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COMPARATIVE ANATOMY OF THE MANDIBLE IN THE MAMMAL SYSTEMATICS (MAMMALIA: INSECTIVORA, CHIROPTERA, RODENTIA) FROM ROMANIA (II)

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Abstract. The autor describes the mandible anatomy in 10 mammal species of the orders Insectivora, Chiroptera and Rodentia. For each species, the drawings of the mandible, with its elements and corresponding explanations are presented. The nomenclatura is according to Tudor & Constantinescu (2002) and “Latin nomina anatomica” (Internet). The paper is useful to the mammalogists, ornithologists and paleontologists.

Résumé. On décrit l’anatomie de mandibule de 10 espèces de mammifères des ordres Insectivora, Chiroptera et Rodentia. Pour chaque espèce, on présente les dessins de la mandibule, avec ses éléments et les explications correspondantes. La nomenclature est conformément à “Nomina anatomica veterinaria” et “Latin nomina anatomica” (Internet). Le travail est utile aux mammalogistes, aux ornithologistes et aux paléontologistes.

Key words: mandible, morphology, description, Mammalia, Insectivora, Chiroptera, Rodentia.

Since Antiquity animals were described after their morphological features, and in the same time were studied from anatomical point of view. But many studies stopped especially those on the human body. Therefore, in the beginning, the anatomy was descriptive and only at the beginning of the 19th century proper studies of comparative anatomy were made.

Miller (1912), Grassé (1955 a, b), Topál (1969) (for chiropterans), Eisenberg (1989) present the drawings of the skull or even of the mandible of different genera and species in their papers on mammal zoology, anatomy, systematics and biology, but without making comments on their morphological differences.

Murariu (2005) presented a drawing (after Heptner & coll., 2001) where a comparison between the mandible of *Vulpes vulpes* (Linnaeus, 1758) with that of *Nyctereutes procyonoides* (Gray, 1834) is made, but without showing their morphological differences.

George and Gaughran (1954) made a comparative osteological and miological study of the skull and cervical region in *Blarina brevicauda* (Say, 1823) and *Scalopus aquaticus* (Linnaeus, 1758) where they also mention the morphological features of the mandible in each species.

Other studies of mammal comparative anatomy refer to: the spine - Dornescu & Nițescu (1965), Nițescu (1966); pelvic girdle - Heráň (1968); turbinated bones - Andreescu – Nițescu (1970); scheleton of the small mammals – Nițescu - Andreescu (1971); șoulder 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). Also, measurements of the coxal bones were made by Heráň (1967).

English translation by Mihaela Barcan Achim.

The knowledge of the mandible structure enables the easier recognition of the species among the skeleton remains from pellets, collections or found in the terrestrial substratum, tree hollows, caves, bridges, etc. For the time being, the systematists based especially on the phenotypical and genetical serological features of the mammals in identifying the species. The mandible morphology will contribute to the knowledge completion on the phenotypical features of the species as well as to the enrichment of the mammal identification keys. The paper is necessary to the mammalogists, ornithologists and paleontologists.

In this paper, the mandible morphology in 10 Romanian mammal species (Insectivora, Chiroptera, Rodentia) is presented continuing the previous one (Răduleț, 2005) where the mandibles of 30 micromammal species were described.

MATERIAL AND METHOD

Studied skulls are from the collections of “Grigore Antipa” National Museum of Natural History from Bucharest, and because their number is very small, I used only 1-2 skulls for each species. They were collected during different field trips, in different regions of Romania. The skulls were studied using the stereomicroscope and drew using *camera lucida*.

Grassé (1955 b) presents the mandible in *Blarina brevicauda*, *Neotetracus*, *Macroscelides*, *Rhynchocyon*, *Tupaia* where he used the following terms: angular apophysis, but also “apophise lémurienne”; sigmoid incisura; coronoid apophysis, etc.

