



Palaeolithic and prehistoric dogs and Pleistocene wolves from Yakutia: Identification of isolated skulls



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ARTICLE INFO

Article history:

Received 31 August 2015

Received in revised form

16 September 2016

Accepted 18 November 2016

Keywords:

Canidae

Domestication

Dog

Wolf

Pleistocene

Arctic Asia

ABSTRACT

Four isolated canid skulls from four sites (Badyarikha River, Tirekhtyakh River, Ulakhan Sular, Malyi Lyakhovsky Island) in the Sakha Republic of northern Siberia are here described. Three specimens date from the Pleistocene and range in age from more than 50,000 years to about 17,200 years old, the fourth specimen is about 950 years old. The Yakutian canid skulls are compared with Palaeolithic dogs, recent Northern dogs, Pleistocene wolves and recent Northern wolves by multivariate analyses of standardised cranial measurements in order to determine with which reference group they have the closest affinity. These analyses permitted to identify the Tirekhtyakh River specimen as a Pleistocene wolf. The Ulakhan Sular specimen resembles the Palaeolithic dogs and the Malyi Lyakhovsky specimen the recent Northern dogs. The Badyarikha River skull falls in between groups. The archaeological implications of the presence of ancient canid specimens resembling Palaeolithic and early dogs in arctic northeast Asia are discussed.

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1. Introduction

The dog is the first domesticated animal. Until recently, most archaeologists accepted that the origin of the dog dates back to the late Upper Palaeolithic around 14,000 years ago (e.g. [Morey, 2010](#) and references therein). However, the antiquity of the domestication of the dog from a wolf ancestor is probably much older. Recent morphometric and genetic studies (e.g. [Freedman et al., 2014](#); [Germonpré et al., 2009](#); [Skoglund et al., 2015](#); [Thalmann et al., 2013](#); [Fan et al., 2016](#)), have suggested that the initial process of dog domestication could have started more than 32,000 years ago, although this is contested by several studies (e.g. [Drake et al., 2015](#); [Morey, 2014](#); [Morey and Jeger, 2015](#)). North-eastern Asia has produced some evidence for Palaeolithic dogs ([Germonpré et al., 2015a](#); [Losey et al., 2013](#)), but this so far has been limited to

southerly portions.

In this study, we describe and analyse four canid skulls from the Sakha Republic (Yakutia) in order to determine if any of these specimens might be early northern dogs. The presence of early dogs in arctic Asia can have significant consequences for the study of prehistoric dogs from North America, as prehistoric humans and their dogs migrated at the end of the Pleistocene from northeast Asia via Beringia to North America ([Leonard et al., 2002](#)). The Yakutian canid skulls reported here are all isolated finds and cannot be related to any identified archaeological site. However, since this material is so exceptional, we think it is justified to study these skulls in detail.

The dates in the text are calibrated in calendar years before 1950 (BP) and are derived from the AMS radiocarbon dates given in [Table 1](#). All have been calibrated using the CalPal software ([Weninger et al., 2013](#)).

2. Sites

The Yakutian canid skulls studied here were all accidentally

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discovered isolated finds. Three specimens date from the Pleistocene, one from the Holocene (Table 1). Three sites are located in Northern Yakutia, the fourth site is on one of the New Siberian Islands (Fig. 1, Supplementary Fig. 1).

2.1. Badyarikha River

The Badyarikha River canid (Fig. 2) was found by Vladimir Cheremkin in Northeast Yakutia in August 2013. It was discovered in the Abyi lowland on the left bank of the Badyarikha River (67°54'49"N, 146°30'56"E"), a tributary of the Indigirka River, about 100 km south from the village of Belaya Gora. The total height of the permafrost cliff is here 20 m and the skull was collected 6 m above the waterline. The Badyarikha skull has an age of c. 30,800 cal BP (Table 1).

2.2. Tirekhtyakh River

The Tirekhtyakh River joins the Indigirka 47 km east of the village of Belaya Gora. The site of the canid skull was found 5 km from the junction of the Tirekhtyakh tributary with the Indigirka (68°53'39"N, 147°12'45"E). The river terrace here is 8 m high and the Tirekhtyakh skull (Fig. 3) was collected 2 m below the surface by Vladimir Malaschkin in 2012 while searching for mammoth tusks. A complete mammoth skeleton with preserved skin and fur on the skull and the left front leg, referred to as the Tirekhtyakh mammoth, was found near this location in 1970 (Lazarev, 2008). The amount of radioactive carbon present in a sample from the Tirekhtyakh (1216) canid skull was very small and this suggests that the radiocarbon age of this specimen is more than 50,000 years (Table 1).

