HOMO ERECTUS *ON UNIFIED QUATERNARY PLATFORM IN INDIA AND CHINA*
A CORRELATION & SEQUENTIAL ANALYSIS

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ABSTRACT

The skull cap of Narmada Man *Homo erectus* was found in Narmada Valley near village Hathnora (22 ° 52" N; 77 ° 52" E) in fossiliferous boulder conglomerate, in district Sehore, M.P., India. The skull cap is completely fossilized undistorted, renal vault nearly complete except few left Supra-orbital and statures are nicely preserved. The various morphological features and robust form of skull and excessive thickness of the bones indicate that it belongs to adult male individual (Sonakia, 1984).

The discovery of skull cap of *Homo erectus* in fossiliferous boulder conglomerate in association of other mammalian fossil is recorded in stratigrphic column of Quaternary deposits at the depth of 83 m , where estimated total thickness of deposits is about (325 m).This blanket consist of sediments of three domain viz. glacial, fluvio-glacial and fluvial, which were deposited in distinct environment during Pleistocene to Holocene time (Khan & Sonakia (1992), (Khan et.al. in press).The statistical analysis of sediments form these different domain in vertical column has been conducted to ascertain the environment of sedimentation and trace the breaks in climate (Khan et.al. in press). In present paper an attempt has been made for the first time to correlate the various stratigraphic columns of associated hominid fossils of Narmada valley (325 m) India and that of Luochuan sequence,(90-120 m) Chenjiawoe (50m) and Congwanling sequence (36 m) of China on unified Quaternary platform tied up and developed at mean sea level. The study revealed that the depth of occurrence of Narmada skull cap on unified Quaternary platform is about (83 m) as compared to with that of Chenjiawo and Gongwangling of China which occur at very shallow depth of 38 and 26 m respectively. The estimated age of Narmada Man based on these parameters is about 1.38 m.y. (+), which is greater than *Homo erectus* of Chenjiawo 0.65 m.y. and Gongwangling 1.15 m.y. of China An Zhisheng and Ho Chuan Kun (1989). On the merits of correlation of startigraphic columns of Quaternary of Narmada, accumulation of sediment, rate of sedimentation, palaeo- environments, lithostratigraphy and biostratigraphic position of boulder conglomerate in unified Quaternary Platform, author consider it as one of the earliest and oldest *Homo erectus* in Asia.

The study of morphometric parameters of skull cap of Narmada man and palaeo-environmental setting of Hominid locality indicates that it belongs to an adult male individual and lived in dry cold and seasonally humid climate in Narmada Valley during upper segment of lower to middle Pleistocene time.

KEYWORDS: Ash beds, Boulder conglomerate, fluvial, fluvial-glacial, glacial, *Homo erectus*, Pleistocene, quaternary, quaternary platform and sedimentation

INTRODUCTION

The Narmada river originates from the Amarkantak plateau of Satpura Ranges in Rewa at an elevation of about 1057 m (220 40' -810 45'), flows westerly course for about 1284 kms length across the middle of Indian subcontinent before entering Gulf of Cambay in the Arabian Sea near Baroda in Gujarat state. It enters the fertile alluvial plain and passes through the deep gorge of about 19 kms long consisting of Marble rocks near Jabalpur. It then takes westerly turn through the alluvial tract, situated between the Satpura and Vindhyan hills. The river course of Narmada conspicuously straight and is controlled by ENE_WSW to E_W lineament, is bounded by Vindhyan in the north and Satpura in the south. The valley has maximum width of about 32 kms.

The Quaternary tract of Narmada basin covers an area of abut 12950 sq. km starting from west of Jabalpur ($23^0 07^0 790530$) to east of Handia (22^0 29'; 76^0 58') for a distance of about 320 km. It is found to be ideal locus of Quaternary sedimentation in Central India as witness by multi-cyclic sequence of Quaternary terraces in the valley. The total estimated thickness of Quaternary sediments in the central sector of Narmada is about 325 m.

