



## Numbers and Fattening Level of Livestock in Western Big Pamir (2006-2017)

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A community ranger counting sheep and goats in Big Pamir, October 2017 - @ WCS/Ali Madad Rajabi

12 December 2017

## Scope of the report

This report presents the results of annual livestock counts carried out in September and October 2017 in the west of Big Pamir by WCS Afghanistan's Ecological Monitoring Team. Analysis of livestock count results categorized according to settlements / grazing areas were not included in this report, but will have added significance after several more years of monitoring. The observed demographic trends since 2006 have already been discussed in previous reports in the frame of sustainable rural livelihoods and landscape conservation (Ostrowski and Rajabi 2013, 2014, 2015, 2017). The present report briefly discusses results collected in 2017 and compares them with previous census results. In addition the report presents, quantitative measurements of the fat deposition (i.e. fattening performance) in a random sample of sheep that grazed the traditional pastures of western Big Pamir in summer 2017.

## Background

Accurately estimating numbers and demographic trends of livestock in the fragile habitat of Big Pamir is central to understanding grazing pressures, the extent of competition with wild herbivores for range use, and the risk of disease transmission from livestock to wildlife. WCS has been monitoring livestock numbers in western Big Pamir since 2006 as a faster and more cost-effective alternative to carrying out thorough assessments of the state of the rangeland. The western side of Big Pamir is used by Wakhis to feed their livestock during the summer months. They remain here from mid May until early October when most withdraw to the Wakhan Valley for the winter.

In March 2014 the Government of Afghanistan declared the Wakhan District a National Park. Prior to this important development, Wakhi communities had agreed to protect a significant portion of the western Big Pamir. The Big Pamir Wildlife Reserve (BPWR) and its associated buffer zone cover 1,542 km<sup>2</sup> of fragile Pamir landscape. It was created to ensure the protection of key Marco Polo sheep (*Ovis ammon polii*) habitat, and promote sustainable livelihood practices. Counting livestock in the Big Pamir is therefore an important monitoring activity, generating baseline information that aims to inform the management of the Wakhan National Park and more specifically of BPWR.

Two estimates of livestock numbers in the western Big Pamir in 2006 were made based on differing methodologies (Mock et al. 2007; Ostrowski 2007). In 2007, Ostrowski et al. (2007) reconciled discrepancies of these two estimates in light of the results of an additional survey, and proposed an adjusted estimate for livestock numbers in the area in 2006 (Table 1). After this initial estimate, livestock censuses were discontinued for the following three years. In 2010, WCS's veterinary team developed a standardized protocol and measured livestock numbers from direct counts at the end of the summer grazing season, every year between 2010 and 2016 (Table 1). The present report

summarizes census results made by the WCS team between September 23<sup>rd</sup>, and October 6<sup>th</sup>, 2017 and updates our knowledge on livestock trends in this part of the Wakhan National Park since 2006.

In addition to counting livestock numbers, we measured a sample of sheep in spring and autumn, at the beginning and end of the grazing season, to evaluate their level of fattening during summer months (see methods in the Appendix). Since the carrying capacity of the rangeland varies according to the grazing pressure during the previous year, as well as precipitation, and other weather parameters, the total number of livestock is only a partial indicator of possible overstocking. However, livestock count results become a stronger predictor of possible overgrazing when they are combined to a measure of fattening performance of key livestock species. An increased number of sheep with medium to low fattening performance during summer would indicate an excess of sheep (and livestock in general) compared to the available forage, with an associated higher risk of adult and lamb mortality during the following winter and spring as a result of exhausted fat reserves and sub-optimal milk production. An overstocking situation would also indicate a higher risk of winter food insecurity on sympatric wild herbivorous species (e.g. Marco Polo sheep, Siberian ibex) living in BPWR and adjacent areas.

## Results

Table 1. Results of livestock counts in the western Big Pamir between 2006 and 2017, Wakhan National Park, Badakhshan Province, Afghanistan (Ostrowski and Rajabi 2013, 2014, 2015, 2017).

