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Prevalence of gastrointestinal and haemo-parasites in hunting dogs in Zaria, Nigeria

AM Ehimiyein*, DD Maishanu & IO Ehimiyein

Department of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria

*Correspondence: Tel.: +2348033920107; E-mail: ajokeeo@gmail.com

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Abstract

The study investigated the prevalence of haemo- and gastrointestinal (GI) parasites among hunting dogs. Blood and faecal samples for analyses were collected from 61 dogs comprising males (n=39) and females (n=22), grouped into 3 based on age; <1-year-old, 1-3 year-old, and >3-year-old, using Giemsa stained thin blood smear and simple flotation methods. Mean PCV of the dogs was 36.28 ± 1.19%; dogs infected with haemoparasites and GI parasites, 34.47 ± 1.58%; and non-infected dogs, 38.28 ± 1.76 %, respectively. Prevalence of dogs with mixed haemo- and GI parasitism was 3.28%, and haemoparasites was 19.67%. *Babesia canis* (16.3%) *Ehrlichia canis* (1.64%), *Dirofilaria immitis* (1.64%) and mixed infections (1.64%) were identified. Dogs aged 1-3-year-old had a highest prevalence of 30%; <1-year-old, 19.5%; and >3-year-old, 10%. Male (23.08%) dogs had higher haemoparasite than females (13.64%) and Nigerian indigenous breeds (22.92%) than the cross-breed (7.69%). Nineteen dogs were infected with GI parasites, with prevalence of 31.5%. GI parasites identified were *Taenia spp* (19.67%), *Toxocara canis* (8.20%), *Isospora spp* (1.64%), *Dipylidium caninum* (1.64%), *Ancyclostoma caninum* (1.64%) and mixed infection (1.64%). Prevalence of GI helminthes in females (40.91%), and cross-breed (46.15%) dogs was higher than in males (25.64%) and Nigerian indigenous breeds (27.08%). Dogs > 3 years old had the highest prevalence (60%) of GI parasite, <1-year-old (26.83%) and 1-3-year-old (20%). There were no significant (P > 0.05) associations based on age, sex and breed, the prevalence of haemo- and GI parasites among the hunting dogs. In conclusion, *Babesia canis*, dogs aged 1-3-year-old, males and Nigerian indigenous dogs showed the highest haemoparasite prevalence, while *Taenia spp.*, dogs that were > 3-year-old, females and cross-breeds had the highest prevalence of GI parasites.

Keywords: Babesia canis, Hunting dogs, Parasites, Taenia spp, Zaria

Introduction

Wildlife hunting has been dated back to the time of human evolution (Lawal *et al.,* 2013). Hunting was a crucial component of hunter-gatherer societies before the domestication of livestock and the dawn of agriculture, beginning about 11,000 years ago. By the Mesolithic, hunting strategies had diversified with the development of the bow 18,000 years ago and the domestication of dogs about 15,000 years ago (Zenin *et al.,* 2003). Like other mammalian hosts, dogs are susceptible to intestinal parasitic helminthes and protozoa, including species of epidemiological significance that may be a source of severe disease for humans (Bajer *et al.,* 2010). Dogs may also be infected with pathogenic haemoparasites including *Babesia* species (Nalubamba *et al.,* 2011), *Trypanosoma* species

(Keck *et al.,* 2009), *Leishmania* spp., *Hepatozoon* spp., *Ehrlichia* spp*., Anaplasma* spp., *Mycoplasma* spp., (*Haemobartonella* spp.,) and *Dirofilaria* spp., which are transmitted through different arthropod vectors, including ticks, lice, triatomes, mosquitoes, tabanids and phlebotomine sandflies. They cause illnesses called canine vector-borne diseases (CVBD) in tropical and subtropical countries (Bhattacharjee & Sarmah, 2013), some of which are of zoonotic importance (Saritas *et al.,* 2005). Incidences of haemoparasites in dogs have been reported in Vom, Nigeria (Kamani *et al.,* 2011), where the prevalence of 42% was reported comprising mostly *Babesia canis* (27%). Similarly, Barker *et al.* (2012) recorded a prevalence of 44% in stray dogs in Australia, comprising 51% *Anaplasma platys* and 44% *Babesia vogeli*.

