

# DISTRIBUTION AND POPULATION STATUS OF THE WILD BACTRIAN CAMEL (*Camelus bactrianus ferus*) IN GANSU PROVINCE, CHINA

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## ABSTRACT

From 1993 to 2002, the geographical distribution, habitat contraction and numbers of wild Bactrian camels (*Camelus bactrianus ferus*) were investigated in Annanba Nature Reserve, Wanyaodun Nature Reserve and Yarden Geological Park. Over the past 1,000 years, the distribution area of the wild Bactrian camel has shrunk 1,000 km<sup>2</sup> westwards in Gansu Province. The major reasons for this are human activities, climate change and grazing competition from domestic Bactrian camels and other domestic ungulates. Result of surveys showed that wild camel group numbers varied from 2 to 21, and mean sizes were 3.2-15.0 (camels/groups). Immature wild camels were 3.2% in Annanba Nature Reserve and 6.3% in Wanyaodun Nature Reserve, respectively. However, in February 2002, the per cent of adult male, female and immature wild camels were 23.9, 74.6 and 1.5%, respectively among 67 wild camels found in Annanba Nature Reserve. Severe winters and wild animal predation are major factors leading to low survival rates for immature wild camels. However, the most serious factor threatening wild camels in Annanba Nature Reserve is cross-breeding between wild camels and domestic camels.

**Key words :** Competition, cross-breeding, geographical distribution, mean group, population, sizes

The wild camel may have lived in vast areas of Gansu Province based on the historical records. The earliest records of wild camels in Gansu are contained in hunting activities depicted in rock paintings in the Danghenan Shan, which were made 3,000 years ago. Several individual camels can be seen in these paintings (Liu, 2001). The domestic camel had not been introduced into China at the time. In the 8<sup>th</sup> century, a poem by Cencan noted 'roasted wild camel' and 'biscuits made of wild camel's milk' at an officers' banquet in Anxi and Jiuquan. In the 10<sup>th</sup> century, the wild camel's eastern boundary was Shenmu in Shaanxi Province, the western boundary was the Yumen Pass (to the north-west of Dunhuang), the southern boundary was Lanzhou and the northern boundary was Ejina Banner of Inner Mongolia (Wen, 1990). In the 11<sup>th</sup> century the wild camel's habitat was mainly in the Hexi Corridor of Gansu Province and western Inner Mongolia. Chinese medicine books published between the 9<sup>th</sup> and 11<sup>th</sup> century listed the wild camel as a source of medicine (Wen, 1990). In the 12<sup>th</sup> and 13<sup>th</sup> century, wild camel's feet were one of the 'eight treasured food' in a banquet of high officials, indicating that

the wild camel was already rare at that time. In 1804, it was registered in 'Yumen County Record' that some wild camels had been seen in Yumen (Wen, 1990). From the 1950s to the 1970s, there were many official reports that wild camels were hunted by local herdsmen, legal and illegal miners and hunters in Mazong Shan. Also in the 1970s, there were reports of hunting in Annanba, Aksai county (Chen, 1984) and Gunpo Spring, near the northern slopes of the Mazong Shan (Wang, 1991). Hare (1997) reported that wild camels moving across the border from Mongolia used the border buffer zone near Dacoatan Spring in Gansu Province. In the past 1,000 years, the wild camels' distribution area in Gansu Province has shrunk by more than 1,000 km (Fig 1). The Wild Camel Protection Foundation, founded by Hare (1997) a UK based charitable foundation, is trying to establish a new Reserve in the northern area of Gansu Province which is contiguous with the international border with Mongolia and the Mongolian Great Gobi Reserve 'A'. The wild camel is a moving species and crosses over the international border into Gansu Province where it is frequently shot by miners for food and hunters for sport (Hare, 1997).

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The distribution area of wild Bactrian camels (*Camelus bactrianus ferus*) in Gansu Province is separated into two geographical areas: (1) The southern area is about 12,000 km<sup>2</sup> which includes Annanba Nature Reserve, Wanyaodun Nature Reserve and Yordan Geological Park. (2) The northern area is over 4,000 km<sup>2</sup>, and is located in the northern Mazong Shan south of the border of the Great Gobi Protected Reserve 'A' in Mongolia.

