

# *A Sea Otter (*Enhydra lutris*) Femur with Embedded Projectile Point Fragment from a Late Prehistoric Camp Site in Long Beach, California*

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## **Abstract**

CA-LAN-2616 is a Late Prehistoric camp located adjacent to the upper reaches of Anaheim Bay, Long Beach, California. Excavation of the site yielded evidence of seasonal occupations focused on the procurement of animal resources from the bay. Among the specimens recovered was a sea otter (*Enhydra lutris*) femur with a projectile point fragment embedded in the shaft above the knee. The specimen provides primary evidence of sea otter hunting using a stone tipped projectile. This procurement behavior is mentioned but not well documented in the ethnography of the Gabrielino Indians who once occupied the Los Angeles Basin. Radiological analyses of the specimen indicate that the animal suffered an infection as a result of the wound, and that the wound had begun to heal by the time that the otter was captured and processed.

## **Introduction**

Between 1994 and 1998, California State University, Long Beach (CSULB) pursued an archaeological test program to evaluate the cultural resources located on the campus (Boxt *et al.* 1999) (Fig.1). This research determined that the area was occupied over a span of approximately four millennia (ca. 1640 BC to AD 1860). During that time, the climate along the Los Angeles coast was punctuated by episodes of wet and dry weather conditions. This weather cycle affected the availability of food and water, and ultimately, the

intensity of human settlement and site location. In response, Late Prehistoric peoples located their seasonal camp sites along the banks of Bouton Creek, which is now situated on the north side of the CSULB campus.

Archaeological site, CA-LAN-2616, is located adjacent to Bouton Creek (Boxt *et al.* 1999). The site is typical of Late Prehistoric camp sites in southern California, where task groups, bands, or families met at certain seasons to procure and consume a variety of marine and terrestrial resources. The assemblage included a complete left sea otter femur embedded with a projectile point fragment.

The point-embedded femur is the only specimen of its kind known from the region. This specimen provides information about ancient hunting behavior and technology. The study specimen demonstrates that prehistoric otter hunters living along the Los Angeles Basin coast used stone tipped projectiles to kill sea mammals. The use of harpoons and similar devices to hunt sea mammals is known for the Gabrielino (Bean and Smith 1978:546; Bennyhoff 1950:303-304;

