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Traditional Hunting of Tibetan Antelope, Its Relation to Antelope Migration, and Its Rapid Transformation in the Western Chang Tang Nature Reserve

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Abstract

On the western Tibetan Plateau the endangered Tibetan antelope, *Pantholops hodgsonii*, has traditionally been hunted for subsistence. Although several hunting techniques are used, a common one that leaves evidence on the landscape is the use of earth or stone diversionary barriers, or drive-lines, with hiding depressions used for shooting. Within the western Chang Tang Nature Reserve on the northwestern Tibetan Plateau we located 45 examples of these generally funnel-shaped trap systems near the northern limits of human habitation in Gertse and Rutok counties, Ngari Prefecture, Tibet Autonomous Region, China. The more recently maintained drive-lines were located farther to the north, and many of the southern ones we observed had, according to locals, not been used in many years, as hunting activity apparently has moved northward. Increasing human population and settlement of northern areas, new pastoral land-tenure arrangements and associated fencing, as well as modern techniques for hunting antelope and increased markets for their fine wool are all changing the human-wildlife dynamic at the northern edge of human habitation in the Chang Tang. Such new developments are likely to result soon in a relegation of the nomadic pastoralists' old hunting practices to a tradition of the past.

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Introduction

Across the northwestern Tibetan Plateau there are still substantial populations of the endangered Tibetan antelope, *Pantholops hodgsonii*, with many animals migrating between calving areas at the plateau's northern boundary, the Kun Lun Mountains, and wintering sites to the south at about 33–34°N (Schaller, 1998). This region is part of what is known as the Chang Tang ("northern plains"), 300,000 km² of which in the northwestern part of the Tibet Autonomous Region was designated as a nature reserve in 1993 (Fig. 1). Tibetan antelope have been hunted in the Chang Tang for at least the past 20,000 years (Brantingham et al., 2001), and since pastoralists arrived on the plateau some 3500–4000 years ago (Barfield, 1989) there has been a combined hunting and herding lifestyle in areas of wildlife abundance. There is isolated evidence of pre-Buddhist pastoralist habitation a little north of 33°N in the western Chang Tang (D. Lhagyal, personal communication), as is more common farther to the south in the large lakes region of the southern Chang Tang (Bellezza, 1997). Nevertheless, permanent human habitation and concomitant pastoralism were apparently very limited north of about 33°30'N in the western Chang Tang until the 1700s when groups emigrated there from the northeastern Tibetan Plateau (Fox and Tsering, 2005; Huber, 2005), and even today areas north of about 34°N are still generally uninhabited. In the late 1800s and early 1900s explorers visiting this area commented (e.g., Hedin, 1909) on herding and hunting lifestyles to the north of the town of Gertse.

The Tibetan antelope has traditionally been hunted using several techniques and in all seasons (Huber, 2005), but most hunting is associated with winter when the large migratory populations come to southern areas for mating. The exact locations of one hunting style, very distinctive in its use of long

diversionary barriers, or drive-lines, can be documented on the ground, and we use these here to illustrate the distribution of such hunting across a part of the western Chang Tang. Because these traditional hunting devices are currently being abandoned, their cultural significance and documentation of their locations are of interest. In recent decades, the traditional subsistence meat hunting has combined with cash incentives associated with international demand for antelope wool or "shahtoosh" (Wright and Kumar, 1998) to substantially increase hunter take in the Chang Tang, and hunting techniques have been rapidly changing. These changes in hunting, combined with modernizing lifestyles and introduction of new livestock management initiatives, are greatly changing the relationship between people and wildlife in the western Chang Tang (Fox et al., 2008b).

Study Area and Methods

The investigations reported here were carried out within a ca. 70,000 km² area of northern Gertse County, and small parts of both Rutok and Gege counties, within Ngari Prefecture in the northwestern Tibet Autonomous Region of China (Fig. 1). Other than the Aru Basin (Schaller, 1998; Fox et al., 2004), this area has not previously received attention regarding antelope distribution, abundance, and conservation. Huber (2005) has described the various antelope hunting techniques used in northern Gertse County, and provided detailed descriptions of the hunting/trapping aids used in this area. We provide a more extensive overview of the distribution and shifts in use of these game-drive structures and their relationship to migratory patterns of antelope in the region.

