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Morphometric studies on adult double humped camel of Ladakh, India

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Abstract

In India, double humped camel is living in Nobra valley of Ladakh region at an altitude of 18,300ft. The animal has been declared critically endangered by IUCN (1998), yet the animal has not been explored in detail. The study was conducted along the breeding tract of the Nobra valley. Thirty out 70 double humped camels having been shifted from their natural habitat, Nobra valley to Government farm chichoot, near the capital city, Leh were also included in the study. Biometric studies were done and the body measurements included measurement of Heart girth, Body Length, Lower jaw, Height up to wither, Tail length, Neck length, Distance between two eyes, Ear length, Face length, Hump 1, Hump 2, Distance between two humps, Length of fore leg, Length of hind leg, Fore foot pad, Hind foot pad and Lower jaw. The animal has relatively shorter legs compared to Mongolian Bactrian. The various biometric characteristics recorded are presented.

Key words: Double Humped Camel, Body measurements, Morphometry, Cold arid desert

Introduction

Dromedary and Bactrian camels are occupied different areas in the world, the dromedary living in hot desert (Gaili et al., 2000) and the Bactrian rather in cold desert (Konuspayeva and Faye, 2010). However, in some cases, they are cohabiting in the same country, even in the same farm for example in Kazakhstan (Faye et al., 2008). In India, the double humped camel is only distributed in Nobra valley, a cold arid region of Ladakh in Jammu and Kashmir State. The highest altitude breeding tract from sea level is 18600 ft (5670 m). Their genetic capability to survive at temperature ranging from -40 ºC to +40 ºC, their adaptability to scarce water and sparse feeding had made them the main mode of transport along the Silk Road. Therefore, ethnic importance of this species in the area is well appreciated. The area remains cut off from rest of the world for 6 months in winter during which feed is not adequate.

The double humped camel population in the Leh and Nobra Valley of Ladakh in the year 2005 was 150 heads which have now increased to 223 camels (Patil, 2011). However, there is an important and wide gap between the official number of camel heads and the camel population available with the nomads. With the launching of conservation drive and awareness after it was declared as critically endangered animal, there was an increase in number. The double-humped camel like the dromedary (Hjort af Ornas and Ali Hussein, 1993) is a multipurpose animal. It is a well-adapted animal to wide difference of temperature between summer and winter and to low oxygen pressure in high altitude.Due to its adaptability for cold arid high altitude area, it is used as mainly as an exclusive source of transportation of load.

A detailed report on phenotypic classification of Camelus *dromedarius* in Saudi Arabia has been recently undertaken (Abdallah and Faye, 2012) by their body measurements, but the morphometric characteristics in Ladakh double humped camel have not been studied so for and their differences on other related parameters to their general conformation were not clearly described. The present study was designed to characterize the Ladakh double humped camel (Figure 1).

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Figure 1. Side view of the Ladakh Bactrian camel.

Material and Methods

The Survey

The study was conducted in the Nobra area of the Ladakh. Four to six years animals belonging to the camel keepers inhabiting the studied area formed the material of the study. As the whole, 100 animals (88 males and 12 females) were submitted to measurement. The sample included 30 out of 70 double humped camels having been shifted from Nobra valley to Government farm chichoot, Leh in the capital city which is not actual habitat of the animal.

The measurements

The following distances were collected individually: Heart girth, Body Length, Lower jaw, Height up to wither, Tail length, Neck length, Distance between two eyes, Ear length, Face length, Hump 1, Hump 2, Distance between two humps, Length of fore leg, Length of hind leg, Fore foot pad, Hind foot pad and Lower jaw (Figure 2). Measurements of height, hump girth and thoracic girth were used to estimate the live weights by using the equation of Yagil (1994): W=50*HSH*THG*HG, where W=live weight in kg, HSH=the shoulder height using the measuring stick vertically from the ground to the top of scapula, THG=the thoracic girth using the meter ribbon around the body just behind the sternal pad, and HG=the hump girth using the measuring tape along the abdomen over the midpoint of the hump.

Figure 2. (a) Measuring Hump Length; (b) Measuring Heart girth; (c) Measuring Hump Length; (d) Measuring Length of foreleg.

The statistical analysis

For the data analysis, Microsoft Excel version 2007 computer package was employed. Differences between two means of quantified data were compared by Student's t-test. Comparisons between two qualitative data were performed using the chi-square test.

Results and Discussion

The measurements were achieved in both male and females animals and reported separately (Table 1). As usual, the male measurements were on average higher than for female (on average 6% more for the whole measurements). The most important difference occurred for neck circumference (40%). However, the measurements appeared higher in female than in male for some parameters as the heart girth and the distance between two eyes, the length of the hind leg and the hind food pad width (Table 1). In their study regarding dromedary camels in Saudi Arabia, Rahim and El-Nazier (1992) has found also sexual differences with on average, male measurements higher for all the parameters. The male head was 11% longer, the neck 12% longer, the neck circumference 13% higher, the thigh circumference 14%. The difference in height (4%) and girth circumference (6%) was less marked.

