BULLETIN OF THE IRAQ NATURAL HISTORY MUSEUM
Iraq Natural History Research Center & Museum, University of Baghdad
https://jnhm.uobaghdad.edu.iq/index.php/BINHM/Home
 Online ISSN: 2311-9799-Print ISSN: 1017-8678

Bull. Iraq nat. Hist. Mus.
(2023) 17 (3): 507-517. https://doi.org/10.26842/binhm.7.2023.17.3.0507

ORIGINAL ARTICLE

A COMPARATIVE-MORPHOLOGICAL STUDY OF SKULLS IN TWO SPECIES OF CARNIVOROUS AND HERBIVOROUS MAMMALS

Hind Dyia Hadi and Noor Hussein Yousif *
Iraq Natural History Research Center and Museum, University of Baghdad, Baghdad, Iraq.
*Corresponding author: husseiny620@gmail.com

Recived Date: 18 January 2023, Accepted Date 08 May 2023, Published Date:20 June 2023

ABSTRACT

The skull is one of the largest bones in the body. It is classified into flat bones that maintain the important organic structures; which are the brain, eyes, and tongue. The skull is a strong support for preserving these organs but they are various according to the type of animals and the environments in which they live and the nature of their nutrition. There are many differences among living organisms in terms of the bones in the skull, their difference or disappearance and their length in the shape of the head. The samples were taken from the scientific storage in the Iraq Natural History Research Center and Museum; Cape hare *Lepus capensis* (Linnaeus, 1758) and Red fox *Vulpes vulpes* (Linnaeus, 1758) and the study was conducted on them in a comparative morpho-anatomical way; it is noted that it differs from one animal to another. The dentition formula was added because the dental tissue is embedded in the jaw bone. Differences were noted in the current study in comparison to other previous studies. However the study of bones needs development in methods and requires an extensive investigations in Iraq as a result of the dissimilarities in species and the nature of living; in addition to the species itself, differences are registered.

Keywords: Cape Hare, Dentition, Facial Bones, Iraq, Morphological, Red Fox, Skull.

INTRODUCTION

The red fox *Vulpes vulpes* (Linnaeus, 1758) is a multi-species carnivore that is widespread in the regions of the Arabian Peninsula. It is also present in Syria, Lebanon, Palestine, and the Sinai region in Egypt; in addition to its presence in Iraq a large region (Harrison, 1968; Mohammad *et al.*, 2003; Lahony *et al.*, 2013); while the cape hare *Lepus capensis* (Linnaeus, 1758) is considered one of the most common mammal species herbivorous distributed in Iraq; additionally it is found on cultivated land or is surrounded by short-hedged (Al-Rammhi *et al.*, 2013). The skull is the main bone by which organisms are classified in phylogenetic studies (Hirasawa and Kuratani, 2015).

The occipital bone in skulls is oftentimes used in judicial and forensic medicine to determine the sex if it is found somewhere over time (Rogers, 2005). The skull is divided into Ossa crania and the face (or Ossa facie). The number of bones is 32, of which 11 are the

cranial bones, 20 are the frontal bones, and one is divided into the skull bones were occipital and sphenoid ethmoidal, interparietal, parietal, frontal, and temporal (Koyabu *et al*., 2014). Mammalia included the cranium, as in the predecessors: premaxillary and maxillary, dentary, palatal, frontal and squamosal, pterygoid, palatine, parietal, nasal and ectotympanic, vomer, exoccipital and basilar, lacrimal, supra-occipital, sphenoid-based, orbitosphenoid, and petrosal depending of development (Koyabu *et al*., 2014).

The bones of the jaws are formed by the union of the incisor and the palate, pterygoid, nasal, lacrimal, zygomatic, cornea, vomer, mandible, and hyoid as reported by Kumawat *et al*. (2014) in dog, Choudhary and Singh (2015) in Ruminants, Dyce (1996) in the horse. Carnivores differ in the destination formula from omnivorous and herbivorous. By examining the teeth in terms of number and type; the buried skulls are identified if they are re-examined and identified as the species. We can find out whether an animal is carnivore or omnivorous and herbivorous by examining the teeth of many mammals. This is known as the examination of the teeth attached to the skull; in addition the eye socket distinguishes the organism in whether it is a predator such as an otters or wolf; where the orbit is prominent to have wider to give three-dimensional vision to determine the location of the predator more accurately. While, the herbivorous have peripheral eyes on both sides of the head to give peripheral vision a warning of attacks (Taylor, 1992; Prebble and Meredith, 2014).