The gastrointestinal helminthosis is the most commonly encountered disease in dogs and also acts as a major constraint in dog keeping across the globe (Traub *et al.,* 2007). The distribution and intensity of the diseases are mainly influenced by geographical, climatic, cultural and economic factors (Robertson *et al.,* 2000). The level of hygienic conditions, lack of Veterinary supervision and public awareness campaign concerning zoonotic diseases exacerbate the transmission of the diseases (Panigrahi *et al.,* 2014). The aim of the study was to evaluate the prevalence of endoparasites in hunting dogs in Zaria, Kaduna State.

Materials and Methods

Study location

This study was carried out with the consent and full approval of the owners of the dogs. Zaria, the selected study area of this research, is a major city in Northern Nigeria, and also a Local Government in Kaduna State. It is located on the geographic co-ordinates of 11°12'N and 7°37' E. Zaria is a large, heterogeneous city with approximate population of 1,490,000.

Sampling design

A cross-sectional study was conducted from April, 2015 through May, 2015 to determine the prevalence of haemoparasites and gastrointestinal parasites in dogs, with no bias towards sex, age and breed of the dogs. Samaru, Hayin-dogo and Bomo village were conveniently selected as the study area, based on accessibility, proximity to the laboratories and high residence of hunters in the areas. Samples were collected by simple randomisation technique. Demographic information, including age, sex, breed and names of the dogs and owners were carefully recorded.

Sample collection

A total of 61 hunting dogs were sampled in the study, and the choice of the number of dogs sampled in each area based on convenience sampling and permission from the dog owners. The dogs were properly restrained; blood samples were aseptically collected from their cephalic veins using 5 mL syringes and 21 gauge needles. The blood samples (1 mL) were stored in well-labeled tubes containing ethylenediaminetetraacetic acid and examined immediately for parasites or refrigerated at 4°C and examined within 24 hours. Faecal samples were collected from the rectum of dogs using well-labeled and lubricated polythene bags, stored in the refrigerator at 4°C and examined within 48 hours after collection.

Blood examination

Determination of packed cell volume:

The PCV was measured using the microhaematocrit method as described by Embert (1986). Briefly, blood was collected into heparinised capillary tubes, and each tube was filled with blood through capillarity, leaving it at least 15 mm unfilled. The tube was then sealed at one end using sealant. The sealed tubes were placed in a microhaematocrit centrifuge and centrifuged at 800 x *g* for five minutes, and the PCV was measured using a reader.

Thin blood smear:

Thin smears were made as described by Dacie & Lewis (1991). A drop of blood was placed in the centre line of a glass slide. A spreader was placed at an angle of 45° to the slide, containing the blood drop and moved back to make contact with the drop. The drop was allowed to spread along the line of the spreader and the film was spread by a rapid, smooth, forward movement of the spreader. The smears were dried and stained with Giemsa and examined at x 100 under oil immersion, and a minimum of 100 fields were examined for the detection of haemoparasites.

Buffy coat smear:

The buffy coat was obtained by cutting the capillary tubes with diamond pencil at the erythrocyte-buffy coat junction and extruding a single drop of buffy coat on a glass slide. A spreader was placed at an angle of 45° to the slide, containing the blood drop and moved back to make contact with the drop. The drop was allowed to spread along the line of the

spreader and the film was spread by a rapid, smooth, forward movement of the spreader. The smears were air-dried and stained with Giemsa and examined at x 100 under oil immersion, and a minimum of 100 fields were examined to detect the haemoparasites.

Simple flotation

The flotation medium was prepared by dissolving 400 g of zinc sulphate and 150 g of sucrose in 1000 mL of distilled water until the crystals dissolved. Thymol was added and stirred to also dissolve the crystals (Hendrix & Sirois, 2007). The specific gravity of the solution used was 1.25, which allowed the debris (the faeces) to sink at the bottom of the tube and the eggs to float on top of the solution, attaching to the glass cover slip.

Two gram of the faeces was put in a universal bottle; 5 mL of the floatation medium was added. The faeces were broken into the medium using a glass rod. It was sieved into a centrifuge tube/ straight-walled test tube through gauze, placed on the tube rack. More of the medium was added until a convex meniscus was formed; a cover slip was gently placed on the preparation and leave for 3-5 minutes. The cover slip was placed on a glass slide and examined microscopically for eggs or oocysts. Maximum effort was made to characterize and classify the different eggs observed under x 10 magnification to the level of genera or species (Soulsby, 1982).

