

Viet Nam National Commission for UNESCO

Address: 2 Le Quang Dao, Nam Tu Liem, Hanoi, Vietnam
Tel: (84 24) 3799 5305

Fax: (84 24) 3799 5315
Email: unescovn@mofa.gov.vn

Ref: 14 /BTK/ 2019

The Vietnam National Commission for UNESCO presents its compliments to the World Heritage Centre and has the honor to submit herewith the report on the State of Conservation of Phong Nha – Ke Bang National Park (N 951 bis), as per the request by the World Heritage Committee relating to this property on the Decision 41 COM 7B.33.

The Vietnam National Commission for UNESCO avails itself of this opportunity to renew to the World Heritage Centre the assurances of its highest consideration. /*nd*

Hanoi, 28th January 2019



UNESCO Heritage Center
7, Place de Fontenoy
75352 Paris
FRANCE

FORMAT FOR THE SUBMISSION OF STATE OF CONSERVATION REPORTS BY THE STATES PARTIES

(in compliance with Paragraph 169 of the Operational Guidelines)

Name of World Heritage: Phong Nha – Ke Bang National Park.

State Party: Viet Nam.

Identification number: 951 BIS

Address: Son Trach Commune, Bo Trach District, Quang Binh Province

Phone: (+84) (232) 3677021 Fax: (+84) (232) 3677021

Email: pnkb@quangbinh.gov.vn

1. Executive Summary of the report

In order to conserve the property's integrity, and sustainable-nature usage, the Management Board of Phong Nha – Ke Bang National Park (PNKB), guided by Quang Binh People's Committee, has carried out its actions responsibly as recommendations by WHC/17/41.COM/7B at the 41th Meeting in Krakow, Poland.

There are no any new infrastructure, restoration within the core zone of the property and mitigate the impacts on the Outstanding Universal Value of the property in terms of the recommendation. The Special National Heritage Plan for the period of 2016 – 2025, vision to 2030 is being implemented. In order to prevent invasive species extend to the property's outstanding values, the Management Board of Phong Nha Ke Bang National Park organized a seminar on measures to prevent and exterminate the species of *Merremia boisiana* in the area of Phong Nha - Ke Bang National Park and implemented the plan "exterminate the species of *Merremia boisiana* to harm the biodiversity of Phong Nha-Ke Bang National Park"; Implementing the Plan "Survey and assess the status of some important mammal species in Phong Nha-Ke Bang National Park" and initially noted the distribution of mammal species in the area.

The forest management and protection have many positive changes, the forest resources are well protected, the hunting and trapping of wild animals, invasive species of wild fauna and flora are discovered and handled in time. The number of violations of forestry law decreased sharply compared to previous years. Scientific research and biodiversity conservation have been more and more intensive and achieved some positive results.

Public awareness campaigns on forest protection and livelihoods of the buffer-zone have been paid attention to; some models of livelihoods support promoted effectively so as to contribute to stabilize and improve the life of people living in the buffer zone of the National Park. Environmental impact assessment is regularly implemented and periodic environmental reports. In parallel, The Management Board of Phong Nha Ke Bang organized workshops in order to figure out the solutions on mitigating negative impacts caused by tourism activities.

2. Response to the Decision of the World Heritage Committee

2.1. Results of law enforcement to prevent illegal logging and poaching in the area of Phong Nha Ke Bang National Park.

Since 2015, Quang Binh Provincial People's Committee has strongly directed forest protection so that the National Park Management Board has taken its task in the field of law enforcement, forests patrolling in key areas such as border and the areas adjacent to the National Park; implemented measures to prevent and handle illegal exploitation such as logging, poaching, transporting wild animals so those were decreased remarkably in the core and buffer zone of Phong Nha - Ke Bang National Park area. From 2015 up to now, Phong Nha - Ke Bang National Park had no "hot spots" for logging, hunting, traps, wildlife trading; transportation and consumption of forest animals has been prevented step by step. Based on observation by the forest guard, mammal species, especially primate, an endemic species to the National Park presented more and more in the region (*Find attached here in Annex: The detail report No.650/VQG dated 26/11/2018 by the Phong Nha Ke Bang Management Board*).

2.2. The status of some important mammal species in Phong Nha - Ke Bang National Park

Seven (7) important large mammal species selected for this study are Tiger (*Panthera tigris*), Asiatic Black Bear (*Ursus thibetanus*), Dhole (*Cuon alpinus*), Asian Elephant (*Elephas maximus*), Gaur (*Bos frontalis*), Large-antlered Muntjak (*Muntiacus vuquangensis*) and Sao la (*Pseudoryx nghetinhensis*). They are large mammal species that are nationally and globally threatened of extinction; all enlisted at high threatening categories both in Vietnam Red Data Book (2007) and 2018 IUCN Red List of Threatened species. All 7 species are enlisted in Append I of Government Decree 32/2006/ND-CP and Annex 1 of Government Decree 160/2013/ND-CP.

Following study methods were used to collect field data: The questionnaire forms to be filled by forest rangers and villagers living in core zone and buffer zone of PNKB NP (750 forms were used); Direct interviewing selected informants who provided the important information in the questionnaire forms (102 villagers from 12 villages were interviewed); Transect survey in forest of PNKB NP (11 transects with total length of 210 km); and Camera trapping survey in 12 forest sites inside the core zone of PNKB NP (total of 4,860 trapping hours). The obtained results can be summarized as the following:

Tiger *Panthera tigris*: Transect and camera trapping surveys have not yet obtained information/data on Tiger existence in PNKB NP, however, results of questionnaire and direct interview survey indicate that there is a small number of Tiger surviving in PNKB NP area. During recent 4 years (2015 - 2018), the Tiger existence was recorded in 12 sites in the core zone and buffer zone of PNKB NP. Tigers are difficult to observe directly in the wild, especially in tropical forests like PNKB. On the other hand, because of the short investigation time and surveying on a certain scale, it should not record tigers in the field. While the forest habitat in PNKB NP is connected with those in Hin Nam No National Biodiversity

Conservation Area (NBCA) and Nakai -Nam Theun NBCA in Laos. Therefore, Management board of PNKB NP need to collaborate with these two NBCA in Laos to increase the Tiger conservation in both countries.

Asiatic Black Bear Ursus thibetanus: Results of all questionnaire survey, direct interview survey and transect survey confirm existence of Asiatic Black Bear in PNKB NP. Questionnaire survey show during 4 recent years (2015 - 2018), the existence of the Bear were recorded in 33 sites. Transect survey found the Bear scratches on trees in 8 sites and Camera traps obtained one image of the Bear in Dai A - Dai Cao area inside PNKB NP. Summarizing all survey data shows that Asiatic Black Bear is still relatively wide-spread in PNKB NP, but their abundance has been significantly reduced in comparison with those before year 2000 and remains now at relatively low level.

Dhole Cuon alpinus: Transect and camera trapping survey have not recorded the evidence of Dhole in PNKB NP. However, the results of the questionnaire survey and direct interview show Dhole still survives in PNKB NP at very low density and in more remote areas of the Park. Dhole is nearly expatriated in some previous areas. During period from 2015 - 2018, existence of Dhole was recorded only in 4 areas inside PNKB NP. Dholes are very sensitive to human disturbance, therefore, they possibly move to remote areas close to Vietnam-Laos border to live.

Asian Elephant Elephas maximus: Results of this study have not recorded the evidence of Asian Elephant existence is found in PNKB NP. Residents from Thuong Trach, Thuong Hoa and Trung Hoa Commune report that in the past, a group of 4-5 elephants often came for feeding in their land. The elephants stayed for about a month then crossed the Ho Chi Minh road and moved further to Tan Hoa Com. of Minh Hoa District and Cao Quang Com. of Quang Trach District outside the buffer zone of PNKB NP. However, in 2017 and 2018, the elephants have not come back. Because the wildlife conservation in the area of Tan Hoa and Cao Quang com. is not under management of PNKB NP, we do not have detailed information about the elephant activities. However, according the report from Tuyen Hoa Forest Protection Department, the elephants are still occasionally encountered in this area.

Gaur Bos frontalis: The existence of Gaur in core zone and buffer zone of PNKB NP was obtained by all used survey methods including questionnaire survey, direct interviews, transect and camera trapping survey. One groups of 5-6 individuals lives in Giang Man mountain, A group of 7-10 individuals lives in mountain near Rao Con village (Tan Trach Com.), 3 individuals lives in the area Khe Tru - Khe Trieng (Phuc Trach Com.); 5-6 individuals lives in the area of Pa Tha - Xa Bien (Tan Trach Com.); 10-15 individuals lives in Rao May - Doc May area (Truong Son Com.). Thus, there are about 16-20 individuals of Gaur that are living and regularly moving from the core zone to the PNKB NP's buffer zone and and vice versa.

Large-antlered Muntjak Muntiacus vuquangensis: Camera trapping and transect survey have not obtained evidence of Large-antlered Muntjak in PNKB

NP. However, results of direct interview survey indicate that Large-antlered Muntjak still exists in PNKB NP. Large-antlered Muntjak is very rare in PNKB NP, therefore, not many villagers know this species. Direct interview survey could identify only 6 areas in PNKB NP where the Large-antlered Muntjak survives including Ka Sai area (Dan Hoa Com.), forest valley near Mo O O and Yen Hop Villages (Thuong Hoa Com.), forest area near Doong Village (Tan Trach Com.), Khe Thi and Xa Bien areas (Tan Trach Com.).

