



A double dog burial from San Nicolas Island, California, USA: osteology, context, and significance

René L. Vellanoweth^{a,*}, Barney G. Bartelle^a, Amira F. Ainis^a, Amanda C. Cannon^b, Steven J. Schwartz^c

^a Department of Anthropology, California State University, Los Angeles, CA, USA

^b Statistical Research, Inc., Redlands, CA, USA

^c Range Sustainability Office, U.S. Navy, Point Mugu, CA, USA

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ABSTRACT

Recent archaeological excavations on San Nicolas Island, located off the coast of southern California, revealed the remains of a double dog burial interred sometime during the 13th and 14th centuries. Two carefully laid to rest and possibly sacrificed juvenile, female domestic dogs (*Canis familiaris*) between the ages of 1 and 6 months were found within a Native American village. Digestive tract residues include burned and unburned fish and marine mammal bone that suggest scavenging behavior or direct feeding by humans. Breed classifications place it between the Short-Nosed Indian dog and the Plains-Indian dog, likely representing a cross between those and other varieties of North American dogs. Comparisons with other dog burials from archaeological sites across southern California suggest commonalities and possible cultural linkages.

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1. Introduction

The relationship between humans and dogs (*Canis familiaris*) has fundamentally altered the evolutionary trajectory of each species over time, and the social bond between them has been as inextricable as any in nature (Morey, 2006). Genetic evidence suggests that dogs descended from wolves (*Canis lupus*) by at least 15,000 years ago, and that domestication of local wolf populations likely occurred in a variety of places around the world since then (Clark, 1997; Leonard et al., 2002; Snyder and Leonard, 2006; Wayne et al., 2006). Genetic evidence also suggests that domestic dogs in the Americas derive from Old World populations rather than independent domestication from American gray wolves. To humans, dogs have been companions and protectors as well as food. They have been workers and beasts-of-burden. They have helped track prey, corral herds, and fend off intruders. They have become critical aides in hunting, gathering, farming, fishing, seeing, hearing and just about everything else humans do. Dogs have become embedded in human history and incorporated in their faith and spirituality (Olsen, 1985; Pifer, 1987; Schwartz, 1997). In short, humans and dogs have formed a co-evolutionary relationship that has led to the success and spread of each species across the globe,

migrations that often occurred together and, nearly always, dramatically affected the landscapes in which they lived.

The propensity for humans to bury dogs whole rather than casually discard them has left a relatively rich global archaeological record that spans at least 15,000 years (Harcourt, 1974; Morey, 2006; McLoughlin, 1983; Morey and Wiant, 1992: pp. 224, 228; Snyder and Leonard, 2006; Schwartz, 1997; Wayne et al., 2006). Old World dog burials have been found in late Pleistocene archaeological sites (Morey and Wiant, 1992: pp. 224, 228; Olsen and Olsen, 1977; Struiver and Holton, 1979: p. 47). In North America, the earliest dog burials have been securely dated to the Early Holocene (Haag and Heizer, 1953; Kerber, 1997; Pifer, 1987; Reynolds, 1985; Yohe and Pavesic, 2000: p. 93; Snyder and Leonard, 2006). In southern California, the evidence for dog burials spans the region (Allen, 1920; Fagan, 2003; Bean and Smith, 1978; Bryan, 1970; Langenwalter, 1986, 2005; McLean, 2007; Rick et al., in press; Winterbourne, 1940), but few detailed studies and no syntheses have been conducted. On the California Channel Islands, off the coast of southern California, dogs have been found in a variety of archaeological contexts, including midden deposits, pits, and formal burials often associated with human cemeteries. As early as 1602, European explorers noted the presence of a dog at the foot of a religious altar on Santa Catalina Island (Bolton, 1930: p. 85). Archaeologists working on San Clemente Island found the remains of numerous dog, fox, and raptor burials (Hale and Salls, 2000). Unfortunately, the majority of dog remains available for study were collected more than 75 years ago when excavation methods were

* Corresponding author.

E-mail address: rene.vellanoweth@gmail.com (R.L. Vellanoweth).

rudimentary and little contextual information was recorded. To further complicate matters, many early archaeologists collected only skulls and left behind post-cranial bones, limiting what can be said about the nature and diversity of dog populations.

On San Nicolas Island, dogs were exterminated in preparation for sheep ranching after the removal of Native islanders in the early 1800s (Schoenherr et al., 1999; Swanson, 1993). However, little is known about the lives of island dogs up to that point and even less about their relationship with humans. Recent efforts have focused on cataloging and radiocarbon dating museum samples (Rick et al., in press). Many of these samples, however, lack details about their discovery and excavation. Museum specimens provide opportunities for osteometric analysis, AMS radiocarbon dating, isotope, elemental, and DNA testing as well as other types of research. New applications of scientific techniques have revolutionized the analysis of animal remains from archaeological sites, but ultimately the specific relationship between past humans and dogs resides in the context in which they were found. This burial context provides the behavioral and social clues necessary for understanding the relationship between humans and dogs, how they interacted and articulated socially and how this relationship changed through time.

In this paper, we describe a double dog burial recovered during archaeological excavations on San Nicolas Island (Fig. 1). We include a detailed osteometric description of the dogs and describe the context in which they were found. We also compare our findings with other published reports on North American dogs and attempt to place them within a broader classification scheme. Our study contributes to the emerging global and cross-cultural view of human/dog interactions through time – a relationship that has fundamentally affected global biodiversity and landscape evolution. That the dogs were located within an area that may have been the focal point of past religious activities provides a behavioral framework for interpreting the archaeological record of dog burials

excavated many decades ago – a middle range link between the past and present. Our study provides this context.

2. San Nicolas Island

San Nicolas Island is located about 120 km (75 mi) southwest of Los Angeles and about 98 km (60 mi) from the nearest point on the mainland. The island, relatively small at only 13 km (8.1 mi) long by 5.6 km (3.5 mi) wide and an overall area of 35.4 km² (22 mi²), is composed primarily of uplifted Eocene sandstones and shales, which have been modified by wind and water erosion (Meighan and Eberhart, 1953; Vedder and Norris, 1963). Topographically, a central plateau of exposed bedrock and stabilized dune fields dissected by numerous gullies and small ravines dominates the island. The plateau reaches a height of over 2900 m (900 ft) and is surrounded by escarpment slopes to the south and lowlands to the northwest. Narrow coastal plains turn to sandy beaches and rocky shorelines that rest on uplifted and underwater marine terraces with abundant kelp forests offshore.

Precipitation comes in the form of small amounts of rain (16.5 cm [6.5 in]) that generally falls during winter months, but frequent fog adds to the overall total. Fresh water accumulates on the island in the form of 12 perennial springs and seeps, mostly on the northwest coast (Burham et al., 1963). Vegetation consists of coastal sage scrub, chaparral, and grassland communities (Junak and Vanderwier, 1988). In general, small shrubs, bushes, vines, and grasses provide ample habitat for a species of deer mouse (*Peromyscus maniculatus*), the island fox (*Urocyon littoralis*), some reptiles (e.g. *Xantusia riversiana*, *Uta stansburiana*), land snail (*Micrarionta* sp.), and numerous spiders and insects (Schoenherr et al., 1999). Although terrestrial biodiversity is relatively low, local marine habitats are rich and contain a variety of plant and animal species.

