Forensic comparison between bear hind paw and human feet.  
Case report and illustrated anatomical and radiological guide

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Abstract: In about a quarter of the forensic anthropological cases one of the goals is to determine the human or non-human origin of the bony specimens. A particular difficulty is represented by the bear paws which show a close resemblance to the human hand or feet. This article is designed as a brief illustrated guide highlighting the most noticeable radiological and osteological differences of the bear hind paw in contrast to human foot.

Key Words: bear paw, human foot, forensic anthropological comparison.

Differentiation between human and non-human remains represents the initial assessment in about 20% [1] - 25% [2] of forensic anthropology cases.

In most of the cases this task is easy to accomplish by the experienced osteologist or anthropologist through morphological examination, especially when the skeleton is complete, the bones are intact or skin with hairs is still attached to the remains.

Difficulties may arise when the bony material is incomplete, fragmented, badly burned and epiphyses are absent or in case of the vertebrae, ribs, long bones, pelvis, and small bones of the hands and feet that have similar anatomical characteristics in humans and other animal species [3].

The skinned bear forepaw and hind paw show a close resemblance to the human hand or foot, emphasized by the absence of the claws that are removed when the bear is skinned, by cutting off the distal phalanges1. The presence of the claws would have made easier the differentiation between the two species.

The bones of a skeletonized bear forepaw and hind paw are also similar to the human hand and foot bones [3].

In all these practical situations, the expert’s opinion is required in order to eliminate the suspicion of the human origin of the specimen.

Bear paws are usually left or thrown away in areas at some distance from the hunting sites, where the bear is skinned and the butchery takes place. However, there are situations when the specimen is found in uncommon circumstances, such as the case presented in this article, when the human origin of the suspect specimen would have been imposed a different course of the forensic investigation.

Brown bear (Ursus Arctos) is a large carnivore found in North America, Europe and Asia. In contrast to most mammals which are digitigrades (walk on toes), bears as well as humans are plantigrades that means they step on the whole length of the foot sole.

The flat feet provide good support for the bear’s massive body, help in climbing and permit to rise up on its hind feet.

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This article is designed as a brief illustrated guide of the radiological and anatomical characteristics emphasizing the morphological differences between bear hind paw and human foot.

During the x-ray scanning of the baggage at the Henri Coanda International Airport, Bucharest, Romania, a suspect specimen similar to a human foot was detected in a passenger’s luggage [4] (Figure 1). The police was alerted and the specimen was sent for anthropological examination to « Mina Minovici » National Institute of Forensic Medicine to determine its human or animal origin.

The specimen (that was frozen at the time of detection) was skinned, had a length of 28cm, a maximum breadth of 11cm, all five fingers had the distal phalanx removed (disarticulated), had an abundant layer of whitish adipose tissue especially on the plantar region and a very developed musculature (Figures 2, 3, 4, 5).

In order to differentiate between human and animal origin three types of examinations were performed, in the following order: serological, radiological and osteological examination.

Three serological tests were performed on small fragments of muscle tissue, all giving negative results for human species: RSID (Rapid Stain Identification for blood), FOBT (Fecal Occult Blood test) and Uhlenhuth immunoprecipitation reaction.
The radiological examination used 2 projections: dorso-plantar and lateral view. For the anatomical-osteological examination, the soft tissues from the specimen were detached, as much as possible, with a scalpel, the remaining tissues being removed through boiling in a diluted NaOH solution, afterwards the bones were bleached with concentrated hydrogen peroxide solution.

Both radiological and osteological examinations showed that the examined specimen represented a bear left hind paw. A number of osteological characteristics of the bear hind paw which can be readily identified on any questioned specimen were selected as markers for differentiation between bear hind paw and human foot: 1. The presence of a great number of sesamoids: 2 semilunar shaped sesamoids (medial and lateral) on the plantar face of the head of each metatarsian (resulting in a total of 10 sesamoids), embedded in the flexor hallucis and digitorum. Another sesamoid bone is medially located at the level of articulation between navicular and medial cuneiform (embedded within the tendon of the tibialis anterior muscle) (Figures 6, 7, 8, 9). Human foot have only 2 sesamoids located on the plantar face of the head of the 1st metatarsian, embedded in the flexor hallucis brevis tendon.

2. Calcaneal tuberosity and sustentaculum tali are more developed in bears than in humans (Figures 6, 7, 10, 11).

3. Bear metatarsian heads have a ridge at the center of their plantar face [5] that separates the sesamoids bones described earlier (Figures 8, 12, 13, 14).
4. Metatarsals styloid process/tuberosity, especially that of metatarsian 5, is more developed in bears than in humans (Figures 6, 7, 13).

5. The head of the proximal phalanges have a deep V-shaped groove, in humans this articular surface has a relatively smooth flat shape [6]. A similar difference is shown by the base of these proximal phalanges (Figures 12, 15).

6. The base of the intermediate phalanges shows a groove that is deeper in bears than in humans (Figure 16).

7. In contrast to humans, the bear 5th metatarsian and the phalanges of the 5th toe are more robust than the 1st metatarsian and phalanges of the hallux. This makes the bear paw a mirror image of human hands/feet: the first toe which is the smallest, is medial on the bear paw and the fifth toe which is the greatest, is lateral (Figure 2). This means "the right paw of a bear looks like the left hand/foot of a human" [7].

References