

# Population Density and Habitat Utilization of Ibex (*Capra ibex*) in Tomur National Nature Reserve, Xinjiang, China

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**Abstract:** Surveys was conducted to study the population density and habitat utilization of the ibex (*Capra ibex*) in Tomur National Nature Reserve during October–December 2005. The results are as follows: ① The mean group size of the ibex in Tomur Nature Reserve is 8.43 and the population density is 269.76/100 km<sup>2</sup>; ② The ibex prefer areas with steep slope (between 30°–45°), broken substrates and cliffs nearby (< 100 m). They avoid grasslands and flat hillsides; ③ The probable reason for this habitat selection is self-protection.

**Key words:** Ibex; Population; Habitat utilization; Tomur National Nature Reserve

## 新疆托木尔峰国家级自然保护区 北山羊种群密度与栖息地利用

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**摘要:** 2005年10–12月对新疆托木尔峰国家级自然保护区北山羊(*Capra ibex*)的种群密度与栖息地利用进行调查。种群密度调查显示该地区北山羊平均群大小为8.43只, 种群密度为269.76只/100 km<sup>2</sup>; 栖息地选择调查结果显示北山羊广泛活动在海拔2 500–3 000 m的区域范围内, 对距悬崖距离、坡度、地形和植被类型有一定选择倾向, 它倾向在悬崖附近(< 100 m)、坡度大于30°而小于45°和崎岖的山地活动, 会避开草地和平坦山坡。北山羊这种栖息地利用模式可能与满足自身安全需要有关。

**关键词:** 北山羊; 种群数量; 栖息地利用; 托木尔峰自然保护区

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The Ibex (*Capra ibex*) is listed as endangered in the China Red Data Book of Endangered Animals and they are a first grade protected animal in China. Because of its remote and rugged habitat, existing infor-

mation about the ibex is limited. They were known as alpine animals and are distributed only in Xinjiang, northwestern Tibet, Qinghai, far northern Gansu and in western and central Inner Mongolia in China (Yang &

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Feng, 1998). Some associated research about the ibex had been done in other countries, including studies of distribution and population (Reading et al, 1999), competition with domestic livestock (Charudutt et al, 2004), morphometry (Bassano et al, 2003), segregation pattern (Richard et al, 2001) and behavioral synchrony (Kathreen et al, 2001). Studies have seldom been carried out in China with the exception of some regional surveys. These have been conducted in the Albin Mountains (Gu, 1990), low mountains of the Altay Range and Tuolimayi Mountains (Wang, 1983) and Taxkorgan Nature Reserve in Xinjiang (Schaller et al, 1987). There is no further information on the ibex in China, leaving their habitat utilization totally unknown. This study addresses the population density and habitat utilization of the ibex in the Tomur National Nature Reserve.

## 1 Study Area and Methods

### 1.1 Study area

The Tomur National Nature Reserve lies in the southern flank of the Tianshan Mountains ( $80^{\circ}07' - 80^{\circ}52'E$ ,  $41^{\circ}40' - 42^{\circ}02'N$ ) in Wensu County, Xinjiang Province, China. The mean elevation of the reserve is 4 000 m and its climate is cold and arid. The mean annual rainfall is 600 – 700 mm and the local fauna and flora is abundant. There are 28 species of moss, eight species of ferns and 634 species of spermatopytes. Many protected animals can be found here, including snow leopards (*Uncia uncia*), wolves (*Canis lupus*), red foxes (*Vulpes vulpes*), ibex, snowcock (*Tetragalpus altaicus*), chukar partridge (*Alectoris chukar*) and argali sheep (*Ovis ammon*) (Mountain Science Investigation Team of Chinese Academy Sciences, 1985; Xu et al, 2005; Ma et al, 2006).

### 1.2 Methods

#### 1.2.1 Methods for population density survey

We used the focus observation method to record group size of each group located for seven days. During this time, each group was tracked for at least four hours to make sure that all members of the groups had been recorded. Using the total number of ibex and the group number, we calculated the mean group size (MGS) of the ibex in the study area.

In the following two days, we surveyed the entire study area ( $50 \text{ km}^2$ ) to search for as many groups of ibex as possible. During this we recorded only the NG and not the total group size.

Using the MGS and NG, we calculated the total number and the population density of the ibex in the

study area.

#### 1.2.2 Methods for habitat utilization

On location of each ibex, the habitat features of the location were recorded. The habitat features; altitude, slope, topography, distance to nearest cliff, vegetation type; can be defined by the following categories (Oli, 1994; Liu et al, 2005a):

Slope including  $\geq 45^{\circ}$ ,  $\geq 30^{\circ}$ ,  $< 30^{\circ}$ ;

Topography including flat or rolling, broken area, very broken area, cliff;

Vegetation types including grassland, shrubs, barren rock.

