

CASE REPORT

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A Case with Bear Facts

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ABSTRACT: During the summer of 1985, human skeletal remains along with accompanying material culture and various debris were discovered beside a logging road in Northern California. An analysis of the human remains and debris, which ran the gamut from a badly damaged 1974 automobile to the feces of a large mammal, revealed that an adult male Caucasoid, who had at one time had skull surgery performed, was partially eaten by a large carnivore, probably a bear. Along with the unusual circumstances surrounding this case which make it interesting, the fact that the victim's identity was later established allowed an opportunity to gain insight into some of the techniques employed by forensic physical anthropologists to discern sex, race, age, stature, and individual features. A review of some techniques is offered.

KEYWORDS: physical anthropology, musculoskeletal system, human identification, bears

Recently cases have been reported in which physical anthropologists have played a major role in the analysis of human remains recovered after carnivorous animal activity [1,2]. Such cases, particularly when an identification results, offer an opportunity to evaluate some of the methods and techniques developed for dealing with incomplete or badly damaged skeletal remains. This report addresses such an instance.

Background

On 9 July 1985 a law enforcement officer was dispatched in Shasta County, California to investigate the discovery of what was reported as human bones and a skull found along a logging road. There the deputy found a 1974 Oldsmobile with out-of-state plates. The automobile had been badly damaged by what the officer had determined to be a bear due to dried muddy tracks on and around the vehicle. Furthermore, he reported extensive damage to the automobile's vinyl top and foam rubber from claw marks. Some windows were broken out and the seats were described as having been badly torn by claws or teeth. The officer's report went on to state that clothing and various personal effects were recovered from within a radius of 70 yds (63 m) from the vehicle. Of particular interest to this report is the fact that animal feces were recovered from atop the hood and windshield of the automobile and in its

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vicinity. Within 65 yds (57 m) of the passenger side of the automobile and down an embankment, a major portion of a human calvarium and mandible as well as portions of the appendicular skeleton were discovered. Although numerous torn and tattered articles of clothing were found both inside and outside the vehicle, no human remains were recovered from within the auto.

While the authorities worked to identify the decedent from personal effects and to determine the circumstances of the death, the remains were brought to the Physical Anthropology Laboratory at California State University (CSU), Chico, to be examined. Beyond the usual forensic anthropological attempt to assist in identifying a decedent by suggesting his probable sex, age, race, stature, and any uniqueness, in this case, the authorities were particularly interested in assistance in determining a possible time and cause of death.

Material

The remains arrived at the laboratory on 25 July. The skull was represented by a well-preserved calvarium missing most of the face and all of the basilar portion. A few loose teeth from the upper dentition along with small contiguous maxillary fragments and an almost complete mandible were the only facial portions recovered. Evidence of alveolar resorption was found on portions of the mandible and on two of the maxillary fragments. Fillings were in evidence on some of both the upper and lower dentition. Before the analysis both the mandible and the calvarium were cleaned of what little adherent tissue remained and samples of hair from the scalp were removed and preserved. Indeed, while the remains were nearly devoid of flesh, each of the bones was greasy.

Of note was a burr hole in the left parietal. The center of the hole was 6 mm posterior to the coronal suture and 29 mm lateral to the sagittal suture. The edges of the hole possessed moderate remodeling as a result of healing and its shape was slightly triangular, measuring 8 (anterior-posterior) by 6 mm (midial-lateral). The hole was located within a circular depression which measured 11 mm in diameter (Fig. 1). While the need for caution in using such features to make positive identifications has been pointed out [3], their value has also been

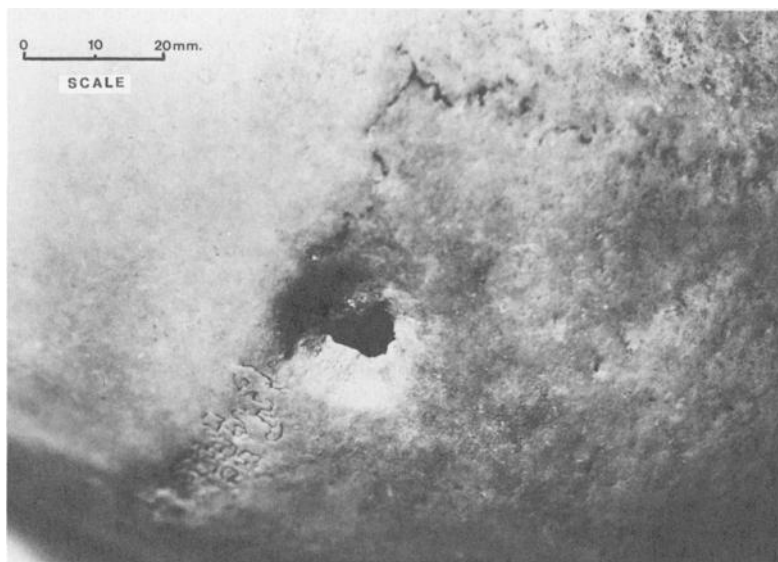


FIG. 1—Burr hole through the left parietal resulting from cranial surgery 20 years earlier.

