BioScientific Review (BSR)
Volume 6 Issue 1, 2024
ISSN$_{(P)}$: 2663-4198 ISSN$_{(E)}$: 2663-4201
Homepage: https://journals.umt.edu.pk/index.php/bsr

Article QR

Title:	**Description of Propotamochoerus hysudricus Fossils from the Siwalik Beds of District Jhelum, Punjab, Pakistan**
Author (s):	Amir Nadeem[1,2]
Affiliation (s):	[1]Government Islamia Graduate College, Civil Lines, Lahore-Pakistan [2]Government College University, Lahore-Pakistan
DOI:	https://doi.org/10.32350/bsr.61.06
History:	Received: August 31, 2023, Revised: September 20, 2023, Accepted: December 29, 2023, Published: January 30, 2024
Citation:	Nadeem A. Description of Propotamochoerus hysudricus fossils from the Siwalik beds of District Jhelum, Punjab, Pakistan. *BioSci Rev*. 2024;6(1):121–129. https://doi.org/10.32350/bsr.61.06
Copyright:	© The Authors
Licensing:	This article is open access and is distributed under the terms of Creative Commons Attribution 4.0 International License
Conflict of Interest:	Author(s) declared no conflict of interest

A publication of
The Department of Life Sciences, School of Science
University of Management and Technology, Lahore, Pakistan

Description of *Propotamochoerus hysudricus* Fossils from the Siwalik Beds of District Jhelum, Punjab, Pakistan

Amir Nadeem[1,2*]

[1]Department of Zoology, Government Islamia Graduate College, Civil Lines, Lahore, Pakistan
[2]Department of Zoology, Government College University, Lahore, Pakistan

ABSTRACT

Background. Siwalik Hills, situated in Punjab, Pakistan, are highly fossiliferous and are well-known worldwide for vertebrate fossil excavations. Suids are even-toed ungulates. Their fossils have been reported in large numbers in the Siwalik region of northern Punjab and other parts of these hills.

Method. To recover new fossils, a field survey was conducted from different geological formations visible around the Hasnot village of District Jhelum.

Results. The recent findings and subsequent documentation of dental remains belonging to *Propotamochoerus* (Mammalia, Suidae) emerged from the Middle Miocene Siwalik beds in the surroundings of Hasnot. The recovered material consists of an isolated second molar on the right side of the maxilla. The genus *Propotamochoerus* comprised middle to large-sized suids. It provides significant insights into the essential dental traits of this particular genus.

Conclusion. The recovered material has been assigned to the species *Propotamochoerus hysudricus* based on its morphological assessment. This particular substance can potentially augment the existing understanding of the species documented in the vicinity of the Salt Range of Siwalik Hills.

Keywords: artiodactyla, molar dentition, *Propotamochoerus,* Siwalik Hills, Suidae

Highlights

- The Hasnot area and its surroundings are still productive for palaeontologists.
- A second molar of the 10-6 million-year-old genus *Propotamochoerus* has been found.
- The specimen is referred to as the species *Propotamochoerus hysudricus* by Stehlin (1900).

*Corresponding Author:amir679@yahoo.com

1. INTRODUCTION

Suids, classified as artiodactyl mammals, exhibit a significant presence inside the Siwalik region of northern Punjab, as well as several other areas situated amidst these mountainous terrains (Figure 1). From the nineteenth century and onwards, numerous scholars including [1–6] have excavated at diverse locations on the hills of the subcontinent, where they have found a large number of fossils. In this regard, [7–15] are among the most well-known palaeontological researchers that have conducted studies in this region. A few millennia ago, the family Suidae was among the most ubiquitous families in the Siwalik Hills of the Indo-Pak region and represented by a significant number of genera. It was due to the family's ability to produce many offsprings [16–18].

