Improving livelihoods and governance through natural resource management in Afghanistan

Activity Report of the Ecosystem Health Team in Wakhan, Afghanistan
September to November 2010

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Cover Photograph:

Dr. Ali Madad "Rajabi" vaccinates an adult yak in the presence of the two Wakhi owners, one of them restraining the animal, in Vagd Boi settlement, Big Pamir, Wakhan District, October 2010.

All photographs: WCS Afghanistan, Ecosystem Health Team, 2010.
Map: Mr. Haqiq Rahmani, WCS

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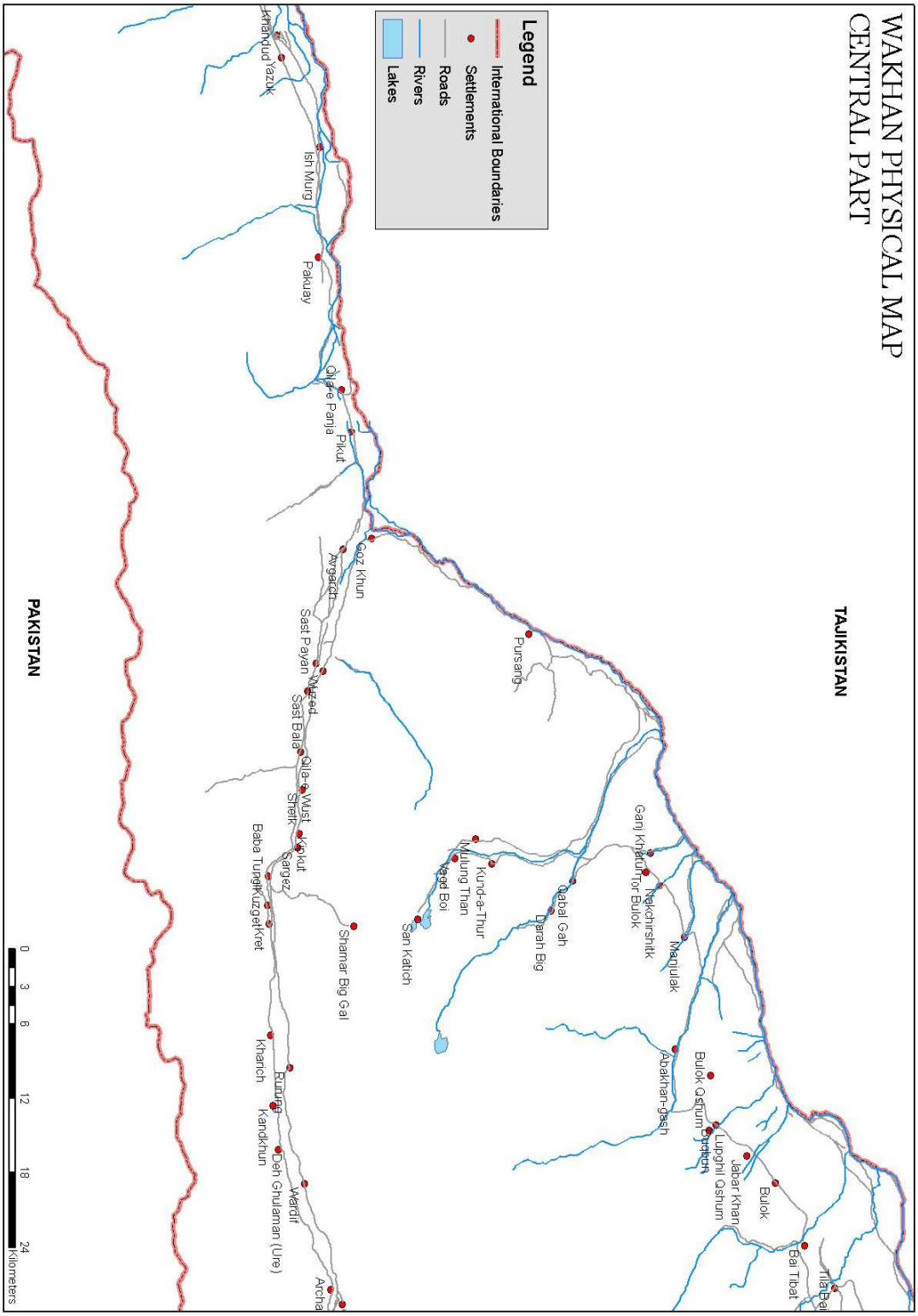

Figure 1: Map of the central segment of Wakhan District where all activities detailed in this report have taken place.

Activity Report of the Ecosystem Health Team in Wakhan, Afghanistan
September to November 2010

(Foot-and-mouth disease mass vaccination campaign in cattle and yak, livestock census in Big Pamir, tuberculin test in cattle and blood sampling of livestock for brucellosis testing)

Authors: Drs. Hafizullah "Noori" and Ali Madad "Rajabi"

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Summary

Between September 21 and November 3, 2010, the WCS veterinary team vaccinated against foot-and-mouth disease (FMD) 1,326 yak and 2,531 cattle belonging to the Wakhi community in Big and Small Pamirs, and in upper and mid Wakhan Valley, Badakhshan Province, Afghanistan. Also it collected blood-samples from 284 sheep, 13 goats, 39 yak and 48 cattle in order to estimate in the laboratory their exposure level to brucellosis. The team completed also a livestock census survey in Wakhi settlements in Big Pamir, and initiated the first ever detection campaign of bovine tuberculosis in Wakhan Valley, using tuberculin skin test method on a sample of 128 cattle.

