# Discovery of a middle Holocene sub-fossil bone from Tiruvallur Taluk, Chingleput District, Tamil Nadu

We record here the discovery of a sub-fossil bone of *Boselaphus tragocamelus* (nilgai) in the upper Kortallayar basin, Chingleput district, Tamil Nadu (Figure 1) and examine its significance in terms of dating, relation to the archaeological record in this region and in the understanding of past climatic conditions. The Kortallayar basin forms a part of the Palar basin, Tamil Nadu. Geologically, the Upper Gondwana sandstones and shales of the Sriperumbudur and Satyavedu formations are capped by Quaternary formations in the form of fluvial/erosional features of ferricretes, pebbles, cobbles and boulders (Middle Pleistocene to Holocene) and alluvial deposits of sands, silts and clays[1].

The region falls in an area of wet tropical moderate bioclimate and dissymmetric rainfall regime with 330 mm in the south-west monsoon and 803 mm in the north-east monsoon[2]. The vegetation consists of the *Albizzia amara* and *Acacia* series of the semi-evergreen series consisting of scrub woodland, closed and discontinuous thorny thickets and scattered shrubs[3].

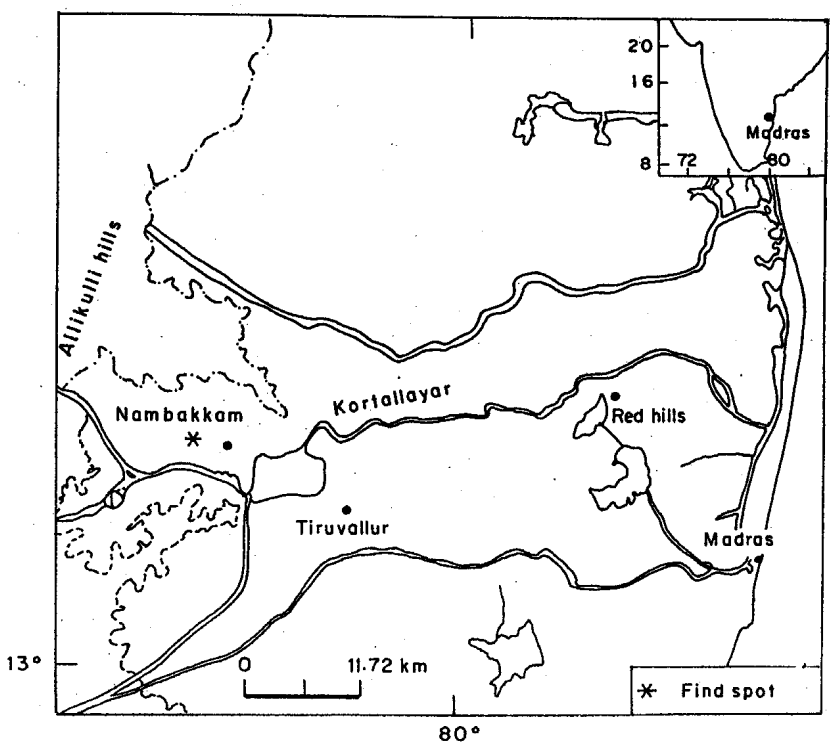


Figure 1. Location of fossil bone, Tiruvallur taluk, Chingleput district, Tamil Nadu.

Ever since the discovery of the first palaeolithic artifact at Pallaveram in Tamil Nadu[4], the Kortallayar basin has been an important centre for prehistoric research in India. More than sixty Lower, Middle and Upper Palaeolithic and Megalithic sites have been discovered here. Recent investigations in order to reconstruct the Quaternary palaeoenvironment and human settlement patterns are being conducted by the first author in the upper Kortallayar basin, in the light of new theoretical and methodological advances. However a major lacuna in the understanding of past ecology lies in the absence of a suitable sample of Quaternary fossils. The earliest discovery of a fossil in this region was made by R. B. Foote in 1863, in the Attrambakkam nullah (Tiruvallur taluk, Chingleput district), which was apparently washed out of the 'lateritic conglomerate' and which was associated with palaeoliths. It was identified by Busk and Boyd Dawkins as possibly forming a part of the human tibia with the platycnemic deformation found in people given to squatting on the ground. However due to the loss of articulations and imperfect condition this was not confirmed. The fossil was subsequently misplaced[5].

As part of the field exploration undertaken by the first author, a fossil bone was discovered in the canal cutting forming part of the Telugu Ganga project located near the village of Nambakkam (79° 53' E; 13° 14' N). The bone was located in compact Holocene clay at a depth of 1 m below the surface. The compact clay extends for a depth of 2 m and overlies the Upper Gondwana shales. It is capped in turn by ferricrete lag (Figure 2). In general, the composite stratigraphic sequence in this region

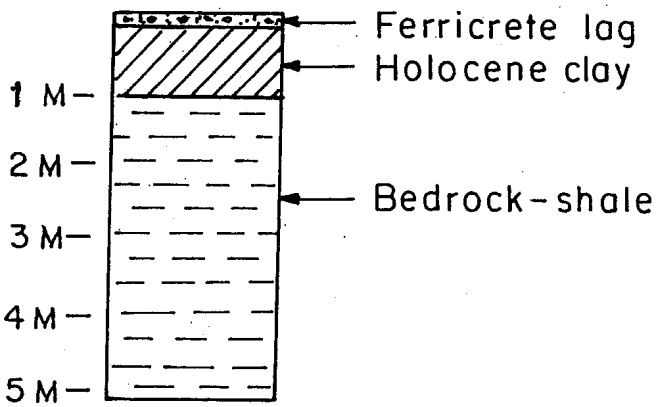


**Figure 2.** Stratigraphic section.

**Figure 3.** Femur of *Boselaphus tragocamelus* showing absence of epiphyseal ends.

consists of ferricrete overlying the bedrock and in turn capped by a ferricretised gravel and ferricrete lag.

