

Original Article

Propotamochoerus hysudricus remains from late Miocene deposits of Hasnot, Pakistan

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Abstract

New fossil remains of the Suid species, *Propotamochoerus hysudricus* are described in this paper on the basis of their morphometric characters. This is perhaps the only known species of the genus *Propotamochoerus* in the Siwaliks. The specimens are collected from the outcrops of Hasnot type locality, Punjab, Pakistan. The present findings will strengthen the previous records of the species *Propotamochoerus hysudricus* from the Late Miocene Siwaliks of Pakistan. This species can act as a marker suid species of the Late Miocene Siwalik deposits.

Key words: Late Miocene, Hasnot, Siwaliks, Suidae, *Propotamochoerus hysudricus*.

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INTRODUCTION

Family suidae is not only an economically important taxon of order Artiodactyla but also the fossilized extinct species of this family contributing a lot in mammalian evolutionary studies as suids established an evolutionary linkage between order Artiodactyla and order Cetacea. Tertiary deposits of Asia have abundant remains of suid species playing central role in adaptive radiation of this family (Pickford, 1993). Siwalik sediments are a rich source of fossils of extinct suid species having varied stratigraphic ranges. Miocene-Pliocene is a time of high diversity of different mammalian families (as is the case with family Suidae). Suid genera such as *Propotamochoerus*, *Hippohyus* and *Hippopotamodon* are the part of palaeo communities of this time span. *Propotamochoerus hysudricus* is a species of genus *Propotamochoerus* present in Siwalik outcrops having an age of 10-06 Ma (Stehlin, 1900). Many authors described this species with different names, so it has very complex synonym list (Pickford, 1988; Bonis and Bouvarain, 1996). Pickford (1988) did an extensive study about *Propotamochoerus hysudricus*. Newly discovered fossils included in this study belongs to the species, *Propotamochoerus hysudricus*, this taxon is

assigned to these remains based on their comparative analysis by Pickford (1988) reported features of this species. The specimens described in this paper were collected from different localities around Hasnot village (Lat. 32° 49' N: Long. 73° 18' E), that is present at 90 km away from the Dhok Pathan type locality of the Siwaliks Potwar Plateau, Punjab, Pakistan and is situated in west of the Jhelum city at a distance of 70 Km (Waseem *et al.*, 2016), (Fig. 1).

Dhok Pathan Formation belongs to Middle Siwaliks of Pakistan. According to Barry *et al.* (2002) magnetic polarity and stratigraphic dating of the Dhok Pathan Formation (the Formation to which Hasnot locality belongs), suggested that mid Late Miocene to early Pliocene is the stratigraphic range of this Formation and thickness varied between 950-1200 meters at different places. This Formation consists of alternate sandstone, clay stone/siltstone beds. The sandstone is hard, cemented and thickness is from few meters to more than 90 meters. Hard, dark grey, greenish-grey or brown clay stone layers are present over silty clays along with lamination of calcium carbonate at certain places. The color of clays is orange brown (Shah, 2009). The fossiliferous area around Hasnot village includes 27 localities as described by Colbert

(1935). Extensive Neogene freshwater sedimentary rocks present around the village and have an average thickness of about 180m. The successions of rocks around the village have similar lithology as in the Dhok Pathan Formation. Pilbeam *et al.* (1977) suggested that the age of the Hasnot was around 07 Ma, however, presence of the cervids, bovids, giraffids, and the suids suggests a Late Miocene to Early Pliocene age for Hasnot

similar to Dhok Pathan Formation. Barry *et al.* (1982) suggested an age between 07-05 Ma for Hasnot on the basis of stratigraphy and magnetic polarity dating. The deposits of the Middle Siwaliks in Hasnot have provided diversified mammalian fauna similar to the Dhok Pathan Formation. Important genera of the Hasnot Suids are *Propotamochoerus*, *Sivachoerus*, *Hippohyus*, *Sivahyus* and *Sus*.

