Project:

The snaring disaster and optimistic solutions for in situ wildlife conservation in Vietnam and Laos

Final Report

Project Overview

1. CLP project ID & Project title: 03121520 - The snaring disaster and optimistic solutions for in situ wildlife conservation in Vietnam and Laos
2. Host country, site location and the dates in the field:
   Vietnam, CYS National Park: 19 December 2020 – 4 February 2021.
   Laos, Khoun Xe—Nongma National Protected Area: 4 December 2020 – 5 April 2021.
3. Institutions involved: Colorado State University, Nong Lam University, Chu Yang Sin National Park Management Board, Southern Institute of Ecology, Saola Foundation, Saola Working Group, Asian Arks.
4. Overall aim: Close critical knowledge gaps on Threatened species' vulnerabilities to snaring and hunters' snaring methodology
5. Full names of author(s): Minh Thi Anh Nguyen, Chanthasone Phommachanh, Quy Tan Le, Phonesouk Chanthalavong.
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7. Date when the report was completed: 8 January 2023

Table of contents

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We would like to convey our thanks to Dr. Joel Berger of Colorado State University, Tran Van Bang of Southern Institute of Ecology, Robert Timmins of Saola Working Group, Dr. Hannah O'Kelly of Asian Ark for help advising the project as well as provide all our team members the best working conditions and supports to conduct the project.

We thank Chu Yang Sin National Park and Khoun Xe Nongma Provincial Protected Area for giving us the consent and support to work in your protected areas.

Especially, we would like to sincerely thanks for the endless support from the Conservation Leadership Program, who not only simply provided us with funding but also gave us a lot of opportunities including trainings and consultations to develop our own capacities.

Section 1

Summary

The project comprised of various activities including interviews, meetings with management authorities and two key camera trap surveys in CYS National Park, Vietnam and Khoun Xe—Nongma (KXNM), Lao PDR. The key contribution is to our understanding of the snaring impact on Large-antlered Muntjac (*Muntiacus vuquangensis*) and other species in the Annamites derived from assistance of hunters, who helped based on their experience in setting camera traps rather than real snares. At the same time, it is expected to gain extra knowledge on factors determining the locations that hunters chose to set up snares, and economic gains as well as motivations from snare hunters. Nevertheless, the Covid-19 pandemic caused key changes to our surveys including delaying and shortening surveying time, increasing human labor requirements, and patrolling effort in the survey area to protect the camera traps from being stolen and destroyed by thieves. We were able to consult with our project's advisors on solutions and were able to finish conducting all the surveys and other project activities. In addition, we employed a new method of camera trapping, which is taking us longer time to record and standardize analyses for the camera trap data we recorded. Therefore, we are doing our best to provide a preliminary analysis of the project results in this report.

Introduction

Large-antlered Muntjac and other Annamite endemics species are threatened by intensive snaring. Some species are more susceptible than others. Snaring is not being effectively managed even in protected areas. A central problem is a lack of understanding of how snare densities and targeting patterns affect animal population viability and how poachers and their snares can be effectively controlled. No single project can provide a solution to this complex and challenging issue. Our project will

Fig. 1 Large-antlered Muntjac dead by snare (Credit: W. Robichaud)

fill a crucial knowledge gap; the first step is to understand better the relative vulnerability (capture 'probability') of different species as well as how hunters operate and their motivations. Real benefit to wildlife will be achieved by engaging other conservation partners and the management authorities of the protected areas in our study and working with them to develop better conservation strategies. We also engaged local community members and other local stakeholders to increase their conservation awareness. Together we hope these actions will reduce snaring impact in study areas, increase conservation awareness of the conservation needs of Large-antlered Muntjac and other threatened species of the Annamites and raise their profiles Globally.

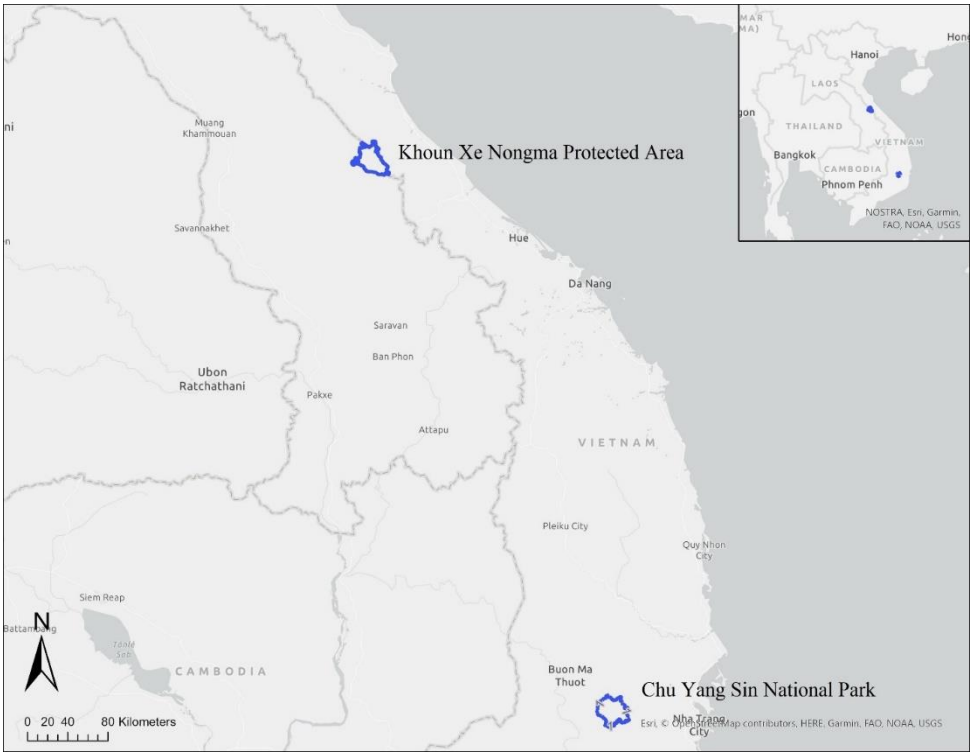

Fig. 2 The project's activities were conducted in Khoun Xe Nongma Provincial Protected Area, Lao PDR and Chu Yang Sin National Park, Vietnam, where there are still reasonable populations of Large-antlered Muntjac for each country.

Our project took place in Khoun Xe Nongma Provincial Protected Area (KXNM) in Lao PDR and Chu Yang Sin National Park (CYS NP) in Vietnam (Fig. 1). CYS NP (12°52′37″N 108°26′17″E) is located in southeast Dak Lak Province in Southern Vietnam with an area of 590 km^2. It covers part of a still extensively forested landscape in the Southern Annamites and is connected to several other protected areas such as Bidoup – Nui Ba NP on the south. KXNM was granted provincial conservation status with an area of 68,000 ha in 2006. It is located in Bualapha District, central Laos, in eastern Khammouane Province. It has a joint border with Phong Nha Ke Bang Natural World Heritage Site in Vietnam to the east, Kato, Nam Chala focal development zone to the west, Laving Laveun PPA of Savannakhet Province to the south.

KXNM is one of only two places that still have a reasonable population of Large-antlered Muntjac in Lao PDR. In Vietnam, CYS NP is adjacent to Bidoup Nui Ba National Park to the south and

Phuoc Binh National Park to the east, and Hon Ba Nature Reserve to the southeast. Together, they form the biggest corridors of protected areas in Vietnam, which also give hope that Large-antlered Muntjac still persist in CYS NP. In addition, Large-antlered Muntjac was only recorded in CYS NP in 2009, therefore it's important to know whether this species still persists in the park to make a better conservation plan on Vietnam side. Therefore, it's reasonable for our project to assess the snaring impact on Large-antlered Muntjac and other wildlife populations in these two protected areas. In addition, our key partner, Nong Lam University and the Asian Arks, Saola Working Group and Saola Foundation were interested in supporting us in obtaining the permission for the project, which was very encouraging for us to conduct the project.

Project members

Minh Thi Anh Nguyen

Minh Nguyen is currently a Vietnamese conservationist, and her work focuses on endangered mammals in Vietnam and Lao. Minh has had a strong passion for nature and wildlife since she was small and has always been proud of the wonderful wildlife diversity in Vietnam. Minh is especially interested in field surveys where she can fully enjoy nature, figure out directions for her conservation work and help tackle current problems towards wildlife conservation in her country. She's currently pursuing a PhD degree at Colorado State University to empower her strength and ability of protecting the Annamites' wildlife.

Chanthasone Phommachanh "Olay"

Olay is biodiversity survey specialist and Lao national with extensive experience in leading field-based biological monitoring teams in the forests of the Annamite range. He is now the Laos Programs Director of the Saola Foundation and a member of the IUCN Species Survival Commission

Quy Tan Le

Quy is a Vietnamese field biologist and a researcher at the Center for Zoological Research and Conservation at Southern Institute of Ecology. His research interests include the diversity, abundance, and distribution of ungulate species in Vietnamese tropical and coastal forests, and their tolerance to human disturbance. He is also active on the university campus to recruit biology students to engage in mammal conservation efforts in Vietnam. He is currently a graduate student of Ecology at the University of Science, VNU-HCM.