The sub-fossil bone has been dated using the method of fluorine analysis. Fluorine analysis of animal bones is a well established relative dating technique and has been successfully used for dating of animal bones from various parts of India[6]. The basic principle involves the progressive accumulation of fluorine in buried bones through time. Thus with increasing age of the bone, the fluorine content increases. Fluorine/phosphate (100 $F/P_2O_5$) ratio is used for relative dating and is immensely successful in establishing the probable age of bones in cases where no other means of dating are available[7-9].

The specimen was analysed for fluorine and phosphorus content. It was found to contain 0.125% fluorine and 8.75% phosphorus with the 100 $F/P_2O_5$ ratio being 0.624. Bone samples from the Neolithic site of Paiyampalli (Tamil Nadu), Hunsgi valley (Karnataka) and Chalcolithic Ramapuram (Andhra Pradesh) as well as those from the Neolithic period at Betamcherla (Andhra Pradesh) have ratios of 0.262, 0.22, 0.214 and 0.335 respectively[10]. Considering the presence of varying geological contexts and fluorine contents in these localities, the ratio of 0.624 for the Nambakkam specimen is considerably higher than those assigned to Neolithic/Chalcolithic bones from Tamil Nadu, Karnataka and Andhra Pradesh. This indicates that the specimen predates the Neolithic/Chalcolithic phase in Peninsular India which is generally considered to have begun around 2500 BC. Thus the fossil can probably be assigned to the mid-Holocene. Although the middle Holocene fossil record in this region is represented by numerous late Mesolithic sites at Red Hills (Figure 1), the fossil bone was not found associated with any artifacts.

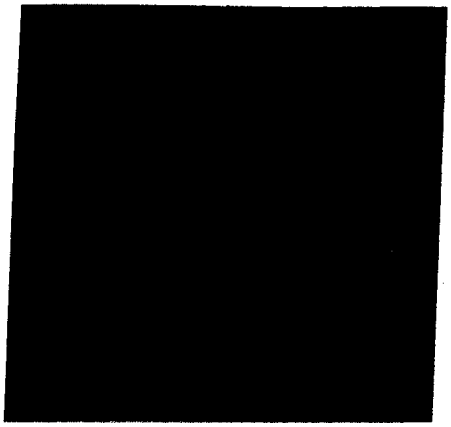

**Figure 4.** Natural chipping at the proximal end of the femur.

The bone has been identified as belonging to *Boselaphus tragocamelus* (nilgai). It forms the right femur represented by a complete shaft which has lost both the epiphyseal ends. The shaft is medio-laterally compressed, forming a prominent ridge on the anterior side of the bone which merges towards the proximal end of the femur (Figure 3). The trochanter minor is broken at the proximal end. The supracondyloid fossa is shallow. The specimen belongs to a younger individual and the epiphyseal ends were either unfused or just fused and hence could not withstand post-mortem taphonomic activates. There are a few irregular chipping marks on the anterior side of the distal end which appear natural and may be attributed to trampling prior to burial (Figure 4). However, the broken edges of the distal and proximal ends are very fresh and do not show signs of abrasion caused by fluvial activity.

Though palaeoenvironmental reconstruction may not be possible on the basis of a single bone, at the minimum it does indicate the possible existence of savanna grassland within the vicinity of the area of discovery during the early Holocene. Living nilgai inhabit open grasslands interspersed with perennial water bodies and are found grazing in association with their smaller cousins like antelope and gazella. However until more discoveries are made in this area, palaeoecological interpretations are tentative and subject to modification.

The significance of this discovery lies in the fact that it is the first fossil bone dated to the middle Holocene to be discovered in this part of the upper Kortallayar basin; and which has been

conclusively dated and identified. The search for further fossils, which is in progress, will throw more light on the nature of the palaeoenvironment and its significance in prehistoric studies in Tamil Nadu.


1. Muralidharan, P. K., Prabhakar, A. and Kumarguru, P., in Workshop on Evolution of East Coast of India, April 18-20, Abstract of Papers, Tamil University, Tanjore, 1993, pp. 1–3.
2. *National Commission On Agriculture, Rainfall and Cropping Patterns, Tamil Nadu*, Government of India, Ministry of Agriculture and Irrigation, New Delhi, 1976, vol. XIV.
3. Gaussen, H., Legris, P. and Viart, M., *International Map of the Vegetation and Environmental Conditions at 1/1,000,000. Notes on the Sheet Madras*, ICAR, New Delhi, 1964.
4. Foote, R. B., in *Mem. Geol. Surv. India*, 3rd s. 1866, part II, pp. 1–35.
5. Foote, R. B., *The Foote Collection of Prehistoric and Protohistoric Antiquities, Notes on their Ages and Distribution*, Government Museum, Madras, 1916, p. 8.
6. Kshirsagar, A., *Man Environ.*, 1993, **XVIII**, 24–32.
7. Kale, V. S., Kshirsagar, A. A. and Mitragotri, V. R., *Curr. Sci.*, 1983, **52**, 95–96.
8. Kale, V. S., Kshirsagar, A. A. and Rajaguru, S. N., *Curr. Sci.*, 1984, **53**, 319.
9. Rajendran, P. and Kshirsagar, A., *Curr. Sci.*, 1993, **64**, 147–148.
10. Joshi, R. V. and Kshirsagar, A., *Chemical Studies of Archaeological Bones from India: Fluorine and Fossilization Process*, Deccan College, Pune, 1986.


Received 2 June 1994; accepted 25 July 1994

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