FMD mass vaccination campaign

Introduction

Foot-and-mouth disease (FMD) is an extremely contagious viral (family Picornaviridae) disease of domestic and wild cloven-hoofed animals. It is endemic in most of Asia (including the Middle East), Africa, and South America. There are seven immunologically distinct serotypes and over 60 subtypes of the FMD virus.

The disease is endemic in Afghanistan where it occurs as regular epizootics. It has a direct effect on food security as it drastically reduces milk production in cows, and also reduces their fertility rate and incapacitates breeding bulls and oxen. A new serotype (Asia 1) was identified in Afghanistan in March 2001 (S. Yingst / CVL–Kabul, pers.comm.), bringing the total of known serotypes to three for the country (A, O and Asia1). The virus is very stable at low temperatures and can survive in frozen tissues. It

may persist for days to weeks in organic matter under moist and cool temperatures. It is however inactivated on dry surfaces and by UV radiation (sunlight). Transmission primarily occurs by respiratory aerosols and direct or indirect contact with infected animals. Sheep and goats are occasionally considered maintenance hosts, and sometime present very mild signs. Cattle are generally the first species to manifest signs of FMD and are therefore considered 'indicators' of the presence of this disease. Recovered or vaccinated cattle exposed to diseased animals can be healthy carriers for 6 to 24 months; sheep can be carriers for 4 to 6 months. The disease also poses a threat to the rich fauna of wild mountain ungulates still present in Pamirs, such as the Marco Polo sheep (*Ovis ammon polii*), the Asiatic ibex (*Capra sibirica*) and the urial sheep (*Ovis orientalis*). The vaccination campaign intends to protect cattle and yak, and secure the dairy food resource which is crucial to local communities. Concomitantly it also aims to reduce the risk of clinically sick livestock transmitting the disease to wild ungulates.

Method

We purchased 4,000 doses of FMD vaccine from the Dutch Committee for Afghanistan, Kabul (the same vaccine that we purchased in 2009 and April 2010). We stored vaccine vials at WCS office in Kabul at a temperature of +1°C-+8°C, according to the manufacturer's recommendations. Vaccines in cool boxes with ice packs were then transported between Kabul and Feyzabad, the administrative center of Badakhshan Province, by an airplane of the US embassy airline, and a day later to Wakhan Valley by car. In Wakhan the team divided in three groups and vaccines were allocated to each group according to the number of vaccinations expected to be done in three different areas. The vaccination campaign in Small Pamir was done by Mr. Sarwar (a Wakhi paraveterinarian) using horses as pack animals to transport vaccines. In Wakhan Valley, between Nishkhawr and Abgarch villages, it was undertaken by Mohammad Gull (the second Wakhi paraveterinarian) and in Big Pamir (Plate 1) by Drs. Hafizullah "Noori", Ali Madad "Rajabi", and Mr. Jawid, a paraveterinarian who joined the mission on behalf of the Ministry of Agriculture in Feyzabad. Only healthy cattle and yak older than two

Plate 1: Dr. Ali Madad Rajabi injects a yak with foot-and-mouth disease vaccine, Frakhchikar camp, Shikargah Valley, Big Pamir, October 2010.

months were vaccinated with 3 ml of vaccine administered subcutaneously in the middle of neck. Before vaccinations, team members always met with the elders (head of shora) in every village and camp visited, and explained to them the program and the importance of doing vaccination, in turn they forwarded their agreement to the populace. Because vaccination targeted large-size, untied livestock species, the collaboration of local people was essential to capture, gather and restrain often uncooperative or semi-wild animals. In each village or camp animals were usually gathered communally in one large herd which was confined to barns and corrals.

Results and discussion

The three teams vaccinated 3,857 animals, comprising 1,326 yak and 2,531 cattle in Big and Small Pamirs and upper and mid Wakhan Valley between the villages of Sarhad-e Broghil and Pukuy (Appendices 1 & 2).

The participation of local communities in the mass vaccination campaign was deemed very satisfactory. This vaccination campaign followed three campaigns done in April 2009, September-October 2009 and April 2010. Interestingly for yak, we observed different levels of acceptance of the vaccination. In Big Pamir large numbers of yak could not be vaccinated because owners believed that vaccination combined to cold weather conditions could be detrimental to their animals. Fortunately part of these yak had already received a vaccination shot in April 2010. On the contrary in Small Pamir the majority of yak owners were very eager to have their animals vaccinated and did not allege that the combined effect of cold weather and vaccination reaction could be detrimental to the survival of their animals. Eventually in villages of Wakhan Valley the vast majority of people accepted enthusiastically the vaccination of their cattle. No deaths or injuries related to the capture and handling of livestock occurred during the vaccination campaign.

Tuberculin skin test in cattle in Wakhan District

Introduction

Bovine tuberculosis (or "TB") is a chronic bacterial disease of cattle that can affect occasionally other animal species including wild ungulates. It is caused by *Mycobacterium bovis* a species of the *Mycobacterium tuberculosis* complex. It is a significant zoonosis transmitted to humans via aerosols or unpasteurized milk. The disease tends to be very rare in human communities with generalized milk pasteurization practices. Between animals the disease is transmitted via close contacts or environmental contamination. It is crucial to evaluate the prevalence of the infection in cattle of inhabitants of Wakhan because non-pasteurized dairy products are consumed almost daily throughout life. Testing TB in cattle is the first investigation of its kind in the area. *Mycobacterium bovis* can be transmitted from domestic animals to wildlife and vice versa via close contact and environmental contamination.

