Final report

"Status and conservation of critically endangered Hylobatidae Nomascus spp. (Crested gibbons) in the Phou Si Thone Endangered Species Conservation Area in the Bolikhamsai Province of Laos PDR"

Prepared for the Margot Marsh Biodiversity Foundation

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Northern white-cheeked crested gibbon (Nomascus leucogenys); Adult female grooming male.
Photo Credit: © Terry Whittaker

1. Executive summary

The overall goal of this grant is to establish the conservation status of critically endangered Hylobatidae Nomascus spp. (Crested gibbons) in the Phou Si Thone Endangered Species Conservation Area (PST ESCA) in the Bolikhamsai Province of Laos PDR".

Five objectives were set in order to achieve the overall goal of the project.

1. Develop the methodology needed to carry out gibbon surveys within PST ESCA and other areas in Laos PDR.
2. Build capacity among local, district and provincial staff to implement gibbon survey within the PST ESCA and other areas within Laos PDR.
3. Implement the gibbon survey on PST ESCA using National staff.
4. Analyse survey results and compile a status report for gibbons in PST ESCA.
5. Use survey results to improve the effectiveness of conservation actions by (A) adding to current local and international scientific knowledge of gibbon ecology and by (B) revising current conservation strategies and activities on PST ESCA.

The survey methodology was finalized using a variation on the standard auditory point approach to provide for more accurate gibbon group position estimates. Two survey teams made up from Lao National staff were equipped and received a five day comprehensive training about the gibbon survey methodology.

The survey was implemented during May – July 2014, in a total of 18 survey sectors within PST ESCA amounting to 54 survey days (Mornings). As a result of this survey effort, 9 individual gibbon groups were identified at 4 survey sectors, and 4 hours and 08 minutes of gibbon vocalizations were recorded.

Based on the analysis of the vocalizations recorded during the survey the species of gibbon located within PST ESCA was confirmed to be *Nomascus leueogenys* (Northern white-cheeked crested gibbon)

Based on the single point analysis method, the estimated number of gibbon groups in PST ESCA is 11.96, with an estimated total population of 41.8 individuals.

The confirmation of the species as *Nomascus leueogenys* has contributed significantly to the overall understanding of the boundary between the northern and southern *Nomascus* populations. Practical lessons learned from the application of the new methodology of the survey will assist in increasing the accuracy of future gibbon surveys.

Information gained from the results of this survey have already been incorporated into the overall enforcement strategy within PST ESCA and will also be incorporated into the new outreach and awareness strategy planned for March 2015.

2. Introduction

Regardless of the numerous data gaps that exist regarding the status of gibbon species in Lao PDR, it is abundantly clear from current knowledge that Lao PDR is globally significant in terms of gibbon conservation (Duckworth, 2008; MAF, 2011). The three species of crested gibbon known to inhabit the forests of Lao PDR range from Globally Endangered (*N. concolor*) to Globally Data Deficient *(N. leucogenys*) (IUCN 2006). All three species are listed as CITES Appendix 1 and within Lao receive full legal protection through the Lao Forestry Wildlife and Aquatic Law. It is also a reality that gibbon populations face numerous challenges in Lao, with hunting, habitat destruction, and population fragmentation being identified as the main threats (Duckwoth, 2008; MAF, 2011).

The Bolikhamxay Province, situated in the central area of Lao PDR, contains some of the most biologically rich intact habitats remaining in the country and is home to at least two gibbon species, *N. leucogenys leucogenys* (Northern white-cheeked crested gibbon) and *N. leucogenys siki* (Southern white- cheeked crested gibbon) classified by the IUCN as globally endangered and data deficient, respectively (IUCN 2006). The eastern boundary of this province lies within the Annamite mountain range, separating Lao PDR from Vietnam. Because of its rugged nature, the habitat, which is primarily moist evergreen forest, is relatively intact and under-explored. Five new mammal species have been discovered in the area in recent years. The landscape harbors important populations of highly threatened wildlife, including the Saola, Francois's langur, Crested argus, the Indochinese and Chinese three-striped box turtles, and the two species of endangered gibbons mentioned. The landscape also supports a small, but ecologically important population of Asian elephants.

Within this province, there currently exist three protected areas considered to be globally significant to gibbon conservation.

a. The Nam Kading National Protected Area (NKD NPA), 167,400ha. Recent surveys identified the presence of both N. leucogenys leucogenys and N. l. siki within its forests (WCS, 2013).
b. The Phou Chom Voy Provincial Protected Area (PCV PPA), 22,000ha. Recent survey of gibbon populations (WCS, 2013) revealed alarmingly low population densities within the core habitat of this area as a result of a number of unchecked threats.
c. The recently declared Phou Si Thone Endangered Species Conservation Area (PST ESCA), 14,186ha, Figure 1.

The PST ESCA has never been surveyed for gibbon species. It is situated entirely within the globally important Annamite mountain range and has significant potential to hold and protect a core population of crested gibbon species.