In the canine family, the skull is elongated with a conical muzzle that extends to the front of the head and sagittally, connected to the lower jaw with muscles, and this is the same as in predators; its eyes are located at the front of its head, giving it a microscopic view that is delicate and stubborn to predation. As for its teeth, they are adapted to eating habits. They contain pointed and sharp incisors teeth for hunting with canines and premolars and blade-shaped premolars for crushing bones (Elbroch, 2006; Ge *et al*., 2012; Parsons *et al*., 2020).

The aim of the current study is to understand the difference between predatory and non-predatory animals and to record the differences between them.

MATERIALS AND METHODS

Skull samples were possessed from the pieces stored in the Iraqi Natural History Research Center and Museum species (One of the stored samples of each species was selected for the skull of the adult animal accession to the museum number of the sample and the data of the collection) Cape hare *Lepus capensis* (Linnaeus, 1758) 75.23.Z8 in 25-4-1973 and Red fox *Vulpes vulpes* (Linnaeus, 1758) 75.62.Z8 in 10-5-1977 (Mohammad *et al*., 2003; Lahony *et al*., 2013; De Rycke *et al*., 2012) and archives and notations for the type and place of collection. Comparisons were made according to the morphological and anatomical differences for one sample of each species stored in the museum.

RESULTS

The number of cranium bones in mammals is estimated at 22-23. The bones in animals differ in terms of number, shape and size. They are also divided into brachycephalic, mesaticephalic (red fox and Cape hare), and dolichocephalic heads. According to the results

of the current study, it was found that the skull of identical in the skull in the presence of the nasal bone and the maxillary bone with the frontal bone and the palatine bone temporal bone mandible bone, but it differed in terms of size in relation to the single bone, as well as its alum face was found in the auditory bulla, occipital crest, occipital condyle, and basioccpital. It lacked it and included the rabbit's skull, as well as the red fox's skull to the front of the premaxilla (Pl. 1, 2). It was observed that the upper jaw of the rabbit consists of the palatine bone, maxilla and nasal bone and is curved open, while it was connected and fused in the red fox (Pl. 1, 2).

The eye orbit of the red fox was larger than that of the rabbit with the presence of the zygomatic arch and the orbit crest was more prominent in the rabbit, note that this is due to animal living and more eye rotation for wider vision for predators Pl. (1, 2) . As for the upper jaw, in the corner of the jaw connection with the eye, there is a place of soft ossification known as (fascia cribrosa), and this is due to a network of collagen fibers and is considered an assistant in maintaining blood pressure between the eye and the surrounding tissues, considering the animal is exposed to predication and may be exposed to a rise in blood pressure in order to preserve the artery, which may bulge somewhat inside the eyeball, structurally, the eye is denser, and this facies cribrosa is sensitive to changes in blood pressure and its work moves backwards from its place in the event of an increase in pressure to complete the process of equilibrium Pl. (3). The lower jaw mandible bone is articulated with the skull by the angled jaw and the jaw condoyle in the two animals Pl. (3, 4). The ossification in the Cape hare skull suture was so complete that its bones were indistinguishable from that of the red fox, whose skull bones were clearly distinguished.

The dental formula for the Cape hare included the upper jaw: 2 incisors with the disappearance of the canines with the presence of 3 premolars and 3 molars, while the lower jaw with 1 incisor and the disappearance of the canines with the presence of 3 molars and 2 molars (Pl. 3); whereas in the red fox the formula of the Dental in the upper jaw: had 3 incisors with 1 canine, 4 premolars, and 2 molars; while the lower jaw included 3 incisors, 1 canines , 4 premolars, and 3 molars (Pl. 3,4) .