Method

We used as reactive antigen a purified protein derivate of *Mycobacterium bovis* prepared from strain AN 5 (Bovituber PPD, Synbiotics Europe, France). Antigens were kept

refrigerated at +4 to +8 °C in cool boxes with icepacks. We started the work at Sarhad-e Broghil, then continued in Goz Khan and ended in Qila-e Panja. In each village we met with the head of shora, explained our program and then shoras proposed cattle for testing. On each animal we cut a patch of hair in the middle of a lateral side of the neck, measured the skin fold thickness, and injected 0.1 ml (2000 UCT) in the skin with a calibrated injector (Plate 2). After 72 hours we revisited the tested specimens and measured again the thickness of the skin fold at injection site (Plate 3). An increase of skin fold thickness by less than 2 mm was interpreted as a negative reaction, between 2 mm and 4 mm as a doubtful reaction, and by more than 4 mm as a positive reaction.

Results and discussion

We carried out tuberculin skin test on 128 adult cattle, 50 in Sarhad-e Broghil, 30 in Goz Khan and 48 in Qila-e Panja. The purpose of the test was to better understand the prevalence of bovine tuberculosis in cattle population in mid and upper Wakhan Valley, both areas supporting also population of Asiatic ibex and urial. The evaluation showed that 127 out of 128 tested cattle (99.2%) were negative to the tuberculin skin test, one cow (0.8%) in Qila-e Panja was doubtful (before injection the skin fold was 5.5 mm and after injection 8.1 mm, or a 2.6 mm increase) and no animal was positive. This preliminary study has found no positive animals and suggests that the prevalence of bovine tuberculosis in the investigated area is lower than 2.3% (95% Confidence Interval). In 2011 we hope to extend bovine tuberculosis testing to a larger sample size of cattle across Wakhan Valley. Detailed skin fold measurements of the 128 tested cattle are shown in Appendix 3.

Plate 2: The model of tuberculin skin test injector used to test cattle in Wakhan in October 2010, here shown without the cartridge.

Plate 3: Dr. Ali Madad Rajabi measures the thickness of the skin fold with a caliper, Dr. Hafizullah Noori records data and animal owners restrain the cow (note the small size of the one year old animal indicative of the extremely poor nutrition conditions prevailing in Wakhan), October 2010.

Blood-sampling for brucellosis testing

Introduction

In sheep and goats brucellosis is mainly caused by *Brucella melitensis*, a Gram negative coccobacillus which is a facultative intracellular pathogen. The closely related *Brucella abortus* is more frequent in cattle and yak. Infection in livestock can spill over into wild ruminants; *B. melitensis* infections have been reported in Alpine ibex (*Capra ibex*) in Italy and in chamois (*Rupricapra rupricapra*) in the French Alps as result of contacts with infected livestock. However, there is no evidence that these wild species served as reservoir hosts for domesticated sheep and goats. The predominant symptoms in naturally infected sheep and goats are abortions, stillbirths and the birth of weak offspring. In wild chamois, this organism has been linked to orchitis, polyarthritis, blindness and

neurological signs, but not abortion. *B. melitensis* is very contagious to humans and is transmitted from animals to humans by contact with the placenta, fetus, fetal fluids and vaginal discharges from infected animals and via consumption of unpasteurized dairy products.

In the present mission the WCS veterinary team collected blood samples from sheep, goats, cattle and yak in Big Pamir, and Wakhan Valley (between Sarhad-e Broghil and Pkuy villages) to investigate the prevalence of brucellosis. Samples were collected on animals gathered in corrals or barns, and sometimes in open field with the help of community members (Plate 4). For each animal we took 5-8 ml of blood in vacutainer vials (Terumo, USA) via jugular vein puncture. Blood samples were kept between 15-22ºC for 3-4 hours to allow for clotting. We extracted two to three ml of serum with a micropipette or plastic 'one-use' pipet after clotting and centrifugation for 5-10 minutes (Manual centrifuge, (Hettich, Germany) (Plate 5). Sera were transferred into labeled cryovials (date, location, access number) and stored in dry shippers in Big Pamir or directly in a liquid nitrogen container (at -196°C) in Wakhan Valley.

All samples were eventually transferred in the liquid nitrogen container and shipped by car to WCS office in Kabul where they were stored in a freezer (-20°C) pending analyses.

Results and discussion

We took 358 blood samples from 286 sheep, 11 goats, 48 cattle and 13 yak in different villages of Wakhan Valley between Sarhad-e Broghil and Qila-e Panja (Appendix 4). In Big Pamir due to coldness and relatively poor weather conditions people were not willing to have their livestock sampled, fearing that removing blood from their animals could harm them and jeopardize their survival in winter. Consequently we only sampled 26 yak in Pamirs. On the contrary, in villages communities agreed to have their animals bled because we explained them the importance of detecting brucellosis and the risk that the disease could pose to them and their animals. We also sensitize the population to the fact that brucellosis was mainly transmitted through the consumption of raw milk and unpasteurized dairy products. Sera samples will be tested in Kabul in winter 2010-2011 with a plate agglutination test. All positive animals will be retested with ELISA or fixation complement test either at Kabul Central Veterinary Diagnostic and Research Laboratory or in a reference laboratory abroad.

Plate 4: Dr. Hafizullah Noori collects a blood sample from the jugular vein of an adult yak. Mr. Sayed Noorudin, the owner of the animal, restrains the yak, Sargaz Valley, Big Pamir, October 2010.