In 2010, the government of Lao PDR (GoL) established the PST ESCA primarily to protect one of the world's rarest species, the critically endangered (IUCN, 2006) Pseudoryx nghetinhensis (Saola), first described to science in 1992. Preliminary investigations and reports from enforcement patrol teams operating within the area suggested a large population of crested gibbons, with calls and sightings reported during almost all patrols.

An important consideration in the selection of this study area is that the Wildlife Conservation Society (WCS) is currently working in partnership with the GoL conservation agencies in developing a strategic management system for PST ESCA, and we are currently involved in providing support for the implementation of a wide range of biodiversity conservation and community related activities on PST ESCA.

WCS has been working with the GoL in Bolikhamxay Province since 2005 as part of the Integrated Ecosystem and Wildlife Management Project (IEWMP), which is a cooperative project between the Bolikhamsai Provincial Office of Natural Resources and Environment, the Department of Forest Resources Management, and WCS.

As a result of this partnership there exists real potential for PST ESCA to become a core conservation area, not only for the critically endangered Saola, but also for critically endangered gibbon groups and habitat areas supporting these species.

This project aimed to build the capacity needed within local, provincial, and district staff to conduct status surveys of gibbon species within this key habitat in order to add to current scientific information needed to better understand broader gibbon ecology, and to refine current conservation programs and activities at PST ESCA.

3. Site location

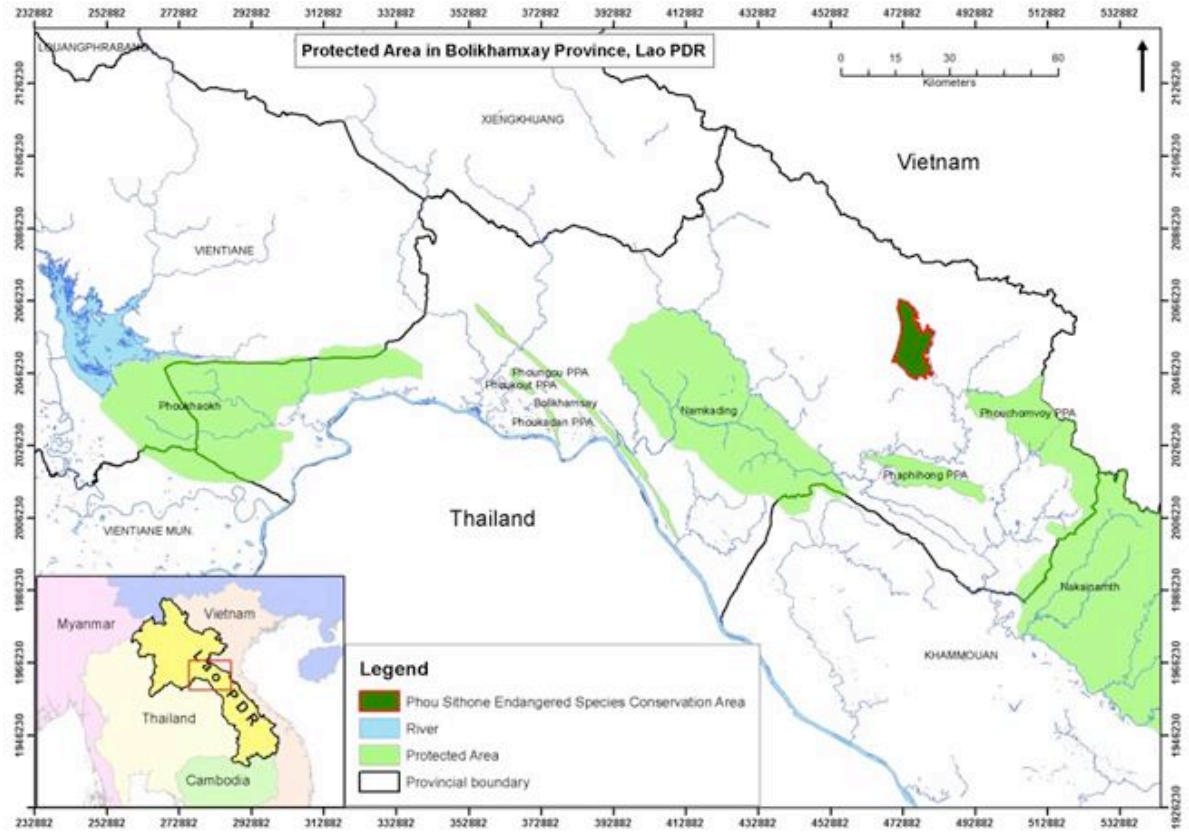

Figure 1: Location of PST ESCA in Bolikhamsai Province, Lao PDR

4. Activities undertaken to achieve each objective.

1. Develop the methodology needed to carry out gibbon surveys within PST ESCA and other areas in Laos PDR.

The methodology chosen for the survey was the auditory survey (point) approach. In preparation for the survey, the following steps were followed.