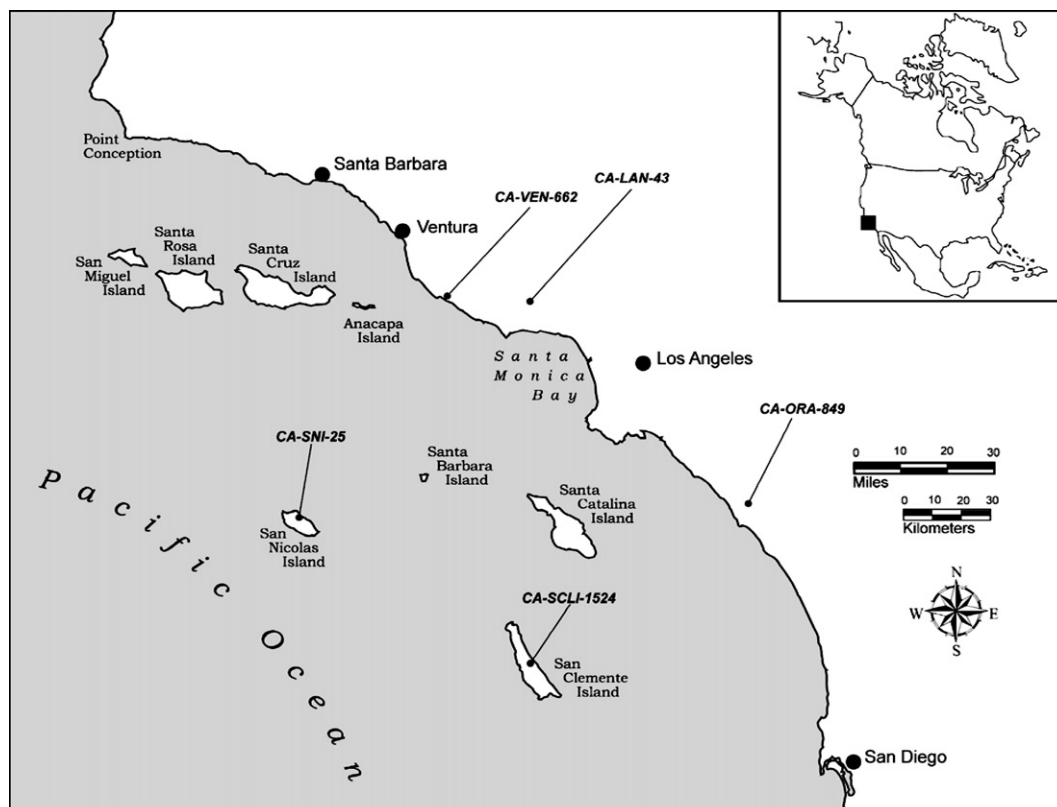


Fig. 1. Map of southern California showing Channel Islands and archaeological sites discussed in text.

2.1. Archaeological context

Archaeological sites ($n = 540$) are distributed across the island and range in size from large multicomponent middens in active sand dunes, to interior sites adjacent to drainages and productive plant habitats. Because of the near-constant wind on the island deflated hearths and other features erode out of many of the archaeological sites, particularly those located on the northwest coast. Radiocarbon dates suggest that San Nicolas Island was occupied throughout the Holocene, with human settlement intensifying over time. The earliest human colonization of the island remains unclear. At least three components have been dated to the early Holocene (Martz, 2005), although sea level transgression likely destroyed or buried many of the earliest sites (Naval Facilities Engineering Command, 2002). More than 20 components date to the Middle Holocene and over 40 to the Late Holocene, when human use of the island peaked just before European contact (Martz, 1994a,b, 2005). Historically, the Native people of the island spoke Uto-Aztec languages, lived in large villages, and traded with people throughout western North America (Johnston, 1962; McCawley, 1996; Munro, 1994).

3. Tule Creek Village (CA-SNI-25)

The Tule Creek site is located about 3.2 km (2 mi) southeast of Thousand Springs, the northern most point of the island. Occupied by at least 2000 B.C., the site was heavily used as a village base from about A.D. 1200 to European contact. Archaeologists began working at the site in the early 20th century. They described numerous pit house depressions, at least two cemeteries, a possible communal structure, and other features (Rogers, 1930, 1993). Recent excavations have revealed the remains of compact living surfaces, storage pits, and trash heaps. Archaeological evidence suggests that people extensively used the marine environment to obtain food and other resources. Artifacts recovered include shell fishhooks, beads, and other ornaments; bone awls, whistles, and hairpins; and, stone drills, arrow points, pendants, bowls, and cooking plates (Cannon, 2006). Obsidian from eastern California, soapstone from Santa Catalina Island, and chert from the northern Channel Islands provide information about past trade networks in the region (Cannon, 2006; Hudson and Blackburn, 1986; Jackson and Ericson, 1994; Rick et al., 2001; Thomas-Barnett, 2004). Evidence for religious activities at the site include heliacal hearth alignments (perhaps to the rising and setting sun), ceremonial trash pits, dog and fox burials, other animal and plant offerings, and abundant paraphernalia such as ochre, crystals, incised bone, and iron concretions (*toshwaat* stones) found in discrete caches.

3.1. Double dog burial

The double dog burial was discovered on the northeast quadrant of the site in an area called East Locus (Fig. 2). The dog remains were found in a silty sandy loam (10YR5/8, yellowish brown) about 25 cm from the surface. The sandy matrix made it difficult to detect a pit outline. In fact, the dogs appear to have been placed on top of a thin (<4 cm) layer of wind blown dune sand and buried in place. A 20-cm thick archaeological deposit (Stratum II; 10YR3/1, very dark gray) overlays the dogs, and the surface is made up of a roughly 5-cm thick mixture of archaeological debris, post-occupation aeolian sand, and modern vegetation. The dog's crania were oriented to the north with their rostrums facing east. The larger of the two dogs, Dog A, rest directly behind the smaller Dog B (Fig. 3). Removing the dogs intact, especially Dog B, proved difficult. Many of the bones had not yet fused and Dog B's entire cranium was fragmented at the sutures at the time of discovery, limiting cranial measurements for this dog.



Fig. 2. East Locus at Tule Creek Village (CA-SNI-25) on San Nicolas Island, California, facing east. Arrow indicates location of double dog burial.

A number of artifacts and features found within a 1-m radius of the dogs appear to be stratigraphically associated. Many of these objects were made of materials not native to the island and include an incised steatite doughnut stone associated with a splintered redwood (*Sequoia sempervirens*) fragment (perhaps a handle); two balanced rock cairns, one consisting of a sandstone bowl, a chunk of basalt, and a flat ground piece of steatite; prepared ochre; morning glory and wild cucumber (*Marah macrocarpus*) seeds; iron concretions known as *toshwaat* stones; calcite crystals; and other reliquary. A direct AMS radiocarbon date on Dog B's left humerus produced a corrected and calibrated 1 sigma age range between



Fig. 3. Double dog burial from Tule Creek Village (CA-SNI-25), San Nicolas Island, California.

A.D. 1280 and 1380 (NOSAMS 65342). Radiocarbon dates on associated marine shells suggest the dogs and these features were interred sometime between about A.D. 1280 and 1580 (Cannon, 2006).

4. Methods and procedures

After transporting the dog remains off the island, they were taken to the Archaeology Laboratories at Humboldt State University, where they were dry brushed and laid out for analysis. The skeletons were reconfigured and measured using a sliding digital caliper following protocol established by Haag (1948) and von den Driesch (1976). Some scholars have argued against measuring juvenile samples because of problems with immature morphology and incomplete development (von den Driesch, 1976: p. 4). The double dog burial, however, was found mostly intact, allowing for detailed measurements of the bone. We were unable to take some measurements because most bones had not yet fully developed and fused and permanent dentition had not yet emerged for either dog, making it at times difficult to perform certain measurements. Other measurements that we developed for this study, however, were taken in attempts to address some of the specific problems that arise when measuring juvenile dog bones. Measurements were made for the bone tissue of both dogs that was intact and could withstand handling. For this reason the measurements for the youngest, Dog B, are largely incomplete. The analysis assumes bilateral symmetry and post-cranial measures are for the left side of both dogs. Relevant sources for osteometric comparisons and breed determinations include Allen (1920), Haag (1948), Valadez Azúa (2000), and von den Driesch (1976).