Livestock census in Big Pamir

Introduction

On the 27th of September 2010 we departed from Goz Khan Village toward Big Pamir with Mr. Inayatullah (cook), Mr. Jumagul (assistant) and Mr. Javid, a veterinary auxiliary from the Agriculture department in Feyzabad. After 4 days of walk we reached Jabarkhan settlement in Jelmasirt grazing area and started counting livestock. We counted livestock with and without hand counters either on their return to night corrals (Plate 6), or in case people were reluctant to let us count their animals in settlements, from far away with binoculars when they were grazing at altitude pastures during the day. The census of

Plate 5: Dr. Ali Madad Rajabi processes blood samples, Dr. Hafizullah Noori labels and databases samples and Mr. Jumagul, a Wakhi assistant, learns about the serum extraction procedure, Kund-u Thur settlement, Big Pamir, October 2010.

livestock was carried out in all Wakhi settlements in Big Pamir in order to better understand the abundance and composition of livestock in the area. Results of counts made during the present survey will be compared with those done in summer 2010 in order to retrieve estimations of summer survival rates.

Results and discussion

Results of livestock counts are detailed in Appendix 5. Compared to June-July 2010, they were no longer cattle in Big Pamir, because they had already been moved to the valley to be used for cereal harvesting activities, also at a time natural pastures around villages offer good forages. Compared to summer counts the number of livestock has, in general,

Plate 6: Dr. Hafizullah Noori counts sheep and goats in Khoshabad pasture, Big Pamir, Afghanistan, October 2010.

decreased as a result of livestock being battered to traders for food (flour, rice) and commodities needed for winter. In Boqbon and Ganj-e Khatoun settlements the number of sheep and goats has increased compared to summer 2010. This increase is explained by the fact that these two settlements have received additional animals between our two counts. In such circumstances people tending animals of others in Pamirs retain the wool and dairy products and return the fattened animals to their owners in autumn.

This year very little mortality occurred in livestock during summer owing to the excellent forage conditions (according to shepherds). Although several kids and lambs have died of diarrhea, they were far less in numbers than typically in summer in Pamirs. Livestock were in very good body conditions during the census, incomparably better than 3 years ago, in summer 2007.

Conclusion

We have achieved successfully the second mass-vaccination campaign for foot-and-mouth disease in Wakhan. Compared to 2009, a greater autonomy was given to the two paravets, who vaccinated almost 60% of the animals (30% in 2009). We hope to extend their participation to almost 100% by autumn 2011. Like in spring 2010, we will carry out a questionnaire investigation in spring 2011 to evaluate the effectiveness of the vaccination, comparing cattle vaccinated in upper and mid Wakhan Valley with those not vaccinated in lower Wakhan Valley. The future is evidently to progressively turn over all prophylactic activities to local paravets with financial support directly from the community. Yet this will take time for two reasons. One is that Wakhis were until our 2009 FMD campaign absolutely not convinced that vaccination was something reasonably good for their animals. The second reason is that cash economy is still relatively undeveloped in the area, meaning that paravets who are often paid in nature have trouble resupplying in drug retailers. FMD vaccination is relatively expensive (2.5$/cattle/year for a double shot), yet given that Wakhi and Kyrgyz survival depends crucially on pastoral incomes (100% for Kyrgyz) it justifies to our opinion a higher level of investment in livestock health. The communities are in the process of understanding that. Paravets also offer other vaccinations to their communities but for the reasons mentioned above they have not been very successful so far. The efficiency of FMD vaccination will hopefully push local communities at investing in the future in mass vaccination campaigns against this disease. We need to pursue these efforts, an example of human development activity conflicting only marginally with wildlife. We intend to measure for another two years whether this initiative is sustainable from an ecosystem conservation point of view by monitoring vaccination success and livestock productivity.

Tuberculosis testing is also of great importance to Wakhi livelihoods, their health and to evaluate the risk of transmission of this disease to wildlife. First results support that this disease might not be very common in Wakhan, further testing in 2011 on larger sample sizes should provide more robust indications on the disease prevalence.

Laboratory analysis will provide indications on the exposure level of livestock to brucellosis. Regardless of these results we will collect in 2011 at least 300 additional blood-samples on livestock in lower Wakhan Valley, in order to complete the regional detection effort for this disease.

Quantifying livestock in Big Pamir is used as a proxy to evaluate the economical wealth of mid and upper Wakhan communities. It also allows predicting the grazing level, the extent of competition with non-domestic grazers and the value of an array of distal conservation activities (vaccinations, range management…). This activity must be continued as long as possible and ultimately supervised by communities.

Acknowledgments

This mission would not have been possible without the financial support of the USAID, from the American People. We thank all WCS staff in Kabul for logistical support throughout the missions. Wakhi communities provided invaluable help during all activities. Special thanks go to Mr. Sarwar and Mr. Mohammed Gull the Wakhi paravets who helped us tremendously during the mission, and endorsed efficiently part of the FMD vaccination duties. Also we express our gratitude to Mr. Inayatullah, our cook, to Mr. Jumagul, our field assistant, both of them helped us through the mission in Big Pamir and in Wakhan Valley. Eventually we thank Mr. Javid, paravet from the agriculture department in Feyzabad, who accompanied us throughout the mission.

Appendix 1

Location, date, gender, age and number of yak vaccinated against foot-and-mouth disease in Wakhan District, in September and October 2010.

