

Two surveys were made in the Tibet Autonomous Region. The first one, done in cooperation with Li Bosheng of the Institute of Botany, Academia Sinica, and Wang Zhongyi of the Milu Research Center, Beijing, comprised a trip from Kashi in Xinjiang through western Tibet to Lhasa. The second one was conducted jointly with Yang Jianxianq, Yang Jinhe and others of the Forest Bureau, Lhasa, and it covered north central Tibet (see Figure 1).

Most surveys followed tracks and roads accessible by vehicle; in addition a 510-km cross-country trip to Memar and Aru Co (Co means "lake") was made in northwestern Tibet.. Large ungulates on the plains were counted in a transect strip of 1 km on each side of the car, a strip width of 2 km. Foot surveys in mountainous terrain gave an impression of relative wildlife abundance, especially of blue sheep and snow leopard. Such surveys were made near Aru Co, south of Seling Co, in the mountains north of Lhasa--especially in the Nyaingentangla Shan, and at the eastern limit of our travels.

Almost the whole region covered by our surveys comprises rolling to hilly grasslands used at least seasonally by yak and sheep pastoralists. One exception was the most southern part, between Lhaze and Lhasa and around Lhasa, which has much agriculture and a dense human population. Another was at the eastern edges of our route where grasslands give way to a terrain of gorges, sharp-edged ridges, and massive peaks whose lower slopes are forested with juniper, birch, and spruce, a habitat that generally extends eastward from 94°E.

#### Western Tibet (August 14-29)

On entering the northwestern corner of Tibet, our route first took us to the county town of Rutog (Ritu), then east to Memar and Aru Co and from there south to the road at Yanhu; after going east as far as the Donq Co, we headed south via Cogen and east to Lhaze where we joined the main road to Lhasa. The total distance within Tibet was about 1925 km.

Wildlife was scarce along our route of travel except in the vicinity of Memar Co and Aru Co. Table 1 (Nos. 1-4) shows the number of wild ungulates observed during the road transects in the grasslands. The wildlife noted away from the road in going to and from Aru Co is treated separately in Table 2. As is evident from Table 1, wild ungulates were seldom sighted. It might be argued that animals avoid the vicinity of roads where they may be shot from passing vehicles. However, surveys away from roads usually reveal a similar scarcity, as do interviews with local people. Most grasslands along our route were devoid of wildlife except for a rare Tibetan antelope, a few Tibetan wild ass, and occasional Tibetan gazelle. The last-named tend to occur in clusters, small populations separated by many kilometers

during which none are seen.

Cross-country travel began near Domar. We headed east up a broad valley across a plateau and over a low pass into a basin, and then over a second pass into another valley. In 140 km the

only wild ungulates observed were 4 Tibetan antelope. Not until we reached Lumajangdong Co was wildlife (antelope, ass) moderately abundant. A major concentration of animals was found in the basin of Aru Co and Memar Co. Antelope and wild ass also occurred in fair numbers in the hills and plains south of Aru Co, but then ceased rather abruptly about halfway between the lake and the community of Yanhu. In a 112-km stretch before reaching Yanhu no antelope and only 13 wild ass were observed. Thus, wildlife tends to be localized and large areas of suitable terrain are devoid of animals or almost so (Fig. 2).

Strip censuses during which animals were counted within 1 km of each side of the car revealed that wildlife densities in the Aru Co region were considerably higher. than elsewhere (Table 2),

with densities ranging from 1.1 - 3.7 plains ungulates per km<sup>2</sup>. Tibetan antelope were generally most abundant, followed by wild ass and gazelle. Wild yak had concentrated near the western shore of Aru Co, making it locally the most numerous species. Argali were rare. Blue sheep were not included in the transect results because they frequent rugged terrain which is not easily surveyed by car.

#### Tibetan gazelle

A total of 65 gazelle were observed in the Aru Co region and 28 elsewhere. These comprised 33 adult males, 13 yearling males, 34 females (adult and yearling) and 13 young, ratios of 135 males: 100 females and 38 young: 100 females. Gazelle were seen alone and in herds of 2-7 animals.