Year	Month of census	Sheep and goats	Yaks	Total livestock <sup>1</sup>	Rate of growth <sup>2</sup>
2006 <sup>3</sup>	Jul-Aug	8,749	740	9,489	-
2010	Jul	12,377	930	13,307	+40.2%
2011	Sept	14,559	1,171	15,730	+18.2%
2012	Sept	14,388	1,058	15,446	-1.8%
2013	Sept	19,467	1,298	20,765	+34.4%
2014	Sept	19,075	1,108	20,183	-2.6%
2015	Sept-Oct	19,135	1,188	20,323	+0.7%
2016	Sept-Oct	16,281	1,071	17,352	-14.6%
2017	Sept-Oct	16,558	1,167	17,725	+2.1%

<sup>1</sup>Excluding cattle usually not present in Big Pamir after mid September. <sup>2</sup>Since the previous count. <sup>3</sup>The survey in 2006 combined two different methods; direct counts (75%) and questionnaire surveys (25%); therefore true numbers of livestock might have been underestimated by 5-10%

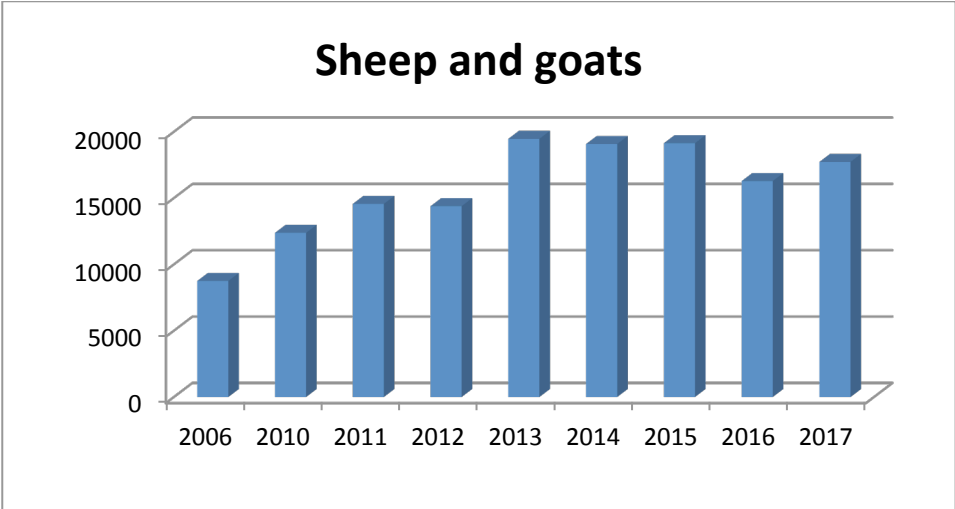


Figure 1. Annual estimates of sheep and goat numbers in the western Big Pamir between 2006 and 2017, Wakhan National Park, Badakhshan Province, Afghanistan.

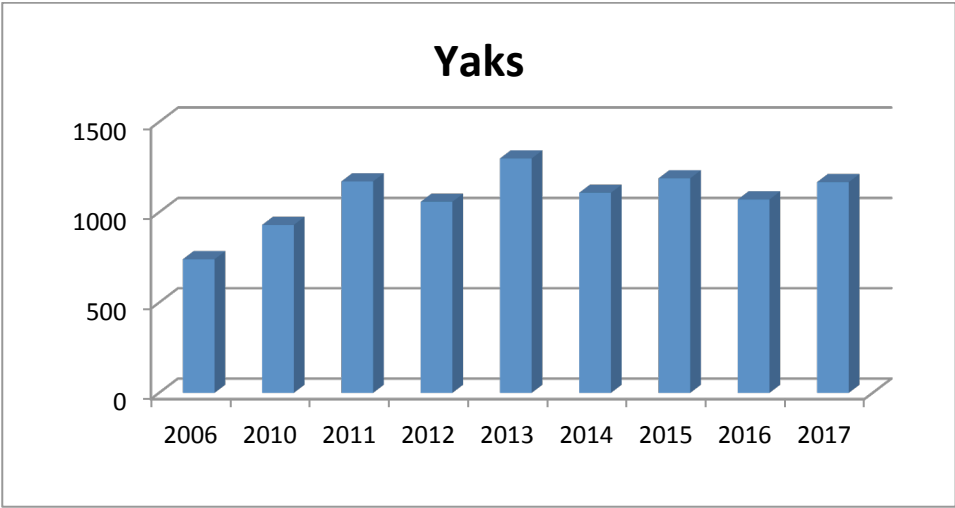


Figure 2. Annual estimates of domestic yak numbers in the western Big Pamir between 2006 and 2017, Wakhan National Park, Badakhshan Province, Afghanistan.