recognized [4,5]. It did assist in making the identification in this case, as did dental records and various personal effects. It was later learned that the trephination was performed on the individual following an automobile accident 20 years earlier.

Also present were fragments from the shafts of both femurs, tibias, and humeri as well as the right radius. Moreover, a large fragment from the acetabular portion of a left innominate was discovered (Fig. 2). The ends of each of the long bones showed evidence of gnawing, with many ends exhibiting large conical or spiral fractures. These features were accepted as being like those described by Binford [6], which he suggests may be attributed to the work of large carnivores. As can be seen in Fig. 2, the innominate had also been badly damaged by animal chewing and indeed lacked those portions most effectively employed in suggesting age and sex. Also absent from the remains were the ribs, sternum, vertebrae, and many of the bones of the hands and feet. Indeed, the only remains from any of the digits were discovered following an X-ray of some of the recovered feces. The X-ray revealed the still articulated distal, middle, and proximal phalanges from the fourth digit of the left hand. Moreover, the nail was still attached. These observations offer evidence concerning the state of the victim at the time of being eaten. That is to say he was either still alive or he was eaten early during the decomposition process. Also discovered within the feces were several bone fragments too small to identify, and a large quantity of unidentified plant fiber.

Sex

There was a lack of various important features frequently used in assessing sex. However, observations of the size of the mastoids and browridges combined with evidence of moderate robustness on the nuchal area and a few of the fragmented long bones suggested maleness. This was in part supported by two more objective techniques, a discriminant function analysis of the mandible [7] and the measure of femoral shaft circumference [8-10]. The discriminant function analysis of the mandible, which is summarized in Table 1, yielded a value of 2043.20, which is greater than the critical value of 1960.05 for suggesting a Caucasoid male. However, when the function for separating black males and females was applied, a value of

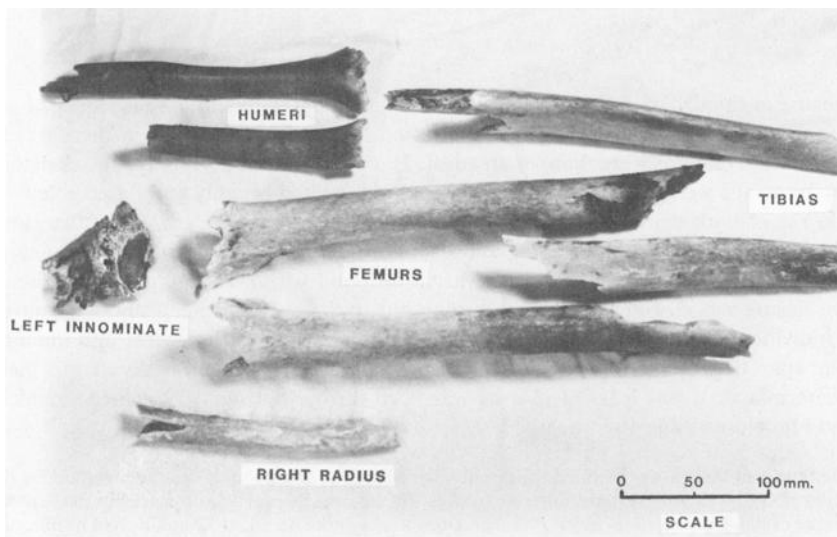


FIG. 2—Appendicular bones recovered.

TABLE 1—Discriminant function of sex by mandibular measurements [7].

Measurement	Value, mm	Caucasian		American Negro	
		Weight	Score	Weight	Score
10 ^a	37	22.206	821.622	2.020	74.740
11 ^b	29	-30.265	-877.685	-2.292	-66.468
12 ^c	82	1.000	82.000	2.606	213.692
16 ^d	68	19.708	1340.144	3.076	209.168
17 ^e	92	7.360	677.120	1.000	92.000
Discriminant score			2043.201		523.132
Critical value ^f			1960.05		549.82
Percent correct, reported by Giles [7]			85.9		86.9

^aHeight from the lowest median point on the jaw (menton) to the lower alveolar point.