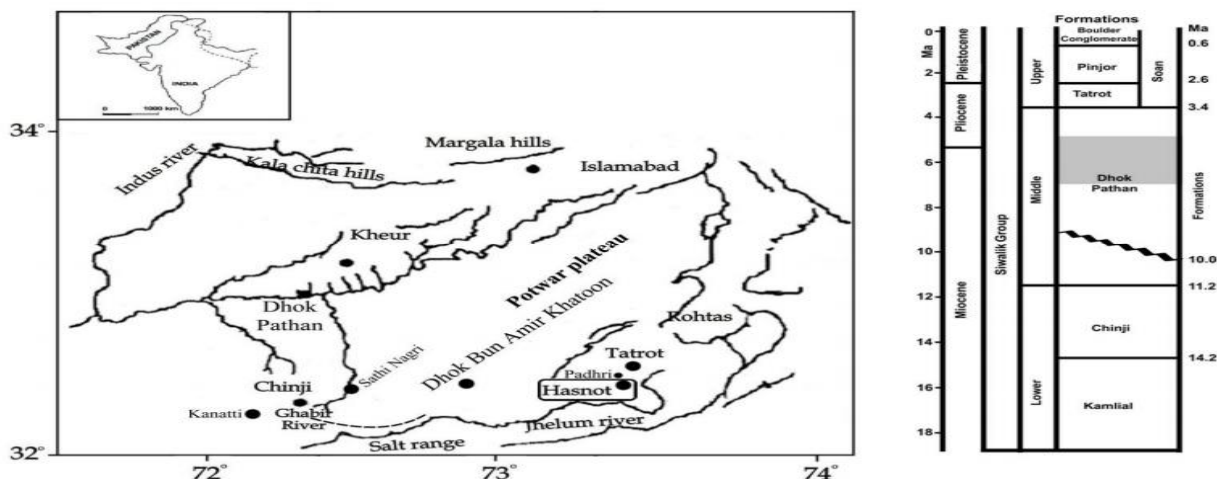


Figure 1: Stratigraphic sections of the Map of the Siwaliks of Pakistan along with stratigraphic divisions (Barry *et al.*, 2002), Studied area is highlighted.

MATERIAL AND METHODS

The studied specimens were collected from the Hasnot type locality of the Siwaliks of Punjab, Pakistan by a team of paleontologist from the Department of Zoology, University of the Punjab, Lahore. The specimens were cleaned and thoroughly washed in the laboratory. The material is kept in the Paleontology laboratory, Department of Zoology, University of the Punjab, Lahore, Pakistan. The specimens were measured in millimeters (mm) by using metric vernier caliper. The morphometric characters of the specimens are analyzed. The catalogue number of the specimens consists of series i.e., yearly catalogue number and serial catalogue number, so figures of the specimens represent the serial number (denominator) and collection year (numerator) (e.g. PUPC 15/19). Terminology and taxonomy follows Pickford (1988).

Systematic Palaeontology

Order Artiodactyla Owen, 1848
Family Suidae Gray, 1821

Genus *Propotamochoerus* Pilgrim, 1925

Propotamochoerus hysudricus Stehlin, 1900

Type specimen: GSI B30, right mandibular ramus in worn condition having P³-M³ dentition.

Referred Material: PUPC 15/17 right second upper molar, PUPC 15/18 left third upper molar, PUPC 15/19 left third lower molar, PUPC 15/20 right second lower molar

Locality: Hasnot, Potwar plateau, Pakistan.

Description: PUPC 15/17 is an isolated second right molar of maxilla. It has four main cusps i.e., protocone, paracone, hypocone and metacone, with anterior, median and posterior accessory cusps. Thick cingulum is present anteriorly and posteriorly. There are variable basal pillars in the ends of median valley, which represent remnants of the buccal and lingual cingula. PUPC 15/18 is an isolated third left molar of maxilla. It has four main cusps i.e., hypocone, protocone, paracone and metacone with accessory cusps. It differs from second molar by having talon. Anteriorly, cingulum is expanded. PUPC 15/19 is an isolated third left molar of mandible. Four main cusps along with accessory cusps are present. The lingual cusps

are slightly higher than labial ones. In the median valley, medial accessory cusp is present. Labially, cingulum forms median basal pillar at

the end of median valley. Talonid is well developed.



Figure 2. Isolated upper and lower molars of *Propotamochoerus hysudricus* from Dhok Pathan Formation of Hasnot, Pakistan. PUPC 15/17, 1a; occlusal view, 1b; lingual view, 1c labial view. PUPC 15/18, 2a; occlusal view, 2b; lingual view, 2c; labial view. PUPC 15/19, 3a; occlusal view, 3b; lingual view, 3c; labial view. PUPC 15/20, 4a; occlusal view, 4b; lingual view, 4c; labial view. Scale bar 10mm.

PUPC 15/20 is an isolated second right molar of mandible. It has four principle cusps. Cusps of lingual side are broader than labial ones. Cingulum forms moderate flare anteriorly, posteriorly and mesially it forms median valley. Enamel is shiny. Posterior accessory cusp is broader and prominent. All the above mention characters clearly identify these molars to be representative of the genus *Propotamochoerus* and probably the species is *Propotamochoerus hysudricus*. The specimens, metrically and morphologically (Fig. 1a-4c) resemble to the species *P. hysudricus*, are recovered from Dhok Pathan Formation of Hasnot, Pakistan.