Phonesouk Chanthalavong “Hamnoi”

Hamnoi is from Champasak Province, south of Laos, LAO PDR. He’s a data manager and field assistant with 7 years of experience in the survey of wildlife using camera trapping. He studied environmental technology at the National University of Lao for my bachelor’s degree in 2015. His thesis was on using camera trapping for a survey of wildlife in the Phusithon Endangered Species Conservation area, Lao PDR. After graduating he worked as a research assistant for a carnivore study project in Nam Et-Phou Louey National Park, Lao PDR. Then he spent 4 years with the IUCN Saola Working Group as a field assistant in the Annamite range in Laos, and he also worked for Asian Arks as a technical coordinator of wildlife monitoring and law enforcement in the Khoun Xe Nongma Provincial Protected Area. Currently, he works with Saola Foundation as a technical team leader.

Section 2

Aim and objectives

Aim: The central objective is to help close critical knowledge gaps on Threatened species vulnerabilities to snaring, hunter's methodology of snare set up, and their motivations, which will aid in design of effective enforcement strategies.

Objectives:

1. Threatened species vulnerabilities estimated through calculation of frequency (encounters/day/fake-snare) and capture probability ('captures'/encounter) and where possible off-take (individuals/day/fake-snare) of muntjacs and other species that encounter fake-snares, and predictions made of species most vulnerable to snaring in the Annamites.

2. Better understanding of factors and useful correlates determining the location of snares achieved.

3. Estimates of the potential economic gains from snaring made and other motivations of poachers better understood.

4. Field activities, data and results used to engage stakeholders in both countries and internationally to influence effective enforcement strategies and increase conservation awareness.

Changes to original plan

In CYS NP, bad weather and the Covid-19 pandemic interrupted the process of obtaining permission for field surveys as well as the travel between Dak Lak province (where CYS NP is located) and Ho Chi Minh City. Therefore, we had little notice as to when the survey had to start, and we had no choice but to start the survey immediately as soon as permission was granted, which was close to the Lunar New Year (starting from 4 February 2021). Such sudden change caused the camera trapping effort to be shortened to 47 days instead of two months as in the proposal since no one wanted to work over Vietnamese New Year. The escalating hunting activities right before new year also added further risks to camera traps being destroyed or stolen, as well as the safety of the survey team. Therefore, we had to hire more rangers and local people than expected and the budget was higher than expected. In addition, we had to organize the technical meeting earlier than expected (in April instead of in July or August) as soon as the NP could gather with our team for a meeting.

In KXNM, there was also a small delay due to bad weather conditions (one month delayed as originally planned) for the field surveys in KXNM. The restriction to travel caused by Covid-19

pandemic also made us organize the technical meeting earlier than proposed in the proposal (in April instead of July or August). The travel restriction also made it impossible for Minh to travel from Vietnam to Laos for the survey with Lao team members. However, we adapted the situation by many careful discussions and planning for the survey design and implementation online, which helped Lao members feel confident to conduct the survey by themselves.

Finally, our survey method is new which need newly constructed methods for both data recording from pictures and videos of camera traps, and for data analysis. Therefore, it has taken us a lot of time recoding and now analyzing the data. We cannot provide the full analysis but a preliminary one is found in this report. However, we hope to finish the analysis for a publication soon, which will also support our participation in the ICCB conference in Rwanda.

Methodology

Interview survey (support objective 1, 2, and 3):

Five hunters were recruited at CYS NP by using connections through rangers and local people, especially those considered to have a trustworthy voice in the village. A local NP ranger introduced us to the vice head of the Cho village named Mr. Ket, who already joined our first preliminary survey in CYS in August – September 2020. We built a relationship with Mr. Ket and had his help in contacting and finding experienced hunters living in the area. These hunters are very experienced with setting snares in the forests close to their villages. Following them, they don't travel to the forests of other provinces, or even to the core area of the CYS NP to set up snares since far distance need much more effort of snares checking and transporting hunted animals out of the forest. With his help, we managed to be able to approach hunters and successfully hired five who joined our survey. However, since hunting is illegal and a sensitive issue, most hunters said that they are ex-hunters. From our observations, all hunters are very experienced with setting snares. From our observations when working with hunters in the field, the two oldest hunters didn't show much familiarity with the core area we took them to since they didn't go hunting in this area for a long time. They also hunted much bigger mammals like bears by snares more than 20 to 30 years ago. In contrast, three other hunters are younger and very proficient at snare hunting, both single snare and snare line. They also expressed their great knowledge of current wildlife populations in CYS NP. Mr. Ket also let us know one interesting fact that more 20 local people helped carrying our equipment and camping stuffs to the forest are also experienced with snare hunting, which revealed that snare hunting is likely to be a very common hunting method in this area.

In KXNM, we have known very well one hunter named "Phern", who has worked together with us since 2017. Phern recommended other three hunters to us. These hunters were recruited based

on their experience to build both single snare and snare fences in forest areas close to their villages. From our observations from the field, most of hunters chosen are very experienced setting single snares and snare lines for at least 10-20 years (at least few hundred snares were set by them in the forest).

All recruited hunters moved to the field site where we chose from our preliminary surveys before. We applied semi structured interview technique with open-ended questions, providing the hunters the chance to express all their ideas and opinions. Such questions gave us the opportunity to learn deeper about the topic than the hunters shared. In addition, these answers helped us connect to other questions, which made the interview happen naturally as a conversation. Since there is a lot of sensitive information that we needed to obtain from the hunters, we divided our interviews into many different sections. Depending on the level of comfort the hunters felt, which tended to increase with the time length of the survey, each section was chosen to ask at different times. For example, during our move from the local village to the camp site, we utilized this time to ask about the background information of each hunter to get familiar with them. A formal interview on how each hunter set up snares was then asked during the first dinner at the camp as pre-information to evaluate later information that hunters provided us while we searched for places to set up snares. Sensitive information about the wildlife off-take and economic gain was asked on the last days in the field. Details of our interview questions are provided in Appendix 1. The order of interviews for each section is described in detail in figure 2. In CYS NP, since the survey was very hectic, we couldn't conduct the interview following this process strictly. However, we were flexible in choosing the appropriate time to ask when walking with a hunter to search for a good snaring location (one whole day). For each hunter, we spent one whole day in the forest to work with them. Therefore, each hunter was interviewed independently.

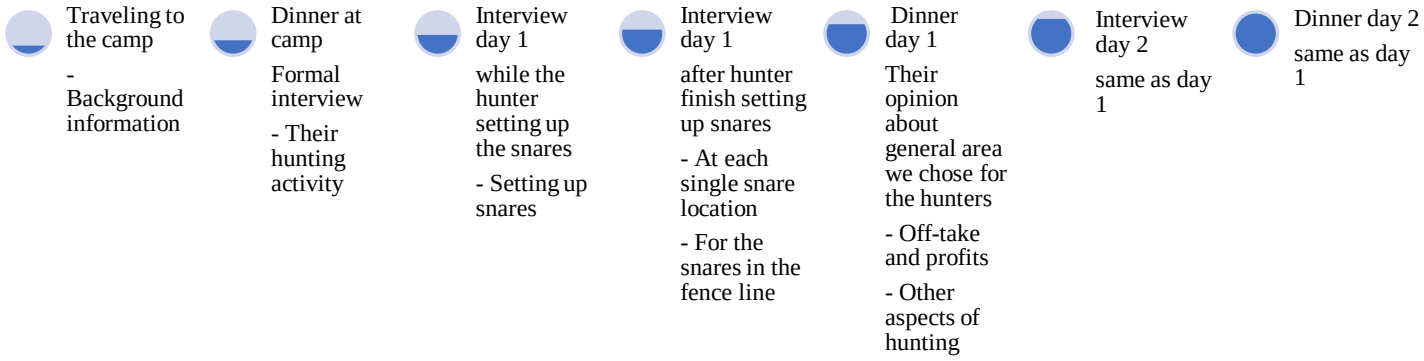

Fig. 3 The interview process includes different sections of information were asked at different time during the field trip to make the hunters feel the most comfortable to share information with us.

Camera trapping survey (support objective 1):

Setting up the snare line (Fig. 3): We conducted two camera trap surveys at each of the three study areas Chu Yang Sin NP and KXNM (Fig. 1). All field surveys were coordinated with the hunters in as realistic a way as possible to emulate real hunting trips to establish snare lines. Hunters made all decisions on placement and construction (except for the broad area in which the fieldwork was undertaken) to ensure that subsequent data collection reflected behavioral decisions when animals confronted snare fences. For our sampling purposes however, snares were purposefully deactivated to not cause injuries to animals.