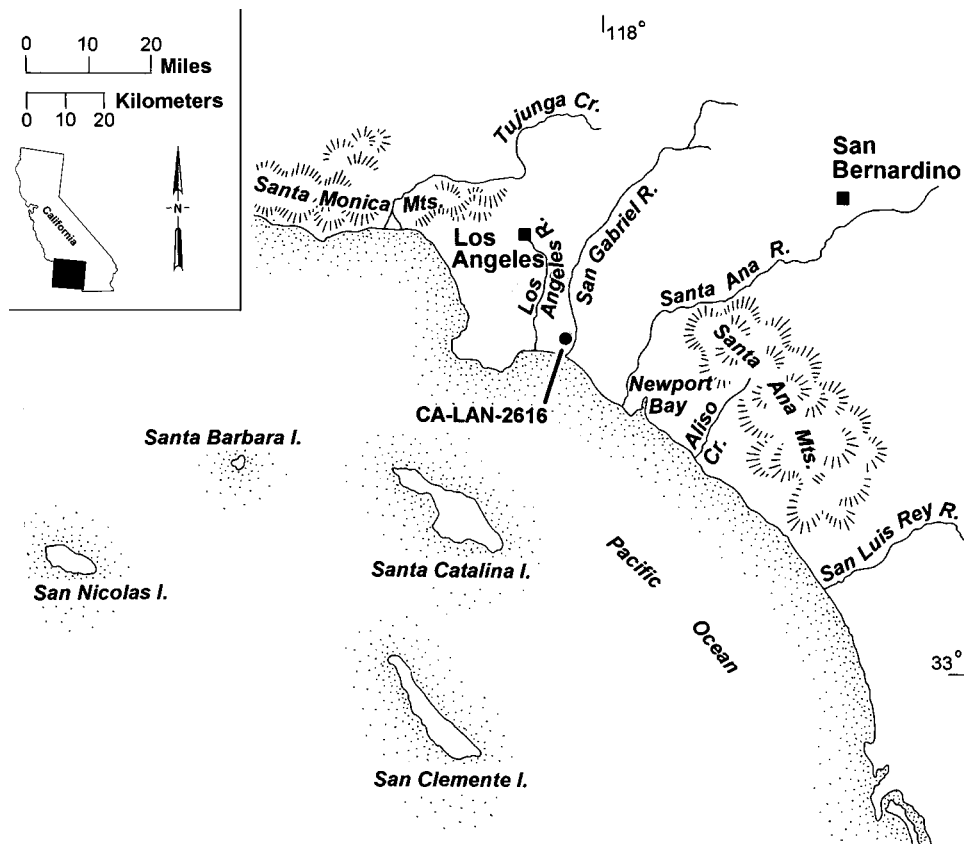


Fig. 1. Regional location map of CA-LAN-2616, greater Los Angeles area, Southern California.

McCawley 1996:123, 125-126, 141). Although not specifically mentioned, stone tipped projectiles were probably used by the prehistoric Gabrielino, as they were for the Chumash who lived to the north (Hudson and Blackburn 1982).

#### CA-LAN-2616

Approximately 28 cubic meters of earth were excavated at CA-LAN-2616, a site consisting of a midden in association with overbank deposits, and containing evidence of multiple occupations interspersed with periods of abandonment. A suite of 14 radiocarbon assays indicates that foraging peoples utilized this site from ca. AD 1420 to the early eighteenth century. The assemblage included ground stone tools associated

with plant food processing, projectile points used to hunt wild game, lithic waste flakes denotative of tool maintenance, and 150 kilograms of invertebrate and vertebrate faunal refuse, including the study specimen.

Inhabitants of CA-LAN-2616 procured aquatic vertebrate species from Alamitos Bay rather than journeying to the open coast which lays about 3.5 km to the southwest. Today, Alamitos Bay is located nearly 3 km south of CA-LAN-2616, but at the time of occupation the bay was a complex bay/estuarine system which extended much further inland. The upper part of that system was composed of marsh, slough and tidal flats that extended to within 0.5 km of the eastern edge of the site. Twenty-six of the more than 40 vertebrate species used by the inhabitants of

CA-LAN-2616 were procured from Alamitos Bay. Seals and sea otters were a major food source, second only to fish. The prehistoric diet was supplemented with other aquatic species including mollusks, turtles and birds. Terrestrial species (deer, rabbits, etc.) provided a smaller portion of the dietary resources.

### Sea Otters

Sea otters (*Enhydra lutris*) are large fissiped carnivores that inhabit marine waters along the California coast and the adjacent Channel Islands (Ingles 1965). They range along the Pacific Rim from lower Baja California to the Aleutian and Commander Islands of the Bering Sea, thence southwestward to Hokkaido in northern Japan (Estes 1980). Growing to a length of 1 to 1.5 meters, and weights of 14 to 45 kilograms, otters subsist on sea urchins, mollusks, crabs and fish (Estes 1980; Ingles 1965). Sea otters spend most of their time foraging in kelp beds, rarely coming ashore, diving from three to 37 meters, although rarely more than 20 meters, to obtain their prey (Kenyon 1969).

Sea otter remains are known from coastal sites occupied throughout the Holocene, particularly those occupied after 2000 BC (c.f. Walker 1982). Specimens displaying direct evidence of procurement with specific tools are absent in the archaeological record. Archaeologists usually depend on the co-occurrence of animal species and specific tool types to draw inferences about past human behavior. These interpretations often rely entirely on ethnographic analogy, but the specimen described below provides direct evidence of the tool used in its capture.

### The Study Specimen

The study specimen is a complete left femur from an adult sea otter, embedded with a projectile point fragment (Fig. 2). The specimen bears moderate acidic surface etching from post-depositional contact with plant rootlets. It was found with other disarticulated

remains from the same individual, and a second subadult individual. The presence of an associated adult baculum implies that the animal was a male.

Otters are represented in the CA-LAN-2616 archaeofaunal assemblage by bones of the head, thorax, hips, fore and hind limbs, including feet. This implies that they were taken to the site whole, although they may have been gutted off-site. Most of the otter limb bones were fractured, presumably for marrow extraction. The bone ends and splinters bear spiral and longitudinal breaks consistent with impact fractures. Two specimens possess apparent impact marks. The only limb bone excluded from fracturing is the wounded femur. This bone may have been discarded because of obvious infection.