The wild camel listed as critically endangered by the International Union for the Conservation of Nature (IUCN, 2002) belongs to one of the most endangered ungulates in the world, and surveys over past decades suggest a marked decline in camel numbers and reproductive success (Reading *et al*, 1999). It is therefore attracting increased attention from zoologists, ecologists and biological conservators. During the latest 30 years research includes: (a) Geographical distribution, habitat contraction (Gu and Gao, 1987; Hare, 1996; 1997; 1999; Olson, 1988; Tolgat and Schaller, 1992; Yuan, *et al*, 1999a and b; 2000), (b) Life history, habitat status (Gu and Gao, 1987; Reading *et al*, 1999; Yuan *et al*, 1999a and b; 2000; Zhao *et al*, 1999) in China and Mongolia. Chen (1984), Wang (1991) and Hare (1997) reported some of the geographical distribution, habitat, food and individual numbers, of wild camels in Gansu Province. In this paper, we are presenting information on geographical distribution, habitat contraction and population status of the wild camel based on data collected from 1993 to 2002.

### Study Area

The surveys were conducted separately in Annanba Nature Reserve located near the northern slopes of the Arjin Shan, Wanyaodun Nature Reserve and Yordan Geological Park situated on the Shule River, 92°15' - 93°56'E, 39°05' - 40°51'N, a total area of about 12,000 km<sup>2</sup> (Fig 2). There is an altitude of 900 - 960 m in Wanyaodun Nature Reserve, 1100-3800 m in Annanba Nature Reserve and 810 - 970 m in Yordan Geological Park. The climate is continental and arid. The coldest month is January (mean temperature - 7.8°C) and the hottest month is July (mean temperature +25°C). Precipitation is very low, averaging 15 - 97 mm a year, with most precipitation falling in the summer months and some areas receiving no precipitation for years. Springs and other water sources include Houkengzi, Mamitu, Tianqiaodun and Da Spring in Wanyaodun Nature Reserve, Huanyanggou, Dahong Shan Spring, Simutu Spring, Yema Spring, Gan Spring (salt water) and Kushui River in Annanba Nature Reserve (Fig 2). But

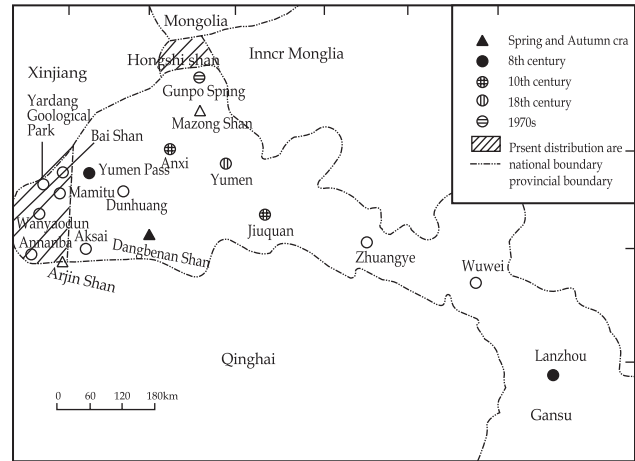


Fig 1. The wild bactrian camel's historical and current distribution in Gansu Province.

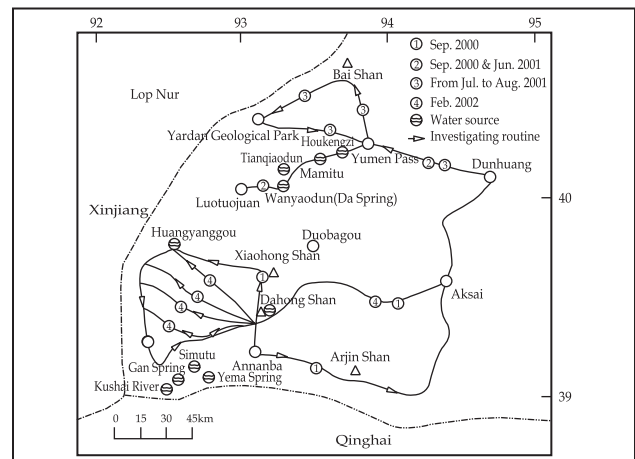


Fig 2. Investigation of the wild Bactrian camels habits and water sources in southern Gansu Province from 2000 to 2002.

