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Food Resource Evaluation for Snow Leopards, China

Sanjiangyuan National Nature Reserve, China

Dates in the field: July 2013 – December 2014

Peking University, Shanshui Conservation Centre

Overall aim: To sustain long-lasting snow leopard populations with abundant prey populations.

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September 18st, 2015

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Project Partners & Collaborators
Please list and acknowledge all of the project's collaborators, including individuals, organisations and government departments. Please provide a brief description of how each was involved in the project.
We want to thank Professor Zhi Lu from Peking University (Project leader Lingyun Xiao's PhD supervisor) and Professor Charudutt Mishra from Snow Leopard Trust for providing us scientific guidance and supervision.
We also want to thank Peking University for providing all field equipment, Shanshui Conservation centre for providing field vehicles and local support and field assistants, Panthera and Snow Leopard Trust for providing us funds and all the camera traps.
We also want to thank local government of Yushu Profecture and Zaduo County and all the local township governments and village leaders for providing support and trust for us to collect scientific data and undertake conservation work there.

Section 1:

Summary (max 200 words) *the summary should be written concisely, summarising the entire report with a statement on each of the following: project aim, objectives, key results, main impacts. If project or progress was different to that expected, brief details should be given here.*

Maintaining a healthy natuaral prey population is critical for large carnivore conservation. Blue sheep is the main prey of the endangered snow leopard in Sanjiangyuan National Nature Reserve of China. However no information on their population status is available now. This study aims to assess blue sheep population status and the impact of resource limitation on it, at the meantime start community-based blue sheep monitoring projects to involve local people into snow leopard conservation. Our results show that blue sheep density is largely limited by livestock density at the landscape scale. At home range scale habitat quality became more important compared with livestock abundance. Blue sheep birth rate and recruitment rate were mainly determined by its own density and winter weather, which also indicates resource limitation. This result will be used in future management plan of snow leopards and suitable actions could be taken targeting the threats identified. We've built blue sheep monitoring team in one village and snow leopard monitoring team in two villages. The news was spread using different communication tools such as TV, newspaper, internet and conferences, which not only raised public awareness of snow leopard conservation, but also effectively encouraged both local governments and villagers. They start to actively participate

into snow leopard conservation for instance clearing traps, building a snow leopard square and developing a snow leopard management plan.

Introduction (max 500 words)

Keep the introduction short and include a brief section on each of the following:

- *The conservation value of the project work*
- *The conservation problem and issues addressed*
- *Background to the project site and its conservation significance*
- *Identify the key partners and their role*
- *Include a map of the area*

The snow leopard is an endangered species with 60% of its habitat in China, including the vast Tibetan Plateau. Sanjiangyuan Area locates in the core area of The Tibetan Plateau. It's the reserve that contains the largest and most continuous snow leopard habitat, which makes it the strong hold for snow leopard conservation. The status of snow leopards' wild prey, blue sheep is of major concern for the species survival. From the 1960s massive hunting on wild ungulates has pushed blue sheep to the verge of local extinction in many villages. Over-grazing by livestock and climatic factors also caused grassland degradation in some parts of the plateau, which made the living condition of wild ungulates even more difficult. Wildlife hunting was mostly stopped after gun-control laws implemented in 2002. Livestock numbers have also dropped from the peak in early 1980s due to livestock control policy combined with snow storms. Livestock however still dominate the rangeland in most places and much of the grassland had been degrading over the Plateau. Since 2005, the central government of China initiated grassland conservation programs and has invested hundreds of millions of Yuan throughout Sanjiangyuan Area. However the effect remains unclear. This project aims to assess blue sheep population status and the impact of livestock husbandry on it. Community-based blue sheep monitoring projects will also be started to involve local people into snow leopard conservation. The results will be applicable to managing livestock in the way that also allows snow leopard survival. In this project Peking University provided us field equipment. Shanshui Conservation centre provided us field vehicles, local relationship and field assistants, Panthera and Snow Leopard Trust provided us funds and all the camera traps. The local government of Yushu Prefecture and Zaduo County, the local township governments and village leaders provided us support and trust to collect scientific data and undertake conservation work there.

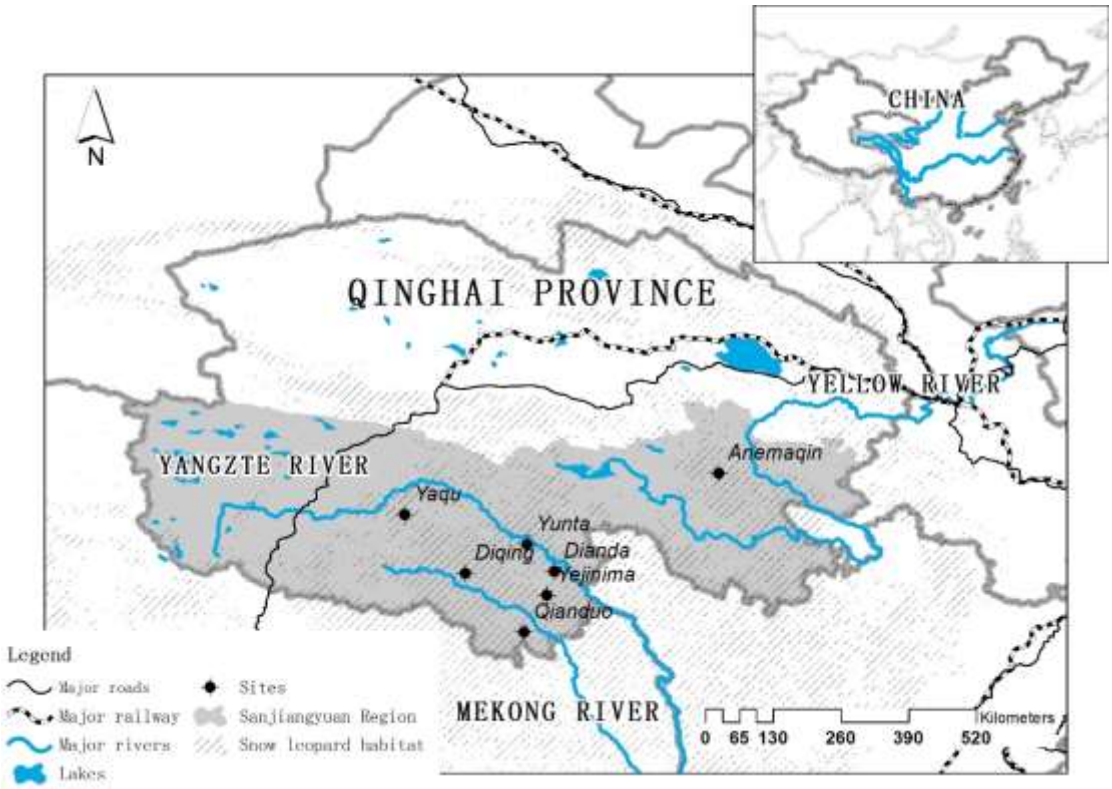

Figure 1. Map of Sanjiangyuan Area (in grey). Seven sites along a gradient of livestock densities within snow leopard potential habitat (dashed line) are selected to study the impact of livestock husbandry on blue sheep populations, in which Yunta and Diqing village were selected to build local community-based monitoring teams.

Project members

List the project members, giving brief details of their relevant qualifications, experience, current occupation and employer, and their main roles in the project. Where relevant give an indication of the age group.

Lingyun Xiao

Previous education experience: 2010.7. MSc, Ecology and Conservation, Uppsala University, Sweden. 2008.7. BSc, Biology, Fudan University, China.

Relevant skills and experience you bring to the project: Design, collection, and statistical analysis of scientific data for ecological research and management. Application of Geographic Information Systems (GIS) technology in wildlife habitat modeling. Data management and analysis skills with the following software: Access, Excel, Camera Base, CANOCO, CAPTURE, DISTANCE, MaxEnt, SYSTAT, MINITAB, and Program R.

Current Job Title: PhD candidate

Team Role: Team leader, ecologist, data analysis.

Dorshuggya

Previous education experience: 2011.7. High school diploma, Jigme Gyaltsen Welfare School. China

Relevant skills and experience you bring to the project: Tibetan language advantage. One-year experience in community-based conservation project and field experience in Sanjiangyuan.

Current Job Title: Running his own hostel and restaurant.

Team Role: Field assistant, interpreter before he left Shanshui in 2014

Xiang Zhao

Previous education experience: 2011.7. BSc. Environmental Science. Sichuan Normal University, China

Current Job Title: Regional Coordinator of Shanshui Conservation Centre

Team Role: Conservation work management, government relationship maintain

Relevant skills and experience you bring to the project: Several years volunteer experience in different conservation projects. 3-year-experience in community-based conservation project in villages of Sichuan and Qinghai Province.

Dawachangcze

Previous education experience: N.A.