The tip of the chert projectile in the wounded femur is no thicker than 2.42 millimeters. We were unable to identify the point type; however, the general shape compares to the Cottonwood Triangle projectile points commonly used along the southern California coast during the Late Prehistoric period. The edges of the projectile point appear to have been serrated, implying that it may have been a Sonora Type, which is similar to the Cottonwood Triangle (Koerper and Drover 1983:16-19; Koerper *et al.* 1996).

### Trauma and Pathology

The wound consists of an entry wound, with embedded projectile point fragment, and an adjacent cavity (abscess), located on the lower part of the posterior shaft above the lateral condyle of the knee joint. These were examined with low power microscopy, radiograph, and conventional computed tomography (CT). The wound is an ovoid shaped fissure at least 6.08 millimeters long and 2.42 millimeters wide. It occupies the site of a fossa typically present on the shaft immediately above the lateral condyle. The infection has enlarged the fossa, and caused pore-shaped fenestra on the adjacent bone. The lateral side



Fig. 2. Sea otter femur. Aspect of posterior surface. Arrow denotes location of injury.

of the fossa has been obliterated by reabsorption of the bone resulting from post-traumatic infection. The edges of the fissure were slightly compressed by the entry of the projectile point. Radiograph (Fig. 3) and CT (Fig. 4) indicate that the point extends four to five millimeters into the femur shaft, and penetrates the medullary cavity.

Wound location and angle of penetration imply that the weapon struck the otter's leg from behind. The angle of entry is on an arc, about 80 degrees above the distal end of the long axis of the bone shaft. Assuming that the projectile was lofted and that it followed a relatively flat arcing trajectory, the leg was probably extended and in swimming stroke at the time of impact. This entry angle would not be expected if the animal was on land at the time it was wounded. The broken edge of the projectile implies that the point broke on impact, allowing the weapon to be dislodged from the soft tissue of the leg.

The radiograph and CT images show sclerotic (pathological hardening) bone reaction at the periphery of the abscess indicating the wound was non-fatal. The infection site consists of a semicircular pit, representing the residue of an abscess, with a maximum diameter of about 7 millimeters, and a depth of more than 3 millimeters. These characteristics may be found at sites of previous bacterial infection. We are not able to determine how long the otter survived prior to death.

The local loss of cortex and crescentic rim of bony sclerosis in the medullary shaft indicates that the infection involved the medullary canal, as well as the external surface of the bone and wound area. Thus, the bony lesion may be classified as osteomyelitis (infection involving the medullary canal) (see Baker and Brothwell 1980:63). This contrasts with the class of osteological infections classified as osteitis, which includes infections of the bone tissue (bone or bone surface).