Grassé (1967) mentions *processus coronoideus*, *processus condyloideus* and even specifies “La région de l’*angulus* peut s’étirer en une (*apophyse angulaire*) tranchante (Marsupiaux, Insectivores, Rongeurs, beaucoup de Carnivores)”.

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

Pucek (1981) names it *angular processus*. Also, he points out this formation in his identification key, but only for the genus *Plecotus*.

Murariu (1999) names it *processus angularis*, but also *angular apophysis* (Murariu 2004).

Taking into consideration the nomenclature from “Nomina anatomica veterinaria” (Tudor & Constantinescu, 2002) as well as that from “Latin nomina anatomica” (Modern Latin anatomical term – Internet), which do not refer to this formation, and the scientists’ irresolution in naming it, I kept the term “*non nominatus processus*” (NNP).

Abbreviations:

<i>caput mandibulae</i>	CAP M
<i>collum mandibulae</i>	COLM
<i>corpus mandibulae</i>	CORM
<i>incisura mandibulae</i>	IM
<i>linea obliqua mandibulae</i>	LOM
<i>non nominatus processus</i>	NNP
<i>processus condylaris (condyloideus)</i>	P CON
<i>processus coronoideus</i>	P COR
<i>ramus mandibulae</i>	RM

RESULTS AND DISCUSSIONS

Description of the mandible morphology in 10 mammal species:

Order Insectivora

Family Erinaceidae Bonaparte, 1838

In *Erinaceus europaeus* Linnaeus, 1758 (Fig. 1) the mandible has: LOM vertical; RM has a deeper concavity centrally, from CORM towards/in P CON; IM semicircular; P COR is a trapezoidal blade with thickened anterior and superior sides; P CON is trapezoidal, the sides thicken and centrally it has a triangular depression; CAP M is ellipse-shaped, interiorly bent, with the inner side pointed; NNP is a thick blade with a flattened tip upwards, triangular in a dorsal view.

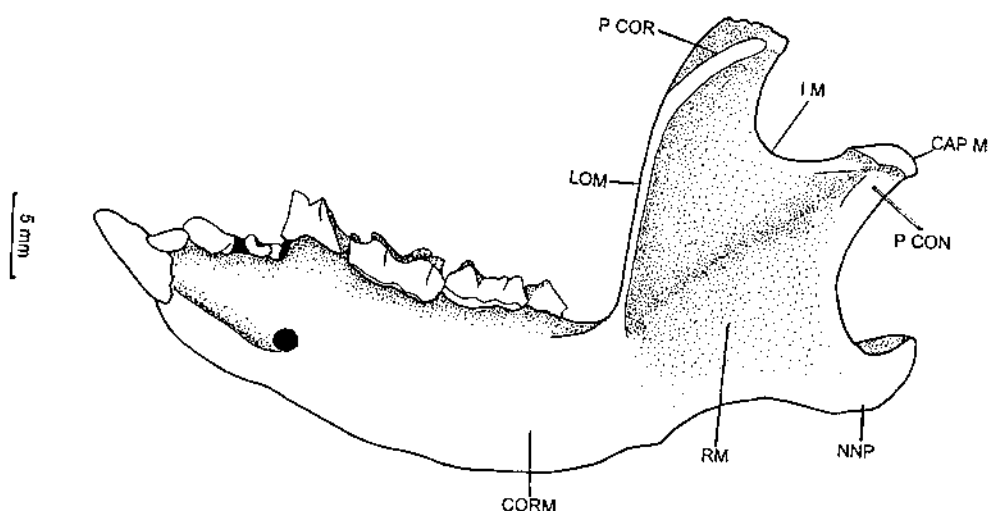


Fig. 1 – External lateral view of the mandible in *Erinaceus europaeus* Linnaeus, 1758.

Order Chiroptera

Family Vespertilionidae Gray, 1821

In *Myotis capaccinii* (Bonaparte, 1837) (Fig. 2) it can be observed that: RM with a central concavity emphasised from CORM to P CON; P COR is a thin triangular blade with its tip as an acute angle; P CON triangular with a rounded tip exteriorly directed; CAP M is elliptic, transversal, with a rounded surface; NNP like a spine with an upwardly bent tip.

