

Bone remains at the Golah Road Site, Rush NY: an analysis of species identification and pathology

Robyn Wakefield-Murphy, PhD

Assistant Professor, Anatomy

New York Chiropractic College

1.0 Introduction

Bone remains were discovered during cultural resource management investigations of the Golah Road site, in Rush NY. Previous anthropological consultation suggested that the remains belonged to a heron or a bear. This report contains an anthropological analysis of the remains at the Golah Road site to be presented to Invenergy Inc, the Seneca Nation, and the State Historic Preservation Officer of New York.

2.0 Species Analysis

The bone recovered from the Golah Road site resembles a human phalanx. In forensic and archaeological contexts, bones of bird and mammal species may also resemble human phalanges (Sims 2007:1; France 2010; France 2016:659). In a comparison of human, bird, and mammalian bones, there are several key differences. Bird bones are hollow, have a smooth and glossy external texture and frequently have sharp bony projections (Beisaw 2013:18). Bird bones also do not contain trabeculae (Beisaw 2013:20). Mammalian long bones have a rough, wood grain type texture and feature concentrations of trabecular bone at the articular ends with small marrow cavities within the diaphysis (shafts) (Beisaw 2013:18-20; France 2016). The bone from the Golah Road site has a wood-grain textured surface and has concentrations of trabecular bone at the articular ends exposed through taphonomic alterations and is therefore representative of a mammalian species (Figure 1).



Figure 1: A) Dorsal surface of Golah Road site bone, arrow featuring mammalian wood-grain cortical texture; **B)** Proximal articular surface of Golah Road site bone, arrows feature taphonomically exposed trabeculae. Photos by Robyn Wakefield-Murphy, PhD.

The bone from the Golah Road site is a proximal phalanx based on the shape of the articular surfaces and length and gracility of the diaphysis; the diaphysis and articular surfaces are too gracile to be that of a bear intermediate phalanx. Mis-identification of black bear vs. human phalanges commonly occurs in forensic and archaeological contexts as the general size and shape of the hand/foot phalanges between these species bear a distinct resemblance (Stewart 1959; Orcholl et al. 2001; Sims 2007:1; Dogăroiu et al. 2012; Gocha et al. 2013). Comparison of the distal articular surfaces of human vs. bear phalanges reveals distinct diagnostic differences between the two species (Orcholl et al. 2001:9). The diagnostic feature of bear phalanges is a deep v-shaped midline notch on the distal articular surface that is markedly absent in human phalanges (Orcholl et al. 2001:9; Sims 2007:3; Dogăroiu et al. 2012: 133) (Figure 2). The proximal articular surfaces of first bear phalanges also have a deep midline groove that is characteristically absent in humans (Dogăroiu et al. 2012: 133)(Figure 3). The bone from the Golah Road site does not have a deep v-shaped midline notch in the distal articular surfaces, nor does it have a deep midline groove in the proximal articular surface (Figure 4). The diagnostic features of bear phalanges are not present on the bone from the Golah Road site, therefore it is a human phalanx. The Golah Road site bone is diagnostically similar to a proximal human foot phalanx (Figures 5-7), though there is a pathological lesion on the distal articular surface (see Section 3.0).

