

Early historic and ethnographic accounts report the presence of two types of dogs (*Canis familiaris*) kept by the Makah and Coast Salish peoples of the south central Northwest Coast of North America (southeastern Vancouver Island, northern Olympic Peninsula, the Gulf Islands, Puget Sound and the Fraser River Delta). These accounts describe a medium-sized, short-haired dog and a smaller, long-haired one. The small type or "wool" dog was reportedly kept almost exclusively for its thick soft fur, which was woven into blankets. The ethnohistoric evidence suggests that the two types of dogs were deliberately maintained as separate populations, with explicit economic reasons for doing so, and thus may constitute true breeds. This pattern of dog use has not been recorded anywhere else in North America. However, the cultural implications of this unique situation cannot be appreciated fully until the issue of whether the wool dog really existed as a separate type during prehistoric times is resolved.

The purpose of this study was to determine whether two distinct physical types could be distinguished within a sample of 1163 dog skeletal remains collected from 20 archaeological sites spanning 4000 years of prehistory. The sample consists of crania, mandibles, major front and hind limb elements, selected tarsals, metapodials and vertebrae. A statistical method cribbed from paleontological studies was used to interpret the variation in size demonstrated by the sample. This method allowed specimens to be classified, on an element by element basis, as either large or small according to its total length dimension. Multivariate discriminant function analysis was used to investigate the relationship between breadth and length dimensions. This analysis constitutes the first comprehensive work on prehistoric dog remains from this area. It is a long overdue database that will allow almost all dog skeletal elements, previously excavated material and future remains alike, to be compared and assessed.

This introductory chapter provides a summary of the ethnohistoric evidence of dogs of this region and discusses the prehistoric skeletal evidence in general. It presents the conceptual framework for this research and discusses previous studies.

Chapter 2 presents the sampling strategy and defines the criteria used for sample selection. The data set is described in general terms in this chapter along with several unique problems associated with it (especially sexual dimorphism). The prehistoric time periods into which the archaeological material is grouped are defined. The taxonomic status of the material is also discussed, both in specific and general terms, with a brief overview of the current status of knowledge of dog domestication processes.

Chapter 3 describes the statistical methods used in the analysis to describe and interpret the variation within the sample. As the methods used here are somewhat different than those used in previous studies, they are described in some detail.

Chapters 4 through 8 contain the results of the osteological and osteometric analyses of the sample. In order to simplify the assessment and comparison of new material, the analysis is presented by body part: crania, mandibles, front limbs (including scapula, humerus, radius, ulna and metacarpals), hind limbs (including innominate, femur, tibia, fibula, metatarsals and selected tarsals) and vertebral column. For each element sample, the skeletal dimensions used are defined and a general osteological description is reported. The osteometric analysis of the intact (whole) element sample is presented next in table form: this analysis defines the dog types or breeds.

Graphs showing relationships between various dimensions of selected elements are provided. Classification to type for the fragmented specimens in the sample is offered (by element) in a separate table and lastly, classification of previously reported material (Gleeson 1970; Montgomery 1979) and comparison to other regional analyses (where applicable) is provided. Raw data tables for elements which had insufficient sample sizes for classification analysis are listed at the end of each section (for which only basic univariate statistics have been calculated).

This presentation style, while it might appear cumbersome and at times unnecessarily detailed, was chosen to facilitate comparison of material in the hands of other researchers. It is hoped that this study will serve as a foundation database, a sort of

## Introduction

reference manual for Northwest Coast dogs, to which both future and other previously excavated material can be appended and compared.

A summary of the osteometric analysis is presented in Chapter 9, which includes a discussion of the congruity of type classification as applied to various associated elements recovered from the same individual. The osteological (non-metric) characteristics of the types derived from this analysis are discussed. An estimate of the live shoulder height for each of the breed types determined from the skeletal analysis has been calculated and differences in limb proportions and body length between breeds are also examined.

In Chapter 10, the geographic distribution and prehistoric chronology of the types are discussed. Chapter 11 contains a final discussion of the analysis and summarizes the pertinent points covered. Some recommendations for future analysis are offered. The osteometric characteristics of the two defined types are listed in a useful summary table, which lists the expected ranges of measurements for specific element dimensions for each of the breed types.