Table 2. Results of fattening performance in sheep randomly sampled at the beginning and end of the grazing season, western Big Pamir, Wakhan National Park, Badakhshan Province, Afghanistan.

	Beginning of grazing season	End of grazing season	Difference <sup>1</sup>
Mean body mass (kg)	28.9	44.8	Very highly significant
Mean girth size (cm)	76.7	88.7	Very highly significant
Mean girth/tarsus	3.11	3.48	Very highly significant
Mean body mass/tarsus	1.16	1.80	Very highly significant
Mean fat score	2.2	4.8	Very highly significant

<sup>1</sup>The differences between mean values at the beginning and end of the grazing season were tested with a paired Student's *t* test or a Wilcoxon signed-rank test for mean fat score. A very highly significant result corresponds to  $P < 0.0001$ . At such high level of significance no Bonferroni correction was deemed necessary to correct for multiple comparisons.

## Discussion

The livestock population in western Big Pamir remained relatively stable compared to 2016 with limited increase of 2.1% compared to 2015. Despite this modest increase, the overall trend in livestock numbers in western Big Pamir is a significant increase of c. 87% over the last 12 years. However, this increase could be divided into two periods.

Between 2006 and 2013 the livestock population growth in western Big Pamir has been dramatic, at +118.8%, or an annual average growth rate of 16.9% (Table 1). This demographic increase was reported in all livestock species; sheep, goats (Fig. 1), yaks (Fig. 2) and probably cattle as well, but those have not been included in the surveys because they remain in the Pamirs for only a short period of time (early July-early September). We think that concomitant to this increase in numbers, Big Pamir also supported locally increased densities (Ostrowski et al. 2013). Livestock range-use surveys carried out between 2006 and 2008 suggested that Wakhi people already maximized the use of available pastures for their livestock (Ostrowski 2009). In such circumstances an increase in livestock numbers should inevitably translate into an increase in livestock densities. Using GPS data collected by herders Ostrowski (2009) found that the average home range and density of eight of these herds, totalling nearly 5,000 sheep and goats, were  $30.2 \pm 5.3 \text{ km}^2$  and  $20.8 \pm 5.2 \text{ animals/km}^2$ , respectively.

After 2013 livestock numbers have levelled off and even significantly declined in 2016. This levelling off or possibly negative trend is as important to understand as the

preceding period of growth. The significant population increase between 2012 and 2013 (+34%) raised concerns regarding the sustainability of current grazing practices by Wakhi herders in Big Pamir (Ostrowski et al. 2013). We predicted that livestock populations might have reached maximum numbers in the area, which were likely to decrease in the future because of degraded pastures. Aligned with our predictions, livestock numbers in 2014, 2015 and 2016 seemed to have levelled off with a modest (and probably genuine) decrease of 2.6% in 2014 compared to 2013 followed by an increase of 0.7% in 2015 compared to 2014 and then a clear decrease of 14.6% in 2016 compared to 2015. Interviews with herders in September 2014 and September-October 2015 confirmed that pastures were forage-depleted by the end of August, one and half months ahead of the usual end-of-grazing period. In 2014, most herders put the blame on low precipitation during the past winter, while a few assigned fault to the increasing stocking rates and added grazing pressures caused over the past decade. However, in 2015 pastures were also forage-depleted by the end of August (Ostrowski and Rajabi, 2015) despite relatively good precipitations (in the form of snow) in February-April, which would indicate that overstocking is the main cause for rangeland low productivity. Noticeably, until 2016 and despite the alleged situation of chronic forage depletion likely due to intense grazing, the livestock population had not been affected by significant winter losses, possibly because of the relatively mild weather conditions that prevailed in Wakhan for the last few winters. It is also possible that livestock were not in significantly poorer fattening stage compared to previous years (hence challenging the assumption that pastures were prematurely depleted) and could still withstand the demanding winter conditions. This last hypothesis was refuted based on the observations made in early 2016.