In present paper attempt has been for the first time to correlate the Quaternary sequence of Hominid locality Hathnora ($22^o 52' 77^o 52'$) (325 m) India, with that of Luochuan (90-120 m) Chenjiawo (50m) and Congwanling sequence (36 m) of China on unified coded model of Quaternary platform tied up and developed at mean sea level to ascertain the depth of occurrence and age of skull cap of Narmada *Homo erectu*s Sonakia (1984) which has been recovered from boulder conglomerate in the vom of Narmada .

REVIEW OF THE LITERATURE

Splishbury (1833) was first to initiate the paleontological studied of Quaternary deposits of Narmada valley. Princep (1832) described the Splishbury collection, which now forms the part of fossil collection in British museum. Falconer (1859) and Yedekker (1880, 1882, 1884) have given the detail account of vertebrate fauna from Narmada valley. Theobold (1860, 1881) was first to study the Quaternary deposits of Narmada in Hoshangabad and surrounding area. He referred the Quaternary deposits of Narmada is of Pleistocene age. He divided these deposits in lower and upper Groups and reported an axe from reddish clays of the Upper Group. In the following year Late (1881) recorded a human cranium (transported), which was identified as *Homo sapien*, supposed to have come from conglomerate bed of Lower Group. Unfortunately the cranium specimen was lost in the museum of the Asiatic society of Bengal, hence the find remained inconsequential. Pilgrim (1905) reported various stone implements and considered the deposits to be Pleistocene age. De Terra and De Cardian (1936), De Terra and Petterson (1939) correlated these deposits with the Pleistocene of Northern India. Broadly they agreed to the classification of Narmada in to lower and upper Group as opined by Theobold (1860). The *Homo sapien* cranium, which Theobold thought, came from the conglomerate bed, according to them it could have come from a younger deposit. They collected many Paleolithic tools, and stone

implements but they were unsuccessful in coming across any mammalian fossil. Based on fossil assemblage and stone implements they compared the Quaternary of Narmada with those of Middle Pleistocene of North Western India characterized by fauna Elephas antiques (mammalian). Hoojier (1963) and Khatri (1980) studied various paleontological aspects of Quaternary deposits of Narmada valley. Triparthi (1968) compared and correlated the Quaternary deposits of Godavari Valley with the sediments of Narmada Alluvium, on the basis of fossil assemblage and stone implements. According to him the Narmada fauna was equivalent to older alluvium fauna of Indo-Gangetic plain and slightly older than that of Kurnool cave deposits. Roy, A.K. (1971), studied various aspects of ground water of Narmada valley. Gupta (1974) studied geological and geomorphologic aspects of parts of Narmada valley. Adyalkar (1975) studied paleogeography of Narmada in relevance to ground water potential. Biswas and Dassarma. (1981) Badam (1979) and Dasssarma (1979) studied the fossil assemblage of Quaternary strata of Narmada valley.

Khan (1984) carried out detailed geological, geomorphological and sedimentological studies and identified three prominent terraces in the Central sector of the Narmada. (Khan Sonakia 1992), studied Quaternary deposit in vertical column in relevance to occurrence of Human Skull and reported glacial and fluvio- glacial deposit in Narmada valley for the first time. The boulder bed which yielded Hominid fossil for the first time reported to be of glacial - fluvial origin (Khan & Sonakia 1992). Beside occurrences of association of ash beds with fossileferous boulder conglomerate (Khan & Rahate 1991) indicates some distant volcanic source. .

Khan and Sonakia (1992) reported for the first time glacial and interglacial deposit in the Narmada valley, Central India which is represented by arid and humid cycles. Magneto-statigraphic studies are being carried out by (Rao, et.al 1997). The lithostratigraphy of Narmada valley described by Khan (1984), Khan & Benarjee (1984), Khan & Rahate (1990-91), Khan & Sonakia (1992), Khan *et al* (1991), Rahate & Khan (1985), Khan (1991), Khan & Sonakia (*1992*), Yadav & Khan (1996).