Relevant skills and experience you bring to the project: 3 years of field work and house-to house interview experience in Sanjiangyuan.

Current Job Title: Program Assistant of Shanshui Conservation Centre

Team Role: Field assistant, interpreter after Dorshuggya left.

Sonamsco

Previous education experience: 2013.7. MSc. Wildlife management. Forestry University of Northeast China

Relevant skills and experience you bring to the project: 2 years of field work experience, data management and analysis skills in Microsoft Access, Excel and Camera Base.

Current Job Title: Program Officer of Shanshui Conservation Centre

Team Role: Data management, community-based monitoring maintain after she joined us in 2014.

Section 2:

Aim and objectives (max 200 words)

Provide a statement of the main aim and underlying objectives of the project as described in initial project outline or explain any changes or adaptations to the original statement.

Main aim: Evaluate population status of blue sheep, the main food resource for snow leopards, and the influence of livetock on blue sheep populations. At the meantime set up a blue sheep monitoring program undertaken by local herders.
Objectives:

1. Evaluate population status of both blue sheep and livestock at 6 selected sites with a gradient of livestock density and similar grassland biomass.

   Changes: 6 selected sites changed into 7.

2. Examine whether the grassland resource reached a limitation to both blue sheep and livestock populations based on population parameters measurement.

   Changes: Livestock population parameters are based on interview data. However this part has been considered unreliable since herders gave quite different answers of new-born number and adult female number, due to different understanding of the definition "adult females".

3. Assess the impact of livestock on blue sheep population parameters.

   Changes: Not only impact on population parameters, but also impact on blue sheep density were estimated.

4. Set up community-based monitoring projects for blue sheep in two villages.
   Changes: Herders show much higher interest in snow leopard monitoring. So we undertake blue sheep monitoring in one village and snow leopard monitoring (camera-trap based) in two villages (including the same one with blue sheep monitoring). If chance, we will try to develop blue sheep monitoring in the other village too.

Changes to original project plan (max 200 words)

Please give details of any changes to the original project plans, including any objectives that were not fully delivered and explain how this impacted the delivery of the project. Describe how any problems were addressed and what solutions were found to deal with these issues.

1. To sample through a more comprehensive livestock gradient we added 2 study sites to the original 6 sites. Then we have to give up one due to local cooperation problems. That turns up be to 7 sites at last.
2. The question of livestock recruitment is hard to ask. Our interpreter tried his best to explain that we are asking new-born number and adult female number. They feel it hard to understand adult. So we tried with reproducible females, but since females give birth every two years so they will sometimes gave us the number of females that reproduced this year. The results are unreliable thus we dropped this part. This is not a crucial part for our final question. We will simply just examine blue sheep recruitment instead.
3. The impact of livestock is not only on blue sheep recruitment, but should also be observed on population density. Thus we added this analysis into the report.
4. We used to plan to develop blue sheep monitoring projects in local villages. But after we did this in one village we found that community support and trust is very precious. Instead of spread too thin we decided to develop the community work deeper in one village. We developed snow leopard monitoring project and garbage disposal project corresponding

to the villagers' interests. Then opportunity came to another village. The villagers showed a strong interest in snow leopard monitoring. The project is quite successful there too. By learning the local interests and requests we adjusted our plan and the goal (involvement of local herders into snow leopard conservation) was met in a slightly different way.

Methodology (max 500 words)

For each objective *please describe in concise and specific statements all project methodologies. Including any relating to ecological and social science research, as well as activities involving project stakeholders such as education & outreach, livelihoods, policy or capacity building. This section should provide adequate detail so as to enable the study to be repeated.*

1) Blue sheep density: Each site is a presumed closed population of blue sheep, with similar habitat and animal community. Blue sheep density was quantified using double-observer survey (Forsyth et al. 1997). This is by now the only feasible and inexpensive method to count mountain ungulates and get comparable results (Suryawanshi et al. 2012). Each site was divided into sub-units delineated by ridge-lines. We randomly chose 50% sub-units and walked along the best route covering the whole sub-unit. Two observers counted together following Forsyth el al. (1997). One herd is defined as all individuals walking in the same direction and within a distance of 20 m.

Blue sheep herds located by observer one will be capture, and those located by observer two will be recapture. Based on capture-recapture model the density of blue sheep can be calculated (Forsyth et al. 1997).

2) Blue sheep birth rate and recruitment rate: Surveys were done after birth season, before winter and after winter. Following the same transects with the density survey. Age and sex composition will only be recorded when all individuals could be identified reliably according to the criteria adopted by Wegge (1979). We only divided them into adult males, adult females, yearlings and newborns. Based on this birth rate and recruitment rate were calculated.

3) Livestock density: During blue sheep survey, we also recorded livestock herds on transects. However livestock will not be there for the year-round. Thus the count data was only used to verify the livestock number herders gave us (they sometimes won't tell the truth). We interviewed every houses to obtain the livestock number and range-shifting schedule to calculate weighed year-round livestock density for each site.

4) Winter temperature and winter precipitation (snow fall) data were downloaded from the website of China Meteorological Administration. We used data from the coldest quarter (December – February) to represent winter temperature and precipitation.

5) Enhanced Vegetation Index (EVI) data for each site was downloaded from USGS website (Kamel Didan. 2015) and we used the mean of the 8 layers (16-day temporal granularity) with the highest EVI value to represent aboveground grassland biomass of the growing season (Y.H. Yang et al. 2009).

6) Elevation data were downloaded from the Global Digital Elevation Model (ASTER GDEM).

7) Terrain ruggedness: We used the VRM tools developed by to calculate terrain ruggedness based on the 30m resolution DEM layer. Neighbourhood size is set on 3, the smallest size (30m) you can choose.

8) We used the 1:250,000 resolution national landuse map to extract rock areas. Then we corrected it based on our familiarity of the study sites.

9) Generalized linear models were used to identify the main factors that affect blue sheep abundance. Using each sub-unit as a sampling unit, mean EVI from the last ten years (2005-2014), elevation, ruggedness, mean winter precipitation over the last ten years (2005-2013, data of year 2014 not available due to unknown reasons), mean winter temperature over the last ten years (2005-2014), rock area percentage, and livestock density were built into the model with site as a random effect, to study their relative impact on blue sheep density.

10) Generalized linear models were used to identify the main factors that affect blue sheep birth rate and recruitment after the first winter. Taking each blue sheep herd as our sampling unit, local blue sheep density, local livestock density, EVI of the birth year, winter temperature and winter precipitation of the last year, together with site and sub-unit as random effects were the main factors in the model.

Outputs and Results (max 500 words)

For each objective *please provide details of all the quantifiable results of the project's activities. For quantifiable research outputs of you should include presentation and data analysis of the results, with tables and graphs to summarise where suitable. For quantifiable outputs of activities involving stakeholders you should include, for example, the number of publications or posters and their distribution, the number of workshops and participants, the number of stakeholders engaged, evidence of behaviour change, funds raised etc. Include photos where appropriate.*

1. Evaluate population status of both blue sheep and livestock at 7 selected sites with a gradient of livestock density.

   Outputs and Results: We chose 7 sites as representative of different livestock grazing pressure in Sanjiangyuan Area. The livestock density is shown as below. They formed a gradient raising from 34-144 individual/km2.

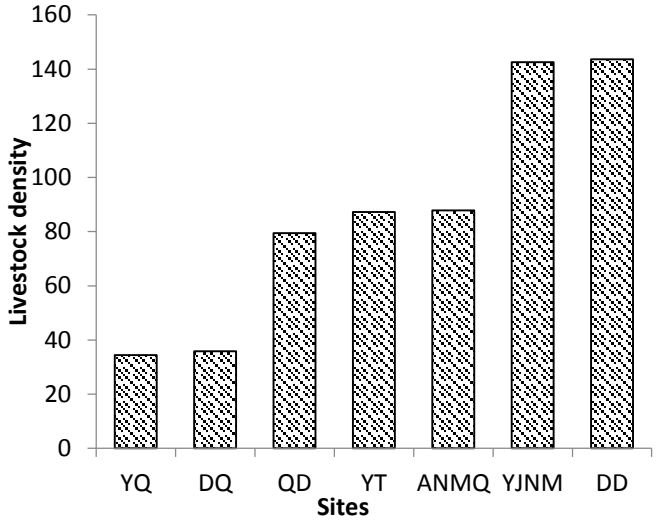

Figure 2. Livestock density at the seven sites

Blue sheep density in those sites are shown in Figure 3. They also formed a gradient dropping from 10-2 individual/km2, which is one order of magnitude lower than livestock density.