## 2 Results

### 2.1 Population density of the ibex

In the seven days of the observation, we recorded a total of seven groups of ibex with a MGS of 8.43 per group (Fig. 1).

In the process of the NG survey, we recorded 16 groups in the study area. The population density of the ibex in the study area was found to be  $269.76/100 \text{ km}^2$ .

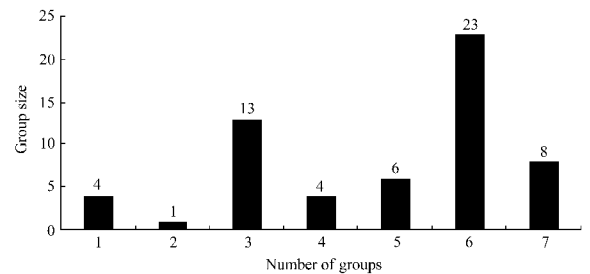


Fig. 1 Group size of each study group of ibex in Tomur National Nature Reserve 2005

### 2.2 Habitat utilization of the ibex

Ibex were found extensively at elevations between 2 500 – 3 000 m with a mean distance of  $< 100 \text{ m}$  to the nearest cliff. Using habitat use proportions, the ibex show preference for certain different habitat features (Fig. 2 – 4). They prefer slopes of  $45^{\circ} \geq$  and  $\geq 30^{\circ}$  and will avoid flat or rolling areas and grasslands.

## 3 Discussion

The population density of the ibex in Tomur National Nature Reserve is  $269.76 \text{ per } 100 \text{ km}^2$ . This density is higher than previously reported results. Gu (1990) reported the population density of Albin Mountain as  $1.25/\text{km}^2$ ; Wang (1983) reported  $1.378 \pm 0.868/\text{km}^2$  in the low mountains of the Altay Range and Schaller (1987) found a density of  $0.37/\text{km}^2$  in the Taxkorgan Nature Reserve. The difference between

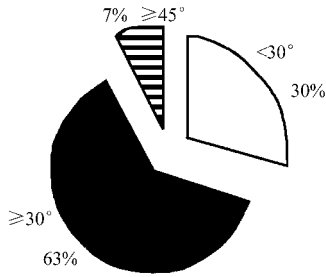


Fig. 2 Different ratio of slope use of the ibex

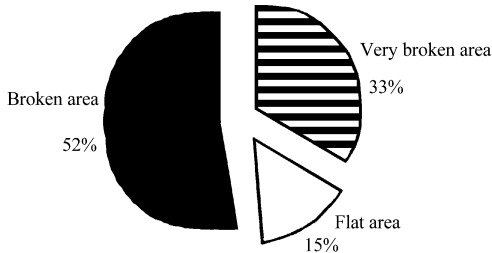


Fig. 3 Different ratio of topography use of the ibex

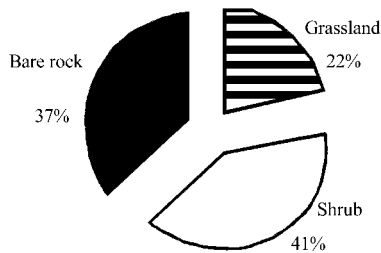


Fig. 4 Different ratio of vegetation types use of the ibex

these results and our own can be explained as follows:

① The Tomur Nature Reserve has been protected since 1980 and was promoted to a national reserve in 2003. Illegal hunting, deforestation and environmental destruction has been controlled in the nature reserve since

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that time. Under these circumstances a relatively high population density of the ibex in the nature reserve has been fostered. ② The population densities of the other areas was surveyed more than 15 years ago and at that time wildlife protection conditions were not well established in China. With further societal development, more people now care about wildlife protection in China, possibly contributing to a higher population density.

Our results show that ibex prefer to use rugged areas and prefer areas with cliffs nearby. They will avoid grasslands in preference for shrub and bare rock areas, but did not show a preference for elevation. This result is similar to the habitat selection patterns of blue sheep (*Pseudois nayaur*) in Helan Mountain. It was reported that blue sheep preferred areas with a short distance to bare rock (Liu et al, 2005a) and preferred steep slopes, bare rocks and good shelter areas for bed sites (Liu et al, 2005b). Oli (1994) also hypothesised that cliffs make an ideal place for the mountain ungulates to escape predators. The ibex preference for steep slopes and bare rocks can also be attributed to this reason.

Because of the remote and rugged habitat of the ibex, there may be other factors which affect their habitat use. Further studies are required in future to understand the ibex in China.

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