Saola Pseudoryx nghetinhensis: Until 2012, the areas of previous Saola records in buffer zone of PNKB NP (in Thuong Hoa, Dan Hoa and Hoa Son Com.) had not been allocated to PNKB NP management. The forest in these areas have been seriously degraded due to forest clearing for agricultural fields and cattle raising grounds and no more suitable for Saola to inhabit. Transect and camera trapping surveys (2018) have not yet find evidence of Saola, however, results of questionnaire and direct interview surveys indicate a small group of Saola (4-5 individuals) still survives in forest area (Cemetery Hill) near Doong Village (Tan Trach Com., Bo Trach District) inside PNKB NP. The most recent evidence was found in January 2018, when Mrs. Ho Thi Vai (from Dong Village) met a Saola mother and her baby eating young "dong" stem (*Stachyphrynium placentarium*) in this area.

Threats to the 7 important large mammal species and mammal fauna in PNKB NP: During recent years, due to considerable intensification of forest patrolling as well as strict violation trial and prosecution, the threats to wildlife and biodiversity in PNKB NP has been considerably reduced. At present, the key threats occur mainly in buffer zone and small parts of core zone of PNKB NP located close to villages. It is of great concern now is also the forest disturbance by large illegal encroachment of people into core zone of PNKB NP for collecting bee honey and other non-timber forest products and increase of ecotourism inside PNKB NP. These large human encroachment (illegal and legal) cause the loss of habitat security, that negatively affect the normal life of wild animal species in the Park, especially, endangered species which are naturally very sensitive to human encroachment. Therefore, there is a high risk of these threats happened again in core zone of PNKB NP if enforcement activities of PNKB NP would not remain at high intensity in future. In addition, global climate change also leads to more strong storms and heavy floods happened inside the PNKB NP causing significant negative impact on many endangered species.

Regarding the 7 study large mammal species, the most serious threat is the wildlife hunting/snaring activity which are not yet controlled in buffer zone and some village-closed areas in core zone of PNKB NP. The other less serious threats include significant reduction of prey animal stock for Tiger and Dhole; Habitat degradation by free-ranging cattle raising, illegal collecting of non-timber forest products; and Habitat disturbance by encroachment of local residents and increase of tourists inside the PNKB NP.

Proposed measures for conservation of the 7 important large mammal species: Based on the obtained results, following urgent conservation measures for conservation of the 7 important large mammal species as well as other wildlife species in PNKB NP are proposed, including: 1) Intensifying forest patrolling for forest and wildlife protection enforcement in PNKB NP, especially, strict control over gun possession and wildlife hunting by gun; 2) Conducting more education activities to increase the wildlife conservation awareness of all residents living in core zone and buffer zone of PNKB NP with special focus on the 7 study species; 3) Intensifying patrolling and strictly prosecuting/bringing to trial the violations on wildlife protection in buffer zone and its nearby areas where key threats are still intensive and out of control by the PNKB NP; 4) Conducting further surveys to clarify population status of Saola and Large-Antlered Muntjak in PNKB NP area using camera trapping technique. They are endemic species of Annamite Range, critically endangered and lacks of relevant scientific data for their effective management; 5) Implementing monitoring programme for the 7 important large mammal species in PNKB NP to timely detect the change in their population and apply relevant management measures; 6) Enhancing international collaboration with Laos partners to strengthen conservation of the important large mammal species because these species occur in transborder protected areas in both countries or may frequent between these protected areas.

2.3. Concerns about proposals to construct a cable car to provide access to the Son Doong cave within the strictly protected zone of the property

The World Heritage Committee expressed concern about the cable car project approaching to the Son Doong cave. Until now, Quang Binh Provincial People's Committee hasn't had any plans and not permitted any project to build the cable car to the entrance of Son Doong cave. Quang Binh Provincial People's Committee always respects the integrity of Phong Nha-Ke Bang National Park and takes measures to preserve the integrity of its outstanding values. The Quang Binh Provincial People's Committee committed strictly to comply with the provisions of the Vietnamese law and the Convention concerning the Protection of World Cultural and Natural Heritage on 16 November 1972 was signed by Vietnam.

2.4. Some issues are affecting the property, including inadequate conservation funding, impacts of climate change and invasive species, and the measures taken to address these issues, in particular to address the threat posed by the invasive species *Merremia boissiana*

*** Funding for conservation:**

Funds to invest in scientific research activities as well as awareness raising are limited; The expenditure for wildlife rescue is still very low, and the existing wildlife

rescue infrastructure remains small and is not up to standards and does not meet the demand. In the coming time, Quang Binh provincial People's Committee will actively seek funds to meet the requirements of the above-mentioned tasks, especially to re-allocate funds for tourist activities. On the other side, the authority will urgently invest in rescue and protection of wildlife to meet the practical requirements in terms of national park's task.

***Natural disasters and forest fires:**

Every year, the Phong Nha - Ke Bang area often experiences floods that occur in September and October. Severe storms and floods have occurred that impacted extremely on wildlife as well as the tourism infrastructures. Frequency and severity of floods and other natural disasters are likely increased as a result of global warming and global climate change.

Large-scale forest fires rarely occur in the Phong Nha-Ke Bang National Park area. Small-scale forest fires occasionally occur in areas adjacent to upland fields, however, early detection and extinguishing in time is almost impossible. Causes of forest fires are mainly due to slash-and-burn agriculture, honey collection and the carelessness of those who engage in illegal tourism activities.

*** Illegal exploitation of NTFPs:** Harvesting of NTFPs occurs almost year-round, depending on the availability of the area. Non-timber forest products are often illegally exploited such as rattan, herbs, orchids, conical hats, bamboo shoots, honey ... due to high market demand; Lack of employment, habits of living based mainly on exploiting forest resources and livelihoods of local people in some places in the buffer zone of the National Park have not been significantly improved.

*** Invasive species:** Through the survey, 14 species were identified as invasive species in the area. Flora is mimosa, Giant sensitive plant, Basket plant, Big-sage, Siam weed, Billy goat wee, Wild tamarind, Whitetop wee, Hyacinth, Bindweed. Fauna is Golden apple snail, Giant african snails; African sharptooth catfish, Mozambique mouth-breeder. The most dangerous to the endemic ecology are the Mimosa, Golden apple snail, and Bindweed (*Merremia boissiana*)

Especially, the serious invasive species of Bindweed (*Merremia boissiana*) in the core area of up to 1,000 ha is the risk of affecting the biodiversity and the integrity of the ecosystem of Phong Nha - Ke Bang National Park. In order to prevent the spread eradicate this invasive species, Phong Nha - Ke Bang National Park has conducted research and experiment with some environmentally friendly methods to exterminate Bindweed starting from 19/11/2016 - 22/02/2017. Results showed that 100% Bindweed were exterminated by the infusion method. All death Bindweed were decayed. Indigenous species were being developed with new shoots growing due to more nutrient.

For more scientific research, on January 12th, 2018, Phong Nha - Ke Bang National Park Management Board held a scientific workshop "Measures to prevent and eradicate the invasive species of *Merremia boissiana*" to have a full scientific argument for the scheme and eradication plan. Based on the results of workshops and opinions of related departments, Management Board of the Park has set up

“Test plan to eradicate invasive species of *Merremia boissiana* in Phong Nha – Ke Bang National Park” in an area of 100ha in the the service-administrative zone of the National Park. The plan were approved by Quang Binh Provincial People’s Committee under the Decision No 2336/QĐ-UBND dated 17/7/2018. The plan has been implemented at in plots 3 and 10, sub-zone 615A; plot 3 and plot 6, sub-zone 615 belonging to the service-administrative zone. Seven random research plots were set up to assess the current status of resources before and after eradication; To assess the forest status, record the distribution of species of animals and plants in the survey area is as a basis for control . According to the plan, *Merremia boissiana* will be treated by the end of February 2019.

2.5. Adjustments and additions to the Sustainable Tourism Development Plan of Phong Nha-Ke Bang National Park

With regard to this recommendation, the provincial People's Committee is now instructing relevant agencies to adjust the Sustainable Tourism Development Plan of Phong Nha-Ke Bang National Park 2010 - 2020 with vision to 2025 issued by Decision No. 2822 / QĐ-UBND dated 01/11/2010 of Quang Binh People's Committee, including the extension area of Phong Nha - Ke Bang National Park in the area Minh Hoa district. The final result will be expected to be completed in 2018.

2.6. World Heritage Center / IUCN Reactive Monitoring Mission

Quang Binh Provincial People's Committee has coordinated with Viet Nam National Committee for UNESCO to send letters of invitation and arrange procedures for World Heritage Center / IUCN mission to Phong Nha National Park. - Ke Bang.

From 11 to 20/7/2018, World Heritage Center / IUCN mission conducted conservation monitoring activities at the World Natural Heritage and worked with Quang Binh PPC, the National Park Management Board, relevant agencies in Vietnam. The World Heritage Center / IUCN Monitoring Mission carried out fields in the buffer zone communes of the PN-KB National Park (Son Trach, Xuan Trach, Tan Trach, Thuong Hoa) and the core zone of the Property; direct observations on key spots for biodiversity and wildlife conservation; Interviews with key staff, members of local communes NGOs and private sector representatives..

