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COMPARATIVE ANATOMY OF THE MANDIBLE IN NINE BAT SPECIES (MAMMALIA: CHIROPTERA) FROM BRAZIL (SOUTH AMERICA)

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Abstract. The drawings and the corresponding explanations of the mandible in nine bat species (Order Chiroptera: families Emballonuridae, Mormoopidae, Furipteridae, Phyllostomidae with the subfamilies Phyllostominae, Lonchophyllinae, Glossophaginae, Carolliinae, Desmodontinae) are presented. The material was collected during the expedition made in Brazil (1994) by the scientists of "Grigore Antipa" National Museum of Natural History together with the "Santa Ursula" University (Rio de Janeiro).

Résumé. On présente les dessins et les explications correspondantes sur la mandibule des chauve-souris (ordre Chiroptera: les familles Emballonuridae, Mormoopidae, Furipteridae, Phyllostomidae avec les sousfamilles Phyllostominae, Lonchophyllinae, Glossophaginae, Carolliinae, Desmodontinae). Le matériel a été capturé pendant l'expédition faite au Brésil (1994) par les spécialistes du Muséum National d'Histoire Naturelle "Grigore Antipa" et de l'Université "Santa Ursula" (Rio de Janeiro).

Key words: mandible, morphology, description, Mammalia, Chiroptera, Brazil.

Studies on the mandible morphology were made since the Antiquity, but the studies of comparative anatomy started to be made only in the first part of the 19th century.

Some scientists as Miller (1912), Grassé (1955 a, b), Topál (1969) (for chiropterans), Eisenberg (1989) presented the drawings of the skull or even of the mandible in different mammal genera and species but without discussing the morphological differences between them.

George & Gaughran (1954) made a comparative study of osteology and miology of the skull and of the cervical region in *Blarina brevicauda* (Say, 1823) and *Scalopus aquaticus* (Linnaeus, 1758) where they pointed out also the morphological features of the mandible for each species.

Several studies of comparative anatomy refer to: the spine - Dornescu & Nițescu (1965), Nițescu (1966); pelvic girdle - Heráň (1968); turbinated bones – Andreescu-Nițescu (1970); small mammal skeleton – Nițescu-Andreescu (1971); shoulder blade - Žalman (1971); postcranial skeleton - Červený & Žalman (1974), Červený (1978); coxal bone in 6 South-American bat species - Răduleț & Murariu (2000); coxal bone in 11 Romanian bat species - Răduleț (2003); mandible in 30 Romanian mammal species - Răduleț (2005). Measurements of the coxal bones were also made by Heráň (1967).

If, for the time being, the systematists based on the phenotypical, genetical and serological features of the mammals in identifying the species, the illustration of the comparative anatomy of the mandible will make easier the recognition of the species from the skeleton remains from the pellets, collections or found in the terrestrial substratum, hollow trees, caves, bridges etc. Thus, the illustration of the

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comparative anatomy will complete the knowledge of the phenotypical features of the species and will improve the identification keys in mammals. The paper is necessary to the mammalogists, ornithologists and paleontologists.

The mandible morphology in 9 bat species (Order Chiroptera) from Brazil (South America) is presented further on.

MATERIAL AND METHOD

For study I used skulls from the mammal collections of "Grigore Antipa" National Museum of Natural History (Bucharest). Their number being very small, I studied around 20-25 skulls. They were collected during the field trips in different regions of Brazil (Serra do Navio, Vila Nova, Ilhéus, Olivénça, Andarai, the caves Pratinha and Lapa Doçe, farms Arvoredo and Ponte Alta) made in the 1994 expedition by the scientists of "Grigore Antipa" Museum and "Santa Ursula" University. The mandibles were studied with the stereomicroscope and drew using *camera lucida*.

Grassé (1955 b, 1967) named different structures of the mandible *processus coronoideus*, *processus condyloideus,* sigmoid incisura, angular apophysis, etc.

George & Gaughran (1954) used the term *angular process* for the formation on the posterior side of the mandible ramus and under *processus condyloideus* (P CON).

For the same formation Pucek (1981) used the term *angular processus* and mentioned it in the identification key of the genus *Plecotus*.

Murariu (1999) named it *processus angularis,* but also *angular apophisis* (2004).

Taking into consideration the scientists inconsistency in naming this formation I used the term "*non nominatus processus*" (NNP), according to the nomenclature from "Nomina anatomica veterinaria" (Tudor & Constantinescu, 2002) as well as that from "Latin Nomina Anatomica" (modern Latin anatomical term – Index and glossary of medical terms, Internet).