^bMandibular body height as measured between the first and second molars.

^cFrom the most anterior point on the mandibular symphysis to an imaginary point formed by the posterior margin of the ramus and the anterior-posterior axis of the body, and measured parallel to the axis.

^dHeight measured from the uppermost point on the condyle to the middle of the inferior border of the body parallel to the vertical axis of the ramus.

^eMaximum diameter, externally, on the angles of the jaw (gonion).

^fValues larger than the critical value suggest maleness while those below suggest femaleness.

523.13 was obtained, which is less than the 549.82 value necessary for suggesting a male. The circumference of the femur at mid shaft was 88.3 mm and greater than those values reported by either Black [8] or DiBernardo and Taylor [9] for suggesting a male. It can be seen from Fig. 2 that this was an example of what DiBernardo and Taylor suggested when they stated that while the innominate permits greater accuracy in determining sex, the resistance of the femoral shaft to insult and decomposition often makes it of greater value [10]. In this case the remains were concluded to be those of a not-too-robust male. Following identification it was determined that the decedent was a 165-lb (74-kg) male.

Age

Because of the size of the bones, the degree of dental development, and evidence of union on the recovered phalanges as well as the previously mentioned resorption, there was little doubt that the remains were those of an adult. However, critical portions of the skeleton for determining age were absent. Therefore, age was estimated roughly and based solely upon the degree of both dental attrition and endocranial as well as ectocranial suture closure. While the value of each of these aging criteria is considered suspect due to both the degree of subjectivity involved and the degree of variation found within an age group, in this case suture closure was viewed with special caution due to the possible effects of cranial surgery. This individual was suggested to have died during his fifth or sixth decade, and the middle 10-year span between 45 and 55 was considered most likely.³ When the decedent's identity was determined, it was learned that he was born during Spring 1939, which would have placed him close to age 46 at death.

³The timing of this case prohibited the application of Meindl and Lovejoy's revised method for determination of age based upon lateral-anterior sutures. By the time their article appeared in the September 1985 issue of the *American Journal of Physical Anthropology*, the decedent's remains had been returned to his family for cremation. It was the restraint of time which prohibited an attempt to determine the victim's age by Kerley's method of osteon count, for once the identification was achieved (it was completed by 30 July), the authorities felt compelled to return the remains to an anxious family.

Race

Although the calvarium and mandible possessed morphology which assisted in a racial diagnosis (for example, the lack of postcoronal depression and alveolar prognathism, relatively long mastoids, and a Carabelli's cusp on the left M_2), the skeletal remains were not in themselves accepted as the most reliable evidence of racial ancestry. Rather, the adhering tissue and most specifically the attached hairs were used. Upon gross examination, the hair was fine and straight, while under magnification ($\times 200$) it appeared uniformly oval in cross-sectional shape. Together, these observations were used to suggest that the decedent was most probably Caucasoid, a conclusion that was later confirmed.

Stature

An estimate for the decedent's stature was derived by using the technique developed by Steele [11] for calculating maximum bone length from fragments. The value 32.9 cm (12.6 in.) was measured from the right femur from Steele's segment two (from the middle of the lesser trochanter to the bifurcation of the linea aspera at the superior margin of the popliteal surface). The remaining long bone fragments were too incomplete to allow the appropriate measurements to be taken to use Steele's stature formulas. Rather, the formulas of Trotter and Gleser [12] were employed. After correcting for age estimate, sex, and race, stature was suggested to within a range of 171.1 to 189.1 cm (5 ft-8 in. to 6 ft-2 in.). The decedent's records state he was 183 cm (72 in.) or 6 ft tall.

