. 705, Ajanta barlangok, Maharashtra, India) 10: dorzális nézet, 11: oldalnézet jobbról, 12: ventrális nézet. 13-14. ábra = az Aselliscus tricuspis péniszcsontja (Inv. No. 2397/1, Stephansort, Uj-Guinea) 13: dorzális nézet, 14: oldalnézet jobbról. 15-17. ábra = a Coelops frithii inflatus péniszcsontja (Coll. No. 151/71, Gia phu, Vietnam) 15: dorzális nézet, 16: oldalnézet jobbról, 17: ventrális nézet.