- Current data on gibbon groups inside PST ESCA were gathered from our enforcement patrol teams working within the PST ESCA (Figure 2, Gibbon observations).
- GIS layers were developed to identify key gibbon habitat as well as areas most likely to contain gibbon groups (Figure 2, suitable gibbon habitat). Parameters used in this development process included:
    - Habitat type
    - Habitat condition
    - Habitat connectivity
    - Buffering around roads
    - Buffering around villages
    - Slope

This resulted in a map for PST ESCA showing the most suitable habitat for gibbons. The area was originally extended to include important gibbon habitat outside of the PST ESCA boundary. Given the level of funding available (including co-funding sources), it was necessary to limit the survey to only areas inside PST ESCA. The final location of the priority survey sectors is shown in Figure 2.

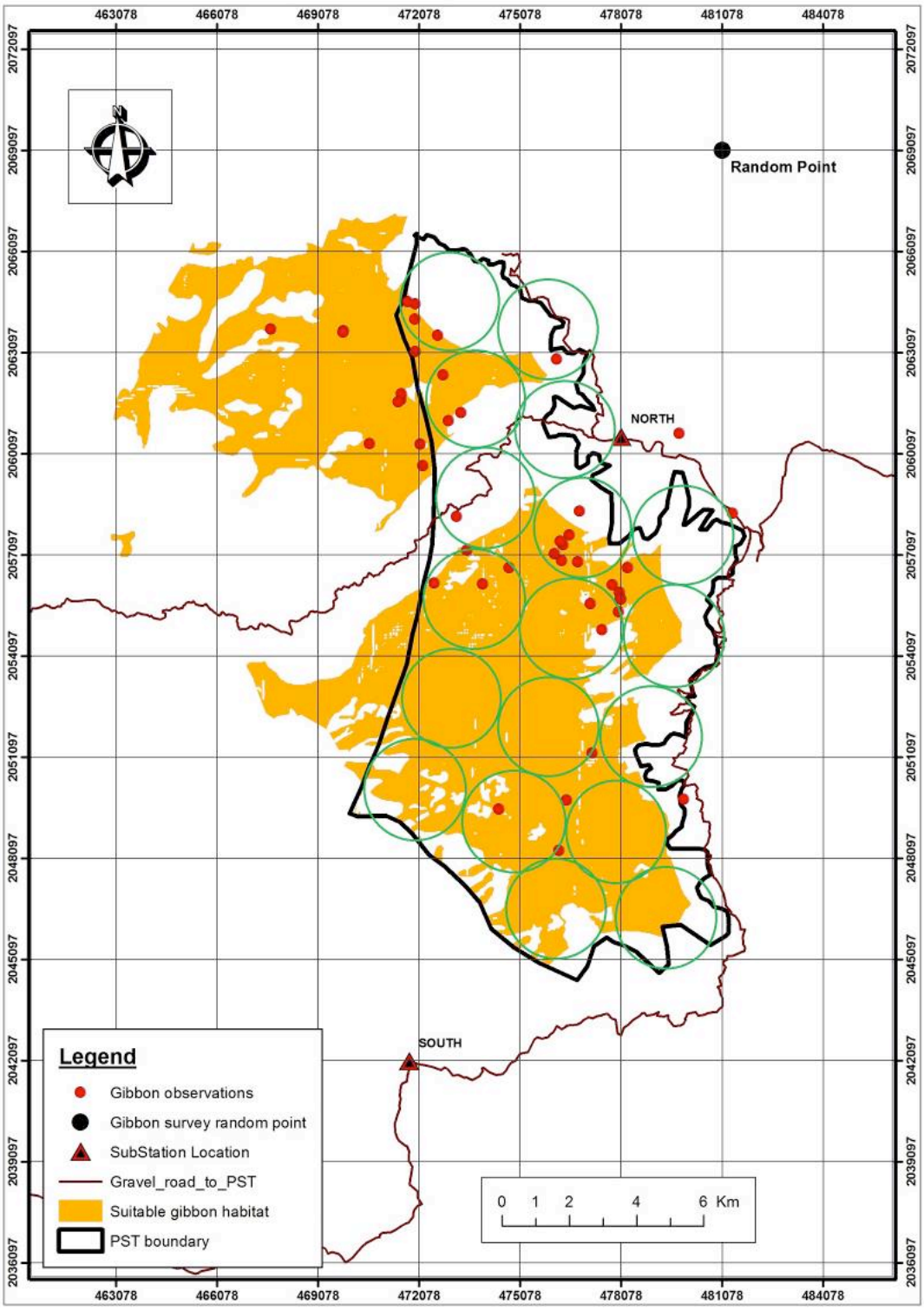

Figure 2: Gibbon observations recorded previously by enforcement personnel in Phou Si Thone Endangered Species Conservation Area, and priority gibbon habitat areas identified using available GIS data, and 18 priority survey sectors (green circles) in PST ESCA.

Survey sectors were set as a circle of 1,500m radius. 1,500m is considered as the maximum distance from the observer that a gibbon call can be heard and its location estimated with any degree of accuracy. (Rawson, 2010)

One of the documented shortfalls of the auditory survey (point) approach (Rawson, 2010) is the location estimation error of actual gibbon groups. This is because the collection of vocalisation distance and bearing data is only gathered from a single point.