Villages & camps/name	Date	Adult male	Adult female	Young unsexed	Total
Jabarkhan	01-Oct-2010	5	6	4	15
Boqbon	02-Oct-2010	3	0	0	3
Manjalak	04-Oct-2010	30	10	5	45
Vagdboy	06-Oct-2010	50	60	14	124
Khoshabad	06-Oct-2010	35	30	15	80
Sargaz valley	06-Oct-2010	7	10	7	24
Molongdon	08-Oct-2010	35	25	17	77
Kundodor	08-Oct-2010	20	14	10	44
Darabig	10-Oct-2010	15	20	13	48
Chashmayeen	09-Oct-2010	12	8	8	28
Frakhchkar (qabalgar)	10-Oct-2010	38	18	10	66
Purson	11-Oct-2010	10	12	6	28
Wuzod	10-Oct-2010	10	0	0	10
Sast	10-Oct-2010	5	0	0	5
Wuzod valley	12-Oct-2010	12	13	5	30
Abgarch	15-Oct-2010	1	4	1	6
Goz khan	24-Oct-2010	0	2	0	2
Wsirm	01-Oct-2010	18	25	15	58
Sangnawishta	02-Oct-2010	22	30	8	60
Madkhof	03-Oct-2010	27	39	18	84
Gharin	04-Oct-2010	48	56	27	131
Gharamday	05-Oct-2010	25	34	14	73
Gharin	06-Oct-2010	10	19	9	38
Saq Big comp	28-Sep-2010	10	15	5	30
Ran	29-Sep-2010	32	68	20	120
Fabig	30-Sep-2010	20	30	14	64
Karkat	18-Oct-2010	0	3	2	5
Sekonj	18-Oct-2010	0	0	8	8
Nirs Bala	18-Oct-2010	10	3	2	15
Qalay e Panja	29-Oct-2010	0	5	0	5
Grand Total	510	559		257	1326

Appendix 2

Location, date, gender, age and number of cattle vaccinated in Wakhan Valley of Wakhan District, in September and October 2010.

Villages & camps/Name	Date	Adult Male	Adult Female	Young unsexed	Total
Sarhad e broghil	16-Oct-2010	11	35	15	61
Qalay-e Panja	28-Oct-2010	85	100	69	254
Sekonj	18-Oct-2010	10	20	8	38
Sarkand	29-Oct-2010	12	30	10	52
Peakot	30-Oct-2010	16	40	20	76
Pak	31-Oct-2010	60	30	20	110
Pukuy	31-Oct-2010	22	40	20	82
Baiqara	08-Oct-2010	62	94	47	203
Sarhad e broghil	12-Oct-2010	4	12	4	20
Sarhad e broghil	13-Oct-2010	25	43	20	88
Sarhad e broghil	15-Oct-2010	129	144	72	345
Chilkand	16-Oct-2010	20	50	18	88
Potokh	17-Oct-2010	43	60	18	121
Karkat	18-Oct-2010	0	6	0	6
Nirs Bala	18-Oct-2010	2	5	4	11
Nirs Bala	19-Oct-2010	5	5	3	13
Nirs Payen	19-Oct-2010	2	1	0	3
Kand Khan	27-Sep-2010	11	15	4	30
Dehghulaman	28-Sep-2010	30	25	10	65
Archa	29-Sep-2010	10	10	5	25
Nirs Payen	29-Sep-2010	15	5	6	26
Nishkhawr	01-Oct-2010	45	80	20	145
Nishkhawr	01-Oct-2010	6	4	4	14
Rorong	02-Oct-2010	10	10	5	25
Rorong	02-Oct-2010	20	15	5	40
Rorong	03-Oct-2010	10	20	10	40
Kret	04-Oct-2010	5	3	2	10
Shelk	05-Oct-2010	5	9	1	15
Kipkot	06-Oct-2010	5	10	5	20
Kipkot	06-Oct-2010	5	7	3	15
Sargaz	07-Oct-2010	5	7	2	14
Qala-e-Woust	07-Oct-2010	10	12	8	30
Sast	08-Oct-2010	20	25	10	55
Sast	09-Oct-2010	25	20	5	50
Wuzod	10-Oct-2010	30	30	20	80
Abgarch	10-Oct-2010	20	30	10	60
Abgarch	12-Oct-2010	40	10	20	70
Wuzod	13-Oct-2010	5	1	4	10
Abgarch	14-Oct-2010	14	8	8	30
Goz Khan	24-Oct-2010	11	13	8	32
Shelk	21-Oct-2010	7	8	2	17
Goz Khan	13-Oct-2010	10	20	12	42
Grand Total		882	2112	537	2531

Appendix 3

Results of tuberculin skin tests carried out by the WCS veterinary team in the villages of Sarhad-e Broghil, Goz Khan and Qila-e Panja in Wakhan District, Badakhshan Province, Afghanistan, October 2010.