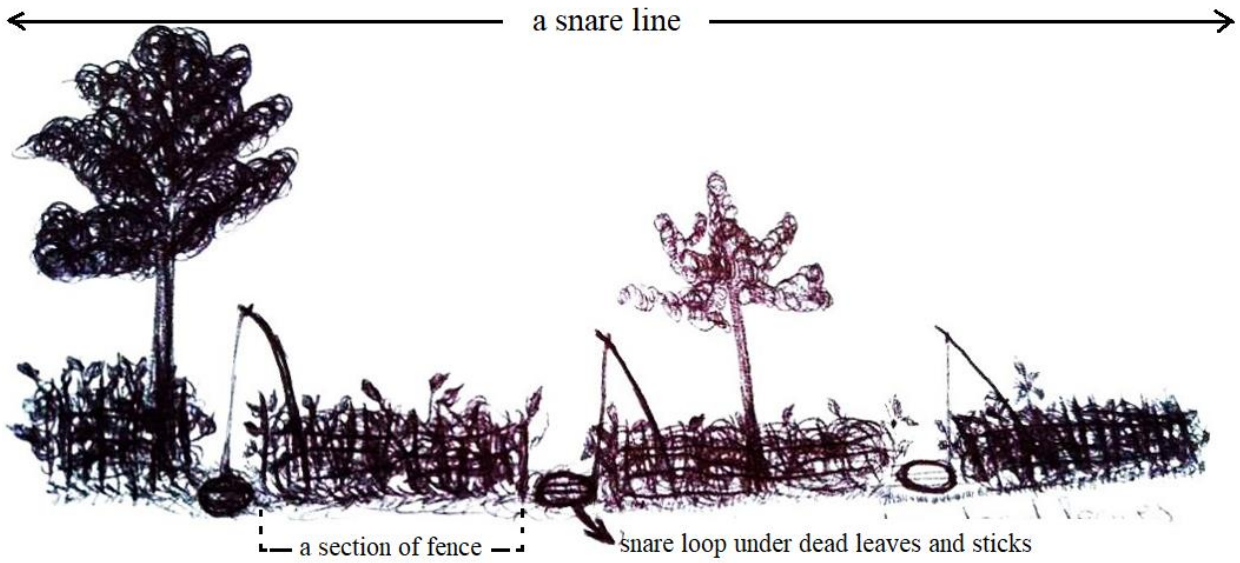

Fig. 4 A snare line is constructed by multiple sections of fences and gaps. Fences are built by the forest undergrowth to stop animals from passing through. At each gap, a snare loop is deployed and covered under dead leaves and sticks to prevent the animal from recognizing it.

Setting up the cameras (Fig. 4): Cameras were subsequently set up to observe the snare gap and the snare fence (Fig. 4). For each snare gap, two cameras were set facing each other. Cameras were about 2.5-3 m from the snare and at about 45° angle to the snare line, to limit photo delay missing the moment when the animal crosses the snare, but sufficiently close to witness if an animal put its foot in a snare. Each successive snare along the line also had two cameras in the opposite pattern and so on. These cameras (Moultrie/Covert/Browning) were set to Video mode, triggered for 10-second-long video and the delay was set to minimum between the triggers (between 0 to1 second). One camera per section of fence was also set to see if any animals were walking alongside the fence. This was on the side of the fence where the adjacent cameras to this camera (focused on the snare) were both at 45° facing away from this camera. This camera was set to photo mode, triggered for a maximum of four continuous pictures and the delay time between

each trigger was set to the lowest option available for different types of cameras (between 0 to 0.6 second).

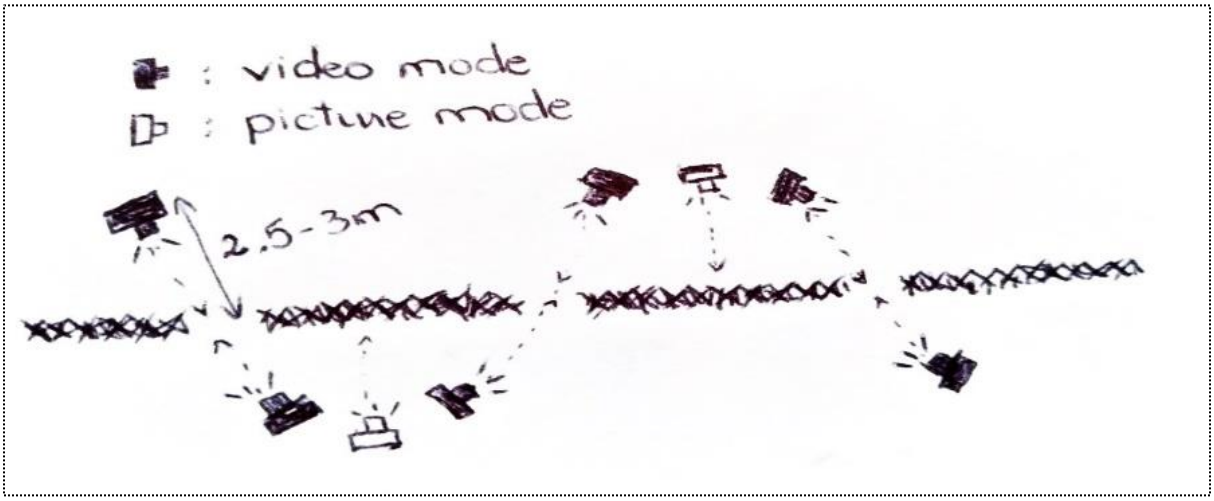

Fig. 5 The top view of a snare line and cameras positions are included.

A total of 102 cameras were set in CYS NP to monitor 35 snare gaps of a snare line, 305 cameras in KXNM to monitor 102 snare gaps (Table 1). The duration of cameras in the field varied by site based on permissions and logistics of individual sites (Table 1).

Table 1: The number of cameras and survey length for treatment and control samples

Sites	**Number of snare gaps**	**Number of cameras**	**Survey period**	**Camera trap nights/camera**
Chu Yang Sin NP	35	102	11 Dec 2020 – 4 Feb 2021	47
Khoun Xe Nongma PPA	102	305	4 Dec 2020 – 5 Apr 2021	97

Fig. 6 Setting up the camera to take video of how the animal walking through the snare gap.

Stakeholders' engagement:

There is no specific method for stakeholders' engagement, but we believed that the awareness and concerns regarding snaring issue will be obtained with "learning by doing." Therefore, we tried our best to be very clear and specific about our goals and our concerns to our international and local stakeholders, and briefly share with them information about the issue. During the implementation of our project, we engaged our stakeholders directly in our project by informing them with meetings before starting the project, involving them directly in conducting surveys and finally shared the results we found with them. The continuous engagement from the start to the end of the project provided them with opportunities to receive information about the issues, then observe the issue by themselves in the field, and finally confirmed their learnt knowledge and experience.

Outputs and Results

Objective 1: Estimating Threatened species vulnerabilities to snaring using camera-traps set a fake snare location.

Since we are still working on recording the remaining data from KXNM, we provide with a part of result from 163 cameras set up at video mode in KXNM. It's not surprising that most species have a very high probability of being captured by snare if they chose to approach the snare line, which is more than 50% (except the Large-antlered Muntjac) (table 2). We anticipated at the beginning of the project that Large-antlered Muntjac would be more susceptible to snare than other species. In contrast, we were surprised that the probability of being captured by snare if Large-antlered Muntjac when it approaches the snare line is lower than other species (p=0.45). Additional data from our remaining camera traps should be able to provide further insight into this unexpected outcome. Other factors that attracted our attention are the number of encounters or the number of times that Large-antlered Muntjac appeared at the snare line and the probability of never being captured by snare. The more encounters that Large-antlered Muntjac were seen at the snare line, even with low probability of being captured per approach, the animal is still having a high probability of being captured. It is obvious with our raw analysis that other than Ferret Badger, Large-antlered Muntjac is the species with highest encounter rate at the snare line (0.2). Then the question will be how many encounters it needs to gain a greater than 99% probability of capture (table 2). The results showed that almost no species can survive a snare line. For Large-antlered Muntjac, it only took an animal 8 encounters or visits at the snare line to have it captured by snare. Here at only one single snare line, the Large-antlered Muntjac appeared more than 255 times.

Fig 7 A sub-adult male Large-antlered Muntjac stepped into the snare gap (between two parallel sticks align along with the snare line).

Fig. 8 A juvenile sambar stepped into the snare gap while feeding.

Table 2. Different probability of being captured by snare given that an animal chooses to approach the snare line and cross the snare gap were calculated based on testing events. All the species are vulnerable to snares since they can be easily captured by snares only after very few encounters at the snare line. Since we didn't set up real snares, we can see the high frequency of different species appearing at the snare line that imply high vulnerabilities of these species to snares.