Bears

The last documented case of a grizzly bear in California was in 1922 [13]. Today the only bears remaining in California are those commonly known as the black bear. The genus and species *Ursus americanus* is represented in California by two subspecies: *U. a. altifrontalis* and *U. a. californiensis*. The *altifrontalis* variety ranges from British Columbia in the north to the Coastal Range in the northwest portion of California in the south. The *californiensis* variety is found from south central Oregon and the Cascade Mountains along the eastern side of California in the Sierra Mountains to as far south as the southern end of the San Joaquin Valley. Indeed, because either variety may be found in the area where this incident occurred, it would be difficult to determine which was responsible. Both are omnivorous, feeding off vegetation, berries, insects, honey, carrion, fish, frogs, fruit, and nuts [14], all of which are generally passed approximately one day after eating.⁴ It is said that as carrion eaters, bears aid in clearing their range of dead animals and that such activity is likely to occur following a harsh winter [14, 15]. While the bears are generally considered harmless, information provided by the Big Game Division of the California Department of Fish and Game suggests that black bears are notorious for scavenging trash cans, dumpsters, and campsites and occasionally break into cabins and mobile homes in their pursuit of a preferred food, such as bacon. Such incidents, if repeated, may require that rangers trap and relocate the offending animals.⁵ Although encounters which require relocation are seldom seen as threatening to human life, authorities suggest that the bears will attack if provoked. A situation involving a female bear with cubs or a human withholding food from a bear is considered particularly dangerous. According to Mr. D. Cook, the Department of Fish and Game's district authority on bears, during the period from 1977 to 1986 there has been only one potentially life-threatening incident, and it occurred when a lone camper in Trinity

⁴D. Cook, California Department of Fish and Game, Big Game Division, Sacramento, CA, personal communication, 5 Sept. 1986.

⁵J. Vencenti, California Department of Fish and Game, Sacramento, CA, personal communication, 3 Sept. 1986.

County slept on top of his bacon in a foolhardy attempt to protect it from animals. The camper survived a mauling to his lower extremities by climbing a tree, and he was later capable of walking to safety.⁴ It would appear that unless the bear or bears had been provoked, the automobile in this case was approached and attacked as if it were a large dumpster or small mobile home.

Circumstances of Death

It has been said to be difficult to determine the time since death from skeletal remains alone [16], and that an estimate is usually little more than an educated guess [17]. The difficulties are in part due to the fact that those agents which affect skeletonization, such as temperature, humidity, and the presence or absence of necrophagous insects and carnivores, are themselves quite variable [18,19]. However, a positive identification or unusual circumstances may assist in determining an exact time of death, as in a case discussed by Perzigian [20]. Following the identification of the decedent in this case, it was determined that he was last seen alive by a sheriff's deputy on 19 Nov. 1984 when he was discovered in a parking lot asleep in his automobile. When the authorities next discovered the vehicle it was at the evidence scene on 9 July 1985, although it apparently was seen from afar two months earlier by a passing motorcyclist who was riding a dirt bike through the area. The cyclist reports that he approached the automobile close enough to notice it was badly damaged but did not investigate it further, nor did he detect any emanating odor. Thus the time of death can be narrowed to between 19 Nov. 1984 and early May 1985.

Although a serious explanation for the cause of death cannot be offered, it should be pointed out that the decedent was medically diagnosed as being crippled and requiring a cane to walk. Under the circumstances it may be that the victim found himself in a position where he felt he could not trek out, and rather, decided to spend the night in his automobile with hope that he would soon be discovered. Such a decision would doom an unprepared person to certain death from exposure, if not from bears, since at this time of the year the elevation of this location would have insured harsh winter storms and nighttime temperatures well below freezing.

Also, although it may be tempting to suggest that the victim provoked a bear attack, it is not likely since bears in this area of Northern California hibernate through the winter months from approximately early to mid-October until early April (see footnote 4). Furthermore, the condition of the recovered feces and the dried muddy tracks at the scene suggest that the victim was eaten during the spring.

Therefore, based upon our knowledge of personal encounters with the decedent, we can only narrow the time of death to between 19 Nov. 1984 and mid-May 1985. Knowledge of the weather conditions for Northern California during this period along with knowledge of bear behavior leads us to suggest that the victim probably died early during that period only to be frozen and discovered later during the spring thaw by carrion-seeking bears.

Summary

By the use of various physical anthropological techniques developed both inside and outside forensic science circumstances, it was suggested that human skeletal remains recovered from Northern California were those of a male Caucasoid who was approximately 45 to 55 years of age at death. Moreover, the person, who had at one time undergone skull surgery, was believed to have stood between 5 ft-8 in. and 6 ft-2 in. (171 and 189 cm).

Upon identification of the individual by means of personal effects, dental records, and evidence of skull surgery, it was learned that he was indeed a male Caucasoid approximately 46 years old at death and that he had undergone cranial surgery 20 years earlier for a hema-

toma produced by an automobile accident. Furthermore, it was determined that although the victim walked with a cane, he was actually 6 ft (183 cm) tall.

Although the circumstances of the death will never be made clear, we are certain that the individual was eaten by a large carnivore, probably a bear, and that the attack likely occurred during the spring following the victim's death.

Acknowledgments

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