#### Tibetan antelope

About 635 antelope were tallied, all except 7 of them in the Aru Co region. Of these 482 were classified by sex and age. As Table 3 shows the sexes tend to segregate in summer: one area had predominantly males, another females. One-third of the males consisted of yearlings, just over one year old. About 40% of the females (adult and yearling combined) had young at heel at Aru Co and to the west of the lake, but only 23% of the females did so in the south. Possibly many non-breeding females and those that lost their young had concentrated there. Most herds were small, containing 2-10 individuals; the three largest herds, all consisting of females and young, numbered 40, 50, and 55 animals. One male herd comprised 16 adults and 5 yearlings. These animals crowded on a patch of snow on a steep slope at 5000 m apparently to escape bothersome flies. Another male herd comprised 15 adults and 12 yearlings. One adult male was found dead of unknown causes. It weighed 37 kg.

#### Tibetan wild ass

A total of 216 wild ass were observed in the Aru Co region, most of them alone or in small herds of 2-10 individuals; the largest herd contained 27 animals. Six percent of the ass comprised young, born within the past month or two. An additional 42 ass were tallied in other areas, and of these 4.8% were young.

#### Tibetan argali sheep

Argali were seen on only 3 occasions during the survey, two herds east of Rutog and two females near Aru Co. One herd contained 6 males, 11 females, and 5 young, a total of 22; the other herd contained 4 females and 2 young.

#### Blue sheep

Blue sheep occur in or near precipitous terrain, a habitat which we sampled only occasionally during the survey trip. One herd of 52 blue sheep was seen in the mountain range that borders the western edge of Aru Co.

#### Wild yak

One herd of 6 yak and another of 12 were observed as we approached Aru Co from the west. Then, after crossing a pass and descending into the Aru Co basin, we encountered a total of 191 yak, including 3 solitary bulls and 6 herds of 5, 7, 9, 19, 58, and 90 animals. The following day we made an attempt to count all yak along the west shore of Aru Co north to the southern end of Memar Co. A total of 315 yak were tallied, both on the sloping ground bordering the lake and in the steep hills farther inland. These comprised solitary bulls and small bull herds with 2-8 members as well as mixed herds with bulls, cows, and calves, the two largest numbering 93 and 106 animals. Some of the animals observed that day had also been recorded the previous day. However, at least one large herd seen earlier eluded our count. An estimated 400-500 yak frequented the area at that season.

Yak are wholly black except that there may be some gray around the muzzle. Domestication has produced various color patterns. About 30-60% (depending on area) of the domesticated animals have patches of white, and a few are gray, dark brown, or otherwise atypical. A small percentage (1-3%) of domestic yak have a golden or light yellow-brown pelage. At Aru Co there were a few golden wild yak. Since none of these wild yak had white patches or other atypical colors, the golden trait may represent a local mutation rather than hybridization with domestic animals. At least 8 golden yak were tallied, about 1.5% of the population.

#### Snow leopard

Snow leopard require precipitous terrain and a blue sheep population large enough to sustain a number of cats. Most of the terrain along our survey route was either unsuitable for snow leopard or the animals did not occur there anymore according to local informants. Snow leopard persist just south of Lumajangdong co and in the range bordering the west side of Memar

Co and Aru Co, where we found a scrape made by this cat.

#### Wolf

Three or possibly four half-grown wolves were seen near the southern end of Aru Co. Of 9 droppings checked for food remnants, 6 contained marmot, 1 yak, 1 antelope, and 1 argali.

#### Brown bear

The brown bear is one of the most endangered animals on the Tibetan Plateau. One was observed at Aru Co. Two droppings consisted wholly of pika remains.

Good pasture and ample fresh water have made the Aru Co and Memar Co region one of the finest wildlife areas on the Tibetan Plateau. It is essential that this region receive full protection as part of the proposed Qian Tang wildlife reserve (see Fig. 2). At present herdsmen bring their domestic stock to the area for only 2 months of the year, beginning in late August. There is, nevertheless, considerable hunting. We found the remains of several yak that had been butchered, and were told of a bear that had been killed the previous year; blue sheep horns litter camp sites; and we met two herdsmen that carried antelope traps. Aru Co and especially the valleys to the west of it appear to represent not only a major wintering area for antelope but also a place where they congregate to mate. This makes them vulnerable to exploitation for wool, meat, and horn and emphasizes the need for protection.