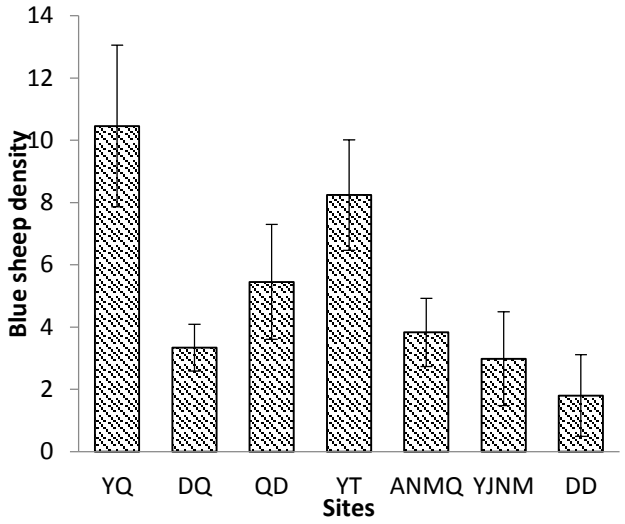

Figure 3. Blue sheep density of the 7 sites, by field survey using double-observer method.

We've also compared population growth parameters of blue sheep at the 7 sites. As shown in Figure 4 below, birth rate (newborn/female ratio after birth) are similar across all 7 sites. They also didn't show any discernible relationship with livestock density. However, recruitment rate (newborn/female ratio after the first winter) start to show some difference across sites.

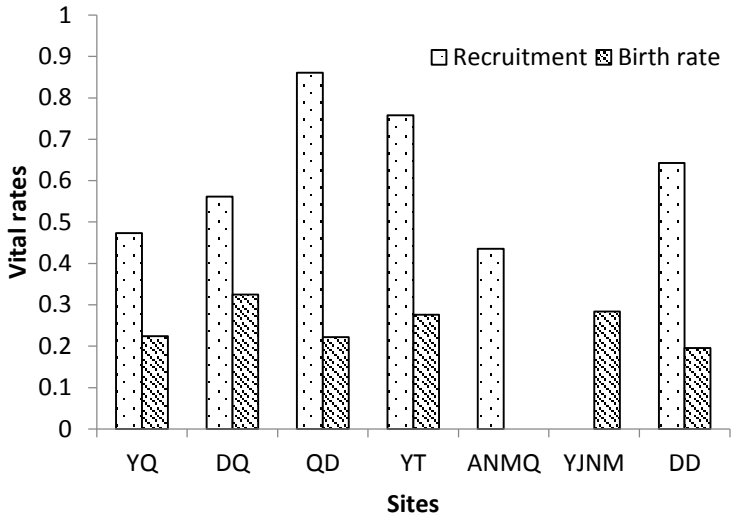

Figure 4. Birth rates and recruitment after the first winter of blue sheep populations based on newborn to female ratios collected at the seven sites.

2. Examine whether the grassland resource reached a limitation to blue sheep populations based on population parameters measurement.
3. Assess the impact of livestock on blue sheep density and population parameters.
   (We did the analysis for these two objectives together.)

Outputs and Results:

Exploratory analysis using plots for data from the 7 sites

As in Figure 5, blue sheep density formed a negative relationship with livestock density. Increasing livestock density by 50 ind/km2, we will expect a 2 ind/km2 drop of blue sheep density. The only outlier is the point representing the site DQ (Diqing village in Zaduo). The reason is most possibly the poor grassland there.

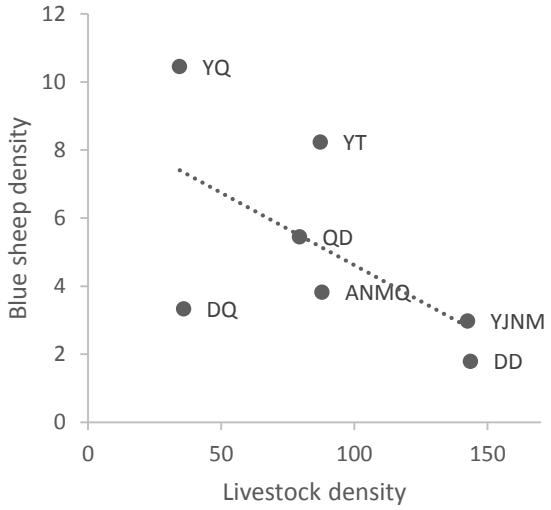

Figure 5. Relationship of blue sheep and livestock density at each site

As shown in Figure 6, the only outlier in Figure 3, Diqing village has the lowest enhanced vegetation index value, which is an indicate of desertification. EVI values around 2.5 indicate high-quality grassland, such as site YT (Yunta village in Haxiu) and YQ (Yaqu village in Suojia), both of which have a high density of blue sheep. However higher EVI value suggests that shrubs is taking over grassland, leaving no good habitat for blue sheep again. The relationship is a bell-shaped quadratic curve.

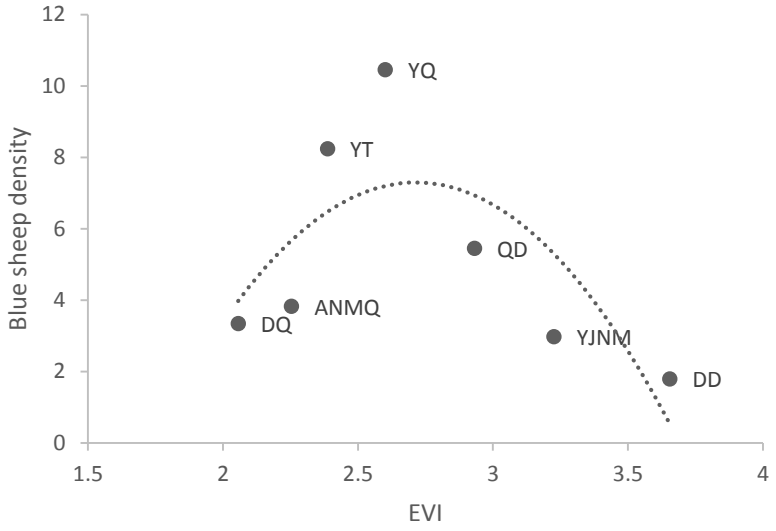

Figure 6. Relationship of blue sheep density and enhanced vegetation index (EVI) at each site

Figure 7 shows an obvious positive relationship between percentage of rock area and blue sheep density. Rock serves as good shelter for blue sheep to escape from their natural enemies.

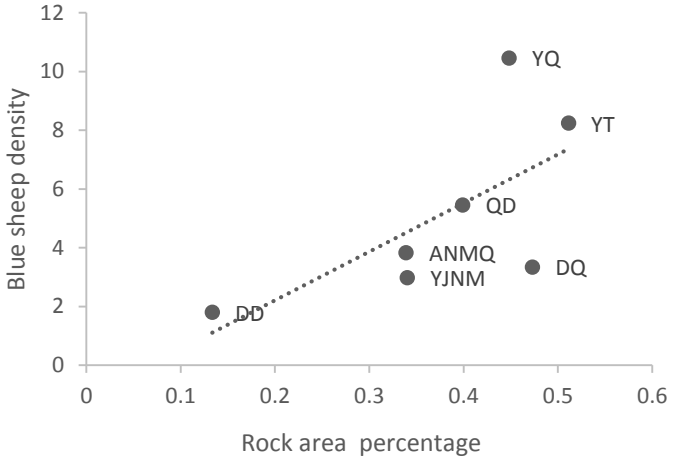

Figure 7. Relationship of rock percentage and blue sheep density

If we plot female fecundity rate against blue sheep density at each site, we get the curve shown in figure 8. Fecundity rate was low when blue sheep density is low, increased following the blue sheep density, but dropped again after blue sheep density get too high.

The curve suggests strong intra-species competition and density-dependent growth of blue sheep populations.

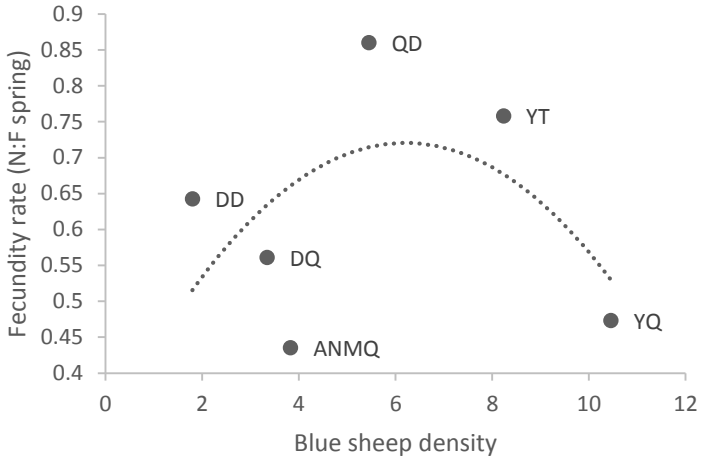

Figure 8. Relationship between female fecundity rate of blue sheep and blue sheep density

However, when we plotted female fecundity rate against livestock density, there's no clear pattern. This indicates that inter-species competition between blue sheep and livestock is strong enough to affect blue sheep number, but not strong enough to have an impact on blue sheep growth parameters. The scheme might be that livestock draw the boundary of blue sheep distribution, thus determines blue sheep number, together with suitable habitat (rock and good grassland). However once blue sheep find a suitable small patch of habitat (mostly on top of the mountains around rocks), intra-species competition becomes the most important thing constraining their growth.