Our results are based on six 2- to 6-week excursions to the northwestern Chang Tang during 2000–2002 and 2005–2007, with

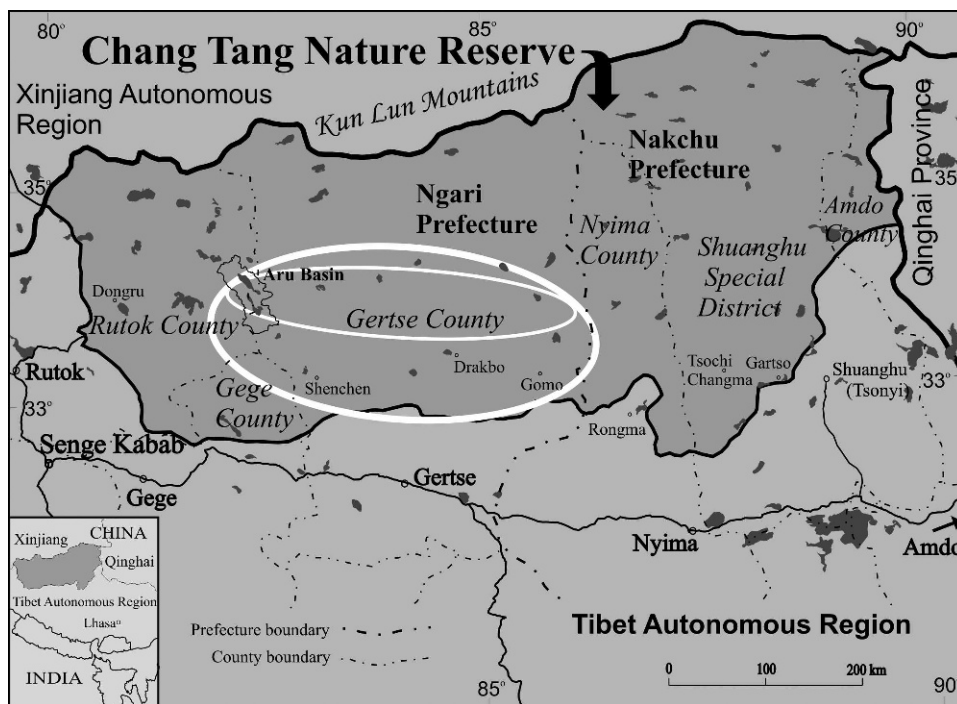


FIGURE 1. The Chang Tang Nature Reserve in northwestern Tibet Autonomous Region. The large oval indicates the general region surveyed, and the smaller oval the area with most trapping locations.

the first 3-year period primarily in the vicinity of the Aru Basin on both sides of the boundary between Gertse and Rutok counties, and the 2005–2006 fieldwork including extensive surveys of the northern limit of inhabited areas across Gertse County. Abundance results from the antelope population surveys are referred to here, but will be reported in detail elsewhere. We questioned many nomads and local officials regarding hunting activities, but most of the anecdotal information reported here is based on interviews with eight men between the ages of 58 and 78 who had experience with large mammal hunting in the northern Chang Tang, six from Gertse County, one from Gege County, and one from Rutok County. These men, and some other younger individuals, gave us general information on the location of hunting areas, antelope mating areas and migration routes, and often accompanied us on journeys to inspect these sites. The Aru Basin and vicinity was the

most thoroughly searched area for evidence of hunting, whereas a 2005 excursion, and a shorter foray in 2006 across parts of northern Gertse County at ca. 34°N, provided less detailed but more extensive searches.

Results and Discussion

There are a number of different approaches to antelope hunting, depending on season and animal behavior (Huber, 2005). But in general, most antelope hunting traditionally takes place during the winter period when herds congregate in large numbers for breeding. Hunters sometimes construct small (2–3 m diameter) hiding depressions (Fig. 2) near water sources in antelope wintering (mating) areas. We have found only a few examples of



FIGURE 2. Hunter hide in Tibetan antelope wintering area, ca. 2.5 m in diameter and constructed near a winter water source in eastern Gertse County at about 34°N.