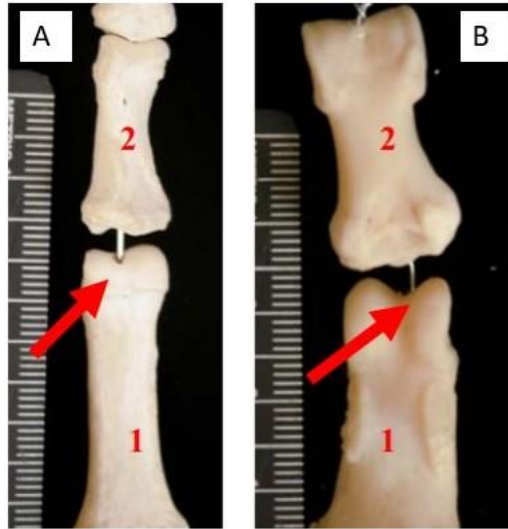


Figure 2: **A)** Palmar surface of human hand phalanx, arrow features slight midline indentation of distal articular surface with an absent v-shaped midline notch. **B)** Palmar surface of black bear phalanx, arrow features diagnostic v-shaped midline notch. **1:** proximal phalanx **2:** intermediate phalanx. Photo adapted from page 3, Figure 4 of Sims, ME. 2007. Comparison of Black Bear Paws to Human Hands and Feet. Identification Guides for Wildlife Law Enforcement No. 11. USFWS, National Fish and Wildlife Forensics Laboratory, Ashland, OR.



Figure 3: **A)** Human phalanges, palmar surface; arrow indicates absent midline groove on proximal articular end. **B)** Bear phalanges, palmar surface; arrow indicates marked midline groove on proximal articular end. **1:** Proximal phalanx **2:** intermediate phalanx **3:** distal phalanx. Photo adapted from page 3, Figure 3 of Sims, ME. 2007. Comparison of Black Bear Paws to Human Hands and Feet. Identification Guides for Wildlife Law Enforcement No. 11. USFWS, National Fish and Wildlife Forensics Laboratory, Ashland, OR.

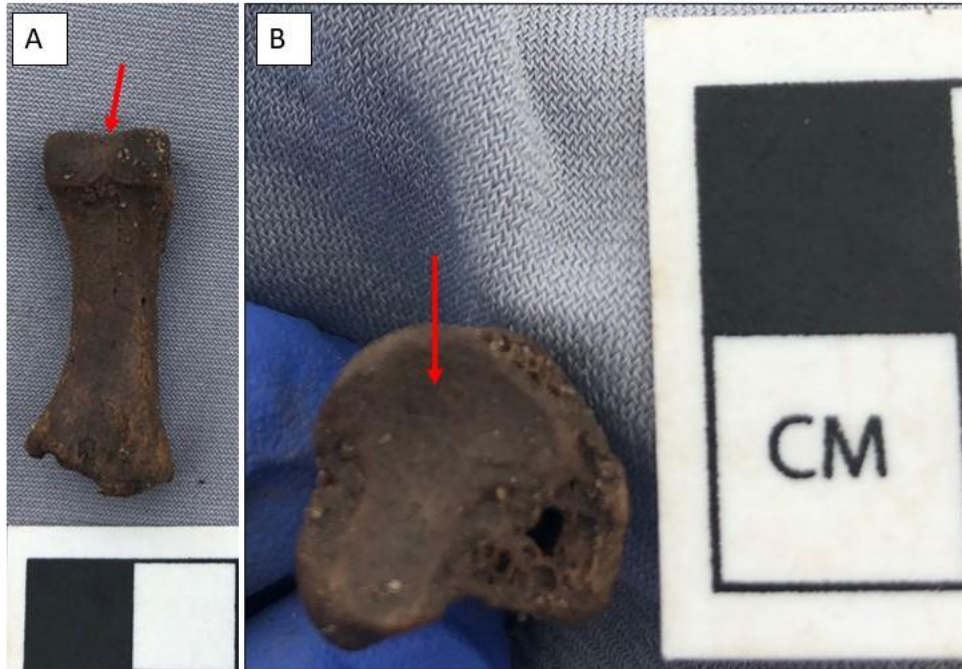


Figure 4: A) Golah Road site bone, plantar surface; arrow indicates margin of distal articular surface with lack of diagnostic v-shaped notch **B)** Golah Road site bone, proximal articular surface; arrow indicates smooth articular surface with lack of a deep midline groove. Lack of a v-shaped notch in the distal articular surface and lack of a midline groove in proximal articular surface indicates that this phalanx is human rather than black bear. Photos by Robyn Wakefield-Murphy, PhD.

