

# Preliminary Identification of 11 Subfossil Canid Skulls from Little Fish Lake, Alberta, Canada

Patricia E. Ralrick, M.Sc.  
Department of Biological Sciences  
University of Calgary  
peralric@ucalgary.ca

## Introduction

The Canidae have a long and complex evolutionary history. The oldest known direct ancestor of the modern Canidae evolved in North America during the Miocene around 9 million years ago (Wang and Tedford, 2008; Wang et al., 2004; Tedford et al., 1987). These ancestors then moved across the Bering Land Bridge into the Old World of Asia and eventually became extinct in North America (Olsen and Olsen, 1977). By the Late Pleistocene, the Old World canids had evolved into many forms including wolves (*Canis lupus*), coyotes (*Canis latrans*) and foxes (*Vulpes* spp.; Matthew, 1930). These species migrated back into North America across the Bering Land Bridge and moved into nearly every ecological niche, including the prairies of Alberta (Nowak, 1979).

Also moving into the Alberta prairies during this time were prehistoric peoples who traveled with their domesticated dogs (*Canis familiaris*; Olsen, 1974; Matthew, 1930). The oldest domesticated dog material from Canada is a mandible that was collected in the Yukon and dated at possibly 12,000 years before present (Beebe, 1980) and a skull from the Crowsnest Pass region dated at 6400 years before present (Driver, 1976 as cited in Bryan, 1991).

Domesticated dogs are descendents of wolves (Wang and Tedford, 2008; Vilà, 1997); therefore, dogs and wolves can interbreed and create viable offspring (Gray, 1954). This close relationship can cause confusion when attempting to identify isolated canid material found at archaeological sites. In general, dog skulls can be differentiated from wolf skulls in multiple ways. With domestication the skull has become shortened, the teeth smaller and the tooth row crowded. Also, most domestic dogs have a much higher cranio-facial angle than wolves (Lawrence and Bossert, 1967). However, skull identification of wolf/dog hybrids is more problematic.

Little Fish Lake (LFL), near Dorothy, AB, is an ephemeral prairie lake with a multi-toxic subfossil bonebed located along the southeastern edge on a loose quartzite sand beach (Ralrick, 2007). It was concluded that this bonebed was developed as a time-averaged allochthonous site that included pulses of toxic algae induced mass mortalities. Twelve large canid skulls were collected from this bonebed (Figure 1). All are now accessioned at the Royal Alberta Museum in Edmonton, AB, and accession numbers are available upon request. For simplicity, field numbers will be used in this abstract. One of the skulls is fragmentary and species level determination cannot be made (LFL 12, Figure 1).

## Discussion and conclusions

Forty-nine measurements were taken on the remaining eleven LFL skulls as well as fifty known wolf skulls (twenty-five of each sex), fourteen unsexed wolf skulls, two male, three female and thirty-two unsexed large breed domesticated dogs such as Huskies and German Shepherds, and four known wolf/dog hybrids. Preliminary bivariate comparisons indicate that nine of the skulls cluster with wolves, while two (LFL8 & LFL9) cluster with the hybrids. Principle component analyses will be run in the future in an attempt to corroborate these results.

Several of the canid skulls are from old individuals, one with severe dental pathologies (LFL 7). Some archaeologists believe that severely worn teeth are an indication of human intervention or care because wild animals could not survive with such a high degree of tooth damage (Walker, 1975). However, wild wolves with canines worn down to the gum line are known (Mech, 1988; Pasitschniak-Arts et al., 1988; Cross, 1940), including an alpha female from Yellowstone that survived and hunted successfully with four broken canines (Van Valkenburgh pers. comm., 2006). Also, many specimens of the large Late Pleistocene canid, the Dire Wolf (*Canis dirus*), also show severely worn teeth (Van Valkenburgh and Hertel, 1993) and they were obviously not domesticated nor under the care of humans.

Archaeological artifacts such as tipi rings and cairns indicate that First Nations peoples inhabited the area surrounding LFL in the past (Gryba, 1984). Therefore, some of the canids found at LFL may, in fact, have been domesticated dogs or hybrids.

