ASSESSMENT OF EFFECTIVNESS OF THE SAOLA CONSERVATION IN LAOS

SOUVANNA PHENGSISOMBOUN

MASTER OF SCIENCE

IN

NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT

SCHOOL OF SCIENCE

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THESIS COMMITTEE

Apisom Intralawan .....CHAIRPERSON
(Dr. Apisom Intralawan)

Panate Manomaivibool .....ADVISOR
(Dr. Panate Manomaivibool)

S. Ratanapojnard .....EXTERNAL EXAMINER
(Dr. Sorrayut Ratanapojnard)

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ABSTRACT

The Saola (*Pseudoryx nghentinhensis*) is an animal found in the Annamite Mountains of Laos and Vietnam. It is one of the most enigmatic animals in the world. Since its scientific discovery in 1992 it has declined to the status of critically endangered species of IUCN in 2008 and CITES list in 2009. Now, it is one of the most endangered mammals in the world with estimated population not more than few hundreds. This research studies the activities of Saola Working Group (SWG) for Saola conservation in Laos in order to evaluate the effectiveness of this program by using theory-based evaluation (TBE). The SWG worked for Saola conservation and efforts to protection Saola from extinction with strategies for conservation including: protection, research**,** awareness-raising, mentoring and fund-raising. Based on these strategies, seven distinctive but interrelating activities for Saola conservation can be identified: camera-trapping, field survey, patrols, protected area management, awareness raising capacity building and community participation.

The activities vary in its effectiveness to detect and protect Saola. SWG's camera-trap failed to record any picture of Saola with, as Saola lives in forest that is hard on camera-traps and a little is known at Saola's behavior. Field survey also was

problematic. At present, it discovered but cannot prove with certainty that the hoof prints, dung, or feeding signs belong to Saola. Their identifications are currently subjective without definite parameters. One activity that was effective was patrols. During 2011 to 2012 patrols team reduced threats to Saola by destroying 26,651 snares and 11 poacher's camps in Saola habitat. In 2012 SWG also helped WMPA improving protection at Nakhai-Nam Theun Biodiversity Conservation Area (NNT NBCA) by providing technical trainings on a protocol of patrols, ranger-based data collection, building local understandings and supporting strategic patrol planning. All rangers and villagers that related to Saola conservation were trained. And now there are new three protected areas established for Saola in Laos and Vietnam. SWG also conducted the workshop with the staff and rangers for improving their technique for snare removal and field survey. Awareness program was conducted with 12 villages and 11 schools at NNT by providing the information about Saola and convincing them to be active on Saola conservation. The community participation was also one of the more effective activities. Local people were very active and always join the patrols or field survey because they got the appropriate compensation.

With limited funding and unsustainable financial supported, the SWG faces difficultly to implementation activities for detecting and protecting Saola. It would be extremely difficult to monitor Saola population directly. There are also some constraints for Saola conservation in Laos such as limited knowledge about Saola, difficult to keep the animals in captivity and a security reason that prevents foreign experts accessing some sensitive areas. In order to make the conservation program more effective, this research suggest that SWG should continuous with selective focus on the most important activities including local experts , rangers and villagers, would allow the work to be more continuous and routine. And SWG also would be

continuous and improve the activities that were not yet effective but necessary to detection such as camera-trap.

Keywords: Wildlife conservation/Saola/Saola conservation/Saola Working Group

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ABBREVIATIONS AND SYMBOLS

ADB	Asian Development Bank
AWCSG	Asian Wild Cattle Specialist Group
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species
CEPF	Critical Ecosystem Partnership Fund
CPAWM	Centre for Protected Areas and Watershed Management
DNA	Deoxyribo Nucleic Acid
DFRC	Division of Forest Resources Conservation
DIDA	Danish International Development Agency
EWCL	Emerging Wildlife Conservation Leaders program
EDGE	Evolutionarily Distinct and Globally Endangered
EAZA	European Association of Zoos and Aquaria
FAO	Food and Agricultural Organization
FFI	Fauna and Flora International
GWC	Global Wildlife Conservation
GOL	Government of Laos
GMS	Great Mekong Sub-region
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
GLAZA	Greater Los Angeles Zoo Association
IUCN	International Union for the Conservation of Nature
IWRB	International Wildfowl Research Bureau
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
Lao PDR	Lao People’s Democratic Republic
LAZ	Los Angeles Zoo
LCAOF	Liz Claiborne Art Ortenberg Foundation

MoNRE	Ministry of Natural Resources and Environment
MAF	Ministry of Agriculture and Forestry
MIST	Management Information System software program
MRC	Mekong River Commission
NBCA	National Biodiversity Conservation Area
NNT	Nakai-Nam Theun
NTFPs	Non-Timber Forest Products
NGOs	Non-Governmental Organizations
NPA	National Protected Area
NSDS	National Sustainable Development Strategy
PA	Protected Area
RNA	Ribo Nucleic Acid
STEA	Science, Technology and Environment Agency
SWG	Saola Working Group
SSC	Species Surival Commission
TBE	Theory-Based Evaluation
UN	Unit Nation
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environment Programme
WCS	Wildlife Conservation Society
WWF	Worldwide Fund for Nature
WFF	Wild Fauna and Flora
WMPA	Watershed Management and Protection Authority
WCN	Wildlife Conservation Network
WREA	Water Resources and Environment Administration
ZSL	Zoological Society of London's

CHAPTER 1

INTRODUCTION

1.1 Background

The global diversity scenarios are changing and concentrations of biodiversity in many countries change in the global environment. When the world population and consumption increase the issues of environmental also increases. The most important determinants of biodiversity change at the global such as change in land use, atmospheric CO2 concentration, nitrogen deposition and acid rain, climate change and biotic exchange in the ecosystem. For this problem, it requires the integrated efforts and mitigation activities tailored to the biodiversity considering both global and local biological, social and economic context (Sala et al., 2000). The current state of biodiversity in Southeast Asia has been worsening. Many species are listed as critically endangered or extinct species by IUCN. The number of threatened species in Asia IUCN is ranging from 20 critically endangered (CE) to 686 vulnerable (VU) species of vascular plants, 6 to 91 species of fish, 0 to 23 species of amphibians, 4 to 28 species of reptiles, 7 to 116 species of birds and 5 to 147 species of mammals (International Union for Conservation of Nature [IUCN], 2003). More ever there is an estimatation that 22% of mammals, 32 % of amphibians and 14 % of birds were threatened with extinction (Hilton-Taylor, Pollock, Chanson & Katariya, 2008). The loss of the biodiversity will ultimately impacts functional of ecosystems and wellbeing of humans (supply goods and services) including: reduce the efficiency which ecological communities essential resources, increase the stability of ecosystem functions, change accelerates as biodiversity increase, climate change and land use change (Cardinale et al., 2012).

At the present, there are many conventions at the international level that work on biodiversity issue, and work. Implement at the national, regional and international

level to share and collaborate to achieve the goals of biodiversity conservation and sustainable use is apparent. First, the Ramsar convention is the one of oldest of convention for the environmental that as know is the convention of Wetland, there are more than 1,900 sites covered nearly 186 million hectares with 160 contacting Parties (Koester, 1999; Ramsar Convention Secretariat, 2011). Second, the convention on biological diversity (CBD) is another convention that focuses and consider the status of biological resources, threats to loss of diversity and cause of those threats, there are 186 Parties (Conversation on Biological Diversity [CBD], 2000). Last the agreement that is known wildlife trade is the convention on international trade in endangered species (CITES), CITES represent and promotes a cooperative effort in each country to prevent the loss of species from international trade. Currently, there are 178 Parties and protect 5,000 species of animals and 29,000 species of plant (Pervaze & Corn, 2005).

The great Mekong Sub-region (GMS) consists of Laos, Thailand, Myanmar, Cambodia, Vietnam and China. In the GMS is the most biologically and culturally diverse places on the planet. The region's dependence on the natural ecosystems require that governments, communities, development banks and private sector are working in the collaborating manner to maintain the functions of ecosystem. There the iconic species in the region including tiger, elephant and Saola (World Wide Fund For Nature [WWF], Greater Mekong, 2013). Most of ecosystems have been greatly reduced and there are condition severely degraded by centuries resulting from human exploitation. However, there is the Mekong River Commission (MRC) cooperative initiative includes official joint agreement from six GMS countries to develop a green and balanced economic, awareness of the importance of natural resource management, standard of living are rising, freeing more people from the reduce poverty and also for sustainability of natural resource management. The region are already undergoing severe losses of natural resources and ecosystems function, the significant threats from the planned infrastructure and demand for resources to develop the economic capital in each country. The high demanded for land use, agriculture products and with weak institutions of governance leading to continue to loss and degradation of forest. The consequent for loss of forest cover puts the communities at increased risk from natural disasters and the effects to the organism

(animals) from habitat loss. The GMS has also exceptionally rich wildlife in many species endemic to the region, but the threatened from human increasing to the important biodiversity of wildlife and to the point of pushing some species to verge of extinction. Intensive hunting and extension deforestation have caused to loss the large species including Asia elephant, tiger, banteng and gaur to suffer serious declines in number. And there are endemic species such as Saola, kouprey, giant and white-shouldered. The kouprey has not been seen for many years and is likely to be extinct (WWF, Greater Mekong, 2013).

The WWF's analysis the changing forest resources in the GMS between 1973 and 2009 are show in Figure 1.1. Forest are has been loss especially in Myanmar accounted about 31% of total forest loss, followed by Thailand 27%, Vietnam 24%, Laos 24% and Cambodia 21% (Food and Agriculture Organization of the United Nations [FAO], 2010). Mekong river basin is one of the most productive and diverse river systems and rich in migratory fish species. Sediments and nutrients from upriver sustain the productive to supports food crop production and marine fisheries and aquaculture in Vietnam more than 50%. Linked character of a river system present, it has challenges for human management activity, and the power projections of increasing electricity demand in the GMS, to product energy through hydropower, up to 11 dams are planned for the main steam in lower Mekong river alone. Many projects are poorly planned from a social and environmental perspective. Implementation is with a little consideration of the impacts on the freshwater ecosystems, river's connectivity and flow; ecosystem survives the people rely on (many people who rely on wild fish as their major source of protein) and disturbances affect section both far upstream and downstream. Many researchers have pointed out that although dams would bring substantial additional income to the region, but it would be the negatively impacts to fisheries, increase inequality and net poverty, and also detrimental environmental impacts (Amornsakchai et al., 2000; Mekong River Commission [MRC], 2010; Dugan et al., 2010; ICEM, 2010).

Source WWF, Greater Mekong (2013)

Figure 1.1 Forest cover in the Great Mekong Commission

The Lao People's Democratic Republic (Lao PDR) is a country abundant with natural resources and biodiversity in Southeastern Asia with a total area about 236,800 Km2 and total population about 6.4 million (United Nation [UN], 2010). Lao PDR is one of the world's global biodiversity. Nevertheless, it is clear that the Lao PDR has an outstanding biodiversity, as it is rich in both fauna and flora, the country depends on natural resource and sustainable use is the one of key means for poverty reduction. But natural resource degradation, combined with inadequate provision of environmental services is disproportionately affecting the poor in Lao PDR. The Saola (*Pseudoryx nghetinhensis*) is one of the most enigmatic animals in the world, and also one of the most threatened that can be found only in the Annamite Mountains of Laos and Vietnam. Since the species'scientific discovery the first horns of Saola in 1992 in Vietnam (by John Mackinnon, Vu Van Dzung and Do Tuoc), and next year later can found horns of Saola at Vangban village in Laos in 1993. It has been a status of critically endangered. There are few animals as phylogentically distinctive and so threatened with extinction. The common name "Saola" was from a native Lao name; it means spinning-wheel posts (See in Figure 1.1) that referring to the long and straight horns of Saola (Robichaud, 1998b).

Figure 1.2 Saola horns and spinning-wheel posts

Since was known to the world in 1992, Saola decline to the status of critically endangered of IUCN. In 1996 thirteen Saola have been captured in the captivity, within 3 days after arriving it seemed to ignore humans who entered her cage and calmly accepted food from the hand. The Saola tameness contrasted with the skittish behavior and fear of humans shown by the neighboring animals in the menagerie. And then eleven Saolas diet in captivity with five months saved just two and released it back to the wild. The government plan to save the Saola by identified the snare and hunting that the main threats to Saola, also more awareness Saola both in Laos and Vietnam, and also increased funding from donors to support the conservation are necessary at this time (Robichuad, 1999). In 2006, the IUCN established a Saola Working Group (SWG) and it accepted in 2009, to bring more focused attention to Saola conservation and the WWF great Mekong program has also been activity involved in Vietnam, which improve the conservation management and supports the livelihood to the local people in Saola habitat. And 2010 WWF has also been active in helping provincial authorities established the three new protected areas for Saola in Laos and Vietnam.

Nakai-Nam Theun Biodiversity Conservation Area (NNT NBCA) is Saola habitat and it is also the important habitat for the countyr's wildlife heritage. Over threatened species live in this area such as elephant, giant maniac, gaur, Asiatic black bear, sun beer, clouded leopard, tiger and Saola. Saola has since been sight at NNT only third of which falls within the protection of the NNT NBCA, one of the unique features of NNT conservation area and especially the northern extension is the occurrence of highly restricted "Everwet forest". This occurs only in narrow bands where there are low elevation saddles in the Annamite Mountains (Sai Phu Louang) and it has very diverse range of the principle habitats of Annamite Mountains (Watershed Management Protection Authority [WMPA], 2010)

1.2 Problem Statement

The Saola could find only in the Annamite Mountain in Laos and Vietnam. As discovery in 1992 and captured 13 of Saola in 1996, still a little know about animal.

In 2009 IUCN estimates the population of Saola that probably a few hundred and Saola appears to be in grave danger of extinction. Until now the scientists cannot see any Saola in the forest before. For these reasons, it is not possible to estimate the number of Saola remaining in the wild. Whatever it is the current population size; the species clearly merits its IUCN Red List status of Critically Endangered in 2008 and CITES listing in 2009.

The conservation of Saola still continuous and in 2009 IUCN accepted to set up Saola Working Group (SWG) to work and focus to conserve Saola in Laos and Vietnam. Despite the challenging context it has been working, SWG was acknowledged as an emerging model for successful species conservation at the World Conservation Congress in Jeju, South Korea. The SWG worked with the limited and unsustainable financial to support to implementation the activities for Saola conservation and also there are some constraints of Saola. So it has limitation toward to Saola conservation in Laos.

1.3 Research Objectives

This research aims to investigate the current status and activities for Saola conservation base on the information collect from SWG in Lao. The specific research objectives are as below:

1.3.1 To systematically compile the activities of Saola Working Group for the Saola conservation

1.3.2 To evaluate the effectiveness of the activities of the SWG

1.4 Research Questions

1.4.1 What did SWG do under its program to conserve Saola?

1.4.2 How effective was the conservation program for detecting the existence and for protection of Saola in Lao?

1.5 Scope and Limitations

The main point of scope for this study focuses on activity of SWG to see the effectiveness and weakness of the approach for improving Saola conservation in Laos. I collected the secondary data and sources with SWG since estimated set up in Laos, the SWG focus to work in the Annamite Mountains both Laos and Vietnam, but I was choose focus in Lao site because I have been conection with SWG' coordinator and WMPA, it was better to access the sources of Saola, and I would like to improving the Saola conservation in Lao to be better. And data also will be gathered from available variety sources. After getting the data, I was listed the activities of SWG and all projects with partnership, and then compare with the conceptual framework that serves as evaluation theory in TBE for wildlife conservation.

The limitation of this research was the data collection, most of sources, data and information about Saola were too old, unavailability or difficult to access. Some reports of the project was secret, so it has seems narrow scope with this sources. And another that SWG doesn't have the office and unavailable database, the data I have got that coming from an interviewed with the SWG' coordinator and some sources from IUCN, WMPA, WCS and WWF.