Abbreviations:

caput mandibulae	CAP M
corpus mandibulae	CORM
incisura mandibulae	IM
linea obliqua mandibulae	LOM
non nominatus processus	NNP
processus condylaris (*condyloideus*)	P CON
processus coronoideus	P COR
ramus mandibulae	RM

RESULTS AND DISCUSSIONS

Description of the mandible morphology in the 9 chiropteran species.

Order Chiroptera

Family Emballonuridae Gervais, 1856

Saccopteryx bilineata (Temminck, 1838) (Fig. 1) has: RM with a very deep central concavity from CORM to P CON; P COR is a vertical isosceles triangle-like blade, with the anterior side widened, thickened and the tip rounded and thickened;

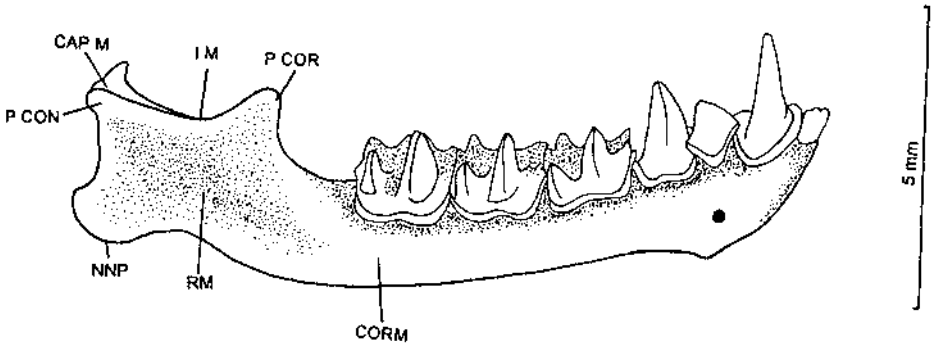

Fig. 1 – External lateral view of the mandible in *Saccopteryx bilineata* (Temminck, 1838).

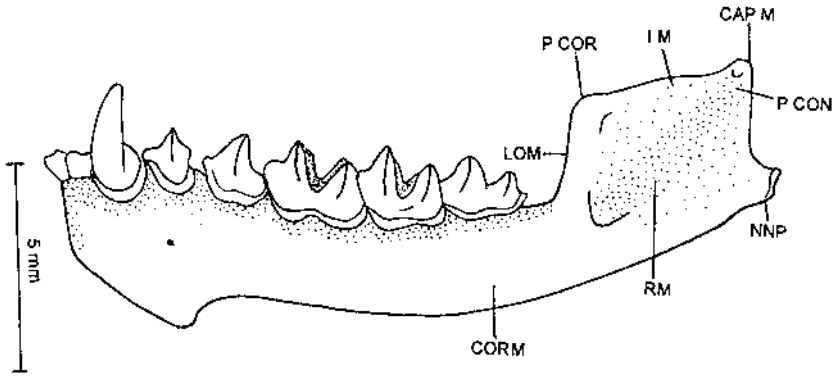

Fig. 2 – External lateral view of the mandible in *Pteronotus parnellii* (Gray, 1843).

IM widely semicircular; P CON is triangular with the tip bent to outside; CAP M like a wand with rounded ends, and the surface rounded slightly concave in dorsal view; NNP is a trapezial blade perpendicular on RM where the anterior margin is bent innerly, and terminally rounded.

Family Mormoopidae Koch, 1862-63

Pteronotus parnellii (Gray, 1843) (Fig. 2) has: RM with a deeper depression on the axis P CON – CORM; P COR is a triangular blade, slightly bent to outside, with thickened margines and the tip almost in right angle, but rounded; LOM almost vertical; IM slightly convex; P CON is triangular, innerly bent, with a rounded tip bent outside; CAP M ellipsoidal asymmetrical wand, innerly bent; NNP like a short arm, with the tip flattened upwardly.