Present work

The first author was associated with Narmada valley project as official assignment from 1982 to 1992 on the merits data base data synthesis and results obtained he attempted to build up the lithostratigraphy of sediment, to conceive the three dimensional model of Quaternary platform of Narmada with special reference to concealed and hidden fossiliferous boulder conglomerate to correlate the Quaternary of Hominid locality Hathnora ($22^{o}52'77^{o}52'$) (325 m) India, with that of Luochuan (90-120 m) Chenjiawo (50m) and Congwanling sequence (36 m) of China on unified Quaternary platform. (Table No 1)

QUATERNARY SEQUENCE OF NARMADA INDIA

In Narmada Valley the area around Hominid locality of Hathnora is occupied by thick and multiple sequences of Quaternary sediments. Based on study of statistical parameters of sediment their deviation and breaks in vertical stratigrphic column between 00.00 to 260 m below the ground level indicate that the sediments consist of three domains viz. glacial, fluvio-glacial and fluvial.(Khan et.al in press) The study of these concealed sediments, their sedimentary environments and sedimentation and correlation both in vertical and horizontal

columns indicates that the lower most units, Boulder bed (20 to 260 m. below ground level) is of glacial origin, where as the fossiliferous bed Boulder conglomerate (260 to 278m. above m.s.l.) is of fluvio-glacial and top four formations in increasing antiquity Sohagpur, Shahganj, Hoshangabad and Janwasa(278 to 350m. above m.s.l.) are of fluvial origin and represent the complete sequence of Quaternary sedimentation in Central India. The Janwasa formation comprises of sediments of active channel deposit where as the older three (Sohagpur, Shahganj, Hoshangabad formation) are related to older flood plains deposits of paleo-do-main of Narmada and are grouped under older alluvium. Boulder conglomerate of fluvio-glacial origin is assigned an independent formational status. Khan & Sonakia (1992).

HOMINID LOCALITY HATHNORA

(22° -52 'N-77° 52' – E)

The skull cap of Narmada man *Homo erectus* Narmadanesis was found in near village Hathnora (22 ° 52" N; 77 ° 52" E) in fossiliferous boulder conglomerate, (Sonakia, 1984) at an elevation of about 268m above the m.s.l. and at the depth of about 83m in Central Narmada Valley. These deposits are underlain by glacial deposits and overlain by fluvial deposits of palaeo-domain of Narmada. The Quaternary sequence of Hathnora is described by Khan & Sonakia (1992).

The boulder conglomerate at Hominid locality Hathnora consist of stratified hard compact basal unit comprising of rook fragments of different shape and size of granite, quartzite, sandstone, agate, chalcedony, chart, basalt and calcareous nodules tightly cemented in the matrix of brown, red and grayish sand and silt. These rock clastics constitute various sub-litho units and are supported by grey and brownish, cross bedded sand. The sub-litho units consists of mostly pebble supported horizons which contains vertebrate fossils, stone implements, like chopper, scraper hand axes and core flakes mostly of quartzite, flint, chalcedony and quartzite.

A mandible of Lantian hominid at Chenjiawo (China) was found in paleosole (S6) and at the depth of 38 m in the loess deposits A Zhisehng et. al. (1989). Assumingly a roughly uniform accumulation rate of sedimentation in the line of Ma. et.al. (1978) estimation of age, the date of the Lantian mandible at Chanjiawo is computed to be about 0.65 m. m.y.r. Ho-chuan at the depth of 26m which were deposited in typical fluvial environments. In view of recovery of skull cap of *Homo erectus* (Narmada Man) from older deposits and from deeper level (83m.) as compared to Chinese Hominid, the claim of Lantian Hominid of Congwangling (1.15 m.y.r.) after A Zhisehng et. al. (1989)\ needs re-evaluation of reassessment of its age.