Order Rodentia

Family Sciuridae Hemprich, 1820

In *Sciurus vulgaris* Linnaeus, 1758 (Fig. 3) RM is like a central depression, elongated from CORM towards/in P CON, bordered by two small prominences at the base of P COR and NNP; P COR is like a thin short spine, posteriorly curved; IM semicircular; P CON trapezium-shaped, with the lower margin thickened; CAP M is

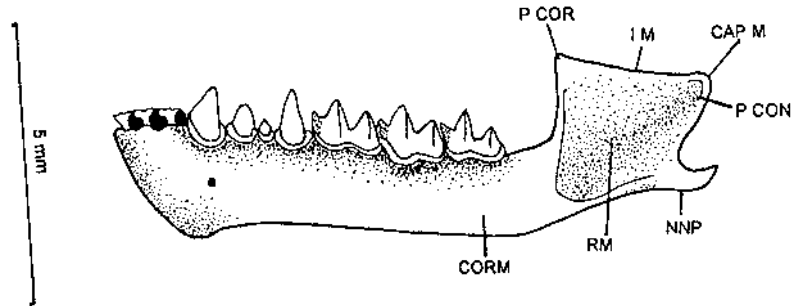


Fig. 2 – External lateral view of the mandible in *Myotis capaccinii* (Bonaparte, 1837).

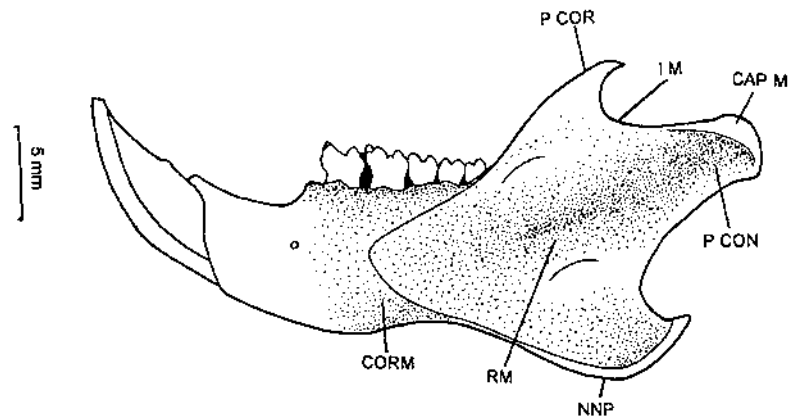


Fig. 3 – External lateral view of the mandible in *Sciurus vulgaris* Linnaeus, 1758.

oval; NNP is a wide blade, in an oblique position towards exterior on RM where the lower margin is thickened, interiorly bent, with a short pointed tip, upwardly oblique.

Family Muridae Gray, 1821

Subfamily Arvicolinae Gray, 1821

Arvicola terrestris (Linnaeus, 1758) (Fig. 4). In external lateral view the mandible has: RM plan; P COR like a spine with an elongated flattened tip towards P CON; IM oval; P CON with a basal prominence like a blade obviously curved from the base obliquely towards inside; CAP M is a comma-like calotte; NNP triangular blade, obliquely directed towards exterior with the lower margin bent interiorly, and the tip upwardly oblique, rhombic in a dorsal view.

In *Ondatra zibethicus* (Linnaeus, 1766) (Fig. 5) there is: RM plan; IM oval; P COR a spine with the anterior margin thickened, the tip pointed elongated, obliquely directed to the posterior side; P CON a blade with an elongated prominence centrally and slightly curved towards interior; CAP M like a fusiform calotte; NNP like a triangular blade with the lower margin bent towards interior and with a rugged rounded tip, upwardly oblique.

Subfamily Cricetinae G. Fischer, 1817

In *Cricetus cricetus* (Linnaeus, 1758) (Fig. 6), on the outer side, the mandible has: RM with a central prominence, limited by a depression towards IM; P COR is like a thin spine with an elongated tip posteriorly directed; IM oval; P CON like a bent blade innerly; CAP M like a comma; NNP, triangular blade, oblique towards outside on RM, with a flattened tip upwardly directed, and the lower margin bent innerly.