Species	**Probability of crossing snare if animal approach the snare**	**Probability of captured by snare if animal cross the snare**	**Probability of captured by snare if animal approach the snare**	**Testing events**	**Encounter frequency**	**Probability of never being captured for one encounter**	**Number of encounters needed for an animal being 100% captured by snare**
Annamite striped rabbit	1	1	1	5	0.004	0	
Serow	0.73	1	0.72	12	0.009	0.27	4
Common palm civet	0.92	0.86	0.79	26	0.03	0.21	4
Ferret badger	0.93	0.89	0.82	233	0.22	0.18	3
Hog badger	0.92	1	0.92	22	0.02	0.08	2
Large antlered muntjac	0.57	0.79	0.45	255	0.2	0.55	8

Species	Probability of crossing snare if animal approach the snare	Probability of captured by snare if animal cross the snare	Probability of captured by snare if animal approach the snare	Testing events	Encounter frequency	Probability of never being captured for one encounter	Number of encounters needed for an animal being 100% captured by snare
Mask palmed civet	0.9	0.96	0.86	189	0.17	0.14	3
Sambar	0.73	0.98	0.71	103	0.08	0.29	4
Spotted linsang	1	0.89	0.89	34	0.04	0.11	3
Wild pig	0.73	0.99	0.72	212	0.17	0.28	4
Yellow throated marten	1	0.74	0.74	68	0.07	0.26	4

Objective 2: Better understanding of factors determining the location of snares achieved.

KXNM:

Areas that hunters frequently hunt are far from villages because there is less human disturbance and it is likely to hold good animal populations. Hunters chose a new area to hunt by a combination of (1) looking for a new area to hunt by going to forest to check that the area has a lot of animal signs first and (2) they also sometimes ask recommendations from family/friend/other hunter/other people.

It was recommended that hunters hunt during the rainy season (June–October) because animals are more active and easier to catch, particularly in the snare line. Hunters always work together when using snares. The snare fence always was built like a long fence usually along ridges, ridge-slopes, and tops. Hunters need to work with other hunters to cut the trees for building the fence, which is one of the most important parts of snare line. For single snare and small single snare for civets which is set individually and often targets at a specific species, there can be less people working together but it will be good to be paired in the forest. Hunters usually set up the camp in the forest because it is easy to check the snares and when animals get caught.

The hunters chose a snare location based on fresh/recent animal signs found and obviously the hunters gave importance to areas that included fruit trees, ponds, and mineral licks. The frequency of hunters to check the snares depends on how far from where they set the snares and where they are based. If they set the camp in the forest checking every 1-2 days would be considered. If they are from a village and a bit far from the snares checking every 3-4 days would be determined. Hunters like to leave the snares as long as possible it depends on how often the animals get caught. They will stop checking the snares after 1-2 months when no animals get caught any more.

Table 3. Advantages and disadvantages of each type of snaring (following hunters in KXNM).

Type of snaring	**Advantage**	**Disadvantage**
Snare fence	Many species likely to be caught	More expensive to buy hundreds of snares and a lot of manpower and time needed to complete.
Single snare	Maximize few target species likely to be caught such Wild Pig *Sus scrofa*, muntjacs *M. rooseveltorum* group and included *Muntiacus vuquangensis* and *Muntiacus vaginalis*, Sambar. Not too expensive. No need for more people. Take less time as no cutting a lot of trees	Number of animals that will be caught less than compared to setting in the fence snare line. Likely to forget where to set the snares
Small single snare for civets	Less expensive. No need for more people. Take less time as no cutting a lot of trees	Just only civets will be caught in the snare and low chance to catch the species

At each single snare location not in the snare fence. Hunters always considered the place having fresh/recent animal signs and something about fruits, and pond and mineral lick vicinity. Most hunters target Wild Pig, Muntjacs and Sambar. If animals were caught by snares, then hunters always set up the snares again. For single snare hunters expected that the snares would catch animals daily as they minimized disturbance by cutting just only few trees, but they will check the snares every 3-4 days (medium to large ungulate will survive more than few days).

For the snares in the fence line. The reasons hunters chose the alignment were (1) seeing fresh/recent with high detection rate of animal signs, (2) the presence of fruit trees and (3) ponds and mineral licks found. All hunters built the fence snare line they expected to catch everything. All species would be caught in the fence snare line including small-medium-large ungulate, civets, mongooses, porcupines, small and big cats, bears, ground birds, pangolins, doucs, and macaques. Hunters thought some of the snares in the snare line would be better than others. The one close to fruit trees and fruits falling on the ground this would be the best and the one with pond and mineral lick vicinity would be second respectively. Hunters also thought that snare would be good because of (1) having fresh/recent animal signs, the fruit trees presence and ponds and mineral licks around. Hunters mentioned fruit trees which attracted animals including palm trees and fig trees. Wild Pig, muntjacs and Sambar would be attracted by palm fruits and ground birds and also muntjacs would be baited by fig trees. Hunters expected to catch pheasants in the first few days, a first 10 day would be pigs and muntjacs and when leaves along the fence becomes brown/dry then would be others. Based on interviews, experiences of the hunters indicated at least 70-100 individuals of all species hunters estimated could be caught by all the snares in the snare line. Hunters checked the snares every 1-2 days if they set the camp in the forest. It took 6 days to finish 1,481 m long of the snare line alignment (247 m long, fence was built per day) with 85 gaps (snare locations)(14 snare locations was completed per day on average, 8-19 gaps in ranges) in the snare line.

CYS NP:

Interview data revealed that the most common methods of hunting are snare fence and single snare, though the former is more favored than the latter because of its effectiveness in catching almost all ground-dwelling species. The hunters prefer hunting not so far away from their villages to prevent conflict with the H'mong ethnic who immigrated from the North of Viet Nam. They prefer an area with a lot of footprints and hoofprints as well as close to water resources because they are the indicators of abundant wildlife. Hunters in CYS NP said that they don't pay much attention to fresh animal signs when setting up a snare fence unless it is a for single snare location. However, from our observation, they always looked for animal signs when leading us to a good snaring location. Area with soft soil, not so many rocks, and a high abundance of small trees are important for them because it is easier to set up snares under those circumstances. Steepness is not a factor affecting their decision for a snare fence location, although flat terrain is preferable. In addition, the hunters prefer to set up snare lines at the start of the rainy season since it will help the soil softer to work on. It can be interpreted that while KXNM hunters' answers are more focused on a general area to hunt, CYS hunters' answers shed light on specific conditions where snares can be easily set. A typical hunting trip of CYS hunters should last around 7 - 10 days, and hunters work

in a group in setting up a snare line. After that, they will check the snare line daily or once per week depending on the distance between their camp, or village to the snare line, or how frequently animals will be caught in the snare line.

Objective 3: Estimating the economic gains from snaring and understanding other motivations of poachers.

The main species in KXNM they are trying to hunt including Wild Pig, muntjacs, Sambar, civets, pangolins, and bears *(*Asian Black Bear *Ursus thibetanus* and/or Sun Bear *Helarctos malayanus)*. Wild Pig is the most wanted by hunters because it can be caught easily and quickly, the biggest population compared to other medium-large ungulates, good price and tasty. These species are what species hunters could sell easily. The price of each species is different such fresh meat of Wild Pig will be USD 1.17-2.34 per kg, muntjacs shall be USD 1.17-1.75 per kg, Sambar USD 2.34-2.92 per kg (horn of Sambar costs USD 29.2) and civets and pangolins will be price of individual, adult one USD 11.68 and USD 70.08 respectively (scales of pangolins cost USD 1.17 per kg). The species that make hunters the most profit is alive bears both *(Ursus thibetanus* and *Helarctos malayanus)* as the price USD 584.04 per individual (parts also can be sold including gallbladder and claw USD 292.02 and 175.21 respectively). Gaur is the second most profitable as the price of gallbladder and horn are USD 116.81 and 87.61 respectively (Table 7). The price of each species changed depends on traders and whether the animals are alive or dead. When Vietnamese New Year "Tet" coming, the price of all species will slightly increase. One of hunters, Mr Yen mentioned in last few years until now, surprisingly prices of individual of both pangolins are significantly lower as USD 11.68 per individual but the price of Large Indian Civet *Viverra zibetha* increased to be USD 5.84 per kg—those costs USD 19.86-53.73 (Its weight ranges from 3.4–9.2 kg). It also depends on the condition of animal such fresh or very old meat (strong smelling). The condition hunters can sell each species including if it can be alive or dead. It is also a part of animal and very specific gallbladder/claw, horn, and bone. For instance, only bones of small cats and Red-shanked Douc *Pygathris nemaeus* can be sold USD 5.84 per kg and macaques will be USD 3.5 per kg (Table 7). There are a lot of animals caught but hunters can't sell including Hog badger *Arctonyx collaris* because it is very smelly. Pheasants and rats are likely to be rotten very quickly after being caught in 1-2 days. The most common species that will be caught are Wild Pig, muntjacs and Sambar. On the opposite, the rarest species are Crested Argus *Rheinardia ocellat* and Serow *Capricornis milneedwardsii*. Serow's fresh meat is the same as Sambar USD 2.34-2.92. Hunters didn't provided the prices for other Threatened species such as gibbons (Northern White-cheeked Gibbon *Nomascus leucogenys* and/or Southern White-cheeked Gibbon *Nomascus siki*), Annamite Striped Rabbit *Nesolagus timminsi*, otters, Crested Argus, turtles, and least concerned such pheasants, porcupines, mongooses, and bamboo rats. Hunters estimated a total of at least 68-102 individuals were caught in the snare line of 1-2 km long with ~250 snares.