Regression analysis on watershed scale

1) Impact of livestock on blue sheep density:

Since the sample size of 7 is not enough for statistical analysis. We further divided the 7 sites into 55 watersheds delineated by ridgelines to test which variables have the greatest impact on blue sheep density on this finer scale. The over-dispersion test indicated over-dispersion of the data, thus Poisson regression is not suitable. We then compared negative binomial model and mixed effect negative binomial model with site as a random effect, the result shows the variable site (categorical) is not a significant random effect, thus we excluded it from further analysis. Since my data has excessive zeros, we tested zero-inflated model for this kind of data. Transect sight coverage in each watershed is used as inflation predictor. The zero-inflated negative binomial model outcompeted negative binomial regression model, thus was used as the final model.

Table 1. Models with the highest rank

Int	df	logLik	AIC	delta	weight

Rock	4	-259.145	526.3	0	0.332
Livestock+Rock	5	-258.953	527.9	1.62	0.148
Rock+Wprec	5	-258.988	528	1.69	0.143
DEM+Rock	5	-259.098	528.2	1.91	0.128
AGB+Rock	5	-259.123	528.2	1.96	0.125
Rock+Viewshed	5	-259.125	528.2	1.96	0.125

Ranked by AIC value.

In a full zero-inflated model including all the variables, livestock density is the only variable that has a significantly impact. However from Table 1 we can see the best model includes only the percentage of rock, which has a positive impact on blue sheep density, just as indicated by Figure 5. Livestock density has a negative impact on blue sheep density and together with rock percentage formed the second best model.

Table 2. Averaged model

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Count variables				
Intercept	3.784223	3.760448	1.006	0.3143
Rock	0.642458	0.336704	1.908	0.0564
Livestock	-0.12014	0.127802	0.94	0.3472
Winter precipitation	-0.14197	0.160032	0.887	0.375
Elevation	-1.56368	5.063518	0.309	0.7575
Above-ground biomass	0.376117	1.174063	0.32	0.7487
Above-ground biomass^2	-0.03363	0.077552	0.434	0.6646
Winter temperature	0.006196	0.062924	0.098	0.9216
Ruggedness	0.299292	0.473983	0.631	0.5278
Inflation variables				
Intercept	-0.97813	0.409447	2.389	0.0169
Viewshed	-1.13705	5.58954	0.203	0.8388

We took the high-ranked models with delta AIC < 3 to build the average model. The coefficient in the average model shows negative or positive impact of different variables on blue sheep density. The quadratic term of above-ground biomass has a negative impact, which indicate a bell-shaped quadratic relationship of above-ground biomass and blue sheep density, as indicated by the scatterplot in Figure 4. In the averaged model rock percentage has a P value close to significant.

This watershed scale analysis suggests blue sheep density at a finer scale is largely dependent on area of suitable habitat, especially rock area. Impact of livestock density still exist in the high-ranked models, however compared to rock area it faded at this scale. This result is also explainable as we mentioned before: Livestock draw the boundary of blue sheep distribution, thus determines blue sheep number at the landscape scale, together with suitable habitat (rock and good grassland). However once blue sheep find a suitable

small patch of habitat (mostly on top of the mountains around rocks), habitat quality becomes the most important factor for blue sheep density at a finer scale whereas the impact of livestock blurs. It also gave us the conservation suggestions for both blue sheep and snow leopards: on the landscape scale, decreasing livestock density is important. But on the local scale, to preserve and protect a patch of suitable habitat with enough shelters (rocks) and good grassland for them becomes the most important thing.

2) Impact of blue sheep and livestock density on blue sheep birth rates

We used Poisson regression model to explore the impact of different variables on blue sheep birth rates (newborn-female ratio after birth). We compared AIC values of models with a single predictor variable and their differentIn the full model the only significant variable is blue sheep density. However after we compared different forms of X variables we chose the one with the lowest AIC value to put into the model. Blue sheep density was transformed into (density + density^2). After transformation all variables became not significant. There are 3 observation that was shown as presumable outliers (high influence on the final results). The original data shows the three observation are not error input. We tried the model excluding the three outliers. The results show winter temperature became the only significant variable. However both with and without outliers, the model selection table based on AIC shows that, blue sheep density are always within the models with the highest rank (Table 3 and 4). Including site and sub-unit as random effects didn't bring any changes to the results so we exclude them in the final model.

Table 3. Models excluding outliers ranked by AIC

Models	df	logLik	AIC	delta	weight
Wtem	2	-94.821	193.6	0	0.237
Wpre+Wtem	3	-93.897	193.8	0.15	0.219
BS^2+BS+Wtem	4	-93.057	194.1	0.47	0.187
log(EVI)+Wtem	3	-94.281	194.6	0.92	0.149
BS+Wtem	3	-94.615	195.2	1.59	0.107
BS^2+Wpre+Wtem	4	-93.67	195.3	1.7	0.101

Table 4. Models with all observations ranked by AIC

Models	df	logLik	AIC	delta	weight
BS^2+Wpre+Wtem	4	-116.268	240.5	0	0.305
BS+Wpre+Wtem	4	-116.55	241.1	0.56	0.23
BS^2+Wpre	3	-118.207	242.4	1.88	0.119
BS^2+LS+Wpre+Wtem	5	-116.217	242.4	1.9	0.118
BS^2+BS+Wpre+Wtem	5	-116.241	242.5	1.95	0.115
BS^2+log(EVI)+Wpre+Wtem	5	-116.258	242.5	1.98	0.113

We took the high-ranked models with delta AIC < 3 to build the average model. The coefficient in the average model shows negative or positive impact of different variables on blue sheep birth rates. We can see winter temperature has a positive effect, winter

precipitation has a negative one, blue sheep density^2 has a negative effect which indicates a bell-shaped curve, both with and without outliers (Table 5, 6).

Table 5. Averaged model excluding outliers

Variables	Estimate	Std. Error	Adjusted SE	z value	Pr(>|z|)	
(Intercept)	0.579313	0.927175	0.949493	0.61	0.5418	
Wtem	0.171101	0.057415	0.059118	2.894	0.0038	**
Wpre	-0.02779	0.025518	0.026259	1.058	0.2899	
BS^2	-0.00098	0.00105	0.001067	0.922	0.3565	
BS	0.03452	0.038554	0.039143	0.882	0.3778	
log(EVI)	-0.16856	0.692461	0.706322	0.239	0.8114	
LS	-0.00038	0.007467	0.007686	0.05	0.9604	

Table 6. Averaged model with all observations

Variables	Estimate	Std. Error	Adjusted SE	z value	Pr(>|z|)
(Intercept)	0.057085	0.831329	0.847065	0.067	0.9463
BS^2	-0.00064	0.000329	0.000338	1.882	0.0598
Wpre	-0.05301	0.026455	0.027154	1.952	0.0509
Wtem	0.099186	0.051726	0.053206	1.864	0.0623
BS	-0.0223	0.016531	0.016897	1.32	0.1869
LS	0.001942	0.00609	0.006271	0.31	0.7568
log(EVI)	-0.17898	0.518032	0.530252	0.338	0.7357

By plotting effects of different variables we can see their impact more clearly (Figure 10, 11). Both of the figures with and without outliers inside the model shows a clear positive impact of winter temperature and a negative impact of winter precipitation on blue sheep birth rate. Impact of blue sheep density shows a quadratic form but with outliers inside the model the curve only shows the declining part. We can at least conclude that blue sheep density has a negative impact on birth rate when the density becomes really high. Livestock density and Enhanced vegetation index has unstable pattern with or without outliers, so we can't conclude any clear impact of them.