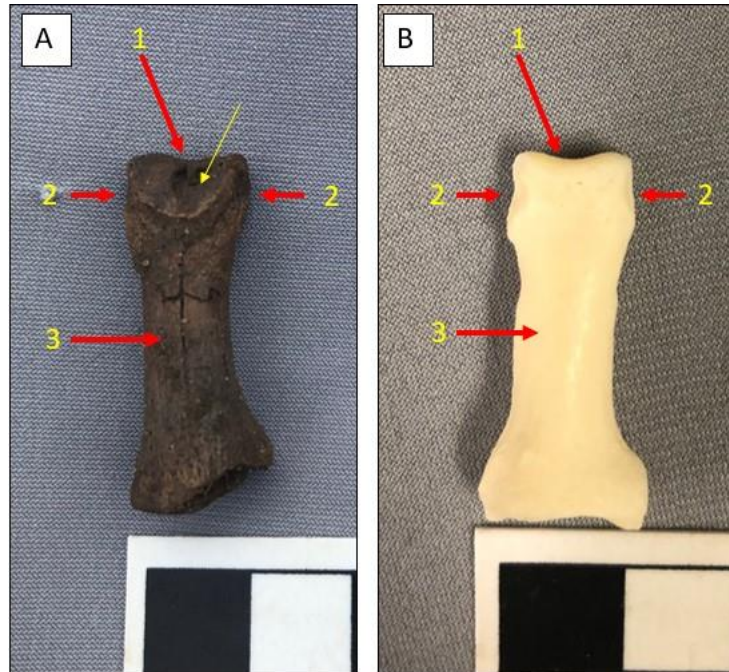


Figure 5: A) Golah Road site human proximal foot phalanx, dorsal surface **B)** modern human anatomical specimen, proximal foot phalanx, dorsal surface. Notable similarities in the following structures **1:** smooth margin of distal articular surface with lack of deep v-shaped notch **2:** impressions for distal lateral surface fossae **3)** diaphysis that tapers inwards mid-shaft. Yellow arrow indicates pathological lesion on distal articular surface of Golah Road site phalanx. Photos by Robyn Wakefield-Murphy PhD

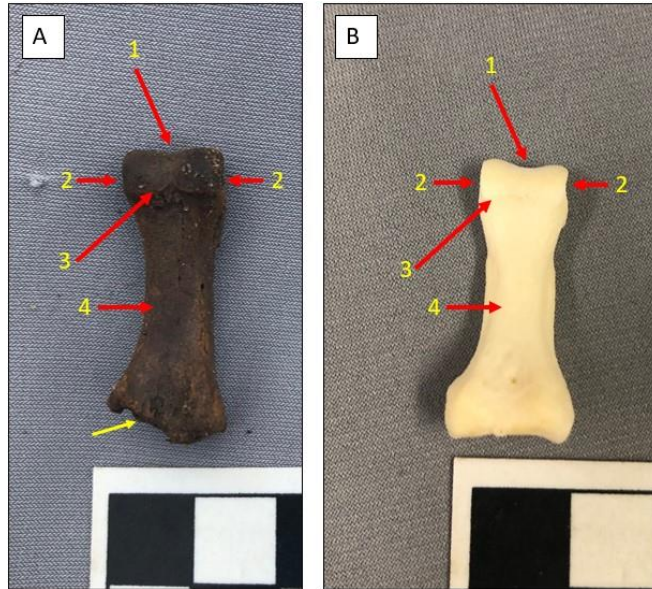


Figure 6: A) Golah Road site, human proximal human foot phalanx, plantar surface **B)** modern human anatomical specimen, proximal foot phalanx, plantar surface. Notable similarities in the following structures: **1:** smooth margin of the distal articular surface with lack of deep v-shaped notch **2:** impressions for distal lateral fossae **3:** distinct lower margin of distal articular surface **4:** diaphysis that tapers inwards mid-shaft. Yellow arrow indicates taphonomic weathering of proximal articular surface of Golah Road site phalanx. Photos by Robyn Wakefield-Murphy, PhD.