Mesocricetus newtoni (Nehring, 1898) (Fig. 7) has: RM centrally with a prolonged prominence in P CON; P COR like thin spine, with a rounded tip, upwardly oblique; IM oval; P CON is a blade with the central prominence bordered

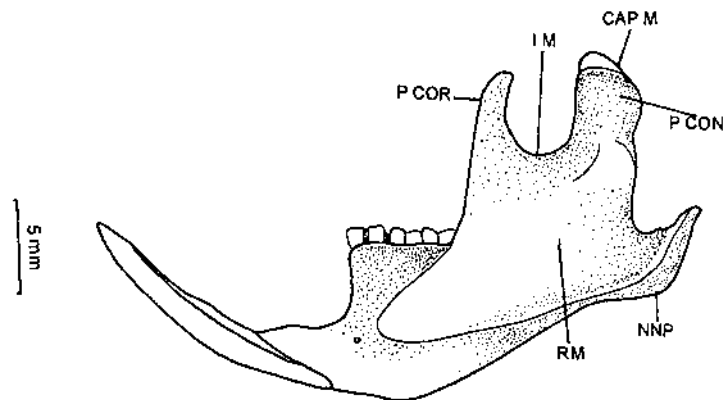


Fig. 4 – External lateral view of the mandible in *Arvicola terrestris* (Linnaeus, 1758).

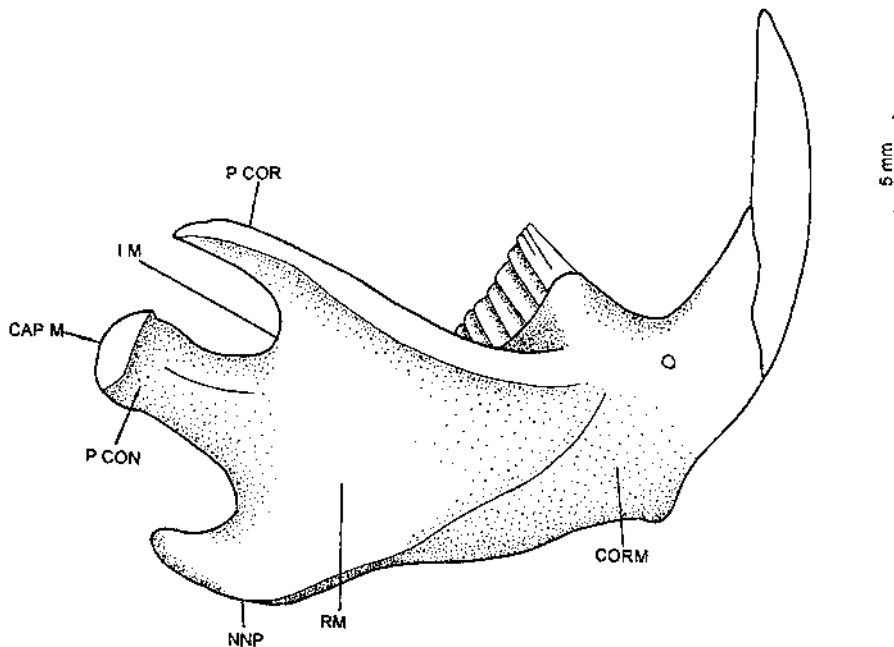


Fig. 5 – External lateral view of the mandible in *Ondatra zibethicus* (Linnaeus, 1776).