On this occasion, the Management Board of Phong Nha - Ke Bang National Park also provided detailed written reports and related documents for the World Heritage Center, including:

- General Plan for Phong Nha – Ke Bang National Park to 2030 (on Decision No.209/QĐ-TTg dated February 08th, 2015 of The Prime Minister on approval for general plan for Phong Nha – Ke Bang National Park to 2030);
- Sustainable Tourism Development Plan 2010-2020 (Decision No .2822/QĐ-UBND dated November 01 2010 of Quang Binh Provincial People’s Committee on approval for Sustainable Tourism Development Plan 2010-2020 in Phong Nha – Ke Bang area);
- The master plan for developing National Tourist Area of Phong Nha - Ke Bang until 2030 (Decision No.2128/QĐ-TTg dated December 29th, 2017 of The

Prime Minister on approval for master plan for developing National Tourist Area of Phong Nha - Ke Bang until 2030);

- Strategic Management Plan 2013-2025 for Phong Nha Ke Bang National Park (Decision No.808/QĐ-UBND dated April 09th, 2013 of Quang Binh Provincial People's Committee on approval for the strategic Management Plan for Phong Nha Ke Bang National Park, period 2013-2025);

- Operational Management Plan 2013 – 2020 for Phong Nha – Ke Bang National Park (Decision No.809/QĐ-UBND dated April 09th, 2013 of Quang Binh Provincial People's Committee on approval for Operational Management Plan for Phong Nha – Ke Bang National Park, period 2013-2020);

- The management regulations of Phong Nha Ke Bang National Park (Decision No.18/2007/QĐ-UBND dated August 16th, 2007 by Quang Binh PPC regulating the management regulations of Phong Nha Ke Bang National Park);

- On the other hand, the Management Board reported the status conservation in the period of 2015 – 2018 consisting of: i) *density of key species*; ii) *Patrolling capabilities (Finance, human resources and support resources)*; iii) *patrol scale (area patrolled, patrolling time, field)*; iv) *The confiscation of forest products (types)*; v) *The number of violations have been handled*.

On 23 Nov 2018, the World Heritage Center has a report on the results of the conservation status assessment of Phong Nha - Ke Bang National Park by the World Heritage Committee/IUCN Monitoring team of experts. The mission has evaluated the overall status of heritage conservation and made recommendations for sustainable tourism in order to preserve and be compatible with the Outstanding Values of the National Park World Heritage Site.

3. Other issues in conservation and promotion of Heritage values

Conservation of biodiversity

To effectively implement the breeding programs of precious and rare species of high conservation value and high economic value; The care and rescue of wild animals and plants is well done¹; Continue to monitor biodiversity and implement an Action Plan for the conservation of primates in the National Park².

Implementation of the provincial science and technology project “Eco-study and distribution of *Calocedrus rupestris* in Phong Nha-Ke Bang National Park”, is implementing the fieldwork and interviews to collect information on the distribution and ecological characteristics of *Calocedrus rupestris* in 05 communes in the Park's buffer

¹ Collecting 7,600 seeds, 160 cuttings, producing 6,285 seedlings for propagation for conservation; additional planting 136 indigenous trees for conservation of genetic resources and landscaping at Botanical Gardens; 1,330 cuttings of orchids to propagate clonal propagation. Currently ongoing monitoring capability to shoot and 292 tubers of orchid have been planted; Survey and assess the current status of resources in the Nui Doi area. Results were recorded 234 species of flora in 170 genera, 74 families and 87 vertebrates, including 12 species of mammals, 25 species of birds, 18 species of fish, 20 species of reptiles and 12 species of amphibians; received and rescued 101 wildlife species, the success rate of rescue reached 94%; 51 individuals have released on the natural environment, six individuals died, currently raising 44 wildlife species, raising two species of wildlife conservation (including 08 species Porcupines and 115 birds); received 295.2 kg of nine species of Orchid.

² The results show that there are 178 herds, about 1,200 individuals, including 50 herds, 252 individuals of Ha Tinh langur; 36 flocks, 341 individuals of Rhesus macaque; 31 flocks, 188 individuals of Stump-Tailed Macaque; 09 flocks, 52 individuals of Assamese Macaque; 04 flocks, 48 individuals of Pig-tailed Macaque; 41 flocks, 301 individuals of red-shanked douc langur; 07 flocks, 18 individuals of Southern white-cheeked gibbon. Also recorded the presence of 06 herds with 16 individuals of Eurasian Wild pig, two individuals of Southern Serow, Small Indian Civet, chicken, Keeled Box Turtle, Squirrel, snake, Annamite Striped Rabbit.

zone (include communes: Hoa Son, Thuong Hoa, Truong Son, Tan Trach, Thuong Trach); Planning fieldwork for 4 routes in areas of Doong village, Khe Tum, Cu Ton and Khe Rung.

Update the list of plants and animals in Phong Nha – Ke Bang National Park. Up to now, it has been recorded that 2.951 species of plants (belonging to 1,006 genera, 198 families, 62 orders, 11 classes, 06 branches), 1.394 species of animals (belonging to 835 breeds, 289 families, 66 sets, 12 classes, 04 branches)³.

Conservation of geological, geomorphological, environment

Completion and acceptance a provincial science and technology tasks in 2018 “Investigation, preliminary survey unpublished caves in Phong Nha - Ke Bang National Park and propose solutions for management and conservation”; recorded 44 new caves; Coordinate with the Department of Science and Technology to implement the project “Research and assessment of outstanding geoheritages of Phong Nha – Ke Bang National Park to promote tourism”⁴; Building a project on investigating, surveying, detailed plannings on inland water conservation zone “Rivers and subterranean rivers in the Karst of Phong Nha-Ke Bang National Park, Quang Binh Province”; To conduct observation and supply of information and meteorological data in Phong Nha-Ke Bang National Park; continued monitoring, impact assessment of tourism activities on the caves in the National Park ⁵; In collaboration with Royal Geophysical Research Association of the UK and the Hanoi Natural Science University, added 32 caves in 16 areas in Phong Nha - Ke Bang National Park (length 11,300m) including 29 new survey caves, 02 caves for the second survey from 2017). Up to now, 392 caves have surveyed, with a total length of over 220km.

Conservation of cultural, historical relics

Continue to study and collect documents on historical and cultural relics in Phong Nha - Ke Bang area; manage and preserve historical and cultural relics and spiritual values and promote their values, meeting the requirements of conservation and the needs of visitors.

4. In conformity with Paragraph 172 of the *Operational Guidelines*, describe any potential major restorations, alterations and/or new construction(s) intended within the property, the buffer zone(s) and/or corridors or other

³ Flora: there are 112 species listed in the Vietnam Red Data Book, 121 species listed in the IUCN Red List, 39 species listed in Decree 32-2006 / ND-CP, 01 species listed in CITES Appendices; Fauna: there are 83 species listed in the Red Data Book of Vietnam, 110 species listed in the IUCN Red List, 68 species listed in Decree 32-2006 / ND-CP, 55 species listed in CITES Appendices.

⁴ Conduct field surveys, take photos and describe some areas of Phong Nha-Ke Bang National Park (cave landscape survey in Phong Nha cave, Thien Duong cave: geological, geomorphology and paleontology survey on routes 20, Phong Nha - U Bo, Phong Nha - Quy Dat, Quy Dat - Cha Lo, Va - Nuoc, Nuoc, determining the locations of sample collection and composing of the sub-topics).

⁵ Inspection of tourism and environmental sanitation at the tourism route of Hamada – Tra Ang, En cave and Son Doong cave, Sinh Ton valley; Check the preparation work for environmental interpretation activities in the semi-wild; Investigate natural resources for the project “Tourism Product Complex Project on explore the nature, conquer the cave Thac Chay - Hang Vom”, landmarked sites, assess the current status of the resource for the project of leasing forest environment in Song Chay area - Dark cave, field survey the status of Gao forest – O Ro cave area, Inspect of exploitation and encroachment of forest land in the area of FPS No. 6...

areas, where such developments may affect the Outstanding Universal Value of the property, including authenticity and integrity.

There are no buildings and new constructions in the core zone, buffer zone, ecological corridors that impacted on the integrity of the property.

5. Public access to the state of conservation report

[Note: this report will be uploaded for public access on the World Heritage Centre's State of conservation Information System (<http://whc.unesco.org/en/soc>)].

Signature of the Authority



**Tran Tien Dung
VICE CHAIRMAN**

PROVINCIAL PEOPLE'S COMMITTEE

ANNEX 01

PEOPLE'S COMMITTEE OF QUANG BINH PROVINCE
MANAGEMENT BOARD OF
PHONG NHA-KE BANG NATIONAL PARK

No. 650/VQG

THE SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom – Happiness

Quang Binh, November 26th, 2018

REPORT

ON FOREST LAW ENFORCEMENT TO PREVENT AND CONTROL ILLEGAL LOGGING AND POACHING IN PHONG NHA - KE BANG NATIONAL PARK, THE PERIOD 2015-October 2018

Phong Nha-Ke Bang National Park (PNKB NP) has a total land area of 123,326 ha, located in the administrative areas of Bo Trach and Minh Hoa districts, Quang Binh province. The Park is surrounded by a buffer zone of 13 communes (including 7 communes in Bo Trach district, 5 in Minh Hoa and 1 in Quang Ninh district). Over the last years, PNKB NP has faced numerous threats, of which the most serious are the illegal logging and poaching. Based on its own efforts, close collaboration with and active support of local authorities and relevant agencies in law enforcement, until now the PNKB NP Management Board has fundamentally pushed back the major threats and minimize negative impacts to the natural values of the PNKB NP, achieving the following results:

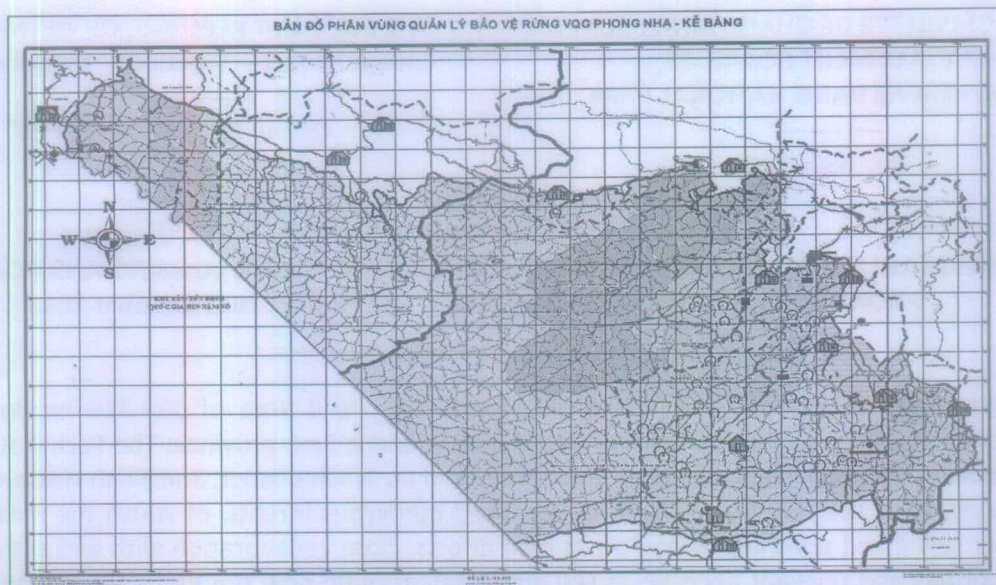
I. ENHANCEMENT OF FOREST PROTECTION AND MANAGEMENT BY LAW ENFORCEMENT PERFORMANCE

1. Forest patrolling

Based on the natural features, distribution of natural resources and levels of threats to each forest zone in the Park, the ranger stations (ranger stations) have proactively prepared their forest patrolling plans in an appropriate and practical manner, ensuring the highest protection of natural resources in the assigned forest zones. The patrolling plans have been flexibly adjusted based on updated information and steering of the PNKB NP Forest Protection Unit (PNKB FPU). During patrol trips, the forest patrol groups have conducted patrolling tasks, using GPS to track coordinates of points, record relevant information, changes in the patrol routes. The recorded date and information are integrated in a software and then converted into maps to be used for forest protection and management purposes. Monthly, each ranger station implement 15 patrol trips, spending 18 days and 5 nights in the forest for patrolling 105 km.

During patrol trips, the ranger groups have taken the major patrol routes and extended the patrolling based on the fishbone approach: when violation signs were observed, patrolling was focused on the areas of relatively flat terrain and with water-rich surface where violators often select for camping, putting traps and snares; when signs of illegal logging, traps, snares, camping sites, etc. were observed, forest rangers groups immediately approached violation cases or conducted secret ambushes to arrest violators and removed traps, snares, camps, etc.

Patrol trips of PNKB forest rangers have the involvement of the village forest protection groups and village conservation groups whose members are local people (including some who were illegal loggers/poachers). These villagers are respected in the communities, have a good insight of the areas, know forest trails very well, have forest experiences and a good understanding of local forest plants as well as wildlife. Their indigenous knowledge have made significant contributions to improved effectiveness of forest patrols and biodiversity monitoring of PNKB forest rangers.



Forest patrol routes of PNKB NP ranger stations

By enhancing patrolling, detection, handling of violation cases in combination with awareness raising communication activities during 2015-2017 period, the number of snares, traps, camps in and violators to PNKB NP has significantly reduced (*see the following table for detailed data*).

Year	Results		
	No. of trap lines	No. of camps	No. of violators
2015	3,338	70	1,038
2016	2,032	51	444
2017	1,854	20	155
To 31/10/2018	822	23	71
TOTAL	8,037	164	1,708

Results of forest patrol trips by PNKB NP forest rangers during 2015-2018

In addition, The Forest Protection Department of Quang Binh (Quang Binh FPD) has instructed FPU's in Bo Trach, Minh Hoa and Quang Ninh districts to strengthen the patrolling and protection of forests, inspect the operations of forest owners in the adjacent forests. Specifically: 81 forest patrol and protection trips have been carried out in the adjacent areas of the NP, 87 inspections implemented to the forest owners' operations (Bong Lai, Bo Trach Forest Enterprises, Minh Hoa and Truong Son Forest Enterprise's branches... and community forests of the communes). As a result, these have contributed to detecting and handling violation cases of illegal logging, wildlife trapping and poaching, infringe timber and wildlife transportations; to guide and assist forest owners in increasing the effectiveness on forest protection and management, communicate to and mobilize forest owners to strictly follow the regulations on forest fire management, forest protection and management in the allocated forests, creating a safe corridor for forest areas in the core zone of the NP.

*** Establishing and maintaining the activities of key forest ranger groups in critical forest areas:**

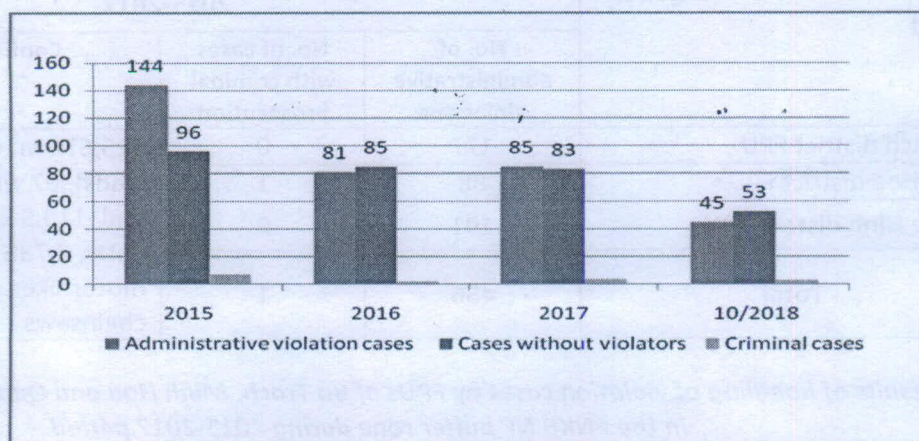
Currently, NP FPU Unit has 13 ranger stations and 02 Inter-agency check-points (Khe Sen and Hoa Son). Locations of these stations and check-points are in critical forest areas, where there are access roads to forests, and are often considered as 'hotspots' for extracting forest products, poaching, and infringe timber and wildlife transportations. The ranger stations work on shifts on a 24/24-hour basis. During the shifts, when violations occurred, if there is any delay in detecting and reporting violations, the in-charge ranger team of such shift will take full responsibilities and be then handled according to the regulations. The performance of these 13 ranger stations have contributed to early detection of violators, right at the beginning of cases, thus prevented and chased away people infiltrating into forests for infringe purposes and minimize infringement behaviors to forest resources, especially logging and wildlife poaching.

There are 02 roads crossing PNKB NP, including Road 20 (passing through Ranger Station No. 6, and Thuong Trach Ranger Station) and the Western branch of Ho Chi Minh highway (passing through the Ranger Stations - Tro Mong, Km 37, Km 40, U Bo). To control in-and-out activities of people and vehicles on these roads, the PNKB FPU has installed 03 barrier stations with check-points at 03 ranger stations (No. 6, Tro Mong, Thuong Trach) which are entrances to the NP. These barrier stations always have staff on duty (working on shifts on a 24/24-hour basis, especially they have surveillance cameras. As a result, all activities of people and transport means on these two routes are closely monitored and supervised; the cases of people taking an advantage of tourism activities to enter the forests, using cars to hide and transport forest products have been basically detected and stopped at these barrier stations.

2. Forest patrolling - handling of forest law violations

During 2015-2018 period, NP's Forest Protection Unit has strengthened the detection, arrest, and handling of forest law violations. As a result, the number of administrative sanctions and the violators with sanctions have strongly increased and many cases transferred to criminal handling. Arrest and strict handling of violators is the most effective method of education and deterrence, so one of the breakthrough instructions of the park leaders is the determination to arrest violators for handling; for cases of without violators or violators escaped, the patrol teams and relevant individuals shall have to prepare a report to justify to the leaders of the PNKB FPU for verification and clarification, to avoid negative manifestations or the lack of positive behaviors and the lack of determination in arresting offenders.

