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The Distribution of the Two Domestic Camel Species in Kazakhstan Caused by the Demand of Industrial Stockbreeding

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Abstract: There are two domestic camel species: the dromedary and the Bactrian camel. The distribution of the two domestic camel species is clearly differs, although they meet at the latitude corresponding to an average temperature of around 21°C. The Bactrian occurs in the eastern area of Afro-Eurasia continent; from Mongolia to Central Asia. While, the dromedary inhabits western area; from the Arabian Peninsula to the Sahara desert. In Kazakhstan, they keep both species and hybrid of them. The dromedary is dominant in the eastern Kazakhstan, around Almaty; and the Bactrian is prevalent in north-western part, around Aktobe. In our study, we found that nowadays, the geographic distribution of both camel species is greatly determined by the climatic factors; for instance the one-humped camel could be breed in environment where the annual average air temperature is above 10°C and the record low air temperature dips minus 38°C or above. It is difficult to keep one-humped camels in the northern region to the 45°N altitude. Also, economic demand is important factor for the geographic distribution of both camel species. Nowadays, the dromedary is dominant especially in Almaty region despite its severe climatic conditions. Because, Almaty is a largest economic center in Kazakhstan and in another side, the dromedary produce much more milk than Bactrian.

Key Words: Bactrian, distribution, Dromedary, Kazakhstan.

1. Introduction

Modern nomadic stock farming culture is witnessing great change due to motorization, which has led to the diminishing value of horses and camels, as well as due to the privatization of land, which has created obstacles to the nomadic way of life. However, horses, cattle, and camels continue to be reared in Kazakhstan, all three are prized in the region for their meat and dairy. Especially camels are still used not only for meat and milk but for work and transportation in remote areas.

The rearing of camels over the last hundred years in Kazakhstan has been deeply affected by the collective farming of the Soviet era, as the number of camels fell steeply from 1,200,000 in 1927 to 100,000 in the 1990s. The purpose of camel-breeding in traditional Kazakhstan was either for transport, ceremonial purposes (Kartaeva, 2017), or having a necessary number in order to preserve one's fortune, and were thus bred in large numbers. However, the "rationalization" that coincided with the advent of the Soviet Union restricted the number of livestock an individual could raise in an effort to achieve collectivization, and is considered to have led to a severe decrease in the number of camels. Soviet policy not only had an effect on the quantity of camels, but also their purpose: in the 1980s, the government emphasized the use of camels as foodstuffs.

The number of camels in Kazakhstan continued to decline even after the country's independence in 1991, as the agriculture and stockbreeding industries continued to flounder in depression after independence, a major cause for which was the dismantling of the "sovkhoz" and "kolkhoz" farm management systems, leading to widespread disruption as farms were restructured into individual entities.

However, the decrease steadied in 1999, after which the numbers of camels started to rise again. This has been claimed to be due to the health benefits that camel milk, and in particular fermented milk (shubat), are said to provide.

Fermented camel milk is said to contain vitamin C and immunoglobulin, and is advertised as not only possessing the capacity to strengthen one's immune system against disease, but also contains anti-aging effects (Konuspayeva and Faye, 2004).

In response to the increasing prominence of camel milk, Kazakhstan has begun to turn away from Bactrian camels in favor of dromedaries.

There are two species of camels: dromedaries and Bactrian camels. There is also a wild camel species, although it only inhabits the region spanning from Mongolia to China. Furthermore, the distribution of the two domestic camel species differs (**Fig. 1**), although they meet at the latitude corresponding to an average temperature of around 21°C (Masson, 1979).

While the areas that these two camels were originally bred and raised in did not initially overlap, they have long been reared in Kazakhstan and have been actively crossbred to

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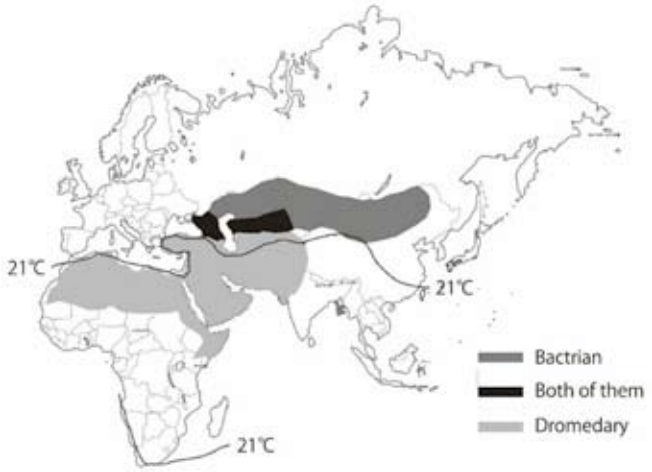

Fig. 1. Distribution of the two domestic camel species in the world.

create hybrids (Kartaeva and Sala, 2017).

Bactrian camels were formerly the most common camel species in Kazakhstan, and until nowadays constituted 80% of the total number of camels in the country (Konuspayeva and Faye, 2004).

