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SHORT COMMUNICATION

Records of the dhole (*Cuon alpinus*) in an arid region of the Altun Mountains in western China

Yadong Xue[1] · **Diqiang Li**[1] · **Wenfa Xiao**[1] · **Yuguang Zhang**[1] · **Bin Feng**[1] · **Heng Jia**[2]

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Abstract The dhole (*Cuon alpinus*), a canid, is categorized as Endangered (EN) on the IUCN Red List and is listed as a category II protected species in China. Presence-absence data are extremely rare in western China, and possible existence of remnant populations of dholes is not clear. Here, we document new records of dhole in a protected area in an arid region of the Altun Mountains in Xinjiang Autonomous Region in western China. From a total of 4517 camera-trap days at ten water sites between 2011 and 2013, we obtained seven independent records of dhole at three sites. Additionally, another reserve in Gansu Province which is located near Altun Mountains also recorded the species through camera-trap surveys. Our results indicate that dhole populations exist in the vast arid region of the Altun Mountains, and the current distribution of the dhole might be widespread in western China. We suggest that conservation efforts in this region should focus on minimizing the persecution and poaching of both dholes and their prey.

Keywords Altun Mountains · Camera trap · China · *Cuon alpinus*

✉ Yadong Xue
xueyadong334@163.com

[1] Key Laboratory of Forest Ecology and Environment of State Forestry Administration, Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry, Beijing 100091, China

[2] Department of Wildlife Conservation and Nature Reserve Management, State Forestry Administration, Beijing 100714, China

Introduction

It is estimated that fewer than 2500 mature individuals of the dhole (*Cuon alpinus*) remain in the wild and the population trend is decreasing (Durbin et al. 2008). This species is categorized as Endangered (EN) in the IUCN Red List and is a category II protected species in China. The main threats to the species are habitat loss and fragmentation, depletion of prey base, interspecific competition, persecution, and possibly disease transmission from domestic and feral dogs (Durbin et al. 2008). The dhole occurs in India, Thailand, Laos, and Peninsular Malaysia in South and Southeast Asia, and studies on food and foraging behavior, social behavior, and competition with other carnivores of dhole have been carried out in the region (Venkataraman 1995, 1998; Grassman et al. 2005; Borah et al. 2009; Kamler et al. 2012). Dholes were reported in Jiangxi of south China and Tibet in recent years. Also, dholes were recorded with camera traps in Baima Snow Mountain Nature Reserve in Yunnan which is near southeast Tibet (W. Bleisch, pers. comm.). Dholes are known to have once been present in parts of western China in the Tian-Shan Range (Durbin et al. 2008), but little is known about the species' current status in western China due to most areas of western China are difficult to access. Here, we document new records of dhole in two reserves in an arid region in the Altun Mountains of Xinjiang Autonomous Region and in the Qilian Mountains of Gansu Province in western China.

Material and methods

As part of a larger project to examine the richness and distribution of mammals, we conducted camera-trap surveys at water sites in Xinjiang Lop Nur Wild Camel National Nature Reserve in an arid region of the Altun Mountains (also

called the Arjin Shan). The nature reserve lies in the south-eastern part of Xinjiang Autonomous Region, extending to the boundary of Qinghai and Gansu Provinces. Camera-trap surveys were carried out on the northern slope of the Altun Mountains on the southern edge of the Kumtag Desert (91° 00′–92° 30′ E, 39° 13′–39° 32′ N) (Fig. 1). The elevation of