Dental Formula: $\frac{\text{Upper Jaw: Incisors, Canines, Premolars, Molars}}{\text{Lower Jaw: Incisors, Canines, Premolars, Molars}} \times 2$

Rabbit $\frac{2+0+3+3}{1+0+2+3}$

Red fox $\frac{3+1+4+2}{3+1+4+3}$

It is a hallmark that there is no difference between the skulls of females and males, and there is no distinct difference mentioned for the differentiation of the bones of the skull. The joints between the skulls were almost clear; as the animal was an adult and most of them were

ossified, with plane joint and the suture fibrous type is clear in both animals between the skull bones.

DISCUSSION

In the current study with some prior knowledge results, the dental equation is similar to wild hares (Riggs *et al*., 2016). Some studies utilizing computed tomography (CT) revealed that the bones of the skull consist of nasal bone, maxilla, palate, sphenoid bone, frontal bone, parietal bone, zygomatic bone, temporal bone with bulla tympanum, occipital bone, and mandible matched the results of the current study with wild rabbits whereas found that there is lake bone connection between the base of the skull and the temporal bone, with clearly differentiated occipital and temporal bone (Prebble and Meredith, 2014). In the dental formula, they were identical in terms of the number and shape of the teeth of the hare and in the red fox, the bones in the skull were identical in terms of the presence of the jawbone, nose, palatine, temporal, frontal, occipital, and zygomatic prominence with Birngruber *et al*.(2010).

The occipital bone in its location and shape is similar to that of the dog (Miller *et al*., 1964) and cat leopard (Sarma *et al*., 2001, 2002); while in the bull (Raghavan, 1964) the occipital bone was formed from the ventral part of the occipital bone, this bone is one of the basic bones that make up the skull. The convexity in the frontal bone (Nickel *et al*., 1973) was less convex in ruminants and cats as in rabbits compared to sloths (Kalita *et al*., 2006) it was more convex while meat-eaters had little convexity (Kumawat *et al*., 2014). The supra-orbital foramen perforates the zygomatic root of the zygote in the tiger (Joshi, 2004; Shankhapal *et al*., 2004); in an adult sloth bear (Kalita *et al*., 2006) and a dog (Miller *et al*., 1964) matched the hole in a red fox. The zygomatic bone in the red fox was distinguished by the presence of the zygomatic arch, while it was absent in the rabbit, and this is similar in the horse and bull (Getty, 1975). The absence of the zygomatic arch (Raghavan, 1964) for the zygomatic bone. The orbit of the eye or lacrimal bone from the articulation of the frontal bone anteriorly and the maxillary bone posteriorly with the posterior palatine bone in the rabbit is identical to the camel (Getty, 1975), Indian blackbuck (Kumawat *et al*., 2014). The bones of the frontal, maxillary, and palate zygomatic arch (Joshi, 2004), in sentences with, and (Prebble and Meredith, 2014) dog with palatine bones, front, jaws and the zygomatic (Miller *et al*., 1964) equal to the red fox. From previous studies, the presence of the supraorbital foramen matched in the ox (Raghavan, 1964), horse (Getty, 1975), Indian blackbuck (Choudhary and Singh, 2016). It was absent in tiger (Joshi, 2004), dog (Miller *et al*., 1964) and the sloth bear (Kalita *et al.*, 2006) and arctic foxes (Zuoliang, 2004), and in the current study of the hare and red fox showed that the palatine foramen is located close to the molars, a long, narrow, and double foramen consisting of the hard palate, the palatine bone, the ventral part of the maxilla, and the incisor bone. This foramen is clearly visible, it can be seen and differentiated, and it penetrated the hard part of the rostral palate (Salih, 2013). In dogs and camels, the hump and apex match, It is not observed in foxes as the maxilla is not observed hump (Choudhary and Singh, 2016; Shahid and Kausar, 2005).

The mandible bone in rabbits contains a mental foramen; the anterior border of the ramus is a clear hole in bull (Raghavan, 1964), dogs and deer (Miller *et al.*, 1964) disappeared in red foxes, camels, and horses; the jaw was completely ossified (Getty, 1975; Prebble and Meredith, 2014; Choudhary and Singh, 2016). The tubercle was well developed in the jaw of yaks (Archana *et al*., 1998); as in the red fox and hares.