Table 4. The prices of each species caught and sold from KXNM to local and Vietnamese traders.

Species	Price of individual in USD	Price of fresh meat/kg in USD	Price of body part in USD	Note
Wild Pig		1.19-2.38		
Muntjacs		1.19-1.78		
Sambar		2.38-2.97	29.71	Skull with horn
Civets	11.88			Alive or dead one
Large Indian Civet	20.20-54.66			Recently the price increased USD 5.94 per kg, if its weight ranges from 3.4–9.2 kg
Pangolins	71.3		11.88	Alive one in last five year and scales respectively
Pangolins	11.68 - 70.08		11.88	Recently alive one, the price decreased and scales respectively
Bears	594.17		297.09 and 178.25	Alive one and for gallbladder

Species	Price of individual in USD	Price of fresh meat/kg in USD	Price of body part in USD	Note
				and claw respectively
Gaur			118.83 and 89.13	Gallbladder and skull with horn respectively
Small cats			5.94	Bones
Red-shanked Douc			5.94	Bones
Macaques			3.57	Bones

****Noted the prices are determined by hunters selling at the villages.*

Comparing the interview result with the camera trapping result above for KXNM, it is consistent that species with higher encounter frequencies are more likely to be caught by snares. Wild Pig, muntjac and sambar were reported as commonly caught species, while serow was the least caught species. In our camera trapping result (table 2), muntjac, Wild Pig and sambar have much higher encounter frequencies than serow. It's surprising that the hunters didn't mention much about civets since the encounter frequency for civets is also very high. However, the most important implication from the results showed that almost all ground-dwelling mammals are very vulnerable to snare hunting. If the intensity of snare hunting is still high in the area, we are going to lose the most unique fauna of the world.

In CYS, the main species hunters targeted are Wild Pig, muntjacs, serow, and civets (in order of preference). Interestingly, when it comes to selling, they are less likely to sell muntjacs meat and keep it for household consumption because local people enjoy the animal's meat taste. On the other hand, muntjacs' antlers can be sold. Bears and pangolins are very valuable to sell but they have become rare nowadays, so they are less to be the focus of snaring. Economic incentives from Wild Pig ranging from USD 8.52 to 10.65/kg; pangolin from USD127.82 – 170.43/kg; serow and muntjac fresh meat from USD 3.41 to 5.11/kg; while dry meat being sold for USD 12.78/kg. Additionally, a pair of muntjac's antlers can be sold up to USD 42.61. Civet was sold around USD 38.35/kg; porcupine meat being around USD 12.78/kg (while their gastric can go up from 29.83 – 42.61 per individual due to their presumed medicinal properties). Regarding

investment for snare hunting, the price for a meter of the wire is quite cheap, around USD 0.11 (for buying 300 snares) and USD 0.17 (for buying 100 snares).

In comparison with the price for caught wildlife from KXNM, the cost in CYS is 4 to 7 times higher for Wild Pig, and approximately 3 times higher for muntjac meat. In addition, the result from the interview survey also reflects higher hunting intensity in Vietnam in the past many years that causing the bear and gaur population becomes much rarer while bear and gaur are still expected to be caught and sold at a high price in KXNM. Therefore, high profit can be earnt from Vietnamese traders (even still much lower than the price for wildlife in Vietnam) and less wildlife in Vietnam, it's not surprising that there is a strong wave of hunting from Vietnam to Laos. It's more obvious when the hunters in KXNM reported the price of selling wildlife to not only Laotian but also Vietnamese traders.

Objective 4: Engage stakeholders nationally and internationally to influence effective enforcement strategies and increase conservation awareness.

The major advantage that our project brings to KXNM and CYS NP is our collaboration with local and international organizations working on the wildlife conservation of these two protected areas. In KXNM, Asian Arks, Saola Working Group and Saola Foundation have many long-term projects in protecting this area from illegal hunting. More specifically, they have been conducting many camera-trapping surveys from 2017 until 2022 to search for Saola. They also set up patrol teams to patrol every month and check for any signs of illegal hunting, retrieving snares. Our work is a very first step in helping inform them about the destructive impacts of snare hunting and providing them with a better idea of how intensive their management needs to be. We hope this first step will be the base for the next study on identifying the snaring threshold that such organizations can base on to assess their effectiveness in control snaring issues. In CYS NP, this area is a national security sensitive area, which didn't allow any international organization to come and work in this area since 2010. From our discussion with WildAct, a local NGO, they want to build up patrol teams for this national park to address illegal hunting issues. After our surveys, we informed WildAct on priority sites in CYS NP that need a focused and intensive protection effort.

Regarding local governments, we organized many meetings to inform them about our work before the project started as well as meetings right after we finished our surveys. The first meeting in CYS NP was in August 2020, which involved one director, one technical staff, and one ranger to discuss the project's objectives, methods and expected outcomes, and how to gain permission for the CLP project. From this first meeting, the director, staff and even rangers of CYS NP showed that they were not aware of snare hunting being an issue. They were very determined that their area doesn't have snare hunting. Only during the survey, rangers and the CYS NP staff observed many snare line and recognized the seriousness of this issue. We then had a second meeting with two technical staff and six rangers in December 2020 to discuss the objective and the plan for camera trapping surveys and how the CYS NP's staff and local communities would be involved in the survey. Finally, a technical meeting was held on 2 April 2021 with the participation of 30 people from the NP, including the vice-director and 29 technical staff and rangers, to present preliminary results from the camera trapping surveys. The meeting provided CYS NP not only

with interesting results and the species we recorded but also the seriousness of how snare hunting is threatening the wildlife population in CYS NP, especially the Large-antlered Muntjac. In our first workshop on Large-antlered Muntjac conservation in Vietnam (August 2022), the director of CYS NP participated in the meeting and enthusiastically raised his concern toward the issues of snare hunting and Large-antlered Muntjac conservation, "Located in a border province, our national park is subjected to limited access to international sources of funding, resulting in the lack of human resources and technical expertise to update the status of endangered species, such as the Large-antlered Muntjac. Evidence-based policy to successfully safeguard these species, therefore, cannot catch up soon enough to address the problems. Regarding snaring, increasing removal efforts alone won't lead to a big reduction in the number of snares in protected areas. Sustainable livelihood improvement schemes must have to follow." His concern means that we successfully raised the awareness of the national park about the snaring issue as well as the conservation of Large-antlered Muntjac.

Fig. 7 The first national workshop on Large-antlered Muntjac conservation having the participation of the Ministry of Agriculture and Rural Development, national parks, conservation NGOs, research and conservation institutions. We utilized our result from Chu Yang Sin National Park to present about the status of Large-antlered Muntjac population in Vietnam as well as the serious impact of snaring issue.

In KXNM, prior to the fieldwork in February, the scope and objectives of the CLP project and survey activities were discussed with our collaborating partners, Saola Working Group, Saola Foundation, Asian Arks, and Department of Forestry (DOF), Ministry of Agriculture and Forestry (MAF). Other meetings also were held before the fieldwork with government staff from the Provincial Agriculture and Forestry Office (PAFO) and border military of Khammouan Province, with at least 6 key people, to discuss objectives, methods and expected outcomes. Protected area

patrol team members supported by Asian Arks (8 rangers) joined the survey and conducted patrols in the camera-trapping area to provide additional security for the cameras and our survey areas.

At the end of fieldwork, we organized a technical meeting on 12 April 2021 with the management authorities (including PAFO and DAFO to inform them about our initial CLP survey's results).

Communication and application of results

The most practical application of the results has been described clearly in the outputs of the stakeholders' engagement. Our results were used to inform our collaborator including Asian Ark, Saola Foundation, and Chu Yang Sin National Park about the destructive impacts that snares cause to wildlife, therefore, we need to have a clear strategy on how to enhance their effort in patrolling and snare removal. In details, they need to identify priority areas to focus their intensive effort on instead of spreading their effort, or "chasing after the hunters". Especially, the preliminary results were used to update and inform about the status of Large-antlered Muntjac population as well as the snaring crisis to the Vietnamese government, conservation NGOs and institutions. Whereas in KXNM, the survey results were used to enhance the patrol effectiveness.