In order to reduce this error it was decided to adapt the single point survey methodology by including two additional observation points at each survey location spaced at intervals of roughly 500m. It is expected that the combination of distance and bearing data from these three points will provide a more accurate estimation of the location of a gibbon group and thus reduce the possibility of counting the same gibbon groups twice.

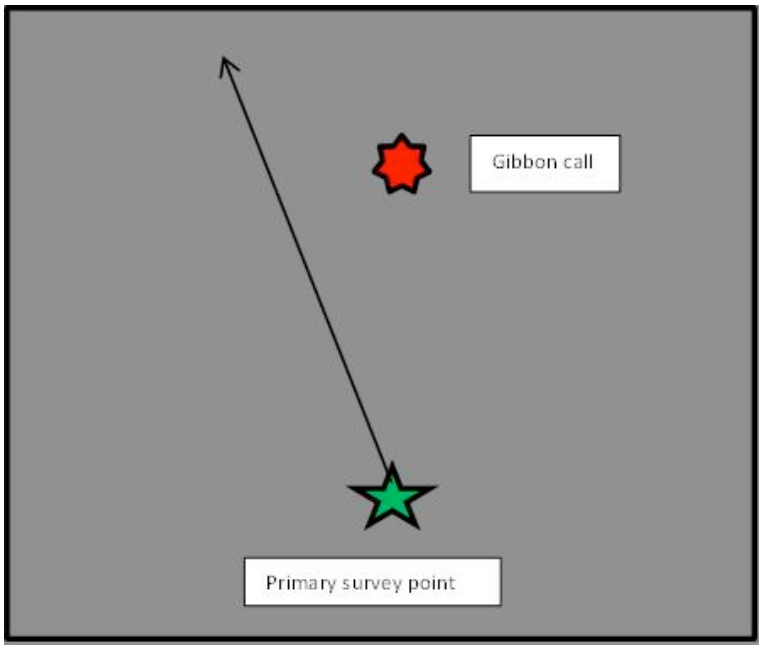

Figure 3: Traditional method using a single observer point

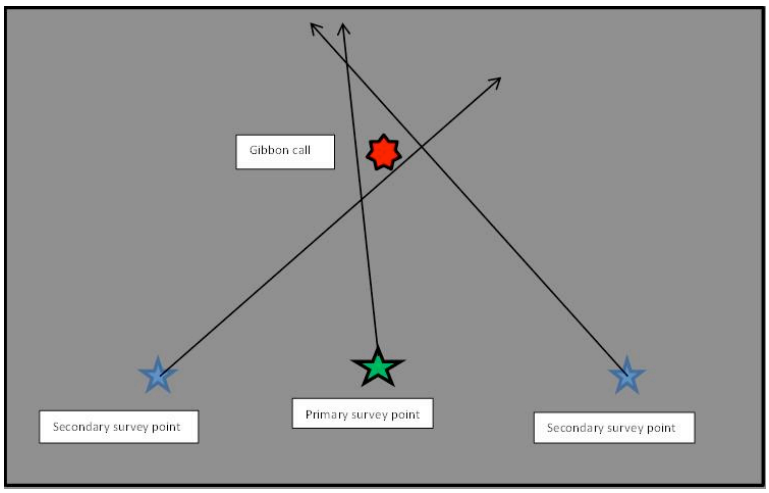

Figure 4: Adapted method using three observer points

The final survey areas thus each contained a primary observation point and two secondary observation points spaced at 500m intervals either side of the primary point.