The following section provides detailed osteological measurements and analyses of the bone pathologies, trauma, and demographic profiles for the double dog burial from San Nicolas Island. Measurements of all diagnostic bones are presented in Tables 1–4, with Table 1 accompanied by figures to demonstrate how the measurements were made (Figs. 4–7).

5. Results

5.1. Sexing and aging

Because the burials were complete, sexing of the dogs was possible by observing the lack of a baculum (*os penis*) for both individuals (Reitz and Wing, 1999). The age of the female dogs was determined by comparing tooth eruption with known deciduous and permanent dentition eruption sequences for dogs (Arnall, 1961; Jeffcoat et al., 1978; Kremenak, 1967; Popesko, 1977; Shabestari et al., 1967; Williams and Evans, 1978). While some of this research has been conducted on one particular breed of dog, Cahill and Marks (1982) have shown that the pattern of dental eruption is very close, if not identical, in time and sequence for both purebred and mongrel dogs. Age estimates can also be inferred by noting the degree of ossification and fusion of the boney skeleton (particularly the crania). The lack of fusion of the cranial bones of Dog B prevented its analysis in more detail.

Due to discrepancies between the varying sequences of ossification it is difficult to assign an exact age. However, approximate age estimates are quite reliable when utilizing both dental eruption patterns and degree of ossification, especially with such complete skeletons as the ones presented here. Various sources cite that permanent dentition in domestic dogs emerges around 3.5 to 4 months and is complete by 6–8 months (Jeffcoat et al., 1978; Kremenak, 1967; Shabestari et al., 1967). Based on dental eruption sequences, Dog A appears to have been between 4 and 8 months old at the time of death. Most of Dog A's permanent teeth are visible and in the process of breaking through even though some

Table 1

Skeletal measurements of the double dog burial based on Haag (1948)

Osteometrics (mm)	Dog A	Dog B	Figs. 4–7 measurements
Crania (axis)			
Occipital length (A–B)	127.58	–	Fig. 4
Condylar-basal length (A–H)	99.07	–	Fig. 4
Basion to anterior edge of palate ^a	120.07	–	–
Width of palate (K–K')	47.01	–	Fig. 4
Width at canines (J–J')	30.83	–	Fig. 4
Width at mastoids (M–M')	50.19	–	Fig. 4
Width at occipital condyles (N–N')	29.50	–	Fig. 4
Width at zygomatic arch (L–L')	73.95	–	Fig. 4
Nasal length (O–P)	35.40	–	Fig. 4
Occiput to nasion (P–B)	73.49	–	Fig. 4
Orbit to alveolus (A–E)	52.74	–	Fig. 4
Supraorbital width (R–R')	34.40	–	Fig. 4
Interorbital width (Q–Q')	26.51	–	Fig. 4
Cranial height	50.11	–	–
Least cranial width (S–S')	34.23	–	Fig. 4
Maximum cranial width (X–X')	49.81	–	Fig. 4
Meatus to alveolus	113.53	–	–
Dental			
<i>Upper dentition</i>			
Alveolus I1 to M1 ^a	68.74	–	Fig. 4
Alveolus canine to M1 ^a	56.70	–	Fig. 4
Alveolus P1 to M1 ^a	47.51	–	Fig. 4
Alveolus P2 to M1 ^a	39.92	–	Fig. 4
Length of carnassial, P4	7.96	–	Fig. 4
<i>Lower dentition</i>			
Alveolus I1 to M1 ^a	63.81	–	Fig. 5
Alveolus canine to M1 ^a	58.61	–	Fig. 5
Alveolus P1 to M1 ^a	48.70	–	Fig. 5
Alveolus P2 to M1 ^a	43.16	–	Fig. 5
Alveolus P3 to M1 ^a	34.07	–	Fig. 5
Alveolus P4 to M1 ^a	28.29	–	Fig. 5
Alveolus I1 to P4 ^a	46.46	40.42	Fig. 5
Alveolus canine to P4 ^a	41.20	36.61	Fig. 5
Length of carnassial to M1	18.25	–	Fig. 4b
Condylar-symphysis length	88.81	–	–
Bicondylar width	61.52	–	–
Postcrania			
Scapula length	63.85	42.62	Fig. 6a
Humerus	86.63	53.73	Fig. 6b
Diameter of the head	24.33	–	Fig. 6b
Transverse diameter of the head	18.63	–	Fig. 6b
Ulna	106.33	56.94	Fig. 6c
Ulnar notch	20.40	14.50	Fig. 6c
Radius	87.15	52.12	Fig. 6d
Femur	95.72	60.72	Fig. 7a
Fibula	79.65	47.17	Fig. 7b
Tibia	101.41	59.52	Fig. 7c

^a New measurement developed specifically for juvenile samples and those lacking M2 teeth.

deciduous teeth are still present (Figs. 4b and 5a). Age estimates based on dental eruptions are corroborated by the complete fusion of the atlas in Dog A, which occurs at 106 days of age, or approximately 3.5 months (Evans and Christensen, 1979; Watson et al., 1986). Dog B had all its deciduous teeth at death, no permanent teeth showing, and no fusion present in the atlas, making this dog between 5 weeks and 3.5 months old (Fig. 5b; Evans and Christensen, 1979).

5.2. Size

While height and weight estimates may be calculated from limb bones and the lower mandible (Haury, 1949; Wing, 1977, 1978) these estimates cannot be used reliably on immature specimens. We include possible breed verities in Section 6 and emphasize that these are broad comparisons meant to provide descriptive context for understanding ancient dogs of western North America, rather than pinpoint identifications of particular breeds or mixes.

Table 2
Cranial measurements of the double dog burial based on von den Driesch (1976) ^a

Osteometrics (mm)	Dog A	Dog B
(1) Total length	127.58	–
(2) Condylbasal length	120.07	–
(4) Basicranial axis	35.81	–
(7) Upper neurocranium length	61.20	–
(10) Greatest length of the nasals	35.40	–
(11) Length of braincase	71.06	–
(13) Median palate length	47.01	–
(13a) Palatal length	45.67	–
(14) Length of the horizontal part of the palatine	22.79	–
(14a) Length of the horizontal part of the palatine corresponding to M 13a	22.17	–
(17) Length of premolar row	34.04	–
(18) Length of the carnassial	7.96	–
(18a) Greatest breadth of the carnassial	7.57	–
(19) Length of the carnassial alveolus	6.50	–
(20) Length of M ¹	11.43	–
(20a) Breadth of M ¹	13.39	–
(22) Greatest diameter of the auditory bulla	17.06	–
(23) Greatest mastoid breadth	50.98	–
(24) Breadth dorsal to the external auditory meatus	49.52	–
(25) Greatest breadth of the occipital condyles	29.50	–
(26) Greatest breadth of the bases of the paraoccipital processes	28.85	–
(27) Greatest breadth of foramen magnum	15.50	–
(28) Height of the foramen magnum	15.18	–
(29) Greatest breadth of the braincase	48.59	–
(30) Zygomatic breadth	73.95	–
(31) Least breadth of skull	33.49	–
(32) Frontal breadth	32.03	–
(33) Least breadth between orbits	29.96	–
(34) Greatest palatal breadth	52.58	–
(35) Least palatal breadth	29.25	–
(36) Breadth at the canine alveoli	29.83	–
(37) Greatest inner height of the orbit	27.52	–
(38) Skull height	48.88	–
(39) Skull height without the sagittal crest	48.88	–
(40) Height at the occipital triangle	33.68	–
(41) Height of the canine	20.54	–

^a Numbers to left of measurement descriptions correspond to von den Driesch (1976: pp. 42–45). Missing numbers indicate measurements not taken. See von den Driesch (1976) for complete list.