CONCLUSIONS

From the previous and current studies, it was concluded that the differences there are many dissimilarities due to the difference in species and the identical type as a result of the type of nourishment and the surrounding environment, where we need to know the types of bones in the skull; as well as the differences between the animals studied, where differences were found in terms of protrusion of bone in carnivores and their disappearance in herbivorous Furthermore, developed bones were found in red foxes than in rabbits as a result of the fact that the animals belong to a predator or prey and the development of ossification is over the ages. Extensive studies are required in Iraq regarding skulls in and their bone formation.

AKNOWLEDGMENTS

The author is grateful to the laboratories of the Iraq Natural History Research Center and Museum for their support in completing the research, obtaining animal skulls, and conducting all macroscopic studies in it.

CONFLICT OF INTEREST STATEMENT

"The authors have no conflicts of interest to declare".

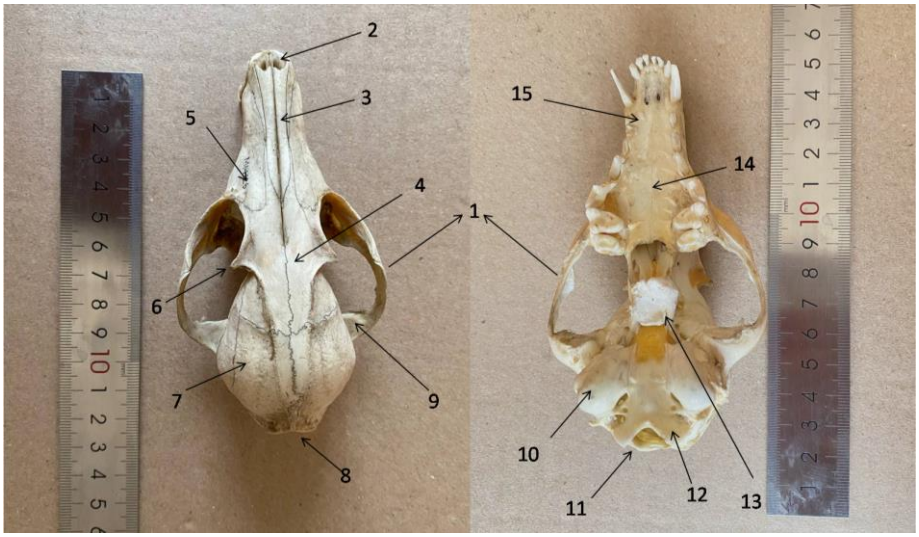

Plate (1): Skull mesaticephalic of red fox [1 (Zygomatic arch),2 (premaxilla), 3 (nasal bone), 4 (frontal bone), 5 (palatine bone), 6(temporal fossa),7 (parietal bone), 8 (occipital bone), 9 (squamosal),10 (Auditory bulla),11(occipital crest), 12 (occipital condyle), 13 (basioccpital),14 (palatine plate), and 15 (maxilla)].

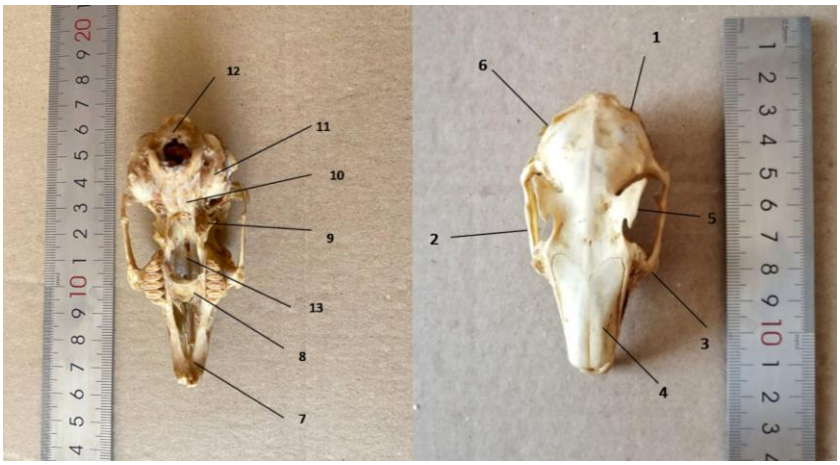

Plate (2): Skull of Cape hare mesaticephalic [1(frontal bone),2 (orbit crest), 3 (palatine bone), 4 (nasal bone), 5 (Zygomatic arch), 6 (temporal fossa),7 (maxilla bone), 8 (palatine plate), 9 (squamosal), 10(occipital bone), 11 (occipital crest),12 (Auditory bulla),13 (basisphenoid bone)].