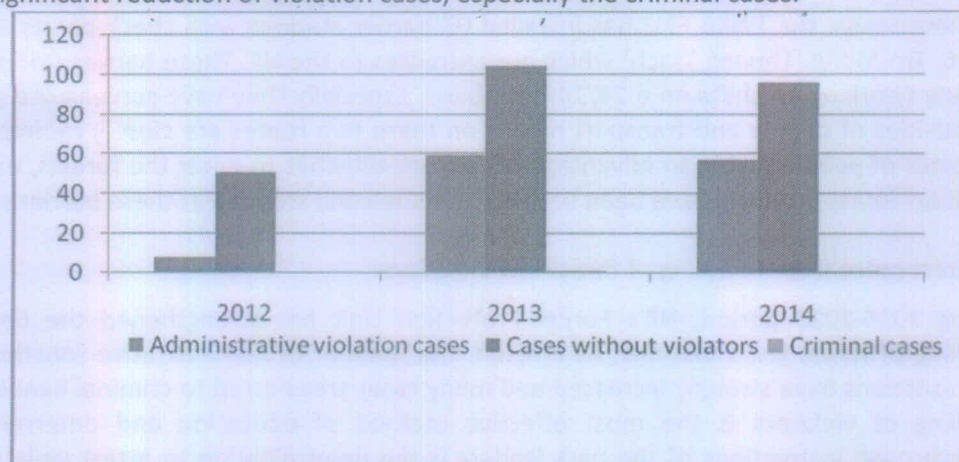
From 2015 to 31/10/2018, the PNKB FPU has filed case dossiers and: issued decisions to handle 671 violation cases, including the sanctions of 355 cases of administrative violations for 550 offenders, with a total fine of over 2.2 billion VND; 316 cases of without violators; issued decisions on prosecuting 11 criminal cases, decisions to transferred to the Police for prosecution of 05 cases. Police have issued decisions to prosecute 27 accused individuals to investigate violations of regulations on forest protection and development. 96.625 m³ of timber (of all kinds), 262 wildlife individuals, more than 660 kg of wildlife body parts, 6,887 kg of non-timber forest products (NTFPs), 584 tools of various types, 56 transport means and 15 chainsaws had been confiscated. 23 guns of different types, 5 bullets, 1.3 kg of self-made ball bullet, 350 metal-ball-bullets 1.8 kg of explosives and 32 detonators had been transferred to the Police.



No. of forest violation cases handled by PNKB NP FPU, 2015 -10/2018

- In 2015: PNKB FPU made a comprehensive change to the forest patrolling approach and method, combined with the determination in the steering and handling of violations to enhance the deterrent and education impacts. As a result, the number of violation cases detected and handled was substantially increased; the number of violators arrested and handled was also higher; the cases of without violators was gradually decreased. And during 2015-2017 period, 2105 was the year with the highest number of violation cases criminally handled.

- In 2016 and 2018, due to enhanced forest law enforcement in combination with communicating of relevant laws and regulations, local people's awareness had been step-by-step changed, contributing to the significant reduction of violation cases, especially the criminal cases.



No. of forest violation cases handled by PNKB NP FPU, 2012 -2014

The above chart, comparing the number of violation cases during 2012-2014 and 2015-2018 periods, shows that the number of violation cases detected and handled in PNKB NP had increased from 2012 to 2015 (with the highest in 2015) and gradually decreased after 2015 in spite of the increasing tightened and strengthened law enforcement. It indicates the illegal logging and wildlife poaching in the PNKB NP has decreasingly reduced and thus the natural resources of the NP has been increasingly better protected.

During 2015-2017 period, Quang Binh FPD has also accelerated the handling of violation cases in the buffer zone communes (*see the following table for detailed data*).

Comparison of violation cases handled by PNKB FPU from 2012 to 2014

Period	Agency	2015-2017		
		No. of administrative violations	No. of cases with criminal prosecution	Confiscated items
Bo Trach district FPU		177	0	525,672 m ³ of timber (different kinds), 07 wildlife individuals and 119.5 kg of wildlife body parts, 2,786 kg of NTFPs, 30 motorbikes, 15 carts and 09 chainsaws
Minh Hoa district FPU		88	1	
Quang Ninh district FPU		191	0	
Total		456	1	

Results of handling of violation cases by FPUs of Bo Trach, Minh Hoa and Quang Ninh districts in the PNKB NP buffer zone during 2015-2017 period

Due to the drastic measures undertaken by Quang Binh FPD, together with the involvement and collaboration of the FPUs in Bo Trach, Minh Hoa and Quang Ninh districts, violations of forest law and regulations such as illegal logging, poaching, trapping, shooting, transportation, trade and consumption of forest products, especially wildlife, etc. in the PNKB region have been detected, prevented, controlled and handled in a timely manner, contributing to limiting the extraction of forest resources in its buffer zone and core zone in 2015-2017 period.

II. MEASURES TO SUPPORT LAW ENFORCEMENT AND IMPROVEMENT OF THE EFFECTIVENESS OF FOREST PROTECTION AND MANAGEMENT

1. Communication and dissemination of legal regulations on forest protection and development to local people in the PNKB NP buffer zone communes

From 2015 to 31/10/2018, the PNKB NP Management Board has organized 521 conferences to introduce Law on handling administrative violations, Law on forest protection and development, regulations on forest fire prevention and control, on precious and rare wildlife protection in the villages of the buffer zone communes; conducted 25 environmental interpretations for about 700 school pupils, students, youth union members in the buffer zone communes, in collaboration with village forest protection teams to disseminate 143 times; implemented an education and training programme on nature conservation education skills for teachers and school students secondary schools in the buffer zone; integrated the knowledge and information about PNKB NP into the teaching curriculum for grades 6, 7, and 8; organized contests "Writing letters to introduce Phong Nha-Ke Bang National Park as the World Natural Heritage Site to your global friends"; developed school posters on the theme "I love My homeland's Green Forests" for secondary school students in the buffer zone communes; produced and hung 150 panels to communicate the values of forests and call for wildlife protection, forest fire management; signed commitments not to violate the regulations on forest protection in PNKB NP with local business households, traders in the communes of Tan Trach and Thuong Trach; signed commitments not to trade and consume wildlife with the local restaurants in the buffer zone communes and other tourism enterprises in PNKB NP.

In addition, Quang Binh FDP has actively strengthened the activities in communicating and disseminating the laws and regulations on forest protection to the local people in the buffer zone communes. The ranger stations have advised the Commune People's Committees (CPCs) to elaborate the community village meeting plans in details for this purpose; collaborated with local authorities and functional agencies to conduct 154 information campaigns on disseminating laws and regulations on forest protection and forest fire management; printed 02 big-sized panels, distributed 46 CDs, leaflets to the local population; developed programs on forest protection and forest fire management for broadcasting in the provincial and district televisions, and the information campaign via loudspeaker systems of the buffer zone communes. This activity has also implemented for different forest owners, especially the local Forest Enterprises and communities who have managed the forests adjacent to PNKB NP.

Thanks to these activities, the awareness and attitudes of the local people have seen positive changes and increasing improvements; the number of people who had illegally exploited forest products has been reduced considerably, the number of people involving in forest protection or becoming informants to the functional agencies has been increasing, etc., contributing to the protection and management of forest resources in the buffer zone and core zone.

* Communication with and mobilization of local people to hand over weapons and explosives

In order to mitigate wildlife poaching, contributing to maintaining the security and social order the buffer zone communes, the Park Administration (PNKB NP Management Board) has instructed its ranger stations to actively acquire relevant information about and prepare lists of individuals who have signs of keeping and using weapons and explosives such as military guns, sport guns, self-made guns, mines, bombs and others. These information and lists have been provided to the local authorities and functional agencies in the area who have coordinated with the PNKB FPU in convincing those individuals to hand over weapons and explosives. From 2015 up to now, a list of 147 people who have shown signs of keeping and using guns has been prepared and they have been mobilized to hand over 89 guns of all kinds, contributing to minimized poaching in the Park.

2. Development of a map showing the distribution of precious, endangered & rare species, and rich forest areas with high risk of threats for working out forest protection measures.

With the target to acquire accurate and updated understanding of the local situation for adequate and effective forest protection measures, the Park Administration has directed its ranger stations in

conducting a survey on assessment of the distribution of forest resources in the area and developing a map showing the distribution of precious, endangered & rare species, and rich forest areas in the park with high risk of threats. Based on this map, key protection measures have been worked out by each ranger station, as follows:

- Brief overview of the conditions of the forest area which each ranger station is in charge of protection (natural conditions, population and social conditions), working condition of the ranger station
- Preliminary assessment of current status of forest resources and major threats to forest resources in the in-charge forest area.
- Identification of critical and sensitive forest areas for protection and management, particularly zoning of hotspots of forest products extraction, especially timber, hunting, shooting, trapping, trading, transporting wildlife animals, of the areas where people often enter the forests for collect forest products and other areas prone to fires.
- Identification of patrol routes, key check-points for forest protection, including: name of patrol routes; start point, end point; patrol time; sensitive and critical areas which need be considered in the routes (with coordinates), patrolling members on each route.
- Forest protection measures/solutions in the area and implementation.

Apart from the general forest protection plan, each ranger station has developed a detailed action plan for forest protection for each site and for each period of year (focusing on the period of hotspots for forest product extraction, wildlife poaching such as: before, during and after the Lunar New Year, animal breeding seasons, season of collecting orchids, *Michelia* seeds, bee honey, etc. to ensure that their action plans on forest patrol have been always updated and based on the reality of each area.

Due to the realistic action plans for forest patrol, each ranger station has been always proactive in approaching the area, able to arrange their patrol teams and trips in a suitable way, enabling investigation, detection and timely prevention of infringe behaviors to forest resources, and accordingly resulting in no passive work performance and unforeseen occurrences.

3. Strengthening of the effectiveness of collaboration with local authorities and functional agencies in the local area for forest protection and management.