The rock basin of Narmada is occupied by the Quaternary sediments of three domains viz. glacial, fluvio- glacial and fluvial which were deposited in distinct environments during Quaternary time. The glacial deposit comprised of thick pile of sediments occupied base of rock basin and was deposited by glacial activities in dry and cold climatic condition during early Pleistocene time. The boulder conglomerate constitute fossiliferous horizon of Narmada, deposited in fluvio-glacial environments (interglacial). It is a marker horizon of Quaternary

sedimentation in Narmada Valley and as well in Central India its disposition and relation with other deposits in the valley, indicates a significant change in regional climate from cold dry to warm and humid, during which the sediment were re-worked from glacial front intermittently and deposited in the valley over a very long time. The skull cap of *Home erectus* (Narmada Man) and other fauna recorded along with calc- nodules within the boulder conglomerate; suggest that warm climatic phase prevailed long time. The Lantian hominid cranium at Gongwangiling was found in silty loess at the depth of about 26 m. and it Luochuan standard sequence the fossil bearing stratum un-doubted to the middle part of silty loess L-15 which at Luochuan was dated to be 1.09 to 1.20 m.y.r. The hominid fossil and associated faunas were discovered in the middle part of silty layer; the age of the fossils at Gongwanling can be pinpointed narrowly to 1.15 m.y.r. This dates differs from the earliest (0.75-0-80 m.y.r.) of Ma. et. al. (1978) and from 1 m.y.r. estimate of Cheng et. al. (1978). The Lantian fossil hominid at Gondwangling is considered as earliest *Homo erectus* in China. Ho Chuan Kun (1986).

In India Narmada basin considering the one of a main loci of Quaternary sedimentation, and assuming the uniform accumulation rate of sediment in the basin in the line of Ma. et. al. (1978) Yobin Sun & Zhisheng, An (2005) and comparing the Narmada sequence of Quaternary deposit (325 m.) with those of Luochuan standard sequence of Chenjiawo and Congwangling sequence of China. The skull cap of *Homo erectus* (Narmada Man) recovered from the boulder conglomerate of fluvio-glacial origin in middle part of Quaternary column from deep level of Narmada, at the depth of 83 m. above glacial deposits, in association of ash bed, as compared to Chenjiawo Hominid from inter bedded sequence of paleo sols loess and silty loess at the depth of 38 m. and Congwangling 26 m. from paleo sols which are younger than Narmada deposits.

The Narmada skull cap of *Homo erectu*s which is recovered from the vom of basal unit of boulder conglomerate at the depth of 83 m. (278 m. above m.s.l.) is estimated to be of upper segment of lower Pleistocene age. It is older than the *Homo erectu*s of Chenjiawo, Congwangling of China which were recovered from paleosole and loess deposit at the depth of 38 and 26 m. The Quaternary sequence of Narmada (325 m.) as compared to Louchuan (136 m.) sections of China on unified Quaternary platform is older and represents the complete and type sequence of Quaternary sedimentation in Central India. The occurrence of skull cap of early man at the depth of 83 m. in basal unit of boulder conglomerate of fluvio-glacial origin in Narmada Valley is one of the earliest and oldest *Homo erectu*s in Asia.

HOMINID LOCALITY LUOCHUAN CHINA

In China the study of human origins and evolution, now known as palaeoanthropology, began with the discovery of a worn and fossilized hominid molar tooth at Zhoukoudian, 48 km southwest of Beijing, by the Austrian geologist Otto Zdansky in 1923. Subsequent work at the cave deposit between 1927 and 1937 by European, North American, and Chinese scholars, including Johan Anderson, recovered a large number of hominid fossils and associated cultural remains Wu, M.(1980,1983, 1987), Wu, R. (1988), Wu, R et.al (1982,1983, 1987), Wu, X & Poirier (1995),Wu,X et.al (1966), Wu, X. & W L; 1985, Wu,X. & Zhang, Z (1985) Weidenreich, F, (1936) Weidenreich, F, (1937b). Up until 1995, information on Middle Pleistocene China was restricted by the minimal amount of publication in languages other than Chinese, the research opportunities and interests of western palaeoanthropologists and the