Appendix A is a contribution by Shigehara, Onodera, and Eto: "Sex determination by discriminant analysis and evaluation of non-metrical traits in the dog skeleton" (based on an earlier work in Japanese by the same authors, "Discriminant analysis of the sexual differences of the skeletons in Shiba dogs (*Canis familiaris*)", published in *Acta Anatomica Nipponica* 1987, Vol.62).

Pertinent provenience data for all specimens discussed are presented in Appendix B (by specimen number), which includes relative dates of the deposits.

### **Ethnographic and historic evidence of dogs**

A fascination with the unique indigenous dogs found on the south central Northwest Coast of North America began with the first European visitors to these shores. The records left by these men reflect both the awe and confusion they felt when observing the relationship between First Nations people of this area and their dogs. Domesticated livestock animals (such as sheep and goats) did not exist in prehistoric North America before Europeans brought them here. However, it appeared that a special breed of dog, a type distinct from the common village "cur" encountered elsewhere in North America, had assumed the role

of a wool sheep in this restricted region of the west coast.

The accounts of these early European explorers indicate that two types of dogs, *Canis familiaris*, were kept simultaneously on the south central Northwest Coast (Allen 1920; Howay 1918; Barnett 1955; Keddie 1993; Schulting 1994 and references therein). In general, these accounts describe a medium sized, coyote-like animal sometimes used for hunting (often referred to as the hunting dog, but I prefer the more generic term "village" dog) and a smaller, long-haired dog kept almost exclusively for its thick coat (the "wool" dog). Measures were reportedly taken to keep the two types from interbreeding. The wool dogs were said to be sheared, much like sheep, several times a year and the wool woven into blankets.

Captain George Vancouver's account appears to be the first of the historic records that mention wool dogs (1801, cited in Howay 1918: 130). Vancouver describes the animals he saw in Puget Sound in 1792 :

The dogs belonging to this tribe of Indians were numerous, and much resembled those of Pomerania, though in general somewhat larger. They were all shorn as close to the skin as sheep are in England; and so compact were their fleeces, that large portions could be lifted up by a corner without causing any separation.

Several historic accounts mention that the wool dog was noticeably smaller than the village dog and that most were white, although a few were brownish-black or white with black. The wool dogs were said to have had upright ears, long thick fur and a tail that curled up over the back, as do all modern "spitz"-type breeds. The village dog is described as having had short fur in various shades of brown (perhaps with white markings), resembling somewhat a large, short-haired coyote. The village dog appears to have been a common, widely distributed type across western North America (Allen 1920).

Despite the historic descriptions, there are no pictures of Northwest Coast indigenous dogs except for a sketch of a wool dog produced by artist Paul Kane in 1847 that was incorporated into a painting in 1855 (Gustafson 1980). The well-known painting is suspect as real evidence of the physical appearance of this breed due to the

## Introduction

startling resemblance of the dog to a shorn sheep. Although Kane's original pencil sketch appears somewhat more realistic than the later rendition, its usefulness is still rather limited (Schulting 1994). The pencil sketches on the cover are modern composite drawings produced by an experienced forensic artist (Crockford and Pye, in press).

The history of these dogs after European contact is intimately tied to the economic value of the wool dogs. Dog-hair blankets were said to have been replaced as a favoured item in the aboriginal economy by Hudson's Bay blankets during the early historic period, circa 1800 (Howay 1918; Amoss 1993). The result of this change in preference was that the weaving of dog-hair blankets was abandoned (Keddie 1993; Schulting 1994) and dog hair ceased to be a valuable commodity. As a consequence, the impetus for keeping the wool dogs isolated from the village dogs was lost and the wool dog as a separate type soon became extinct (by 1858, according to Howay 1918). Today, after more than 100 years of freely interbreeding with both wool dogs and European breeds, the village dog can likewise be considered extinct as a distinct type.