In April 2016 a late episode of heavy snowfall in the upper Wakhan and Pamirs combined to a drop in ambient temperature resulted in a mass mortality of livestock caused by hypothermia and food shortage. A mission conducted on 27-30 April by Rupani Foundation, FOCUS, Mission East and DAIL estimated from a questionnaire survey that nearly 16,000 sheep and goats died during this event in upper Wakhan and Big Pamir (Anonymous, 2016). Although the number of deaths is to be considered with caution since people often overestimate this information with the expectation to receive more support from food security agencies, it was unquestionably a large scale die-off as supported by the many dead animals seen by the mission and also by a team of WCS visiting the Kyrgyz community in Big Pamir in May 2016 (Ali Madad, pers obs.). Although the possibility of a disease outbreak as a cause of the die-off has been suggested (Anonymous 2016), the fact that livestock of different species (yak, cattle, horse, donkey, Bactrian camel) were all affected concurrently, during one episode of harsh weather conditions and in areas distant from one another (Wakhan, Big Pamir, Little Pamir) strongly supports the conclusion that bad weather was the primary driver of the mortality event. The mortality affected the weakest animals as well as new-born lambs and kids no longer milked by mothers. In contrast fittest animals even among

those Wakhi herds that remained in Big Pamir during winter were very little affected by the die-off (Ali Madad Rajabi, pers. obs.), supporting the inference that the poor body condition of animals during the harsh weather episode was a crucial factor explaining mortality. We therefore hypothesize that low fat reserves at the end of summer 2015 as a result of overstocking could have increased the mortality risk in April 2016 for a number of livestock, particularly lactating females.

The decrease in number of sheep and goats (and to a lesser extent yak) observed in western Big Pamir in summer 2016 was a consequence of the April mortality, which in turn might have resulted from overstocking in summer 2015. However, this decrease in livestock numbers brought to the western Big Pamir in summer 2016 was not only a mechanical consequence of fewer animals surviving the harsh weather conditions in April 2016. It has also to be understood in the light of the peculiar system of *amanat* prevailing in the Wakhi community. The *amanat* in Wakhan is a mechanism by which land-rich families or those with livestock but little manpower do not take their livestock to Pamirs themselves, but instead send them with a relative, a Kyrgyz herder or a poor Wakhi herder. The herder shall return the fattened animal to the owner after the grazing season and keeps the dairy production, wool and occasionally one or two animals as payment. Because mothers stopped lactating as a result of losing offspring during the April cold wave, they were not sent to Pamirs as no dairy products could be collected from them. These ewes and goats had to be kept in the Wakhan Valley in summer or because of the few pastures available in the valley, sold or bartered to traders. Therefore harsh weather conditions in spring have had significant impact on livestock numbers both in Pamirs and Wakhan Valley. This case also illustrates the complexity of the livestock economy in the semi-nomadic pastoral system prevailing in Wakhan, where economic and social factors are intimately weaved.

In autumn 2017 the livestock population remained stable compared to autumn 2016. This finding is coherent with the fact that winter 2016-2017 was not particularly harsh in Wakhan and, importantly, that no mid spring cold wave struck the area such as in April 2016. Also, the fattening indices measured in a sample of sheep in autumn 2016 were good and suggested that livestock had stored enough fat reserves to withstand the winter conditions. The fattening indices measured in autumn 2017 were comparable to those measured in 2016 and support also that livestock have been 'well prepared for winter'. It will be interesting to measure how the animals are affected in case of harsh winter or should a spring cold wave occurs in the area in spring 2018.