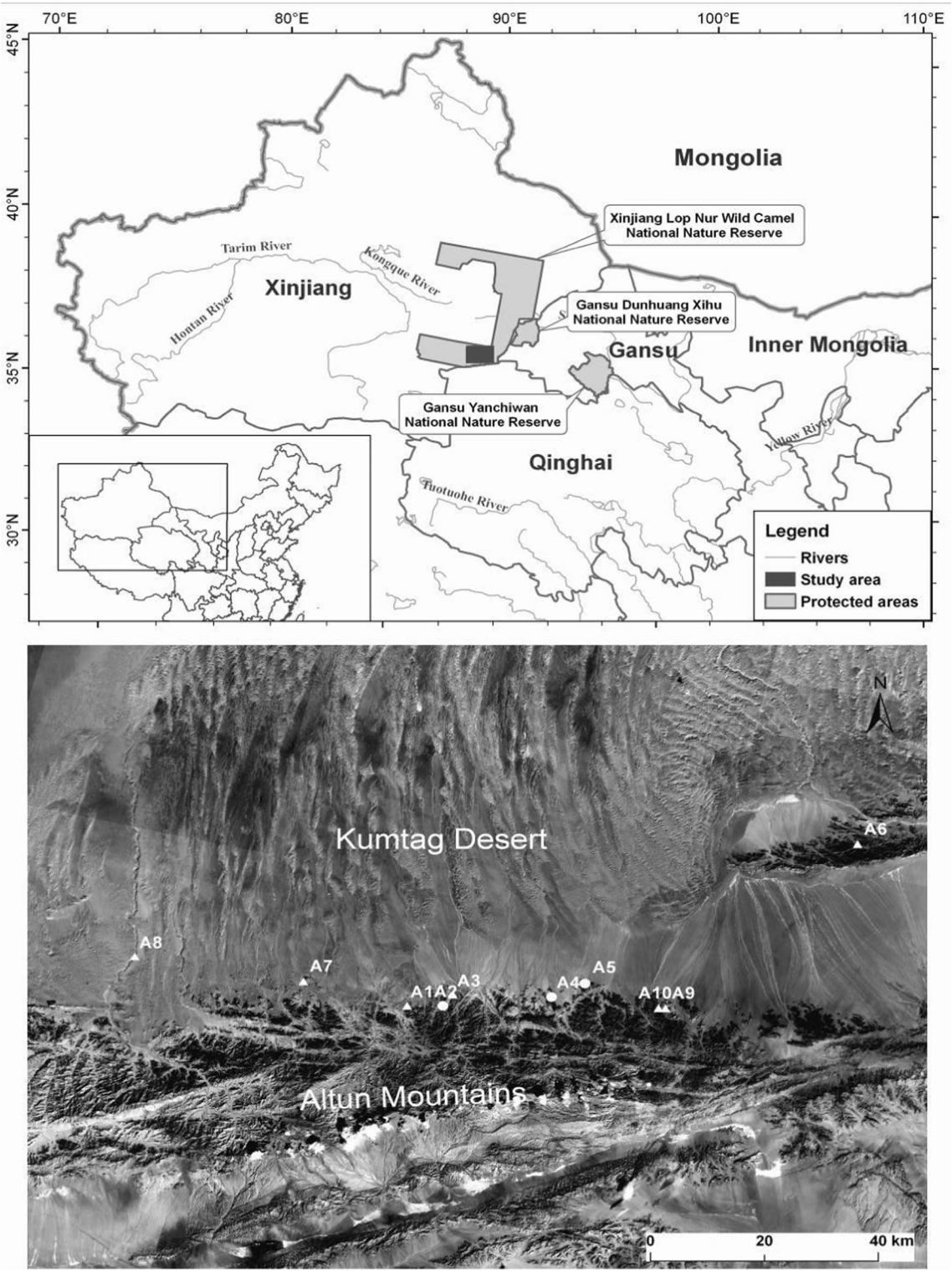

Fig. 1 The study area in an arid region of the Altun Mountains, western China (indicated by the *dark rectangle on the regional map*), with the location of the three protected areas where surveys were conducted between 2011 and 2013. The *white triangle and white circles* indicate the locations of water sites, and *white circles* also indicate the locations of camera-trap records of the dhole *Cuon alpinus*

the study sites varied from 1700 to 2400 m. The study area is extremely arid with an annual precipitation of less than 50 mm, which occurs mainly during summer (May–August). Mean monthly temperatures range from −14.7 °C in January to 27.8 °C in July (Science Team of Kumtag Desert 2012). Water sites in the mountains provide water for a variety of ungulates and carnivores. The arid environment supports only sparse vegetation. Water sources are fed by springs concentrated along the base of the north slope of the mountain range, which is the source of most of the water in the region. The areas around the water sites are dominated by *Populus euphratica*, *Phragmites australis*, and *Achnatherum splendens*, while the valleys and vast desert areas are predominantly occupied by *Sympegma regelii*, *Reaumuria kaschgarica*, and *Ephedra przewalskii* (Yuan and Zhang 2012). Gansu Dunhuang Xihu National Nature Reserve is on the east edge of the Kumtag Desert (92° 45′–93° 50′ E, 39° 45′–40° 36′ N) (Fig. 1). The reserve has an area of 6600 km^2, with wetland area about 980 km^2. The other areas are mostly covered by desert. The climate is similar with Xinjiang Lop Nur Wild Camel National Nature Reserve.

Camera traps were placed from November 2011 to December 2013 at sites A1 (780 trap days), A4 (779 trap days), and A6 (121 trap days); from February 2012 to December 2013 at sites A2 and A3 (662 trap days), and A5 (591 trap days); from September 2012 to December 2013 at site A8 (275 trap days); from January 2013 to December 2013 at site A7 (216 trap days); and from May 2013 to December 2013 at sites A9 and A10 (216 trap days). Cameras were positioned adjacent to open water, or 3–5 m from animal trails leading to the water. Two to four cameras were set near each water site according to the topology of the sites. Cameras were checked every 3 to 4 months to replace SD cards and batteries. Consecutive photos of the same species were considered independent records when the interval between them was at least 12 h (Fusco-Costa and Ingberman 2012). Additionally, we gathered reports of observations of the dhole from the adjacent reserves. Confirmation of species was by photographic identification.

