Sex, Age and Height Determination in Asiatic Elephant 
(*Elephas Maximus*): A Case Study

**Abstract**

The present investigation was carried out on the skeletal remains of a dead Asian elephant (*Elephas maximus*) presented to the Centre for Wildlife Health, OUAT, Bhubaneswar by the District Forest Officer, Chandaka suspected of dying due to burning to determine the sex, tentative age and height of the animal. Basing on the morphology of skull, i.e. rounded and convex parieto-occipital crest, absence of temporal line in the postero medial wall of the temporal fossa and thin, short and pointed lip bone, it was confirmed that the suspected elephant was a female one. The tentative age of the animal was found to be about 6 years basing on the number of lamellae present on the table surface of molar tooth. The tentative height of the animal was ascertained from the shoulder height or height of the forelimb which was found to be about 6 feet. This study will help explore new avenues in the forensic wild life science in dealing with the vетero legal cases.

**Materials and Methods**

The present investigation was carried out on the skeletal remains of a dead Asian elephant (*Elephas maximus*) presented to the Centre for Wildlife Health, OUAT, Bhubaneswar by the District Forest Officer, Chandaka suspected of dying due to burning to determine the sex, tentative age and height of the animal. Most of the facial bones such as nasal, lacrimal, malar, distal part of the frontal bones were completely burnt. An investigation was carried out to ascertain the sex, tentative age and height of the animal. The sex of the suspected Asian elephant was determined based on the morphology of skull [5]. The tentative age of the animal was confirmed basing on the number of lamellae on the table surface of molar tooth [6] and the tentative height of the animal was ascertained from the shoulder height or height of the forelimb [7].

**Results and Discussion**

**Determination of sex**

The sex of the suspected Asian elephant was determined based on the morphology of skull [5]. The following findings played important role in determining the sex of the animal. The Pareito-occipital crest was found to be rounded and somehow convex on the dorso-median region of the skull (Figure 1), in contrast the said crest is reported to be concave or distinctly depressed on the median plane of the dorsal boarder of the skull of a male elephant. On examination of the postero-medial wall of the temporal fossa of the suspected elephant no temporal line was observed, rather, the area was smooth. As per literature, if the temporal line is present on the postero-medial wall of the temporal fossa of the skull of elephant, then it belongs to male sex. Therefore, absence of temporal line in the said location of the suspected elephant skull authenticates its female sex (Figure 2). On examination of the lip bone of the mandible of the suspected elephant, which is located as a median projection from the anterior end of the mandibular symphysis, it was found to be thin, short and pointed (Figure 3). This is the character of lip bone in case of female elephant. However, in case of males, this bone appears to be elongated, dropped downwards and somehow thick and broad. From the above three gross morphological observations on the skull bones of the suspected elephant, it was concluded that probably the suspected dead elephant was a female one.

**Determination of age**

The age of the Asian elephant depends on the number of closed loop called lamellae or lamina on the table surface of the molar...
tooth (Figure 4). In the present study, it was found that the enamel fold pattern on the table surface of the upper (6'' x 2.5'') and lower 3rd molar (6'' x 2.5'') revealed about 9 close looped (U-shaped) lamellae [7]. On comparison with the literature on the dentition pattern of the Asian elephant, it was found that the second molar (eight no. of loops) totally replaced by third molar by 6th year and one extra loop was about to grow [8]. So, the approximate age of the animal was speculated to be 6 years.

**Determination of height**

The current literature reveals that the height of the Asian elephants depend on their shoulder height [8]. Hence in the present investigation, the measurements pertaining to the bones of fore limb were considered to estimate the height of the shoulder for assessment of animal height (Table 1). The lengths of individual bones of fore limb were summed up for shoulder height, which comes to 70 inches (i.e., 70 inches/12 = 5.83 feet). Thus the estimated tentative height of the suspected dead elephant was about 6 feet.

**Table 1: Length of bones of forelimb.**

| Bone                          | Length (in Inch) |
|-------------------------------|------------------|
| Scapula                       | 18               |
| Humerus                       | 22               |
| Radius and Ulna               | 18               |
| Capals, Metacarpal including Phalanges | 12           |
| Total                         | 70               |

**Conclusion**

From the present investigation, it was confirmed that the suspected elephant was a female one and about 6 years old. The tentative height of the animal was found to be 6 feet. It is confirmed that the sex of the Asian elephant can be determined by studying the morphology of skull. Similarly, the tentative age can be calculated by counting the number of lamellae present on the table surface of the molar teeth. Further, the tentative height of the animal can be ascertained by the shoulder height which can be determined by summing up the lengths of the bones of the fore limb.

**References**

1. Choudhury A, Lahiri Choudhury DK, Desai A, Duckworth JW, Easa PS, et al. (2008) (*Elephas maximus*). IUCN Red List of Threatened Species. Version 2014 International Union for Conservation of Nature.
2. Sukumar R (1993) The Asian Elephant: Ecology and Management. (2nd edn), Cambridge University Press, England.

3. Stiles D (2009) The status of ivory trade in Thailand and Vietnam (PDF). TRAFFIC Bulletin 22(2): 83-91.

4. Shoshani J (2005) (Order Proboscidea). In Wilson DE, Reeder; Mammal Species of the World: A Taxonomic and Geographic Reference. (3rd edn), Johns Hopkins University Press, USA.

5. Todd NE (2010) Qualitative comparison of the cranio dental osteology of extant elephant, Asian elephant (Elephas maximus) and African Elephant (Loxodonta africana). Anat Rec (Hoboken) 293(1): 62-73.

6. Mariappa D (1986) Textbook of Anatomy and Histology of the Indian elephant.

7. Shoshani J, Tassy P (1994) The Proboscidea: Evolution and Palaeoecology of elephants and their relatives. Oxford science publication, Oxford, UK.

8. Kalita SN, Sarma M (2003) Anatomy of elephant: some important features. In Das D (Ed.), Health Care, Breeding and management of Asian elephants. College of Veterinary Science, Assam Agricultural University, Assam, India.