FIGURE 3. Funnel-shaped game drive structures, locally known as “dzaekha,” used to force Tibetan antelope into small narrow areas for trapping and shooting. Each photograph is taken from the narrow neck area of the structure, and shows only one of the barrier lines.

these depressions, in open flat areas; the one in Figure 2 was found in 2005 and showed signs of recent maintenance. In hilly areas small rock-wall blinds are occasionally used for hunting, although these can serve equally well as wind shelters for livestock herders. Prior to the introduction of muskets, there is ample evidence in rock carvings (Bellezza, 2000) that the bow and arrow was the primary means of hunting. In any case, before and after muskets, winter hunting was conducted primarily by shooting from concealed locations, either natural landforms that provided concealment, or these man-made shelters, or depressions in flat open areas.

More prominent on the landscape, although still often difficult to recognize in the vast basins, are characteristic man-made constructions used for directing antelope movement to trapping and shooting sites. These funnel-shaped game drive structures (Fig. 3) are used primarily in the spring migratory staging areas, as female antelope gather and begin their northward calving migration. One of these traditional barrier trap systems, or “dzaekha,” and associated hunting activity have been described in some detail by Huber (2005). The diversionary lines are usually many hundreds of meters in length, up to several kilometers, and some people reported that the largest are over 5 km in length. We surveyed the full extent of only a few dzaekha; the coordinates we give (Appendix) refer to the neck where possible, but many locations reflect our passing through just one part of the structure. The diversionary lines sometimes consist of just 10- to 20-cm-high piles of dirt or sand, but usually rocks are placed upright on top of the piles, and sometimes large rocks alone are used, i.e. without the dirt piles (Huber, 2005; Fox, unpublished data), but we have seldom encountered any part of the structures over 30 cm in height. Wild reindeer (caribou), *Rangifer tarandus*, are known to have been directed to hunting sites with funnel-shaped series of rock cairns or rock walls in North America (Brink, 2005), Greenland (Grønnow et al., 1983), and northern Europe and Asia (Ingold, 1980), and the photo of one from northern Canada by Brink (2005, Fig. 10) is strikingly reminiscent of the “dzaekha,” although on a somewhat smaller scale. Also, the pronghorns (*Antilocapra americana*) of North America were sometimes guided to hunting sites with drift fences and corrals (Lubinski, 1999; McCabe et al., 2004), as were other ungulates in the Rocky Mountains (Benedict, 2005), and similar hunting techniques were used in other parts of the world. It is interesting, however, that the

low height of these dzaekha suggests that Tibetan antelope are somewhat unique in refusing to cross such low barriers.

Small hiding depressions are sometimes constructed near either side of the neck of the dzaekha (Fig. 4, right), for shooting animals coming through the barrier's neck; the maximum we have seen at one dzaekha was four, two on each side. These depressions are smaller than the one at the water source site in Figure 2, because fewer hunters would be present at a single dzaekha. Also, commonly placed within the neck of the dzaekha are small locally made leg-hold traps or “khogtse,” constructed from antelope horn, plant material, and animal hair (Fig. 4, left); see Huber (2005) for a description of its construction. Several of the former hunters we interviewed recalled various activities typical of the spring hunt in antelope migration staging areas, conducted in teams of 6 to 8 persons, where either the khogtse traps were used in funnel necks of the dzaekha or the hunters hid themselves nearby with their rifles ready, and this represents somewhat larger spring hunting groups than previously reported by Huber (2005). Hunters place a number (reportedly anywhere from 20 to 100) of these khogtse below the ground surface within the neck of the dzaekha, frozen into or anchored to the ground. Once caught in the trap the animal is either shot, killed with a knife, or is left to die on its own. In very large dzaekha there are sometimes two neck openings, an inner one where the hunters dig depressions for shooting, and another outer neck where they lay the traps. Khogtse are also sometimes placed in well-used antelope migratory trails, or around their winter watering sites, but they are intimately associated with the dzaekha hunting technique.

DZAEKHA LOCATIONS

We located 39 dzaekha in northern Gertse County, and six in Rutok County (Fig. 5, Appendix, and Fig. 1 for county boundaries). Their condition varied from recently maintained to disused with only remnants remaining, and a few of the old sites were near current settlements and well-known to local communities. There are certainly more dzaekha present in the northern areas of Gertse and Rutok counties surveyed here, which we did not locate, but the present assemblage provides ample examples of their variety, and sufficient evidence to document a recent northward shift in the use of these hunting aids. The landscape and layout of one of the dzaekha reported here (T¹ in the center of Fig. 5) has earlier been



FIGURE 4. Tibetan antelope leg-hold trap or “khogtse” (left, 18 cm diameter), and one side of a diversionary trap barrier system with a hunter hiding depression located near the narrow neck area of the diversion (right). Khogtse traps are placed within the neck area of the barrier structure.

described in some detail (Huber, 2005) and represents one of those that has received relatively recent maintenance; the others showing recent maintenance are marked with an asterisk (T*). We did not visit the largest dzaekha in Gertse County, known to many former hunters, but its approximate location is designated as T^L in the center of Figure 5.