3.1. Development, signing, issuance and implementation of relevant agreements on collaborating with local authorities and functional agencies in forest protection and management

During 2015-2018, PNKB FPU has strengthened the collaboration in forest protection with the buffer zone authorities and relevant agencies in the area by developing and implementing related action plans, specifically:

- Signing, updating and implementing the collaborative plan on forest protection and management, forest fire management, prevention and control of transportation of illegal forest products and prevention of cross-border smuggling in the PNKB NP region with 6 Border Army Stations: Ca Roong, Con Roang, Lang Mo, Ca Xeng, Ra Mai and Cha Lo International Border Gate.
- Signing and implementing the regulation on collaboration between the PNKB FPU and FPUs of Bo Trach, Minh Hoa and Quang Ninh districts in communication and dissemination of the relevant lawful regulations, in investigation, prevention and handling of violations; in forest fire management as well as in information exchange.
- Implementing the regulation on collaboration in forest protection and management; forest fire management with the state forest companies who have been assigned to manage and develop the adjacent forest areas: North Quang Binh and Long Dai Forestry Companies.
- Signing and implementing an action plan to minimize violations of forest protection and development legislation in PNKB NP region with 07/13 buffer zone communes which share the

boundary with the NP (Xuan Trach, Phuc Trach, Son Trach, Tan Trach, Thuong Trach in Bo Trach district, Thuong Hoa, Hoa Son in Minh Hoa district).

- Continued the contracts for forest protection with 58 forest protection units under the Special-use Forest Protection and Development Project, 28 forest protection groups (with the involvement of 275 households) and 21 village conservation groups (140 members) in the buffer zone communes. As a result, hundreds of joint forest patrol trips have been implemented in the PNKB forest areas which share the boundary with the buffer zone communes; infringe information has been provided and exchanged in a timely manner, enabling adequate patrolling, searching, prevention, chasing away of suspected people and coordination with relevant agencies in handling of violation cases in a timely way.

3.2. Participation in inspection and control of forest products at inter-agency check-points

The PNKB NP Management Board has assigned its forest rangers to participate in forest inspection and control at 02 inter-agency check-point, including:

- Khe Sen Inter-agency check-point (Xuan Trach commune, Bo Trach district), established in 2011 with the participation of 03 agencies: Bo Trach Forest Enterprise, Bo Trach Forest Protection Unit, PNKB FPU to perform the tasks of strict control of human activities and transport means in the area from the Da Deo mountain peak to Khe Gat Airport (along Ho Chi Minh highway) and the forest area from the milestones 57 to 61 inside PNKB NP. During 2015-2017 period, Khe Sen Inter-agency check-point had detected and processed 66 cases of violation (04 cases of administrative violations, 62 cases without violators), confiscated 56,406 m³ of illegal timber, 21 motorcycles and 01 cart.
- Hoa Son Inter-agency check-point (Hoa Son commune, Minh Hoa district), set up in December 2016, with the participation of the agencies: Minh Hoa Forest Enterprise, Minh Hoa FPU, PNKB FPU, Ca Xeng Border Army Station, Minh Hoa District Police and Hoa Son Commune Police. By the end of December, 2017, this check-point had detected and handled 12 cases of violation (06 cases of administrative violation and 06 cases without violators), confiscated 2,902m³ of timber, 18 kg of orchids and 02 wildlife individuals.

The performance of these 2 inter-agency check-points have contributed to the protection and management of forest areas adjacent to the NP, preventing the illegal extraction and transportation of forest products on the different roads.

3.3. Coordination in handling of criminal cases of violation

In 2015- 10/2018 period, PNKB FPU has directly detected and reported 16 cases of violations related to criminal law (including cases prosecuted by PNKB FPU and cases transferred to the Investigation Police) for on violations of the regulations on extraction and protection of forests in accordance with Article 175 of the Penal Code (01 case) and violations of the regulation on management and protection of endangered, precious and rare wildlife, with priorities given to protection under Article 190 of the Penal Code (15cases). The PNKB FPU has actively coordinated, exchanged information and organized inter-agency meetings with functional agencies such as Quang Binh Provincial Forest Protection Department (Quang Binh FPD), Police, Procuracy to handle the above cases. Concurrently, the PNKB FPU has also proactively provided relevant information to the Press, Media agencies (Quang Binh Newspaper, Law Newspaper, Quang Binh Television, Vietnam Television and others) to communicate and educate the public on law observance. As a result, those who have violated the criminal law on forest protection and management have been handled in a strict, timely and fair manner.

5. Enhance relevant rules and disciplines in the National Park, improve the law enforcement capacity of forest rangers:

5.1. Enhance relevant rules and disciplines in the management of forest protection

Defining the capacity and morality of law enforcement staff a very important role, which decides the quality and effectiveness of forest protection and management, PNKB NP Management Board has focused and enhanced the management of human resources, tighten the discipline performance and been determined to strictly handle the cases that any NP staff and forest ranger has negative work performance practices, lack of responsibilities, are afraid of difficulties and hard tasks or opt out of responsibilities, tasks, make infringe work practices, violate the relevant regulations of the NP; show manifestations of making use of his/her position and power for his/her own benefits, etc. to clean up the NP management system and thus strengthening the effectiveness of law enforcement.

Year Form	2015	2016	2017	10/2018
Review (not disciplinary sanction)	08	17	29	12
Disciplinary sanction	02	01	03	07
Dismissal	01	0	0	0
Removal from office	0	01	0	0
Non-reappointment	0	0	02	0
Total	11	19	34	19

Summary of handling violation cases by PNKB NP forest rangers, 2015-2017 period

5.2. Strengthening the law enforcement capacity of FPU rangers

During 2015-2018 period, the following advanced trainings have been provided for PNKB FPU rangers:

- Training on criminal investigation in forest protection and management for 21 forest rangers (in 2015)
- Trainings on SMART (Spatial Monitoring and Reporting Tool) in forest patrolling and biodiversity monitoring for 39 forest rangers (in 2015 and 2016)
- Trainings on professional knowledge and skills in forest protection for 59 forest rangers (with the support of Phong Nha-Ke Bang Region Project, in 2015 and 2016)
- Trainings on monitoring skills on tourism routes in PNKB NP for 50 forest rangers (in 2016)
- Training on the Management Effectiveness Tracking Tool (METT) for 12 PNKB NP staff
- Trainings on handling of administrative violations in forest protection, management and development and management of forest products for 40 rangers (in 2017).
- Training on criminal investigation in forest management, forest development, forest protection and forest product management for 69 forest rangers.
- Training on capacity building for 105 specialized forest protection, village forest protection; and.
- Training on management and use of weapons - supporting tools for 127 forest rangers.

The trainings have been conducted based on the realistic requirements of task performance of forest rangers, focusing on practical skills and technology application in forest protection and management. Therefore, the trainings have laid an important foundation on professional knowledge qualifications and skills for the park rangers, significantly contributing to their improved capacity in law enforcement.

6. Improvement of local population's livelihoods:

The forest area of PNKB NP shares the boundary with 13 communes in its buffer zone, with a population of more than 64,000 people, mainly of ethnic minorities who have faced numerous difficulties in livelihoods, lacked of funds for production, land for cultivation; they also have limited educational level, limited understanding of lawful regulations and their livelihoods have been dependant on the forest resources in the PN and subsidies from the government. Thus, improvement of their livelihood conditions on a sustainable basis plays a crucial role in the forest protection and management of PNKB NP. During the 1025-2018, the PNKB NP Management Board has implemented some programmes and plans on livelihood improvement for several villages in the buffer zone such as bee-keeping model, F1 chicken raising, goat

raising, clean-vegetable plantation, plantation of indigenous tree species (e.g *Dalbergia Tonkinensis* Prain) and others.

Year	Budget	No. of villages supported
2015	840 million VND	21
2016	640 million VND	16
2017	1 billion 220 million VND	31
2018	480 billion	12

Budget and No. of villages in the buffer zone supported by PNKB NP Management Board

In addition, there are also other livelihood improvement projects for the local population in the buffer zone implemented by the Management Unit of "Forest Protection and Development Project of Bo Trach district" such as: The project on supporting the plantation of production forests for households in Thuong Trach commune (with an area of 44.7ha); the project contracting the protection and management of natural forest as protection forest for households in Tan Trach and Thuong Trach communes (5,000ha) funded by the governmental budget. Furthermore, the ranger station in Thuong Trach has provided advices to Thuong Trach commune in issuance of permit on extracting NTFPs (the medicinal plant: *Milletia reticulata* Benth or *Huyet dang* (local name)) in the natural forest managed by Thuong Trach local community. The natural forest in this commune has been allocated for local community-based management, aimed at increasing their incomes and at the same time implementing the participatory forest protection and management in this area.

Despite of many challenges in funding sources, in human resources for developing and implementing the livelihood improvement for local people in the buffer zone, these projects have resulted in initial positive impacts, contributing to improved living conditions of the local population in the buffer zone. The projects have also received consensus and support from the local authorities and people, replacing the local population's dependence on the forest resources by sustainable jobs, and eventually contributing to reduced pressures on local livelihoods on the natural forests of PNKB NP. The Management Board of Phong Nha Ke Ban National Park is kindly sending the report on the results of law enforcement activities to address illegal logging, hunting and firefighting in the period of 2015-2018 as requested.

C.c:

- MARD, MoCST;
- Cultural Heritage Department, MoCST;
- Vietnam National Commission for UNESCO;
- UNESCO Office in Hanoi;
- People's Committee of Quang Binh province;
- PNKB NP Forest Protection Unit;
- PNKB NP Division for Science and International Cooperation;
- For filing.