there is no water source in Yordan Geological Park. All these water sources apart from Gan Spring hold fresh water. Xerophytic and hyperxerophytic semi-shrubs, shrubs, scrub vegetation and turfy grasses dominate. Main plants include *Reaumuria soongrica*, *Stipa glareosa*, *Alhagi maurorum* and *Haloxylon ammodendron* in Annanba Nature Reserve, *Populus alba*, *Alhagi maurorum*, *Phragmites australis* and *Glycyrrhiza uralensis* in Wanyaodun Nature Reserve and *Agriophyllum squarrosum* in Yordan Geological Park, respectively.

### Methods

Groups of wild camels were searched for by jeep, and group sizes and numbers (including female, male and immature camels which was no more than one years old) were observed by using telescopes or the naked eye. For gender differences, the male owns a stockier build and more developed skeleton, shorter length and longer width head, stronger neck, and thicker mane (Ningxia Agricultural College

and Inner Mongolian Agricultural College, 1980). Comparison on the above features, the differences can be discerned between the male and female of the adult in the field. The wild camels were investigated in Wanyaodun Nature Reserve in September, 1993 and 2000, and from July to August, 2001; in Annanba Nature Reserve in October, 1995, September, 1998, September, 2000 and February, 2002; and in Yarden Geological Park in June, 2001 (Fig 2). Wild camels' footprints were counted to ascertain group sizes and numbers by surveying moving routes, and the difference of footprint size between the mature and the immature was significant. When in a group, wild Bactrian camels move in a fixed direction from a water point, so in 2000 we estimated group numbers in Wanyaodun Nature Reserve by counting newly made footprints which differ from old ones. However, this method can only be used where there are no domestic camels in the vicinity. The distinctions between the hybrid and wild or domestic camel are apparent. The hair color of the hybrid is closer to that of wild camel, grey and brown, but the body size is closer to the domestic, and the hybrid is more tameless than the domestic. Comparing on these features, the hybrid can be discerned easily from the domestic. On the other hand, the vegetations were recorded in all investigating routines.

## Results

### *Geographical distribution and moving information*

**(1) Southern area:** Wild camels were encountered in two isolated areas of Gansu Province - the southern region from Arjin Shan to Yarden Geological Park in a latitudinal direction, and from Gansu-Xinjiang border to Dahong Shan, Xiaohong Shan and Mamitu in longitudinal direction, with a total area of about 12,000 km<sup>2</sup>.

**(2) Northern area:** Wild camels were not encountered. Information based on herdsmen's reports in Mazong Shan. In 1970s, the northern distribution region extended to Gunpo Spring (Wang, 1991). But now there is a town where many legal and illegal miners live. Wild camels were reported by herdsmen near Yema Spring, an area of more than 4,000 km<sup>2</sup>.

### *Population structure*

From 1995 to 2002, 29 groups were found in 4 field surveys in Annanba Nature Reserve. 4.7% of individuals (usually bull camels) were found living on their own, the other 95.3% were found in groups and the average size of a group was 3.4 to 9.6 (Table 1).

Since 1993, 4 field surveys have been conducted in Wanyaodun Nature Reserve and Yarden Geological Park. In Wanyaodun Nature Reserve, a female wild camel was found dying from dystocia on the 2<sup>nd</sup> March, 2002 and seven days later she was found dead. In all, 84 individuals were found, out of which 4.8% were found on their own and the other 95.2% in groups (14 groups). The average size of the groups was 3.2 to 15 (Table 2).

In the northern area of Gansu, wild camels were observed by local herdsmen in Mazong Shan and there were also reports that some wild bull camels matured successively with domestic female camels. In 2002, there were 16 wild camels reported by herdsmen in this region.

### *Group number*

There were 23.9% of male, 74.6% of female and 1.5% of immature wild camels among 67 wild camels (Table 3). In September, 2000, there was 1, or 3.2% immature wild camel among 31 in Annanba Nature Reserve; and at the same time, 1, or 6.3% immature among 16 in Wanyaodun Nature Reserve.