Placement of the dzaekha is associated primarily with initial antelope travel from staging areas where females congregate to begin their calving migrations to the north, but a few appear to be situated along the early parts of migration routes, especially in sites constricted by topography. Most of the dzaekha we encountered did not show indications of recent maintenance, with the exception, however, of 11 northern sites that have evidence of recent mound repair or rock (re)placement. Most all dzaekha we encountered had their neck openings oriented in a northerly

direction (Appendix), or along land formations that led to northern openings, and this is illustrated from a small area of dzaekha concentration in the vicinity of an antelope staging area within and near the Aru Basin (Fig. 6).

The southernmost of the dzaekha we encountered were located within and near areas of current permanent settlement, with some less than 200 m from current winter houses (all of which were built within the past 15 years). None showed signs of recent maintenance, and some were clearly only disused remnants. It thus appears that the areas of antelope winter concentration and certainly their staging areas for the spring calving migration have shifted northward. The existence of such a northward shift was confirmed in our interviews with the men experienced in hunting, who virtually all agreed that areas of antelope concentration and overall numbers were fewer in the more southern areas, and that

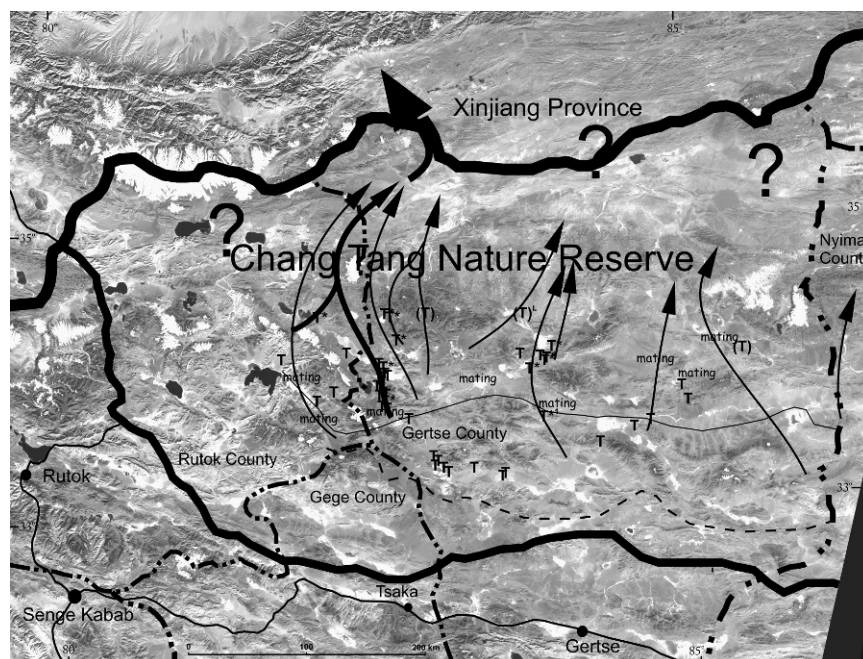


FIGURE 5. Locations of dzaekha, diversionary trap systems for Tibetan antelope, in northern Gertse and Rutok counties, Ngari Prefecture, Tibet Autonomous Region, China. “T” denotes trap sites; those in parentheses are locations visually pointed out to us by locals but which we did not visit. Migratory routes for female Tibetan antelope were described and pointed out to us by local herders and/or former hunters. The thick arrows represent a known major migratory route to a known calving area, whereas the question marks indicate current lack of knowledge regarding the northern portion of migration routes and calving area destinations. The solid line near the south end of the migration routes represents the approximate current southern limit of antelope winter use, whereas the dashed line below that is the approximate limit within memory of the old men we interviewed. See Figure 1 for scale.