1.6 Structure of The Thesis

This research studies on SWG for Saola conservation in Laos, to see the activities of SWG and evaluate the effectiveness of this program to improve the approach for effective of the Saola conservation in Laos by using theory-based evaluation (TBE) and comparison SWG's activities with the theory of wildlife conservation in the conceptual framework. So this thesis consists of 5 chapters. The present chapter there is introduction, problem statement, research objective, research question, scope and limitation of the study. In chapter 2 is the literature review to preview the wildlife conservation. In chapter 3 are interviews the method, theory-based evaluation, material and criteria to show the reader to understand the basic principle of the wildlife conservation. And subject analyzes the data by using theory

of wildlife conservation to the result and discussion in chapter 4. The whole thesis has concluded in chapter 5 which also recommendation to improve some points and suggestions research in the future.

1.7 Conceptual Framework

This is the first conceptual framework that I was daft it before data collection with SWG, then I improved it to be used for evaluate the SWG and finalize of this conceptual will be show the main factor of the conservation. And activities for wildlife conservation with clear the objective of those activities with the outcome that can to protect habitats and reduce threats to wildlife. With create from this conceptual that provide the more detail for the wildlife conservation in the implementation theory of SWG. (See Figure 4.2 in chapter 4).

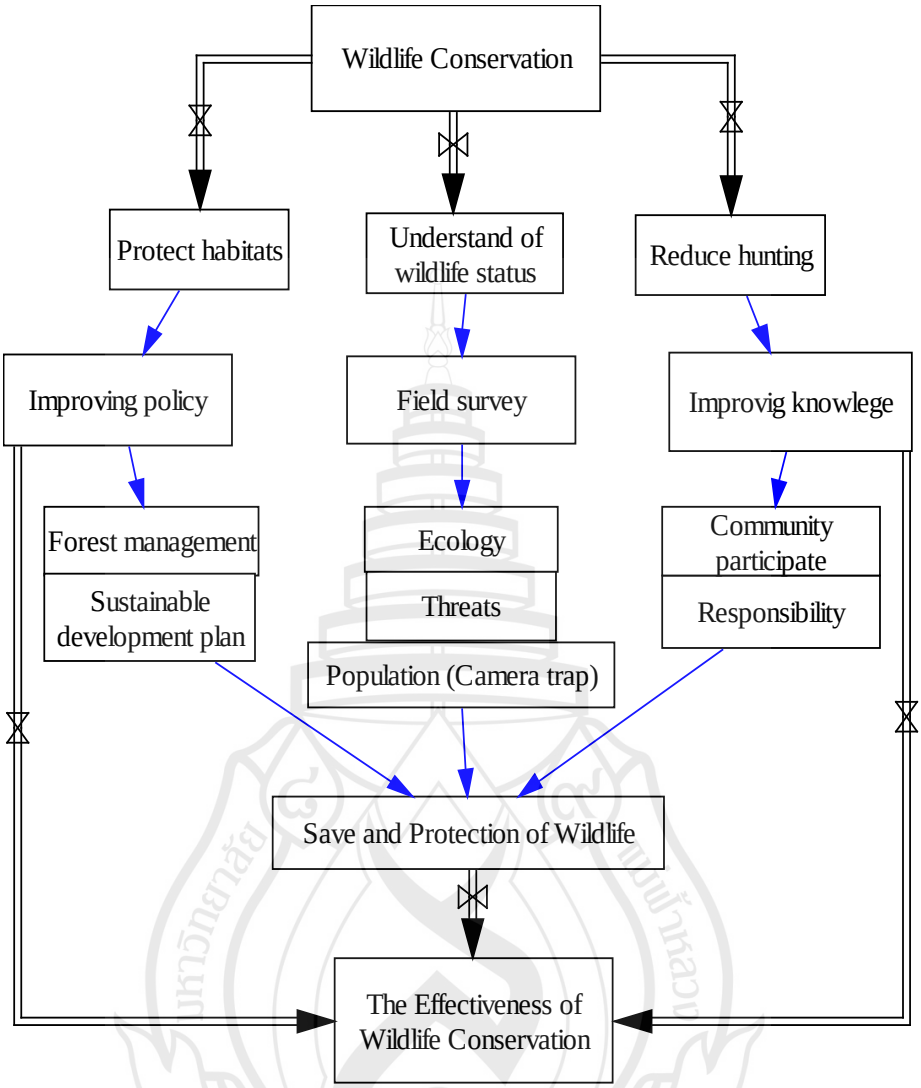

Figure 1.3 Conceptual frameworks for wildlife conservation

CHAPTER 2

LITERATURE REVIEW

2.1 Wildlife Conservation

2.1.1 Brief History of Wildlife Conservation

In the past, wildlife conservation was not an issue, but when the number of human populations in the world grows up threats to wildlife populations also increase. Human activity is main impacts to wildlife status, every country needs to promote the economic and forgot to care about resource, so the problem still have in each country in difference level. In 1961 the IUCN formed the first fundraising organization, the International Wildfowl Research Bureau (IWRB). There are several other organizations like the Food and Agriculture Organization (FAO) of the United Nations (UN) the Smithsonian institute and the conservation foundation both in Washington DC and the Fauna Preservation Society in London. The IUCN through it's Survival Service Commission (SSC), is dealing specifically with animals threatened with extinction. Their function is to collect data on endangered species throughout the world and initiate action to prevent the extinction of the species. The SSC investigates the status and ecology of a species and advises governments and organizations. Such advice is often continued with direct action financed by the World Wild Fund (WWF). And nowaday, there are many non-organizations (NGOs) that work about conservation and biodiversity including IUCN, WCS, WWF, etc. These organizations try to promote and protect the wildlife from the extinction of species in the world.

2.1.2 Threat of Wildlife

As the world human population continues to grow, it is becoming increasingly important to wisely manage our remaining natural resources, wildlife is now facing multiple threats. Most of the threats to wildlife species were from human activities such as, turning the forests into the agricultural land and urbanization resulting in a

widespread loss of important habitat, poaching and hunting. The major threats to wildlife divided into two causes are direct and indirect base on the impacts to wildlife in the world and most of threats become to the main issue of wildlife in each country.

Direct threats to wildlife are hunting for consumption and trade. When the human populations grown increase, the demand of wildlife meat or other part of wildlife also increases. Many countries depend on the hunting for medicinal ingredients and livelihood. Most of the rich people want to collect born, skin, horns or other part from animals. Other threats are habitats loss from poaching by human activities such as convert forest to agriculture, logging and also when the people go to the forest to collect the non-timber forest products (NTFPs). And indirect threats including climate change, nature phenomena (flood, earthquake, forest fire, etc.).

2.1.3 Objective and Approach for Wildlife Conservation

Wildlife conservation is educate the people attempt to protect the endangered species as promote the conservation, saving habitats and also against wildlife trade. The goal of wildlife conservation needs the people to recognize the importance of wildlife and ensure that it can be maintains as a long with the next future generation. The government is a most important to help the conservation by provide the policy making to protect wildlife and control hunting. And many organizations in each country dedicated to work and promote wildlife conservation. Wildlife conservation requires the specific knowledge for work to protection and control wildlife resource, it must be attempted to manage the wildlife resource balancing with consumption and conservation and balancing the conservation with development.

So the successful conservation is having the components and requires the objective of the conservation to be the target of the project to create or design the model and approach to do the conservation that try to find the solution for good conservation. The objectives of conservation require: Protection of natural habitats, reduce threats, save the number of wildlife and have the good ecosystem for the species. And the objective of conservation is mean to educate the public understand the impact of human to wildlife to teach and show people why conservation is important and need to protect and preserve it as a long, for making the policy to people as link between the integration of conservation and development. Wildlife

conservation is also defined as the process by which organizations protect and preserve the species through conservation policy in each country, which entails the preservation of habitat and management of wildlife species (Douglas, 1978).

Approaches and models of wildlife conservation need to protect and increase the number of population of wildlife. It is important to design the specific techniques in field survey to the researches. On the approach for wildlife conservation also depends on each country that will use and adapt the program. Although, the effective conservation was have many factors to focus and the community participation from the people. At the present there are many approaches to conservation of threatened wildlife including:

1. Ecosystem Approach to conservation is the one method that needs to understand the ecosystem management, understanding the basic dynamics of adaptive, and objective of ecologically sustainable management. The restoration of ecosystem approach is very challenges with the climate change, habitat loss and sustainable use for protect and maintaining the composition, structure and function of natural, and the modified the ecosystems for long term and human sustainability. After that CBD also adopted the implementation of ecosystem approach for the integrated natural resources management, under this model CBD promotes the conservation and sustainable use to help the project had appropriate methodology for scientific focused on the levels of biological, essential process, functions and among organisms. It can helps to recognize that human and their cultural diversity are the component of ecosystems (CBD, 2000)

2. Eco-tourism is the one approach to do conservation, because the people can get the benefit of wildlife it the best incentive to people to do conservation. Now a day, many countries apply this approach in their methods to conserve wildlife e.g., Africa (Elephant, Lion, etc.), Australia (koala), Chinese (Panda) and many countries in Asia. It was getting the benefit to the local people, help them to improve the better livelihood because the people will get an income to family and in the same time, it can promote the good livelihood that was not just depend on the demand, but should care about conservation for the long-term on resource use. Ecotourism quite successful in many cases, because it provides the best way for sustainable development and good option for intensive to the local people to do conservation. The

greatest achievement of eco-tourism and important is can manage the minimization of waste, energy efficiency, reforestation, offsetting the natural. Under this approach would be provide the direct financial benefit to the local people and supports the human rights to them (Honey, 2008).

3. Community-based wildlife management approach: This model is the approach to works with the local community to help them manage the natural resources and provide the knowledge about sustainable use. It will be more effective in their resources use by trying combine creative thinking with the living standard for protecting ecosystem and wildlife populations for sustainable development to their livelihood for long term. The conservation by local community can protect and increase the number of wildlife populations, the people have to reduce and control hunting of wildlife by designing or seting up some quota and make the rules to the reserve for traditional hunting. In addition the people might get the benefit from the forest and to ensure of sustainable use of wildlife resources in the protected area. It builds upon the principles of sustainable development and integrated rural development, which imply that natural resources are brought under local control and that local communities are given the decisive voice in planning their management (Sibanda, 1996; Friedmann, 1992).

2.1.4 Successful Conservation Projects

In a world dominated by crises, it is important to remember that not all is bad. Indeed, if there were not solid evidences that the correct resources (not just money, but personnel, expertise and public support) are brought to bear to protect highly threatened species in the field, then the value of directing further resources to that aim would be questionable. Although the successes are relative and can never be definte because conservation is a never ending work. Some programs and projects have been stronger in striving towards the goals of wildlife conservation than the others here. I have been choosing the examples in Asia because they are situated in contexts closer to that of Laos.

The two successful projects that I show in this section are the projects in Vietnam, because it were clear the approach and methodology for good conservation. The first project is Tonkin Snub-nosed Monkey conservation; they worked with the

local community to find the solution for conservation. The second project is Cat Ba Langur conservation; they focused on protection national park including capacity building, radio system of the park, boats, maintenance of a floating ranger station and education material. In two case, the success is increasing the number of the population and have law enforcement to control the animal, so that they were seen sucessful because they can save wildlife population and protection habitat.

1. Tonkin Snub-nosed Monkey Conservation Programme, Vietnam That is an achievement to protect the monkeys by community-based patrol group, raiseing awareness among local community, establishing the conservation area for monkeys, good participation from local community in forest management and development of the conservation action plan of species. They are considered the protection an immediate priority, habitat conservation by agreement and signed by the households in the villages. There are six communities to do patrol in the forest, monitor the monkey population and the patrol team can confiscate guns from the households in the villages, and they were often raising awareness in their villages by provided the information about the important of monkey and measures to protect it. The community rangers have the role to inform the local people about the project as well village meeting, they were very active to focus on raising pride of this rare species. In every year the project will gives calendars depicting the monkey to all villages. And this project also has the participatory forest management; the local communities was represented and have been officially endorsed in the villages, in every three months they will conducted meeting to discuss about the issue of protected area. The villagers and government will provided a unique way to exchange and jointly plan protected area management measures. Local species conservation action plan by works with villages around the site to help them find the best solutions about local people' needs and also for assure the monkey survival in the forest.

2. Cat Ba Langur Conservation Project (CBLCP), Vietnam

One of the first achievements in 2002 was the creation of a strictly protected area inside the National Park which contains approximately 35% of the remaining langur population. This peninsula is protected through natural barriers like steep cliffs and a small land bridge as a connection to the main island. Several local people are contract holders with the duty to protect the entrance of fjords close to the

sanctuary. In return, they are the only floating house owners legally allowed to stay inside the National Park. To mark the whole area several buoys and signs were set, providing information about the status of the sanctuary.

The general protection in the National Park is supported by the CBLCP through provided equipment for the daily work, including the radio system of the park, boats, maintenance of a floating ranger station and education material. Capacity building of National Park staff through regular trained courses for rangers and the management board of the park plays an important part in the success of long term conservation measures. Beside the cooperation with the National Park, several groups of local people are part of a community-based langur protection program, organized and supported by the CBLCP. In three communes several local people are in charge to monitor and protect single langur groups, occurring in their areas.

Conservation success: The urgency and the success of the project have been reflected by the population numbers. While 100 langurs had been counted in 1999, only one year later the population had been reduced to only 53 individuals. All the above mentioned efforts have culminated in bringing hunting of langurs to a halt; since the start of the project, in total 23 births of Cat Ba langurs were recorded, versus 11 known deaths.

All reproductive social units are located in the south of the island; no reproductive social units remain in the north, and at least two groups contain only females. Thus, a translocation plan was designed as part of the long-term strategy. Three females, isolated on a small offshore island because of the destruction of the mangrove forest which was once a connection between the main island and the smaller islands, are to be translocation into the langur sanctuary. The preservation of the Cat Ba langur goes hand in hand with the protection of its habitat. The poaching of langurs was brought under control, but the exploitation of the forests on Cat Ba Island is still ongoing. Only if Cat Ba's residents can be persuaded to realize the langur and Cat Ba's exceptional nature as unique and something to take pride in and make sustainable use. (Conservation success projects in Southeast Asia Campaign, EAZA See http://www.southeastasiacampaign.org/conservation-success).

2.2 Biodiversity Conservation in the Lao PDR

The Lao PDR is rich in biodiversity scientific assessment of Indochina's biodiversity had concluded that the country is of globally important in the region. In comparison to flora and fauna is relatively well documented and monitored making its assessment more or less accurate as to its richness of the populations and habitats found less than those in others country in the region. There are 8-11,000 species of flowering plants and these resources comprised between at least 150 to more than 200 reported species of reptiles and amphibians, at least 700 species of birds, over 90 known species of bats, more than 200 species of mammals and more than 100 species of large mammals, about 500 species of fish (WREA, 2008). Natural resource conservation in the Lao PDR has much strength which sets it aside from, and in many respects, ahead of its South East Asian neighbors. It retains a relatively intact resource base, with approximately 20 percent of its land area devoted to forest conservation.