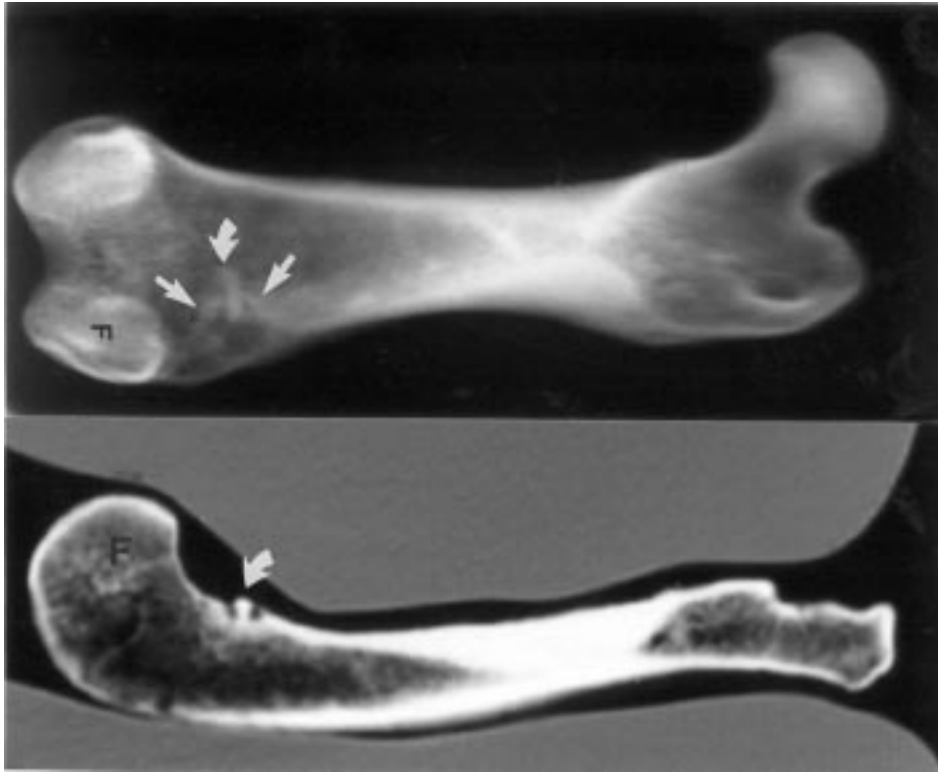


Fig. 3. Radiographs in posterior and lateral views.

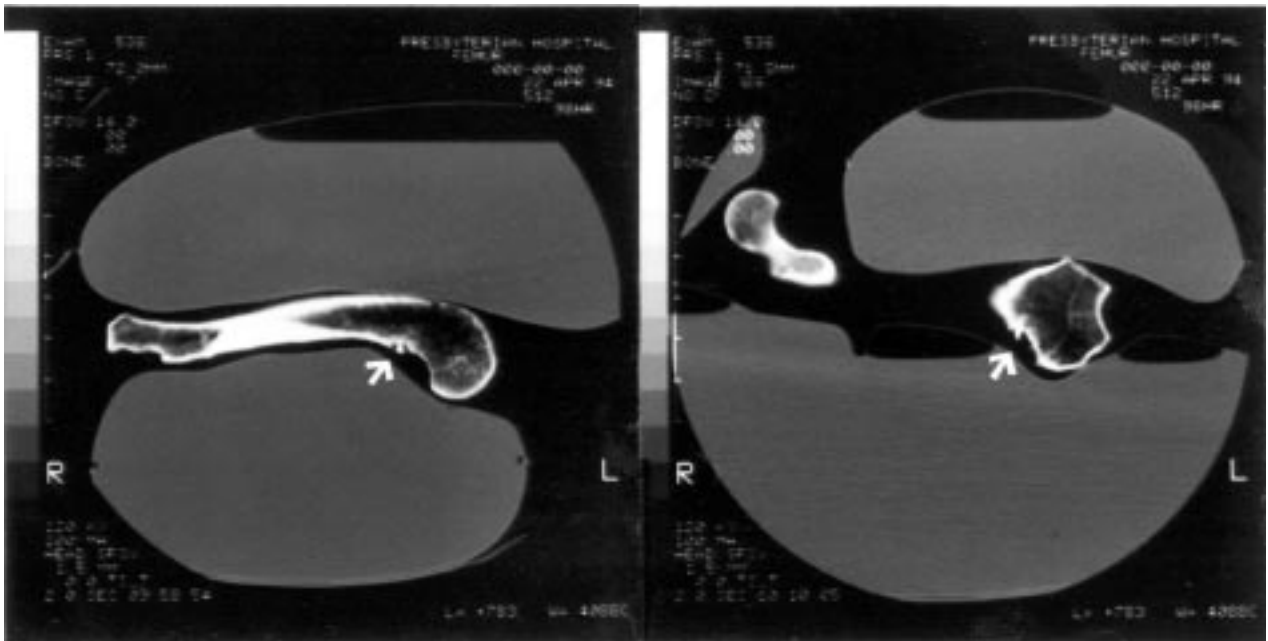


Fig. 4. CT scan images in posterior and lateral views.