limited travel opportunities available to the Chinese scientific community. This situation as dramatically changed in 1995 with the publication of Wuand Poirier's *Human evolution in China*. (Wu, X & Poirier 1995), it has provided for the first time the detailed morphological, metrical descriptions and associated quaternary sediments of all of the major Chinese Pleistocene hominids in a single volume.

Author availing the opportunity of availability of Chinese literature and data of Homonid localities has studied and correlated the Quaternary sequence of Hathnora of Narmada India with Luochuan Quaternary sequence of China taking all salient and diagnostic elements and parameters on unified Quaternary platform for correlation for the first time.

Luochuan sequence

The Luochauan is considered to be standard and type sequence of Quaternary deposits of China. A Zhisehng et. al. (1989). The Chenjiawo and Congwanling hominoid sequence have compared with the sequence of Luochuan and Narmada for the purpose of building the lithostratigraphy and magneto-stratigraphy and ultimately assigning the age to hominid fossils. The Luochuan Sequence is multiple sequence of red clay, silty loose, loess and paleosole constituting differential litho units of variable thickness. The red clay with loess constitute the base of these deposits whereas the two sub-litho units of silty loess (L_9 & $L_{15)}$ are located W in the sequence at depth of 60 and 80 m inter bedded within paleosole and loess units. There are fourteen (14) sub-litho units of loess litho bedded with paleosole at an average depth of 0-75 m; besides three weathered paleosole ws-1 to ws-3 between 90 to 120 m. The paleosole units though form thinner horizons as compared to loess sediments but their frequency of occurrence and cumulative thickness constitute the major part of Luochuan deposits.

These deposits are associated with fairly good amount of calc- matrix and depict multiple cyclic sequences. Though the thickness of various sub- litho units decreases towards top and average total thickness of these deposits is about 130 m. These deposits are of riverine in origin as evident by the study of litho-logs after An Zhisheng (1989).

(iii) Chenjiawo Sequence

The Chenjiawo (34.15.N, 115.00 E) is located in a small tributary of Xiehu. Though the stream is of subsequent nature, but contribute appreciable sediment load from higher reaches and have entrenched the quaternary blanket of Bahe river, the trunk stream Xiehu drains north easterly across the Central China.

The Chenjiawao deposits consist of inter bedded complex sequence of palaeosole, loess, silty loess with sand and rock gravels at the base. It comprises of nineteen (19) sub-units of palaeosole, twelve (12) sub-units of loess, two (2) sub-units of silty loess with one (1) sub-unit of sand with sand gravel at the base. The total thickness of these deposits is 50 m. The sediments are fairly calcified depict cyclic sedimentation and upward fining sequence typical of basin deposits. An Zhisheng (1989).

The Mandiable Hominid of Chenjiawo was found in palaeosole (S6) at the depth of 38 m. assuming a roughly, uniform accumulation rate of soil loess couplets within Brunhes portion of the section, the date of Lantian mandiable at Chenjiawo is estimated to be 0.65 m yr. This is in

line of Ma et al. An Zhinsheng (1989). The Chenjiawo deposits besides Lantian Hominid consist of other final assemblage and are of middle Pleistocene age.