Six skull fragments were sent to the IsoTrace Lab at the University of Toronto for radiocarbon dating. The results from oldest to youngest were: 1760 ± 70 (LFL9); 1490 ± 70 (LFL8); 1480 ± 80 (LFL 1); 1140 ± 40 (LFL2); 640 ± 40 (LFL5); and 300 ± 50 (LFL7) years before present. These dates indicate that these animals are not modern wolves or dogs and were deposited over an approximate time span of 1400 years. Therefore, they were deposited naturally into a time-averaged accumulation, perhaps as victims of the previously mentioned toxic algal blooms.

## Acknowledgements

I would like to thank Dr. Len Hills for his support during this project and my masters project in general. Len was instrumental in my acceptance into the Interdisciplinary Graduate Program at the University of Calgary and helped tremendously in allowing me to pursue my dream career of vertebrate paleontology. Congratulations, Len, on a long and illustrious career!

## References

- Beebe, B.F., 1980, A domestic dog (*Canis familiaris* L.) of probable Pleistocene age from Old Crow, Yukon Territory, Canada: Canadian Journal of Archaeology, 4,161-168.
- Bryan, L., 1991, The Buffalo People: Prehistoric archeology on the Canadian plains: University of Alberta Press, Edmonton, 215 p.
- Cross, E.C., 1940, Arthritis among wolves: Canadian Field-Naturalist, 54(1), 2-4.
- Driver, J.C., 1976, Dogs and doubts: Some aspects of the prehistory of Albertan dogs: Ninth annual meeting of the Canadian Archaeological Association. (Not seen - unavailable).
- Gray, A.P., 1954, Mammalian hybrids, a check-list with bibliography: Commonwealth Agricultural Bureau, Bucks, UK.
- Gryba, E.M., 1984, Historical resources impact assessment of Dinosaur, Little Fish Lake and Zeiner Provincial Parks and the proposed Callahan Borrow Pit: Archaeological Survey of Alberta Report, Permit Number 84-56, pp. 14-25.
- Lawrence, B. and Bossert, W.H., 1967, Multiple character analysis of *Canis lupus*, *latrans*, and *familiaris*, with a discussion of the relationship of *Canis niger*: American Zoologist, 7(2), 223-232.
- Matthew, W.D., 1930, The phylogeny of dogs: Journal of Mammalogy, 11(2), 117-138.
- Mech, L.D., 1988, Longevity in wild wolves: Journal of Mammalogy, 69(1), 197-198.
- Nowak, R.M., 1979, North American Quaternary *Canis*: In Coyotes: biology, behavior and management. Edited by: M. Bekoff. Academic Press, New York, USA.
- Olsen, S.J., 1974, Early domestic dogs in North America and their origins: Journal of Field Archaeology, 1(1-2), 343-345.
- Olsen, S.J. and Olsen, J.W., 1977, The Chinese wolf, ancestor of New World Dogs: Science, 197(4303), 533-535.
- Pasitschniak-Arts, M., Taylor, M.E., and Mech, L.D., 1988, Note on skeletal injuries in an adult arctic wolf: Arctic and Alpine Research, 20(3), 360-365.
- Ralrick, P.E., 2007, Taphonomic description and interpretation of a multi-taxic bonebed at Little Fish Lake, Alberta, Canada: Unpublished masters thesis, University of Calgary, Interdisciplinary Graduate Program. 348 pp.
- Tedford, R.H., Skinner, M.F., Fields, R.W., Rensberger, J.M., Whistler, D.P., Galusha, T., Taylor, B.E., Macdonald, J.R., and Webb, S.D., 1987, Faunal succession and biochronology of the Arikarean through Hemphillian interval (late Oligocene through earliest Pliocene Epochs) in North America: In Cenozoic mammals of North America. Edited by: M.O. Woodburne, University of California Press, Berkeley, CA, USA.
- Van Valkenburgh, B. and Hertel, F., 1993, Tough times at La Brea: tooth breakage in large carnivores of the Late Pleistocene: Science, 261(5120), 456-459.

Vilà, C., Savolainen, P., Maldonado, J.E., Amorim, I.R., Rice, J.E., Honeycutt, R.L., Crandall, K.A., Lundeberg, J., and Wayne, R.K., 1997, Multiple and ancient origins of the domestic dog. *Science*, 276, 1687-1689.

Walker, D., 1975, Non-bison remains from the Vore Bison Jump, Crook County, Wyoming. *Plains Anthropologist*, 20(69), 217-224.

Wang, X. and Tedford, R.H., 2008, *Dogs: Their fossil relatives and evolutionary history*, Columbia University Press, New York. 219 pp.