Faecal examination

A dog was categorised as positive, if at least one egg was observed (Lorenzini *et al.,* 2007) by microscopy in the employed technique. The helminthes eggs were identified based on their morphology and characteristic identification key as described by Bowman (2009).

Statistical analysis

The prevalence was calculated for all data as number of infected individual divided by the number of individuals examined, and expressed in percentage by multiplying by 100. Chi-square was used to determine association between age, sex and breed, and the prevalence of haemo- and GI parasites in hunting dogs.

Results

The mean ± SEM PCV of the hunting dogs was 36.28 ± 1.19%. The dogs infected (n=61) with haemoparasites and GI helminthes had a mean PCV of 34.47 ± 1.58%, and that of the non-infected dogs was 38.28 ± 1.76 % ($P < 0.05$). The overall prevalence of dogs with haemoparasites was 19.67%. The parasites identified were: *Babesia canis*, *Ehrlichia canis* and *Dirofilaria immitis* (Plate I) with prevalence of 16.39%, 1.64% and 1.64% respectively (Table 1). Dogs with mixed infection had a prevalence of 1.64% (1/64). Statistical analysis indicated that dogs, aged 1-3 years had the highest prevalence of 30%; dogs <1 year, 19.51%; while those above 3 years had 10.0 % prevalence (Table 2); however, the difference in the values was not significantly ($P > 0.05$). Male dogs were found to have prevalence of 23.08%, and female dogs had 13.64% prevalence (Table 2). Based on breed distribution (Table 2), Nigerian indigenous

Table 1: Prevalence of haemoparasitic infection by species in dogs in Zaria, Nigeria

Haemoparasite species	Infected dogs	Prevalence (%)
Babesia canis	10	16.39
Ehrlichia canis	1	1.64
Dirofilaria immitis	1	1.64
Mixed infection	1	1.64

n = 61

Table 2: Age, sex and breed distribution of the prevalence of haemoparasites in hunting dogs in Zaria, Nigeria

	Group	Dogs sampled	Infected dogs	Prevalence (%)	P value	X^2
Age	<1 year	41	8	19.51	0.5249*	1.289
	1 – 3 years	10	3	30.00		
	>3 years	10	1	10.00		
	Total	61	12	19.67		
Sex	Male	39	9	23.08	0.5092*	
	Female	22	3	13.64		
	Total	61	12	19.67		
Breed	Nigerian indigenous breed	48	11	22.92	0.4318*	
	Cross breed	13	1	7.69		
	Total	61	12	19.67		

*= $P > 0.05$

breeds had the highest prevalence than the cross breeds, with prevalence of 22.92% and 7.69%, respectively. Again, the difference was not significantly associated with the infection (P > 0.05).

Nineteen of the 61 hunting dogs (Table 3) were infected with GI parasites, with overall prevalence of 31.15%. The parasites identified were: *Taenia* spp., *Toxocara canis*, *Isospora* spp., *Dipylidium caninum* and *Ancylostoma caninum. Taenia* spp had the highest prevalence of 19.67%, and *Toxocara canis* was found to have the second highest prevalence of 8.20%, while *Isospora* spp, *Dipylidium caninum, Ancylostoma caninum* each had prevalence of 1.64% (Table 3). Mixed infection had a prevalence of 1.64%. The age distribution of the prevalence of GI parasites among the hunting dogs showed that dogs above 3 years old had the highest prevalence of 60%, while those less than 1 year had the prevalence of 26.83%, and dogs between 1-3 years had prevalence of 20% (Table 4).