#### North-Central Tibet (September 10-October 16)

The surveys in north-central Tibet had two purposes: a) to determine the status of the plains ungulates in the huge expanse

of grasslands that extends west and north of Nam Co past Seling Co to the northern limit used by pastoralists near Garco (Shuanqhu), and east of Nam Co past Nagqu to the western limit of forest; and b) to determine the status of snow leopard in north-central Tibet especially in the mountains north and east of Lhasa. Total travel distance was about 3700 km.

Table 1 (Nos. 5-13) shows that except for a few Tibetan gazelle, the vast pasture lands south and east of Seling Co are virtually devoid of large ungulates. Local people told us that a few antelope and wild ass persist south of Seling Co but that east of Nagqu these species are now gone. North of Seling Co, however, wildlife persists in moderate numbers. Our high count of wild ass on the road to Garco was due to a concentration of animals, including a herd of 85, in one valley. Tibetan antelope were seen only around Garco (Fig. 2) where they, as well as gazelle, persist in fair number even though the inhabitants kill them for food.

#### Tibetan gazelle

Gazelle, though generally scarce, remain the most widespread

ungulate on the grasslands, transects usually yielding at least a few animals. Most occur in small groups with 2-8 individuals; the three largest herds comprised 14, 15, and 16 animals. Of 254 gazelle observed, 222 were classified according to age and sex. Among these were 95 males (15 of them yearlings) and 92 females, a 1:1 ratio: there were also 35 young, a young:female ratio of 38:100.

#### Tibetan antelope

Antelope occurred around Garco in small herds, most with 2-8 animals and the largest with 16. Among the 127 animals tallied, there were no adult males, 4 yearling males, 81 adult females, 6 yearling females and 36 young. 'These figures indicate that at this season the males occupy another area. The young:female ratio (adult and yearling females combined) was 41:100, similar to that for gazelle.

#### Tibetan wild ass

A total of 264 wild ass were tallied, but, unlike antelope and gazelle, the sex of these animals could not be easily determined at a distance. In a sample of 229 ass were 31 young, born within the past 2-3 months, or 13.5% of the population.

#### Tibetan argali

The argali sheep is now perhaps the rarest among the once-common ungulates in Tibet. Two herds, one of 16 and another of 13 and both consisting solely of females and young, were seen on steep hillsides at 5000 m southwest of Garco (Fig. 2).

#### Wild yak

No wild yak persist within our survey area except in a small mountain range west of Garco. We found the remains of an adult female yak, killed the previous day by 5 wolves according to a herdsman; we saw one wolf near the remains.

#### Wolf

Wolves were seen on three occasions: 3 animals half way between Seling Co and Garco, one southwest of Garco, and three about 80 km east of Nagqu on the Jhali road.

In sum, the area we surveyed south and east of Seling Co comprises a tract of grassland of over 70,000 km<sup>2</sup> in size in which gazelle, antelope, wild ass, and argali have been almost exterminated. Only north of Seling Co where the population of herdsmen with their livestock is still relatively small is there much hope of preserving the plains wildlife.

On the Tibetan plateau, the principal prey of snow leopard is marmot and blue sheep. With the former hibernating in winter, the presence of blue sheep is essential to the survival of snow leopard from October to April. In the absence of blue sheep, livestock represents the only alternative prey except in eastern Tibet where musk deer may be abundant enough to sustain a small cat population. Any snow leopard which persistently preys on

livestock will soon be trapped or shot.

Blue sheep occur in or near precipitous terrain. During our survey we endeavored to find blue sheep populations large enough to sustain viable cat populations. In this we were unsuccessful. Blue sheep nevertheless remain widespread in suitable habitat. A few animals were seen in most mountain valleys we searched on foot--after local people told us that the species still occurred in the area (Fig. 2). Ten herds were observed, five with fewer than 10 animals; the largest herd had 46 individuals. The composition of two herds south of Seling Co was:

Adult male	Yearl.male	Adult female	Yearl.female	Young	Total
3	3	9	0	6	21
3	?	10	1	-	22