Wang, X., Tedford, R.H., Van Valkenburgh, B., and Wayne, R.K., 2004, Ancestry: evolutionary history, molecular systematics, and evolutionary ecology in Canidae. *In* *Biology and conservation of wild canids*. Edited by: D.W. MacDonald and C. Sillero-Zubiri. Oxford University Press, New York, USA.

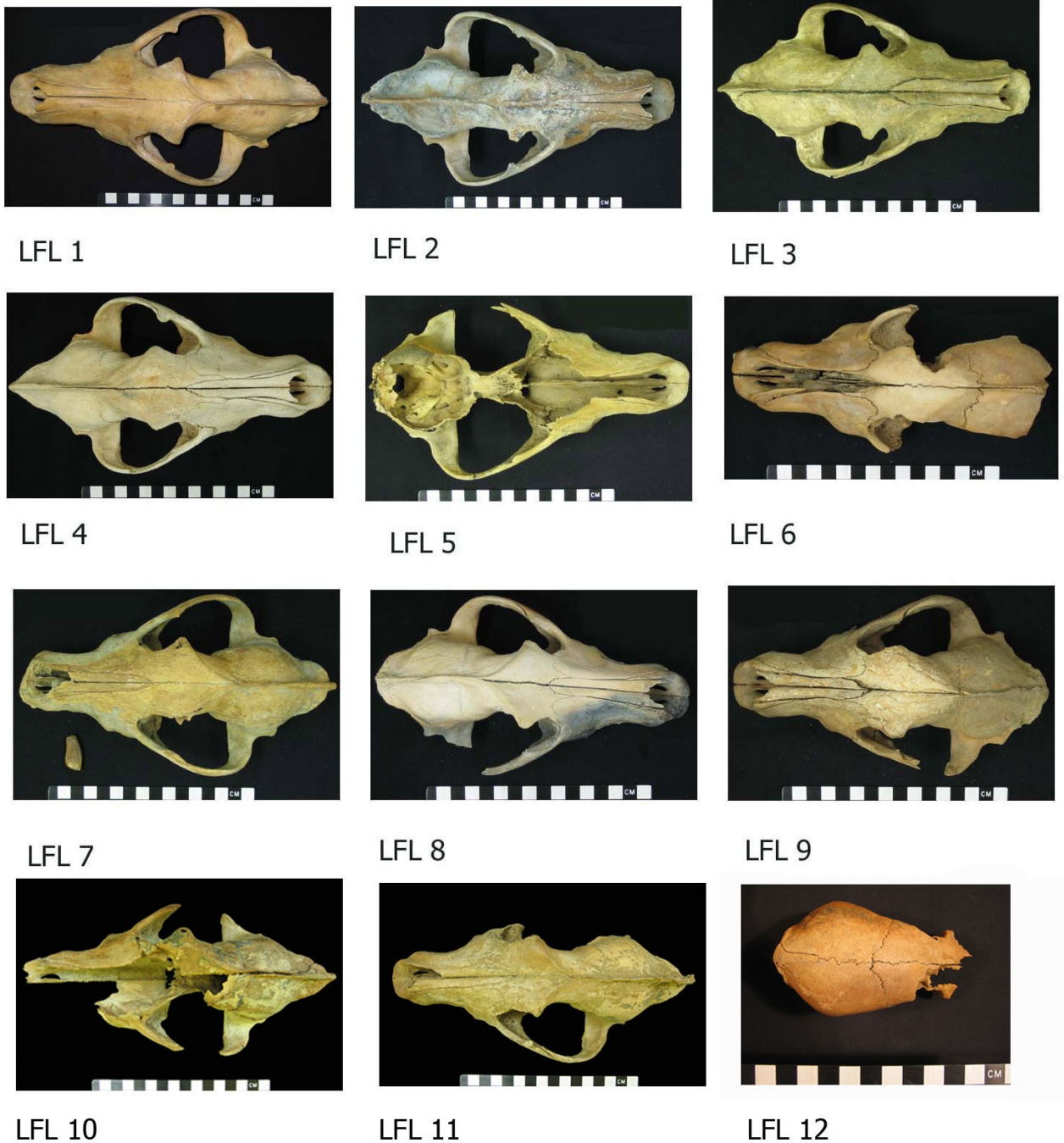


Figure 1. Twelve large canid skulls in dorsal view collected from the Little Fish Lake area with associated field numbers. Scale bar in centimeters.