2.3. Ulakhan Sular

The Ulakhan Sular site in North Yakutia (67°41'40"N, 135°44'24"E) is a 65 m high and 1.2 km long bluff located on the right bank of the lower reach of the Adycha River, a tributary of the Yana River, at a distance of 8 km from the Betenkes village. Four main stratigraphic units are present (Lazarev, 2002; Lee et al., 2015; Nikolskiy, personal communication 2016). The lowest unit (layer 1) is composed of gravel and pebbles in a sandy matrix. The fauna dates from the Early Pleistocene and includes remains from *Archidiskodon* sp., *Equus verae* and *Praealces* sp. The next unit (layer 2) was deposited about 360,000 ± 17,000 years ago, based on ESR measurements of bivalve shells. The fauna is composed of *Panthera* sp., *E. nordostensis*, *Cervalces latifrons* (Lazarev, 2002) and *Canis* cf. *variabilis* (Lee et al., 2015). The third stratigraphic unit (layer 3) is a loamy sand deposit with a large quantity of palaeobotanical remains. The fauna includes *Bison priscus crassicornis* remains. The sequence is topped by the fourth stratigraphic unit (layer 4) consisting of silty sands with a peat layer. In some portions of the profile, down cuts filled with younger sediments are present. Here, the fauna is very rich and composed of typical mammoth fauna species such as woolly mammoth, woolly rhinoceros, horse, red deer, reindeer, bison, muskox, wolf, bear and lion (Lazarev, 2002). The Ulakhan Sular (1346) canid skull (Fig. 4) was found at this site in 2012 by an inspector of the Verkhoyansk Branch of the Ministry for Nature Protection of Yakutia. The skull has an age of c. 17,200 cal BP (Table 1).

2.4. Malyi Lyakhovsky Island

Malyi Lyakhovsky Island is part of the New Siberian Islands archipelago. The canid skull was found on the south coast of the island near a river mouth (73°57'36"N, 140°47'42"E). The permafrost

cliff is here 20 m high. The canid skull (Fig. 5) had been washed out from the sediments and was collected on the beach by Yuri Gorkhov in 2012. The canid skull has an age of c. 900 cal BP (Table 1).

3. Materials and methods

3.1. Materials

3.1.1. The unknown cases

In this study, we describe and measure four fossil canid skulls from the four Yakutian sites mentioned above (section 2) (Table 1). In addition, two ancient canid skulls from Siberia are also evaluated. The Razboinichya Cave canid from southern Siberia has a calibrated age of about 34,200 BP and has been described as an incipient dog (Ovodov et al., 2011). The Shamanka dog skull has a calibrated age of about 7400 BP and was found in the Early Neolithic cemetery site of Shamanka II from the Cis-Baikal region (Losey et al., 2011, 2013). Although the latter skull has been securely identified as from dog by osteometrics (Losey et al., 2011, 2013), it is added here as a control. All canid skulls are from adult animals with completely erupted teeth, showing at least slight wear. These six unknown cases are compared with four canid reference groups (Table 1).

3.1.2. The reference groups

The first reference set, the Palaeolithic dog group, includes eight canid skulls from early Upper Palaeolithic, mid-Upper Palaeolithic and late Upper Palaeolithic sites in North-western, Central and Eastern Europe (Germonpré et al., 2009, 2012) (Table 1). Although several researchers have questioned the validity of the Palaeolithic dog group (e.g. Morey, 2014 (but see Germonpré et al., 2015b); Boudadi-Maligne and Escarguel, 2014; Drake et al., 2015), we have shown that the skulls and mandibles of the Palaeolithic dogs have a unique morphology that is intermediate between that of wolves and recent Northern dogs (Germonpré et al., 2009, 2012, 2015a; Galeta et al., 2016; see also 5.1.). This suggests that the Palaeolithic dogs are most likely not a part of the natural variation in Pleistocene wolves.

The second reference group, the recent Northern dog group (rNd) contains specimens from Siberia, Sakhalin Island, and Greenland, dating from the 19th and 20th centuries. We prefer these recent Northern dogs as reference material over modern European dog breeds because since these dogs lived in the arctic and subarctic, they were, just as the Pleistocene canids, adapted to a cold environment (see also Germonpré et al., 2015b). Furthermore, it is likely that the amount of recent admixture between the recent Northern dogs and European breeds is limited thanks to their geographic and cultural isolation (cf. Larson et al., 2012; Brown et al., 2013; van Asch et al., 2013). In addition, it has been shown that the Siberian Husky and Greenland Sledge dog breeds, all presumably directly related to our recent Northern dogs, have a closer genetic relationship to a Pleistocene wolf from Taimyr compared to modern European dog breeds (Skoglund et al., 2015). Greenland dogs trace their origin to ancestors brought to North America by Thule people that migrated from Northern Asia about 1000 years ago (Brown et al., 2015). This suggests that North Asia could have been an important region for the dog's evolutionary history (cf. Pilot et al., 2015). The recent Northern dogs are therefore well suited as reference material.

In addition to the dog groups, the comparative sample consists of two other reference groups: Pleistocene wolves and recent Northern wolves. The Pleistocene wolf group includes seven skulls; six have been identified previously by us (Germonpré et al., 2009, 2012), and one skull from the French Maledier cave was identified by Boudadi-Maligne (2010) (Table 1) (see also 5.2.). All specimens from this comparison group date or are estimated to date

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