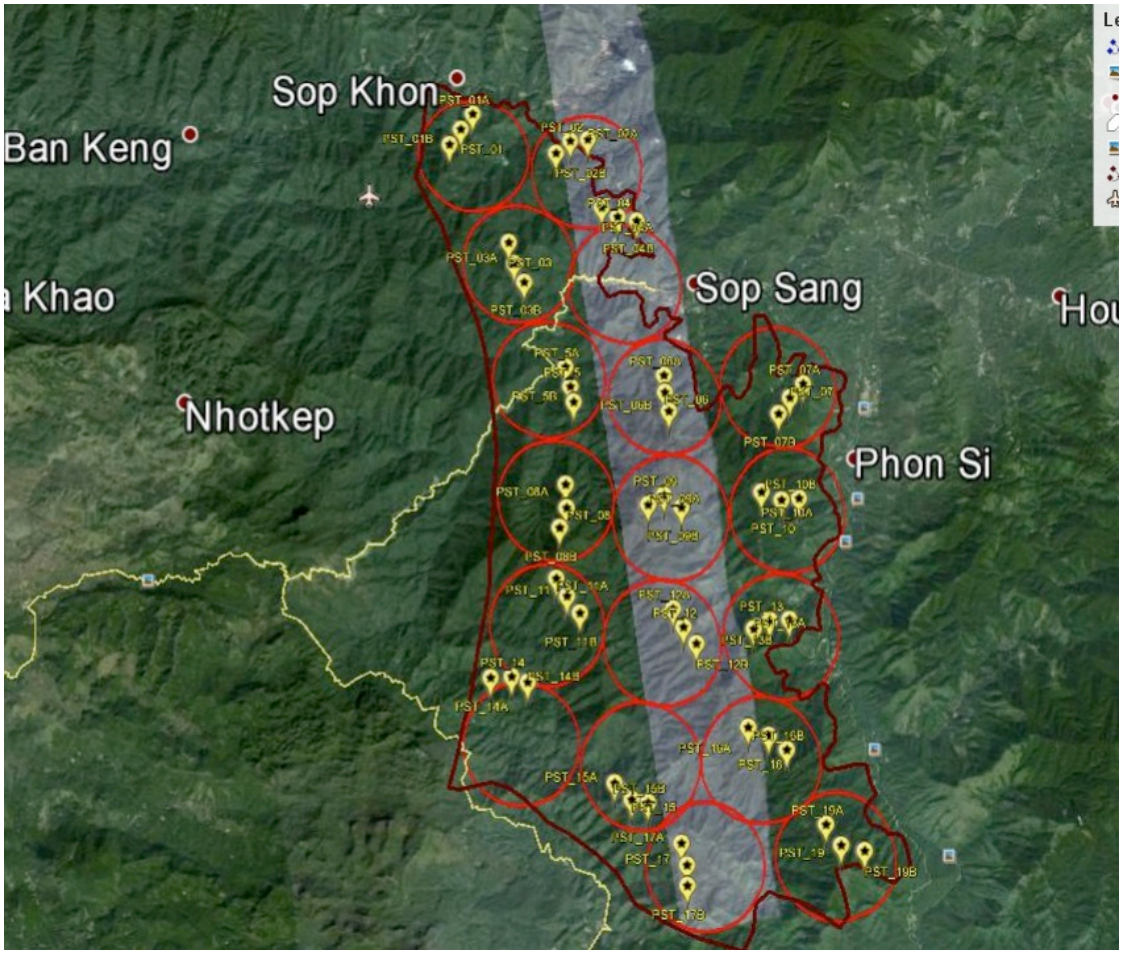

Figure 5: Final location of observation points indicating the three observation points

2. *Build capacity among local, district and provincial staff to implement gibbon surveys within the PST ESCA and other areas within Laos PDR.*

During the period 5 – 10 May 2014 we conducted the gibbon survey training course aimed at developing capacity among provincial and district staff to conduct the survey. A total of 6 people participated in the training; 2 staff from the Provincial Office of Natural Resources and Environment and 4 students from the Bolikhamsai Agriculture and Forestry College.

The training course consisted of the following modules:

1. Introduction to monitoring
2. Introduction to gibbon behaviour
3. Introduction to the survey site and survey methodology
4. Navigation – Map and compass
5. Navigation – GPS
6. Range finding and distance estimates
7. Sonogram recording
8. Field conduct
9. Survey methodology
10. Gibbon survey simulations

All gibbon survey training materials used were updated to include the details of the new methodology and to ensure relevance to the survey area of PST ESCA.

Time was divided into classroom sessions and practical field exercises. The final two days were devoted to gibbon survey simulations using tape recordings of gibbon calls played through speakers hidden in a nearby forest area. These simulations tested the skills that participants had learnt during the training and simulated the actual survey conditions. All participants successfully completed the training.

Village and district officials who participated in survey teams were given 'on the job' training in the field by the team leaders in order to conduct the secondary observation points.

During training we also conducted tests to evaluate the accuracy of the new methodology. Based on the results of our tests we concluded, as expected, that the method using three observers to calculate the location of a gibbon call were more accurate than results using only one observer (Figure 6).