5.3. Pathology and trauma

There does not appear to be any pathology of the bones. There is no skeletal trauma extensive enough to have caused death; however, Dog B does have a fractured ulna (Fig. 8) that appears to have occurred close to the time of death, since there is no evidence of healing. An independent observation by a veterinarian confirmed our analysis, concluding that Dog B had a transverse fracture that occurred between 10 and 14 days before or right at time of death (J.R. Hight, D.V.M., 2008, personal communication). When first uncovered it appeared as though Dog B's skull had been crushed; however, further analysis showed it was simply crumbling when exposed due to the lack of fusion of the cranial bones, indicating its young age. The cause of death is unknown at this time.

5.4. Diet

There have been only three documented cases in California where digestive tract residues have preserved in dog burials excavated from archaeological sites (Langenwalter, 2005). Many mainland sites suffer from heavy bioturbation that has compromised stratigraphic integrity and preservation, making it difficult to uncover direct dietary evidence. Samples of soil within the visceral section of each canine from the double dog burial contained the remains of vertebrate bones that allow basic dietary

Table 3
Mandibular measurements of the double dog burial based on von den Driesch (1976) ^a

Osteometrics (mm)	Dog A	Dog B
(1) Total Length	93.46	71.59
(2) Length: the angular process	94.82	–
(3) Length from the indentation between the condyle process and the angular process	84.33	–
(4) Length: the condyle process-aboral border of the canine alveolus	80.29	–
(5) Length from the indentation between the condyle process angular process – aboral border of the canine alveolus	72.30	–
(6) Length: the angular process-aboral border of the canine alveolus.	82.18	–
(11) Length of the premolar row, P ₁ –P ₄	29.94	–
(12) Length of the premolar row, P ₂ –P ₄	25.02	–
(13) Length of carnassial	19.83	–
Breadth of carnassial	6.48	–
(14) Length of carnassial alveolus	18.83	–
(17) Greatest thickness of the body of the jaw	9.85	–
(18) Height of the vertical ramus: basal point of the angular process	32.75	–
(19) Height of the mandible behind M ₁	15.53	–
(20) Height of the mandible behind P ₂ and P ₃	15.73	–
(22) Calculation of the basal length: measurement number two multiplied by 1.21	114.73	–
(23) Calculation of the basal length: measurement number four multiplied by 1.37	109.99	–
(24) Calculation of the basal length: measurement number five multiplied by 1.46	105.55	–
(25) The mean of M 22, 23, and 24	110.09	–

^a Numbers to left of measurement descriptions correspond to von den Driesch (1976: pp. 42–45). Missing numbers indicate measurements not taken. See von den Driesch (1976) for complete list.

inference or at least a look at the final meals consumed before death (Fig. 9). Tightly clustered bones were also found extending from the perineum or rectal section of both dogs, suggesting defecation reflex at death. Although the bones were too fragmentary to allow specific species identification, class level determinations were possible. Dog A contained burned and unburned fish bones that showed etching and pitting presumably from chewing and partial digestion from stomach acids. Dog A also had a partially chewed sea mammal phalange, probably sea otter (*Enhydra lutris*), and an extremely gnawed and pitted sea mammal vertebra. The visceral and rectal areas of Dog B contained only burned and unburned fish bone. That some of the stomach contents contained burned fish bone suggests these dogs ate the discarded remains of human food refuse, perhaps from direct scavenging of food refuse piles, offal scavenging, or direct and deliberate feeding by humans.

6. Discussion

Detailed measurement of the dogs proved useful on a number of fronts. We provided baseline data for the study of juvenile dog remains and developed new measurements specific to juvenile dog bones. We included measurements of long-bones both with and without the epiphyses attached, as these elements are often missing in the archaeological record. In conducting these measurements, we came across a particularly interesting find regarding the femur of Dog B. As should be expected measurements with the epiphyses attached should be greater than those without and for the most part this held true with the double dog burial. The reverse, however, proved to be the case with the greatest depth of the Caput femoris on the left femur of Dog B. Dog B's developing epiphysis had not grown to cap and fuse with the metaphysis on the femur. There is a margin between it and the perimeter of the metaphysis. So the measurement with the epiphysis (8.06 mm) is that of the

Table 4Post-cranial measurements of the double dog burial based on von den Driesch (1976) ^a

Osteometrics (mm)	Dog A	Dog B
Atlas		
Greatest breadth over the wings	–	19.07
Greatest length	14.60	9.79
Greatest breadth of the cranial articular surface	–	15.16
Greatest breadth of the caudal articular surface	–	10.30
Greatest length from the Facies articularis cranialis to the Facies articularis caudalis	–	6.47
Length of the Arcus dorsalis, median	–	3.71
Axis		
Greatest length in the region of the corpus including the dens	10.06	8.97
Greatest length of the arch including the caudal articular process	26.15	12.81
Greatest breadth across the cranial articular surface	21.96	16.71
Greatest breadth across the caudal articular process	18.96	15.98
Greatest depth across the transverse process	22.02	17.26
Smallest breadth of the vertebrae	15.98	12.46
Greatest breadth of the caudal articular surface	8.61	7.89
Greatest height	24.65	18.82
Sacrum		
Greatest breadth	22.19	–
Greatest breadth of the cranial articular surface	12.39	–
Greatest height of the cranial articular surface	6.49	–
Seventh cervical vertebrae		
Physiological length of the body	9.80	–
Greatest length from the cranial articular process to caudal articular process	21.51	9.63
Greatest breadth across the cranial articular process	21.48	18.45
Greatest breadth across the caudal articular process	19.91	16.41
Greatest breadth across the transverse process	25.23	20.57
Greatest breadth of the: (a) cranial articular surface	10.13	8.66
(b) Caudal articular surface	11.73	11.28
Greatest height of the: (a) cranial articular surface	8.02	–
(b) Caudal articular surface	6.62	–
Height	24.73	–
First thoracic vertebrae		
Physiological length	7.20	–
Greatest length from the cranial articular process to the caudal articular process	14.04	9.47
Greatest breadth across the cranial articular process	20.90	17.64
Greatest breadth across the caudal articular process	16.84	11.69
Greatest breadth across the transverse process	25.78	20.71
Greatest breadth of the: (a) cranial articular surface	10.15	8.60
(b) Caudal articular surface	13.89	8.59
Greatest height of the: (a) cranial articular surface	7.81	–
(b) Caudal articular surface	7.42	–
Height	33.90	–
First lumbar vertebrae		
Physiological length	10.39	–
Greatest length from the cranial articular process to the caudal articular process	21.76	10.98
Greatest breadth across the cranial articular process	16.20	12.64
Greatest breadth across the caudal articular process	13.81	8.91
Greatest breadth across the transverse process	31.73	12.54
Greatest breadth of the: (a) cranial articular surface	13.10	12.51
(b) Caudal articular surface	8.03	–
Greatest height of the: (a) cranial articular surface	8.70	–
(b) Caudal articular surface	7.33	–
Height	22.48	–
Scapula		
Height	62.80	42.46

Table 4 (continued)