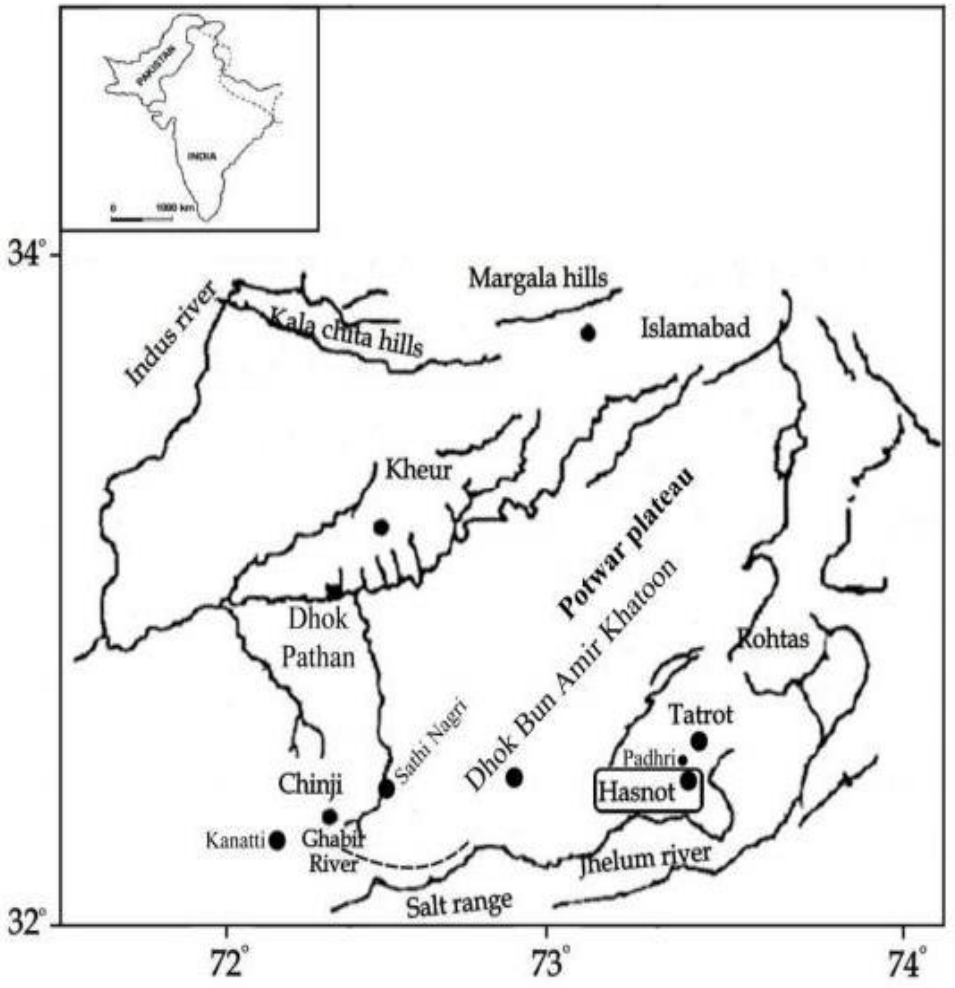

Figure 1. Map showing Different Fossil-Bearing Localities of the Potwar Plateau in Northern Punjab, Pakistan [19]

Even though many species from that time have left a significant number of fossil records discovered repeatedly, others exhibit significantly fewer fossils that represent them. As a result, the discovery of any additional examples of these ancient species is of utmost significance in order to understand the ecological part they played and where they stood during the evolution of this particular group. The five component formations, namely Soan, Dhok Pathan, Nagri, Chinji, and Kamlial are apparent in the region around Hasnot [10]. Out of these formations, the Dhok Pathan formation is vibrant for the fossils of even-toad ungulates including Suidae [20, 21].

The Siwalik Hills of Punjab, Pakistan have a reputation for housing vertebrate fossil sites at places like Hasnot, District Jhelum (Figure 1), and many others [22, 23]. Hence, a field survey was scheduled to be carried out to locate and examine any deceased remnants of previous life inside the study region. The objective was to describe the morphological features of these remains and categorize the retrieved material to the level of specific genera or species.

2. MATERIALS AND METHODS

The tooth described above was found in the Nagri formation in Punjab, Pakistan in the general region of the Hasnot hamlet. During field visits, it was found partially exposed in the formations present around Hasnot. The tooth was excavated carefully with the help of field hammers, chisels, fine needles, and brushes. Then, it was transferred carefully to the Palaeontological Laboratory of GC University, Lahore, covered within several layers of cotton. There, once again, it was carefully cleaned and washed by using different brushes, needles, water, and cotton in order to make it ready for morphological identification. Currently, it is stored in the paleontological collection of the Department of Zoology at Government College (now known as GC University), Lahore, Pakistan. The measurements were obtained using a Vernier caliper calibrated in millimeters (mm) and the recorded data were expressed in this unit of measurement (Table 1). The morphometric features of the specimen under investigation were examined. The specimen in question was assigned a serial catalog number. The numbers associated with the specimen represent the serial number as well as the year the specimen was collected (the denominator and the numerator, respectively). For example, Government College Palaeontological Collection Number 370/2001 (where "Government College Palaeontological Collection Number" is abbreviated as "G.C.P.C. No."). The terminology used to describe the parts of the dental crown and the measurement methods is based on [6].