Family Phyllostomidae Gray, 1825

Subfamily Phyllostominae Gray, 1825

In *Macrophyllum macrophyllum* (Schinz, 1821) (Fig. 3) has: RM has a wide concavity, deeper towards CORM directed to P CON; IM straight, oblique towards P CON; P COR has the anterior margin thickened, a prominent rounded tip; P CON

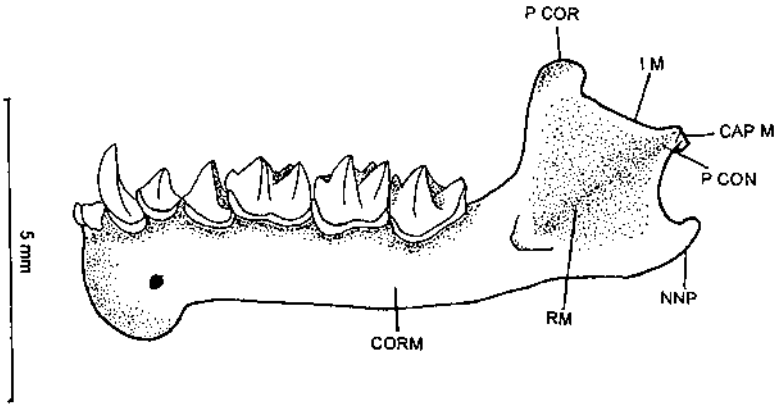

Fig. 3 – External lateral view of the mandible in *Macrophyllum macrophyllum* (Schinz, 1821).

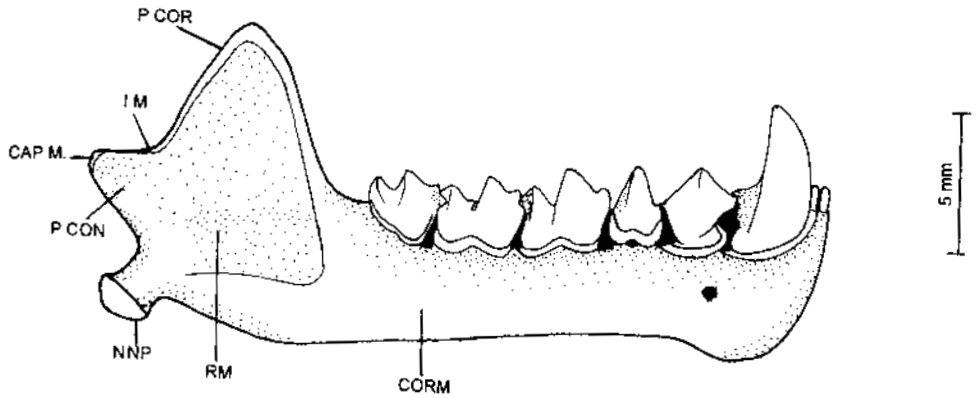

Fig. 4 – External lateral view of the mandible in *Phyllostomus hastatus* (Pallas, 1767).

like an equilateral triangle with the tip bent to outside; CAP M elliptical, innerly bent; NNP an obliquely-laterally directed blade on RM, with a thickened rounded tip, flattened upwardly.

Phyllostomus hastatus (Pallas, 1767) (Fig. 4) has the RM with a deep concavity towards CORM; P COR is a triangular blade with the anterior margin thickened, an acute angled but rounded tip; IM semicircular; P CON is like an isosceles triangle; CAP M like a wand slightly innerly bent, with a pointed exterior end; NNP like an obliquely-latyerally directed arm on RM, with thickened margins, and the tip flattened upwardly.

Subfamily Glossophaginae Gray, 1821

In *Glossophaga soricina* (Pallas, 1766) (Fig. 5), on the outer side: RM has a superficial central depression; LOM is oblique; P COR is like a triangular blade with a rounded tip posteriorly arched; IM semicircular; P CON like an isosceles triangle; CAP M is oval, asymmetrical, innerly bent; NNP is a short arm with a rounded tip slightly bent upwardly.

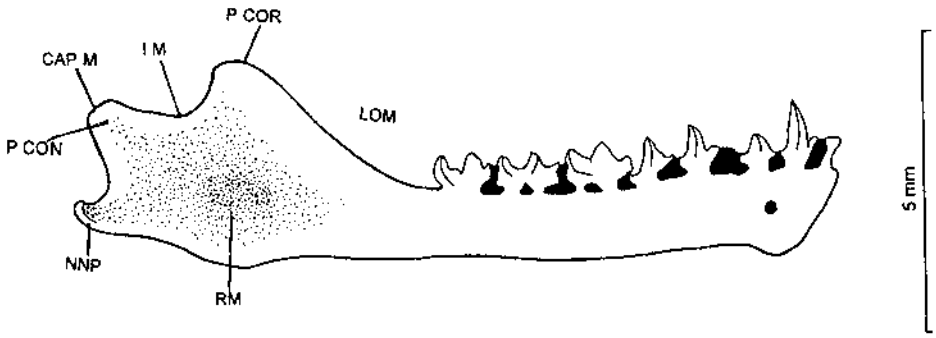

Fig. 5 – External lateral view of the mandible in *Glossophaga soricina* (Pallas, 1766).