All herds were extremely shy upon sensing our presence, a good indication that they are much hunted by local people. Two other ungulates, both potential snow leopard prey, need mention. Musk deer still occur on steep hillsides among boulders and brush in the mountains north of Lhasa. This species was also

surprisingly common in the willow and rhododendron shrub and in the juniper forests in the eastern part of the survey area near Jhali and the Chuchuwei valley (a county reserve) southeast of Rumbu. (The latter area also had many white eared pheasants.) White-lipped deer reach the western limit of their range near Jhali and Rumbu. We were told that a few survive near Jhali and in the Chuchuwei valley but we failed to find evidence of their presence. We investigated 7 potential snow leopard areas, spending 1-3 days in each searching ridges, passes and other sites where the cats tend to leave spoor. Locals told us that hen xiao (very few) cats occurred in these areas now. They were correct. In only one place, just south of Seling Co, did we find evidence

of

snow leopard, one scrape and the remains of a goat killed three days previously. That area represents unusual snow leopard habitat in that the cat or cats occupy a few isolated limestone cliffs and pinnacles dispersed among rounded grass ridges. The western part of the survey area contains little potential snow leopard habitat. Only two small areas, both south of Seling Co, have at most a few cats, neither with a future. The hills north and south of Lhasa have ample snow leopard habitat and scattered herds of blue sheep persist. Snow leopard have, however, been reduced to rare stragglers. The same is true of the Nyainqentangla Range south of Nam Co.

In the east, where grasslands give way to rugged ridges and peaks are thousands of square kilometers of ideal blue sheep and

snow leopard habitat. It extends from near Sogxian and Jhali eastward into Sichuan. These two species exist or once existed

there in the narrow altitudinal zone of alpine meadows and low shrub that lie between forest below and the rock and ice above 5100 m..

Local informants told us, and our surveys confirmed the information. that even in the extensive mountain tracts we surveyed the blue sheep have been greatly decimated and snow leopard largely eliminated.

Our survey in north-central Tibet encompassed an area of about 190,000 km<sup>2</sup>. Based on site visits and information from

others, there is no evidence that within this vast region any viable snow leopard population persists. The decline in number of cats has been rapid and drastic, occurring principally between 1960 and 1980. Killed not only to protect livestock, but also to sell pelts and bones (the bones of snow leopard, used for medicinal purposes, now bring the equivalent of \$200), the cats were unable to sustain such extreme hunting pressure, and it is unlikely that most populations can recover.

Tibetan argali sheep, and wild yak--are unique to these highlands. Most occur in the Tibet Autonomous Region. And it is, therefore, the responsibility of Tibet to preserve this natural heritage not only for its own people, but also for those in the rest of China and the world. Properly protected and ultimately managed, these animals represent an important cultural resource and potentially also an economic resource. They are almost gone from southern Tibet. Those in the central and western part have been greatly reduced, often to small, scattered populations,

or, as in the region around Nagqu, eliminated. I predict that in the future all antelope, ass, argali and others will disappear from the grasslands of this region. Wildlife survives in moderate numbers: in the northwest, the Qian Tang. Herdsmen occur only around the periphery of this region. However, hunting is on the increase. Rumor has it that antelope wool is being illegally exported to Nepal. The only way that Tibet can assure the survival of antelope, ass, wild yak, argali, and gazelle is to create a huge reserve in the Qian Tang (see proposed boundary, Fig. 2). A reserve must be large because antelope and ass and perhaps others migrate long distances, although the actual extent of movement of each population remains unknown. There is urgent need to protect the area now. Furthermore, yak and argali--both seriously threatened species--occur in discrete, scattered populations which cannot retain contact unless part of a very large reserve.

represents the number one conservation priority for Tibet.

Hunting is the most immediate threat. Wildlife wardens must be posted in such places as Garco, Gerze, Yanhu, and Domar to control illegal activities, and check points on the main east-west and north-south roads would help prevent the smuggling

of meat, hides, horns and other animal parts. Conservation initiatives are usually made too late, in response to crises. In the Qian Tang China has' an unequalled opportunity to protect a large area and plan for the wise use of

its resources before these have been damaged. By contrast, blue sheep and snow leopard have been so reduced in most of the mountain tracts we surveyed that little can be done except to discourage trapping and shooting.. With time and protection, blue sheep populations will recover in many areas. There is little cause for optimism that snow leopard will do so. It is urgent that Tibet pinpoint viable snow leopard populations through intensive surveys and that these then be vigorously protected.

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