	Result of intradermal tuberculin test for cattle in Wakhan District									
#	**Species**	**Village**	**Sex**	**Age (year)**	**Injection date**	**Injection time**	**Skin fold prior (mm)**	**Skin fold after 72 h (mm)**	**Difference (mm)**	**Results**
1	Cattle	Sarhad e broghil	F	10	15-Oct-10	09:45	5.5	5.5	0	neg
2	Cattle	Sarhad e broghil	F	8	15-Oct-10	09:48	5.3	5.3	0	neg
3	Cattle	Sarhad e broghil	F	6	15-Oct-10	09:53	4.8	5	0.2	neg
4	Cattle	Sarhad e broghil	M	3	15-Oct-10	09:58	5.8	6	0.2	neg
5	Cattle	Sarhad e broghil	M	2	15-Oct-10	10:02	6	6.3	0.3	neg
6	Cattle	Sarhad e broghil	M	2	15-Oct-10	10:06	5.9	5.9	0	neg
7	Cattle	Sarhad e broghil	F	1	15-Oct-10	10:09	5.8	6	0.2	neg
8	Cattle	Sarhad e broghil	F	2.5	15-Oct-10	10:12	7	7.2	0.2	neg
9	Cattle	Sarhad e broghil	F	12	15-Oct-10	10:18	4.7	5	0.3	neg
10	Cattle	Sarhad e broghil	F	9	15-Oct-10	10:21	5.6	5.6	0	neg
11	Cattle	Sarhad e broghil	M	1	15-Oct-10	10:24	5.4	5.5	0.1	neg
12	Cattle	Sarhad e broghil	F	10	15-Oct-10	10:27	7	7	0	neg
13	Cattle	Sarhad e broghil	M	2	15-Oct-10	10:31	6.3	6.3	0	neg
14	Cattle	Sarhad e broghil	M	3	15-Oct-10	10:35	6.6	6.5	-0.1	neg
15	Cattle	Sarhad e broghil	F	9	15-Oct-10	10:40	7	7	0	neg
16	Cattle	Sarhad e broghil	F	8	15-Oct-10	10:43	5.5	5.5	0	neg
17	Cattle	Sarhad e broghil	F	5	15-Oct-10	10:49	6.6	6.5	-0.1	neg
18	Cattle	Sarhad e broghil	F	2	15-Oct-10	10:53	5.7	5.7	0	neg
19	Cattle	Sarhad e broghil	F	8	15-Oct-10	10:55	6	6	0	neg
20	Cattle	Sarhad e broghil	F	2	15-Oct-10	10:57	7.1	7	-0.1	neg
21	Cattle	Sarhad e broghil	M	2	15-Oct-10	10:59	6.8	7	0.2	neg
22	Cattle	Sarhad e broghil	F	2	15-Oct-10	11:01	7	7	0	neg
23	Cattle	Sarhad e broghil	F	12	15-Oct-10	11:05	5	5	0	neg
24	Cattle	Sarhad e broghil	F	12	15-Oct-10	13:17	5.5	5.5	0	neg
25	Cattle	Sarhad e broghil	F	5	15-Oct-10	13:21	7.5	7.5	0	neg
26	Cattle	Sarhad e broghil	F	8	15-Oct-10	13:24	6.3	6.3	0	neg
27	Cattle	Sarhad e broghil	F	1	15-Oct-10	13:35	7.1	7	-0.1	neg
28	Cattle	Sarhad e broghil	M	4	15-Oct-10	13:42	6.8	7	0.2	neg
29	Cattle	Sarhad e broghil	F	4	15-Oct-10	13:45	6	6	0	neg
30	Cattle	Sarhad e broghil	F	2	15-Oct-10	13:47	6.9	7	0.1	neg
31	Cattle	Sarhad e broghil	F	2	15-Oct-10	14:01	5.5	5.5	0	neg
32	Cattle	Sarhad e broghil	F	2	15-Oct-10	14:07	6.1	6.1	0	neg
33	Cattle	Sarhad e broghil	F	1.5	15-Oct-10	14:09	5.8	5.8	0	neg
34	Cattle	Sarhad e broghil	M	1.5	15-Oct-10	14:12	4.7	4.7	0	neg
35	Cattle	Sarhad e broghil	M	4	15-Oct-10	14:15	15.9	16	0.1	neg
36	Cattle	Sarhad e broghil	F	5	15-Oct-10	14:21	15.9	16	0.1	neg
37	Cattle	Sarhad e broghil	F	4	15-Oct-10	14:24	7.3	7.3	0	neg
38	Cattle	Sarhad e broghil	M	4	15-Oct-10	14:27	7	7	0	neg
39	Cattle	Sarhad e broghil	M	3	15-Oct-10	14:31	6.2	6.2	0	neg
40	Cattle	Sarhad e broghil	F	6	15-Oct-10	14:36	6	6	0	neg
41	Cattle	Sarhad e broghil	F	6	15-Oct-10	14:39	5.7	5.7	0	neg
42	Cattle	Sarhad e broghil	F	5	15-Oct-10	14:42	5.9	6	0.1	neg