Subfamily Lonchophyllinae Griffiths, 1982

Lonchophylla mordax Thomas, 1903 (Fig. 6) has the RM with an oval depression in the lower half of RM, under P COR; IM semicircular; P COR centrally has an oblique fold towards P CON and the tip slightly widened, prominent, rounded; P CON has a triangular concavity; CAP M elliptical, asymetrical towards inside; NNP like a straight spine, horizontally directed on RM and with a rounded tip.

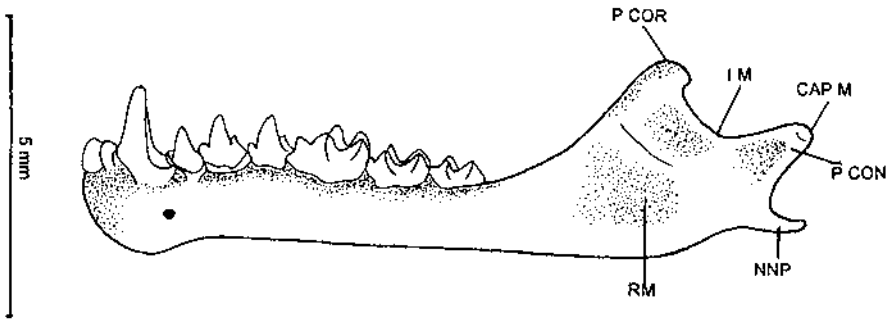

Fig. 6 – External lateral view of the mandible in *Lonchophylla mordax* Thomas, 1903.

Subfamily Carolliinae Miller, 1924

Carollia perspicillata (Linnaeus, 1758) (Fig. 7) has on the external side: RM with a centrally deeper depression which also penetrates P CON, P COR; IM oblique, semicircular; P COR is a triangular blade with a rounded tip which is thickened together with the anterior half; P CON has a triangular concavity centrally, with a tip bent outside; CAP M ellipsoidal, asymmetrical towards inside; NNP is an arm with the tip and the lower margin thickened.

Subfamily Desmodontinae Bonaparte, 1845

In *Desmodus rotundus* (E. Geoffroy, 1810) (Fig. 8) has: RM has a central concavity from CORM to P CON; LOM almost vertical; IM straight; P COR is like a right-angled triangle with the anterior margin thickened and a rounded tip; P CON

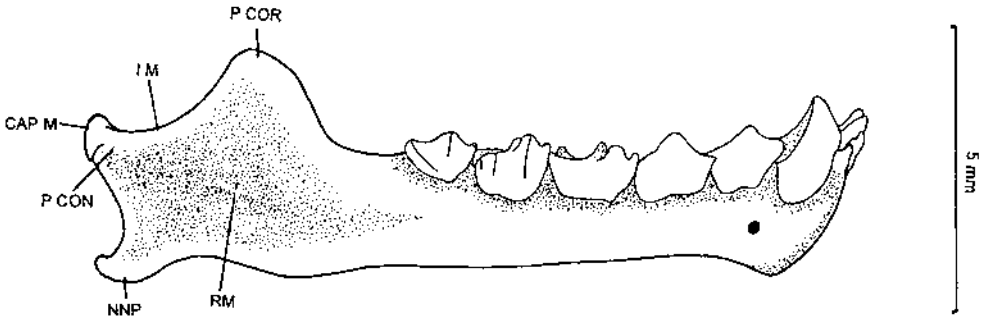

Fig. 7 – External lateral view of the mandible in *Carollia perspicillata* (Linnaeus, 1758).