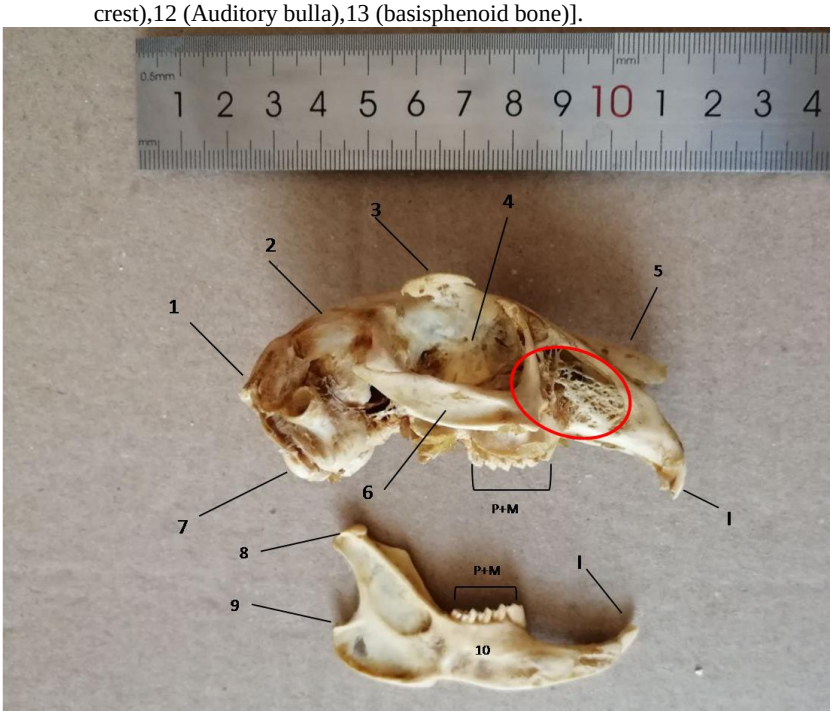

Plate (3): Skull of rabbit [1(occipital crest), 2 (palatine bone),3 (orbit crest),4 (orbisphinod bone), 5 (nasal bone),6 (Zygomatic arch temporal fossa),7 (occipital condyle),8 (jaw condyle),9 (angle of jaw),10 (mandible bone), with teeth =I(Incisors) +P(Premolars) +M (Molars)and the red circle (facies cribrosa)].