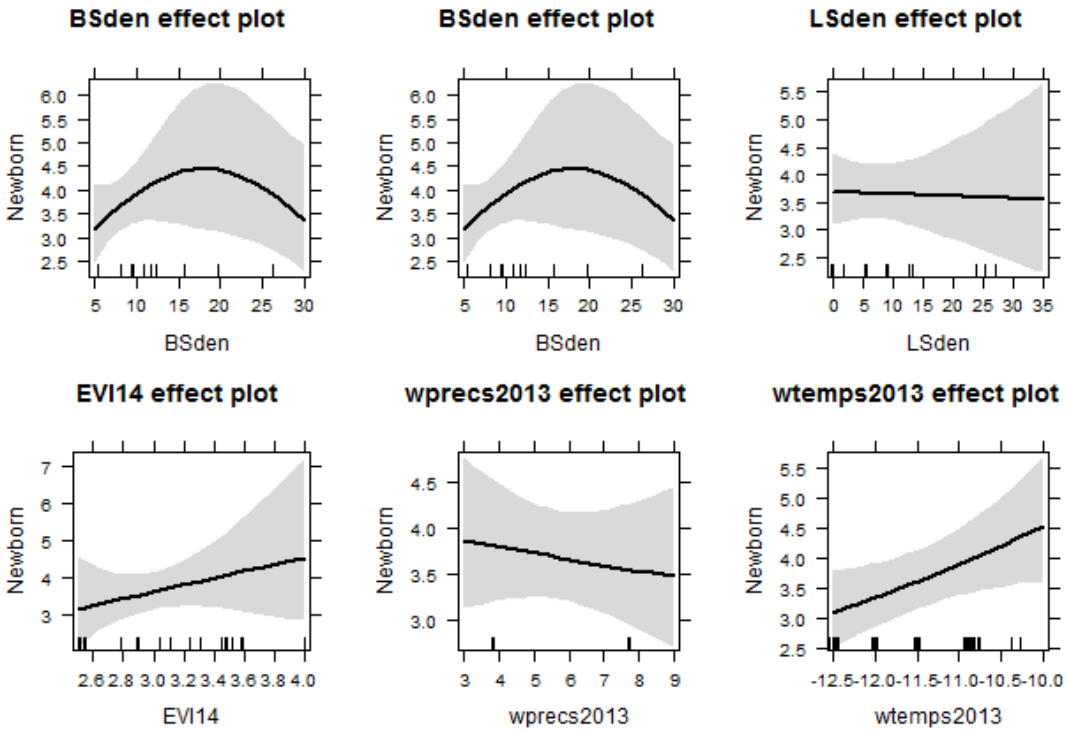

Figure 10. Variable impacts on blue sheep birth rate without outliers

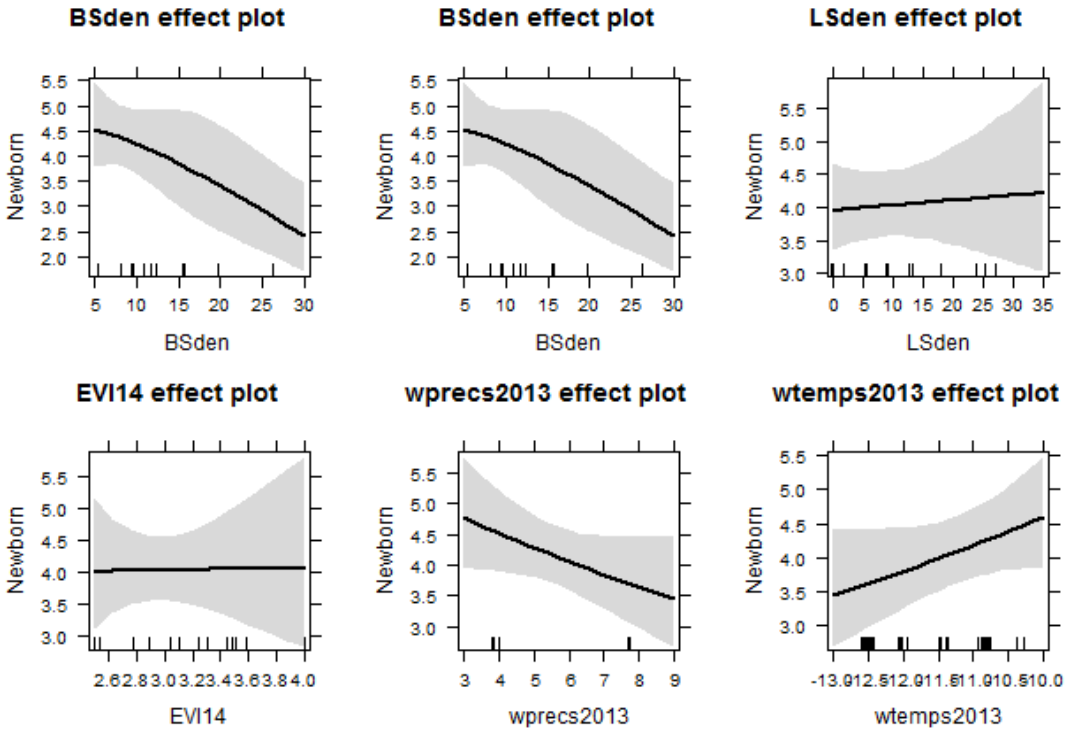

Figure 11. Variable impacts on blue sheep birth rate with all observations

3) Impact of blue sheep and livestock density on blue sheep recruitment rates

We used Poisson regression model to explore the impact of different variables on blue sheep recruitment rates (newborn-female ratio after the first winter). In the full model the only significant variable is winter temperature. The model selection table based on AIC shows that, winter precipitation, winter temperature and blue sheep density are the first 3

variables in the models with the highest rank (Table 7). Including site as a random effect didn't change the results so it was excluded in the final model.

Table 7. Models with the lowest AIC value

Models	df	logLik	AIC	delta	weight
log(Wpre)+Wtem	3	-142.679	291.4	0	0.269
Wtem	2	-144.02	292	0.68	0.192
BS+Wtem	3	-143.203	292.4	1.05	0.159
BS+ √LS+Wtem	4	-142.339	292.7	1.32	0.139
log(Wpre)+ √LS+Wtem	4	-142.438	292.9	1.52	0.126
√LS+Wtem	3	-143.534	293.1	1.71	0.115

We took the high-ranked models with delta AIC < 3 to build the averaged model. The coefficient in the averaged model shows negative or positive impact of different variables on blue sheep recruitment rates (Table 8). We can see both winter temperature and winter precipitation have a positive effect, meanwhile both blue sheep density and livestock density have a negative effect on blue sheep recruitment rate after the first winter.

Table 8. Averaged model

Variables	Estimate	Std. Error	Adjusted SE	z value	Pr(>|z|)
(Intercept)	1.134938	0.723276	0.731819	1.551	0.12094
log(Wpre)	0.162863	0.109468	0.111335	1.463	0.14352
Wtem	0.151442	0.045845	0.046487	3.258	0.00112**
BS	-0.00745	0.007586	0.007697	0.968	0.33282
√LS	-0.03236	0.033131	0.033667	0.961	0.33653
log(EVI)	0.069915	0.455201	0.462893	0.151	0.87995

By plotting effects of different variables we can see their impact more clearly (Figure 12). The figure shows a clear positive impact of winter temperature and winter precipitation on blue sheep recruitment rate. Blue sheep density and livestock density both show a negative impact on recruitment rate. Enhanced vegetation index shows a slightly positive impact on recruitment rate.

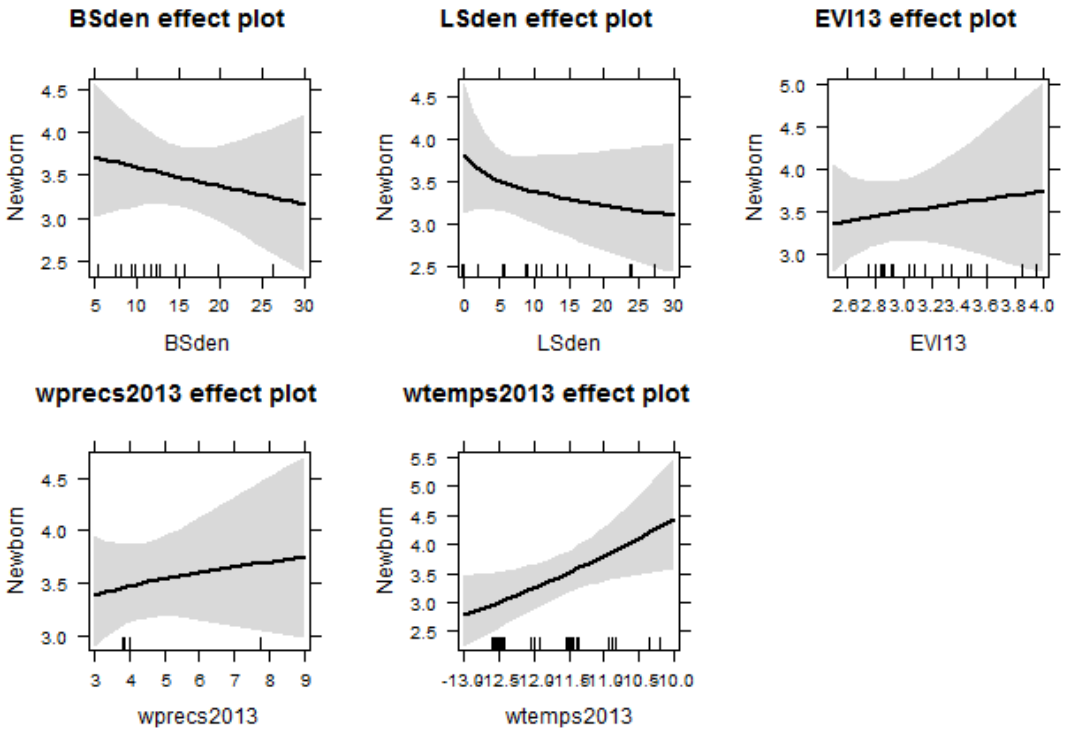

Figure 12. Impact of variables on blue sheep recruitment rate

4. Set up community-based monitoring projects for blue sheep in two villages.

Outputs and Results:

The blue sheep monitoring was only taken in one village (Yunta). The monthly counts are similar to our survey data shown before. However we also set up snow leopard monitoring in two villages (Diqing and Yunta). Snow leopard density was calculated as below.