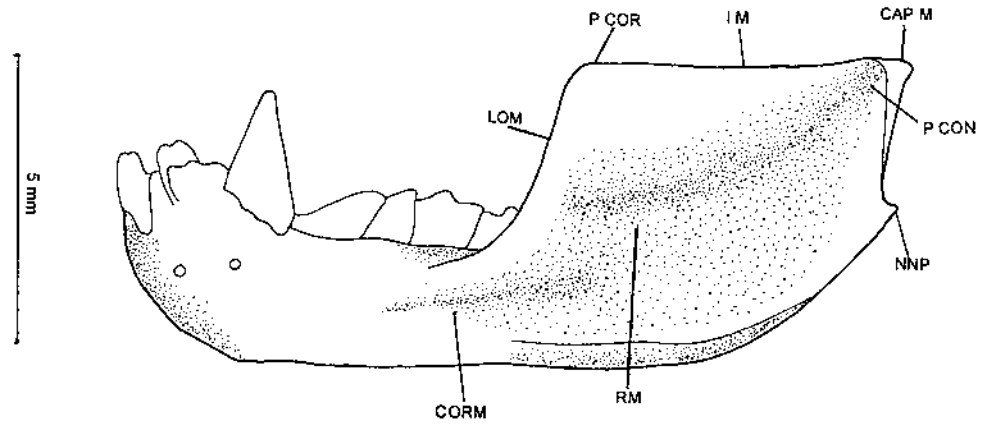

Fig. 8 – External lateral view of the mandible in *Desmodus rotundus* (E. Geoffroy, 1810).

is a triangle with the posterior side thickened; CAP M is oval, asymetriacal towards inside; NNP like a very short arm with the tip flattened upwardly.

Family Furipteridae Gray, 1866

On the outer side of the mandible *Furipterus horrens* (F. Cuvier, 1828) (Fig. 9) has: RM with a deeper concavity from CORM towards/in P COR, P CON; P COR like a triangular blade obliquely directed towards outside, with the anterior margin and the tip thickened; IM widely semicircular; P CON triangular with thickened sides; CAP M ellipsoidal, asymmetrical towards inside; NNP like a short blade outerly directed, with rounded margins.

Conclusions

On the outer side of the mandible it can be observed that RM, P COR, P CON, CAP M, IM, NNP are different in each species by size, shape, position, thickness, direction. Thus the mandible is characteristic to each species and can enrich and complete the identification keys of chiropterans.

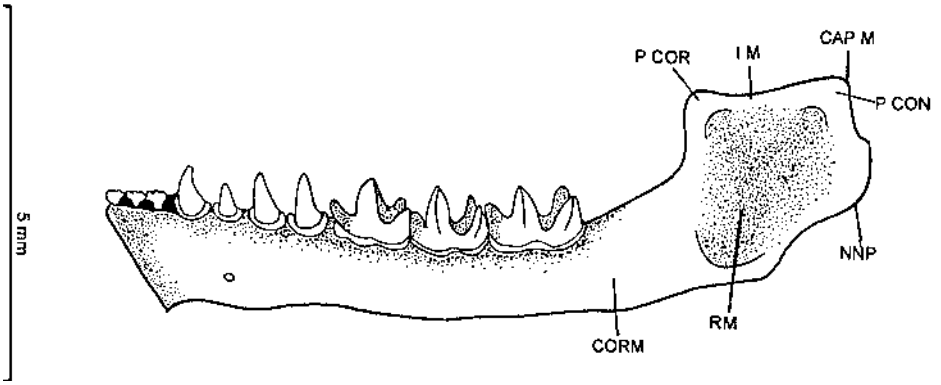

Fig. 9 – External lateral view of the mandible in *Furipterus horrens* (F. Cuvier, 1828).

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ANATOMIA COMPARATĂ A MANDIBULEI LA NOUĂ SPECII DE LILIECI (MAMMALIA: CHIROPTERA) DIN BRAZILIA (AMERICA DE SUD)

REZUMAT

În lucrare este descrisă morfologia mandibulei de la 9 specii de lilieci (Chiroptera), din fauna Braziliei (America de Sud). Materialul este rezultatul colectărilor de teren efectuate în Brazilia (1994) de cercetătorii de la Muzeul Național de Istorie Naturală "Grigore Antipa" (București) în colaborare cu cei de la Universitatea "Santa Ursula" (Rio de Janeiro). Sunt prezentate desene ale mandibulei cu părțile componente și explicațiile corespunzătoare. Lucrarea își propune să evidențieze principalele structuri (RM, P COR, P CON, IM, CAP M, NNP) care diferă de la o specie la alta prin mărime, formă, poziție, grosime, orientare una față de cealaltă. Cunoașterea morfologiei mandibulei va completa cheile de determinare a speciilor de lilieci și va fi de un real ajutor pentru mamalogi, ornitologi și paleontologi.

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*** – Latin Nomina Anatomica (modern Latin anatomical term) –Index and glossary of medical terms. Available online at http://vesalius.northwestern.edu/indexterms.html

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