## Discussion

### *The causes of wild camel habitat contraction in Gansu province*

#### **(1) Human activity**

Fluvial plains of the Shule and Dang Rivers in Dunhuang and Anxi counties have a history

**Table 1.** The number of wild Bactrian camels in Annanba Nature Reserve, Gansu Province.

Date	Group no.	Total no.	Mean group size, (Min-max.)
Sep, 1975	2	15	7.5±0.7 (7-8) <sup>1</sup>
Oct, 1995	2	16	8.0±2.8 (6-10)
Sep, 1998	11	85	7.4±5.5 (1-20)
Sep, 2000	9	31	3.4±5.5 (1-17)
Feb, 2002	7	67	9.6±6.6 (2-21)

<sup>1</sup>From Chen (1984)

**Table 2.** The number of wild Bactrian camels in Wanyaodun Nature Reserve and Yarden Geological Park, Gansu Province.

Date	Group no.	Total no.	Mean group size, (Min-max.)
1993	1	9	9.0 ± 0.0
Sep, 2000	5	16	3.2 ± 4.4 (1-11) <sup>2</sup>
Jun, 2001	1	15	15.0 ± 0.0 <sup>2</sup>
Jul-Aug, 2001	7	44	6.3 ± 5.3 (1-14)

<sup>2</sup>investigated wild bactrian camels tracks.

**Table 3.** Group number of wild bactrian camels in Annanba Nature Reserve, February 2002.

No. group	Group size	Male no.	Female no.	Immature no.
1	4	1	3	0
2	2	2	0	0
3	13	3	10	0
4	9	2	7	0
5	21	2	18	1
6	5	3	2	0
7	13	3	10	0
Total	67	16	50	1

of cultivation of over more than 2,000 years. The fine grasslands and water sources of Annanba, Wanyaodun and the dry river course of the Shule River are good grazing areas for wild camels. Vast areas of grassland and bush which the wild camels survived on have been turned into farmland. Human activity on the Silk Road and later the Gansu-Xinjiang highway and the Lanzhou-Xinjiang railway, together with increased cultivation, have led to the division of wild camel habitat in Gansu province into southern and northern areas. It is a man-made boundary which it is impossible for the wild camel to cross.

### (2) Climate change and overuse of water resources

Aridity has intensified in the Hexi Corridor, many pools have dried up in the last 3,000 years (Liu *et al*, 1998). Construction of dams and overuse of ground water in agriculture and industry have led to a decrease of ground water levels and the disappearance of surface runoff. The habitat of the wild camel has shrunk to an area around springs and seasonal rivers. During the surveys in the two reserves and the park, we found that wild camels drink only fresh water, but it is reported that they do survive in totally salt water in Lop Nur, Xinjiang Province (Hare, 1997).

### (3) Competition from domestic camels and other domestic ungulates

Historically, pasture near the mountains running north/south along the Hexi Corridor have been wild camel grazing areas. Rock paintings indicate that wild camel and domestic ungulates shared pasture in the Danghenan Shan and the Arjin Shan 3,000 years ago. With the increase of domestic ungulates and the introduction of domestic camels after the emergence of the Silk Road and the intensification of grazing competition, wild camels have been forced to move to less fertile grazing areas.