The following results were drawn after the detailed study of the recovered specimen from the study site, namely Hasnot village of District Jhelum, Punjab, Pakistan.

2.1. Systematic Account

Order	Artiodactyla	Owen, 1848
Family	Suidae	Gray, 1821
Genus	*Propotamochoerus*	Pilgrim, 1926
Species	*P. hysudricus*	Stehlin, 1900

2.2. Specimen under Study

G.C.P.C. No. 370/2001, an individual upper second molar located on the right side of the maxilla. It was obtained from Hasnot, a region situated in District Jhelum, Punjab, Pakistan.

3. RESULTS

The morphological description of the material under study is given below.

3.1. Upper Dentition: Second Molar

The specimen is an isolated second maxillary molar. It was recovered from Hasnot, which is a village within the Jhelum District of Punjab, Pakistan. The presence of a pressure mark on both the front and posterior aspects of the tooth is indicative of its classification as a second molar. The crown view of the tooth shows all of its principal cusps, which are rounded and pyramidal and have pretty clear summits. The tooth is quadrangular in its general contour. The enamel layer is thick, shiny, and corrugated. The lingual surface of the tooth and the transverse valley both exhibit the presence of a thin layer of cement. The tooth exhibits a robust multituberculated cingulum, both at its anterior and posterior aspects. The development of this condition occurs at an early stage on both the labial and lingual surfaces of the tooth. On the whole, the tooth is well-preserved and is only slightly touched by wear. Its height-to-width index (Table 1) indicates that it is a brachyodont and broad crowned tooth. The tooth's prominent cones including the protocone, paracone, hypocone, and metacone are clearly distinct and readily identifiable. The protocone inhabits the frontal side of the specimen and is connected to the anterior accessory conule through a narrow channel of its anterior lobe. From its posterior and lingual sides, it is attached to the basal pillars present at the very entrance of the tooth's transverse valley. The median lobe of the protocone exhibits continuity with the median accessory conule observed within the transverse valley of the tooth without complete obstruction.

2-A 2-B 2-C

Figure 2. Crown View (2-A), Lingual View (2-B), and Labial View (2-C) of the Specimen

The paracone is conical in shape and all three characteristic suid grooves are clearly visible. It is surrounded by a thick cingulum forming a shelf-like structure, that is, the cingular ridge is present anteriorly to the paracone. The enamel is corrugated and somewhat rough, perhaps due to the process of weathering. The paracone is attached to the protocone through the longitudinal valley and blocks it to some extent, which is further disrupted by the presence of the median accessory conule. The hypocone is pyramidal in its present shape and it's all three characteristic suid grooves are easily visible. From its anterior end, it is attached

to the median accessory conule. Posteriorly, it is attached to the posterior accessory conule, which is contiguous with the posterior cingulum. The metacone is the vertically highest cone of the tooth. It is posteriorly attached to the posterior accessory conule through a thick channel, which is contiguous with the wrinkled cingulum of the posterior side. The cingulum is thick lingually and gradually becomes thin towards the labial end. Unlike the anterior cingulum, the posterior cingulum shows comparatively straightforward cingular ridges which, due to wear, have become almost flat. The median accessory conule is fairly worn out but still shows characteristic suid grooves, such as the principal cones of the tooth.

Table 1. Measurements (in mm) of G.C.P.C. No. 370/2001

Preserved anteroposterior crown length	19.2
Reconstructed anteroposterior crown length	19.5
Preserved transverse crown width	19.3
Reconstructed transverse crown width	20
Preserved crown height	13
Reconstructed crown height	13.5
H/W index	67.5
W/L index	102.5
Enamel Thickness	1

4. DISCUSSION

The specimen is an isolated upper, second molar of the right maxilla recovered from the outskirts of Hasnot hamlet of District Jhelum, Punjab, Pakistan. The tooth is quadrangular in appearance and has a rounded posterior part with rounded and low tubercles, which are the characteristics of pigs [24, 25]. The molar teeth are devoid of complications and there is no crowding on the crown [4].

The molar teeth of the genus *Propotamochoerus* exhibit a longer length as compared to their width. They possess robust anterior and posterior cingulum, while these features are not present on the lateral aspects, save for a small, significantly reduced, basal pillar located at the entrance to the transverse valley on the lingual and labial sides, specifically in the case of the second molar. Anterior accessory conules are very small. The size of the posterior auxiliary tubercle is greater than that of the anterior tubercle, although the median tubercle is the biggest. The median accessory tubercle is isolated from the primary tubercles of the tooth. Some additional suid grooves are also present on these tubercles, since these are the generic characters of the genus *Propotamochoerus*. So, the specimen may be referred to as the genus *Propotamochoerus*.