There are four large mammals were discovered in Laos such as small dark Muntjac, Giant Muntjac, Saola and also Annamite rabbit. 10% of birds in Laos are highly threatened and some species no recent records as the Indian Skimmer (*Rynchops albicollis*). There are more than 200 species of amphibians and reptiles, out of which 11 species of reptiles and 5 species of amphibians are being threatened. Knowledge on theirs presence in Lao PDR has remained unknown for a long time (Khounboline, editor, 1999). At present, there is not much documentation about invertebrates in Laos except for some accounted species. Although poorly documented, it is likely that invertebrate diversity is higher in tropical freshwater ecosystems than in marine ecosystems, a typical condition in Lao PDR, at least for crustaceans, mollusks, insects, and especially nematodes. Currently, fish species diversity in the Mekong basin established about 1,200 species and 500 species indigenous fish, out of which about 6 to 9 species are believed threatened as presented. It is believed that the Mekong fish fauna, as in other large river systems, is generally characterized by a high degree of within-species diversity. Fish diversity of the Mekong River basin is estimated to be roughly three times that of the Amazon River.

The government has a strong commitment to conservation and recognizes to the local communities about sustainable resources use in the protected areas, government try to make the policies emphasizes participation action with villagers to develop sustainable livelihood and conservation strategies through the local communities. In addition, human use of these once remote areas are raising a result of increased the biodiversity market demands, population growth, migration and settlement. That is the result are expanding agriculture, hunting, illegal logging and uncontrolled burning forest these main cause of decline in biodiversity. Despite the lack of detailed information, over-harvesting and wildlife trade are clearly the principal reasons for the decline in biodiversity, threatening much of it with local extirpation. Current principal issues in biodiversity and management in Lao PDR:

1. Loss of natural habitat for wildlife
2. Controlling slash and burn cultivation
3. Unsustainable logging and excessive collection of non-timber forest products
4. The proliferation of rubber and eucalyptus plantations
5. Excessive hunting of wild animals for subsistence consumption and for domestic and foreign markets
6. The low public awareness and education about the importance of biodiversity in the provincial and local level.
7. The reformation of the relevant law and the restructure of the committee for the efficient and effective management attended by all relevant public and private sectors (Ministry of Agriculture and Forestry [MAF] & Science Technology and Environment Agency [STEA], 2003).

2.2.1 Threats to Wildlife in Laos

Wildlife populations in Laos are declining very fast, the richness of wildlife has less with the human interventions with the low human population density and consequently extensive forest cover. In some remote areas from human settlements has provided the partial protection wildlife resources, but the hunting still high because the population and development increasing so the demand of wildlife' meat also increase in the market. Threats to wildlife in Laos have both direct and indirect

factors from human activity that can provide such as hunting, wildlife trade and loss the habitat.

1. Local hunting

In Lao PDR there are the traditional of hunting long time ago and the local people were dependent on hunting for their livelihood. But the new hunting methods using automatic weapons, explosives and cable snare had impacts on wildlife populations. Since wildlife trade has been in Lao PDR the number of wildlife populations was decline very fast, the value of wild products increases. There are the hunting for international trade because demand from the neighboring countries to use wildlife for traditional medicine. Another form of hunting occurs in the lowlands and maybe will describe as recreational hunting. There are few birds and mammals in the fields and forests around Mekong villages because they are also hunted. Although this situation may be improving slightly many visitors arriving in the Lao PDR for the first time comment on this remarkable phenomenon. Groups who live in the hills have probably done most of the local hunting in the Lao PDR. Some of their wildlife meat and products are sold at provincial markets to lowland people. They hunt with modern and muzzle-loading guns, hunting dogs, snares and deadfall traps. The two main types of snare used in the country are either made of nylon strings meant for small terrestrial mammals and birds or cable, effective for large mammals including bears, tigers, Sambars, Muntjacs and gaurs. The Lao wildlife populations continue to reduce in numbers, and some species have become extinct in the past few years such as the Chinese Three-striped Box Turtle *(Cuora trifasciata)* and the Kouprey *(Bos sauveli).* Some species of water bird are expected to become extinct in the next few years.

2. Wildlife trade

Wildlife trade increased during the 1980s and 1990s due to the opening of domestic and international markets and increases the demand of the people visiting from neighboring countries to buy wildlife products and to consume. Most of the Lao wildlife trade is driven by demand outside the country, including its neighbors, and a range of groups with different affiliations within the Lao PDR (officials, the military, as well as large and small businesses).

Wildlife trade in the Lao PDR involves a large internal trade for food and medicine and a substantial international trade for a diverse range of uses including

traditional medicine, food, and trophies. In markets and restaurants, it is not uncommon to see displays of squirrels, monitor lizards, birds, soft shell turtles, snakes and sometimes pangolins, as well as fresh and dried deer meat. Wildlife has direct economic value for the people of the Lao PDR. Many rural people, particularly in the remote areas are dependent on bartering or selling wildlife, which includes the trade of medicines made from wildlife, wildlife meat, and zoo specimens, in exchange for rice to meet shortfalls during certain parts of the year. Trade is also carried out for quick cash. Wildlife is consumed at all levels in society and the trade is both domestic and international, moving wildlife throughout the country and across its borders. The use of wildlife for medicines includes:

1) Bones of large and small cats, bears, primates, elephants, wild cattle, deer, Serow, civets, Hog Badgers, Sambar and Muntjac;

2) Horns of Serow and wild cattle;

3) Legs and hooves of deer and Serow;

4) Oil or fat from Serow, bears and cats;

5) Skin or fur of elephants, pangolins, civets, cats;

6) Teeth of elephants, cats, bears;

7) Claws of tigers and bears;

8) Carapaces and plastrons of turtles and tortoises;

9) Dried birds; and

10) Shells of freshwater and marine mollusks.

3. Loss of wildlife habitat

1) Clearance for agriculture: In remote areas of the country local people practice shifting cultivation thereby clearing forests for agricultural purposes, which puts pressure on forests in high biodiversity areas. The Lao PDR Government plans to halt the practice of shifting cultivation by the year 2020.

2) Forest fire: Currently forest fires are a threat to biodiversity in many parts of the Lao PDR. Projects that focus on the prevention of forest fires should be implemented at all government levels, and should include methods and information on forest fire prevention for farmers who use fire to clear land and fields.

3) Logging (illegal and legal): Logging is the main cause of deforestation. Logging concessions convert large tracts of healthy forest into degraded

lands, and importantly, these logging activities develop roads deep into the forest interior, creating easier access for wildlife hunters. The government has regulations and policies for projects and companies to follow in logging practices and these regulations should be strongly enforced by forestry officials. Revenue-generating programmes should also be implemented in order to assist with the creation of biodiversity management budgets.

4) Hydropower and road development: Hydropower development enables large tracts of land to get flooded and inundate areas during dam construction displacing wildlife from their natural habitats. Nevertheless, if the hydropower projects develop funding mechanisms and use power revenues to support conservation and promotion activities related to biodiversity protection. Some tradeoffs maybe worth its such as the cases of the Nam Leuk and Nam Thuen 2 hydropower projects which make contributions to biodiversity conservation. For example, currently 1% of electricity export revenues from the Nam Leuk hydropower project is provided to support the management of the Phou Khao Khouay NBCA.

On the other hand, the current road development in the rural areas spur infrastructure development necessary to bring growth and progress in these underdeveloped places in the country. However, as accessibility is enhanced through this road network, access to protected areas also are facilitated which in turn, as mentioned earlier, encourages encroachment, increases over harvesting and trading of wildlife and other forestry resources, and other destructive activities that threaten the biodiversity in the protected areas. Hence, strict regulations and compliance with existing policies on the protection of the protected areas in the country must be strictly enforced and followed.

5) Pollution and poisoning activities: The use of poisonous substances or materials for some economic activities is practiced widely in Lao PDR. However, the excessive use of poison and other allied substances, have large impacts on wildlife species and other biodiversity resources. Government regulations on the use of poison for fishing and hunting should be enforced by local authorities. Public awareness programs are needed to help local people understand the impacts of excessive poisoning of wildlife and agriculture pests such as insects and rats. Too much accumulation of these toxic elements and other wastes from the industry and the

domestic users result in pollution threatening the whole environment and the human population in the country (MAF & STEA, 2003).

2.2.2 History of Wildlife Conservation in Laos

In 1988 the Sida and IUCN was support the department of forestry to begin a survey of suitable areas for conservation in Laos for stimulated to improve in wildlife survey and knowledge of fauna in Lao PDR. So since 1988, wildlife surveys have been carried out only in designated protected areas in cooperation with foreign experts, and have focused on large mammals, birds and some amphibians. Insect data remain limited, as is data concerning many types of plant species, particularly herb species. Data on threatened plants for example is so scarce, that status assessments on category of threat are mostly made based on the situation in neighboring countries. The IUCN Red List of Threatened Species 2000 can be referred to for general information on habitat loss as well as more detailed information on plant and animal species. And in 1994 WCS was also support the major role with faunal survey work and discovered new species along Annamite Mountain and increase the knowledge of bat in Laos (Salter, compiler, 1993; Duckworth, Salter & Khounboline, 1999).

Issues of concern: The current status of wildlife populations, the current status of protected area management and the effective size and fragmentation of protected areas have serious implications on what types of wildlife can be sustained for food security and other forms of development (such as sustainable forestry and eco-tourism) in the Lao PDR. While it is hard to put a monetary value on the potential loss of ‘goods and services’ from biodiversity, it can be assumed to be significant. Healthy forests also provide national income through timber for industrial forestry, stable watersheds for hydropower and irrigated and un-irrigated rice production. Because of the reduction in the number and species of wildlife, the human population can anticipate the following problems:

1. Less food for sustainable subsistence lifestyles
2. Lower income earned from wildlife harvest
3. Less forest trees because of the loss of seed carrying animals
4. Lower paddy rice yields from rain fed and irrigated systems

5. Lower income from NTFPs because fewer plants are seeded by animals and also Fewer traditional medicines

6. Lost income for eco-tourism

7. Increased land-use disputes

8. Increased dependence on the central government (and international donors) for food in times of crop failure and natural disasters

9. Increased dependence on the central government to provide jobs because of lower income from the forest

10. Loss of international aid for biodiversity conservation because there is less to protect (MAF, 2010).

2.2.3 Present Policies and Strategy of Wildlife in Laos

All government policies now refer to poverty eradication as the primary objective. The socio-economic development strategy has been laid down up to 2020, and the socio-economic 5 year plan (2001-2005) sets the framework for these policies. At the present many wildlife species that require complete protection, some species that do not require any protection. The Wildlife Unit of Centre for Protected Areas and Watershed Management (CPAWM) was draft more comprehensive code of wildlife protection law, by proposed the definitions of protected species based on the information gather from past survey (MAF & STEA, 2003).

2.2.3.1 Wildlife and wild plants policies

The policy on wildlife in Lao PDR is sometimes confusing and sometimes contradictory law for protection of wildlife (Duckworth et al., 1999). At the present, many species require to protection in necessary such as tiger, Saola etc., and some common species not require protect measures but still need in the listed as subject of hunting controls. Lao PDR strengthening enforcement against illegal wildlife trade within the country and improving enforcement in the country. Forest management has been improving, but the enforcement is still weakness especially at the borders. There is no effective system to monitor and enforce, and should to learn new ways of protecting the species and ultimately improving the situation for wildlife in NPA. Despite these obvious strengths, the issues remain to be addressed including (1) the lack of an effective planning framework of wildlife and plants for integrating the

multiple demands being placed on the natural resource base, (2) the lack of trainning staff and funding for conservation management, (3) insufficient information on key wildlife and habitats, and (4) the coordination at the regional and provincial levels are inadequate.

In the year 2001-2002 the Department of Forestry disseminated the Forestry Law and CITES regulations. The outputs of these activities show that many staff involved at various levels (including central, provincial and border personnel) clearly understand the importance and necessity of relevant laws and regulations and seek reasonable ways to coordinate their work. Illegal trade of wildlife in the local markets was reduced in many provinces. Now Lao PDR approved to be a member of CITES. Nevertheless, in practice, the Forestry Law compared with other Lao laws and regulations still has some gaps to fill. The main issues are to clearly identify terms of reference and national coordination systems between organizations involved in any laws and regulations (MAF, (2003; STEA, 2004).

2.2.3.2 Existing policies and strategies

Natural resource conservation in the Lao PDR has much strength which set it aside from, and in many respects, ahead of its South East Asian neighbors. It retains a relatively intact resource base, with approximately 20 percent of its land area devoted to forest conservation. Government supports to sustainable use for sustainable livelihood to the local community in the protected area. So there are many law and strategy to promote conservation in Laos including:

1. Forestry law
2. Environmental protection law
3. Aquatic and wildlife law (2007)
4. First national environmental action plan (1994)
5. Forest vision for 2020 (2000)
6. Agriculture and forestry Sector development plan (2001)
7. Master plan study integrate agricultural development Lao PDR (2001)
8. National biodiversity strategy and action plan year up 2010 to 2020 (2004)

9. National environmental strategy years up to 2020 and the environmental action plan (2006-2010)

10. Convention on biological diversity (CBD)

11. Convention on wetland (Ramsar)

12. Convention on international trade in endangered species (CTES)

The current status of wildlife populations, the current status of protected area management and the effective size and fragmentation of protected areas have serious implications on what types of wildlife can be sustained for food security and other forms of development (such as sustainable forestry and eco-tourism) in the Lao PDR. The government try to control and solve this case, Although Lao PDR have the policy, law and regulation for wildlife management, but the problems of wildlife still have with some area (World Bank**,** Science Technology and Environment Agency [STEA], 2005; WREA, 2008).

2.2.4 Major Conservation Programs and Projects

The Government's strategy is to identify, promote and strengthen sustainable growth and target at the same time the poorer segments of the population. Being a signatory to the CITES (May 2004), and the WCS embarked on vigorous efforts to regulate threatening activities through the implementation of a national gun collection, and strict enforcement of existing relevant laws and regulations to curb and minimize the widespread practice of these activities. These efforts resulted in the modest decline and less visibility of the wildlife trading in the country and more or less regulated the harvesting of wildlife and wild products that are traded locally and internationally (WREA, 2008).

Collaborative projects with international funding organizations have been established that contribute to biodiversity protection in Lao PDR, as well as with neighboring countries such as Cambodia and Vietnam. More recent studies and research were carried out in co-operation between national organizations such as the Ministry of Agriculture and Forestry (MAF) its department and research organiztions and external donors. There are among others organization including the International Unit for the Conservation Nature (IUCN), the Japanese International Co-operation Agency (JICA), the World Wildlife Fund (WWF), the Wildlife Conservation Society

(WCS), the Swedish International Development Agency (SIDA), the World bank, the Asian development Bank (ADB), the Danish International Development Agency (DIDA), the Deutsche Gesellschaft for Technische Zusammenarabeit (GTZ), the International Rice Research Institute (IRRI) and UN-organizations. Projects supported ranged from natural resource management and biodiversity to agricultural biodiversity conservation. However, the knowledge about the Lao PDR's biodiversity still remains limited, so the ratification of the ASEAN Centre for Biodiversity as a legal body within the ASEAN framework has also increased the participation of Lao PDR in the collaboration and sharing of knowledge and experiences among the other ASEAN Member States. Many of the technical people have attended workshops and conducted training courses by the ACB on biodiversity related conservation and management (MAF & STEA, 2003; Lao PDR, 2004). The three main organizations that worked to focus on biodiversity conservation in Laos including: IUCN, WCS and WWF

2.2.4.1 IUCN Lao PDR: IUCN is the big one of NGO that works to protect and promote on biodiversity in the world and also established in Lao PDR in 1992. The IUCN work to supports and contributes to conserve the natural diversity to ensure that sustainable use of natural resources in the country. IUCN consider and focus in four main key including:

1. Protected area: IUCN supports to improvement of protected area as well as the conservation species both in and outside protected area by development management plan with local community provide functional linkages between PA to conserve habitat, species and ecosystem service as sustainable livelihood for the local people in PA. Especially supports and design of a comprehensive Saola conservation project.