Diqing village

In Diqing the monitoring has started since April 2014. 38 camera traps were set out in 5*5 km grids, covering an area of 950 km^2. 20 herders were picked to form a monitoring team. However during the fungus season and the whole following summer, the herders all moved to remote summer pastures and lost contact. The data during those period is then not good enough for analysis (some cameras were moved to other places). After they moved out we called a meeting and put everything into the right track. We took the three months from November 3rd to February 1st for capture-recapture analysis. During this period 23 different individuals were recognized, in which 19 were adults, 2 were one-and-half-year sub-adults, 2 half-year newborns. 7 days was taken as a sampling occasion and based on it we built the capture history of the 23 individuals (Table 9).

Table 9. Capture history of the 23 snow leopard individuals in Diqing Village

		Occasions												
Animal ID	Category	1	2	3	4	5	6	7	8	9	10	11	12	13
DQSL01	Adult	0	0	0	0	0	0	1	0	0	0	0	0	0

DQSL02	Adult	0	1	1	1	1	0	1	0	0	0	0	0	0
DQSL03	Adult	0	0	0	0	0	0	1	0	0	0	0	0	0
DQSL04	Adult	0	0	1	1	1	0	0	0	0	0	0	0	0
DQSL05/09-1	Sub-adult	1	0	0	0	0	1	0	0	1	0	0	0	0
DQSL06	Adult	0	0	1	1	1	0	0	1	0	0	0	0	0
DQSL08	Adult	0	0	0	0	0	1	0	0	0	0	0	0	0
DQSL09	AdultFemale	1	0	0	0	0	0	0	0	1	0	0	0	0
DQSL09-2	Sub-adult	1	0	0	0	0	0	0	0	1	0	0	0	0
DQSL10	Adult	0	0	0	0	0	0	1	0	0	0	0	0	1
DQSL11	Adult	1	0	0	0	0	0	0	0	0	0	0	0	0
DQSL12	Adult	1	0	0	0	1	0	0	0	0	0	0	1	1
DQSL13	AdultFemale	0	1	0	0	1	0	0	0	1	0	0	0	1
DQSL13-1	Newborn	0	1	0	0	1	0	0	0	1	0	0	0	1
DQSL13-2	Newborn	0	1	0	0	1	0	0	0	1	0	0	0	1
DQSL14	Adult	0	0	0	0	1	1	0	0	0	1	0	0	0
DQSL15	Adult	0	0	0	1	0	0	1	0	1	0	1	0	0
DQSL16	Adult	0	0	0	0	0	1	1	0	0	0	0	1	0
DQSL18	Adult	0	0	0	0	0	1	0	0	0	0	0	0	0
DQSL19	Adult	0	0	0	0	1	0	0	1	0	1	1	1	0
DQSL20	Adult	1	0	0	0	0	0	1	0	0	0	0	0	0
DQSL22	Adult	0	0	0	0	0	0	1	0	0	0	0	0	0
DQSL23	Adult	0	0	0	0	0	0	1	0	0	0	0	0	0

0 means no capture, 1 means capture.

Our cameras took 49 days to capture all individuals, in which 56% individuals and 47% adults were captured by the day of 28th (Table 10).

Table 10. Summary of captures

		Occasions												
		1	2	3	4	5	6	7	8	9	10	11	12	13
Individuals	Caught n(j)[1]	6	4	3	4	9	5	9	2	7	2	2	3	5
	Total caught M(j)[2]	0	6	10	12	13	15	18	23	23	23	23	23	23
	Newly caught u(j)[3]	6	4	2	1	2	3	5	0	0	0	0	0	0
Adult	Caught n(j)[1]	4	2	3	4	7	4	9	2	3	2	2	3	3
	Total caught M(j)[2]	0	4	6	8	9	11	14	19	19	19	19	19	19
	Newly caught u(j)[3]	4	2	2	1	2	3	5	0	0	0	0	0	0

[1]: Capture number in occasion j;

[2]: Total capture number before occasion j;

[3]: New capture number in occasion j.

For all individuals and adults, CAPTURE (z=-0.647，p=0.25886；z=-1.273，p=0.10154) and CloseTest（X^2=20.49945，df=14，p=0.11516；X^2=17.23271，df=13，p=0.18888）support the hypothesis of a closed population.

By comparing different models (Table 11), capture rate of all individuals and adults are not affected by individual heterogeneity, or behavior differences, or time change. The scores given by CAPTURE also ranked the highest for Mo (Mo=1.00、Mh=0.70、Mb=0.00、Mbh=0.21、Mt=0.34、Mth=0.30、Mtb=0.58、Mtbh=0.90). We took the null model Mo to estimate population abundance.

Table 11. Model comparison

Models	All individuals			Adults		
	X^2	*df*	*p*	X^2	*df*	*p*
Mo vs Mh	3.97	2	0.13739	3.666	1	0.05555
Mo vs Mb	1.818	1	0.17751	0.691	1	0.40568
Mo vs Mt	19.387	12	0.07961	13.96	12	0.30329
Mh vs Mbh	31.004	7	0.00006	30.607	6	0.00003
Mh goodness of fit	19.306	12	0.0814	17.741	12	0.12377
Mb goodness of fit	43.793	17	0.00037	40.83	17	0.00099

As shown in Table 12, based on the calculation of Mo, capture rate of all individuals and adults are 0.20 and 0.19. Snow leopard abundance in surveyed area is estimated to be 24 individuals (SE= 1.36, 95%CI=24~30) and 20 adults (SE= 1.38, 95%CI=20~26). All individuals have the maximum moving distance as 10.8 km. We generated a 5.4-km-wide buffer area around all camera sites, giving us an effective sampling area around 1273 km^2. Snow leopard density is thus estimated to be 1.9 per 100 km^2 (SE=0.1). All adults have the maximum moving distance as 10.5 km. We generated a 5.3-km-wide buffer zone around all camera sites, giving us an effective sampling area around 1247 km^2. Adult density is thus estimated to be 1.6 per 100 km^2 (SE=0.1).

Table 12. Snow leopard abundance and density estimation based on model Mo

Data	Capture rate	Abundance (95%CI)	Sampling area/km^2	Density /per 100km^2
All individuals	0.20	24±1（24-30）	1273	1.9±0.1
Adults	0.19	20±1（20-26）	1247	1.6±0.1

Yunta Village

In Yunta the monitoring has started since October 2013. Everything was standardized and stabilized since the summer in 2014. Finally 14 camera sites with paired camera traps were set out by 14 herders in 5*5 km grids to cover an area of 250 km^2. We took the three months from October 10th to January 8th for capture-recapture analysis. During this period 11 different individuals were recognized, in which 7 were adults, with 2 one-year sub-adults and 2 half-year newborns. 7 days was taken as a sampling occasion and based on it we built the capture history of the 11 individuals (Table 13).

Table 13. Capture history of the 11 snow leopard individuals in Yunta Village

Animal ID	Category	Occasions											
		1	2	3	4	5	6	7	8	9	10	11	12
A01	Newborn	1	1	0	0	0	0	0	0	0	1	1	1
A02	Newborn	1	0	0	0	0	1	1	0	0	0	1	0
A03	AdultFemale	0	0	0	1	0	0	0	0	0	0	0	0
A04	Adult	0	0	0	0	0	0	1	0	0	0	0	0
A05	Adult	1	1	0	0	0	0	0	0	0	0	0	0
A06	Adult	0	1	0	0	0	0	0	0	0	1	0	0
A07	AdultFemale	0	0	0	0	0	0	1	0	0	0	0	0
A08	SubAdult	0	0	0	0	0	0	1	0	0	0	0	0
A09	SubAdult	0	0	0	0	0	0	1	0	0	0	0	0
A10	Adult	1	0	1	0	0	0	1	1	0	1	0	0
A11	Adult	0	0	0	1	0	0	1	1	0	0	0	0

0 means no capture, 1 means capture.