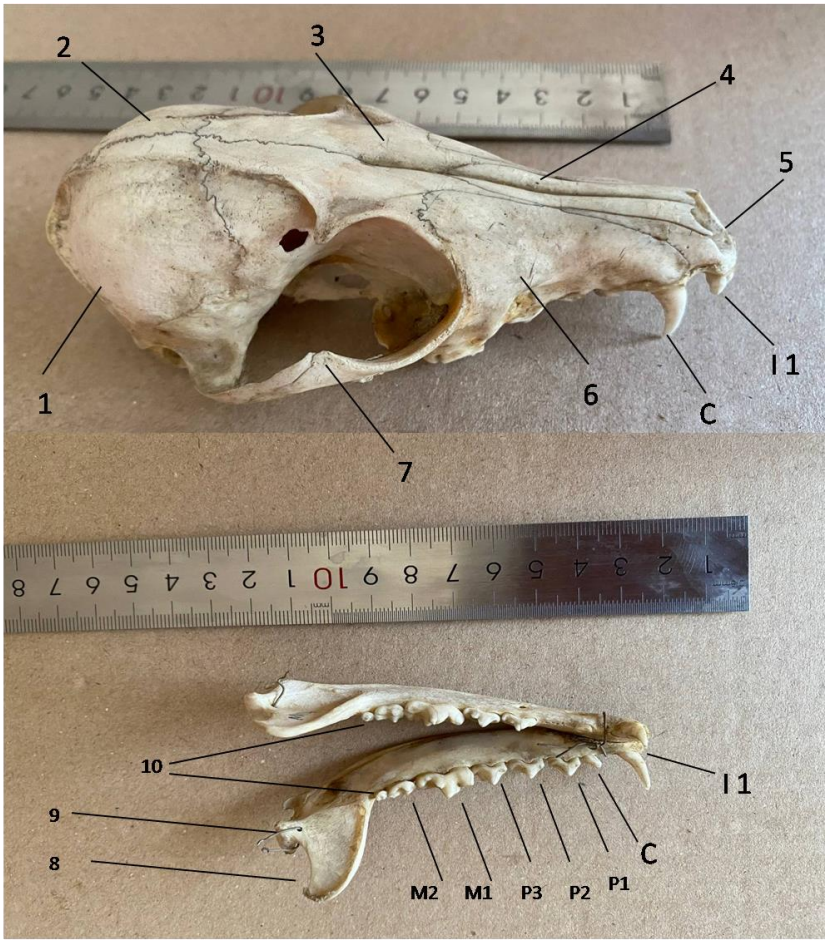

Plate (4): Skull of red fox [1 (parietal bone), 2 (palatine bone), 3(frontal bone), 4(nasal bone), 5(premaxill), 6(maxillary bone), 7(crest), 8(jaw condyle), 9(angle of jaw), 10 (mandible bone), with teeth = I(Incisors)+C(Canines) +P(Premolars)+M(Molars)].

LITERATURE CITED

Al-Rammhi, H. M., Mohammad, M. K. and Mohammad, M. H. 2013. Tick infestation of hares (*Lepus capensis*) in Al-Qasim district-Babylon, Iraq. *Euphrates Journal of Agriculture Science*, 5 (1):8-14. [Click here]

Archana, L. S. and Sharma, D. N. 1998. Anatomy of the mandible of yak (*Bos grunniens*). *Indian Journal of Veterinary Anatomy*, 10 (1-2):16-20. [Click here]

Birngruber, C. G., Kreutz , K., Ramsthaler, F., Krähahn, J. and Verhoff, M. A. 2010. Superimposition technique for skull identification with Afloat® software." *International Journal of Legal Medicine*, 124(5): 471-475. [Click here]

Choudhary, O. P. and Singh, I. 2016. Morphological and Radiographic Studies on the Skull of Indian Blackbuck (*Antilope cervicapra*). *International Journal of Morphology*, 34 (2):775-783. [ResearchGate]

Choudhary, O. P. and Singh, I. 2015. Morphometrical Studies on the Skull of Indian Blackbuck (*Antelope cervicapra*). *International Journal of Morphology*, 33(3): 868-876. [Click here]

De Rycke, L. M., Boone, M. N., Van Caelenberg, A. I., Dierick, M., Van Hoorebeke, L., van Bree, H. and Gielen, I. M. 2012. Micro-computed tomography of the head and dentition in cadavers of clinically normal rabbits. *American Journal of Veterinary Research*, 73(2): 227-232. [CrossRef]

Dyce, K. M, Sack, W.O. and Wensing, C. J. G. 1996. Textbook of Veterinary Anatomy. 2nd ed. Philadelphia, Saunders, 856pp. [Click here]

Elbroch, M. 2006. Animal skulls. A guide to North American species. Stackpole Books, Mechanicsburg, Pennsylvania, 727pp. [CrossRef]

Ge, D.Y., Lv, X. F., Xia, L., Huang, C. M., and Yang, Q. S. 2012. Geometric morphometrics of postnatal size and shape changes in the cranium of cape hare (Lagomorpha, Leporidea, *Lepus capensis*). *Acta Theriologica Sinica*, 32(1): 12-24. [ResearchGate]

Getty, R. (ed.) 1975. Sisson and Grossman's: The Anatomy of the Domestic Animals. Volume 1and 2, 5th Edition, W.B. Saunders, Canada, 2095 pp. [Click here]

Harrison, D. L. 1968. The mammals of Arabia: Carnivora, Artiodactyla, Hyracoidea. London, Ernest Benn Limited, p 308-313. [Click here]

Hirasawa, T. and Kuratani, S. 2015. Evolution of the vertebrate skeleton: morphology, embryology, and development. *Zoological Letters*, 1 (2):1-17. [CrossRef]