2. Environmental governance: IUCN efforts to strengthen intuitions and enhance the processes of decision-making and across rang of stakeholder to achieve national conservation and development projects as promotes of SEA in the development projects and implementation in Laos by improved capacity for effective governance and also build the key knowledge and tools to improve forest law enforcement and governance in Lao PDR.

3. Water and Wetlands: Water is very important to the Lao people as a long. The governments try to improved water resources management and protection

of watersheds and wetland management at a local, regional and international level. IUCN also support the government to be the member of Ramsar convention and at the same time IUCN Lao has also been capacity building the institutions of the valuation of water and wetland.

4. Climate change: With the adaptation with climate change IUCN focus on ecosystem-based solution which sustainable use of biodiversity and ecosystem service to minimize the adverse impacts of climate change on people by mainstreaming ecosystem approach and development, capacity building, food security the role of forest products in Laos.

2.2.4.2 WCS Lao PDR: WCS stared to work at Lao PDR in 1994, They was started science survey of wildlife population to abundance and work with the local community to reduce causes, effects of poaching and habitats loss and wildlife trade by design and test the effectiveness of the conservation in the field. WCS also provide education, training for provincial to help them the new skill on forest management. WCS helped Lao to establish the baseline of biodiversity status report such as bird areas, Eld's deer, western black crested gibbon, Siamese crocodile, and tiger; and developed the conservation strategy for Asian elephant. WCS also work with the local community to promote for reduce the hunting and wildlife trade.

2.2.4.3 WWF Lao PDR: WWF in Lao work to conserve the biodiversity by focused to train in wildlife management, wildlife policy, environmental threat assessment, public speaking and awareness-raising, development and implementation of biodiversity conservation. In the wildlife management need to foster the key species, strengthening institutional capacity, improve the legion framework and management at the community, national and regional level to work with the stakeholders group focus on: Development and update wildlife legislation, regulations, policies on wildlife; Improve understand of economic dimensions on wildlife trade; Developing management plan for selected species and setting in place wildlife populations monitoring; Developing and testing models on community-based on wildlife management; and Raising awareness and understand of wildlife issue to ensure the effective of wildlife conservation.

2.2.5 Successes and Challenges

In governance of biodiversity conservation at the national level, successes have been achieved in crafting the many legislations and policies that can be found in the different strategy plans and action programs of the government. One major document is the National Sustainable Development Strategy that was adopted in December 2008. Biodiversity conservation concerns and some indicators have been included in many of the sectors identified in the National Sustainable Development Strategy (NSDS) 2008. Indicators pertaining to biodiversity have been included in the NSDS and are being used in monitoring changes and trends. Monitoring could further be enhanced by training more technical people. At present, the State lacks the technical staff to achieve it. Hunting pressures in the country are increasing threats in some areas, their relatively far distances from human settlements, have provided to some extent, temporary protection to the wildlife in the country. Whenever, the human population increase and development pressures in the country that will be eventually have negative impacts on the wildlife population. Related to this is the clear understanding on the importance of biodiversity and the wildlife resources among most of the Lao people, primarily believing that wildlife species are just wild organisms that have no importance, and most of the time posed dangers to humans and domestic resources (MAF & STEA, 2003).

Foremost among the successes are the implementation of the GMS programmes in partnerships with international organizations such as the WWF, IUCN, ADB, among others. With work which was partnered by WWF and IUCN, identified biodiversity conservation corridors to ensure that adequate linkages in the landscapes will be properly and adequately protected and managed to maintain biodiversity resources and vital ecosystem services to sustain resources productivity and livelihoods of the affected communities and hence, contribute to the sustained growth of the national economy. Other successful programmes implemented in partnership with WWF and the GMS include the Community Fisheries, to augment and increase productivity of the fishery sector in the Mekong River basin, and the Green Club, which deals more on the educational and information campaign for environmental management and other related activities (Lao PDR, 2004).

The big challenges in Lao PDR are wildlife trade, unsustainable hunting and loss of wildlife habitats, the implementation of the protected management was by no means complete and a lot has to be done to improve its implementation. Addressing the issues on access and benefit sharing to the indigenous peoples' knowledge should be one of the government priorities. On the other hand, expertise of dealing with issues is limited and assistance is needed for addressing this issue in the short and medium terms. As such, reducing or removing the threat of the biodiversity remains a challenge (World Bank & STEA, 2005).

2.3 The Animal: The Saola

2.3.1 Introduction About Saola

The Saola have the common name is Saola *(Pseudoryx nghetinhensis)* it was from the Lao native name that refer to the long strength horns of it (another name Vu Quang ox, Sun Duong). Saola is one of the most recently discovered large mammals and its formal description elicited an incredible to the scientific due to its highly distinctive physical traits. The Saola was classification into the Family Bovinae. It has a head and body length about 150 cm and weight 100 kg (adult), it has dark brown color with short hair, narrow black stripe which runs down the spine from the shoulders to the tail. It has darker legs sport two white dots just above the hoofs. On the face has striking white markings, including a stripe above each eye and a variable pattern of spots, stripes on the cheeks beneath the eyes; chin and lips are also white and on the face has the big maxillary gland in front of the eyes of the cheeks, heavy neck and long. And the special character of Saola is a long straight horns that found in both sexes, it long around 35-50 cm.

Figure 2.1 Captive female adult Saola in 1996 Lao PDR.

Figure 2.2 The special character of Saola

2.3.2 History of Saola Discovery

Since discovered in 1992, it is more than twenty years later but still have a little known about the biology and behavior of Saola. Since 1992, only a handful of

confirmed Saola sightings is on record, including camera-trap photos taken in 1999 Lao PDR because Saola was very extremely secretive and very seldom seen; their habitats a very restricted range, and until now there is still no reported of Saola in the wild by scientist before, the effort to keep it in captivity was failed in the past (Timmins, Robichaud, Long, Hedges,, Steinmetz, Abramov, Do Tuoc & Mallon, 2008). The first photograph of Saola in the wild was taken in the vicinity of mineral lick in Vietnam (Whitfiel,1998), and a few months later two photos that taken by camera-trap in Laos (See in Figure 2.3 and Figure 2.4). One is standing in the steam at noon and one descending a forest slope at 17:01 in the evening (Robichaud, 1999).

In 2008, WMPA was surveyed wildlife by using camera trap in NNT and I also joined with this field for my thesis writing on undergraduate degree. The result from set up camera-trap in 6 months it is could not take picture of Saola, but we found some vestige of Saola such as footprint that look like Saola' foot, food (leaves plants that probably Saola' food) and feeding food was seen many times around Saola's range.

Table 2.1 The history of Saola

Year	Sources
1992	Discovered the first horns of Saola in Vietnam (by John Mackinnon, Vu Van Dzung and Do Tuoc)
1993	Discovered the horns of Saola in Nakai-Nam Theun (NNT) NBCA in Laos(by Bob Dobias, IUCN)
1996	Thirteen known Saolas were captured and kept in captivity, but eleven died within five months; the two surviving Saola were released to the forest (Timmins *et al.)*
1999	Two Saola pictures were recorded on film (the first picture at noon and the last picture at 17:01pm) by camera trap at Vangban in Laos. *(*William Robichaud)

Table 2.1 (continued)

Year	Sources
2006	1. IUCN established a SWG in the part of AWCSG to bring more focused attention to Saola conservation and accepted in 2009 2. In Vietnam, WWF Great Mekong's Species Program has also been activity involved in Saola conservation to setting up initiative the Vu Quang project for improve the conservation management and support the livelihood of the local people in area where Saola discovered.
2008	WMPA surveyed wildlife using camera trap in NNT NBCA. In 6 months, it could not take picture of Saola, but some other clues such as footprints and leaves that were probably Saola' food were found
2010	In August, the villager in Lao was captured a Saola but it died in captivity before released its back into the wild.

And in the August 2010, the government of Lao PDR was confirmed from the villagers in Xaychamphon district of Bolikhamxay province that the local people caught a Saola (an adult male) in the forest. This is the first indisputable recorded of the Saoal in more than ten years. Immediately the government and WCS dispatched a technical team to examine the Saola and release it back to the forest. Saola still alive when the team reached the village, but unfortunately Saola seem much weakened from the ordeal of several days in captivity and it died shortly afterwards. It was not clear why the villager brought the Saola in captivity. The government and district authority was urged to villagers in the area that not to capture the Saola and immediately release others they might encounter.

Figure 2.3 The first of Saola picture on film by camera-trap at Lao PDR, 1999

Figure 2.4 The last of Saola picture on film by camera-trap at Lao PDR, 1999

2.3.3 Ecology and Behavior

The Saola habitat is the Annamite Mountains of Laos and Vietnam. This area has rainfall for ten months per year or a little dry season (Robichaud & Timmins, 2004). Very few Saola have been studied alive in the wild, scientists have recorded only 11 living Saola in the captivity, so the majority of behavioral and biological data

on this species comes from Saola that captured in 1996 and local villagers' tales. The local people reported that Saola eats the leaves of fig trees along the river bank, and it was always visits the mineral licks (Phaengsintham, 1996).

2.3.3.1 Ecology

Saola favour ever wet forests with little or no dry-season, most of Saola recorded from the climatically wet evergreen forests at mid-elevation about 400-800 m above sea level, and in this weather there are important species distributed also such as Annamite striped rabbit, short-tailed Scimitar Babbler and Crested Argus (Robichaud & Timmins, 2004). Saola use forest in differing seasons, even entering lowland forest along river only 200 m (Schaller, 1995). The villagers reported that Saola feeds on the leaves of fig trees and other riverside bushes, and they reported that Saola is quite fond of the medicinal herb. And the observed Saola in captivity rarely jerked or pulled on vegetation while feeding, but rather chewed the petioles to separate the leaves from the stem before chewing the leaves themselves, it on occasionally pulled leaves into the mouth using her tongue. After that scientist identified as the plant related to species *Schismatoglottis cochinchinensis* in Family Araceae (Dung, Giao, Chinh, Tuoc, & MacKinnon 1994; Robichuad, 1999).

2.3.3.2 Behavior

Saola appears to be a solitary species based on reported from the local people and Saola was captured in1998 studied by Robichaud was the source of the majority of behavior data of Saola (Robicaud, 1998a). Local people have reported seeing Saola traveling in groups of two or three in the forest, it makes the territories by opening up a flap on the snout to reveal scent glands and the gland was largest of any living animals. One local people reported that Saola are known locally as the polite animal and very shy because Saola always step slowly and quietly through the forest was not obstinate or excitable. The Saola' behavior that observed in the captivity it fed at most time during the day and rarely at night and rumination occurred mostly in the morning. It rests chin on the ground with closed eyes most frequently during of darkness. And interviewed by the Laotian people indicate that Saola is very active in the morning, late afternoon and at night. The only thing Saola afraid is a dog, because in the past local people used dog for hunting Saola, so the dogs provoke a strong defensive to Saola. When chased by dogs in the wild Saola will

run to the nearest stream, make their stand and when faced with dogs it will turn the face to the threat, arch the back by brining all feet together and bow the head such that the tips of the horns at the dogs (Schaller, 1995).

2.3.4 Distribution and Population

Saola occurs only in the Annamite Mountains of Laos and Vietnam (See in Figure 2.5). In Laos, it confirmed that Saola occur in the NNT NBCA in Khammouane province (Evans, Duckworth, & Timmins 1996; Timmis, 2001) and Nam Chat-Nam Pan in Bolikhamxay province (Souvannalath, 1996) and Nam Chouan proposed NBCA in Bolikhamxay province (Robichaud, 1998b). And during wildlife surveyed in 1998 at Hin Namno NBCA, the local people reported that Saola were once found near their village and probable it still occurs in remote area near Xe Bangfai headwaters in southern of Khammouane and northern of Savannakhet province (Walston & Vinton, editors, 1999).

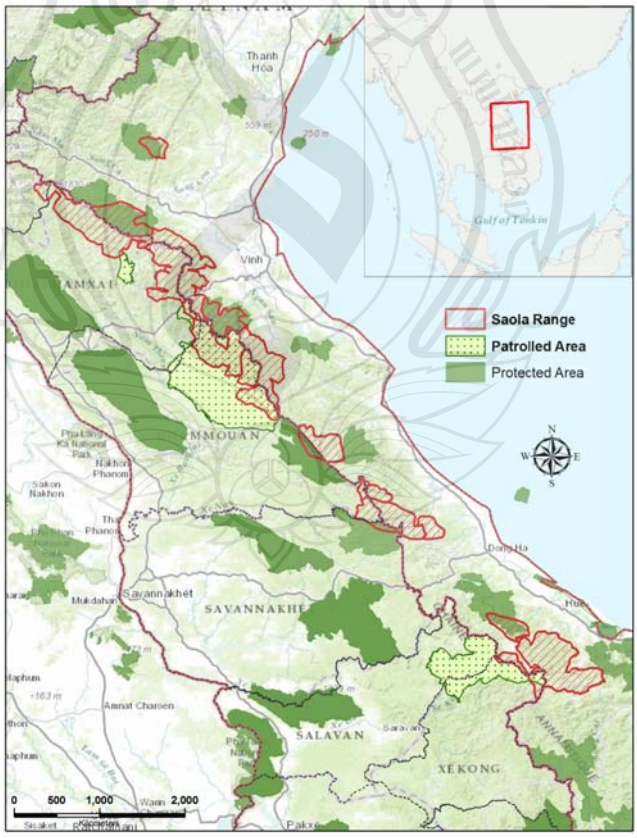

Figure 2.5 Global distribution of Saola

In Vietnam, there is evidence of Saola occurred in the Nghe An, Ha Tinh, Ouang Binh, UQuang Tri, Thua-Thien Hue and Quang Nam province. It suspected to occur in less than 15 forest blocks in Laos and Vietnam. The satellite images of this area show that is apparently suitable for extending the habitats and the species is present in the adjacent contiguous area of Vietnam, where the discovery the first horn of Saola (Le Manh Hung, Pham Duc Tien, Nguyen Duc Tu &Vu Huu Trac, 2002; Le Manh Hung, Pham Duc Tien, Andrew, Tordoff & Nguyen Dinh Dung, 2002). The local people also reported that they have seen it and Saola still present on both side of Laos and Vietnam (Tham Ngoc Diep, Dang Thang Long & Do Tuoc, 2004).

In 2006 IUCN established the Saola population that probably no more than a few hundreds or possible as few as a few ten. Saola lives in the grave danger of extinction; it is unlikely that global distribution is greater than the low hundred at most. To date, scientists have documented of Saola in the wild only four occasions, in fact there is not a reliable method for detecting the species other than field survey and camera-trap, or other potentially reliable method of detection by genetic analysis of feces, but for encounter with Saola are extremely rare. The paucity data of Saola is itself an indication to critically small population, the reported from local people in the past decade not number in the thousands or hundred but in the tens.

2.3.5 Threats

The main threats to Saola are hunting and wildlife in Saola' ranges is most threatened by traditional medicine trade, the specific demand of Saola for medicine or meat almost nonexistent because in china unknown as Saola in the traditional pharmacopoeia. Instead, Saola was snared incidentally in the intense that pursuit of other animals because snares set in the forest for wild boar, sambar or barking deer and also trap Saola. The people increase the hunting to supply the illegal trade in wildlife so it increases in hunting pressure.

Figure 2.6 Poaching snares that collected in NNT NBCA

2.3.5.1 Hunting

Hunting is the main current threat to Saola. Extensive snaring and hunting with dogs are the main problems. Local people hunting for their own consumption are believed to be less of a threat than trade-driven hunting. However, this may still be a significant threat in parts of Lao PDR in particular, in villages remote from market access, especially since Saola populations everywhere are small. Targeted hunting of Saola for trophies (horns or mounted specimens) was not considered a major current threat. However, there is some uncertainty about this, given the difficulty of assessing the scale and nature of this highly illegal trade, and the rarity of Saola.