As during the previous three autumn surveys a continuing concern is the presence of cattle in Big Pamir in summer; a large-size grazer that was not reported in this area at this time of the year between 2010 and 2013. In Wakhan cattle are usually moved by early September to the main valley, where farmers use them as draft animals for agriculture. Without an observed increase of agriculture mechanization in the area, the

presence of 239 and 111 cattle in Big Pamir in late September 2014 and 2015, respectively, suggests that cattle were left in Big Pamir for increasingly longer periods of time. In 2016 only 24 cattle were counted in western Big Pamir and none in 2017, but counts took place slightly later than during the previous two years. In 2017 30 domestic Bactrian camels were counted for the first time in the last decade. Free-ranging cattle (and camels) constitute an additional grazing burden on already heavily utilized rangelands and particularly in the Big Pamir Wildlife Reserve where they are released intentionally.

The lack of long term (>15-20 years) continuous monitoring of livestock in Wakhan does not rule out a possible “boom-and-bust” livestock demographic hypothesis. However, after 12 years of monitoring it seems unlikely that the current observed trends could be part of a longer term (possibly even cyclical) fluctuation of livestock numbers across Wakhan, which will be followed by a decrease as a result of consecutive winter mass mortality of livestock.

In 2006 and 2007, an exhaustive rangeland study of Big Pamir showed that the sedge meadow / wet meadow, Alpine grass, and Artemisia steppe vegetation covers, which are the most significant to wild and domestic grazers, suffered from the effects of heavy, long-term grazing, which significantly reduced the standing crop (Bedunah 2009). With the doubling of the livestock population grazing this landscape seven years later, and sustained high stocking rates in 2013-2015, an even higher level of degradation of this fragile vegetation cover, which is essential to wildlife, is possible. A pessimistic scenario would even suggest that the increased livestock numbers could in time threaten the entire ecosystem, exposing populations of wild and domestic herbivores to food shortages.

This alarming scenario is however tempered by the results of sheep body condition and rangeland monitoring conducted in 2016 and 2017. The body condition measurements suggest that the fattening levels of sheep grazing the western Big Pamir in summer 2016 and 2017 were optimal. On average, 30-kg body mass animals at the beginning of the grazing season left the area 20-kg heavier and all fattening indices showed very highly significant increases after summer grazing (Table 2). Of course it should be noted that in 2016 these results were retrieved in the context of a ca. 15% decrease in livestock numbers in the area and a year with very good precipitation, but in 2017 similarly good fattening levels were observed while livestock numbers remained stable for the preceding year. Overall these results support the view that the rangeland condition in the Big Pamir might not be as bad as initially anticipated, or at least that it has retained a good capacity to regenerate. These conclusions were supported by Zandler (2016) who carried out a rangeland survey in Big Pamir in August-September 2016. He found that, averaged over all plant community types, total foliar vegetation cover in the western Big Pamir increased by 18.25% between 2007 and 2016 with more change in

the grass- and forb-dominated communities. Averaged over all community types, total canopy vegetation cover in the Little Pamir increased by 3.5%. These results suggest an improvement in range condition over 10 years. However, precipitation was below average in 2007 and well above average in 2016 suggesting that range plant productivity was unusually low in 2007 and atypically high in 2016. A new rangeland survey planned for summer 2018 should provide insightful information on the variability of rangeland conditions in Big Pamir two years apart.

Protection and vegetation recovery remains a main conservation priority in the western Big Pamir. Unfortunately solutions to tackle the summer high stocking situation in Big Pamir are few. They all require a community-driven effort to introduce more sustainable grazing practices and limit livestock numbers and the extent of them grazing 'most valuable areas'. In theory specified grazing periods, durations, and rotations among livestock owners could be proposed and an increased destocking effort in the autumn, primarily via sales could be developed. Restrictions imposed on usage of Pamir pastures by non-Wakhi herders will also have to be taken into consideration. Such management practices are likely to be difficult to implement considering the role livestock production plays in the subsistence of the Wakhi, and the local economy in general. It is currently the only large-scale profitable activity in the district.

We suggest starting by implementing a more efficient no-grazing policy within the Big Pamir Wildlife Reserve, using the community and government ranger teams and according to the management plan endorsed by representatives of the local communities. The most valuable (and sensitive) areas in the buffer zone of the reserve will have to be identified and rehabilitation processes mentioned above initiated. Exclosure plots within the reserve, in the buffer zone and in non protected rangelands in 2016, will help monitor the quality and speed of rehabilitation processes and provide communities with a visual and quantifiable indicator of the benefits of sustainable grazing practices.