Joshi, H. 2004. Gross anatomical studies of the skull of Indian tiger (*Panthera tigris*). M.V.Sc. thesis submitted to the Rajasthan Agricultural University, Bikaner. Cited in: Bharti, S. K. and Singh, I. 2018. Morphological, morphometrical, applied studies on cranial cavity, nasal cavity and dentition of blue bull (*Boselaphus tragocamelus*). *Indian Journal of Veterinary Anatomy*, 30(2): 83-84. [Click here]

Kalita, P. C., Kalita, H. C. and Sarma, K. 2006. Anatomy of the skull of sloth bear (*Melursus ursinus*). *The Indian Journal of Animal Sciences*, 76(3): 225-227. (Cited in:

Rajashailesha, N. M., Prasad, R. V., Sha, A. A., Jamuna, K.V. , Satyanarayana, M. L. and Naik, S. G. 2018. Gross anatomy of bony orbit and eyeball of sloth bear (*Melursus ursinus*). *Indian Journal of Veterinary Anatomy*, 30(2): 85-87. [Click here]

Koyabu, D., Werneburg, I., Morimoto, N. Zollikofer, C. Forasiepi, A., Endo, H., Kimura, J., Ohdachi, S., Truong Son, N. and Sánchez-Villagra, M. 2014. Mammalian skull heterochrony reveals modular evolution and a link between cranial development and brain size. *Nature Communications*, 5 (3625): 1-9. [CrossRef]

Kumawat, R., Joshi, S., Mathur, R. and Choudhary, O. P. 2014. Gross anatomical studies on the cranial bones of skull in chital (*Axis axis*). *Indian Journal of Veterinary Anatomy*, 26 (1):54-55. [Click here]

Lahony, S. R., Mohammad, K. M., Ali, H. H., Al- Moussawi, A. A. and Abd Al-Rasul, M. S. 2013. fauna and flora of Hawraman mountain (part one) Hawraman lowest zone, Kurdistan province north east of Iraq. *Bulletin of the Iraq Natural History Museum*, 12 (4):7-34. [Click here]

Miller, M. S., Christensen, G. V. and Evans, H. E. 1964. Anatomy of dog. 2nd edition, W.B. Saunders Co., Philadelphia. (Cited in: Rajashailesha, N. M., Prasad, R. V., Sha, A. A., Jamuna, K.V., Satyanarayana, M. L. and Naik, S. G. 2018. Gross anatomy of bony orbit and eyeball of sloth bear (*Melursus ursinus*). *Indian Journal of Veterinary Anatomy*, 30 (2): 85-87. [Click here]

Mohammad, M. K., Jasim M. K. and Al-Moussawi A. A. 2003. The parasitic fauna of the Red fox *Vulpes vulpes* (L., 1758) in Iraq with some notes on its biology and ecology. *Bulletin of the Iraq Natural History Museum*, 10 (1):59-76. [ResearchGate]

Nickel, R., Schummer, A. and Seiferle, E. 1973.The viscera of the domestic mammals. New York, Verlag Paul Parey, p. 211-279. [Click here]

Parsons, K. J., Rigg, A., Conith, A. J., Kitchener, A.C., Harris, S. and Zhu, H. 2020. Skull morphology diverges between urban and rural populations of red foxes mirroring patterns of domestication and macroevolution. *Proceedings of the Royal Society B*, 287 (1928): 20200763. [CrossRef]

Prebble, J. L., and Meredith, A. L. 2014. Food and water intake and selective feeding in rabbits on four feeding regimes. *Journal of Animal Physiology and Animal Nutrition*, 98 (5):991-1000. [CrossRef]

Raghavan, D. 1964. Anatomy of the ox; with comparative notes on the horse, dog and fowl. New Delhi, Indian Council of Agricultural Research, 760 pp. [Click here]

Riggs, G. G, Arzi, B., Cissell, D. D., Hatcher, D. C., Kass, P. H., Zhen, A. and Verstraete, F. J. 2016. Clinical Application of Cone-Beam Computed Tomography of the Rabbit Head: Part 1 - Normal Dentition. *Frontiers in Veterinary Science*, 3(93):1-12. [Click here]

Rogers, T. L. 2005. Determining the sex of human remains through cranial morphology. *Journal of Forensic Science*, 50 (3): 493-500. [Click here]