43	Cattle	Sarhad e broghil	F	3	15-Oct-10	14:44	6.1	6.1	0	neg
44	Cattle	Sarhad e broghil	F	7	15-Oct-10	14:46	15.9	15.9	0	neg
45	Cattle	Sarhad e broghil	F	8	15-Oct-10	14:49	7	7	0	neg
46	Cattle	Sarhad e broghil	F	1.5	15-Oct-10	14:52	5.9	5.9	0	neg
47	Cattle	Sarhad e broghil	F	15	15-Oct-10	14:54	6	6	0	neg
48	Cattle	Sarhad e broghil	M	1.5	15-Oct-10	14:56	7.3	7.3	0	neg
49	Cattle	Sarhad e broghil	M	5	15-Oct-10	15:25	6.5	6.5	0	neg
50	Cattle	Sarhad e broghil	F	3	15-Oct-10	15:30	4.9	5	0.1	neg
51	Cattle	Goz Khan	F	2	23-Oct-10	10:44	5.9	5.9	0	neg
52	Cattle	Goz Khan	M	6	23-Oct-10	10:46	6.3	6.5	0.2	neg
53	Cattle	Goz Khan	F	2	23-Oct-10	10:48	6.8	6.9	0.1	neg
54	Cattle	Goz Khan	M	3	23-Oct-10	10:50	6.8	6.8	0	neg
55	Cattle	Goz Khan	F	3	23-Oct-10	10:52	5.6	5.6	0	neg
56	Cattle	Goz Khan	M	3	23-Oct-10	10:54	5.4	5.3	-0.1	neg
57	Cattle	Goz Khan	F	4	23-Oct-10	10:57	7	7	0	neg
58	Cattle	Goz Khan	M	8	23-Oct-10	11:00	7	7	0	neg
59	Cattle	Goz Khan	F	4	23-Oct-10	11:02	6.7	6.9	0.2	neg
60	Cattle	Goz Khan	F	2	23-Oct-10	11:05	6.9	6.8	-0.1	neg
61	Cattle	Goz Khan	M	2	23-Oct-10	11:07	5.4	5.4	0	neg
62	Cattle	Goz Khan	M	4	23-Oct-10	11:09	6.9	7	0.1	neg
63	Cattle	Goz Khan	F	4	23-Oct-10	11:11	6.9	6.8	-0.1	neg
64	Cattle	Goz Khan	F	2	23-Oct-10	11:13	5.6	5.8	0.2	neg
65	Cattle	Goz Khan	F	2	23-Oct-10	11:15	5.6	5.6	0	neg
66	Cattle	Goz Khan	M	3	23-Oct-10	11:17	6	6.2	0.2	neg
67	Cattle	Goz Khan	M	3	23-Oct-10	11:20	7	7.3	0.3	neg
68	Cattle	Goz Khan	F	6	23-Oct-10	12:08	6	6	0	neg
69	Cattle	Goz Khan	F	7	23-Oct-10	12:10	6.1	6.4	0.3	neg
70	Cattle	Goz Khan	M	2	23-Oct-10	12:15	6.4	6.5	0.1	neg
71	Cattle	Goz Khan	M	2	23-Oct-10	12:18	7	7	0	neg
72	Cattle	Goz Khan	F	6	23-Oct-10	12:20	6.6	6.8	0.2	neg
73	Cattle	Goz Khan	F	3	23-Oct-10	12:23	9.8	9.7	-0.1	neg
74	Cattle	Goz Khan	F	10	23-Oct-10	12:25	5.4	5.6	0.2	neg
75	Cattle	Goz Khan	F	2	23-Oct-10	12:28	6.4	6.3	-0.1	neg
76	Cattle	Goz Khan	F	2	23-Oct-10	12:30	7.4	7.4	0	neg
77	Cattle	Goz Khan	F	7	23-Oct-10	12:32	5.5	5.6	0.1	neg
78	Cattle	Goz Khan	F	2	23-Oct-10	12:35	6.8	6.7	-0.1	neg
79	Cattle	Goz Khan	M	2	23-Oct-10	12:37	7.5	7.6	0.1	neg
80	Cattle	Goz Khan	F	3	23-Oct-10	12:40	6	6	0	neg
81	Cattle	Qila-e Panja	M	2	28-Oct-10	09:12	5	5	0	neg
82	Cattle	Qila-e Panja	F	4	28-Oct-10	09:14	6.8	8.3	1.5	neg
83	Cattle	Qila-e Panja	F	5	28-Oct-10	09:16	6.3	6.3	0	neg
84	Cattle	Qila-e Panja	M	3	28-Oct-10	09:20	6.6	6.6	0	neg
85	Cattle	Qila-e Panja	F	5	28-Oct-10	09:22	5.8	5.8	0	neg
86	Cattle	Qila-e Panja	F	4	28-Oct-10	09:25	4.8	4.8	0	neg
87	Cattle	Qila-e Panja	F	6	28-Oct-10	09:27	5.2	5.2	0	neg
88	Cattle	Qila-e Panja	M	1	28-Oct-10	09:30	5.7	5.7	0	neg
89	Cattle	Qila-e Panja	F	5	28-Oct-10	09:32	6.1	6.1	0	neg
90	Cattle	Qila-e Panja	F	5	28-Oct-10	09:34	5.1	5.1	0	neg
91	Cattle	Qila-e Panja	F	4	28-Oct-10	09:36	5.7	5.7	0	neg
92	Cattle	Qila-e Panja	F	4	28-Oct-10	09:40	5.7	5.7	0	neg
93	Cattle	Qila-e Panja	F	5	28-Oct-10	09:42	5.7	5.7	0	neg
94	Cattle	Qila-e Panja	M	1	28-Oct-10	09:44	5.8	5.8	0	neg
95	Cattle	Qila-e Panja	M	10	28-Oct-10	10:11	6.2	6.2	0	neg
96	Cattle	Qila-e Panja	M	6	28-Oct-10	10:13	7.1	7.1	0	neg
97	Cattle	Qila-e Panja	F	2	28-Oct-10	10:15	7	7	0	neg