Discussion

The present study showed a 19.67% prevalence of haemoparasites in hunting dogs in Zaria in Northern Nigeria. This is the first prevalence study of haemo- and GI parasites in hunting dogs in Zaria and its environs to the best of our knowledge. This result agrees with the findings of Okubanjo *et al.* (2013), who reported a 17.3% prevalence of *Babesia canis* and *Hepatozoon canis* in dogs within Zaria. However, the prevalence was lower than that of 42.1%, previously reported by Kamani *et al.* (2011) in North Central Nigeria. Differences in climatic conditions as well as proper veterinary services, especially presence of Veterinary Teaching Hospital in Zaria may contribute to the lower prevalence in Zaria (Okubanjo *et al.,* 2013). The result of the current investigation showed 16.39% prevalence of *Babesia canis*, higher than 8.9% prevalence reported by Jegede *et al.* (2014), and 11.66% by Obeta *et al.* (2009) in Abuja during the months of October to December, and 10.2% reported by Amuta *et al.* (2010) in Makurdi. The difference in the prevalence may be due to geographical variations and season of the study, varying in tick availability. Similar results were obtained by Edosomwan & Chinweba (2012), who recorded prevalence of 28.0% in Benin City, Southern Nigeria while working on normal house-

Table 3: Prevalence of gastrointestinal helminthes infection in hunting dogs in Zaria, Nigeria

Helminthes species	Infected dogs	Prevalence (%)
Taenia spp	12	19.67
Toxocara canis	5	8.20
Isospora spp	1	1.64
Dipylidium caninum	1	1.64
Ancylostoma caninum	1	1.64
Mixed parasitism	1	1.64

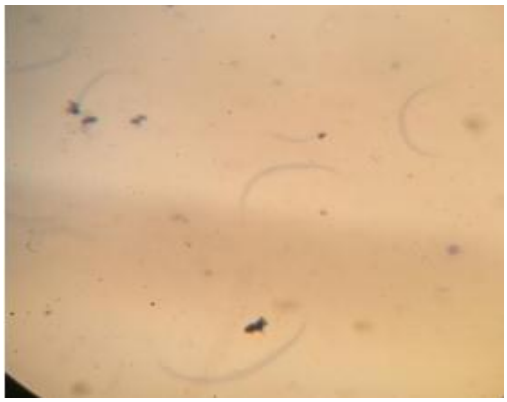

Plate I: *Dirofilaria immitis* in dog's blood smear

Table 4: Age, sex and breed distribution of the prevalence of gastrointestinal helminthes in hunting dogs in Zaria, Nigeria

	Group	Dogs sampled	Infected dogs	Prevalence (%)	P value	X^2
Age	<1 year	41	11	26.83	0.0899*	4.816
	1-3 years	10	2	20.00		
	>3 years	10	6	60.00		
	Total	61	19	31.15		
Male	Male	39	10	25.64	0.2163*	1.529
	Female	22	9	40.91		
	Total	61	19	31.15		
Breed	Nigerian indigenous	48	13	27.08	0.1878*	1.735
	Cross breed	13	6	46.15		
	Total	61	19	31.15		

*= P > 0.05

hold dogs. The prevalence of 37.3% was also observed by Anosike *et al.* (2006) in rural community in central Nigeria, 34.8% by Ramirez-Barrios *et al.* (2004) in Venezuela. However, the prevalence was lower than the 62.7%, obtained by Ogunkoya *et al.* (2006) in Zaria, 93.8% observed by Umar, (2009) in Kaduna metropolis, 52.6% by Okoye *et al.* (2011) in South-easthern Nigeria, and 59.3% by Swai *et al.* (2010) in Tanzania. The variations in the prevalence obtained in this study and that obtained by Ogunkoya *et al.* (2006) in Zaria from January, 1978 to December, 2008 may be due to sampling size of study. Furthermore, in the present survey the dogs sampled were apparently, healthy hunting dogs, while Ogunkoya *et al.* (2006) focused on clinically-sick dogs, presented to the Veterinary Teaching Hospital, Ahmadu Bello University, Zaria. The result obtained in this study showed that the faeces of dogs examined contained eggs of different parasites.

The GI parasites observed in this study were similar species observed by Mustapha *et al.* (2016) in hunting dogs in Maiduguri, Ogunkoya *et al.* (2006), Umar, (2009) in Kaduna metropolis, and Paniraghi *et al.* (2014) in India. In the present study, *Taenia* spp. had the highest frequency of occurrence in the dogs, with prevalence of 19.67 %; followed by *Toxocara canis*, 8.20%; while *Isospora* spp., *Ancylostoma caninum* and *Dipylidium caninum* each had prevalence of 1.644%. Dogs with mixed parasitism were found to have prevalence of 1.64%. This finding disagreed with the results obtained by Mustapha *et al.* (2016), where *Ancylostoma* spp. had the highest prevalence (54.8%), and *Taenia* spp had the lowest (7.3%). The current result showed that the hunters were at risk because of the public health importance of the GI helminthes observed. The result disagrees with the findings of Mustapha *et al.* (2016), who obtained a higher prevalence of GI helminthes was higher in hunting dogs >1 year-old (48.1%) in Maiduguri, Nigeria. Female dogs (40.91%) showed a slightly higher overall prevalence of GI helminthes than male dogs (25.64%), although the result disagrees with the findings of Mustapha *et al. (*2016), who recorded a higher prevalence of 40.8% in males than females (36.1%).