Recently in Kazakhstan were counted around 130,000 camels: 110,000 two-humped and 20,000 one-humped. Of the total two-humped camels, 45,000 are females (of which 31,000 raised in purity) and 65,000 are males (of which 1,800 raised for mating). Almost all one-humped camels are female and raised in purity (Baimukanov and Baimukanov, 2009).

Up until a decade ago, Bactrian camels were the norm. But situation is changing. Dromedaries produce much milk than Bactrians, as a result of the increases demand for fermented camel milk, the dromedaries began to be imported from Turkmenistan due to their increased milk output.

According to 2015 FAO statistics, about 171,000 camels are kept in Kazakhstan. However, the number of each camel species was not detailed in available sources. Also there has been no research on the current geographic distribution of Bactrian and dromedaries in Kazakhstan. Therefore, we actually visited six cities and investigated the distribution of these two types of camel at each location.

2. Research area and methods

To clarify the distribution of one-humped camels and two-humped camels the field survey have been conducted by observations and interviews from 2012 to 2016 in Almaty, Turkestan, Kyzylorda, Aral, Aktau, and Aktobe. The camel herd structure, ratio between one humped and two humped camels were studied in herds no more than 300 heads. In Almaty there is one ranch enterprise keeping 3000 one-humped camels and producing fermented camel milk. We excluded the herd of this enterprise from counting numbers of camels because the scale of this ranch is too large to analyse natural situation of camel breeding.

Some climate data about the six cities were obtained from website “Pogoda i Klimat (Wether and climate)”.

3. Results and Discussion

3.1. Purebread and hybrid of camels

At present, there are about 20 breed type names of camels (**Table 1**) in Kazakhstan (Imamura *et al*., 2016). Almost of these names are used in vernacular context and some of those are in scientific context, too (*e.g.* Saparovich, 2010). The nomenclature of camel types in the Kazakh culture is mainly intended for distinguishing different steps of the crossbreeding process, and witnesses a deep knowledge of all the basic breeding procedures of double-cross, backcross and rotational cross (Kartaeva and Sala, 2017). The camel types obtained as third generation offspring, being at the end of the reproductive chain, deserve a lesser number of classificatory names, and these are very variable within regional dialects (Kartaeva and Sala, 2017).

We will classify all complicated camel names into four types: 1) dromedary, 2) Bactrian, and 3-4) two types of hybrids. 1) The vernacular name of purebred one-humped camel is “aruana”. 2) The purebred two-humped female is called “ingen” and males as “bura” or “aiyr bura”. Among hybrid camels, both one and two-humped varieties can be found, which are called 3) “nar” and 4) “kospak”, respectively.

Typically, first generation hybrids (F1) of pure one-humped and pure two-humped camels, become one-humped (nar), while second-generation hybrids (F2) of those nars, backcrossed with pure two-humped camels, tend to become two-humped (kospak). Starting from the crossbreeding of a one-humped and two-humped purebreds (P1, P2), F1 has one elongated hump and is the largest and strongest among all camels. When F1 is repeatedly backcrossed to Bactrian purebreds, the morphological appearance of hybrids is as follows; at first a single hump with two raised regions, then two humps with fused bases, then two separate humps (Kartaeva and Sala, 2017).

Those hybrid camels, that acquire hybrid vigor during accurate crossbreeding, become stronger, milkier and more docile of both the purebred ancestors. So, in Kazakhstan, they are the main camels used in the practical life and constitute the absolute majority of the herd, representing 80% of the total camel number (Baimukanov and Meredov, 1989). Each of the different types has its own specific qualities for crossbreeding or utilization purposes.

3.2. Distribution of one-humped and two-humped camels

We visited six cities and at each location investigated the

Table 1. Names of camel breeds.*

female	(h)	male	(h)	offspring	(h)	generation
aruana	1	two-humped camel**	2	betbatsha nar	1	F1
two-humped camel**	2	aruana	1	kolbatsha nar	1	F1
betbatsha nar	1	kolbatsha nar	1	zhamboz nar	1	F2
zhamboz nar (i)	1	betbatsha nar (i)	1	zhonen	1	F3
zhamboz nar (i)	1	betbatsha nar (i)	1	myrza kospak	2	F3
zhamboz nar (i)	1	kolbatsha nar (i)	1	zhonen	1	F3
aruana	1	zhonen	1	kylagan nar	1	F4
aruana	1	dromedary	1	ale nar	1	F1
ale nar	1	dromedary	1	zhelmaya(female)	1	F2
aruana	1	Bactrian	2	birtuar nar	1	F1
birtuar nar (i)	2	two-humped camel** (i)	1	kospak nar	2	F2
birtuar nar (i)	1	Bactrian (i)	2	kyzyl nar	1	F2
betbatsha nar	1	aruana	1	kurt nar	1	F2
zhelmaya(female)	1	aruana	1	kerdermaya(femal)	1	F3

