

# Human v. Non-Human: An Anthropologist's Cross to Bear

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## INTRODUCTION

- A severed limb, partially articulated with desiccated soft tissue (Figure 1), was discovered in rural Ohio and delivered by law enforcement to the local Coroner's office to determine possible medico-legal significance.
- Law enforcement initially thought the remains might be from one of two persons missing from the area where the remains were found and search efforts were mounted.
- The local Coroner's office contacted the Forensic Anthropology Case Team at Ohio State to ask assistance in analyzing the remains.
- Morphology alone was enough to establish that the skeletal elements were diagnostic of non-human; they were determined to be the remains of a bear hind paw. This was reported immediately to the Coroner's office, which then relayed the information to law enforcement and search efforts were suspended.
- Radiographic and histological analyses were subsequently conducted to supplement the gross morphological examination and more fully examine differences between human and bear anatomy.



Figure 1: Suspected human remains articulated with desiccated soft tissue.

## GROSS MORPHOLOGY

- A gross morphological investigation revealed the skeletal elements in question to include a distal tibia and fibula, seven tarsals, five metatarsals, five proximal and three intermediate pedal phalanges. Unfused epiphyses indicated the remains were from a juvenile.
- While bear paws without claws, especially when still covered with soft tissue, are easily mistaken as human hands or feet, there are several gross morphological features of the bear hind limb that are not consistent with normal human morphology (France 2009, Smart 2009):
  - Tibia – distal articular facet is more heavily sculpted
  - Fibula – shaft is smooth and rounded rather than angular
  - Calcaneus – more angular, displaying a 'pinched' appearance

## GROSS MORPHOLOGY (contd.)

- Astragalus/Talus – more flattened, with deeper concavity in the trochlea
- Navicular – more triangular; lacking large medial tuberosity
- Cuneiforms – smaller and lacking wedge shape
- Cuboid – overall smaller, but with relatively larger cuboid tuberosity
- Metatarsals – central ridge on distal articular surface
- Phalanges – more angular proximal and distal articular surfaces



Figure 2: Articulated bear paw (superior view, left), and bear metatarsals (inferior view) displaying a central ridge on the distal articular facet.

## RADIOGRAPHY

- Radiographically, the most distinguishing features that differentiate a bear hind limb from a human foot are as follows:
  - Two sesamoid bones per digit, rather than only with the hallux
  - Central ridge on distal articular surface of metatarsals
  - Phalanges exhibit more angular articular surfaces



Figure 3: Comparative radiographs of a bear hind limb (left) and human foot exemplar (right).

## HISTOLOGY

- Cross-sections were taken from the bear and a human exemplar from the distal 1/3 of the tibia (Figure 4) and fibula (Figure 5), ground to approximately 100µm and photographed under polarized light.

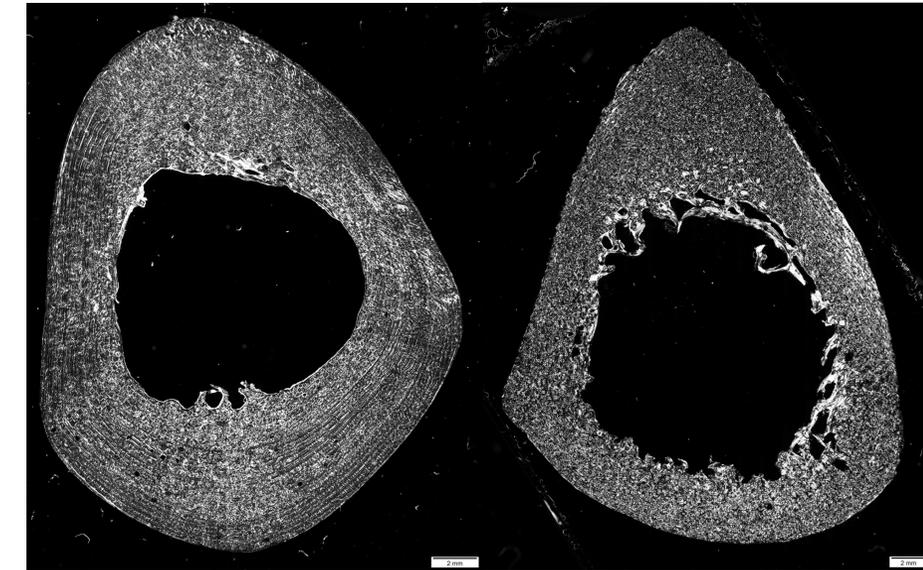


Figure 4: Comparative histology of bear tibia (left) and human tibia (right).

- Histologically, the bear differed from human via the presence of long, lamellar bound primary and secondary osteon bands visible in both the tibia and fibula, as well as large areas of plexiform bone observed in the tibia.

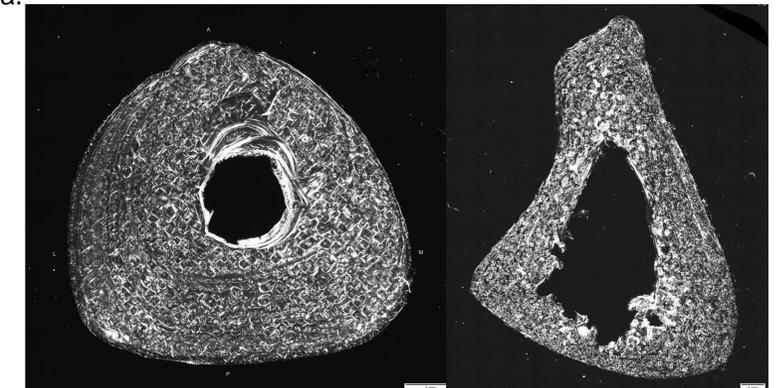


Figure 5: Comparative histology of bear fibula (left) and human fibula (right).

## CONCLUSIONS

- This case study demonstrates the utility of anthropological analyses to discern between human and non-human skeletal elements, helping to determine if unknown remains are of medicolegal significance.
- Multiple lines of evidence are presented here to demonstrate that, although similarities exist between bear paws and human hands/feet, diagnostic differences are present morphologically, radiographically, and histologically.

### REFERENCES CITED

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