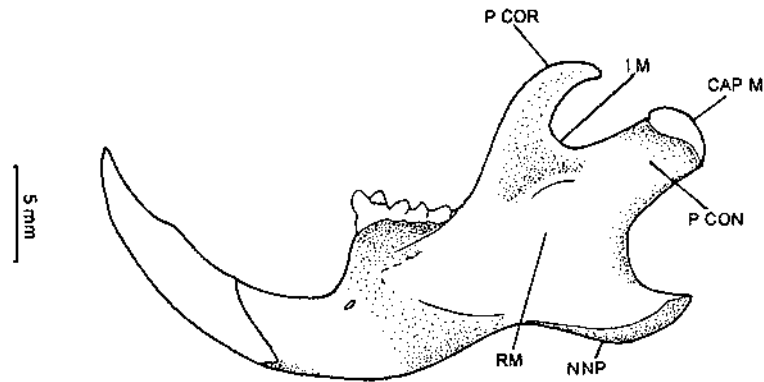


Fig. 6 – External lateral view of the mandible in *Cricetus cricetus* (Linnaeus, 1758).

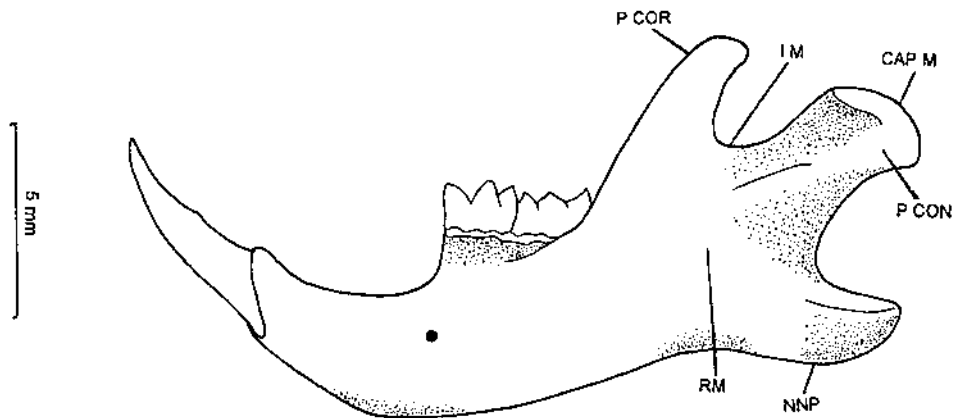


Fig. 7 – External lateral view of the mandible in *Mesocricetus newtoni* (Nehring, 1898).

by a concavity towards IM; CAP M is an elliptical calotte; NNP, a blade obliquely directed towards outside, with the lower margin innerly bent, the tip being rounded, flattened towards posterior side.

Subfamii Murinae Illiger, 1815

Rattus rattus (Linnaeus, 1758) (Fig. 8) has: RM with an elongated prominence limited by a depression in the upper side; P COR is like a thin spine with the tip curved posteriorly; IM oval; P CON, a trapezoidal blade slightly curved innerly; CAP M is ellipsoidal in dorsal view; NNP is a blade with thickened margins, innerly bent and with a rounded tip, flattened towards upper side.

Rattus norvegicus (Berkenhout, 1769) (Fig. 9). In outer lateral view the mandible has: RM slightly convex centrally, from where a depression starts, elongated towards CORM and another one in P CON; P COR is like a triangular blade with a rounded elongated tip, bent towards P CON; IM oval; P CON is trapezoidal with the lateral margins thickened, and centrally with a triangular

depression, deeper at the limit with RM; in lateral view, CAP M is like a ram head; NNP is a wide blade obliquely-laterally directed on RM, with the margins thickened, and the lower one strongly bent innerly and the tip directed outside, triangular with the base upwards.

Subfamily Spalacinae Gray, 1821

In *Nanospalax leucodon* (Nordmann, 1840) (Fig. 10) the mandible is thick, solid where the RM has a concavity under P COR; IM semicircular; P COR is like a triangular blade, with a rounded tip posteriorly bent; outside P CON has a higher condyloid apophysis terminally rounded, oblique on RM, and P CON is, in fact, shorter, innerly oblique; CAP M is an oval calotte; NNP like an elongated rugged narrow blade, mostly fused to RM, with the lower margin innerly bent, and the tip, short, rounded, oblique upwardly.