In conclusion, the haemo- and gastrointestinal parasites detected in this study were; *Babesia canis, Ehrlichia canis, Dirofilaria immitis, Taenia* spp., *Toxocara canis, Isospora* spp., *Dipylidium caninum* and *Ancylostoma caninum.* The present study reported prevalence of GI parasites of public health significance, for the first time, in hunting dogs in Zaria, Nigeria.

It is recommended that further investigations should be conducted in order to obtain detail information about parasitism of dogs in the study area, so as to adopt efficient control and preventive measures against the parasites.

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References

Amuta E, Atu B, Houmsou R & Ayashar J (2010). Prevalence of *Rhipicephalus sanguineus* infestation and *Babesia canis* infection in dogs with respect to breed type and degree of freedom in Makurdi, Benue State, Nigeria. *The International Journal of Parasitic Diseases,* **4**(1): 247-249.

Anosike JC, Zaccheaus VO, Adeiyongo CM, Abanobi OC, Dada EO, Oku EE, Keke IR, Uwaezuoke JC, Amajuoyi OU, Obiukwu CE, Nwosu DC & Ogbusu FI (2006). Studies on the intestinal worm (helminthiasis) infection in a Central Nigerian Rural Community. Journal of *Applied Sciences* and *Environmental Management,* **10**(2): 61-66.

Bajer A, Bednarska M & Rodo A (2010). Risk factors and control of intestinal parasite infections in sled dogs in Poland. *Veterinary Parasitology,* **175**(3-4): 343-350.

Barker EN, Langton DA, Helps CR, Brown G, Malik R, Shaw SE & Tasker S (2012). Haemoparasites of free-roaming dogs associated with several remote Aboriginal communities in Australia. *BioMed Central Veterinary Research,* **8**: 55.

Bhattacharjee K & Sarmah PC (2013). Prevalence of haemoparasites in pet, working and stray dogs of Assam and North-East India: A hospital-based study. *Veterinary World,* **6**(11): 874-878.

Bowman DD (2009). Georgi's Parasitology for Veterinarians, nineth edition. Philadelphia, USA: Saunders Company. Pp 419.

Dacie VJ & Lewis SM (1991). *Practical Haematology,* seventh edition. Churchill Livingstone, New York. Pp 138-142.

Edosomwan EU & Chiweuba CR (2012). A Survey on helminth parasites of dogs in Benin, City, Edo State, Nigeria. *Journal of Veterinary Medicine and Animal Health,* **4**(4): 56-60.

Embert HC (1986). *Veterinary Clinical Pathology, fourth edition*, W. B. Saunders Company, Philadelphia. Pp 42-78.

Hendrix CM & Sirois M (2007). *Laboratory Procedures for Veterinary Technicians*. Mosby, Inc., USA. Pp 416.

Jegede OC, Obeta SS & Faisal B (2014). Infection of dogs with *Babesia canis* in Gwagwalada Area of Federal Capital Territory, Abuja, Nigeria. Sokoto *Journal of Veterinary Sciences,* **12**(3): 37-41.

Kamani J, Weka PR & Gbise SD (2011). Parasitic cause of anaemia in dogs in Vom, Nigeria. *International Journal for Agro-Veterinary and Medical Sciences,* **5**(3): 283-289.

Keck N, Herder S, Kaba D, Solano P, Gomez J, Cuny G & Davoust B (2009). Epidemiological study of canine trypanosomosis in an urban area of Ivory Coast. *Parasite* (Paris, France), **16**(4): 305-308.