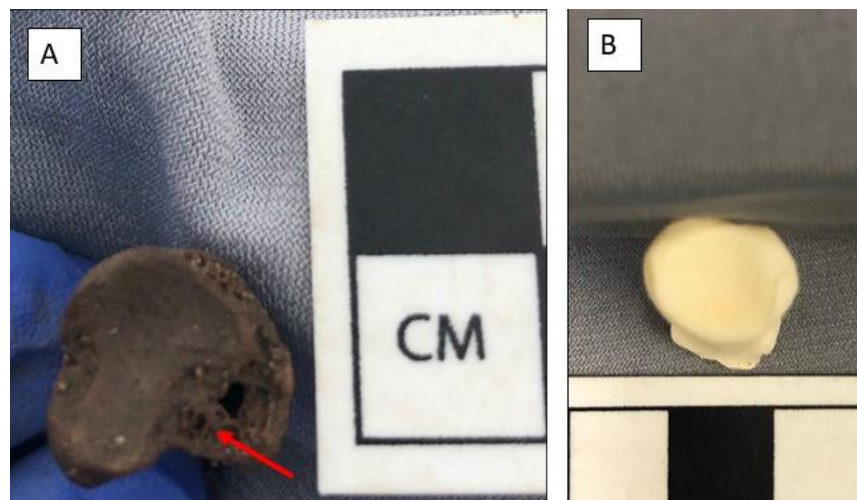


Figure 7: A) Golah Road site human proximal foot phalanx, proximal articular surface, red arrow indicates taphonomic weathering **B)** modern human anatomical specimen, proximal foot phalanx, proximal articular surface. Notable similarity between smooth, round proximal articular surfaces with lack of midline groove. Photos by Robyn Wakefield-Murphy, PhD

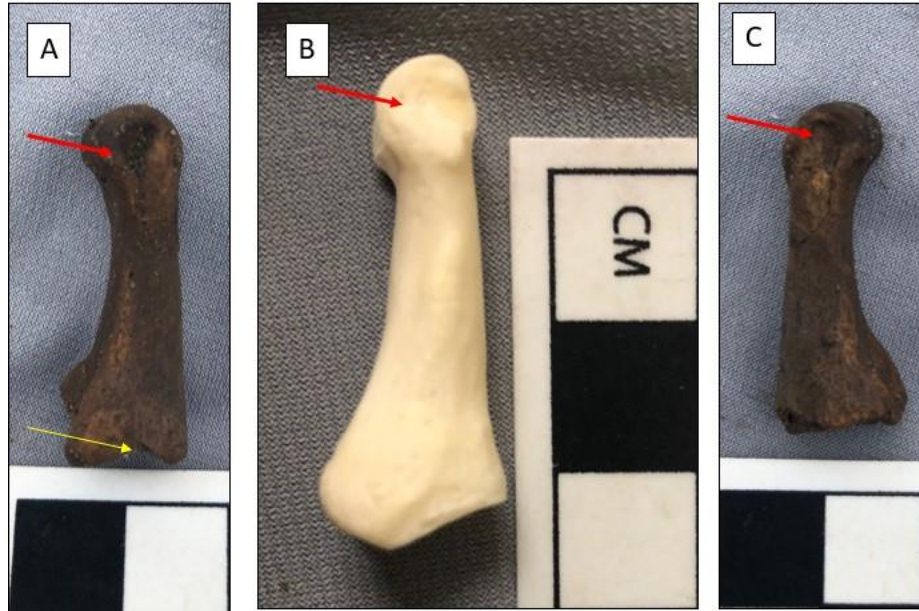


Figure 8: **A)** Golah Road site, proximal human foot phalanx, lateral view; yellow arrow indicates taphonomic weathering of proximal articular surface **B)** modern human anatomical specimen, proximal foot phalanx, lateral surface **C)** Golah Road site, proximal human foot phalanx, opposite lateral view from A. Red arrows indicate lateral distal surface fossae with marked similarities between modern human anatomical specimen (B) and Golah Road site specimen (C). The opposite lateral surface of the Golah Road site specimen in (A) shows a slightly more pronounced lateral fossa than B and C, but this is not outside of the normal range of human variation. Photos by Robyn Wakefield-Murphy, PhD.