Results

The surveys resulted in a total of seven independent records of the dhole at three sites in the Altun Mountains (Fig. 1, Table 1). In Gansu Yanchiwan National Nature Reserve, the staff obtained confirmation by camera trapping that an adult individual and three pups were recorded from 2012 to 2013 (Hongyan Fu, pers. comm.). In the videos provided by the reserve, the dholes were wandering around their den and running along the ridge. In contrast, in Gansu Dunhuang Xihu National Nature Reserve, no records were obtained by camera trapping (662 trap days), and no observation of dhole was reported by the reserve staff from 2011 to 2013 (Zhicheng Sun, pers. comm.).

Discussion

Most of the available information on dholes comes from studies carried out in tropical dry and moist deciduous forests or evergreen and semi-evergreen forests in South and Southeast Asia (Venkataraman et al. 1995; Karanth and Sunquist 2000; Grassman et al. 2005; Kamler et al. 2012). However, studies on dholes in arid and semi-arid regions in western China is absent because of the harsh environment and the dholes' cryptic features. Kawanishi and Sunquist (2008) and Kamler et al. (2012) note that dholes are almost exclusively diurnal. Our limited data also showed that the dhole were diurnal in western China. Dholes usually live in packs of 5–10 individuals, or even more (Durbin et al. 2004). Camera-trap surveys in Peninsular Malaysia recorded a maximum pack size of dhole of 4 individuals (Kawanishi and Sunquist 2008). We estimated group size by the video mode camera-trapping method. In our study, the maximum number of animals recorded at water sites was five animals, the other 6 dhole photos consisted of either single or paired animals, suggesting that pack sizes might be smaller on our study site compared to other regions.

Medium to large ungulates are the main prey species of dhole in South and Southeast Asia countries (Venkataraman et al. 1995; Grassman et al. 2005; Kawanishi and Sunquist

Table 1 Sample effort and records of dholes *Cuon alpinus* at three water sites in the Altun Mountains, western China

Water sites	Altitude (m)	Photographic records	Photo-capture date	Photo-capture time	Dhole numbers
A2	2317	1	2013-08-07	09:37	1
A4	2321	1	2013-09-29	09:50	5 (Plate 1)
A5	2203	5	2012-09-23	10:46	1
			2012-09-24	19:13	1
			2013-03-18	16:51	2
			2013-04-09	09:29	1
			2013-04-14	17:41	1

Plate 1 Camera-trap photograph of dholes *Cuon alpinus* at A4 water site in the Altun Mountains, western China

2008; Borah et al. 2009; Kamler et al. 2012). The availability of medium to large ungulate prey species may be an important factor that may influence habitat selection (Durbin et al. 2008). Gansu Dunhuang Xihu National Nature Reserve is located on the eastern of Kumtag Desert with a more than 85 % area covered by desert and gobi (Wu and Yuan 2010), but no evidence of the dhole was found there. In that desert region, only two ungulate species, wild camel (*Camelus ferus*) and goitered gazelle (*Gazella subgutturosa*), were detected occasionally. Prey richness and abundance were higher in the adjacent nature reserve in the northern slope of Altun Mountains and Gansu Yanchiwan National Nature Reserve where dhole was recorded. The detected ungulate species in Xinjiang Lop Nur Wild Camel National Nature Reserve include wild camel, kiang (*Equus kiang*), goitered gazelle, blue sheep (*Pseudois nayaur*), and argali (*Ovis ammon*) (Xue et al. 2014). The ungulate species in Gansu Yanchiwan National Nature Reserve include kiang, goitered gazelle, blue sheep, argali, and Tibetan gazelle (*Procapra picticaudata*) (Hongyan Fu, pers. comm.).

At water sites in the Altun Mountains, dholes were sympatric with wolf (*Canis lupus*; 123 records), red fox (*Vulpes vulpes*; 268 records), snow leopard (*Panthera uncia*; 5 records), and eurasian lynx (*Lynx lynx*; 2 records) (Xue et al. 2014). Due to the low detection probability of these species, it is difficult to study the interspecific competition at water sites.

There are 11 recognized subspecies of dholes (Durbin et al. 2004). Three subspecies exist in China: *C. a. lepturus* (south of Yangze River, China), *C. a. hesperius* (East Russia and China), and *C. a. fumosus* (West Szechuan, China, and Mongolia). The subspecies that exists in the Altun Mountains is likely *C. a. fumosus* (Durbin et al. 2004; Iyengar et al. 2005). Though historically widespread in distribution, dhole are becoming more and more difficult to observe in nature due to rapid habitat loss and fragmentation, the result of ever-growing natural resource demand in China. The status, distribution, and biology of dhole populations in China are poorly known and require further study. Our results indicate that a dhole population exists in the vast arid region of the Altun Mountains. The distribution of the dhole might be widespread in western China, probably because human population levels in western China are much lower than eastern and southern China and a number of these areas are remote places that are difficult to access. More research needs to be conducted on the status and distribution of dholes in western China, and other areas of China as well.

Despite their continued presence in protected areas in western China, dholes are still threatened due to widespread hunting and prey decreases. During our survey, a lame wolf and red fox were recorded, which included a red fox with a steel trap still on its foot. Evidence of poached blue sheep also was found in the area during our study. We suggest that additional conservation efforts in this region should focus on minimizing the persecution and poaching of both dholes and their prey.

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