In addition, we hope to publish our results soon, both in a scientific journal and public media or news to engage the public further into addressing the snaring crisis as well as the need to pay more attention toward wildlife conservation in the Annamites.

Monitoring and Evaluation

The project leader is the person who helps inform the team about the flow of the project activities, as well as their progress. We worked together to plan on how to obtain the permission and conduct the project's activities with the conditions that we had. During the implementation, we informed each other about the progress of the project activities through different channels, including emails for heavy files or important files (survey plan, budget) and WhatsApp. Photos and raw data were recorded and uploaded on One Drive to let all members have access to them. Since we were very good at informing each other about the progress of the activities we were responsible for, we could easily keep track of what we finished and did not finish. Field reports, raw data, and communication with our stakeholders are the best way for us to evaluate the effectiveness and quality of our project's activities. For example, the interview survey we conducted for hunters in CYS NP was not planned very well for when we should ask different set of questions. Even though we were able to manage to ask the questions following our situations with the hunters, it is a lesson learnt for our next survey on how we should plan to conduct the interview survey.

Achievements and Impacts

From our last preliminary report, we are still working on the data analysis to obtain the bigger impact since this is the most important outcome of our project. Therefore, we don't have many more achievements and impacts from the one we listed in the last preliminary reports except two new achievements listed in bold.

- Our project's biggest impact will come mainly from the results of our data analysis since it will show how snares impact different ground-dwelling wildlife, especially Large-

antlered Muntjac. This result will help inform effective conservation management strategies. Even though we are still in the process of standardizing our data analysis, by conducting the project's activities, we have had various achievements:

- We demonstrated that Large-antlered Muntjac are still present in CYS after their first record in 2009 even though our survey area is very small, only along 280 m of snare fence. The fawn recorded by camera trap implies that the Large-antlered Muntjac population is still breeding in CYS NP, which is a very encouraging sign for the conservation of the species in Vietnam. The result also helped raise much more conservation attention, especially from the CYS NP and higher-level government agencies, to this important area with the presence of a Critically Endangered and endemic species. In addition, the records of Large-antlered Muntjac in CYS NP helped contribute greatly to the understanding of the snaring impact from heavily hunted areas (in comparison with KXNM with less hunting) on this Critically Endangered species.
- We enhanced knowledge and nature appreciation in the managers and staff at CYS National Park, especially concerning the species present, their significance and status. The NP technical staff informed us that there was no information on the presence of ground-dwelling large mammals in CYS NP since the last survey in 2009 by Birdlife. The lack of information caused a lot of confusion in the wildlife management strategies for the NP since they don't know where they should focus their protection efforts on. They can only conduct the patrolling sometimes in the forest to check the hunting activities, but mainly to inform the hunters of illegal activities, which is clearly not so effective. Their current effort and knowledge can check on the presence or absence of trees (rare species are marked) but cannot check on the presence of absence of the wildlife. Therefore, the NP was very curious about our camera trapping results. The NP's eagerness in learning about which species are presented in the NP, was another reason the technical meeting was organized earlier in April. After showing our list of species and some camera footages of wildlife, the vice director and other 31 participants were in awe that Large-antlered Muntjac still present in CYS NP and how beautiful and interesting to see the wildlife clearly on our pictures and videos. They even took pride to file a report to the Department of Agriculture and Rural Development of Dak Lak province to earn more conservation attentions to the NP.
- We increased awareness in CYS National Park of the snaring impact and the crucial positive role of cooperating with many organizations to conserve the Large-antlered Muntjac and other endemic species. Our first meeting with the CYS NP revealed that they were unaware of the snaring situation in CYS, they even said "there's no or very few snares in CYS". After our field surveys as well as our discussions about the snaring impact on the wildlife, the local rangers and technical staff started to recognize that snare fences appeared nearly everywhere in the forest. We even encountered one stump-tailed macaque captured and dead in a snare. We were able to bring the snaring issue to the attention of the NP with clear evidence from the field and changed their views.

- In KXNM, our NGO partners had been more aware of snaring issue than in CYS NP. Even though the snaring issue is less intensive in KXNM than CYS, information on snaring was still reported nationally to our government counterparts, especially the law enforcement unit. The results were also shared internationally with our NGO partners, who are contributing efforts to *in situ* conservation for the KXNM at the same time. As a result, more intensive patrolling effort is invested in KXNM. Our partners at the site are really looking forwards to the data analysis and how it can help inform ongoing site management and help convince other stakeholders of the severity of the snaring issue.
- ***We successfully based on our results from CYS NP to raise further funding and organized the first national workshop on Large-antlered Muntjac conservation in Vietnam. The workshop had the participation of most related government agencies from the Ministry of Agriculture and Rural Development, national parks within the range that Large-antlered Muntjac still persists or having an intensive law enforcement system, conservation NGOs, research institutions, universities. After the workshop, the profile of Large-antlered Muntjac and snaring issue became much concerned topics that many conservation organizations want to get involved in to address.***
- ***One of our team members, Le Tan Quy, participated in the 21st Student Conference on Conservation Science in the University of Cambridge, United Kingdom to further develop his capacity to work in wildlife conservation, create a bigger impact for another species of concern, the Data-Deficient Silver-backed Chevrotain, the only ungulate species endemic to Vietnam.***

Capacity Development and Leadership capabilities

The technical skills of our project team members enhanced significantly throughout the project execution. We were introduced to TimeLapse, a simple and innovative tool to record animal behavioral data when approaching the snares from camera trap videos. TimeLapse workflow also allowed us to possibly identify encountered animal to individual level by giving detailed description of morphological differences. TimeLapse will be useful in the future for all team members when we move forward into more in-depth study of animal behavior. Indeed, Quy Tan Le makes the best use of TimeLapse in his MSc study about the silver-backed chevrotain, another endemic species to Vietnam.

The leadership capabilities of our team members were also improved when they successfully coordinated fieldwork to lead field teams consisting of both rangers and local villagers. Hardship was obviously encountered, such as finding consensus among field team members and supporting them with robust scientific data recording skills. The experience and training from CLP boost our confidence in our ability to become independent field researchers and conservation leaders in the future. Our engagement skills were put into practice when our team members presented the preliminary results to the park management board and park personnel. Especially, this was also the first time Quy Tan Le was tasked with disseminating field data to authorities. The presentation

was successful and knowledge, as well as experience, was exchanged and discussed among the park rangers and technical staff.

Apart from the project, thanks to the CLP alumni network, Quy Tan Le also got awarded to attend three online training courses free of charge: Brooke Tully's Making Moves, YALE-ELTI's Tropical Forest Restoration & Agroforestry, and Durell Academy's Leadership Development for Conservation Practitioners. His participation expanded his conservation network and equipped him with the (leadership) skills and knowledge (of tropical ecology and behavior change) he needed to be a better conservationist. We hope to gain the same support for our Lao team members in the upcoming time. Their chances were limited due to Covid restriction in Lao PDR, and a lot of sudden changes in the organizations that they worked. Since their careers are more stable now, it is the right time for our Lao members advance their experience.

Section 3

Conclusion

- From our camera trapping surveys, we found that snare hunting has a destructive impact on almost all ground dwelling mammals since most species we analyzed have a high capture probability by snares. The capture probability is greater than 99% with species having high encounter frequencies, for example the Large-antlered Muntjac.
- Soil, vegetation, animal tracks, fruit trees, mineral licks, water and weather conditions (raining season) are the criteria for hunters to choose a good location for setting up snare line.
- Wildlife in Vietnam has been imperiled seriously from snare hunting with the most recent decline of bear and gaur populations. The price for caught wildlife in Vietnam is much higher than Laos. Therefore, high profit can be earnt from Vietnam and less wildlife for hunting in Vietnam is creating a wave of hunting toward Laos' wildlife. Wild Pig, muntjac and sambar are the most commonly caught species by snares currently. Without any efficient method of management, muntjac and sambar will probably be the next to disappear.
- Before we started the project, the awareness about declining population of Large-antlered Muntjac and snaring were largely ignored in CYS NP while in KXNM, most stakeholders are very concerned about figuring out the best way to control snares. After our project finished, our local stakeholders in CYS NP are aware of the issues and much more committed in supporting conservation work on protecting Large-antlered Muntjac and addressing snaring issue. In KXNM, we provided valuable insight into the snaring issue and the urge to act more intensively to save the Annamite wildlife from hunting.

Problems encountered and lessons learnt

The biggest issue we have now is with data analysis. Since it's a new method, it required Minh to spend a lot of time standardizing the method to record the data as well as writing codes for analyzing the recorded data. Therefore, it's important for us to learn to get a data analyst involved in earlier to cooperate with us on the data analysis since each team member already had their own roles and their own responsibilities, making it difficult to take on extra work.

Even though there are many constraints caused by the pandemic, we benefitted from enormous support from our project partners and the management authorities. This allowed us to finish all our important field surveys in Vietnam and Lao. Until now, all the project activities and outcomes are going well.