DIRECTOR

Le Thanh Tinh

PHONG NHA - KE BANG NATIONAL PARK



FINAL REPORT

THE RESULTS OF THE STATUS ASSESSMENT SURVEY ON SOME IMPORTANT LARGE MAMMAL SPECIES IN PHONG NHA-KE BANG NATIONAL PARK, QUANG BINH PROVINCE



Hổ



Bò tót



Chó sói



Voi châu á



Mang lớn



Sao la



Gấu ngựa

RESEARCH HOSTING ORGANIZATION
**MANAGEMENT BOARD OF PHONG NHA - KE BANG
NATIONAL PARK**

QUANG BINH - 2018

TABLE OF CONTENT

I. INTRODUCTION	4
1.1 The need of this study	4
1.2 Brief information on status of 7 target large mammal species	4
II. GENERAL INFORMATION OF THE PROJECT	7
2.1 Project name	7
2.2 Project aim	7
2.3 Target species	7
2.4 Study Scope	7
2.5 Research content	7
2.6 Project duration	7
2.7 Project budget	7
2.8 List of project implementators	7
III. PROJECT DURATION, STUDY SITE AND METHODS	8
3.1 Project duration	8
3.2 Project site	8
3.3 Study methods	8
3.3.1 <i>Questionnaire survey</i>	9
3.3.2 <i>Direct semi-structural interview of local villagers</i>	9
3.3.3 <i>Transect survey</i>	10
3.3.4 <i>Camera-trapping survey</i>	11
IV. STUDY RESULTS	11
4.1 Current status of 7 important large mammal species in PNKB NP	11
4.1.1 Tiger <i>Panthera tigris</i>	11
4.1.2 Asiatic Black Bear <i>Ursus thibetanus</i>	14
4.1.3 Dhole <i>Cuon alpinus</i>	20
4.1.4 Asian Elephant <i>Elephas maximus</i>	22
4.1.5 Gaur <i>Bos frontalis</i>	23
4.1.6 Large-antlered Muntjak <i>Muntiacus vuquangensis</i>	26
4.1.7 Saola <i>Pseudoryx nghetinhensis</i>	28
4.2 Threats to the 7 important large mammal species and mammal fauna in PNKB NP	31
4.3 Proposed measures for conservation of the 7 important large mammal species in PNKB NP	33
V. CONCLUSION	34
REFERENCE	35
Annex 1. List of key interviewees of direct interview survey	38
Annex 2. Some pictures of the study activities	40

ABBREVIATION

Com.	Commune
CR	Critically endangered
EN	Endangered
FFI	Fauna & Flora International
GIZ	<i>Deutsche Gesellschaft fuer Internationale Zusammenarbeit</i> (GIZ)-GmbH- German Technical Cooperation
IUCN	The World Conservation Union (International Union for Conservation of Nature)
IUCN RL	IUCN Red List of Threatened Species
MARD	Ministry of Agriculture and Rural Development
MoST	Ministry of Science and Technology
NBCA	National Biodiversity Conservation Area
NP	National Park
P.D.R.	People's Democratic Republic
PNKB	Phong Nha - Ke Bang
UNESCO	United Nations Educational, Scientific and Cultural Organization
VAST	Vietnam Academy of Science and Technology
VND	Vietnam Dong (currency)
VRTC	Vietnam - Russian Tropical Centre
VRDB	Red Data Book of Vietnam (2007)
VU	Vulnerable
WCS	Wildlife Conservation Society
WWF	World Wide Fund for Nature

LIST OF TABLES

Table 1. List of project implementators	8
Table 2. The cases of Tiger records from questionnaire survey	11
Table 3. Cases of Asiatic Black Bear records from questionnaire survey	15
Table 4. Sites of Bear foot scratches on trees found by transect survey	18
Table 5. Records of Dhole in PNKB NP	21
Table 6. Records of Gaur in PNKB NP area from questionnaire survey	23
Table 7. Saola records from questionnaire survey	29

LIST OF FIGURES

Figure 1. Sample of Questionare form used for investigation of the 7 target species	9
Figure 2. Location of transects (red lines) used in this survey	10
Figure 3. Putting up the camera traps	11
Figure 4. The sites of Tiger records during period 2015 -2018	14
Figure 5. Scratches of Bear on trees observed in Ma Linh and Hung Dai areas	19
Figure 6. Sites of Asiatic Black Bear Records during 2015 -2018	20
Figure 7. Sites of Dhole records during period 2015 -2018	22
Figure 8. The movement route of Asian Elephant group outside PNKB NP	23
Figure 9. Image of Gaur taken by camera trap in Rao Con area on 29 Oct. 2018	25
Figure 10. Sites of Gaur records during period 2015 - 2018	26
Figure 11. Localities of Large-Antlered Muntjak records during 2015 -2018	28
Figure 12. Distribution of Saola groups in Southwestern Quang Binh Province	29
Figure 13. Localities of Saola records during period 2015 -2018	30

I. INTRODUCTION

1.1 The need of this study

Situated in the centre of the world largest Ke Bang limestone landscape, Phong Nha - Ke Bang National Park (PNKB NP) has been recognized as the most important global ecoregion within Great Annamite Range. The National Park contains the universal outstanding values on biodiversity and high diversity of flora and fauna including many karst-specialist species, endemic species and large quantity of globally endangered species (Batzer et al. 2001). PNKB NP (123,326 ha) was first recognized as a World Heritage Site by the UNESCO World Heritage Committee in 2003 under category VIII: Outstanding universal geological, geomorphic and geographic values. In 2015, PNKB NP was second time inscribed on the World Heritage List for its outstanding universal values on on-going ecological and biological processes (category IX) and biodiversity conservation importance (category X). The PNKB NP is of utmost importance for conservation of Vietnam's and the World biodiversity. According to recent biodiversity assessment, the PNKB NP harbours 2,781 vascular plant species and 188 vertebrate animal species of national and global conservation priority (Nguyen Xuan Dang et al. 2016).

The mammal fauna in the PNKB NP comprises 143 species including 73 species of high conservation concern. The notable species of these species are Tiger (*Panthera tigris*), Asiatic Black Bear (*Ursus thibetanus*), Dhole (*Cuon alpinus*), Asian Elephant (*Elephas maximus*), Gaur (*Bos frontalis*), Large-antlered Muntjak (*Muntiacus vuquangensis*) and Sao la (*Pseudoryx nghetinhensis*). They are all large mammal species. As the rule, large mammal species in comparison with other mammal groups, usually face very high pressure of negative anthropogenic activities due to their high economic value and vast activity area including sometime even agricultivation and human settlement areas. Thus, management of large mammal species usually has more challenges even they are inside nature reserves and national parks.

In order to have sound scientific data for Quang Binh Provincial People Committee and Ministry of Culture, Sport and Tourism to prepare a report to the World Heritage Centre (as requested by World Heritage Committee under Decision WHC/17/41.COM/7B) as well as for development of the short-term and long-term management strategies to conserve the large and also other mammal species in PNKB NP, Quang Binh Provincial People Committee has entrusted Management Board of PNKB NP with project "Status assessment survey on some important large mammal species in PNKB NP". The project duration is from May to November 2018.

1.2 Brief information on status of 7 target large mammal species

1) Tiger *Panthera tigris*

Tiger is widely distributed in many Asian countries. The species has 6 different subspecies and sub-species Indochinese Tiger *Panthera tigris corbetti* is found in Bangladesh, Myanmar, Indonesia, Thailand, Laos, Vietnam and Cambodia. At present, Tiger is facing danger of global extinction (Goodrich et al. 2015). The 2018 IUCN Red List has enlisted Tiger at high threatening category - Endangered (EN)

In Vietnam, Tiger has past distribution range covering many mountainous provinces. However, the Tiger number is now critically decreased, estimated less than 150 individuals and they live in small groups isolated each other in different forest areas of the country. Tiger is enlisted in Red Data Book of Vietnam (MoST and VAST, 2007) at Critically Endangered (CR), in the Group IB (strict ban of hunting and use for commercial purposes) of Government Decree No.32/2006/NĐ-CP and in the Annex 1 (National list of endangered, rare and precious species of conservation priority) of Government Decree No.160/2013/NĐ-CP.

2) Asiatic Black Bear *Ursus thibetanus*

Asiatic Black Bear is widely distributed in many Asian countries (India, Nepal, Myanmar, China, Laos, Thailand, Vietnam, Cambodia, etc.). Due to overhunting and large-scale forest destruction, the species has been significantly decreased in number in almost all of its range countries and faced danger of global extinction (Garshelis et al. 2016). The 2018 IUCN Red List has enlisted Asiatic Black Bear at Vulnerable (VU).

In Vietnam, Asiatic Black Bear was found in many mountainous provinces with high abundance. However, due to overhunting and large-scale forest destruction, the number of Asiatic Black Bear in the wild has been seriously decreased and the species is now facing the danger of extinction. Asiatic Black Bear is enlisted in Red Data Book of Vietnam (MoST and VAST, 2007) at Endangered (EN), enlisted in the Group IB of Government Decree No.32/2006/NĐ-CP and the Annex 1 (National list of endangered, rare and precious species of conservation priority) of Government Decree No.160/2013/NĐ-CP.

3) Dhole *Cuon alpinus*

Dhole was once distributed widely in many Eastern and Southern Asian countries, but now, the species has been extinct from most (>75%) of its distribution range. All remained populations are small or relatively small and isolated each other. The reason of this is overhunting, reduction of prey animal resource, habitat loss, diseases and competition with other species (Kamler et al. 2015). The 2018 IUCN Red List has enlisted Dhole at Endangered (EN).

In Vietnam, Dhole was once distributed widely in many forested provinces ranging from North to the South. Due to overhunting and habitat loss, number of Dhole in the wild has been seriously decreased. The species is enlisted in Red Data Book of Vietnam (MoST and VAST, 2007) at Endangered (EN), enlisted in the Group IB of Government Decree No.32/2006/NĐ-CP and the Annex 1 (National list of endangered, rare and precious species of conservation priority) of Government Decree No.160/2013/NĐ-CP.