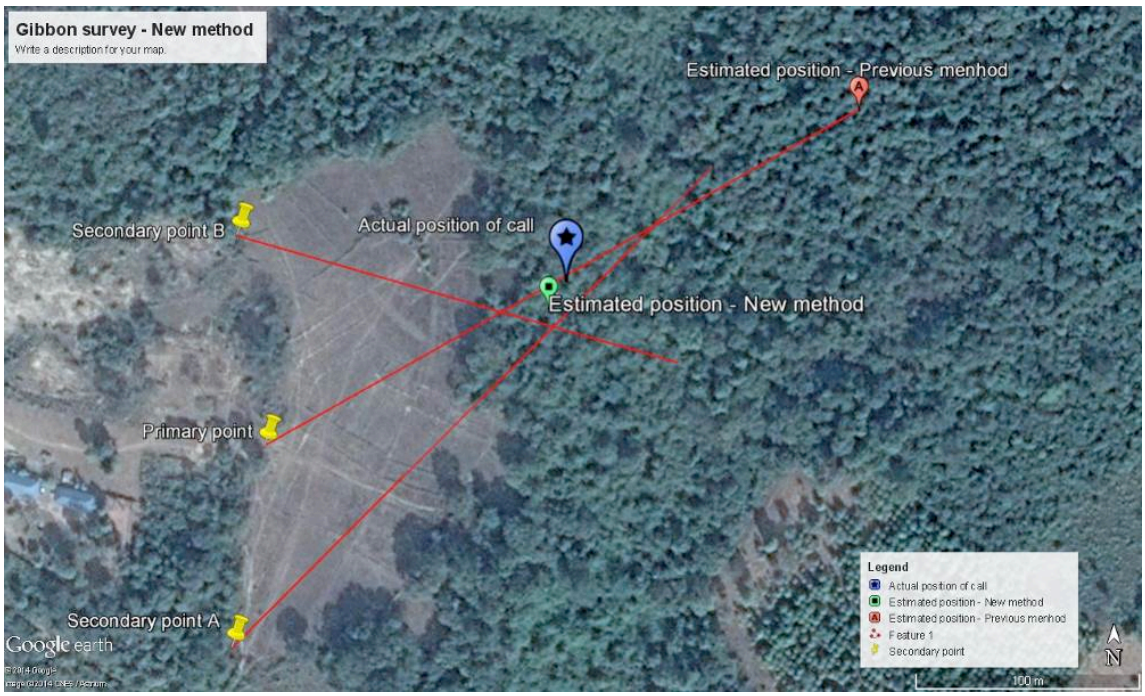

Figure 6: Training results using the new method of survey

Figure 7: Gibbon survey training

3. Implement the gibbon survey on PST ESCA using National staff.

The gibbon survey was conducted from 20 May till 5 July 2015 during which a total of 18 sectors were surveyed. Two survey teams were formed and each consisted of a Team Leader, two students, 2 local community members, and one district official.

Once team surveyed the northern area of PST ESCA and operated out of Ban Phonsi. The second team surveyed the southern area of PST ESCA and operated out of Ban Khamkuna. The teams were resupplied by porters from the local villages at pre-arranged times during the survey.

Each team was allocated nine survey sectors. The highest point (altitude) in each sector was selected as the primary survey point. The location of each primary point was adjusted to ensure a minimum distance of 3km from any other survey point. We also needed to consider the

accessibility by foot and the conditions needed to sustain the team for a period of at least 4 days. Secondary points within each sector were located 500m either side of this primary point.

Teams were instructed to survey each sector for 3 consecutive mornings from 05:00am to 09:00am each morning.

When calls were heard, teams at the primary observation point would record the calls using the sonogram and take distance and bearing information. Observers at the two secondary observation points would only record time, distance and bearing information. All teams collected local climatic conditions as covariate data during the survey time period.

Survey results

The Northern survey team surveyed 9 areas, conducting a total of 27 survey days. They encountered 9 gibbon groups at 5 survey areas and recorded a total of 4 hours and 8 minutes of gibbon calls (Table 1, Figure 8). The Southern survey team surveyed 9 areas, conducting a total of 27 survey days. They encountered no gibbon groups.

Table 1: Northern survey team results

In the table below:

Day = the date of the survey
Survey point = the observation point identification number
Survey day = the first, second or third day of the survey at that survey point.
Gibbon groups heard = Separate gibbon groups observed (calls heard and recorded) For example, on the 28th May, two separate gibbon groups were heard calling, (group A and group B). The next day on 29th May, two additional separate gibbon groups (C, D) were heard, as well as repeat calls from group A.
Call recorded = the length or the gibbon call recordings by the field team on the sonogram.

Day	Month	Year	Survey point	Survey day	Gibbon groups heard	Call recorded (Minutes)
23	May	2014	PST06	1	A	0:15
24	May	2014	PST06	2	B	0:15
25	May	2014	PST06	3	B	0:07
28	May	2014	PST09	1	A	0:22
28	May	2014	PST09	1	B	0:14
29	May	2014	PST09	2	C	0:10
29	May	2014	PST09	2	D	0:16
29	May	2014	PST09	2	A	0:15
30	May	2014	PST09	3	C	0:14
30	May	2014	PST09	3	D	0:19
30	May	2014	PST09	3	A	0:08
2	June	2014	PST05	1	(6A)	0:15
3	June	2014	PST05	2		
4	June	2014	PST05	3	(6A)	0:14
7	June	2014	PST08	1		
8	June	2014	PST08	2	A	0:19
9	June	2014	PST08	3	A	0:10
12	June	2014	PST03	1	A	0:15
13	June	2014	PST03	2	B	0:13
14	June	2014	PST03	3	B	0:07
17	June	2014	PST01	1		
18	June	2014	PST01	2		
19	June	2014	PST01	3		
22	June	2014	PST02	1		
23	June	2014	PST02	2		
24	June	2014	PST02	3		
28	June	2014	PST04	1		
29	June	2014	PST04	2		
30	June	2014	PST04	3		
3	July	2014	PST07	1		
4	July	2014	PST07	2		
5	July	2014	PST07	3		
Totals			**9**	**27**	**9**	**4:08**