The genus *Propotamochoerus* was observed to have originated in the Siwalik Hills within the bunodont pigs. It is distinguished by its possession of simple molars consisting of two rounded tubercles. In the Siwalik Hills, four species of the genus *Propotamochoerus* are present. These are *Propotamochoerus salinus, Propotamochoerus uliginosus, Propotamochoerus hysudricus,* and *Propotamochoerus ingens*. Out of these four species, *Propotamochoerus salinus* is of small-sized suids, with rugose enamel on its molars and a small heal on the last tooth [4]. *Propotamochoerus hysudricus* is

a large suid species characterized by its relatively intricate molar structure [3].

The species *Propotamochoerus hysudricus* was established by Pilgrim [4] based on the examination of a mandibular ramus (Ind. Mus. B. 30), previously described and illustrated as *Sus hysudricus* by Lydekker [26]. Subsequently, Stehlin [3] reclassified it under the genus *Propotamochoerus*. The type specimen was a mandibular ramus bear P_3-M_3. The premolars exhibit elongation and possess a substantial transverse thickness. The M^1 is elongated. *Propotamochoerus uliginosus* has similarities to *Propotamochoerus salinus*, with discernible variations observed mainly in dental characteristics. According to Colbert [5], the species resembles *Propotamochoerus salinus* and *Propotamochoerus ingens* very much, which is a related form of the genus *Propotamochoerus*. According to his perspective, there exists a resemblance between the species *Propotamochoerus salinus* and *Propotamochoerus hysudricus*, with the only discernible distinction being their respective sizes. The author is of the opinion that *Propotamochoerus salinus* is probably a variant of the species *Propotamochoerus hysudricus* [5].

The cranial dimensions of *Propotamochoerus hysudricus* and contemporary African *Propotamochoerus* specimens exhibit a notable similarity in size and morphology. The distinction between the two species is characterized by variations in the location and dimensions of the orbit, with *Propotamochoerus hysudricus* exhibiting a more centralized and comparatively smaller orbit [4]. The presence of the first upper premolar has been seen in *Propotamochoerus hysudricus*, although it is notably absent in the genus *Potamochoerus* [5]. *Propotamochoerus* is a sizable suid species characterized by its intricate molars, possessing smooth enamel together with vertical ridges and grooves [5].

CONCLUSION

The specimen has enamel that is about average in thickness, a crown structure that is straightforward, and tubercles that are round in shape. All of these are typical characteristics of the species *Propotamochoerus hysudricus*. So, the specimen may be refrred to as the species *Propotamochoerus hysudricus.*

CONFLICT OF INTEREST

The authors of the manuscript have no financial or non-financial conflict of interest in the subject matter or materials discussed in this manuscript.

DATA AVALIABILITY STATEMENT

The data associated with this study will be provided by the corresponding author upon request.

REFERENCES

1. Falconer H, Murchinson RI. Notes on fossil remains found in the valley of the Indus below Attock, and at Jubbulpoor. In: H. Falconer, ed., *Palaeontological Memoirs and Notes of the Late Hugh Falconer*. Robert Hardwicke; 1868:414–419.

2. Lydekker R. Indian tertiary and post-Tertiary Vertebrata. Siwalik and Narbada bunodont Suina. *Mem Geol Surv India Palaeontol Indica ser.10*. 1884;3(2):35–104.

3. Stehlin HG. Geschichte des Suiden Gebisses. *Abh der Schw Pal Gesellsch.* 1899;26:e13.

4. Pilgrim GE. The fossil suidae of India. *Mem Geolog Survey Ind*

Palaeontol Ind. 1926;8(4):1–5.