Lawal LA, Sidiqat A, Jones AA, Isreal O & Babatunde MM (2013). Local Hunting Strategies in Kwara State, Nigeria: Challenge for Wildlife Conservation policy enforcement. *Albanian Journal of Agricultural Sciences,* **12**(4): 627-632.

Lorenzini G, Tasca T & De Carli GA (2007). Prevalence of intestinal parasites in dogs and cats under veterinary care in Porto Alegre, Rio Grande do Sul, Brazil. *Brazilian Journal for Veterinary Research and Animal Science,* **44**: 137-145.

Mustapha FB, Balami SB, Malgwi SA, Adamu SG & Wakil Y (2016). Prevalence of gastrointestinal parasites of hunting dogs in Maiduguri, Borno State, Nigeria. *Journal of Agriculture and Veterinary Science,* **9**(8): 39-42.

Nalubamba KS, Hankanga C, Mudenda BN & Masuku M (2011). The epidemiology of canine babesiosis infections in Zambia. *Preventive Veterinary Medicine,* **99**(2-4): 240-244.

Obeta SS, Idris HS, Azare BA, Simon MK & Jegede OC (2009). Prevalence of haemoparasites of dogs in Federal Capital Territory, Abuja, Nigeria. *Nigeria Veterinary Journal,* **30**(3): 73-77.

Ogunkoya AB, Useh NM & Esievo KAN (2006). The haemogram of dogs with gastrointestinal parasites in Zaria, Nigeria. Journal of *Animal* and *Veterinary Advances,* **5**(9): 782-785.

Okoye IC, Obiezue NR, Okorie CE & Ofoezie IE (2011). Epidemiology of intestinal helminth parasites in stray dogs from markets in south-eastern Nigeria. *Journal of Helminthology,* **85**(4): 415-420.

Okubanjo OO, Adeshina OA, Jatau ID & Natala AJ (2013). Prevalence of *Babesia canis* and *Hepatozoon canis* in Zaria, Nigeria. *Sokoto Journal of Veterinary Sciences,* **11**(2): 15-20.

Panigrahi PN, Gupta AR, Patra RC, Mohanty BN, Maiti A & Sahoo GR (2014). Comparative anthelmintic efficacy of ivermectin delivered through different routes in gastrointestinal nematode infected dogs. *Journal of Parasitic Diseases,* **40**(1): 46-51.

Ramirez-Barrios RA, Barboza-Mena G, Munoz J, Angulo-Cubillan F, Hernandez E, Gonzalez F & Escalona F (2004). Prevalence of intestinal parasites in dogs under veterinary care in Maracaibo Venezuela. *Veterinary Parasitology,* **121**(1-2): 11-20.

Robertson ID, Irwin PJ, Lymbery AJ & Thompson RCA (2000). The role of companion animals in the emergence of parasitic disease. *International Journal for Parasitology,* **30**(12-13): 1369-1377.

Saritas ZK, Akın F, Şahal M & Ocal N (2005). Open heart surgery applications in dogs suffering from natural ınfection of *Dirofilaria immitis*. *Turkish Journal of Veterinary and Animal Sciences,* **29**(3): 713-721.

Soulsby EJL (1982). *Helminths, Arthropods and Protozoa of Domesticated Animals, seventh edition*, Bailliere Tindal, London. Pp 24-338.

Swai ES, Kaaya EJ, Mshanga DA & Mbise EW (2010). A survey on gastro-intestinal parasites of non-descript dogs in and around Arusha Municipality, Tanzania. *International Journal of Animal* and *Veterinary Advances,* **3**(2): 63-67.

Traub RJ, Hobbs RP, Adams PJ, Behnke JM, Harris PD & Thompson, RC (2007). A case of mistaken identity reappraisal of the species of canid and felid hookworms (*Ancylostoma*) present in Australia and India. *Parasitology,* **134**(1): 113-119.

Umar YA (2009). Intestinal helminthoses in dogs in Kaduna Metropolis, Kaduna State, Nigeria. *Iranian Journal* of *Parasitology,* **4**(1): 34-39.

Zenin VN, Evgeny NM, Sergey VL, Aleksandr FP, Pieter MG & Marie-Josée N (2003). The first direct evidence of Mammoth hunting in Asia (Lugovskoye Site, Western Siberia) (L). 3rd International Mammoth Conference. Dawson City, Yukon Territory, Canada: John Storer, Government of Yukon.