### *Group Number*

In May, 1995, Yuan *et al* (2000) found in the Arjin Shan of Xinjiang Province, 12 groups of wild camels, totaling 50, among which there were 14 adult camels. Their gender couldn't be recognised, and others were 14 females, 8 males and 14 immature wild camels, i.e. 28.0%. The percentage of immature wild camels from our survey in Annanba in February, 2002 is rather lower than above. The difference is related to the timing of the investigation. The wild camel calves down between April and June, so the rate of immature wild camels must be higher in May. Hare's (1997) research indicated the number of immature wild camels was about 6.0% in Annanba and the Arjin Shan, which is somewhat higher than research undertaken by our team in the Annanba Nature Reserve, but approaches the level found in the Wanyaodun Nature Reserve. The mean group sizes of wild camel in the Annanba Nature Reserve are almost equal to that in Mongolia in March 1997 - mean group size,  $10.26 \pm 2.38$  SE (Reading *et al*, 1999). But there are many predators in our research areas - *Canis lupus*, *Uncia uncia* and *Cuon alpinus* who eat young wild camels. According to Mamuli's research, 89 dead bodies of wild camels were found in Annanba Nature Reserve between 1984 and 1989, which included 7 immature wild camels killed by predators, 8 were hunted, and the rest died of unknown causes. In the spring of 1997, 11 young wild camels killed by *Canis lupus* were encountered in a valley on the northern foothills of the Arjin Shan in Annanba Nature Reserve. This may explain the low per cent of immature wild camels. In the survey of February, 2002, two adult wild camels were found killed by hunters in the Annanba Nature Reserve. In 1987, Tolgat and Schaller (1992) reported that the immature wild camel death rate in the spring, summer and autumn are 13.8, 6.2 and 2.5%, respectively among the wild camels in the Mongolian Gobi Desert. After a harsh winter and attacks from predators, only a few immature wild camels can survive. This explains the 1.5% immature wild camel death rate found by our survey in Annanba in February, 2002.

### *Most serious threats to the wild camel*

The current most serious threat to wild camels in Annanba Nature Reserve in the south of Gansu Province is substantial cross-breeding between the male wild camel and the female domestic camel, but no cross-breeding between the female wild camel and the male domestic camel was observed in our investigation. It usually processes from Dec to Jan of

the next year that the wild mates with the domestic. According to our research, the hybrid could account for about 20 - 30% in all domesticated camels of Annanba Natural Reserve. Domestic camels' genes have been passed to wild camels and the wild camel's gene pool has been affected. Domestic camels' genes have been affected by human selection and its genetic make-up has adapted to a domestic environment. Therefore hybrid camels rapidly become less suited to a natural desert environment. In addition, domestic camels may harbour genes that are harmful to wild camels. If these genes spread widely into wild camels, it could prove disastrous. Today, almost all the wild camels' habitat in Annanba Nature Reserve is domestic Bactrian camels' grazing areas. There are continual reports of substantial cross-breeding. According to our research, 20 hybrid individuals found among domestic camel herds were killed by herdsman in Annanba Nature Reserve only in 1997. The investigations of Yuan *et al* (2000) indicated there were 10 hybrid camels at least in every domestic camel in Arjinshan area of Annanba Natural Reserve. It also appeared in Mongolia that the hybrid number can arrive to 20 at most in every domestic camel group and every year (Yuan *et al*, 2000). In order to preserve the genetic purity of wild camels, the owners of domestic camels must be forbidden to graze their animals in Reserve areas.

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## NEWS

### Disappearing ship of the desert in Asia

The number of camels in Asia has fallen by a fifth in the past 10 years. Statistics from the Food and Agriculture Organisation (FAO) of the United Nations show that camel numbers dropped from 4.5 million in 1994 to 3.5 million in 2004. Lokhit Pashu Palak Sansthan and its Germany-based partner organisation League for Pastoral Peoples, pointed out that a major reason for the startling drop in the camel population was the loss of pasture land.

India has seen one of the swiftest declines in camel numbers accounting for a loss of 38 per cent camels in the past 10 years. In the Thar desert, a tribe of "tubewell nomads" has come up. Farmers pump up groundwater to grow crops such as mustard and wheat. These "tubewell nomads" fence their fields to keep animals out, or even kill them. At the same time, in the name of afforestation or conservation, the Forest Department prohibits access to traditional rangelands.

*Courtesy : The Hindu, Saturday, June 18, 2005*



### Camel takes dog for a ride

Nomadic tribals from thar desert migrate to Madhya Pradesh of India every summer in search of food and water for themselves and their cattle. Their all belonging and small animals and pets are carried over the camel back. They keep guard dogs for safety of their animals. Camels are main source of livelihood for them.

*Courtesy : Times of India May 10, 2005*



### Camels : Ship of River

Camels are used for draught purpose in India. In some cities they are used for transportation of goods either on the back of camel or thorough cart. Camels are used to transport watermelons across the major holy river - the Ganga in Allahabad (U.P.), India. Camels can swim also in deep water but there are reports from Rajasthan where camels were drowned in flood water. However, they can traverse through shallow water.

*Courtesy : Times of India, June 11, 2005*