5. Colbert EH. Siwalik mammals in the American Museum of Natural History. *Trans Amer Phil Soc*. 1935;26:1–401.
6. Pickford M. Revision of the miocene suidae of the Indian subcontinent. *Munchner Geowiss Abh./A Geol Palaontol*. 1988;12:1–91.
7. Muhammad A. *Taxonomy and Distribution of the Siwalik Suids* [dissertation]. Lahore, Paksitan: University of the Punjab; 1995.
8. van der Made J. Listriodontinae (Suidae, Mammalia), their evolution, systematics and distribution in time and space. *Commun Working Group Tertiary Quater Geol*. 1996;33(1–4):3–254.
9. van der Made J. Biometrical trends in the Tetraconodontinae, a subfamily of pigs. *Earth Env Sci Trans Roy Soc Edinb*. 1998;89(3):199–225. https://doi.org/10.1017/S0263593300007136
10. Ghaffar A, Akhtar M. New fossil record of Hyaenictitherium pilgrimi (Carnivora: Hyaenidae) from Dhok Pathan Formation of Hasnot, Pakistan. *Swiss J Palaeontol*. 2012;131(2):275–81. https://doi.org/10.1007/s13358-012-0042-y
11. Batool A, Khan MA, Qureshi NA. New fossils of Suidae (Mammalia, Artiodactyla) from the Hasnot late Miocene, northern Pakistan. *J Anim Plant Sci*. 2015;25(2):578–90.
12. van der Made J, Choudhary D, Singh NP, Sharma KM, Singh NA, Patnaik R. Listriodon dukkar sp. nov.(Suidae, Artiodactyla, Mammalia) from the late Miocene of Pasuda (Gujarat, India): the decline and extinction of the Listriodontinae. *PalZ*. 2022;96(2):355–383. https://doi.org/10.1007/s12542-022-00606-w
13. Jasinski SE, Abbas SG, Mahmood K, Babar MA, Khan MA. New carnivoran (Mammalia: Carnivora) specimens from the Siwaliks of Pakistan and India and their faunal and evolutionary implications. *Hist Biol*. 2023;35(11):2217–2252. https://doi.org/10.1080/08912963.2022.2138376
14. Aftab K, Khan MA, Babar MA, et al. New hipparionine fossils from the Dhok Pathan Formation of Punjab, Pakistan. *Hist Biol*. 2022;34(7):1218–1227.
15. Khizar S, Omer D, Riffat Y, et al. The new discovery of *Hipparion theobaldai* skull from the late miocene deposits of Padhri, District Jhelum, Punjab, Pakistan and associated fossil assemblage of mammals. *Acta Geol Sin*. 2022;96(4):1150–1165. https://doi.org/10.1111/1755-6724.14711
16. Pickford M, Obada T. Pliocene suids from Musaitu and Dermenji, Moldova: implications for understanding the origin of African Kolpochoerus Van Hoepen & Van Hoepen, 1932. *Geodiversitas*. 2016;38(1):99–134.
17. Spassov N, Geraads D, Hristova L, Markov GN, Garevska B, Garevski R. The late Miocene mammal faunas of the Republic of Macedonia (FYROM). *Palaeontogr A*. 2018;311(1–6):1–85. https://doi.org/10.1127/pala/2018/0073

18. Mörs T, Liu L, Hagström J. A miocene tetraconodontine (Suidae, Mammalia) from Falkenberg (Halland, Sweden). *GFF*. 2019;141(1):77–81. https://doi.org/10.1080/11035897.2019.1566273

19. Barry JC, Morgan ME, Flynn LJ, et al. Faunal and environmental change in the late Miocene Siwaliks of northern Pakistan. *Palaeobiology*. 2002;28:1–71.

20. Draz O, Ni X, Samiullah K, et al. New fossil remains of artiodactyla from dhok pathan formation, middle siwaliks of Punjab, Pakistan. *Pak J Zool*. 2020;52(5):1955–1967. https://doi.org/10.17582/journal.pjz/20181028131031

21. Draz O, Samiullah K, Asrar M, Rasul A, Yasin R, Khan L. Fossils remains of even-toed ungulates from the Middle Siwaliks, Punjab, Pakistan. *Hist Biol*. 2021;33(9):1888–1897. https://doi.org/10.1080/08912963.2020.1751836

22. Babar MA, Khan K, Abbas MA, Asim SG, Akhtar M. Tetraconodon and Sivachoerus (Suidae) from Dhok Pathan and Hasnot area of Potwar Plateau, northern Pakistan. *Arab J Geosci*. 2021;14(23):1–6.

23. Sánchez IM, Abbas SG, Khan MA, Babar MA, Quiralte V, DeMiguel D. The first Asian record of the mouse-deer Afrotragulus (Ruminantia, Tragulidae) reassess its evolutionary history and offers insights on the influence of body size on Afrotragulus diversification. *Hist Biol*. 2022;34(8):1544–1559. https://doi.org/10.1080/08912963.2022.2050719

24. Romer AS. Vertebrate palaeontology. In: Geology, ed. *Geological Society of America*. The Geological Society of America; 1941. https://doi.org/10.1130/1888Geology.105

25. Colbert EH. *Evolution of the Vertebrates, History of the Backboned Animals Through Time*. New York: John Wiley & Sons; 1980.

26. Lydekker R. Indian tertiary and post-tertiary vertebrata. Siwalik and Narbada bunodont Suina. *Mem Geol Surv Ind Paleontol Ind*. 1884;3(2):35–104.