98	Cattle	Qila-e Panja	M	2	28-Oct-10	10:20	6.5	6.5	0	neg
99	Cattle	Qila-e Panja	F	3	28-Oct-10	10:24	5.9	5.9	0	neg
100	Cattle	Qila-e Panja	F	2	28-Oct-10	10:45	6.5	6.5	0	neg
101	Cattle	Qila-e Panja	F	3	28-Oct-10	10:46	7	7	0	neg
102	Cattle	Qila-e Panja	F	2	28-Oct-10	10:48	8	8	0	neg
103	Cattle	Qila-e Panja	M	2	28-Oct-10	10:50	6.2	6.2	0	neg
104	Cattle	Qila-e Panja	F	6	28-Oct-10	10:52	6.7	6.7	0	neg
105	Cattle	Qila-e Panja	F	6	28-Oct-10	10:55	6.5	6.5	0	neg
106	Cattle	Qila-e Panja	F	4	28-Oct-10	12:26	6	6	0	neg
107	Cattle	Qila-e Panja	F	2	28-Oct-10	12:28	7.3	7.3	0	neg
108	Cattle	Qila-e Panja	M	4	28-Oct-10	12:32	10.1	10.1	0	neg
109	Cattle	Qila-e Panja	M	7	28-Oct-10	12:36	9	9	0	neg
110	Cattle	Qila-e Panja	M	3	28-Oct-10	12:37	10	10	0	neg
111	Cattle	Qila-e Panja	F	5	28-Oct-10	12:39	6.3	6.3	0	neg
112	Cattle	Qila-e Panja	M	8	28-Oct-10	12:42	5.5	5.5	0	neg
113	Cattle	Qila-e Panja	M	2	28-Oct-10	12:45	8.2	8.2	0	neg
114	Cattle	Qila-e Panja	F	4	28-Oct-10	12:46	5	5	0	neg
115	Cattle	Qila-e Panja	F	2	28-Oct-10	12:48	6.8	6.8	0	neg
116	Cattle	Qila-e Panja	F	3	28-Oct-10	12:50	5.5	8.1	2.6	doubt
117	Cattle	Qila-e Panja	F	4	28-Oct-10	12:53	5	5	0	neg
118	Cattle	Qila-e Panja	F	1.5	28-Oct-10	12:55	5.5	5.5	0	neg
119	Cattle	Qila-e Panja	M	2	28-Oct-10	12:57	5	5	0	neg
120	Cattle	Qila-e Panja	F	5	28-Oct-10	13:00	5	5.2	0.2	neg
121	Cattle	Qila-e Panja	M	4	28-Oct-10	13:28	7	7	0	neg
122	Cattle	Qila-e Panja	F	5	28-Oct-10	13:33	7.8	7.8	0	neg
123	Cattle	Qila-e Panja	M	6	28-Oct-10	13:35	8.5	8.5	0	neg
124	Cattle	Qila-e Panja	M	5	28-Oct-10	13:38	6.5	6.5	0	neg
125	Cattle	Qila-e Panja	F	4	28-Oct-10	13:40	8.5	8.5	0	neg
126	Cattle	Qila-e Panja	F	6	28-Oct-10	13:44	5.2	5.2	0	neg
127	Cattle	Qila-e Panja	F	5	28-Oct-10	13:45	5.5	5.5	0	neg
128	Cattle	Qila-e Panja	M	4	28-Oct-10	13:47	5.6	5.6	0	neg

Appendix 4

Location, date, species and number per gender of livestock blood-sampled in Wakhan in October 2010.

Village/settlement	Date	Species	Female	Male	Total
Vogdboy	06-Oct-10	yak	4	1	5
Khoshabad	06-Oct-10	yak	0	2	2
Sargaz Valley	06-Oct-10	yak	8	3	11
Darabig	10-Oct-10	yak	7	1	8
Goz Khan	13-Oct-10	cattle	6	0	6
Sarhad e broghil	16-Oct-10	cattle	18	0	18
Potokh	17-Oct-10	cattle	5	0	5
Sekonj	18-Oct-10	yak	5	2	7
Sekonj	18-Oct-10	sheep	3	0	3
Nirs Bala	18-Oct-10	sheep	4	1	5
Shoshp	19-Oct-10	sheep	14	1	15
Nirs Payen	19-Oct-10	sheep	10	0	10
Archa	19-Oct-10	sheep	13	16	29
Nishkhawr	19-Oct-10	sheep	8	5	13
Rachon	19-Oct-10	sheep	20	2	22
Kharich	20-Oct-10	sheep	5	0	5
Kand Khan	20-Oct-10	sheep	8	0	8
Rorong	20-Oct-10	sheep	19	0	19
Dehghulaman	20-Oct-10	sheep	19	3	22
Kret	21-Oct-10	sheep	11	0	11
Kozget	21-Oct-10	sheep	2	9	11
Shelk	21-Oct-10	yak	1	0	1
Shelk	21-Oct-10	sheep	0	3	3
Wuzod	22-Oct-10	sheep	2	2	4
Sast	22-Oct-10	sheep	61	5	66
Sast	22-Oct-10	goat	11	0	11
Abgarch	24-Oct-10	sheep	15	0	15
Abgarch	24-Oct-10	yak	4	1	5
Abgarch	24-Oct-10	cattle	6	1	7
Qalay-e Panja	29-Oct-10	cattle	10	2	12
Qalay-e Panja	30-Oct-10	sheep	20	5	25
Grand total					384

Appendix 5

Number of livestock in different Wakhi settlements of Big Pamir counted by WCS veterinary team during 1 - 11 October 2010.

Camp/Name	N/sheep	N/lamb	N/goat	N/kid	N/yak	N/small yak	N/cow	N/calf	Date
Kundodor	320	60	215	90	40	10	0	0	07-Oct-10
Molongdon	280	140	80	58	68	15	0	0	08-Oct-10
Sangtich	320	90	166	50	110	14	0	0	06-Oct-10
Khoshabad	280	130	115	65	65	15	0	0	06-Oct-10
Darabig	255	200	95	50	40	8	0	0	10-Oct-10
Ganjkhaton	390	80	200	85	19	5	0	0	04-Oct-10
Nakhshirshit	396	155	200	90	45	14	0	0	04-Oct-10
Manjalak	425	150	165	77	60	12	0	0	03-Oct-10
Jabarkhan	650	120	140	82	68	15	0	0	01-Oct-10
Boqbon	310	95	140	62	15	5	0	0	02-Oct-10
Bolaq	180	102	70	25	10	5	0	0	02-Oct-10
Lopghal	397	290	150	90	42	5	0	0	02-Oct-10
Senin	244	101	128	78	23	5	0	0	11-Oct-10
Qabalgar	400	180	200	120	80	10	0	0	09-Oct-10
Chashmayen	200	88	65	0	25	3	0	0	06-Oct-10
Sargaz valley	180	60	91	52	49	5	0	0	10-Oct-10
Total	**5227**		**2041**	**2220**	**107**	**759**	**146**	**0**	**0**