Our cameras took 49 days to capture all individuals, in which 64% individuals and 71% adults were captured by the day of 28th (Table 14).

Table 14. Summary of captures

		Occasions											
		1	2	3	4	5	6	7	8	9	10	11	12
All individuals	Caught n(j)1	4	3	1	2	0	1	7	2	0	3	2	1
	Total caught M(j)2	0	4	5	5	7	7	7	11	11	11	11	11
	Newly caught u(j)3	4	1	0	2	0	0	4	0	0	0	0	0
Adults	Caught n(j)1	2	2	1	2	0	0	4	2	0	2	0	0
	Total caught M(j)2	0	2	3	3	5	5	5	7	7	7	7	7
	Newly caught u(j)3	2	1	0	2	0	0	2	0	0	0	0	0

[1]: Capture number in occasion j;

[2]: Total capture number before occasion j;

[3]: New capture number in occasion j.

For all individuals and adults, CAPTURE (z=- 0.309，p= 0.62140；z=- -0.569，p= 0.28464) and CloseTest (X^2= 10.27695，df=8，p= 0.24612；X^2= 4.33754，df=5，p= 0.50191) support the hypothesis of a closed population.

By comparing different models (Table 15), capture rate of all individuals and adults are not affected by individual heterogeneity, or behavior differences, or time change. However the scores given by CAPTURE ranked the highest for Mh (Mo=0.99、Mh=1.00、Mb=0.58、Mbh=0.60、Mt=0.01、Mth=0.00、Mtb=0.65、Mtbh=0.60). We took the null model Mh to estimate population abundance.

Table 15. Model comparison

Models	All individuals	Adults

	X^2	*df*	*p*	X^2	*df*	*p*
Mo vs Mh	3.009	1	0.08281	Expected values too small		
Mo vs Mb	1.004	1	0.31629	1.239	1	0.26572
Mo vs Mt	15.546	11	0.15886	3.5	11	0.98234
Mh vs Mbh	33.88	3	0.00000	Expected values too small		
Mh goodness of fit	24.554	11	0.01059	17.844	11	0.08526
Mb goodness of fit	18.437	14	0.18761	15.892	11	0.1452

As shown in Table 16, based on the calculation of Mh, capture rate of all individuals and adults are 0.15 and 0.18. Snow leopard abundance in surveyed area is estimated to be 14 individuals (SE= 3.4，95%CI=12~29) and 7 adults (SE= 2.4，95%CI=7~19). All individuals have the maximum moving distance as 8.6 km. We generated a 4.3-km-wide buffer area around all camera sites, giving us an effective sampling area around 296 km^2. Snow leopard density is thus estimated to be 4.7 per 100 km^2 (SE=1.1). All adults have the maximum moving distance as 6.4 km. We generated a 3.2-km-wide buffer zone around all camera sites, giving us an effective sampling area around 223 km^2. Adult density is thus estimated to be 3.1 per 100 km^2 (SE=1.1).

Table 16. Snow leopard abundance and density estimation based on model Mh

Data	Capture rate	Abundance (95%CI)	Sampling area/km^2	Density /per 100 km^2
All individuals	0.15	14±3（12-29）	296	4.7±1.1
Adults	0.18	7±2（7-19）	223	3.1±1.1

The results of snow leopard density from their own cameras greatly encouraged herders to be involved into snow leopard conservation. At least 7-8 news (in Chinese) were produced based on the monitoring results. Herders in Yunta found illegal traps set by poachers during monitoring and they volunteered to clear all the traps (more than 100 traps were cleared). Now they formed a trans-township patrol team together with the nearby township Axia to prevent poaching. We also presented the results in the Snow Leopard Forum this year in Yushu. Local governments also showed passion on snow leopard conservation after the Forum. The Zaduo County government even built a snow leopard square close to our snow leopard monitoring village. Now we are planning to work closely with the local government to develop a local snow leopard management plan in the whole Zaduo County.

Communication & Application of results (max 200 words)

Please explain how the project's results have been communicated and how they have been applied to addressing the project's conservation problem.

During the whole procedure we tried to keep active collaboration with multimedia platforms. At least 6 Chinese news (including TV and newspaper) have been produced by our project, not counting numerous mobile media stories. This is an effective way of involving pubic attention and make the local herders and governments proud of their job.

For the project's conservation problem (the possible resource competition posed by livestock to blue sheep), we have to wait until solid study result comes out. Thus no action has been taken for that yet. However during the project procedure we do encountered several other threats and our project tried our best to deal with them.

The first threat comes from national mine exploration plan. There are three major mineral occurrences in Zaduo County and one of them inside the community we've been working in. Mining companies came into the nature reserve under the name of "exploration" but actually digging out trucks of mineral each day. The mineral occurrence in our community happens to be the most important sacred mountain locally. The local herders tried different ways to stop them but failed. We started our community-based monitoring project there under this circumstance and was highly supported by them since it might help resist outside threats. Both Zaduo government and the local township government worked closely with us too since all of them are Buddhists and the sacred mountain is important for them too. We estimated the density of snow leopard there based on community monitoring data. The result turns out that Zaduo together with Zhiduo County holds the largest continuous snow leopard habitat and snow leopard density is high too. We spread the news on influential newspapers. The next year the head of Zaduo County used the result combined with other political approaches, successfully blocked mining companies outside the County.

The second threat comes from outside poachers. In Yunta village there were always rumours about poachers coming across the frozen Yangtze River into the village during winter. Last winter (2014) our blue sheep monitoring team finally found traps during monitoring. They spontaneously organized to clear all the traps. More than 100 traps were cleared. We supported their movement and by collaborating with neighbouring township Axia, we built a trans-township patrol team among those villages to prevent poaching along Yangtze River.

Monitoring and Evaluation (max 200 words)

What Monitoring and Evaluation activities were carried out to assess the effectiveness of the project's activities?

A map for each site produced, with the study area delineated and houses located.

A gradient of livestock density established.

Protocol for blue sheep survey developed.

The density of blue sheep and livestock quantified for each site.

Birth rate and recruitment rate of blue sheep estimated.

Relationship between livestock density and blue sheep density was established.

Resource limitation for blue sheep verified.

32 local herders in two villages participated in data collection and got trained for blue sheep survey and snow leopard monitoring.

News of local monitoring work published each year.

The protocol of blue sheep and snow leopard monitoring that is applicable in communities developed and recommended to local governments on Yushu Snow Leopard Forum this year.

Achievements and Impacts (Max 500 words)

Please list the most important Achievements and Impacts of the outputs listed in the previous sections and explain the significance of each one in relation to the overall aim of the project. If possible you should try to come up with a single sentence for each achievement and follow it with a description and explanation of how this achievement contributes to the project's objectives and overall goal

Output: Relationship between livestock density and blue sheep density was established.

Achievement: Blue sheep density at landscape scale and home range scale was proved to be negatively correlated with livestock density. However rock area percentage is even more important at home range scale.

This achievement indicates that ivestock draw the boundary of blue sheep distribution, thus determines blue sheep number at the landscape scale, together with suitable habitat (rock and good grassland). However once blue sheep find a suitable small patch of habitat (mostly on top of the mountains around rocks), habitat quality becomes the most important factor for blue sheep density at a finer scale whereas the impact of livestock blurs.

By this achievement we successfully captures the relationship between blue sheep density and other environmental covariates. We can produce a blue sheep density map based on this relationship and help identify the most important area for snow leopard conservation.

Output: Resource limitation for blue sheep verified.

Achievement: We proved that blue sheep birth rate and recruitment rate after the first winter were limited by its own density combined with impacts of winter temperature and snow fall. Density-dependence of population growth indicates resource limitation for blue sheep. Even though livestock density didn’t show strong impact here.

This indicates that inter-species competition between blue sheep and livestock is strong enough to affect blue sheep density, but not strong enough to have an impact on blue sheep growth parameters. The scheme might be that livestock draw the boundary of blue sheep distribution, thus determines blue sheep number, together with suitable habitat (rock and good grassland). However once blue sheep find a suitable small patch of habitat (mostly on top of the mountains around rocks), intra-species competition becomes the most important thing constraining their growth.

This achievement gave us the conservation suggestions for both blue sheep and snow leopards: on the landscape scale, decreasing livestock density is important. But on the local scale, to preserve and protect a patch of suitable habitat with enough shelters (rocks) and good grassland for them becomes the most important thing.

Outputs: 32 local herders in two villages participated in data collection and got trained for blue sheep survey and snow leopard monitoring. News of local monitoring work published each year. The protocol of blue sheep and snow leopard monitoring that is applicable in communities developed and recommended to local governments on Yushu Snow Leopard Forum this year.

Achievement: Local involvement and public awareness of snow leopard conservation highly improved after our project.