Salih, K. M. 2013. Gross Anatomical and morophmetrical studies to the skull bones of the local rabbit (*Oryctohgus cuniculus*). *Basrah Journal of Veterinary Research*, 12(2): 267-277. [CrossRef]

Sarma, K., Nashiruddullah, N. and Islam, S. 2001. Anatomy of the skull of a leopard cat (*Felis bengalensis*). *The Indian Journal of Animal Sciences*, 71(11): 1011-1013. [Click here]

Sarma, K., Sarma, M. and Nashirudullah, N. 2002. Anatomy of the mandible of leopard cat (*Felis bengalancis*). *The Indian Veterinary Journal*, 79(10): 1063-1064. [ResearchGate]

Shahid, R.U. and Kausar, R. 2005. Comparative gross anatomical studies of the skull of one-humped camel (*Camelus dromedarius*). *Pakistan Veterinary Journal*, 25(4): 205-206. [Click here]

Shankhapal, V. D., Bhamburkar, V. R., Dalvi, R. S., Banubakode, S. B. and Gawande, A. P. 2004. Morphometrical observations of skull of Indian Tiger (*Panthera tigris tigris*). *The Journal of Bombay Veterinary College*, 12(1&2): 74-76. [Click here]

Taylor, M. A. 1992. Functional anatomy of the head of the large aquatic predator *Rhomaleosaurus zetlandicus* (Plesiosauria, Reptilia) from the Toarcian (Lower Jurassic) of Yorkshire, England. *Philosophical Transactions of the Royal Society B, Biological Sciences*, 335(1274):247-280. [CrossRef]

Zuoliang, F. 2004. Comparative anatomical studies on the skeleton of arctic foxes. *Journal of Economic Animal*, 8 (2):80-84. [Click here]

.

BULLETIN OF THE IRAQ NATURAL HISTORY MUSEUM

Hadi and Yousif

Bull. Iraq nat. Hist. Mus.
(2023) 17 (3): 507-517.

دراسة مظهرية- تشريحية لجمجمة نوعين من اللبائن العراقية اللاحمة و العاشبة

هند ضياء هادي و نور حسين يوسف
مركز بحوث ومتحف التاريخ الطبيعي/ جامعة بغداد، بغداد، العراق.

تأريخ الاستلام: 2023/1/18، تأريخ القبول: 2023/5/8، تأريخ النشر: 2023/6/20

الخلاصة

تعتبر عظام الجمجمة من أبرز العظام في الجسم. يصنف إلى عظام مسطحة تحافظ على التركيب العضوي المهم ، وهو الدماغ والعينين واللسان. تعتبر الجمجمة دعامة قوية للحفاظ على هذه الأعضاء ولكن في الحيوانات المختلفة والبيئات التي تعيش فيها وطبيعة تغذيتها. توجد اختلافات كثيرة بين الكائنات الحية من حيث العظام في الجمجمة ، واختلافها أو اختفائها ، وطولها حسب شكل الرأس. تم أخذ العينات من المخزن العلمي في مركز ومتحف بحوث التاريخ الطبيعي في العراق القلاع الصحراوي Cape hare *Lepus capensis* (Linnaeus, 1758) والثعلب الأحمر *Vulpes vulpes* (Linnaeus, 1758) وأجريت الدراسة عليها بطريقة تشريحية مظهرية مقارنة. وجد الجماجم تختلف بحسب الحيوانات منها قصيرة الانوف ومنها طويلة الانوف ، تمت إضافة تركيبة الأسنان لأن أنسجة الأسنان مغروسة في عظم الفك.

لوحظ ان هنالك اختلافات في الدراسة الحالية مع دراسات سابقة من حيث شكل وعدد العظام وجودها واختفائها لذلك شخص احتياج دراسة العظام إلى تطوير في الأساليب وتتطلب تحقيقات مستفيضة في العراق نتيجة للاختلافات في الأنواع وطبيعة الحياة ، بالإضافة إلى الاختلافات المسجلة في الأنواع نفسها. الهدف من هذه الدراسة هو معرفة الفرق بين الحيوانات المفترسة وغير المفترسة وتسجيل الفروق بينها.