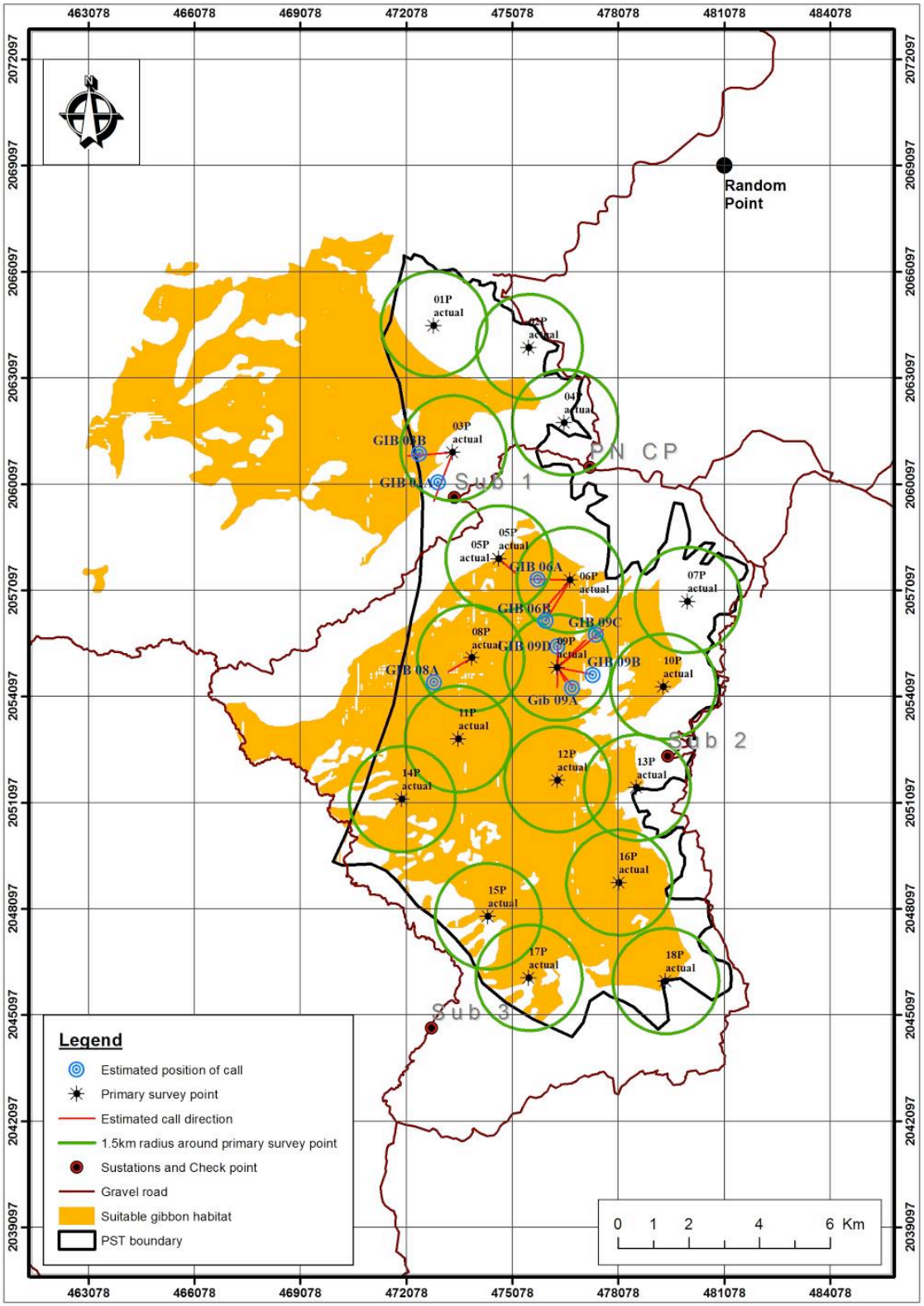

Figure 8: Location of actual surveyed points and estimated position of gibbon groups.

Figure 92: Survey teams conduction activities in the field.

4. Analyse survey results and compile a status report for gibbons in PST ESCA.

i. Gibbon species verification

BY analysing call vocalisations recorded during the survey we confirmed the species of gibbon present in PST ESCA. During the survey more than 4 hours of gibbon calls were recorded by the teams. These calls were analysed by Dr. Julia Ruppel and her findings are presented in Appendix 1.

Vocalisations were analysed by comparing the parameters of call data from 203 song bouts recorded from gibbon populations located in 6 separate protected areas within Laos and Vietnam. The conclusion is that the gibbon population on PST ESCA belong to the **Northern White Cheeked Crested Gibbons** (*Nomascus leucogenys*) species.

This is an important result in terms of confirming the current species boundary between the Northern and Southern species, both of which occur within Boliklhamsai province.

ii. Gibbon density estimate

As discussed earlier in this report, the survey conducted in PST ESCA employed a slightly modified version of the single point observation point method by adding in two secondary observation points within each survey sector. However, the statistical method of analysing this data using secondary points is still in development. Thus for the purposes of this report we employed an analysis using only single point data in order to provide results to the Margot March Biodiversity Foundation.