Table 1. Mean ±S.E of the different body measurements of adult Double Humped Camel of Ladakh (in cm) in male and female

Parameters	Male (n=88)	Female (n=12)
Trunk		
Body Length	152.4±3.1	129.5±2.0
Thorax girth	237.5±4.1	200.6±3.1
Heart girth	203.2±4.9	210.8±2.9
Appendages		
Tail length	50.8±3.1	48.3±0.6
Ear length	15.2±2.0	12.7±0.0
Distance between ears	15.2±2.0	12.7±0.1
Head and Neck		
Face length	44.4±3.03	40.6±0.82
Lower jaw	43.2±2.03	40.6±0.82
Neck length	94.0±4.02	91.4±4.07
Neck circumference	114.3±4.0	81.3±1.04
Distance between two eyes	21. ±2.2	22.9±0.88
Supra orbital foramina	8.9±1.7	7.6±0.32
Hump		
Hump circumference	78.7±3.1	116.2±2.7
Hump 1(Height)	45.7±2.7	38.1± 0.9
Hump 2(Height)	30.5±1.9	26.7±1.1
Distance between two humps	121.9±3.1	182.3±2.0
Total area under hump	121.9±3.1	99.1±2.0
Limbs		
Height upto wither	170.2±2.1	152.4±3.1
Shoulder height	248.6±4.0	212.5±3.8
Length of fore leg	147.3±4.1	152.4±3.05
Length of hind leg	152.4±3.1	175.3±2.3
Knee circumference	50.8±1.6	45.7±1.3
Fore foot pad	60.9±1.1	60.2±1.1
Hind foot pad	50.8±3.1	58.4±1.8

Table 2. Mean ± SE of linear measurements (in m) of camels in both males and females.

Parameter	Male		Female		Significance
	Mean ± SEM	Range	Mean ± SEM	Range	
Shoulder height	2.4±0.1	2.3-2.5	2.2±0.05	2.2-2.3	P <0.01
Hump girth*	2.5±0.1	2.3-2.6	2.4±0.1	2.4-2.5	P <0.01
Thoracic girth	2.3±0.2	2.1-2.4	2.2±0.02	2.2-2.3	P <0.01
Weight	672.5	550.1-811.8	587.0	568.5-657.3	

* (hump first +hump second)/2

Elsewhere in the world, the characterization of the camel has been done on dairy and meat performances (Faye and Bonnet, 2012) or racing performances (Shorepy, 2011). A first phenotypic characterization was achieved for most of the dromedary breeds of the world, based on general morphology but the double humped camel of Ladakh was never described, contrary to dromedary camel in Saudi Arabia (Hussain and Faye, 2012) or in Sudan (Ishag et al., 2011).

Regarding the sexual differences observed for the hump, the measurements in female appeared also higher than in male in our study. On average, the hump circumference was 32% higher in female and the distance between hump also (33%). At reverse, the height of the humps in male were higher, both for hump 1 (20%) and hump 2 (14%). The biometrics of humps revealed that the height of first hump was found greater than second hump both in male and female. Elsewhere, the hump stand erects during summer and was deviated to a side in winter. The shape of the humps of Mongolian Bactrian were small and Pyramid Shaped (Endo et al., 2000) while those of Ladakh Bactrian were distinctly large and irregular. However, the measurement of the hump is a quite debatable parameter to distinguish the phenotypes because the hump is the main fat storage form in camel representing on average 85% of the adipose tissue (Faye et al., 2001a) and its volume is linked to the body condition score which is not under genetic dependence, but linked to the feeding status of the animals (Kamili et al., 2006). In Bactrian camel, the first hump is on the withers and the second one is on the loin region.

Regarding the height up to wither, Endo et al. (2000) reported that the Mongolian Bactrian was higher at the level of hump (7 feet i.e 213.26 cm) than Ladakh Bactrian.

The face of Ladakh Bactrian was triangular and the split in the lip was smaller than that in Mongolian. Two broad toes on each foot have undivided soles and are able to spread widely as an adaptation to walking on hilly terrain and sand (Makhdoomi, 2006).

Conclusion

In camel belts of the world, the variation in morphometry is depending upon different breeds, farming systems or feeding systems. The current morphometric study description could be a first step for establishing standard of the double humped camel of Ladakh, a critically endangered animal. However, in addition of that, control of performances would be implemented for a better characterization of this Bactrian camel.

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