2.3.5.2 Habitat loss

Habitat destruction, degradation and fragmentation are not considered significant direct threats to Saola at present, when compared with hunting. There is far more potential Saola habitat today than there is Saola to inhabit it. Selective logging, whether legal or illegal, is probably not a major direct threat, but it does open up areas to hunting or to the disturbance. Hydropower and mines can be indirect threats, but they also have the potential to benefit Saola through biodiversity offsets, such as pioneered by the Nam Theun 2 dam project in Lao PDR.

Saola have small size and not sure the number of population, it is also the problems or threat to the species. If the population of an animal is reduced far enough, the small population size itself can become a threat because if Saola populations decline below a certain but unknown the level. These small population effects have two important features. It is difficult to document in specific cases, even for species which are easy to study and it is not enough to correct the factors that originally caused the small population (e.g. hunting). The species can still go extinct because the small population size itself has become a threat (Hardcastle, Cox, Nguyen Thi Dao & Grieser, editors, 2004).

2.4 Summary

As the world human population continues to grow up the threats to wildlife population also increase. The major threats to wildlife are hunting for consumption and for trade because the demand and value of wildlife in the market increasing that make incentive to the people become to hunting for trade. The human in many countries have been accustomed to depend on wildlife for medicinal ingredients and some countries wildlife are traditional for their livelihood they also prefer to collect born, skin and horns. Wildlife conservation is educating the people attempt to protect the endangered species as promote the conservation, save habitats and also against wildlife trade. Government is a most important to help too much of conservation to provide the implementation policy to protect wildlife. So how do on successfully conserving biodiversity and achieve appropriate development programs? So the successful conservation is having the components and requires the objective of the conservation to be the goal target of the project to create or design the model and approach to do the conservation that try to find the solution for conservation. The successful conservation must be consciously targeting and harnessing, ensure sustainable use and equitable use of resources by focus to awareness and understanding linkage between conservation and development. The lessons learn from the experience to improve the approach of wildlife conservation.

Although, Lao PDR have the policy for wildlife management, but the problems of wildlife in Lao still have with some areas, the important of problem that very sensitive is a wildlife trade, the exploitation of numerous species and hunting, the government try to control and the WCS and WWF hade survey the species that popular for wildlife trade is has many species, mostly is mammalian and reptilian, the one point is consumption cultural that local people in Lao they believe for a long time that if they eat the wildlife they might get good healthy, more strong and get medicine in natural, it is a livelihood that made their understand for a long time, so the wildlife population are decrease very fast, and another problem is a wildlife trade in market (small market) or restaurant and the most important things is mostly from consumers they are the rich people, so the cost of wildlife very high and that will can help the local people can get more income more than farming or another jobs.

Saola is an animal that occurs in the Annamite Mountains of Laos and Vietnam. More than twenty years, since discovered in 1992 and the last comfirmation of Saola in the forest by villagers in Laos captured Saola in 2010. But until no scientists cannot see Saola in the forest before and it has a little information about ecology, behavior and population. A few Saola have been studied alive in the wild, so the majority of behavioral and biological was sources from 11 Saola in captivity in 1996 and reported from the local people in Saola' range. The main threat to Saola is snare hunting and habitat loss. In 2006 IUCN established the number of population not more than few handreds or possible as few as a few ten. So Saola is one of the most enigmatic animal in the world.

CHAPTER 3

METHOD AND MATERIALS

This research studies on the Saola Working Group for Saola conservation in Laos, to see the activities of SWG for detection, protection and the effective approach for Saola conservation and evaluate the effectiveness of this program to improve the program conservation for the Saola conservation in Laos by use TBE to analyze the data based on the secondary data that collected from SWG. And then comparison SWG's activities with the theory of wildlife conservation in the conceptual framework in Figure 1.2 (Chapter 1) and after data collection was improve the theory of wildlife conservation by creating from the first daft conceptual and finalize to the implementation theory for SWG that will show in Figure 4.2 (Chapter 4). TBE for wildlife conservation is the approach to evaluate the program of conservation. It has provided the knowledge and also tries to find the best solution for work, it looks like the model to find the effectiveness of the program and learn with those outcomes how and why.

3.1 Theory-Based Evaluations

Theory-based evaluation is the one methodology for evaluates the program, that look like gridline to evaluate theory and how to make it effective. That we learn from this approach is the system of the process in theory to clear the outcome "worked or didn't work", at the same time we can learn with that outcome "why and how" to improve the program with try to adapt with the resource and time. The program theory is useful because it looks like the guideline evaluate by identify the key elements of the program and clarifying how these elements to be connected each other. The operationalization of concepts satisfying the requirement of construct validity represents a frame of data acquisition and their interpretation, the data can be

collected by various techniques or from various sources, following that the model of the relations identified in the acquired data to be compared with the model of relations articulated in the program theory (Cooksy, Gill & Kelly, 2001).

The first researcher to incorporate the theory with the program evaluate was Tyler in 1949 in edit written from research, Tyler saw that evaluate based on theory was necessary to ascertain simple whether and he also proposed the idea to curriculum maker must operate on some kind of the theory of learning, it is useful to have this theory of learning of formulate in term both to check it for tenability and see an implication for the curriculum (Tyler, 1949). And then there were researches to evaluation methods allowed for the effectiveness of the program that should have both evaluated (summative) while provided the information to improving teaching and learning (formative) to provide the opportunity for feedback to be used for guideline in the future program. The knowledge of theory evaluation will be useful and help the researchers to learn and improve the program better (Michele, Preston, Daniel & Trujillo, 2010)

In the evaluation program, it has long been acknowledged that important and must understand the relationship of this; it has focused both before and after the program on the process and implementation while the outcome will focus on approach to the program that work or not work, and also it will provide the information how and why in the outcome. In order to understand why the program worked or didn't work, it has to be informed by an understanding of what happened during the intervention and one method of doing evaluation that is based on understanding of the intervention process is called theory based evaluation (Chen & Rossi, 1983; Weiss, 1972). In 1991 Shadish Cook and Leviton provided the characterized the history of theory of evaluation as a story stage such as emphasized the discovery of truth, focused on the way evaluation to development the addressed the integration of inquiry and utility, it is only fitting that evaluation theories themselves be evaluated. They were also provided the good theory of evaluation practice that should have the appropriate principles and practices that based on the knowledge, how to use knowledge, how to construct value and how to practice in the real world (Shadish, Cook & Leviton, 1991; Shadish, 1998).

There are a variety of human activities that contribute to species becoming threatened to wildlife population, including habitat destruction, pollution, disease, climate change and over exploitation. The conservation has consider two things, first to evaluate the human impacts on biological diversity (identify the threats) and to develop practical approaches to prevent the extinction of species. The conservation policy with theory of the ecology, taxonomy and genetic were the basic principle understanding to have the direct implementation for management of species and ecosystems (Soule, 1986; Wilson, 1992). Theory of wildlife conservation is the approach to provide the knowledge on conservation and how to adaptation for the success conservation. There are variety of methods currently being implement to save and protect endangered species, the most common are the creation of protected areas (and must have a protected management), conservation legislation and increase public awareness. The theory of wildlife conservation must be considering the activity to implement in the action for protection habitats; reduce threats and hunting and to ensure that increase the number of population. Most activity has the objectives on this, and for the implementation is difference that depend on policy conservation in each country.

3.2 Materials

This research studies on Saola Working Group for Saola conservation in Laos. The objectives of this study were to see the activities of SWG for detection, protection and the effective approach for Saola protection and evaluate the effectiveness of the Saola conservation in Laos by use TBE. Based on the secondary data was collect from SWG. And I have done a literature review about Saola conservation both in Laos and Vietnam. Most of sources and information in this research were from interviewed with the SWG coordinator (Robichuad & Timmins, 2004) two times were conducted with him, he was an expert at WMPA when I was a team of wildlife survey by using camera trap at NNT in 2008. And I also interviewed with director of IUCN and WMPA, to discuss about policy and limitation of Saola conservation.

In the first interviewed (July 2012) with him, we discussed about my objective want to do research on Saola conservation in Laos. Then he interviewed (explained) to me that SWG was not an NGO, it is a special group in the part of IUCN in focusing on Saola in Laos and Vietnam. In the second interview (May 2013), I confirmed to him that I will do research about Saola under SWG. Therefor we were discussing about the base information about SWG including: organization, activity, and target, objective to protect Saola at this time. And he also talked about the community participation with local people, field survey to detect Saola and the limitation of SWG for Saola conservation because SWG did not have an office in Laos, the coordinator was spending his time only 2-3 times per year in Laos. Therefor I was contacting with him by mail. Most of the members used part time to work together. With unsustainable funding to support the group in often, their activities depends on the donors or funding. At the same time, he was also support the information about Saola and provided some reports of their work that have done in Laos.

Moreover I collected some reports about Saola from other organizations such as IUCN, WWF, WCS and WMPA because all of these organizations are partnerships with SWG. All of them helped too much in supporting sources about Saola. And there was some information that I have been interviewed by local people in 2008 when I have done the research Saola. After finishing data collection, I was starting for data analysis by compiled the SWG' activities have done for Saola conservation and compare with the conceptual framework and also criteria about the wildlife conservation.

3.3 Criterias of Wildlife Conservation

The programmes for wildlife conservations are the program to work for protection save the wildlife population and promote wildlife from extinction. The conservation and under the program has many different activities for detection and protection wildlife. So most of the wildlife conservation programs considering the activity for implementation in difference cause, and the activity of conservation needs to consider the protected management, capacity building, field survey (camera-trap

and patrol), an awareness program and community participation (work with local people). The criteria of wildlife conservation must have the outcome following:

3.3.1 Field Survey (Camera-Trap and Patrol)

Firstly, when we talk about wildlife we must understand the basic knowledge about wildlife such as population, ecology, behavior or wildlife habitat, for the field survey is can conduct in both two methods patrol and camera. There are has a little different, the patrol can reduce hunting and threats to wildlife directly; and the result of camera-trap is the evidence to confirm that animals are alive by show or record picture of animals in the wild, and sometimes can estimate the population. But both of this method is can improve the knowledge about ecology, behavior and also populations of animals in the wild, because the field survey team can record the animals directly of their encounter in the forest. And under this program it helps to understand the basic information on geographic in the areas and contribute into the map later, this can help the field survey more comfortable with using the map.

3.3.2 Protected Management

An effective and international recognized strategy for conservation species and ecosystem is to designate the protected areas. And the most important thing is the forest management plan for sustainable use and control the human activity. And must have a policy and law or regulation to support the wildlife conservation, it helps the conservation more easily by control the hunting and reduce threats to wildlife. The local community is the key of forest management, so must work with them by helping them to manage the resource and put the responsibility to the villagers for protecting the forest, it would be more effective for their livelihood and sustainable use.

3.3.3 Capacity Building

The capacity building is necessary for the person who work or focus on conservation. Under this approach is improving the technical, information, basic knowledge and other technique to staff and local people in the field, because all staff who work related to wildlife conservation must be have the basic knowledge of

animal and the field survey methods or patrol. It will help the activity of field survey more effective.

3.3.4 Awareness Program

In general, the public awareness can increase through education and citizen science program. In awareness-raising are the methods to provide the information about the principle of wildlife conservation to the people why needed to protect, how it's important and how to conserve it. And also it provides the information to people for understanding about animals, try to convince people to interest for conservation and participation.

3.3.5 Community Participation (Work with Local People)

It’s also important for conservation because the local people they are depend on the natural resource as long as, the key conservation needs the participation from the local people, try to convince them to more active on conservation by provide incentive to them and because the local people does not have income or salary if they have the appropriate compensation to them they might mire active on conservation.

3.4 Data Analysis

For data analysis, to evaluate the SWG’ activities for detecting and protection Saola in Laos were reviewed using the theory of wildlife conservation that showed in conceptual framework in the Figure 1.2 (Chapter 1) and with the criteria that showed above. To evaluation the SWG’ activities are effectiveness for detecting and protection Saola, using the following grade system including 5 levels to show the effectiveness activities from very good to poor.

Grade A: The activity has been well effectiveness performed for detecting and protection of Saola with follow the criteria.

Grade B: Is regarded but despite some minor to improve.

Grade C: Is not well satisfactory, activity significant needed to improve.

Grade D: Is poorly with important point needed attempted.

Grade F: The activity has failed at all.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 The Conservation: Saola Working Group

4.1.1 Establishment and Status

The Saola Working Group (SWG) is the part of Asia Wild Cattle Specialist Group (AWCSG) of the IUCN Species Survival Commission (SSC). The SWG established in 2006, which consists of more than 40 experts from a diverse range of specialties in the wild cattle and buffalo range such as Laos, Thailand, Vietnam, Nepal, Malaysia, Philippine, Cambodia, China, India, Indonesia and several western countries. Most of its members work for either government or conservation organizations in Laos or Vietnam. The SWG started as a technical advisory and brainstorming group, but has increasingly evolved to function more like an NGO, in addition to continuing to provide technical advice and coordination.

This First Meeting of the Saola Working Group August 2009 was called to address the lack of conservation attention to Saola and the lack of information about the species (which is a constraint to better conservation) for the new approaches and better coordination for its conservation must become available soon to prevent this. The meeting tried to make the contribution in the long-term, comprehensive strategy for Saola conservation; provided by 2008 daft a strategy for conservation of Southeast Asian wild cattle and buffalo drafted by the IUCN SSC AWCSG. There were also two other earlier Saola conservation action plans, one for Lao PDR in 1999 and one for Vietnam in 2006.

The SWG mission statement: The SWG acts to conserve Saola in the wild, through the identification and implementation of creative, high-priority conservation action, and by encouraging and supporting partnership to do the same. The SWG is an organization of deep collaboration. 18 members include staff of the major

international non-government and national government organizations working on wildlife conservation in Indochina and most of members live in the range countries of Laos or Vietnam, but members also include staff from external partners such as the Smithsonian Institution and White Oak Conservation Center. In-kind contributions (mainly in staff time) to this portfolio were:

1. Cambridge University Darwin Initiative project (Vietnam)
2. Division of Forest Resources Conservation (DFRC), Department of Forestry in Laos
3. Institute of Ecology and Biological Resiurces (Vietnam)
4. Vinh University, Department of Zoology (Vietnam)
5. Wildlife Conservation Society (WCS) Lao Program
6. World Wildlife Fund (WWF) Greater Mekong Programme
7. WWF Lao Programme
8. WWF Vietnam Programme

4.1.2 The Strategy of SWG for Saola Conservation

The initiatives outlined are of two types: long-term measures to conserve Saola in perpetuity, and urgent short-term actions to stabilize Saola numbers and prevent the species' extinction in the wild, while the long-term initiatives take effect. The long-term initiatives, however, also need to be started immediately long-term refers to their duration and/or when significant benefits can be expected, and not an acceptable delay in their implementation. SWG has identified 5 priorities for Saola conservation in their group including: protection, research**,** awareness-raising**,** mentoring and fund-raising**.**

4.1.2.1 Direct protection

Protection of remaining Saola from hunting and snaring is the most urgent priority to save the species from extinction (other initiatives may be equally essential in the long-term, but none is as urgent). There are various means to improve protection of priority sites. Among them are providing supplemental support (both training and funding) to government patrol efforts, hiring contract rangers, and engaging with local communities to encourage them to either reduce their own

killings of local Saola and help reduce outside threats by community engagement more than general awareness raising, which is treated elsewhere.

4.1.2.2 Research

A significant constraint to Saola conservation is limited information about the animals' distribution, population, ecology and behavior. In fact, no biologist has ever reported seeing the species in the wild surely, the largest terrestrial animal of undisputed existence in the world for which this is true. So focus to study the animal also important.