In anticipation of a quantitative update on rangeland conditions across Wakhan, livestock monitoring provides a good proxy of the annual level of grazing pressure on Pamir rangelands in Afghanistan. Although the WCS monitoring effort focuses only on livestock in western Big Pamir, this area receives in summer at least half of the livestock population owned by the ca. 1,500 Wakhi households, who composed in 2014 nearly 90% of the human population of the district (Ostrowski, pers. obs.). In 2018 WCS aims to continue to measure fattening indices of livestock brought to Big Pamir during summer, along with monitoring of numbers.

## **Conclusion**

In recent years Wakhi people have increased livestock numbers in Big Pamir to possibly unsustainable levels. Although this increase could be sustainable it is unknown whether it is a recent phenomenon resulting from new economic incentives, societal modifications, or part of a long-term and possibly cyclical increase in livestock numbers, likely followed by a decrease as a result of harsh, successive winters. After 12 years of livestock number monitoring in western Big Pamir we have no evidence of the existence of such a cyclical pattern. In 2016 we observed a decline in livestock numbers which might have relieved the heavy grazing pressure on the Western Big Pamir vegetation, which in parallel seems to have benefitted from good spring precipitation. In combination these factors might have explained the very good fattening indices measured in a sample of sheep monitored in this area. Similar good indices have been measured in autumn 2017 in a context of a stable livestock population size; around 17,000-18,000 heads. It is important to better understand demographic variations of livestock in Pamirs and it justifies continuing efforts at monitoring livestock. Livestock number measurements carried out by WCS in western Big Pamir since 2006 are accessible in a unique database available with the WCS Afghanistan's Monitoring and Evaluation Department in Kabul.

## **Acknowledgements**

This study was made possible by the generous support of the UNDP/GEF grant: AA/Pj/PIMS: 00076820/00088001/5038. The contents of the report are the responsibility of the Wildlife Conservation Society, and do not necessarily reflect the views of UNDP/GEF. The 2017 survey would not have been possible without the support of the WCS team in Wakhan and the dedicated fieldwork of Ayan Big, Aziz Big, Boy Mohammad, Karmal, and Mirza, the Wakhi collaborators of the community-based Wakhan Pamir Association. Mohammed Ismail Tuwaid, WCS, was responsible of the measurements of fat indices in sampled sheep in May 2017; we thank him for his participation to the spring monitoring work.

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## **Appendix**

### Materials and methods

The team was composed of community rangers led by Ali Madad Rajabi, WCS. The counting methodology is available in earlier WCS livestock count reports.

On May 26<sup>th</sup>-30<sup>th</sup> 2017 we selected randomly 23 healthy sheep (12 males and 11 females) aged 1-5 years old in three grazing areas of western Big Pamir (Nakchirshitk, Manjulak, Senin). We measured their body mass ( $\pm 0.5$ kg, rounded to the nearest kg)

with a hanging scale (Pesola, Switzerland), their girth circumference and 'tarsus' (hind-leg) length with a plastic tape meter. We also scored qualitatively their fat condition on a scale of 1 (leanest) to 5 (fattest) by manual palpation of the GR site (about 10 cm from the midline of the back over the 12<sup>th</sup> rib). We identified the measured sheep individually with a numbered plastic collar. We measured again according to the same protocol and methods 12 of these 23 sheep (11 had been sold in summer) between September 26<sup>th</sup> and October 6<sup>th</sup>. The body mass is subjected to many anatomo-physiological variations such as the body composition (including fat) but also the water and food content in the digestive tract. The girth circumference is a more direct indicator of the thickness of subcutaneous fat whereas the fat scoring evaluates the overall fat content. Because 12 animals were 1 year old when measured (they were still growing, especially males), we also measured the tarsus length. To eliminate the possible effect of growth on girth circumference and body mass we compared the ratios girth/tarsus, body mass/tarsus and fat scores at the beginning and end of the grazing season.