No other North American aboriginal group has this recorded pattern of dog use (Allen 1920; Amoss 1993; Haag 1948) but it is clear that the cultural implications of this unique situation cannot be appreciated fully until some basic questions surrounding the dogs themselves are resolved. In order to investigate the time depth and geographic extent of a prehistoric weaving technology that utilized dog wool, we must at least be able to demonstrate that the dog which produced the wool actually existed as a distinct type before the historic period. We now have evidence from isotope analysis that dog wool was in use in the period 1770-1860 (Schulting 1994). Schulting's chemical analysis of this material (from the B.C. interior) contradicts an earlier study (based on morphological criteria) that failed to confirm dog hair as a constituent of any blanket labelled as "dog-hair" held in museum collections (Gustafson 1980). But what of the dogs themselves?

An analysis of skeletal material has the potential to determine the maximum geographic and temporal range of the wool dog as a distinct physical type, if indeed it existed as such in prehistoric time. However, as far as is known, no wool dogs were ever acquired deliberately as specimens by museums or collectors in the same

manner as the impressive "dog-hair" blankets. Specimens of the village dog were likewise not collected, leaving no definitive remains of either described breed. The archaeological record of skeletal remains is an essential source of data for determining the physical characteristics and prehistoric status of indigenous dog populations, but without known material with which to compare prehistoric specimens the analysis of skeletal material presents an enormous challenge.

### Research Methods

The primary objective of this study is to determine if an analysis of suitable skeletal material can supply evidence that the two historically-described dog types existed during the prehistoric period. As such, it is essentially a biological rather than an anthropological investigation. The ethnohistoric records that mention size as a distinguishing feature between the two apparent breeds was used to formulate the underlying hypothesis of this study: that two distinctly different sizes of dogs should be apparent in the skeletal sample if wool dogs and village dogs existed prehistorically as the distinct physical types described in historic accounts.

The study proceeded in two stages, the first of which was to determine whether two distinct sizes could be distinguished within a large sample of adult dog remains, collected from sites lying within the reported or expected range of the wool dog. The sample was then used to describe any diagnostic osteological, morphological and osteometric characteristics of the dogs and a preliminary attempt made to delineate the differences in prehistoric time and space.

### Prehistoric skeletal evidence

A wide range of sizes of dogs are definitely apparent in the archaeological sample collected from the south central Northwest Coast. This may be a general pattern, however, and not one exclusive to this area. For example, Lawrence (1968) has presented evidence from Idaho that different sizes of dogs existed there prehistorically (see also Allen 1920, 1939; Brothwell et al. 1979; Haag 1948). There is no indication however, that the samples she (or others) examined represent the results of deliberate or "conscious" selection (Darwin 1905) for genetically-distinct breeds. In other words, there are no oral or written records to suggest distinct breeds were maintained, even

## Introduction

though they may well have been. On the Northwest Coast, by contrast, the historic and ethnographic evidence is quite strong. The records suggest that the two types of dogs were deliberately maintained as separate populations and that there were explicit economic reasons for doing so, introducing the possibility that these dogs may constitute true breeds. While the ethnohistoric accounts must certainly be assessed with caution, there was clearly something different going on with dogs in this part of the world that cannot be summarily dismissed.

Dog remains are regular constituents of almost all faunal assemblages recovered from archaeological sites on the Northwest Coast, most of which are shell midden deposits. Cybulski's (1992) report on human burials from a number of coastal midden sites suggests that interment practices for dogs may have been similar to those used for people. Dogs (or dog parts) were occasionally found directly associated with human burials. In addition, the distribution pattern of isolated skeletal elements or partial skeletons of dogs and humans was often found to be similar. Cybulski suggests that burial of both dogs and humans in shell middens may have been a common practice prehistorically, with some interments disturbing the integrity of former ones so that older remains became partially disassociated and/or scattered. Excavation of shell middens, therefore, often results in the recovery of a few complete skeletons, isolated skeletal elements, and/or small numbers of associated elements of both dogs and humans.