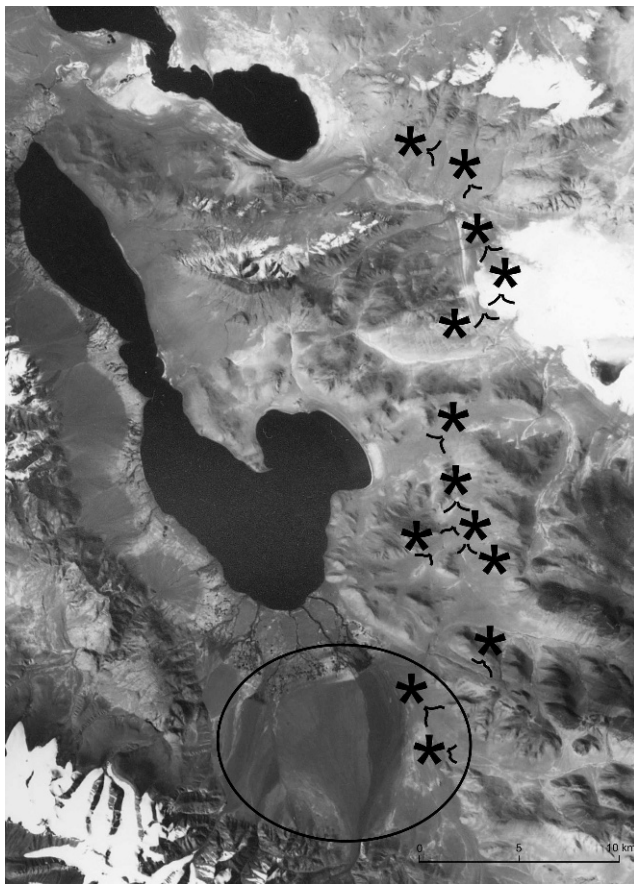


FIGURE 6. Intensive antelope trapping area southeast of Memar (top) and Aru (center) Lakes in the Aru Basin and vicinity of the northwest Chang Tang (see Fig. 1), showing the locations (large asterisks) and orientation (small black drawings) of 13 dzaekha. These sites are near the beginning of the female antelope's northward calving migration. The large flat open area south of Aru Lake (black oval) is a well-known antelope wintering, mating, and migratory staging area.

such a change had occurred over the past 50 years or so of their observation. Most persons interviewed were reluctant to comment on the current levels of hunting in the region, for the practice is illegal and under increasing levels of enforcement, but it was clear that some hunting continues at the northern sites.

ANTELOPE MIGRATION ROUTES

Across the Chang Tang reserve, four major antelope long-distance migratory populations and their general migration routes have been reported (Schaller, 1998), including that of the "Western Chang Tang herd" with staging areas to the east and south of Aru Lake and south of Lumajangdong Lake (large lake directly west of Aru Basin; Fig. 1). This herd's migratory path was first reported by Schaller (1998), and is the one which Ridgeway and his colleagues (Ridgeway, 2003) followed on foot to a now well-described (Schaller et al., 2006) calving area (shown at the end of the thickest arrow in Fig. 5). This major migratory route is illustrated with the moderately thick arrow in Figure 5, but animals from nearby wintering areas also join. When we followed this route north of the Toze Kangri massif (under the "T" in Tang in Fig. 5) in June of 2001, members of a mineral exploration team from Shanxi Province camped there reported to us their observation of numerous antelope groups migrating northward

just to the east of this massif, presumably joining others en route to the known calving area in Xinjiang (Fig. 5). Schaller (1998) apparently did not observe such groups when he was there in 1992, but we now know that across northern Gertse County to the east of the Aru Basin, and unreported to date, there are apparently three or four routes that antelope take in starting their northward migration (Fig. 5). Where these routes lead to calving areas is currently not known, and although several of our informants reported having seen, or heard stories of, calving far to the north, they could not give accurate locations.

Regarding wintering and migratory staging sites for the Western Chang Tang herd, an avoidance of the Aru Basin itself as an area of concentration was reported by Schaller (1998) from his work in the early 1990s. But this is contradicted by our 2000 and 2002 observations of large late autumn and winter concentrations within the basin, local residents' reporting of substantial numbers of antelope remaining in the basin throughout the winter (Fox et al., 2004; J. L. Fox, unpublished data; T. Dorji, unpublished data), as well as the numerous dzaekha shown in Figure 6. More recently, however, our 2005 and 2006 observations indicate a decreased use of the Aru Basin, with more animals to the east of the basin (and perhaps to the west, which was not surveyed) (J. L. Fox, unpublished data; T. Dorji, unpublished data). Taken together, these observations indicate that areas of winter congregation, and subsequent spring migration staging, can change to some extent over time, and the various routes shown in Figure 5 may show substantial differences in the amount of use from year to year. The limited evidence of recent dzaekha maintenance we found may therefore reflect changing areas of antelope wintering concentration and migratory routes, and therefore hunting activity. But such lack of recent maintenance may also reflect the increasing use of new hunting techniques, as described below.