## Ethnographic Background

The early missionization of the Gabrielino by the Spanish in the late eighteenth century resulted in their abandonment of the hunter-gatherer lifeway, and loss of traditional knowledge long before much information was recorded about their culture. Some details of sea otter use are documented. Sea otters were hunted for their fur, as well as their meat. Otter hides were a preferred source of skins used in the manufacture of clothing (e.g.- skirts, robes) (Reid 1926:23-24; Vizcaíno 1959:12). Bennyhoff (1950:304) suggests that sea otters were a principal quarry of Gabrielino and Chumash harpoon hunters because of their high quality fur. The methods used for the capture of sea otters are not well documented. Bean and Smith (1978:546) relate only that protohistoric Gabrielino marine mammal hunters used harpoons, spearthrowers, and clubs. McCawley (1996:123, 125-126, 141) provides additional detail, drawing from Ascension (1929:236), Vizcaíno (1959:16), Landberg (1965:61-62), and Hudson and Blackburn (1982:193-220). In his synthesis, McCawley suggests that sea mammals could have been captured using "...harpoons, tridents, and spears, ...", or run down and clubbed while on shore. Also, that sea otters were likely hunted in the water, and that captive otter pups were sometimes used as decoys (McCawley 1996:123; see Ogden 1941:14, Rudkin 1956:19).

The abundance of hunting information derived by Harrington (1942:6-7) from his Chumash informants, compared to his Gabrielino informants, reflects the extensive amount of information lost concerning Gabrielino culture. Presumably, the Gabrielino harpoon would have been similar in form to the Chumash harpoon. The harpoon was "A composite spear, consisting of a long straight wooden mainshaft and a detachable foreshaft" (Hudson and Blackburn 1982:205). The foreshaft was a compound device, having a wooden shaft, a point and a barb. Foreshaft parts were hafted using twine and asphaltum (Irwin

1946:21). Most foreshafts illustrated by Hudson and Blackburn (1982:211) have chipped stone points. Like the Gabrielino, the Chumash used the harpoon to hunt marine mammals and fish (Timbrook and Johnson 1988).

Most references to harpoons in southern California describe them as tipped with bone points (Simpson 1939:54; Bennyhoff 1950:303). However, harpoons made of shell and flint were referred to by members of the Martinez Expedition who visited the southern California coast in 1792 (Simpson 1939:54; Bennyhoff 1950:303). McCawley (1996: 126) mentions the use of harpoons with stone points for the Gabrielino, but his references only include the Big Dog Cave specimen from San Clemente Island (Bennyhoff 1950:304; McKusick and Warren 1959:129-130) which belongs to the Historic Period and may have been influenced by intercultural contact.

The Chumash employed a fishing spear made with a single piece wooden shaft with bone or wooden points (Hudson and Blackburn (1982:193). The spears lacked detachable foreshafts, barbs and lines. The Gabrielino may have used a similar spear, with a stone point. Some accounts suggest the use of a multi-pointed trident fish spear (Hudson and Blackburn (1982:201), but the identification of the trident in southern California is tenuous, based on a single translation and possible idiosyncratic word usage (see Bennyhoff 1950:303).

The third tool that might have been used by the Chumash to procure the otter is the bow and harpoon arrow. The Chumash used an harpoon arrow with the same basic construction as their larger harpoon (Hudson and Blackburn 1982:189-192) but lofted it by bow. The Gabrielino used stone-pointed arrows, but the ethnographic record does not state whether they used a harpoon arrow.

## Discussion

The presence of a projectile point embedded in a sea otter femur demonstrates the use of stone tipped weapons to hunt marine mammals by the prehistoric peoples in south coastal Los Angeles County. This implies that the marine mammal procurement technology of Gabrielino peoples was similar to that of their Chumash neighbors. The ethnographic record suggests that a harpoon was the weapon most likely used to kill this animal; however, it is also possible that a stone point tipped fishing spear or harpoon arrow could have effected the capture.

The point fragment remains embedded in the specimen, with only the cross-section of the distal midshaft, and a small part of one edge visible. The observable surfaces, and the little that can be inferred from the radiographs and CT images leads us to suggest that the point tip is from a small projectile point. The fragment is similar to the configuration of the small Cottonwood Triangle points, used in the region during the time that CA-LAN-2616 was occupied. If the weapon used to procure the otter included a barb, it is likely that the barb was not set during the attack, since the thickness of skin and muscle over the part of the femur where the injury occurred is relatively thin. In any case, the otter was able to escape.

The otter survived for a time after being injured, during which the wound became infected. The infection was localized and not likely to have resulted in death since, walled off by bony response (sclerosis), it had began to heal. Consequently, it is likely that the animal was successfully hunted, rather than having been collected dead after succumbing to its wound. After procurement, the animal was taken intact to the site, and consumed there.

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