In many cases, although numerous, dog remains from shell midden deposits are dominated by fragmented or badly chewed elements and/or parts from immature individuals. While the total number of specimens recovered from any one site may appear large on paper, those suitable for a study such as this (which requires relatively intact elements from fully adult individuals) are most often a rather small subset of the total. Individual sites almost never contain enough suitable dog material for good comparative analysis and so specimens from a number of sites were combined for this study.

### Previous studies

Allen's (1920) historical study of North American indigenous dogs includes a description of both types of dogs said to exist on the Northwest

Coast at the time of European contact. He refers to the wool dog as the "Clallam-Indian dog" (1920:469), which he considered restricted to Puget Sound and Vancouver Island. The village dog corresponds to his "Plains-Indian dog" (1920:449), said to range throughout western North America from British Columbia to California and eastward to the Great Plains. Although Allen included measurements from a few skulls of this type, they were all archaeological rather than modern specimens that came from southern U.S. sites.

Haag's (1948) classic work expanded Allen's study to include archaeological material from several regions. Unfortunately, the measurements of the seven prehistoric crania from the Northwest Coast are not accompanied by a discussion of breed differences and thus do not offer any resolution of the wool dog/village dog controversy. Haag's examination of institutionally-held historic and prehistoric skeletal collections confirms that no Northwest Coast dog specimens were collected during the historic period (as Eskimo dogs were, for example).

Three osteometric studies specific to south central Northwest Coast prehistoric dogs have been done. All three attempt to find skeletal evidence of the wool dog (Digance 1986; Montgomery 1979; Gleeson 1970) and share some major shortcomings as well as strengths. In particular, all three authors overlook sexual dimorphism in size and shape as a potential source of variation in their samples.

In addition, these studies are all site-specific analyses. Due to the small sample size of intact crania and post-cranial remains from the individual sites, the authors rely almost exclusively on mandibular and/or carnassial tooth measurements in drawing their statistical conclusions. This methodology, imposed by sample shortcomings rather than researcher choice, has severely limited the usefulness of the studies in assessing dog remains recovered from other sites in the region.

More importantly however, the statistical conclusions reached by these authors are probably not valid. Results from a more recent study indicates that carnassial tooth size in domestic dogs is not a reliable indicator of body size, although it may be so for wild taxa (Kurten 1988, Kurten & Anderson 1980; Dayan 1994). Morey (1990, 1992) found that tooth size was not as tightly constrained to skull allometry in dogs as in wild canids and that carnassial tooth size can vary substantially. Such variation should be taken as a warning against

## *Introduction*

using tooth size exclusively as a predictor of body size in domestic dogs.

On a more positive note, both Gleeson and Montgomery provide the raw measurement data for all of the cranial and post-cranial elements they examined, which contributes significantly to the total database of dog material for the south central Northwest Coast (the report by Digance included only carnassial and one other mandibular measurement). Gleeson (1970) reports on the dog remains recovered from the 1966/67 excavations at the Ozette Village site (45CA24), located at Cape Alava on the Olympic Peninsula, Washington State. Much of Gleeson's material was severely damaged by carnivore chewing and in addition, was largely recovered from historic period strata rather than prehistoric (thus introducing the possibility that hybridization with European breeds may be contributing to the variation seen within the sample). Gleeson's study also unfortunately predates the standard osteometric references provided by von den Driesch (1976) which I have used in this analysis.

Montgomery (1979) reports on the dog remains recovered from the prehistoric midden at Semiahmoo Spit (45WH17) south of Point Roberts, Washington State (i.e. northern Puget Sound). These deposits have been dated to the Gulf of Georgia culture type. As Montgomery followed Gleeson's style for defining measurement dimensions, many data sets provided are not directly comparable to my sample. However, as much comparable data as possible from both of these studies has been included in this report for review and possible classification.

Lastly, as all three of the previous studies provide extensive coverage of the ethnographic and historic records concerning south central Northwest Coast dogs, these details are not repeated here. Continued interest in the unique pattern of dog use reported for this area and its cultural significance is reflected in recent papers by Amoss (1993), Keddie (1993) and Schulting (1994), which provide good updated summaries of much of the ethnohistoric information included in previous osteometric studies.