*reconstructed from: Imamura et al. 2016, Table 1
(h)=number of humps; (i)=same offspring also from inverted parents' gender,
**two-humped camel: morphologicaly characterised by possessong two humps, but genetically could not be identified as Bactiran

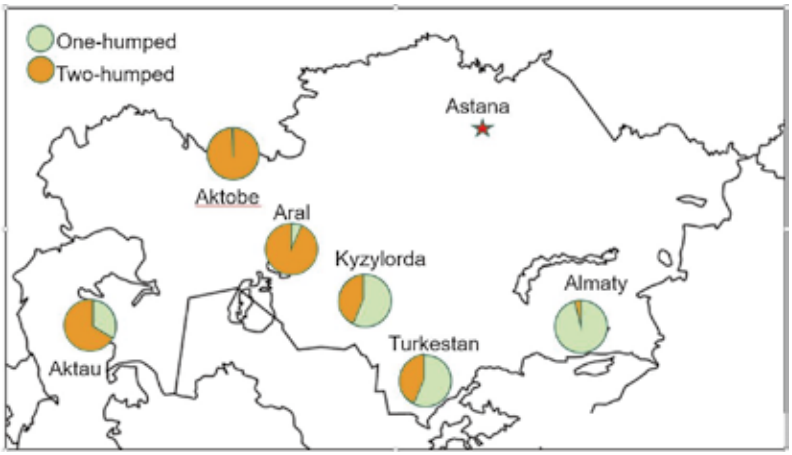

Fig. 2. Distribution of one-humped and two-humped camels in Kazakhstan.

Table 2. Ratio of one-humped camels to the whole.

City	One-humped	Two-humped	total	% of one-humped	Record low °C	Daily mean °C	latitude
Almaty	282	36	318	88.7	-37.7	10.1	43°16' N
Turkestan	125	88	213	58.7	-38.6	13.1	43°17' N
Kyzylorda	28	19	47	59.6	-33.9	10.8	44°51' N
Aral	22	156	178	12.4	-37.9	8.8	46°47' N
Aktau	38	68	106	35.6	-36.9	9.9	43°39' N
Aktobe	12	292	304	3.9	-48.5	5.3	50°17' N

distribution of these four types of camel; one-humped purebred, two-humped purebred, one-humped hybrid, and two-humped hybrid, by observation and by questionnaire to the owners or herdsmen. It was very difficult to distinguish purebred from hybrid among camel herds because of 80% of the total camels are hybrid. Finally, we categorized camels into two groups: one-humped and two-humped. So in this study "one-humped camel" consists of purebred dromedaries and hybrid camels possessing one hump, "two-humped camel" consists of purebred Bactrian camels and hybrid camels possessing two humps.

It is generally said that in the line of hybridization, generation belong to F1 and F2 become stronger and produce much milk and wool than their purebred ancestors, however at the very end of the breeding chain, generations F4 or F5 or later are start to be weaker. So, it is estimated that hybrid camels in Kazakhstan are mainly F1 and F2.

Figure 2 shows the result of our research in the south-eastern part of Kazakhstan, Almaty, Turkestan, and Kyzylorda. In total, 60 to 90% of camels are one-humped, while in the western region of this country, Aral, Aktau, and Akobe, percentage of one-humped camel is less than 35%.

What is the determination factor for geographic distribution

of one-humped and two-humped camels? First factor is an air temperature. Dromedary does not have resistance against coldness as Bactrian, and are more thermophilic than Bactrian. It would be resulted by our study that in Kazakhstan where the annual average air temperature is above 10°C and the record low air temperature dips minus 38°C or above, one-humped camels can be kept although it is not easy to rear and protect colts against coldness. It would be difficult to keep one-humped camels in the northern region to the 45°N altitude (Fig. 2, **Table 2**).

Second factor for the geographic distribution of both camel species is economic demand. Nowadays dromedary is dominant especially in Almaty. Although in Almaty the annual temperature is lower than Turkestan, and Almaty is much colder than Kyzylorda in the record low temperature. In Almaty, it is tough to rear one-humped camel, however people prefer one-humped to two-humped because of their higher milk productivity. Almaty is a metropolis and there is much demand for fermented camel milk, shubat. But until a decade ago Bactrian was a major camel species among the stock rising farmers of Almaty.

Such changes could be explained by the alterations in the camel use from the use as packing animal to as the source of meat and finally of milk. Camel breeders living near the cities intendedly have chosen dromedary which produce more milk than Bactrian. Today, the breeding form of the camel is various: big ranching system considers as enterprise, private individual pasturing, breeding in small yards, and traditional nomadic way.

Fully comprehending the history and current state of active intervention by humans regarding "genetic resources"—the crossbreeding and selective breeding of animals. What is the impact of genetic intervention on the interaction between human society and camels? In addition to determining the actual state of hybridization, in the next step of research we will clarify the resulting impact between humans and animals, that is domestication.

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