DISCUSSION

The age range of the species *Propotamochoerus hysudricus* is about 10-06 million years (Stehlin, 1900). *P. hysudricus* may be the single species representing the genus *Propotamochoerus* in the Siwaliks and has a complex synonymy list (reviewed in Pickford, 1988; Bonis and Bouvain, 1996), but its

illustration is very poor (Pilgrim, 1926; Pickford, 1988). It is expected that *P. hysudricus* is derived from the *hyotherium*, a Chinji Formation species. This change might have occurred about 11 Ma. *P. hysudricus* differs from *hyotherium* by having saggital cusplets in P4, increase in size, change in shape of anterior zygomata and squaring of the snout section. *P. hysudricus* has low crowned molars with shallow furrow. *P. hysudricus* can be compared with the species *Hippohyus sivalensis* in Hasnot area and fossils of both the species are often found together. The dental remains of *Hippohyus* and *Propotamochoerus* can be differentiated on the basis of snout size, shape of incisors and hypsodonty index of both genera. *Propotamochoerus* has long snout as compare to that of *Hippohyus*, has procumbent incisors and is less hypsodont than *Hippohyus* with shallow furrow. Other genus of Suids such as *Sivahyus*, *Sivachoerus*, *Sus* and *Hippopotamodon* are also often found in Dhok Pathan Formation. The closest relatives of the species *P. hysudricus* are found in Eurasia i.e.,

P. palaeochoerus (Kaup, 1833), *P. korynochoerus*, *Propotamochoerus provincialis* (Gervais, 1852) and *P. hyotherioides* (Schlosser, 1903). *Propotamochoerus palaeochoerus* is well known from the Vallesian of Central Europe (Mottl, 1966; Hünemann, 1968; Schmidt-Kittler, 1971) and Ukraine (Van

der Made *et al.*, 1999). Hellmund (1995) describe suid of this name from Maramena, Serres, Greece. The material of this specimen is also reported from Salihpaşalar, Turkey, Alcoy, Spain and Tataros in Romania by Rabeder (1985).

Table I: The measurements of cheek teeth of *Propotamochoerus hysudricus*.

Specimen No.	Position	Length (mm)	Width (mm)	Height (mm)
PUPC 15/17	M ²	24.7	20.0	11.3
*10486		25.0	21.5	-
PUPC 15/18	M ³	26.0	16.0	14.9
*7017		26.5	18.7	-
PUPC 15/19	M ₃	28.9	15.0	10.0
*B39		30.0	15.0	-
PUPC 15/20	M ₂	21.4	14.3	12.4
*2807		20.6	14.3	-

*Referred material taken from Pickford, 1988.

In *P. palaeochoerus*, p3 is also oval shaped, but quite narrow. The p3s of the Indian *P. hysudricus* are always short. *Propotamochoerus* is of Asian or Indian origin and migrated to Europe (Vander Made, 1999). Almost two hundred meters drop of the Sea level occurred in three successive events between 15-10.5 Ma (Haq *et al.*, 1987). Entrance of the Hippopotamodon (*Microstonyx*), probably originated in Asian region, in Europe and the Indian subcontinent occurred almost 11 Ma. *Listriodon* evolved in the Indian Subcontinent from *Bunolistriodon* and dispersed during MN 6 (Neogene mammalian unit) time span in Eurasia (Van Der Made, 1994). Possibly the dispersal of the palaeochoerid *Schizochocerus* was also at the same time. All these evidences suggest the major dispersal events between fauna of Indian and Eurasian continent, climate change occurred during late Miocene contributed a lot in this migration. Cerlinge *et al.* (1997) described a global vegetation change of C4 plants to C3 plants between 06 and 08 Ma. This vegetation change seems to have occurred first at the lower latitudes, whereas Western Europe was not much affected. The vegetation was also seemed to have changed in southern Germany and Turkey (Jung and Mayer, 1980). Such environmental changes are vegetational factors for dispersal of the Suids

between Indian/Asian and European region during Late Miocene.

Conclusion

It is considered that first appearance of *Propotamochoerus hysudricus* in the Siwaliks is in the central part of the Nagri Formation. This species also accompanied Siwalik fauna of the Dhok Pathan Formation and reported from younger outcrops as well where *Hippohyus* and *Sivahyus* are found (Pickford, 1988). The closest relatives of *P. hysudricus* are found in other parts of Eurasia. *Propotamochoerus hysudricus*, *Conohyus indicus*, *Hippopotamodon sivalense*, *Lophochocerus nagrii* and *Tetraconodon magnus* are the Late Miocene species of the Siwaliks, out of these *P. hysudricus* and *H. sivalense* have stratigraphic range up till upper part of Late Miocene. *Propotamochoerus hysudricus* is an indicator species of Late Miocene.

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