There were some problems associated with our field surveys in CYS as listed above; shorter duration of leaving the cameras in the forest and an increase of human labor for the surveys causing budget increase. We overcame this difficulty by immediately consulting with our project's advisors for possible solutions and how the changes would impact our project's outcomes. The

CLP team's fast responses and understanding of how the project changed were also supportive for us.

From the problems we encountered, we learnt that it's important to stay closely connected with the management authorities, the project advisors, and the CLP management team in order to adjust and adapt to the changes as soon as possible.

In the future

Our team will finish the data analysis to publish the results to the public. At the same time, it will give our team members a chance to build up our capacity by presenting our results to the scientific community as well as the public.

Fig. 9 Our collaborated team from different organizations in Vietnam.

Minh is planning for the next step in studying the snaring threshold that we need for assessing the effectiveness of snare removal, which will involve modeling the snaring threshold based on the muntjac movement and snaring pattern. This work is extremely important since it will not only provide management organization with a real tool to monitor snaring risk, but also help change the government's awareness toward wildlife conservation (no capture of large mammals was conducted for conservation in Viet Nam and Lao before).

Financial Report

Itemized expenses	Total CLP requested (USD)*	Total CLP used (USD)	% Difference	Explanation & Proposed Spending**
PHASE I - PROJECT PREPARATION				
Field guide books, maps, journal articles and other printed materials	15.00	23.67	58%	We need to print more interview form + camera trap setting and retrieve data form + maps (most expensive since we have to print the map on quality paper that will not get wet by the rain)
Insurance	120.00	30.81	-74%	We bought some first aid kits for the team + utilize the previous first aid kits that we had in Vietnam
Visas and permits	100.00	0.00	-100%	Since Minh can't travel to Lao to conduct the field survey with the team, we don't need to apply for visa
Team training				
Reconnaissance				
Other (Phase 1)				
EQUIPMENT				
Scientific/field equipment and supplies	655.00	655.90	0.14%	
Photographic equipment			#VALUE!	
Camping equipment	100.00	32.09	-67.91%	We tried to utilize all of our previous camping equipment, which helped us save the cost here.
Boat/engine/truck (including car hire)			#VALUE!	
Other (Equipment)				
PHASE II - IMPLEMENTATION				
Accommodation for team members and local guides	183.00	429.46	134.68%	We have a big survey team in Lao and KXNM is far from Vientiane. It took the team two days to travel to KXNM and gather all the team members, government staffs, local people, etc, so they have to stay at the hostel before moving further to the village on the next day, then straight to the forest.

Food for team members and local guides	4,633.00	2157.05	-53.44%	We mainly stay in the forest, therefore, the cost for food reduces less. We are also awared of the covid situation that we couldn't spend time at the local village long but must wrapping up the preparation or interview as soon as possible. When conducting field surveys, we managed to get into the forest straight away in case the lockdown happened and made us stuck at the village. Therefore, for both Vietnamese and Lao field team, we mainly stayed in the forest, which help saved the food cost
Travel and local transportation (including fuel)	1,813.00	2035.69	12.28%	
Customs and/or port duties			#VALUE!	
Workshops			#VALUE!	We did have two technical workshops with related authorities of protected areas that we conducted the surveys. We didn't apply for funding from CLP since we have the meeting room and administration costs covered by the national park. In addition, we also had the support from Nong Lam University funding to organize the workshop in Chu Yang Sin. After the project finished, we also secured $6200 from Synchonity Earth to organize the first national workshop on the conservation of Large-antlered Muntjac in Vietnam. Details of this workshop is added at the end of this report.
Outreach/Education activities and materials (brochures, posters, video, t-shirts, etc.)			#VALUE!	
Other (Phase 2)	7,381.00	9572.72	29.69%	The survey time was close to Vietnam Lunar New Year, when the hunting is intensive. We were insisted by the rangers that we would need a higher number of rangers and local people in the forest at our camp for our safety. Also we needed to secure a team staying in the forest for area patrolling and camera traps monitoring. As a result, the cost for hiring local rangers and local people working for us increased.
PHASE III - POST-PROJECT EXPENSES				
Administration				
Report production and results dissemination			#DIV/0!	
Other (Please detail:)				
Total	**14,985.00**	**14,913.73**		

Section 4

Appendices

Table. M&E measures

Output	Number	Additional Information
Number of CLP Partner Staff involved in mentoring the Project	02	Stuart Paterson Sherilyn Bos
Number of species assessments contributed to (E.g. IUCN assessments)	01	We are contributing our data to the IUCN Large-antlered Muntjac group to do a general assessment of remaining Large-antlered Muntjac population from camera trapping survey. Currently, this work is still on processing.
Number of site assessments contributed to (E.g. IBA assessments)	0	
Number of NGOs established	0	
Amount of extra funding leveraged ($)	$7905	$1705 from Nong Lam University to purchase camera traps. $6200 from Synchronity Earth for organizing national workshop on Large-antlered Muntjac conservation in Vietnam
Number of species discovered/rediscovered	01	It's not really discovered or rediscovered, but there was no record of Large-antlered Muntjac in Chu Yang Sin since 2009. It was thought that Large-antlered Muntjac might extinct in this area because of hunting, but we successfully recorded the species again during our project.
Number of sites designated as important for biodiversity (e.g. IBA/Ramsar designation)	0	
Number of species/sites legally protected for biodiversity		
Number of stakeholders actively engaged in species/site conservation management	03 -04	Chu Yang Sin National Park is actively involving other organization in supporting them protect and manage the national park. We currently

		support Wild Act in joining in the conservation of the national park but we're uncertain of what is happening since activities haven't been solidly informed. Saola Foundation, Asian Ark Wildlife Conservation Society – Lao program (is going to manage KXNM in the upcoming time)
Number of species/site management plans/strategies developed	0	We are on the first step of trying to get Vietnamese government toward preparing a good strategy for Large-antlered Muntjac conservation in Vietnam from our national workshop. We are currently trying to connect all stakeholders in the countries together in a hope to set up a network for Large-antlered Muntjac conservation.
Number of stakeholders reached	08	During the project: Colorado State University Nong Lam University Chu Yang Sin National Park Southern Institute of Ecology Asian Ark Saola Working Group Saola Foundation Khoun Xe Nongma PPA
Examples of stakeholder behaviour change brought about by the project.	01	Maybe one clear example for behaviour change is the attitude of the director of Chu Yang Sin National Park with his speak during our national workshop in Vietnam, who recognized about the impact of snare as well as the urgent need for the conservation of Large-antlered Muntjac and he also called for more efforts: "Located in a border province, our national park is subjected to limited access to international sources of

		funding, resulting in the lack of human resources and technical expertise to update the status of endangered species, such as the Large-antlered Muntjac. Evidence-based policy to successfully safeguard these species, therefore, cannot catch up soon enough to address the problems. Regarding snaring, increasing removal efforts alone won't lead to a big reduction in the number of snares in protected areas. Sustainable livelihood improvement schemes must have to follow."
Examples of policy change brought about by the project	0	
Number of jobs created	0	The project was not for creating a job but instead for providing continuous support and motivation to younger generations such as Hamnoi and Quy.
Number of academic papers published	1	Paper published on the record of Large-antlered Muntjac in Chu Yang Sin. We hope to publish a paper on snaring impact from camera trapping results soon.
Number of conferences where project results have been presented	0	We hope to present our result soon at the ICCB conference.

Follow up workshop report (funded by the Synchonity Earth):

Synchronicity Earth Report Form – Asian Species Programme

Summary information:

Grant #: *for Synchronicity Earth completion*
Name of applicant/organisation: **Minh Nguyen**

Date of report submission: 18 January 2023
Title of work funded: Workshop on Large-antlered Muntjac conservation in Vietnam.
Contact details of person(s) who completed this form: Minh.Nguyen@colostate.edu
2500 West Mulberry street, Fort Collins, CO 80521.

a) Did you achieve what you set out to do? Please explain. If not, why not?

The workshop (30 participants) listed out 6 main objectives that we wanted to achieve include:

1. Update the status of Large-antlered Muntjac in Vietnam:

The Large-antlered Muntjac population is fragmented and isolated into few small populations. Discrete and low number records of Large-antlered Muntjac indicate the population in Vietnam is declining seriously.

Song Thanh National Park	Recorded by camera trap in 2016
Chu Yang Sin National Park	Recorded by camera trap in 2010 and 2021
Bidoup-Nui Ba National Park	2017-2018: recorded at 5 camera stations. 2020: 17 records by camera traps
Dong Chau – Khe Nuoc Trong	Records of Large-antlered Muntjac in 2014, 2015 and 2017
Bach Ma National Park	Recorded one individual died in a snare

2. Identify and list of threats to Large-antlered Muntjac:

Presentations from the speakers already provided clear facts and evidence regarding why the species is on the edge of extinction. The first evidence is relating to the species traits: endemic to the Annamites, rapid decline in the population distribution and abundance. The second evidence is relating to the characteristics of hunting, especially snare hunting: indiscriminate in the animal they caught, hard to find, effective, can be maintained in the forest for a long time, provide high profit, etc. => hunting happening intensively until the last one fall.