3.0 Analysis of Age and Pathology

The proximal and distal epiphyses of the Golah Road site human phalanx are fused, indicating that the individual was an adult of at least 18 years of age at the time of death following epiphyseal fusion aging standards Scheur and Black (2004). There is a pathological lesion present on the distal articular surface of the bone (Figure 5) consisting of a round pit approximately 3mm in diameter with smooth walls and no exposure of the underlying trabeculae. This lesion is consistent with osteochondritis dissecans. Osteochondritis dissecans is a joint injury that results from the traumatic detachment of a portion articular cartilage and underlying subchondral bone, most commonly due to repetitive stress from vigorous biomechanical loading (Slaus et al. 2010; Polousky 2011, Vikatou et al. 2017).

4.0 Conclusion

Anthropological analysis of the bone from the Golah Road site concludes that the bone is a proximal human foot phalanx due to the lack of diagnostic features of bear phalanges and anatomical similarities to modern human anatomical specimens of foot phalanges. The fused epiphyses indicate this bone came from the skeleton of an adult and the presence of a pathological lesion on the distal articular surface indicates a traumatic injury to the interphalangeal joint known as osteochondritis dissecans.

Bibliography

- Beisaw AM. 2013. *Identifying and Interpreting Animal Bones: A Manual*. College Station, TX: Texas A&M University Press.
- Dogăroiu C, Dermengiu D, and Viorel V. 2012. Forensic Comparison Between Bear Hind Paw and Human Feet: Case Report and Illustrated Anatomical and Radiological Guide. *Romanian Journal of Legal Medicine* 20: 131 – 134.
- France DL. 2010. *Human and Nonhuman Bone Identification: a Concise Field Guide*. Boca Raton, FL: CRC Press.
- France DL. 2016. *Comparative Bone Identification: Human Subadult to Nonhuman*. New York: Taylor & Francis Group.
- Gocha TP, Dominguez VM, and Agnew A. 2013. *Human vs. Non-human: An Anthropologists Cross to Bear*. Poster Presentation. Midwest Bioarchaeology and Forensic Anthropology Association. Columbus OH, November 2013.
- Orcholl JL, Scholar M, and Hudson D. 2001. Diagnostic Criteria for the Comparison of Human and American Black Bear Skeletal Elements. University of Wisconsin, Milwaukee.
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.211.1955&rep=rep1&type=pdf>
- Polousky JD. 2011. Juvenile Osteochondritis Dissecans. *Sports Medicine and Arthroscopy Review* 19: 56 – 63.
- Sims ME. 2007. Comparison of Black Bear Paws to Human Hands and Feet. Identification Guides for Wildlife Law Enforcement No. 11. USFWS, National Fish and Wildlife Forensics Laboratory, Ashland, OR. https://www.fws.gov/lab/idnotes/idg11_bearhumanfeet.pdf
- Scheur L and Black S. 2004. *The Juvenile Skeleton*. Cambridge, MA: Academic Press.
- Slaus M, Cicvara-Pećina T, Lucijanić I, and Pecina M. 2010 Osteochondritis Dissecans of the Knee in a Subadult from a Medieval (ninth century A.D.) Site in Croatia. *Acta Clinica Croatica* 49: 189 – 195.

Stewart TD. 1959. Bear Paw Remains Closely Resemble Human Bones. *FBI Law Enforcement Bulletin* 28(11):18-22.

Vikatou I, Hoogland MLP, and Waters-Rist AL. 2017. Osteochondritis Dissecans of Skeletal Elements of the Foot in a 19th Century Rural Farming Community from the Netherlands. *International Journal of Paleopathology* 19: 53 – 63.