4.1.2.3 Awareness-raising

Saola conservation will require a long-term shift in attitude at various levels of society (both locally and internationally), and conservation awareness-raising can help promote this. However, an awareness effort for Saola must be selective and carefully targeted, because it entails risk. One of the principal advantages for Saola conservation, in fact, that the animal is little known, i.e., that the species has little demand in trade, and has not attracted much attention from the chain of consumers, traders and poachers in Asia. It was making the animal more famous in Laos and Vietnam risks creating a demand, most obviously for its spectacular horns, and also for live animals for private zoos.

4.1.2.4 Mentoring

Saola cannot save itself. Its conservation will achieve by motivated, capable individuals, and in particular nationals of the two range countries, Laos and Vietnam. Technical and professional development is comparatively better advanced, and thus Laos is a more immediate priority for such mentoring and development. Significant mentoring for professional capacity in conservation awareness-raising can come through Lao participation in a Rare Pride campaign. For other sectors, a relationship that the SWG recently established with the US-based donor network, the Wildlife Conservation Network (WCN) holds promise.

4.1.2.5 Fund-raising

Funding is also important for the conservation; fund-raising from the organizations must be the first priority. The first step is to invest in building relationships with potential supporters, inspiring them with the Saola’s story, and introducing them to the SWG. This is best accomplished in person, at some stage.

Once the relationship is built, then the conversation can turn to how the SWG can be a conduit for the donor's wish to support effective, high-priority conservation and it important to implement the strategy.

4.1.3 SWG's Main Working Area in Lao PDR

There are important things that must be supported the Saola conservation because in China never knew Saola in their traditional pharmacopeia so it the tremendous hope and opportunity to save Saola. And the Annamite Mountains are the one of the most remarkable and important ecosystems in the world, since discovered Saola at least one new species of deer, rabbit and several birds have been found in the Annamite Mountains.

4.1.3.1 Bolikhamxay province: SWG and WCS Lao were trained the Lao team was supported by CEPF to conduct a Saola survey in eastern Bolikhamxay province to strengthen protection of Saola in the area. To ensure that effort and funding are targeted in the most important areas. A variety of techniques were used to build up a picture of Saola status in the province: remote sensing analysis of forest types, village interviews, forest searches for ungulate sign, camera-trapping at promising mineral licks, and collection of possible Saola dung for identification by DNA analysis.

4.1.3.2 Savannakhet and southern Khammouane province: The WCS Laos with funding from the Mining and Minerals Group (MMG) was implemented a project to protect Saola in a key area of central Laos, which straddles two provinces in national protected area. MMG provided the funding as a conservation offset to their gold and copper mine elsewhere in Savannakhet Province (which itself probably does not affect any area of importance to Saola).

4.1.3.3 Khammuan province (Nakai-Nam Theun NBCA): IUCN Lao Programme, SWG and WMPA (which has responsibility for protection of NNT NPA). This was a project development phase, to discuss with villagers and WMPA ways to engage local villagers in protection of NNT's Saola. As part of the project also testing three models of digital camera traps, to see which hold up best through the rainy season, before possibly deploying many more in collaboration with villagers.

Figure 4.1 Saola survey team and local people with Saola' horns he killed many years ago in NNT, 2011

4.1.4 SWG's Other Project and Outreach Activities

SWG worked with the members that live in the range countries of Laos or Vietnam, their members also include staff from external partners such as the Smithsonian Institution and White Oak Conservation Center. The members represent exceptional, world-best expertise in the conservation of rare wildlife. At the recent World Conservation Congress in Jeju, South Korea, the SWG was recognized as an emerging model for successful species conservation has been involved in: Pioneering the use in Indochina of direct conservation incentives for villagers (reward payments for camera-trap); Pioneering the use of privately contracted, village forest guards, to protect nature reserves in Vietnam and Laos; and using the technique to develop with villagers a joint Saola survey and monitoring program. It is achievements of SWG for promote and work on Saola conservation.

4.1.4.1 The Critical Ecosystem Partnership Fund (CEPF) supported Saola conservation:

CEPF was a remarkably consistent and supportive donor for sale conservation in a few years ago. CEPF funded a WWF Saola conservation project in Vietnam, the WCS project in Bolikhamxay Province in Laos, a project by Fauna & Flora

International (FFI) to enhance protection in an important transboundary area for Saola (in Vietnam, across the border from Nakai-Nam Theun), and also helped IUCN-Lao and the SWG to draft a comprehensive Saola conservation strategy. In addition, CEPF built close collaboration with the SWG, and invited us to help prioritize their investment in Saola conservation. The CEPF-funded Saola strategy was still in the works. Permission to extend the strategy project through the meeting was given by CEPF, and funding to do so was generously provided by the Los Angeles Zoo (LAZ) and Greater Los Angeles Zoo Association (GLAZA).

1. IUCN-Lao: IUCN-Lao also received a small grant from CEPF to developing a regional Saola conservation partnership (conservation NGOs, government, civil society, development agencies and industry), and designing a comprehensive, two-country, Saola conservation project a recovery plan. And the Liz Claiborne Art Ortenberg Foundation (LCAOF) recently agreed to give a grant to IUCN-Lao, to work in partnership with the SWG, the WMPA, and local villagers, to implement in Nakai-Nam Theun NPA a direct-incentives Saola conservation project.

2. WWF-Vietnam and WWF Annamites Ecoregion: This activity was focused in the Hue and Quang Nam landscape to provide by Provincial People's Committees of Quangnam and Thua Thien Hue Provinces for the beginning of implementation. Under the projects, snare removal was finished in three protected areas and community mapping exercises are partially complete, also supported staff responsible for supervising predominantly enforcement activities in protected areas and learned to work with the WWF team in Mondulkiri and Phnom Phrich in Cambodia and finished training in Management Information System software program (MIST) for enforcement database used in the region which established in all three protected areas.

3. Safeguarding the Saola within the Species Priority Landscape in Vietnam: This project has been designed with SWG priorities in mind, following the outputs of the SWG meeting in 2009. Furthermore, WWF Vietnam received technical support and coordination from the SWG and follow up with the Saola task force discussion, to promote true collaboration and coordination between organizations working towards the same goals for Saola conservation. This project effort to design a

regional, collaborative Saola recovery plan, and in particular secure funding for its long-term implementation in three years (2007-2010).

4.1.4.2 Saola Team of the Emerging Wildlife Conservation Leaders program (EWCL)

This is a group of six outstanding young conservation professionals, supervised by Barney Long (SWG member), who work in spare time to promote Saola conservation. In 15 months the EWCL Saola Team was collaborated with SWG members on the following:

1. Wildlife Conservation Network Expo**:** The SWG Coordinator (Bill Robichaud) present on the WCN Expo in September 2010. Promote Saola conservation, SWG logo design and giveaways that will direct expo attendees to a Saola website.

2. Saola website: In coordination with Wes Sechrest from GWC, the Saola team was building a website to promote Saola conservation to the general public. The website was host information about the Saola intended for a general audience, stories from the field, multi-media as well as a prominent donation page and other call to actions. This Saola page hosted by the Asian Wild Cattle Specialist Group was remaining the source for all things scientific on the Saola.

4.1.4.3 Saola on the radar (EDGE and EAZA):

The Zoological Society of London’s programme (ZSL) and Evolutionarily Distinct and Globally Endangered (EDGE) was promote the Saola into the conservation of 100 of the world's most biologically significant and threatened mammals and Saola justifiably made the list at 46 on the list of 100 (See http://www.edgeofexistence.org/mammals/species_info.php?id=1404).

In 2011, the ZSL and SWG was worked together to ensure that Saola's inclusion in the EDGE was leveraged into additional conservation action Saola in Laos and Vietnam. EAZA campaign is conservation of large threatened animals in Southeast Asia, through its network of member zoos across Europe. EAZA were promoted conservation fund-raising and awareness campaign, EAZA was recognized the significance of Saola and was used it as the campaign's symbol and logo (See http://www.southeastasiacampaign.org/). EAZA was realizes that Saola

conservation cannot wait until all our ducks are in a row - we must act now, with what we have.

Achievements: The purpose of the project component was to support the SWG Coordinator to promote Saola conservation. Primary achievements as a result of support include:

1. Helped persuade the European Association of Zoos and Aquaria (EAZA) to make Saola the logo, and supported Saola conservation a priority project in two-year for fund-raising and awareness campaign (for endangered large animals of Southeast Asia). This guarantees funding for Saola conservation from EAZA (amount not yet determined), starting in 2013.

2. Helped secure post-graduate scholarships (two of them from the Wildlife Conservation Network) for four Lao students: one is a PhD on wildlife conservation awareness (at Cornell University, USA), one is Master on Saola (at King Mongkut's University, Bangkok), and one is a Master on wildlife in NNT. All of them are in the midst of their studies now.

3. Established a good relationship between the SWG and the Liz Claiborne Art Ortenberg Foundation (LCAOF), the Los Angeles Zoo (LAZ), Zoological Society of London (ZSL), Wildlife Conservation Network (WCN). This has resulted focus on Saola conservation, included a major effort to improve protection in NNT NBCA, and WCN twice invites the SWG as a guest speaker at its annual Wildlife Conservation Expo, in San Francisco in 2012.

4. The SWG collaborated with Dr. Shuker (Zoologist) interviewed Saola on the cover of new book about the encyclopedia of new and rediscovered animals by Dr. Karl Shuker. He was considers Saola one of the three most significant zoological discoveries of the last century and it larger than Saola, it several animals discovered in Annamite Mountain after Saola discovery. This was not efforts only Saola but it is also a flagship for conservation of the extraordinary at the Annamite Mountains as a whole (See in the link http://news.mongabay.com/2012/0326-hance_interview_shuker.html?homepg)

4.2 Evaluation of the SWG' Activities

This section show the SWG' activities and evaluate those activities for Saola conservation. In Figure 4.2 shows the implementation theory of SWG for Saola conservation, the activity and objectives have the outcome for protecting habitat and reduce hunting, (Because Saola cannot estimate the number of the population). SWG worked with objectives effort to protect habitats and reduce hunting.

4.2.1 Camera - trap

This approach is the one of the activities that for detecting Saola in the wild, the duration that SWG choose the set up the camera-tarp, mostly was February because in the Saola habitat is very wet in January to February, so at this time the local people reported that is the fertilization of Saola. So it's the best opportunity to see a Saola. Limited technical assistance is required. It is a simple matter to train interested villagers to run the camera traps and record data. Thus, the full-time presence in the field of outside technical assistance is not necessary. Saola has been camera-trapped only four times in Laos but no Saola photo but camera can recorded some species in the Saola' range (See in Figure 4.3).

4.2.1.1 February 2008, Camera trapping conducted in areas of Na meuy-Nameo village, NNT Area. Total of 20 camera traps for 6 months. 10 species captured in images, although, no Saola.

4.2.1.2 February 2009, Camera trapping conducted in areas of Na meuy-Nameo village, NNT Area. Total of 30 camera traps for 8 months. 16 species captured in images, although, no Saola.

4.2.1.3 January/February 2010, Camera trapping conducted in areas of Phou Chom Voy Provincial Protected Area. Total of 32 camera traps for approximately 30 days. 26 species captured in images, although, no images of Saola.

4.2.1.4 May/June 2010, Camera trapping conducted in areas of Xay Cham Phon district. Total of 30 camera traps for 2 months. 16 species captured in images, although, no Saola.

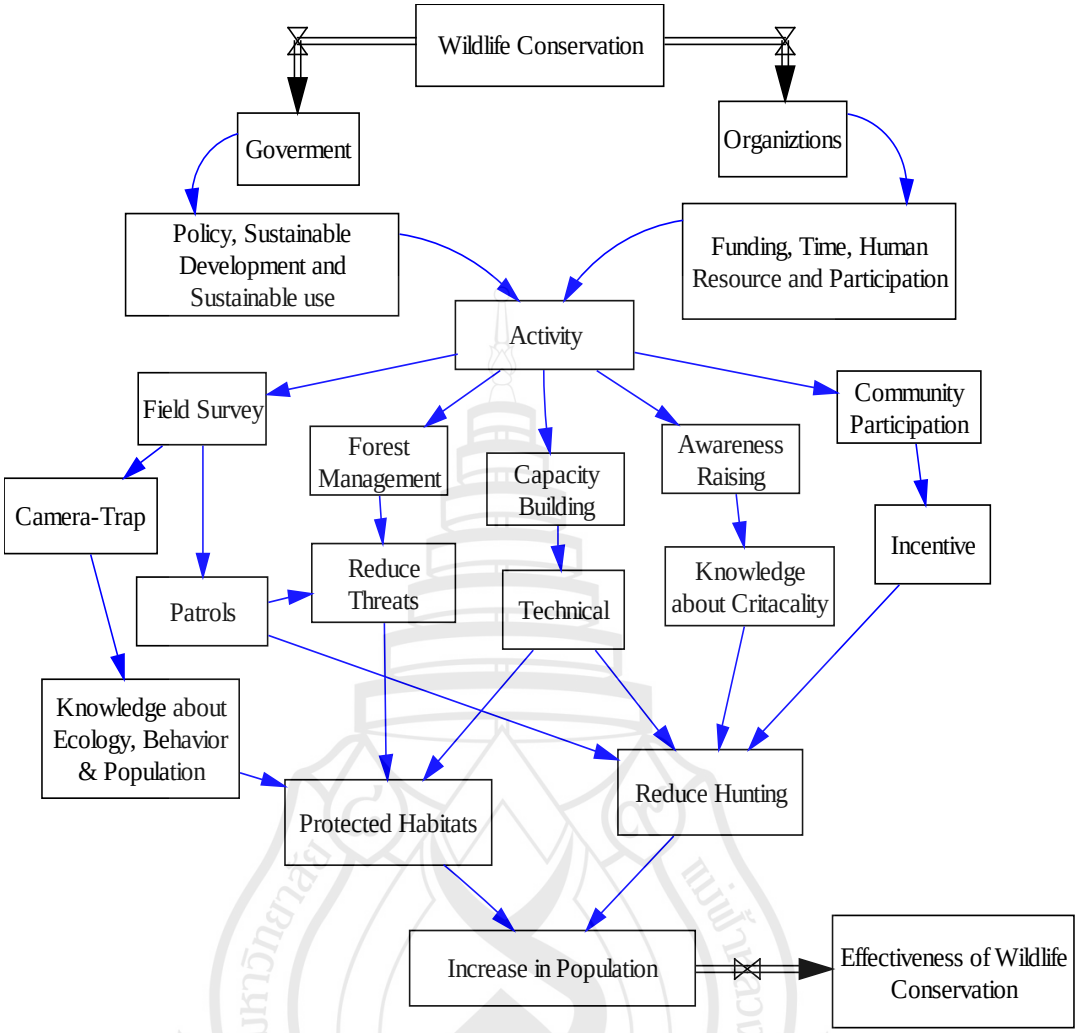

Figure 4.2 Implementation theory of Saola Working Group

Camera-trap has failed to record Saola any picture of Saola with any frequency, probably because the animal is at low density, the species are reportedly quite wary, it lives in forest that is hard on camera-traps (cool and rainy), and a little know about the animal's behavior. In addition, the technology appropriate to camera-trapping such a low density, wary species (i.e digital camera traps) is a fairly recent development. In addition, camera-trapping surveys need to focus over a long period. The fourth time in the past just a few months, so if possible should find some funding to support specific for this approach in 1 or 2 years. While camera-trap surveys for Saola may be appropriate if enough resources are available (because it quits expensive

around 400US–500 US dollar), and in certain situations (e.g at mineral licks), at its best in the case of Saola the method can provide only limited information. Finally, camera-trapping in forest areas believed to hold Saola have been sporadic, because depend on the funding and projects to support this approach and have never been implemented in anything approaching reasonable intensity.