DISTRIBUTION OF DZAEKHA USE IN THE CHANG TANG

The historical presence of khogtse leg-hold traps is also known from other regions of the Tibetan Plateau where antelope did but do not today occur, e.g. from northern Qinghai (Huber, 2005). But, whether they were there also associated with dzaekha, and migratory antelope, is unknown. To date, dzaekha have not been reported from areas other than the western Chang Tang, but thorough searches have not been conducted. On travel to our western Tibet study area, we have noted the presence of stone remnants of what appears to be a dzaekha just north of Nam Co ($30^{\circ}56.0'N$, $91^{\circ}00.3'E$, 4800 m a.s.l.) in Lhasa Administrative District. This would presumably indicate the presence of a migratory antelope population, and in an area where antelope do not presently occur, in this case some 150 km east and south of their current range. Although game drive structures elsewhere that are similar to dzaekha are not necessarily associated with migratory ungulates, whether that association is present in the Chang Tang poses an interesting question. Antelope still occur to the south of the ancient $32^{\circ}30'N$ travel corridor across the Chang Tang (today, the main east-west road to Senge Kabab, Fig. 1), although these are apparently not long-distance migratory populations. With substantially greater evidence of past human habitation and cultural artifacts to the south of this road, perhaps hunting and other human activities sufficiently depleted populations and altered migration patterns of the antelope there that any long-distance movements were long ago disrupted. But a total lack of evidence of dzaekha from other areas south of the road could support a conclusion that relatively diffuse and short basin-to-

mountain movements were the only type of seasonal migration ever present in these southern parts of the antelope's distribution. In any event, the only large antelope populations in the TAR still undergoing long-distance migrations today have wintering concentrations generally north of 33°N, and hunting in the Chang Tang has been, and is still, concentrated in these areas.

Recent Changes in Hunting Behavior

Although current laws do not permit any hunting, low levels of individual resident hunting that involve subsistence procurement of small amounts of meat were tolerated in some areas (such as the Aru Basin) in recent years. But, the increased illegal take of antelope for their skins and consequent intensified overall law enforcement are eliminating even this informal subsistence alternative. The question has been raised regarding possible continuation of some subsistence hunting by residents in this region (Fox and Tsering, 2005), but government policies, as well as the continuation of illegal hunting, appear to be ruling out such a possibility. All antelope hunting was declared as illegal at the time of the creation of the nature reserve in 1993, modern weapons were confiscated from residents in about 1995, and in 2002 attempts were made to confiscate all firearms (including the old muskets) and various leg-hold traps. Nevertheless, antelopes inside the reserve are still being hunted for their fine wool (Fox et al., 2008a; WWF, 2006), and although some traditional trapping is still involved, more commonly modern rifles are used (sometimes supplied by illicit traders) and very recently the use of motorcycles has come into play in chasing down animals (Fox et al., 2008a).

Furthermore, in the northernmost townships, new pasture allocation policies and associated administrative boundary fencing are being introduced within traditional areas of antelope winter congregation and across their migratory routes (Fox et al., 2008a, 2008b), some in the vicinity of old dzaekha. Such fencing, started in 2005 and increasing during 2006, may detrimentally affect Tibetan antelope mortality and movement patterns in a manner similar to what happened with the pronghorn (*Antilocapra americana*) of western North America (O'Gara and Yoakum, 2004). However, their current use in some places as modern dzaekha barriers, with motorcycles to herd and tire the antelope and rifles to dispatch them, point to a completely different pattern of interaction between some residents and the wildlife (Fox et al., 2008a).