Osteometrics (mm)	Dog A	Dog B
Humerus		
Diagonal height	56.88	41.37
Greatest dorsal length	40.99	24.98
Smallest length of the neck of the scapula	15.47	13.42
Greatest length of the glenoid process	17.77	14.06
Length of glenoid cavity	17.68	11.75
Breadth of the glenoid cavity	11.19	9.15
Humerus		
Greatest length	91.34 (79.44)	(51.81)
Greatest length from the head (caput)	90.33 (76.83)	55.83 (50.03)
Greatest depth of proximal end	17.80 (23.29)	11.27 (18.42)
Depth of the proximal end	25.94	19.80
Smallest breadth of the diaphysis	7.98	7.78
Greatest breadth of the distal end	21.77 (19.63)	(17.51)
Greatest breadth of the trochlea	15.84	–
Radius		
Greatest length	89.47 (79.08)	53.05 (48.56)
Greatest breadth of proximal end	12.04 (11.16)	10.32 (10.28)
Smallest breadth of diaphysis	7.12	6.38
Breadth of distal end	15.99 (10.93)	11.99 (10.35)
Ulna		
Greatest length	106.49 (94.09)	(56.85)
Depth across the Processus anconaeus	19.60	11.82
Smallest depth of the olecranon	15.52	9.10
Greatest breadth across the coronoid process	12.00	9.44
Pelvis		
Smallest height of the shaft of ilium	11.32	10.23
Smallest breadth of the shaft of ilium	6.42	6.33
Smallest circumference of the shaft of ilium	29.06	29.53
Femur		
Greatest length	95.72 (84.86)	60.72 (53.61)
Greatest length from Caput femoris	85.45	53.08
Greatest breadth of the proximal end	23.33 (20.79)	17.49 (16.47)
Greatest depth of the Caput femoris	11.97 (9.72)	8.06 (8.61)
Smallest breadth of diaphysis	8.02	7.58
Greatest breadth of the distal end	21.52 (14.70)	14.96 (14.20)
Patella		
Greatest length	10.76	–
Greatest breadth	7.53	–
Tibia		
Greatest length	102.50 (89.91)	58.71 (55.38)
Greatest breadth of the proximal end	22.43 (19.92)	16.18 (16.24)
Smallest breadth of the diaphysis	7.77	7.35
Greatest breadth of the distal end	16.24 (15.42)	12.92 (12.94)
Fibula		
Greatest length	79.65	47.17
Metacarpal long-bones		
<i>Greatest length</i>		
No. 2	30.68	–
No. 3	35.79	–
No. 4	35.92	–
No. 5	6.82	–
<i>Greatest breadth of distal end</i>		
No. 2	7.41	–
No. 3	8.27	–
No. 4	7.99	–
No. 5	6.82	–
Metatarsal long-bones		
<i>Greatest length</i>		
No. 2	34.37	–
No. 3	40.34	–
No. 4	39.40	–
No. 5	35.80	–
<i>Greatest breadth of the distal end</i>		
No. 2	6.51	–
No. 3	7.57	–
No. 4	8.11	–
No. 5	6.20	–

^a Measurements in parentheses were taken without epiphyses attached as were all metacarpal and metatarsal measurements.

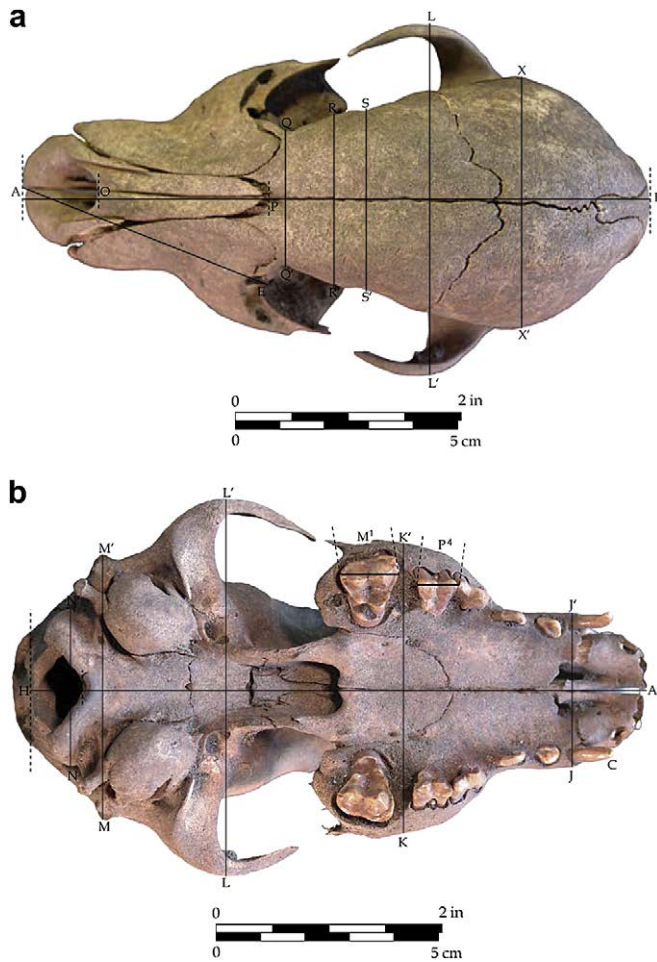


Fig. 4. Skull of Dog A: Superior (a) and inferior (b) views showing measurements reported in Table 1.

developing epiphyseal cap of bone tissue. The measurement without the epiphysis (8.61 mm) is that of the metaphyseal margin of the Caput. The same measurement on Dog A (11.97 mm w/ epiphysis, 9.72 mm without) conforms to expectations and is greater with the epiphysis attached. This measurement may become useful for establishing more refined age estimates among juvenile and subadult dogs.

It seems relatively clear that the dogs from Tule Creek were intentionally buried with great care taken in the burial process. They may have been sacrificed, although presently no definitive evidence has been found to confirm this. Some archaeological evidence found at the site, however, suggests that the dogs were buried in an area that contained other features and objects related to ceremonial activities. In general, the immediate area surrounding the burial appeared deliberately organized and arranged. Discrete pits holding discarded food refuse were found underneath and around the dogs. The presence of prepared ochre “cakes”, crystals, *toshwaat* stones, and other ceremonial paraphernalia suggests highly ritualized activities, especially considering these objects were widely used by shamans across California and beyond (Bean, 1992). Whether or not the double dog burial was part of a broader religious system that involved animal offerings or was an isolated event is impossible to tell at this time. The best that we can do now is build an archaeological context for the dogs by comparing them with other dog burials across southern California and by examining where they fall in the classification of North American dog varieties.

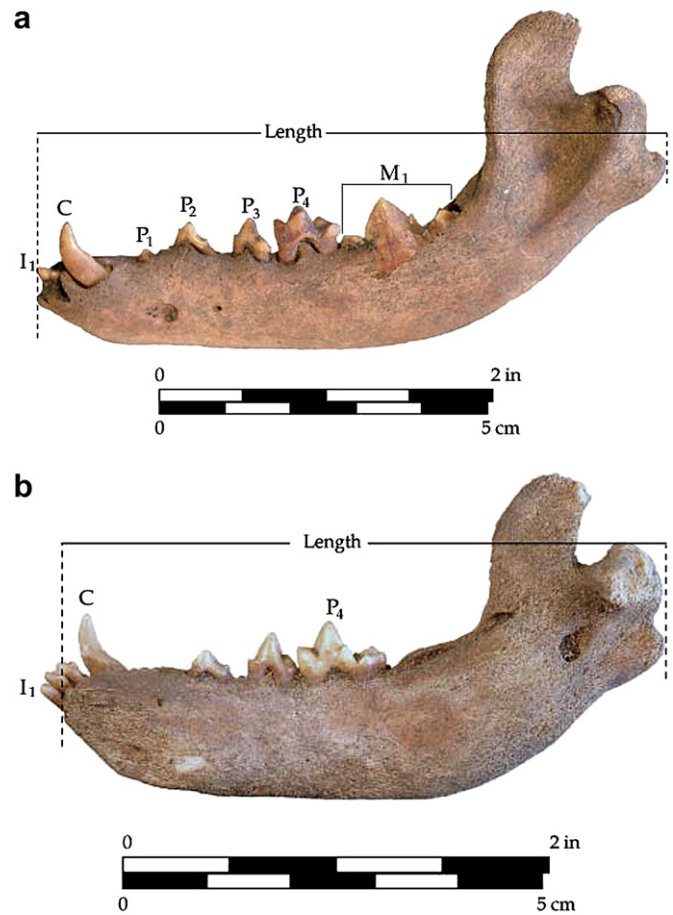


Fig. 5. Lateral view of mandibles for Dog A (a) and Dog B (b) with measurements reported in Table 1.