In nearly future, SWG also will be supports the master' student in Lao to do the research about Saola by using camera-trap at Phu Sithone (Provincial protected area, Laos), it is the same area that villager captured Saola in 2010. Around 60 cameras will set up at Phu Sithone in six months (November 2013 – April 2014).

Figure 4.3 The photo of animals could take by camera-trap at NNT

Although, under this approach cannot improve the knowledge about ecology, behavior or Saola populations in the wild, but camera recorded many animals in 'Saola' range. That is referring that still have the diversity in Saola habitat. Key

advantages of this approach such as direct link between conservation and assistance (contributes to poverty alleviation where it is sometimes most needed in remote areas), puts responsible to the villagers in the forest (more time villagers spend more time in the forest setting and checking camera traps), and direct benefit to local people who joined with the SWG and responsibility to the camera during set up in the forest.

4.2.2 Field Surveys

In 2008, WMPA conducted field survey and setting up camera traps in NNT, during in the field we can find the some clue including footprint that look like Saola' foot, dung, food and feeding signs of Saola. And SWG also conducted field survey during camera trap setting in the forest. Furthermore, ungulate dung does not persist in the damp environment inhabited by Saola and combined with its rarity, makes Saola dung extremely difficult to find, even if we knew what to look for. The only source of information at present is that provided by local people, but their anecdotal information is often imprecise, sometimes inaccurate or conflicting, and cannot yield reliable population estimates. And after field survey they can get the information on geographic (See in Figure 4.6) in the Saola habitats including rivers, streams, mountain, enter/exit routes, salt licks, fruit trees, villages around Saola habitats, it helped them to understand and controls the people in the area.

Figure 4.4 The Saola' food and footprint that could be found in NNT, 2008

Figure 4.5 Field survey team with WMPA at NNT (2008 & 2011)

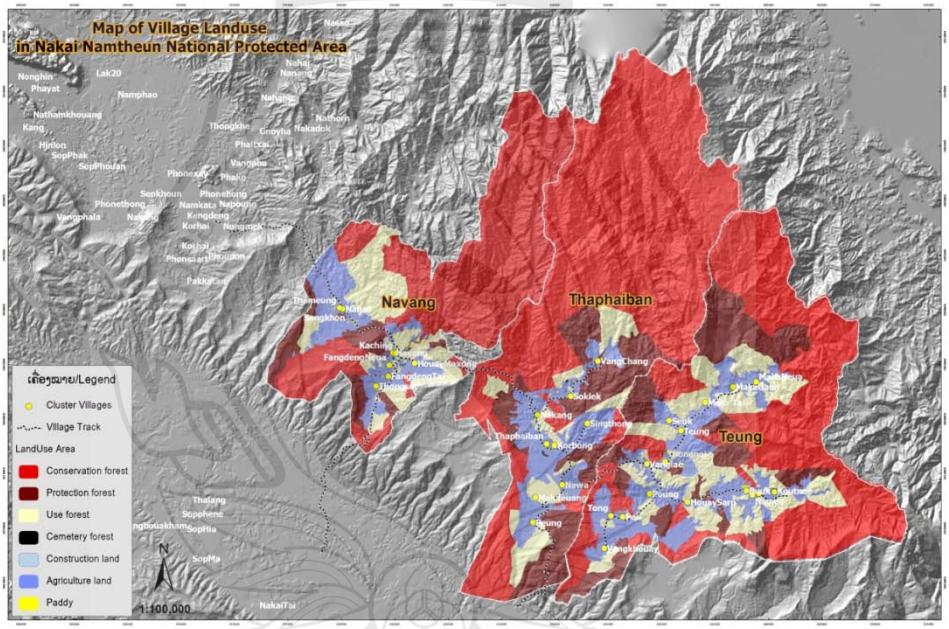

Figure 4.6 Villages land use map in NNT NBCA, Laos

For Saola sign (such and tracks and dung) is also problematic. At present, they could not consistently certainly distinguish the hoof prints, dung, or feeding signs of Saola, it has a similar-sized and ungulates to the animals in the range such as Southern Serow, Large-antlered Muntjac, or young Sambar. Because the information about

Saola provided from local people, while some local hunters (perhaps some biologists) may be able to reliably tell them apart, they don't know which ones can and which can't. So their identifications are currently subjective, without definite parameters (unlike for Tigers and Elephant). But under this activity it gets more understand basic information on geographic terrains of the area and during survey there were seen some animals in the wild. In addition to gathering information on Saola, the method can simultaneously generate information on other wildlife that shares the Saola's range.

4.2.3 Patrols

Village awareness programs alone are not enough to conserve Saola, since many hunters are outsiders. Patrols of Saola habitat are required to collect snares and discourage poachers. Anti-poaching patrols are currently the highest priority action for wildlife and biodiversity conservation in the Saola's range, according to Lao government officials, local villagers, and field assessments. According to village, district, provincial and central government officials, the most appropriate patrol team worked to joint with a unit of provincial or district soldiers and district police, teamed with the village militia in the various target patrol areas.

Figure 4.7 Patrol team destroyed poacher camps and snares in Saola habitat

The SWG collaborated with WMPA and Vietnam always do patrols but the problem of snare still has in some area, the commercial poacher rarely targets Saola specifically, the people set snares for other wildlife are not selective. During 2011-2012, SWG collaborated with Thua Thien-Hue, Guang Nam province in Vietnam and Bolikhamxay province in Laos to patrol the three new protected areas for Saola. In six months (between September 2011 to November 2012) of activity the patrol teams collected 7,058 snares in Laos site and 19,593 snares in Vietnam site, so the total number that patrol team were destroying 26,651 snares and 11 poacher's camps in Saola habitat. And villagers militia sometimes conducted their own patrol near their villages but they have limitation because they have many others responsibilities in the villages (e.g., growing food for their family) and they are often reluctant to patrol far from their village because they are fear to contact with foreigners poachers.

Figure 4.8 Village patrol ranger with snared Red-Shanked Douc and Large-antlered Muntjac dead in NNT, 2011

The activity is the one that most effectiveness at this time, the number of snare those patrol teams were destroying in Saola habitat quite too much, 26,651 snares removed from Saola habitat with six months of activity and also destroyed 11 of poacher's camps of hunters. This is the most concrete on the ground result of Saola conservation. In addition, successful at removing snares and keeping them out of the

forests and efforts has surely that can save many others wildlife beside Saola's range from a slow.

It is important that anti-poaching patrols focus first on the problem of poaching by outsiders, and not the infractions of local people. In this way, the patrols were benefiting not only Saola and wildlife, but also local residents by making their forests safer and conserving forest resources for village use. Village militias sometimes apprehend poachers on their own. Because the village militia receives little or no salary, a system should be established to provide them per diems for the time (sometimes several days round-trip). The effective of the foot patrol such as reduced main threats of Saola and also know the information of poachers and traders in the villages. Recognize that poachers are likely to put snares in areas thought to be often used by wildlife, and thus focus their patrol efforts in those areas. At the same time, it was getting the information of wildlife and biodiversity in their assigned patrol areas.

Figure 4.9 Patrol team helped the Douc Langur from snare in 2011

4.2.4 Protected Area Management

Established and proposed national and provincial protected areas known to harbor Saola are: Nakai-Nam Theun NBCA (Khammouan and Bolikhamxay Provinces, Nam Chat-Nam Pan Provincial Protected Area (Bolikhamxay Province) and Nam Chouan Proposed NBCA (Bolikhamxay and Xieng Khouang Provinces). SWG focused

to implement at the NNT and Nam Chat-Nam Pan PA. In 2012 SWG also Support WMPA for improved protection in NNT and working to help NNT's management body, WMPA to find ways to expand its protection efforts because of the NNT rapid and extensive infrastructure development is underway as the government attempts to reduce the high levels of rural poverty. The strategy of implementation of law enforcement of WMPA including:

4.2.4.1 Set-up MIST and assign man responsible for data entry: The NT2 watershed area needs to be divided into management sectors as described in the section of identification of priority sites. Quality control of data entry once the assigned man has received the patrol data sheets and GPS units and must check whether the patrol data sheets have been filled in correctly and whether the GPS unit has been used according to instruction. Agree on standard monthly Management Information System software program (MIST) output a set of standard monthly reports, chart, and map outputs can be produced.

4.2.4.2 Capacity building for law enforcement (LE) staff : Enforcement of laws and regulations aims to tackle any illegal wildlife and timber activities inside and around the NT2 watershed area. So, in order to ensure smooth and effective implementation of LE, all rangers from any government sectors or villagers involved need to be first provided technical trainings on a protocol of patrols, ranger-based data collection, and other LE techniques including: Informant-network building, incentive program development, building local understandings and supports, strategic patrol planning and legal framework and empowered to WMPA’s staff.

4.2.4.3 Development of manuals and instructions: Design the patrol data sheet, prepare instructions for filling in the patrol data sheets and for setting up GPS and also develop a protocol for foot and mobile patrols.

In 2010 WWF helped provincial authorities establish the three new protected areas established for Saola in Laos and Vietnam such as Phu Sithon endangered species conservation area in Bolikhamxay province (Laos) and Hue Saola nature reserve, Quang Nam Saola nature reserve in Vietnam. A new protected area on the map was only a first step, the area also needs to be well funded, and staff to effectively protect. To this end, the WWF Greater Mekong Programme was collaborated with the provinces on innovative projects for the reserves. The initiative brings in external

funds for special recruitment, training and supervision of the reserves' new ranger teams.

A key component of direct protection will be preparation and maintenance of a monitoring map linked to a database, which shows the knowledge information on where Saola are overlaid with current levels of protection and protected area management. That’s a good approach when SWG helped the WMPA to improve the Saola protection at NNT that also improved the capacity building to WMPA for the effectiveness of Saola conservation in NNT. Under this program the staff and rangers were getting the technical on the protocol of patrols, ranger-based data collection, and other LE techniques, and understandings strategic patrol planning for Saola conservation. And established three new protected areas for Saola, it’s helped too much for protecting Saola habitats and SWG can focus more in these areas.

4.2.5 Capacity Building

The SWG conducted the workshop for improving the capacity building to the staffs, rangers that work related to Saola and also providing the technique assistance, snare removal techniques and supported the equipment for field survey. In 2010 SWG conducted the ranger snare removal in Vietnam with support from WWF, the workshop were training a group of forest department rangers in the natural history of Saola, hands-on training in GIS and snare removal best- practices and community outreach. And in 2011 also conducted the workshop with attended by 100 representatives including scientists and government senior officers from Laos, national agencies and provinces located within the central Annamites region. The workshop covered such a wide range of topics such as: trade-offs in conservation efforts at Truong Son cordillera, in general and Central Annamites, and analysis and assessment of executing conservation policies and the patrol and monitoring activities, training courses conservation to staff and rangers related to Saola conservation.

All of staff and rangers who have been trained from the workshop, they got the knowledge about field survey and snare removal technical, it were helping them for reduce hunting and more effective in the field (e.g. that the patrol team destroyed 26,651 snares from Saola habitat in 2012). It was significant that the workshop did not only deliver technical reports and announcements of conservation research but also

brought about specific solutions and recommendations so as for the government to stop biodiversity loss and especially protect species on the edge of extinction. But there had still limited staff in the field (provincial) because Saola habitat has large scale but the staff in the field not enough. So SWG should be more conduct the workshop both quality and quantity, to be more effective in the provincial, city and villagers.

4.2.6 Awareness Program

This will be a balancing act one of the constraints of Saola conservation is also insufficient awareness of the species' global conservation significance among those who can influence its conservation. WMPA worked with the local community at NNT that try to provide the information of Saola and raise awareness of the species importance in Laos. There are 13 villages at Saola' range, and 2011 WMPA have done awareness at the 12 villages and 11 schools, and also put Saola' poster in every villages. Most of the people interested about on Saola but this approach not be continues because funding and it just propaganda in some place not in the general public. And also put the poster of Saola in every village both of Lao and Vietnam.

And SWG also promoted the Saola at the international level in many conferences, fundraising trips, proposals and outreach to international donors, institutions and other potentially interested in supporting Saola conservation beyond the lifetime of the project. The following additional activities were completed: Gave a presentation and promoted Saola conservation in many conferences including: the Wildlife Conservation Network's Wildlife Expo (San Francisco, 2010), the Research Centre in Biodiversity and Genetic Resources, (Portugal, 2011), at the mid-year meeting of the US Association of Zoos and Aquaria (California, 2012) and present conference of the European Association of Zoos and Aquaria (Vienna, 2012). And also gave interviews on Saola conservation to US radio shows (In 2010 & 2012), and established a Saola YouTube channel, "Saola Stories".

Worked with the local community at Saola' range it helped to providing the information and raise awareness about Saola with them. After WMPA have done have done awareness at the 12 villages and 11 schools in Saola habitat in 2011, try to convince them by discus with them about the impacts of the unsustainable use and

how Saola important in the world and under this activity the local people more understand about Saola and people were very active on Saola conservation. SWG to minimize the risk to Saola, awareness-raising was targeted only, specific, relevant stakeholders and not awareness in the general public in the region.

Figure 4.10 Awareness programs to local community at Saola habitat

So just put the poster in the village and awareness sometime is not enough for Saola conservation. The SWG also promoted the Saola at the international level in many conferences, fundraising trips and outreach to international donors, institutions and other potentially interested in supporting Saola conservation. Raising Saola's

profile internationally, in countries where no demand for it is likely to be created, and where there is a high concentration of donors or other potential partners also has merit mainly as a means to raise funds directly or influence donors to support the conservation. And the good things that in China they never knew Saola in their traditional medicine so this is a tremendous hope and opportunity toward for Saola conservation.

Figure 4.11 Awareness program to schools at Saola habitat

4.2.7 Community Participation

The project focused mostly on the villages along the Nam Chat and NNT, film and batteries were provided to small teams of village cooperators, who were trained in their use. SWG was providing the incentive to local people to be active of Saola conservation and joined with the team for patrol, field survey and also protects the camera during set up in the forest. SWG was supporting the rural development for

their livelihood and payment for labor. The villagers who collaboration to work on Saola conservation, they were getting direct benefit to themselves and villages. So the solution for this, the villagers were offered $200 per Saola photo and $50 for Tiger, and $5 per day for labor that who join the camera-trap or field survey.

Figure 4.12 Worked with the local community to promote Saola conservation

Mitigation such requires not only creating incentivized enforcement strategy in the short term, but working with local communities to ensure their participation on Saola conservation. The local people were very active to work on Saola conservation because every time when WMPA or SWG goes to the filed or patrol the local people always joined with the team. And they were getting the benefit to them, SWG will pay $200 per Saola photo and per diem $5 per day to people when they join patrol and field survey. WMPA and SWG also helped them to manage the resources and improved the livelihood to the community. Because in the past people depend on the natural resources, they were hunted for the consume, collected food in the forest and burn the forest for agriculture, but now they have changed their style for sustainable use such as, they have farming and planting for their household, it has reduced hunting in the Saola habitats and also some villages they have the enforcement in their own villages (who hunting they will penalization the money around 500,000 Kip).

Under the program there have been weakness that should consider and discussion unsustainable finances; this could be enough to motivate the villagers to continue to conserve Saola and patrol against poaching during the interval between camera-trapping visits. And another point is the benefits to villagers are unpredictable, and are unevenly distributed (villages with few or no Saola will get fewer rewards). However, a joint effort with villagers toward a specific target is more effective in shifting their attitudes, enlisting them as allies and working with them in the forest also provides valuable opportunities for information on Saola natural history and conservation needs.