Although some form of subsistence-related hunting could conceivably be continued today for the northernmost residents of the Chang Tang, modernizations are happening so fast that its role is questionable. Various improvements in hunting, e.g., modern weapons and vehicles, and the continued high price for antelope skins make this a difficult proposition. In any case, a limited amount of subsistence hunting could probably constitute a viable management option for the northernmost pastoralists, if livestock numbers are restricted and commercial hunting eliminated. Still, given a rise in living standards for the resident pastoralists, religious sentiment against killing could well deter the hunting anyway. The high market value of antelope skins remains the key issue in hunting today. But even were hunting to be eliminated, as is being attempted, planned livestock development initiatives may be the most important factor to affect human-wildlife interaction in the future (Fox et al., 2008a). The end result is that the numerous dzaekha described here are quickly becoming remnants of a rapidly disappearing lifestyle. The dirt piles will erode with time, and the scarce rocks used to form them may well become the corrals and houses of the future.

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APPENDIX

Locations of 45 game drive barriers, or “dzaekha,” for Tibetan antelope in northern Gertse and Rutok Counties, Ngari Prefecture, Tibet Autonomous Region.

Trap location	Elevation (m)	Opening direction	Trap age, maintenance	Year examined
Gertse County, Shenchen Township				
34°24.2'N, 82°35.2'E	5100	N	recent	2006
34°24.6'N, 82°35.3'E	5090	N	recent	2006
34°24.6'N, 82°44.3'E	5270	?	(reported)	2005
34°23.8'N, 83°35.7'E	4930	?	(reported)	2005
34°13.1'N, 82°40.9'E	5010	N	recent	2006
34°10.9'N, 83°54.0'E	4915	N	recent	2007
34°09.3'N, 83°50.1'E	4940	N	recent	2007
34°08.7'N, 83°51.0'E	4960	?	remnants	2005
34°08.6'N, 83°37.8'E	5050	N	recent	2005
34°08.0'N, 83°51.2'E	4980	NNE	recent	2005
34°06.5'N, 82°31.2'E	5010	N	old	2005
34°05.7'N, 82°32.3'E	5000	N	recent	2005
34°03.9'N, 83°42.1'E	4920	N	recent	2007
34°03.9'N, 82°33.3'E	4915	NNE	moderate	2002
34°02.6'N, 82°33.9'E	4910	NNE	moderate	2002
34°02.3'N, 82°33.0'E	4930	NNE	moderate	2002
33°58.9'N, 82°31.5'E	4990	N	moderate	2002
33°57.6'N, 82°32.0'E	5020	N	moderate	2001
33°56.6'N, 82°31.9'E	5040	N	moderate	2001
33°55.9'N, 82°32.1'E	5060	N	moderate	2001
33°55.9'N, 82°31.1'E	5040	NE	moderate	2000
33°53.2'N, 82°32.4'E	5290	NE	recent	2000
33°50.5'N, 82°32.4'E	5080	N	moderate	2001
33°50.8'N, 82°31.5'E	5050	N	old	2005
33°45.1'N, 82°43.1'E	5170	N	moderate	2005
33°31.2'N, 82°58.0'E	4930	NNW	moderate	2001
33°27.5'N, 82°58.6'E	4815	NNW	moderate	2002
33°25.3'N, 82°59.8'E	4790	NNW	moderate	2002
33°24.6'N, 83°01.2'E	4825	NNW	moderate	2002
33°25.1'N, 83°14.9'E	5070	NE	moderate	2005
33°23.3'N, 83°03.1'E	4870	NNW	moderate	2002
33°21.4'N, 83°28.6'E	5080	NE	old	2005
33°21.3'N, 83°28.5'E	5075	NE	old	2005
Gertse County, Drakbo Township				
34°14.3'N, 85°27.3'E	4955	?	(reported)	2005
33°55.6'N, 84°56.2'E	4945	?	remnants	2005
33°50.5'N, 84°59.4'E	5135	NW	moderate	2005
33°41.5'N, 84°38.1'E	4810	N	old	2005
33°40.3'N, 84°33.8'E	4780	NE	remnants	2005
33°34.4'N, 84°16.3'E	4800	N	old	2005
33°44.5'N, 83°49.2'E	4880	N	moderate	2001
Rutok County, Drulya Township				
34°24.9'N, 82°00.3'E	5130	NE	very recent	2001
34°11.5'N, 82°14.8'E	5040	NNE	very old, remnants	2001
34°08.7'N, 81°45.9'E	5070	NNE	moderate	2002
33°53.6'N, 82°09.6'E	4995	N	moderate	2002
33°52.2'N, 82°06.9'E	4925	WNW	moderate	2002