6.1. Breed determinations

In general, breed determinations among archaeological dogs are difficult and full of challenges, especially considering that there were several varieties of North American dogs in the past – variations of mongrel populations across the region. Allen (1920) concluded that there were three basic forms; a broad muzzled “Eskimo” dog, and a larger and a smaller “Indian dog”, all of which he classified into 17 breeds. Haag (1948), limiting his study to North American dogs, also found three general size categories. Olsen (1985:p. 35), however, cautioned that breed determinations made many years ago were largely artificial because of small sample size, viewing instead variation within a single mongrel group, particularly for western North America. Nevertheless, we found it useful to compare the Tule Creek dogs to archaeological dog “breeds” for North America so that we might better understand what type of dogs they would have grown up to become. The following examines the broad qualitative measure of archaeological dog breeds in western North America and places the Tule Creek dogs within this spectrum.

We immediately eliminated 12 breeds (or mongrel varieties) from Allen's (1920) classification because of their occurrence outside of western North America. Three types of Mexican dogs, because of their small size and shortened snout, resemble the Tule Creek dogs. The oddly shaped, curved femur and disproportionate limb bones of the Short-Legged dog (*Talchichi*) quickly removed it from consideration (Allen, 1920: p. 464; Valadez Azúa, 2000: pp. 198–99). We also eliminated the Mexican Hairless dog (*Xoloitzcuintle*) because of its smaller, simpler dental formula characterized

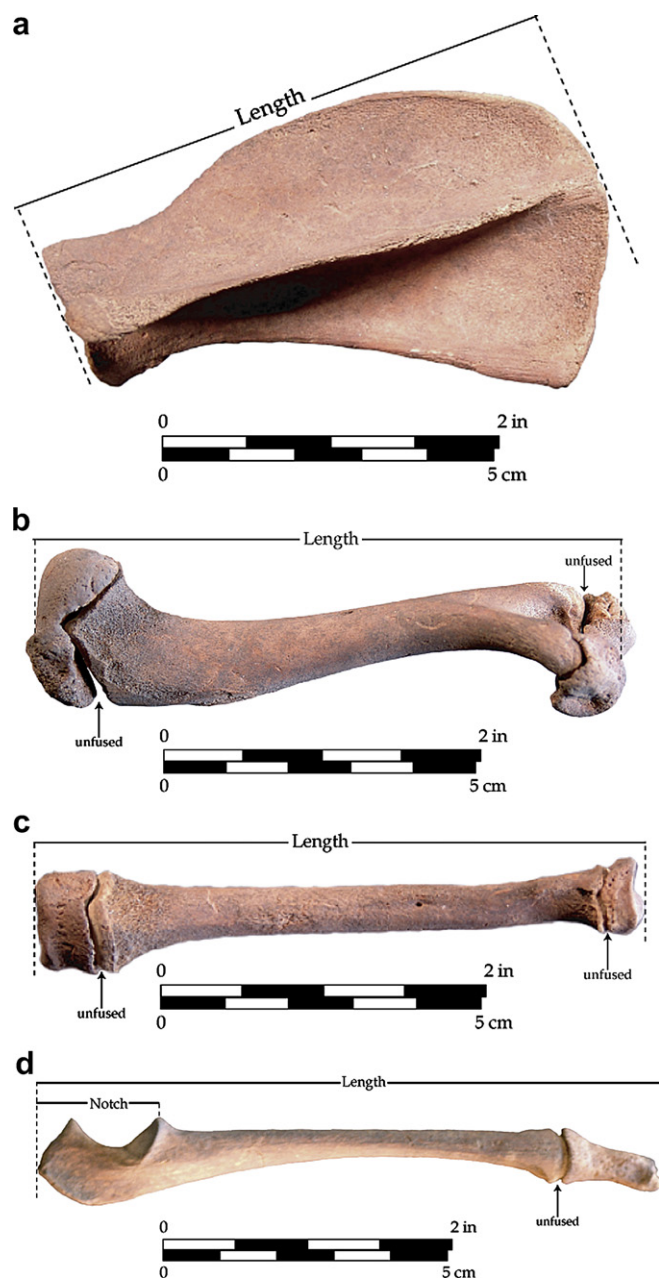


Fig. 6. Scapula (a), humerus (b), radius (c), and ulna (d) of Dog A with measurements reported in Table 1.

by missing canines and premolars (Allen, 1920: p. 478; Valadez Azúa, 2000: p. 195). The general size and shape of the *Techichi* dog caused some consternation because some of its morphological characteristics seemed to fit. Valadez Azúa (2000) indicated that early chroniclers lumped many dogs into this classification, and argued that the *Techichi* was in fact the Common Indian dog (Allen's Plains-Indian and Small Indian dogs) that accompanied North America's first migrants and was a common ancestor to all other domesticated dogs in the New World.

For North America, Allen (1920) described a Small Indian dog and a Plains-Indian dog. The Small Indian dog appears fox-like, having a slender muzzle and long, slim limbs. The slight build of the Small Indian dog contrasts greatly with the stocky build of the Short-Nosed Indian dog (Allen, 1920: p. 446). Like the Small Indian dog, Dog A's limb bones are more slender than short and thick, the sagittal crest is barely developed, the muzzle narrows abruptly at the third molar, and overall size is small. Nevertheless, Dog A's



Fig. 7. Rear leg bones of Dog A showing femur (a), fibula (b), and tibia (c) and measurements reported in Table 1.

somewhat shortened rostrum and high forehead, brachycephalic brain case, and dentition do not resemble the Small Indian dog but instead are like the Short-Nosed dog (Allen, 1920: p. 482).

The Short-Nosed Indian dog has been found at Pecos, New Mexico, White Dog Cave, Kayenta, Arizona and coastal Peru (Allen, 1920: p. 496, 15; Hauray, 1949). The juvenile dog found in White Dog Cave had little to no supratrochlear foramina at the humeri olecranal fossi – an apparent diagnostic trait among Short-Nosed Indian dogs. Allen (1920: p. 499) described the Short-Nosed Indian dog as relatively broad and stoutly built with a high forehead, convex dorsal profile, and small teeth. The Tule Creek dogs' limb bones, however, are more gracile with the supratrochlear foramina of the humeri fully open, but the crania seem very similar to the Short-Nosed Indian dog.

Colton (1970) measured, mostly crania, and compared 110 archaeological dogs from the American Southwest (Ancestral Puebloan territory). Approximately one-third of his sample lacked mandibular premolars, a pattern similar to Allen's Short-Nosed Indian dog. Colton (1970) found that smaller-sized dogs occurred before larger ones in the archaeological record for the region. Included in his data were two mummified dogs from White Dog Cave (Guernsey and Kidder, 1921), both lacked the first premolar, but the larger of the two specimens conformed to characteristics of the Plains-Indian dog (Allen, 1920; Colton, 1970; Guernsey and Kidder, 1921). Colton (1970: p. 158) concluded that the Plains-Indian dog



Fig. 8. Dog B ulna showing fracture.



Fig. 9. Close-up of the visceral section of Dog A showing stomach contents.

began spreading westward from the plains around A.D. 800. This event is roughly coincident with a late phase of Uto-Aztecan migrations into California (see Vellanoweth, 2001).