Zaduo County hired us to develop a regional snow leopard management plan after the Snow Leopard Forum. Mining companies banned by Zaduo government based on our project results. Trans-township anti-poaching patrol team built along Yangtze River. Several other local villages come to us and invite us to help them built their own monitoring team.

Both local involvement and public awareness are crucial for snow leopard conservation. We work closely with local government and villages which made them thinking snow leopard conservation and environmental protection is their own affair. With our help they have the ability to reach outside media and raise public awareness by their work. They feel more capable of protecting their own homeland thus intension of taking actions raised too.

Capacity Development and Leadership capabilities (Max 250 words)

Please describe how the project contributed to improvements in capacity of the project team members in relation to specific skills and leadership capabilities.

Our team also learnt a lot during this procedure. We are now familiar with blue sheep and snow leopard filed survey techniques. Some of us built capacity of data management and statistical analysis skills. We are more capable of communicating with local governments and villagers, confident for organizing training programs with them. We also learnt how to effectively spread our news out through different multimedia platforms to raise public awareness. Each of us gained something differently. One of team member left the project but he keeps to be actively involved in local conservation work. New member came and now they can independently undertake community trainings and field surveys. Old members grew to be leader of their own organization.

Section 3:

Conclusion (max 250 words)

Provide accurate, detailed and specific conclusions, avoiding general inferences and interpretations. Describe the overall project's contribution to its central conservation aim and

answer questions raised in the introduction, highlight any new information exposed by the project process.

This project aims to assess blue sheep population status and the impact of livestock husbandry on it. Blue sheep density at landscape scale and home range scale was proved to be negatively correlated with livestock density. However rock area percentage is even more important at home range scale. Blue sheep birth rate and recruitment rate after the first winter were limited by its own density combined with impacts of winter temperature and snow fall. Density-dependence of population growth indicates resource limitation for blue sheep. After identifying these threats we are able of 1. Delineate the most important areas for snow leopard conservation, including areas with high threats and areas of high conservation value. 2. Take the right action for snow leopard conservation. Blue sheep set the upper limit of snow leopard density and both of them will be influenced by high livestock density in some areas. Management plans will be developed with the local government and experimental actions in some area will be undertaken (for instance excluding livestock from certain areas during winter by providing winter hay supplement to herders).

Problems encountered and lessons learnt (max 500 words)

The purpose of this section is to provide information on lessons learned during the project work that can be usefully applied to other CLP projects. Please answer the below fields:

- *Which project activities and outcomes went well and why?*
  We will consider most of our activities and outcomes went well, both the research part and the community part. We met most of our planned achievements. The reason could be that we were familiar with the area before we applied this project and we tried to set reasonable and realistic target in this project.
- *Which project activities and outcomes have been problematic and in what way, and how has this been overcome?*
  Our final goal of community-based monitoring is to sell this package to central or provincial government. But there's still a long way to go for that. Since our labour and fund could only support us to involve several local villages into active snow leopard conservation. In the long run we need government to spread it out in the term of eco-compensation. Government do have the brief idea and a coarse shape of eco-compensation: they pay salaries to those "ecological rangers" but the people they selected are mostly village leaders who did nothing for that salary. It's again just a way for government to spend program budget and buy popularity. In the short term we cannot change the situation but we will continue our communication with governments.
- *Briefly assess the specific project methodologies and conservation tools used.*
  The tools we used have been proven effective so far. The monitoring protocol is not easy for the herders but after repeated training most of them are doing well. Motivation tools used by us is also working well until now. But we do need to search for a self-motivated scheme for them.

- *Please state important lessons which have been learnt through the course of the project and provide recommendations for future enhancement or modification to the project activities and outcomes.*
  We need to work more closely with higher level government such as provincial and central government. In this project we are able to modify a village or two. In the long term if we want the project self-sustainable, working with the Sanjiangyuan Program (Which is designed by the central government) is crucial.

In the future (max 200 words)

Please explain what efforts you will be taking to sustain this work beyond the grant period and what further work would be useful for the conservation of the target species/area.
Our team could be divided into researchers and NGOers. As researchers, they will continue their career on snow leopard research (conservation-directed). For people working in NGOs, snow leopard conservation is also a major project in their organization too. So technically our project will not end as long as we are still working in this area.

Financial Report

Please copy and paste the summary sheet from your financial report here

Itemized expenses	Total CLP Requested (USD)*	Total CLP Spent (USD)	% Difference	Details & Justification (Justification must be provided if figure in column D is +/- 25%)
PHASE I - PROJECT PREPARATION				
Communications (telephone/internet/postage)	112.00	81.81	-27%	We didn't buy a satellite phone so saved the cost.
Field guide books, maps, journal articles and other printed materials		28.95		
Insurance	96.00	103.05	7%	
Visas and permits				

Team training				
Reconnaissance				
Other (Phase 1)				
EQUIPMENT				
Scientific/field equipment and supplies		1770.91		As written in the budget, Peking University and Shanshui Conservation Center already have basic and old equipments so we didn't apply money from CPL for this item. However, since we saved lots of money from other items as mentions bolow, we try to use the money in improving the field survey and community-based monitoring by purchasing better equipments for them.
Photographic equipment		2122.27		we started snow leopard monitoring in the village after blue sheep monitoring. The items are used for the camera traps in snow leopard monitoring.
Camping equipment		74.26		
Boat/engine/truck (including car hire)		629.29		In the CLP application form there's no car hire item so we put this into Other (PHASE II) in our proposal.
Other (Equipment)		139.86		Mainly used in transportation of the camera traps from Beijing to the field site. We cannot carry all of them onto the airplane so express delivery is used.

PHASE II - IMPLEMENTATION				
Accommodation for team members and local guides	4,654.00	1583.92	-66%	We built good relationship with local government and villagers so they let us sleep there for free
Food for team members and local guides	2,480.00	2328.14	-6%	
Travel and local transportation (including fuel)	3,120.00	6095.90	95%	Field vehicle are old now and the road is very poor in the field, which cost us a lot to repair it every time.
Customs and/or port duties		38.54		
Workshops				
Outreach/Education activities and materials (brochures, posters, video, t-shirts, etc.)	576.00		-100%	
Other (Phase 2)	3,840.00	39.65	-99%	
PHASE III - POST-PROJECT EXPENSES				
Administration				
Report production and results dissemination	100.00		-100%	
Other (Phase 3)				
Total	**14,978.00**	**15,036.53**		
*These figures should be the same as those listed in the original proposal				

Section 4:

Appendices

Please include important additional information not required in the main text along with:

- *Completed CLP M&E measures table (see below)*

- *Raw field data: if large amounts of data were generated, include them here and summarise results using tables and statistics in the main text.*
- *Project Images/Copies of any newspaper/magazine articles relating to the project.*
- *Papers published or manuscripts proposed based on project data*

Output	Number	Additional Information
Number of CLP Partner Staff involved in mentoring the Project	1	Zhi Lu
Number of species assessments contributed to (E.g. IUCN assessments)	0	
Number of site assessments contributed to (E.g. IBA assessments)	0	
Number of NGOs established	0	
Amount of extra funding leveraged ($)		
Number of species discovered/rediscovered	0	
Number of sites designated as important for biodiversity (e.g. IBA/Ramsar designation)	0	
Number of species/sites legally protected for biodiversity	0	
Number of stakeholders actively engaged in species/site conservation management	5	Yushu Prefecture Zaduo County Yunta Village Diqing Village Shanshui Conservation Center
Number of species/site management plans/strategies developed	0	
Number of stakeholders reached	5	Yushu Prefecture Zaduo County Yunta Village Diqing Village Shanshui Conservation Center
Examples of stakeholder behaviour change brought about by the project.	2	Yunta village changed from ignorant of conservation to spontaneously clearing traps. Government of Zaduo Township changed from ignorant of conservation to actively involved into snow leopard conservation.

Examples of policy change brought about by the project	0	
Number of jobs created	0	
Number of academic papers published	0	
Number of conferences where project results have been presented	2	Zoology conference in Guangzhou Yushu Snow Leopard forum

Appendix 4.1 CLP M&E measures

Appendix 4.2 *Raw field data*

The tables are too big to paste here so we include them in the attachment.

Appendix 4.3 *Project Images/Copies of any newspaper/magazine articles*

We had included all the English news in our preliminary report.


2012 12 13 14 41


2012 12 14 12 40

Bibliography

List all the sources that you used, highlighting the most important ones. Also include the publications and communication outputs from the project as well as papers being prepared for publication by project members.

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Address list and web links

An annotated list of useful names, addresses and websites

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Distribution list

List where copies of the report have been distributed for reference by future project leaders and others, and where the report can be bought (if relevant).

We just finished this report so not distributed it yet. But any future project leaders need this we will be glad to send it to them.