The result of SWG' activities for Saola conservation in Laos were effective in partially, so SWG would be continuous and improve the activities that were not yet effective but necessary to detection such as camera-trap, capacity building, awareness program and field survey (ecology and behavior). The most success was reducing threats of Saola by destroying the snare in Saola habitat, so this activity should be continue and routine with the local people, put the responsibility to them conduct the patrols near their village that would be more effective and they also get the benefit to their villages. Lao has security reason that prevents foreign experts accessing some sensitive areas. SWG worked with limited funding and unsustainable financial supported, the SWG faces difficultly to implementation activities for detecting and protecting Saola. It would be extremely difficult to monitor Saola population directly because the limited knowledge about Saola and lack of attention. The best recommendation at present SWG should be continuous in the most important place, field survey and camera-trap to find the Saola in the wild also should be continuous with long period and work with the local people to keep records of their encounters the Saola when they go to the forest. Summary the SWG' activities with table following.

Table 4.1 Summary the SWG' activities

Activity	Effectiveness (Detecting & Protecting)	Results/Supporting Evidences
Camera-trap 1. Improve the knowledge about ecology, 2. behavior and population. 3. Detecting 4. Get information about other wildlife 5. Direct link between conservation and assistance 6. Puts responsible to the villagers	D	1. Feb 2008, total of 20 cameras for 6 months 2. Feb 2009, total of 30 cameras traps 8 months 3. Jan/Feb 2010, total of 32 cameras 4. for 30 days 5. May/June 2010, total of 30 cameras for 2 months 6. No Saola detection and not possible to estimate the population (No Saola photo) 7. Recorded some animals in wild 8. Limited camera in stock 9. Trained the local people for checking camera trap during set up in the forest
Field survey 1. Improve the knowledge about ecology, behavior and population.	C	1. Footprint and dung 2. Food and feeding signs 3. Land use map in NNT

Table 4.1 (continued)

Activity	Effectiveness (Detecting & Protecting)	Results/Supporting Evidences
2. Understand basic information on geographic in the area		
Patrol 1. Reduce hunting 2. Reduce threat	B	1. Destroyed 26,651 snares and 11 poachers camps 2. Village militia sometimes conducts their own patrols
Protected area management 1. Sustainable use 2. Law and regulation 3. Conserving forest resources 4. Protect habitat 5. Put responsibility to villagers	B	1. Focus at NNT And Nam chat-Nam pan PA 2. 2012 helped WMPA to improved protection at NNT by set-up MIST, design the patrol data sheet and capacity building for law enforcement 3. New three protected areas established for Saola in Laos and Vietnam 4. Forest guards
Capacity building 1. Improve technical of snare removal 2. Improve the field survey method	C	5. Training Staff & rangers in 2010 conducted ranger snare removal and 2011 about 100 attended in the workshop in Vietnam 6. Provided equipment
Awareness-raising 1. Provided the understanding to local people 2. Convince people to interest the conservation	C	1. 2011 WMPA have done awareness with 12 villages and 11schools 2. Put the poster in every village and school in Saola' range

Table 4.1 (continued)

Activity	Effectiveness (Detecting & Protecting)	Results/Supporting Evidences
Community participation 1. Reduce hunting 2. Provide incentives 3. Get benefit direct to local people 4. Improve livelihood to community	B	1. Mostly focus at NNT and Nam chat-Nam pan 2. Provide information about Saola 3. Villages enforcement 4. Will pay $200 per Saola photo and per diem $5 per day to people when they join patrol and field survey 5. Local people always joint the patrol and field survey 6. Helped them to manage resources 7. Supported the basic need

Note. A = Very good B = Good C = Medium D = Poor F = Fail

4.3 The New Approach for Saola Detection

The SWG has the two new approaches for Saola detection including: dung detection dogs and leeches to detect the DNA. The ground breaking to use the leeches for detects the DNA of Saola. That's one of the constraints. One of the unpleasantries of Saola conservation is the abundance of leeches in Saola's wet forest habitat in Laos and Vietnam. If it doesn't see leeches it probably not Saola forest. In 2012 the journal Current Biology published the results of a remarkable study by biologists associated with the Natural History Museum of Denmark and the University of Copenhagen, along with Saola Working Group member Nicholas Wilkinson. The group found that in a lab, leeches can retain remnants of mammalian blood, with identifiable DNA,

within four months after consuming the animal's blood. The team tested this by analyzing 25 leeches; he collected from the forest floor in Vietnam. Although there was not Saola blood, the results of this modest trial were nonetheless exciting: 21 of the leeches retained identifiable others animals from the Annamite Mountains including Annamite Striped Rabbit and Annamite Dark Muntjac (Truong son Muntjac deer). The science expected to find the DNA of Saola in leeches because blood sucking leeches is offering the best hope of finding one of the world's rarest animals, but Saola elusive that has rarely been seen alive and numbers of population which probably in the low hundreds.

Dung detection dogs are the methods to using specially trained dogs to locate and identify endangered species has become an important conservation tool around the world, for species of plants, to mammals, birds and reptiles. For mammals, dogs are commonly trained to find the dung (feces) of particularly rare or otherwise difficult to detect species, and this holds promise for Saola. Dung holds small amounts of DNA from the animal, and laboratory analysis can identify the species, and often also individuals (providing information such things as population size, and individual home range size). Dung detection dogs have been successfully used in North America to survey bears (Wasser, Shedlock, Comstock, Ostrander, Mutayoba & Stephens, 2004). Tigers (Kerley & Lozo, 2003), various mammals in Brazil (Vynne et al., 2011) and even whales (Rolland et al., 2006). In 2010, WWF-Vietnam conducted a dung detection survey for Javan rhinoceros, using two dogs trained in the USA (22 rhino dung samples were found). A comparison of the methods of dung detection dogs, hair traps and camera traps for surveying Black Bears, Fishers and Bobcats in North America found that dung dogs had the highest detection rate and highest probability of detection (i.e., lowest probability of a false negative). Although its implementation was comparatively expensive, it proved to be the most cost-effective due to its efficiency at detecting the target species. There are various possible approaches to establishing dung dog surveys, which range from importing a trained dog and handler, to contracting a professional handler to train a local dog (Long, Donavan, Mackay, Zielinski & Buzas, 2007). But for the Saola detection, it difference with another animals because the things or dung of Saola to provide the dogs for training does not sure and also it is most cost-effective for this approach. And

it needs to take long time to train the dogs and it is not sure with the result that dogs will be find Saola in the wild or maybe the information that use for train is not of Saola.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The Saola Working Group (SWG) is the one group that focuses on protection, conservation and promotion of Saola conservation into the international level and still tries to find the Saola in the wild with the seven activities to detect and protect Saola. These activities are camera-trapping, field survey, patrols, protected area management, awareness raising capacity building and work with local people in the Saola habitat. The ultimate goal of the SWG' activities were for the long-term because partial measures will probably not succeed in conserving it in the short-term. And SWG' activities were effective in partially and some activities need to improve and should be more attention to focus.

The patrol team reduced threats to Saola by destroying 26,651 snares and 11 poacher camps in Saola habitat during 2011 to 2012 by patrol team and rangers. SWG also helped WMPA improve protection at NNT (Saola habitat) by providing technical trainings on a protocol of patrols, ranger-based data collection, and building local understandings and supports strategic patrol planning to all rangers from government and villagers that related to Saola conservation. Now there are three new protected areas established for Saoal in Laos and Vietnam. But the areas also needs to be well funded and the staffed to effectively protect Saola and its habitat. For the community participation in the Saola' range, they were very active to do the conservation because they could get additional revenues when they jointed with patrol and field survey. SWG also supported the basic need and improved their livelihood, helped to manage the resources. Field survey should be continuous because little is known about Saola making it difficult to detect it. The footprint, dung, food and feeding signs that could

found in the forest they were identifications are currently subjective, without definable parameters so it was unbelievable.

Awareness program was conducted with 12 villages and 11 schools by providing the information about Saola and put the poster in the village of Saola' range, and SWG also promoted the Saola at the international level in many conferences, fundraising trips to international donors, institutions and other potentially interested in supporting Saola conservation was the best best opportunity to fund-raising from international organization to be support Saola. Capacity building is necessary to improve at this time, there are have limited capacity in the field so that's was not enough to protection with the big area. So SWG conducted 2 workshops for training the staff and rangers by providing the technique of snare removal and field survey. And camera-trap failed to record Saola with any frequency, but in nearly future SWG will supports the master' student for Saola survey by using camera-trap at Phu Sithone protected area in Laos (same place that villager captured Saola in 2010) and SWG also have expect of 60 cameras can be find Saola in the wild. Under this activity it only failed to record Saola but the cameras were record some animals in the Saola habitat, and its can direct link between conservation and assistance by paying the money to people who responded to take care the camera during set up in the forest.

With limited funding and unsustainable financial supported, the SWG faces difficultly to implementation activities for detecting and protecting Saola. It would be extremely difficult to monitor Saola population directly. Saola is rare, solitary, shy animals living in dense, remote forest in difficult terrain. It has proven elusive to camera-trap, and there are no established parameters to distinguish Saola sign (such as tracks, dung or feeding sign). Because Saola was having the limitation and a little attention and a little information about it, so there are constraints of Saola such as limited knowledge, difficult to keep in captivity and difficult to detecting (difficult to monitor the Saola in the forest) and protected area sensitive toward Saola conservation in some areas, security reason that prevents foreign experts accessing some sensitive areas (no foreigners and not even WCS Lao staff, are allowed to visit Saola areas in Bolikhamxay). The Lao government seeks ways to increase cash income for rural residents, it has insufficient resources to widely and rigorously

enforce compliance with wildlife protection laws, and so the voluntary cooperation of the villagers is not only preferable because it is essential. And there is no reason to do captive breeding of Saola, it has already failed in the past. But the good thing that Saola has no high trade value, it is not an important source of food and in China thay never knew Saola in their traditional medicine. So this is the best opportunity and hope for Saola conservation

With the limitation to conserving Saola it was also becoming to the constraints for SWG to work on Saola, so the important to realize should be more attend and promote Saola in the high priority in the country. Maybe in nearly future Saola could soon cause its extinction. So the solutions to each must be sought. There are some good options for advancing implementation of this plan, including securing funding for it. And the limited funds available to support for implementation for monitor SWG because Saola not famous like a tiger or elephant so it was hard to raise money for it, the projects don't continue on the same approach. These problems have become to effect for the SWG to work with Saola conservation in Laos and that would be effective if can upgrade SWG into the big project or NGO like WCS or WWF; it would be stable and more effective to work on Saola conservation. And now SWG is an ongoing continuous to find Saola in the wild, efforts to detect and protect Saola both in Laos and Vietnam. And I also still believe to see a beautiful animal as Saola in the forest as long time.

5.2 Recommendations

The activity and approach of SWG for Saola conservation need to improve and continue with selective focus on the activities that are most important. The cooperation with villages should be more awareness programs, anti-poaching patrols, field surveys and other activities should be continuous. Because Saola cannot be protected directly, so SWG needs to focus on habitat protection and on reducing threats to Saola. So there are some recommendations for Saola conservation in Laos:

5.2.1 Camera-Trap

The camera that SWG used to find Saola was old and limit resources in stock, first thing needed to improve the effectiveness of this activity should is to upgrade the cameras both quantity and quality. The activity should also be more continuous to find the Saola in the wild by focusing on the most important places, set up the camera take over a long period in the forest or if possible try to change the duration because SWG always set up cameras just one season.

5.2.2 Field Survey

SWG should ask the local people who can confirm about ecology, behavior or also the habitat of Saola in the wild must work with them to get the source from them. And before start the field survey should learn more about behavior and habitat of Saola, it will be helping the staff to focus on the important area.

5.2.3 Patrols

For this activity, that is done successfully to reduce threats and hunting for Saola, but it will be more effective if SWG conducts the patrol routinely and focus on the area near the border. SWG should also work with law enforcers when dealing with hunters who might be people from outside. Provincial and district soldiers or police need to support the village militias to patrol near their villages.

5.2.4 Protected Area Management

More focus on the national, provincial or district levels are necessary. At the present, there are three new protected areas for Saola, so must focus on this site by conduct the activity, promote the conservation and work with local people in this area. Local people also reported that Saola always visit the mineral lick, so the important focus to protect the mineral lick in the Saola habitat.

5.2.5 Awareness-Raising

Only conducing awareness raising a few times and putting up the poster in Saola' range was not enough at this time. So SWG should more focus on awareness program about Saola in the general public. Obviously, all projects working on Saola conservation should routinely and continually raise awareness of the species importance

with partners they work with such as villagers and government institutions, promote Saola to NGOs and development projects for more supporting on Saola conservation.

5.2.6 Capacity Building

Limitation capacity in the field is the issue for effective working in the field. So SWG must train the staff that work related on Saola in the field, because it is indispensable to the long-term success by focusing more productively on developing provincial partners to conduct village awareness programs, interview surveys, patrols and monitoring. In addition, Lao PDR has few trained wildlife biologists, if suitable, interested Lao candidates are identified, the opportunity should be provided for them to study about wildlife full time at a suitable institution.

5.2.7 Community Participation

In order to retain support from local villagers, sustainable financial model is needed. So SWG must work with selected villages over a long period, try to shifting their attitudes, enlisting them as allies and working with them in the forest in order to gain valuable opportunities for information on Saola natural history and conservation needs by make good relationship with them (Some people reluctant to patrol because they fear contact with foreigners), try to provide the incentive to convince them to join the patrol or field survey and try to put the responsibility to local people to conduct the patrol around their villages in routine, by providing the appropriate payment to the villagers. This would be enough to motivate them to be active and to continue with Saola conservation.

5.2.8 General Recommendations are also synthesized vinous from such as WWF-Great Mekong Report on Ecosystem in 2013 and interviewed with the local officer. Key conservation should also include

5.2.8.1 Reconsideration on impacts of developments that direct and indirect threatened to the diversity

5.2.8.2 Increase the level of integration both within among countries in the GMS e.g. to reduce fermentation and connectivity of protected areas.

5.2.8.3 Set aside some financial to supports for conservation to ensure continuous implementation of the conservation activities.

5.2.8.4 Empower and ensure community to take in decisions that relate directly to their lives.

5.2.8.5 Develop the new law as well as enforce the existing laws, policies and regulations that reduce illegal hunting, wildlife poaching and wildlife trade. Although, many countries there are have the laws and regulation to control the hunting and wildlife trade, but enforcement still lacking (WWF-Great Mekong, 2013).

5.3 Suggestions for Future Research

We need more study to understand more about Saola in order to conserve this species. Development of field detection methods: Saola conservation efforts suffer greatly from our inability to detect and monitor this rare and elusive species. At present, we have no means to enter an area of forest, and within a few weeks of effort (and probably not even within several months) reliably confirm the presence of Saola if it is there. Counting Saola with any accuracy and precision is at this time a distant hope. And also should have some project to support Saola protection technical advisory team, to improve capacity to achieve best practice protection in areas of high importance to Saola habitat.

Better understanding of Saola ecology and behavior is essential for a credible and effective conservation effort. Radio telemetry is a proven method to gather such information. Such research can generate new information on the species' movements (daily and seasonal), activity patterns, home range size, feeding behavior, and so forth. This information is needed immediately to better protect Saola in situ; e.g. to determine its home range size and seasonal movements, to know how large protected areas must be to support Saola. Such information will also be essential should ex situ conservation of Saola ever becomes necessary in the future.

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CURRICULUM VITAE

CURRICULUM VITAE

NAME	Ms. Souvanna Phengsisomboun
DATE OF BIRTH	13 February 1987
ADDRESS	Saphangmeuk Village Xaysettha District, Vientiane Capital, Lao PDR

EDUCATIONAL BACKGROUND

2008	Bachelor of Science Major of Biology National University of Laos, Vientiane, Lao PDR

WORK EXPERIENCE

2009-Present	Lecturer Faculty of Environmental Science, National University of Laos, Vientiane, Lao PDR