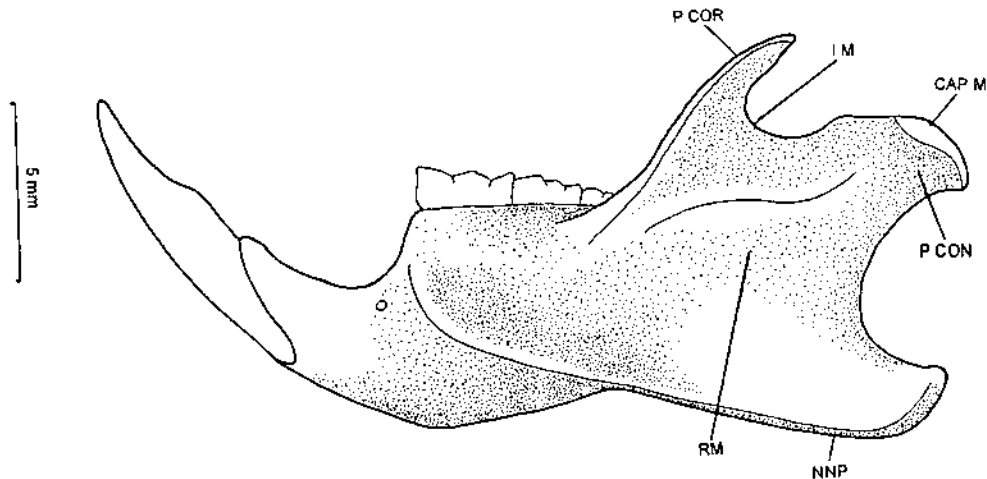


Fig. 8 – External lateral view of the mandible in *Rattus rattus* (Linnaeus, 1758).

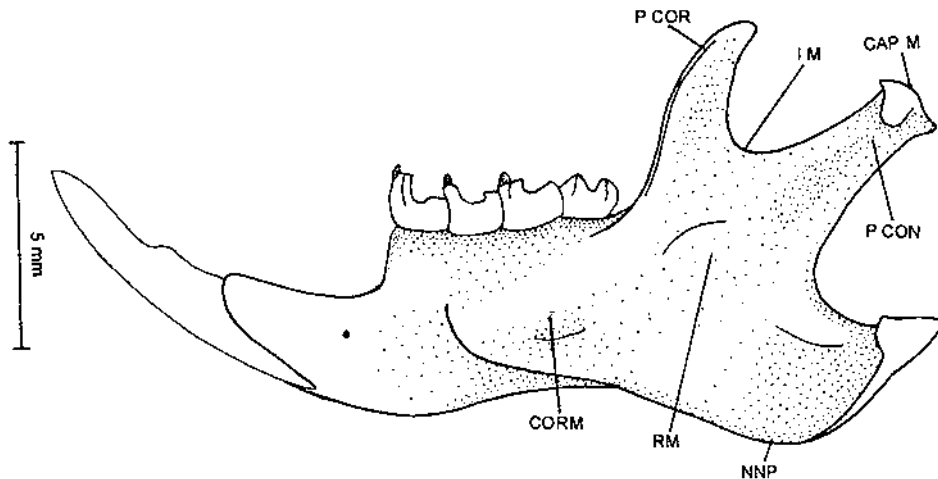


Fig. 9 – External lateral view of the mandible in *Rattus norvegicus* (Berkenhout, 1769).