- Quote from Mr. Tu Van Khanh – vice director of Forest Protection Department of Quang Nam province: "Large-antlered Muntjac is disappearing at a faster rate than other species in the Annamites. Snaring is the main threat causing the disappearance of this population…Therefore, without immediate, decisive, and consistent actions between organizations participated in the workshop, without more than five, ten times the current effort, this rare and endemic species of the Annamites will not be there in the nature anymore".

3. List of current in-situ and ex-situ effort toward Large-antlered Muntjac protection:

- Regular patrol with snare removal but not very effective since snares are hard to find.
- Cooperate with local communities to conduct the patrol in order to present snaring.
- Currently employed SMART Mobile to assess the effectiveness of patrol and snare removal, targeting to have more days of patrol and remove larger amounts of snares.
- A captive breeding centre is built at Bach Ma National Park for urgent captive breeding of endemic and threatened species of the Annamites. However, this process is still obstructed with finding a clear legal base.

4. Identify difficulties in in-situ protection of wildlife population.

- Little understanding on why the management of threats including gun and snare hunting is not effective.
- Little understanding of why heavy punishment by law is still not effective in preventing illegal hunting.
- Inconsistent in land management, which led to habitat loss.

- National parks and protected areas lack of the capacity and ability in investigating, monitoring, and managing the wildlife population.
- Lack of national policy for Large-antlered Muntjac population causes inconsistency in awareness, concerns, and actions toward Large-antlered Muntjac conservation.
- Lack of effective programs in supporting local communities to improve their likelihoods.

5. Identify any available policies relating Large-antlered Muntjac conservation as well as legal punishment for snaring activities.

No clear or specific regulations on illegal activities relating to Large-antlered Muntjac and snaring activities. The species was listed under general laws including decree 06, 84, 160, 64, 31 and 69 or under article 244, 234.

6. Discuss and agree on how to set up a network of support for Large-antlered Muntjac conservation.

National parks and protected area indicated that they welcomed all conservation and research activities to support the conservation of Large-antlered Muntjac as well as enhancing their capacities in investigating and managing wildlife population. Therefore, we compiled the email list to share with all the participants so that they share all the news and encouraging them to reach out for support if needed.

- In conclusion: We achieved all the main objectives well except for objective 6. We can't set up a "formal" network for Large-antlered Muntjac Conservation immediately after the workshop. The reason is that most protected area and national park didn't share consistent and high concern toward Large-antlered Muntjac and snaring issue. Only after the workshop, these issues are recognized and well perceived. They did realize the current disadvantages for Large-antlered Muntjac conservation as well as the urgent and intensive effort needed. However, as in "Theory of change", from awareness to taking action still need to take a lot of actions between to trigger them. Therefore, we can only create a network with email list to exchange information and support. I will need to conduct more successful activities for Large-antlered Muntjac to make them believe that they can make change and take action.

b) What changed (if anything), including budget, timeframe, milestones, outcomes, funding, and partnerships? Please provide details.

Please keep this information as secret: The partnership with Song Thanh National Park changed after the workshop since we are not on the same page with the director of the national park. He wanted to spend the workshop funding on lobbying activities as well as for luxury demand, which we politely refused. We consistently confirmed him that we will spend the budget following the way we proposed, which made him not happy. We also didn't agree with his way of treating his staff. He showed a lot of disrespect, and violate our working rules of diversity, equity and inclusion. Therefore, he was not happy with our standing up for his staff. This culture is actually very common in Vietnam, which we hope to build up some DEI workshop in the future to slowly change this kind of awareness.

In conclusion, our partnership changed since we don't want to agree and support corruption and violation of DEI. Therefore, we want to step back from supporting Song Thanh National Park but finding another better candidate to support them building up their own capacity.

2. a) What were the challenges (both internally and externally) and what did you do about them?

The biggest challenges for our workshop:

1. Lack of information and knowledge on the species ecology, law and regulation for Large-antlerd Muntjac and snaring issues. => Therefore, we have to contact our colleagues to obtain single

information and combined them together to provide the best presentations, help the participants aware well about the issues of Large-antlered Muntjac and snaring issues.

2. The director of Song Thanh National Park attitude and behavior: Our team is a one-mind team, who are always ready to support each other. We also share the same idea and opinion on how to deal with issues regarding to the director. Therefore, even there were conflicts, but everything still happened smoothly with our strong mind. => This is what I really appreciate my team!

b) Do you foresee any new or ongoing challenges for this work? If so, how do you plan to address them?

The example of the director working attitude and awareness is actually a very common issue in Vietnam, which pose extreme difficulties for anyone want to support and change their awareness. As a result, conservation was, is and will still facing this challenge that we really need innovative actions to break this ice.

I plan to conduct my study on the movement of Large-antlered Muntjac in Lao, which people are very hesitate to do. By modelling the movement of the species and the snaring pattern, I can help provide a predictive snaring threshold below which the population still have a chance to persist. By successfully conducting this study, I can:

1. Provide the protected area with a more direct tools in managing their wildlife population, especially Large-antlered Muntjac
2. Provide protected areas and conservation organization with a tool to assess the threat from snares.
3. Break the ice: motivate people to not hesitate to take more intensive actions toward protecting wildlife population, make them believe that they can do a good job for wildlife conservation.

3. If you worked alongside others, (how) did collaboration help you to achieve what you set out to? If it did not, or it cause problems, explain why

In conservation, I believe that no one is a superhero that can do all the tasks. Therefore, I'm so proud to work alongside with my colleagues from Nong Lam University, artist Dao Van Hoang, Southern Institute of Ecology and staffs of Song Thanh National Park. They are all open-minded, hard-working, positive, and determined in doing good things for wildlife conservation. This is actually the first time (among many other times organizing workshop), I was able to fully focus on direct and guide the workshop to achieve the objectives. Therefore, I am so much appreciating these partnerships and hope we will always be on the same mind as this for promoting long-term conservation of the Annamites.

4. What have you learnt from this work and how did you apply and share this learning (if applicable)?

If we want to change the culture that is constraining the wildlife conservation in Vietnam, we need to work differently and not hesitate to work differently. Not because it is a norm that we must make a compromise with it. We are not sure whether these conflicts will constraint our future work, but we believe more people do it, this norm will change into a better direction for conservation. Especially, we hope to have more people stand up for younger generation, as well as the younger generation themselves.

5. What are the next steps (and over what timeframe) to achieve your wider aspirations?

I described the next step in section 2b. I will also share further information of the next step in email.

6. (Where) Has Synchronicity Earth added value? Or where do you think it could add value to your organisation/work? (including and beyond funding)

Firstly, Synchronity Earth (SE) added the value for our team, making us become more confident in our work and our ethics. Confirming of who we are in conservation work is really important for building up our long-term vision of how we will work for wildlife conservation.

Secondly, SE supported us adding the value to the Large-antlered Muntjac conservation in Vietnam, where most of protected areas and conservation organizations now are at least on the same mind of what is happening to the species and what they need to do. The next step is supporting them identifying what they can do.

If you have any interesting photos, videos, or stories that we can use to promote your work, please do share them with us. Thank you.

Youtube link to the workshop activities

1. Presentations: 06 presentation of 05 speakers and one presentation about the endemic wildlife of the Annamites by artist Dao Van Hoang:

https://youtu.be/Tf7m7vfklpk

2. Discussion 01: The current status of in situ management and Large-antlered Muntjac population in protected areas of Vietnam:

https://youtu.be/xn2DUl0yzlw

3. Discussion 02: Are there potential solutions for Large-antlered Muntjac conservation?

https://youtu.be/PKu6V9thirY

- **Links to the presentations for the workshop**

https://bit.ly/3qDcBfv or scan QR

- **Media**

1. Phụ nữ online (Newspaper)

Từ Sao la, lo cho loài Mang lớn - Báo Phụ Nữ (phunuonline.com.vn)

2. Báo Thanh niên online (Newspaper)

https://thanhnien.vn/giai-2-bai-toan-de-bao-ton-loai-dong-vat-thuoc-gen-co-dai-o-truong-son-post1484901.html

3. Đài QRT (Từ phút 14:00) (Workshop was filmed on news of Quang Nam province)

Thời sự tối Truyền hình Quảng Nam | 04-08-2022 | QRT - YouTube

- This is the cutting clip.

Bibliography

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Address list and web links

- *https://therevelator.org/large-antlered-muntjac/*
- *https://www.conservation-careers.com/conservation-jobs-careers-advice/interivews/saving-the-endangered-barking-deer-of-vietnam-and-laos/*
- *https://www.deerspecialistgroup.org/wp-content/uploads/2022/04/DSGNews33.pdf*