Several other crania Allen (1920: p. 451) analyzed “from mounds on San Nicolas Island” were nearly identical to the Pecos cranium and similar to others found in other parts of California, the Pacific Northwest, and across the mid-western Plains, leading Allen to conclude that the wide distribution of the larger more slender Plains-Indian dog also spread across to San Nicolas and the other Channel Islands (Allen, 1920: p. 451). The samples from San Nicolas Island, also lacking mandibular premolars, exhibited great variation suggesting mongrel crosses. For instance, one specimen had the general body and tooth row measurements of the Plains-Indian dog, but a shorter, smaller crania and slightly upturned snout indicative of the Short-Nosed Indian dog (Allen, 1920: pp. 451–452). Many scholars believed they were observing a coyote/dog mix when referring to the Plains-Indian dog (Allen, 1920: pp. 449–450). However, no record of coyotes exists on the Channel Islands and if any interspecies mixing occurred it took place prior to dogs coming to the islands. Interestingly, certain measurements of the Plains-Indian dog agree favorably with a specimen from western Idaho dated to about 4000 B.C. (Yohe and Pavesic, 2000: p. 97) and are broadly similar to those from the Great Basin (Grayson, 1988; Lupo and Janetski, 1994).

The overall size and shape of Tule Creek dogs appear to share characteristics with both the Plains-Indian and Short-Nosed Indian dogs. Dog A is somewhat brachycephalic – a gentle convex dorsal cranial profile and slight sagittal development but with a shortened rostrum and high forehead – all pointing to the Short-Nosed Indian dog. The foramen magnum of brachycephalic breeds is typically more circular than oval and frequently asymmetrical or notched (Evans and Christensen, 1979: p. 123). Dog A’s foramen magnum fits this criteria in all respects. However, the humeri of both dogs have fully open supratrochlear foramina and their limb bones are slender rather than stout, much like the Plains-Indian dog. Allen’s descriptions for Plains-Indian dogs, however, classify their skulls as dolichocephalic, which the Tule Creek dogs clearly are not. Moreover, based on the limb size, it does not appear that either dog would have reached the stature of the Plains-Indian dog but would

have been larger than the Short-Nosed breed. These determinations, of course, must be considered speculative as the individuals were juveniles and had not yet reached full development. In very broad considerations, however, the Tule Creek dogs could easily have been a cross not only between the Short-Nosed Indian and Plains-Indian dogs (as both are known to have existed on San Nicolas Island) but also other breeds of North American dogs.

6.2. Regional comparisons

Dogs have been found in a variety of other archaeological settings on San Nicolas Island, including in midden heaps and formal burials associated with human cemeteries (Rogers, 1930). One dog was found in a redwood coffin, clearly showing the reverence and importance humans placed on dogs (Bryan, 1970). Most dogs reported for San Nicolas Island, however, were excavated decades ago and lack good provenience and context. When compared to the Channel Islands as a whole, more dogs have been found on San Nicolas than any of the other islands despite the fact that it is the outermost and most isolated (Rick et al., *in press*). At least 29 dogs from 13 sites have been recovered from San Nicolas (Rick et al., *in press*). By comparison, Santa Cruz Island, the largest of the islands, contains 21 dogs from 11 sites and is considerably larger and closer to the mainland than San Nicolas. Taken together, at least 95 dogs from 41 archaeological sites have been recovered from the Channel Islands, 40 from the northern islands (Santa Cruz, Santa Rosa, and San Miguel) and 55 from the southern (Santa Catalina, San Clemente, and San Nicolas). Little is known of dogs in Santa Catalina’s archaeological record; however, we know ethnohistorically one was observed at the foot of an altar within a ceremonial enclosure in what is considered the second European contact with that island’s inhabitants (Bolton, 1930). It is unclear why more dogs have been found on the southern islands, but it may relate to cultural differences between the island groups; Chumashan or Hokan speakers lived on the northern islands, whereas Uto-Aztecan speakers lived to the south.

Dog burials have also been found on nearby San Clemente Island, the adjacent mainland coast, and interior valleys, although in general their occurrences are relatively rare in southern

California. Table 5 summarizes the detailed descriptions given below for other dog burials in the region and the archaeological context in which they were found.

6.2.1. CA-SCLI-1524

The Lemon Tank site (CA-SCLI-1524) on San Clemente Island provides an ideal comparison, though no double dog burials were uncovered. The site was excavated in the 1980s and yielded numerous features including multiple canine and raptor (hawk and falcon) burials as well as numerous cache pits containing ceremonial objects (Hale, 1995; Hale and Salls, 2000). Of the 11 canine burials found, five (three adults and two juveniles) were domestic dogs and six (five juveniles and one adult) were island foxes (*U. littoralis*) (Hale, 1995: pp. 23–25). Radiocarbon dates for Lemon Tank suggest that the site was used between about 2000 years ago and just before the Mission period (A.D. 1769–1833) (Hale and Salls, 2000: p. 96), clearly overlapping those for the Tule Creek site.

The dog inhumations from the Lemon Tank site were found extended, flexed, and folded, oriented south ($n = 2$), east ($n = 2$), and vertical head up ($n = 1$), and associated with grave goods that included shell beads, burned baskets, projectile points, stone pipe fragments, ochre powder, quartz crystals, and other ceremonial paraphernalia. In some cases, dogs were carefully interred in pits capped or lined with large stones (Hale and Salls, 2000). Unfortunately, measurements and breed determinations were not reported and no digestive tract residues were recovered. Hale (1995) suggested that the variety of features at Lemon Tank represent the physical manifestations of traditional Native American religious activities, including the remains of initiation, mourning, and puberty ceremonies. The dog burials were just one aspect of these ceremonies.

6.2.2. CA-ORA-849

On the adjacent southern California mainland, a single juvenile dog inhumation was identified at CA-ORA-849, a seasonal camp situated on the southeast bank of Aliso Creek within the ethnohistoric territory of the Uto-Aztecan speaking Juaneño. The dog burial did not contain associated grave offerings; however, it was found 9 m and 18 m from two human burials – an adult female and a juvenile approximately 12 years of age, respectively (Langenwaller, 2005). These burials were found along with the remnants of a circular shelter, several hearths, and bone and stone artifacts reflecting food processing and basket-making. A single radiocarbon date (A.D. 1230–1350) and regional projectile point typology indicate that the camp was occupied between A.D. 750 and 1769, overlapping in time with the Tule Creek dogs.

The CA-ORA-849 juvenile dog was found on its right side in a flexed position orientated east–west, a pattern similar to some dog inhumations found at Encino Village (discussed below). The snout of the CA-ORA-849 dog closely resembles Allen's (1920) description of the Plains-Indian dog (Langenwaller, 2005). The dog is too large to be a *Techichi*; however, unlike the Tule Creek dogs, the CA-ORA-849 dog has a long and narrow face suggesting little resemblance to the Short-Nosed Indian dog.

As with Tule Creek dogs, food remains were found in the visceral section of the CA-ORA-849 dog. The cluster of bone and bone fragments consisted of a whole juvenile gopher (*Thomomys bottae*), a whole brush rabbit (*Sylvilagus bachmani*), and a single deer phalanx (*Odocoileus* spp.) (Langenwaller, 2005: p. 32). The deer bone may reflect deliberate feeding by humans or offal scavenging; however, the fact that the gopher and rabbit were consumed whole suggests the CA-ORA-849 dog foraged rather than scavenged these animals. Unlike the CA-ORA-849 dog, the Tule Creek dogs would have had to rely more heavily on scavenging and deliberate feeding by humans, considering the dearth of terrestrial prey and likely difficulty hunting marine resources.

The significance of the CA-ORA-849 dog burial in relation to the two human burials is not entirely clear. The dog does not exhibit evidence of perimortum trauma, making it difficult to determine whether the animal was part of a funerary sacrifice or reflects the burial of a beloved pet (Langenwaller, 2005). The similar flexed position and orientation of the dog and human burials, however, do indicate traditional mortuary customs were practiced on human and esteemed non-human individuals alike.