(iv) Congwanling Sequence

In China early human fossil were found either at various horizons of loess or in fluvial deposits of river basin. The fluvial deposit represents the former valley floor of river system and sediment of old flood plain facies which are often covered under loess of different ages. The Congwangliang (34 ° 11' 15" N-109 ° 30' 00") is situated in main Bahe river valley north east of Lantian in Shaanxi province of Central China. The *Homo erectus* is recovered from loess deposit (9th layer of loess sequence) which is situated near Gongwangling village. The Gongwangling (Lantian) cranial fragments were discovered east of Lantian, in 1964 by a team from the Institute of Vertebrate Paleontology and Paleoanthropology, Beijing (Wu and Poirier, 1995; Wu et al., 1966). The first hominid fossil to be found was an isolated maxillary molar and several months later this was followed by large cranial vault fragments. A large quantity of mammalian faunal material was also recovered from the site. A dominance of tropical and subtropical species has suggested a warmer climate Gu, & Jablonski, (1989); Qi, (1989). An et al., (1990); An and Ho, 1989; Wu et al., (1989) have described the various artifacts from the Gongwangling site as being primarily cores with five flakes and four scrapers.

The Gongwangling hominid skeletal materials were first described in detail by (Woo, 1965). A detailed English language discussion of Gongwangling can be found in Beijing (Wu and Poirier, 1995). The human fossils (PA 1051-6) include a complete frontal, large part of the parietals, most of the right temporal, part of the left and right nasals, and a large section of the right maxilla with associated second and third molars, and part of the left maxilla.. Features suggestive of Homo erectus are most apparent in the frontal bone which is broad, receding and have a robust supraorbital torus. There is marked postorbital constriction and no sulcus between the torus and frontal squama. Cranial vault bones are also relatively thickened certainly compared with *Homo erectus* from Zhoukoudian, In terms of geological age and sequence of early man in China in chronological order is: Gongwangling *Homo erectus*-Yuanmou *Homo erectus*-Beijing *Homo erectus* (or Chenjiawo *Homo* erectus-Hexian *Homo erectus)*- Dali Man (and Dingchun Man). It is evident that the Gongwangling Lantian Man is the earliest Quaternary human fossil so far found in China.
(Fig. No 1)

CONCLUSION

The skull cap of Narmada man *Homo erectus* Narmadanesis was found in near village Hathnora (22 ° 52" N; 77 ° 52" E) district Sehore, M.P., India in fossiliferous boulder conglomerate. It is recovered in stratigrphic column of Quaternary deposits at the depth of 83 m in of Narmada valley, where estimated total thickness of deposits is about (325 m).This blanket of sediments consist of three domains viz. glacial, fluvio-glacial and fluvial, which were deposited in distinct environment during Pleistocene to Holocene time (Khan & Sonakia 1992).

The Skull Cap is completely fossilized undistorted, renal vault nearly complete except few left Supra-orbital and sutures which are nicely preserved. The various morphological features and robust form of skull and excessive thickness of the bones indicate that it belongs to adult male

individual (Sonakia, 1984). The discovery of Skull Cap of *Homo erectus* in fossiliferous boulder conglomerate in association of other mammalian fossil is recorded at the depth of 83 m; in the Quaternary is estimated to about 1.38 m.y.r. (+) in age and can be considered as the oldest *Homo erectus* in Asia.

The estimation is based on study of fossils assemblage, association of ash beds, paleo soles, tephra bed in boulder conglomerate; palaeo environments, lithostratigraphic and biostratigraphic position of boulder conglomerate, depth of occurrence of skull cap (83 m.) and rate of accumulation of sediment in basin and position of fossil yielding horizon (330 m above m.s.l.), association of tephra beds, palaeo-sole, palaeo-environments, glacial and interglacial activities, in Central India during Quaternary time.

The estimated age of Narmada Man is about 1.38 m.y.r. (+), which is greater than Homo *erectus* of Chenjiawo 0.65 m.y. and Gongwangling man of China 1.15 m.y. Ho Chuan Kun (1988), which occur at the shallower depth of 38 and 26 m respectively in stratigraphic column of unified Quaternary platform as compared to Narmada Man.

The study of morphometric parameters of skull cap of Narmada man and palaeo-environmental setting of Hominid locality, indicate that it belongs to an adult male individual and lived in dry cold and seasonally humid climate during upper segment of lower to middle Pleistocene time.

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