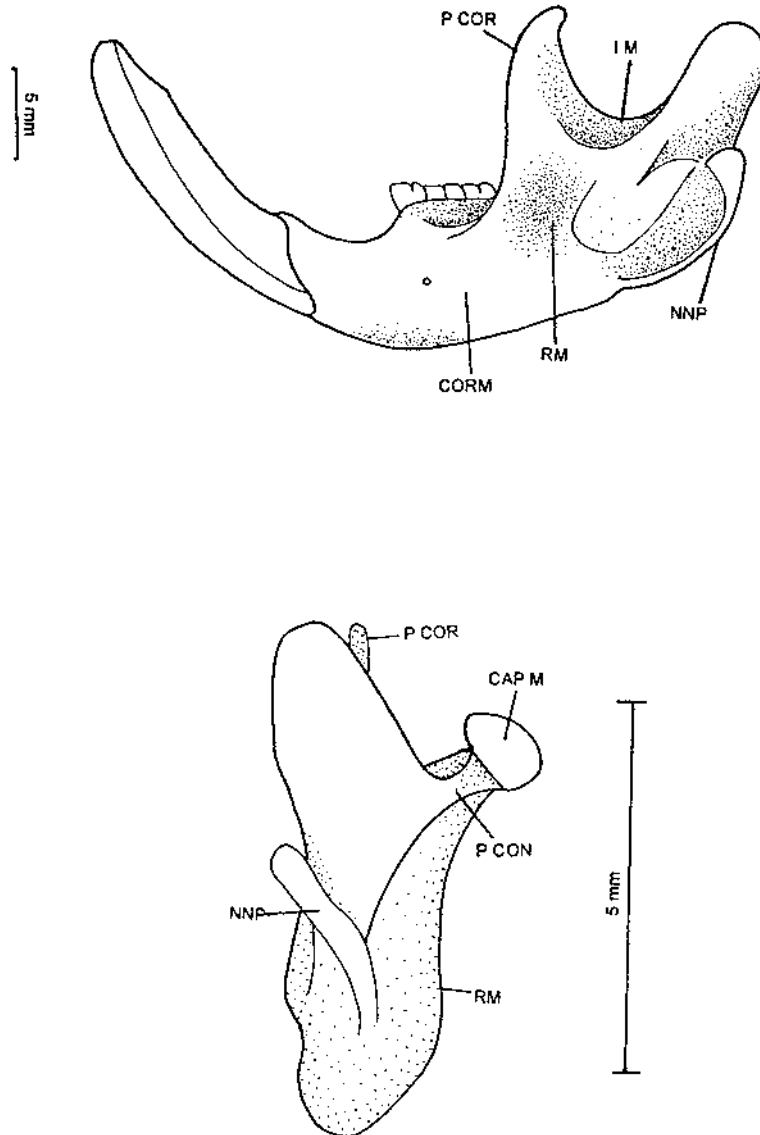


Fig. 10 – A – External lateral view of the mandible in *Nanospalax leucodon* (Nordmann, 1840);
 B – Posterior view of the mandible in *Nanospalax leucodon* (Nordmann, 1840).

Conclusions

The main structures of the mandible (RM, P COR, P CON, CAP M, IM, NNP) are different in each species by their size, shape, position, thickness, direction. It results that, wholly, the mandible is characteristic to each species. Therefore, both the coxal bone and the mandible can improve and complete the identification keys in mammals. The paper is necessary to the mammalogists, ornithologists and paleontologists.

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ANATOMIA COMPARATĂ A MANDIBULEI ÎN SISTEMATICA MAMIFERELOR
(MAMMALIA: INSECTIVORA, CHIROPTERA, RODENTIA) DIN ROMÂNIA (II)

REZUMAT

Autorul prezintă morfologia mandibulei de la 10 specii de mamifere (Insectivora, Chiroptera, Rodentia), din fauna României. Studiul a fost realizat pe baza materialului din colecțiile științifice ale Muzeului Național de Istorie Naturală "Grigore Antipa". Pentru fiecare specie se prezintă desene ale mandibulei, cu părțile componente și explicațiile corespunzătoare. Structurile mandibulei (P COR, P CON, RM, CAP M, IM, NNP) diferă de la o specie la alta prin mărime, formă, poziție, grosime, orientare una față de cealaltă. În viitor cunoașterea morfologiei mandibulei va completa cheile de determinare ale speciilor de mamifere și va fi de un real ajutor pentru mamalogi, ornitologii care studiază hrana unor păsări răpitoare ca și paleontologilor.

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