6.2.3. CA-LAN-43

Dog and human burials have been found in close proximity to one another at other sites on the southern California mainland as well. At the Encino Village site (CA-LAN-43), located in the San Fernando Valley of southern California, 11 dog burials containing 17 individuals and one canine cremation were uncovered during archaeological excavations (Langenwaller, 1986: p. 63). The site was occupied by the Fernandean branch of the Gabrielino, who like the people of San Nicolas and San Clemente islands spoke Uto-Aztecan languages. All of the dogs from the Encino Village site were adults except for one juvenile and two fetal remains (Langenwaller, 1986: p. 69). Langenwaller (1986: p. 66) was not able to conduct a detailed osteological analysis of the canine cremation because the residual bone was too fragmentary, although visible tooth wear suggests it was dog rather than coyote. Like the San Clemente Island canine burials, the Encino dogs were found extended, flexed and folded and oriented in all directions with no identifiable pattern (Langenwaller, 1986: pp. 69–76). Radiocarbon dates for the Encino Village dogs suggest that they were buried between about A.D. 900 and A.D. 1500 (Langenwaller, 1986: p. 93; Taylor et al., 1986), within the time frame of the Tule Creek and Lemon Tank dogs.

Six of the 17 dogs found at the Encino Village site had intact visceral sections, and two of these contained digestive tract residues (Langenwaller, 1986: p. 90). Fragmented skeletal remains of pocket gopher (*Thomomys bottae*), rabbit (*Sylvilagus* spp.), and deer (*Odocoileus* spp.) were found in one dog and only deer in the other (Langenwaller, 1986: pp. 90–91). All the bones except the gopher remains were heavily eroded and/or pitted, suggesting mastication and relatively prolonged exposure to stomach acids (Langenwaller, 1986: p. 91). The gopher remains were fragmented but complete and suggest dogs foraged or hunted for food. However, two rabbit metatarsals and an antler tine also suggest dogs scavenged for food from trash piles left by people or were directly fed leftover scraps. The feeding behavior of the Encino Village dogs probably reflect more foraging than those of San Nicolas because of the relative dearth of terrestrial fauna on the island.

Similar to the dogs from CA-ORA-849, the Encino Village dogs were found in the mortuary area of the site. Many were associated with burial goods, including cairn markers, *Olivella* shell beads, and an unmodified white abalone (*Haliotis sorenseni*) shell. Like at the Lemon Tank site, a juvenile red-tailed hawk (*Buteo jamaicensis*) was also found in the mortuary area (Langenwaller, 1986: p. 66). The hawk burial at the Encino site, however, was missing elements of its head and right foot, which probably occurred prior to interment. Many of the dog burials as well as the hawk were found in discrete pits containing introduced soil that acted as a lining agent or wrapping (Langenwaller, 1986: p. 66). It is clear that these animals were ritually buried (Langenwaller, 1986: pp. 66, 77) and may have been part of broader culturally specific mortuary and ceremonial customs.

6.2.4. CA-VEN-662

To the northwest of the Gabrielino and Juaneño areas, a single dog burial was found at CA-VEN-662, located at Port Hueneme in the ethnohistoric territory of the Chumash. The small camp was occupied between approximately A.D. 1200 and 1600, temporally

Table 5
Regional Comparisons of Dog Burials on the Southern California Mainland, Coast, and Islands

Site overview					Dog Burial overview						References
Site	Geographic location	Date range	Site Description		Dog burials (n)	Dogs (n)	Age	Burial orientation		Associated burial items	
			Type	Features				Body position	Body alignment		
CA-SCLI-1524 (Lemon Tank Site)	San Clemente Island	1000 B.C.–A.D. 1769	Ceremonial activity area	Mourning and puberty ceremony features; caches of ceremonial objects; human, raptor, and canid burials.	5	3 2	Adult Juvenile	Extended; Flexed	East; South; Vertical	Shell beads, burned basket fragments, projectile points, stone pipe fragments, ochre powder, quartz crystals, other ceremonial paraphernalia, and burial capstones	Hale, 1995; Hale and Salls, 2000
CA-ORA-849	Santa Ana Mountains and Laguna Beach area	A.D. 750–1769	Seasonal camp	Circular structure, hearths; two human burials	1	1	Juvenile	Flexed	East	None	
CA-LAN-43 (Encino Village Site)	San Fernando Valley	A.D. 900–1500	Village	Domestic and ritual features; human, raptor, and canid burials	11	14 1 2 1 Canid cremation	Adult Juvenile Fetal Indeterminate	Extended; Flexed	All directions	Cairn markers, shell beads, abalone shell	
CA-VEN-662	Port Hueneme	A.D. 1200–1600	Small camp	Domestic and ritual features; human and canid burials	1	1	Adult	Curled	East	Gray fox cranium possibly ritually interred with the dog	Sutton, 2008
Pit 10	Rancho La Brea, Los Angeles	7000–3000 B.C.	Natural Asphalt deposit	“La Brea Woman” found in 1914	1	1	Adult	Unknown	Unknown	Shell beads, shell fragments, “killed” ground stone	Reynolds, 1985
CA-SNI-25 (Tule Creek Village)	San Nicolas Island	2000 B.C.–A.D. 1800	Village	Hearths, pits, caches, and canid burials	5	2 3	Adult Juvenile	Flexed; Extended; Vertical	East; West; Unknown	Balanced rock cairns, ochre, calcite crystals, steatite artifacts, shell beads	Cannon, 2006

coinciding with Tule Creek, Lemon Tank, CA-ORA-849, and Encino Village dogs (Sutton, 2008). Considering that ritual internment of dogs was not a common Chumash practice, the canid burial at CA-VEN-662 was an unusual find. It is worth noting, however, that Port Hueneme is located in the southern part of coastal Chumash territory bordering Gabrielino territory to the south. Similar to Gabrielino and Juaneño practices, the occupants of CA-VEN-662 interred the dog near human burials – approximately 25 m from the mortuary area (Sutton, 2008). The medium-sized domestic dog was found fully articulated in a curled position. The dog's head was positioned downward and facing east. Near the hindquarters, a fragmented gray fox (*Urocyon cinereoargenteus*) cranium was found positioned in the same manner as the dog cranium. Sutton (2008) speculates the fox cranium may have been part of a pelt-covering placed over the dog at the time of internment. No other items were found in the dog burial. Internment in a discrete pit as well as the association with the gray fox cranium provides compelling evidence that the dog was ritually interred.

7. Conclusions

We may never come to know the specific circumstances that led to the double dog burial at Tule Creek village. Yet we do know the time frame for this event occurred sometime during the 13th or 14th centuries, well over 100 years before the arrival of Europeans into the area. These dogs offer us an excellent opportunity to examine the relationship between humans and dogs in a traditional Native American setting. The similarities between the island and mainland sites discussed above cannot be overemphasized. The overlapping chronologies, the way the dogs were buried, associated features, ceremonial paraphernalia, and their distribution across southern California all suggests a common link. How far these commonalities extended through space and time and how much they were a part of shared culture and worldview is a topic for future research.

For the Indigenous people of southern California, dogs appeared to have been more than just scavengers and pest controllers. On the Channel Islands, dogs likely played an important role in helping humans hunt seals, sea lions, and birds and perhaps even assisted in fishing activities, having a direct impact on island plant and animal communities. In fact, recent evidence has documented the persistence of the flightless sea duck (*Chendytes lawi*) in the archaeological record beyond the initial colonization of the Channel Islands by humans over 12,000 years ago (Jones et al., 2008). Why this seemingly easy to capture animal was not immediately over-hunted is a mystery. Although the flightless duck may have lasted awhile with just humans around, as dog populations on the islands increased throughout the middle and late Holocene (Rick et al., in press), they likely pushed this terrestrial-bound bird to collapse and extinction.

The dogs involved in the double dog burial on San Nicolas Island, only puppies when they died, add to our understanding of the broader role dogs played in past island societies. Dogs and humans had a steadfast connection that melded the practical and spiritual aspects of human life. They were part of the ecological fabric of island society and in times of ceremony dogs were present. It is through this archaeological find that we may better understand the lives of both humans and canines on this small, intriguing island.

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