While results from the multiple point analysis are not expected to vary significantly from the single point analysis, it is expected to provide for more accurate estimation of gibbon group location within the landscape. This is very valuable information when multiple groups are located within a single survey site. Once the analysis has been completed using the multiple point method a short summary will be submitted as an addendum to this report by July 2015.

Survey data from the primary observation point in each survey sector was collated and analysed using the method developed by Tinh and Rawson 2011.

Results are as follows:

a. Estimated group density

0.146 groups per Km2
(95% confidence interval: 0.131 - 0.196)

b. Estimated total number of groups in the surveyed area

9.173 Groups in the surveyed area.
(95% confidence interval: 9.00 – 12.274)

c. Estimated number of groups on PST ESCA.

11.962 Groups within the boundary of PST ESCA.
(95% confidence interval: 11.737 – 16.007)

d. Estimated number of individuals within PST ESCA.

Based on a standard group size of 3.5 individuals,
41.87 Individual gibbons within the boundary of PST ESCA.
(95% confidence interval: 41.08 – 56.02)

General discussion of results:

Although both teams were equally skilled and experienced in field activities, no gibbon groups were heard by the team surveying the 9 southern survey sectors of PST ESCA. This result is however not inconsistent with the monthly patrol data received from our patrol teams operating in this part of PST ESCA (see Figure 2) who recorded only single gibbon observations in this sector during the same period. One of the possible reasons for this is as follows,

During the Mu Mat survey (*Luu Tuong Bach and Rawson, B.M. 2011)* data revealed a significantly higher density of gibbon calls at higher altitude than at lower altitude. (.051 Gibbon groups per km2 at >700masl and .271 groups per km2 at <700masl)

While the sample size of the PST ESCA survey data is too small to adequately demonstrate stratification due to elevation, it is interesting to note that more than 70% of calls were heard at sites above 1200 masl.

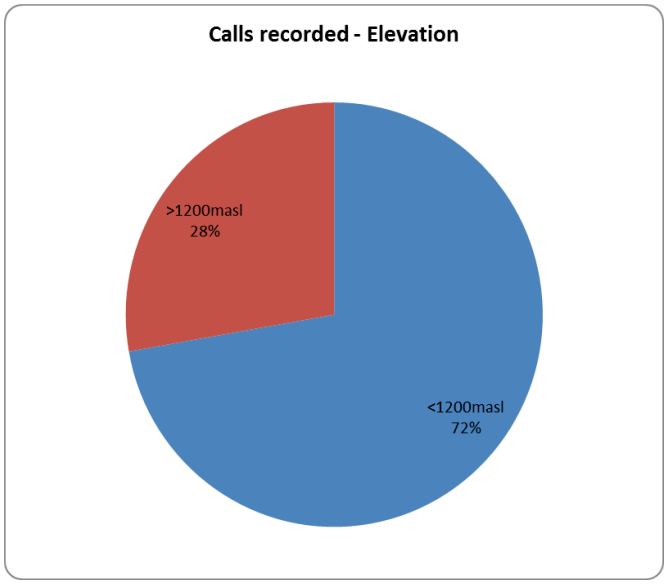

Figure 3: Evaluation at which calls were heard.

The southern team had NO sites with elevations above 1200m.

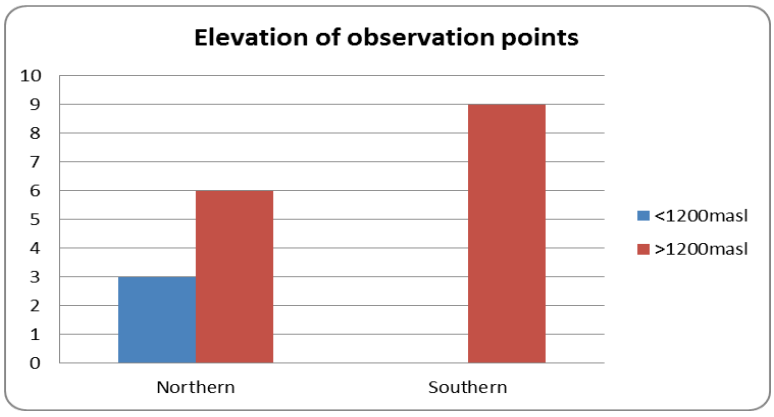

Figure 4: Elevation of survey points.

This is one possibility, while other potential reasons are higher levels of hunting in the south of PST ESCA or climate variations between the two sectors during the survey. There is however insufficient data to test these possibilities with any level of confidence. We will continue to monitoring these populations thought the SMART enforcement data brought in by the enforcement teams on a monthly basis.

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When comparing PST ESCA gibbon density (0.156 group/km2) with those of Pu Mat PA approximately 49km NW of PST ESCA in Vietnam (0.161 groups/km2*) and PCV PPA approximately 35km east of PST ESCA in Bolikhamsai (0.029 groups/km2**) it is clear that densities in PST ESCA are similar to those found on the Pu Mat PA. Densities in PCV PPA are far lower than those found in both Pu Mat PA and PST ESCA (Figure 12).

**Luu Tuong Bach and Rawson, B.M. 2011*
***WCS internal report 2013*