4) Asian Elephant *Elephas maximus*

Asian Elephant was once distributed widely in many Asian countries, however, at present, the species is found only in 13 countries. Its global population in 2003 was estimated about 40,000 - 50,000 individuals (Choudhury et al. 2008). Current number is unknown, very likely, is lower. Illegal hunting for ivory, habitat loss and ever-increasing human-elephant conflict has led the species to danger of global extinction. The 2018 IUCN Red List has enlisted Asian Elephant at Endangered (EN).

In Vietnam, Asian elephant has original distribution range covering many provinces ranging from Lai Chau Province to Binh Phuoc Province and some Central coastal provinces (MoST and VAST 2007). Due to illegal hunting for ivory and large-scale forest loss, population of Asian elephant in Vietnam is now critically reduced in number and distribution range. Its current number is estimated only about 100-130 individuals. They live in 8 provinces including Son La, Nghe An, Ha Tinh, Quang Nam, Dak Lak, Lam Dong, Dong Nai and Binh Phuoc (MARD, 2013). Most of the groups consists of only 1-5 individuals and live isolated each other. There are only 3 areas which harbor the populations of over 10 elephants: 1) YokDon - Ea Sup area (Dak Lak Province) harbors about 60-80 individuals, 2) Pu Mat NP (Nghe An Province) harbors about 11 individuals, and 3) Cat Tien National Park - Dong Nai Nature Reserve area harbors about 10-11 individuals (Nguyen Xuan Dang, 2015). Asian elephant is enlisted in Red Data Book of Vietnam (MoST and VAST, 2007) at Critical Endangered (CR), enlisted in the Group IB of Government Decree No.32/2006/NĐ-CP and the Annex 1 (National list of endangered, rare and precious species of conservation priority) of Government Decree No.160/2013/NĐ-CP.

5) Gaur *Bos frontalis*

Gaur was widely distributed in many Southern and Southeastern Asian countries. At present, the species occurs only in 10 countries including India, Bhutan, Myanmar, Nepal, China, Thailand, Laos, Vietnam, Cambodia and Malaysia. Total global population of Gaur is about 15,000 - 35,000 individuals (Duckworth et al. 2016). Almost all Gaur populations in the World are in danger of extinction due to illegal hunting and large-scale forest loss. The 2018 IUCN Red List has enlisted Gaur at category Vulnerable (VU).

In Vietnam, Gaur was distributed in many mountainous provinces ranging from Lai Chau Province in the North to Dong Nai and Binh Phuoc Provinces in the South and at high abundance (Dang Huy Huynh et al. 2008). At present, due to illegal hunting and vast forest loss, Gaur remains only in 27 areas in 15 provinces, mostly in Tay Nguyen Highland and eastern provinces of South Vietnam. The gaur is expatriated from Northwestern Vietnam and some provinces in Southern Central Vietnam. Nguyen Manh Ha (2008) estimated only 59 groups of Gaurs totaling at 344 individuals remained in Vietnam. The Gaur is enlisted in Red Data Book of Vietnam (MoST and VAST, 2007) at Endangered (EN), enlisted in the Group IB of Government Decree No.32/2006/NĐ-CP and the Annex 1 (National list of endangered, rare and precious species of conservation priority) of Government Decree No.160/2013/NĐ-CP.

6) Large-antlered Muntjak *Muntiacus vuquangensis*

Large-antlered Muntjak was first discovered in 1994 based on specimens from Vu Quang District, Ha Tinh Province. Later investigation found that the species distributed along Annamite Range in Vietnam, Laos and small part of Cambodia. The extensive wildlife hunting and vast forest deforestation during recent decades has led Large-antlered Muntjak to brink of extinction (Timmins et al. 2016a). The 2018 IUCN Red List has enlisted Large-antlered Muntjak at category Critical Endangered (CR).

In Vietnam, Large-antlered Muntjak was found along Annamite Range from Thanh Hoa Province in the North to Lam Dong and Ninh Thuan Provinces in the South. Due to extensive hunting pressure and vast deforestation during recent decades, the population of Large-antlered Muntjak in Vietnam has been significantly reduced in number. Large-antlered Muntjak is now enlisted in Red Data Book of Vietnam (MoST and VAST, 2007) at Vulnerable (VU), enlisted in the Group IB of Government Decree No.32/2006/NĐ-CP and the Annex 1 (National list of endangered, rare and precious species of conservation priority) of Government Decree No.160/2013/NĐ-CP.

7) Saola *Pseudoryx nghetinhensis*

Saola was first discovered in 1993 based on specimens from Huong Son District, Ha Tinh Province. The discovery of Saola is considered one of the three most significant zoological discoveries of the last century (Shuker 2012). Saola is distributed along Annamite Range in Vietnam and Laos (Timmins et al. 2008b). Saola is recognized as a symbol of unique biodiversity of Global Ecoregion Annamite Range (Baltzer et al. 2001). Saola has naturally very low density in the wild and is consistently facing high hunting pressure. The number of Saola was estimated only 250 individuals in 2008 and its populations continue to be decreased (Timmins et al. 2008b). The 2018 IUCN Red List has enlisted Saola at category Critical Endangered (CR).

In Vietnam, the studies has identified Saola existing in 50 communes of 20 districts and 6 provinces. Distribution range of Saola ranging from Que Phong District, Nghe An Province in the North to Tay Giang District, Quang Nam Province in the South. In 2007, it was estimated totally global population of Saola only 120 -160 individuals. They live in small groups (mostly less than 10 individuals) and all groups are facing high pressure of illegal hunting and habitat loss (Nguyen Xuan Dang 2007). Saola is enlisted in Red Data Book of Vietnam

(MoST and VAST, 2007) at Endangered (EN), enlisted in the Group IB of Government Decree No.32/2006/NĐ-CP and the Annex 1 (National list of endangered, rare and precious species of conservation priority) of Government Decree No.160/2013/NĐ-CP.

II. GENERAL INFORMATION OF THE PROJECT

2.1 Project name

Status assessment survey on some important large mammal species in Phong Nha - Ke Bang National Park, Quang Binh Province

2.2 Project aim

This study aims to have sound scientific data on 7 important large mammal species in PNKB NP for Quang Binh Provincial People Committee and Ministry of Culture, Sport and Tourism to prepare a report to the World Heritage Centre (as requested by World Heritage Committee under Decision WHC/17/41.COM/7B) as well as for development of the short-term and long-term management strategies to conserve the large and also other mammal species in PNKB NP.

2.3 Target species

The target species of this study are Tiger (*Panthera tigris*), Asiatic Black Bear (*Ursus thibetanus*), Dhole (*Cuon alpinus*), Asian Elephant (*Elephas maximus*), Gaur (*Bos frontalis*), Large-antlered Muntjak (*Muntiacus vuquangensis*) and Sao la (*Pseudoryx nghetinhensis*).

2.4 Study Scope

This study is confined to core zone of PNKB NP and some adjacent areas in Bo Trach, Minh Hoa and Quang Ninh Districts of Quang Binh Province.

2.5 Research content

- Field survey to identify existence of the 7 important large mammal species in PNKBNP
- Assessing the trend of abundance and distribution range of the 7 important large mammal species in PNKBNP
- Identifying threats to the 7 important large mammal species in PNKBNP
- Developing management measures for protection of the 7 important large mammal species in PNKBNP

2.6 Project duration: May to November 2018

2.7 Project budget:

Total project budget is 943,850,000 VND (Nine hundred forty three million eight hundred fifty thousand VND) from provincial budget sources of Quang Binh Province in 2018.

2.8 List of project implementators

There are 14 persons implementing this project including 2 scientists from university and research Institute (table 1).

Table 1. List of project implementators

No.	Name	Positions	Employment
-----	------	-----------	------------

1.	Dinh Huy Tri	Deputy Director	PNKB NP
2.	Bui Ngoc Thanh	Deputy Head	Science and International Relationship Department, PNKB NP
3.	Nguyen Xuan Dang	Associate Professor, Ph.D.	Institute of Ecology and Biological Resources, Hanoi
4.	Nguyen Hai Ha	Ph.D.	Vietnam Forestry University, Hanoi
5.	Dang Ngoc Kien	Technical staff	Centre for Rescue, Conservation and Creature, PNKB NP
6.	Nguyen Tran Quynh	Forest ranger	Hoa Son Ranger Station, PNKB NP
7.	Ha Tien Dung	Forest ranger	Thuong Trach Ranger Station, PNKB NP
8.	Phan Van Luc	Forest ranger	Km40 Ranger Station, PNKB NP
9.	Forest ranger, Km40 Ranger Station	Forest ranger	Km37 Ranger Station, PNKB NP
10.	Tran Minh Hieu	Forest ranger	Km6 Ranger Station, PNKB NP
11.	Nguyen Xuan Bach	Forest ranger	Tro Muong Ranger Station, PNKB NP
12.	Truong Cong Phuoc	Forest ranger	Khe Gat Ranger Station, PNKB NP
13.	Nguyen Van Thanh	Forest ranger	U Bo Ranger Station, PNKB NP

III. PROJECT DURATION, STUDY SITE AND METHODS

3.1 Project duration

Project duration lasted from May to November 2018. The field study was conducted from June to November 2018

3.2 Project site

The study was conducted within core zone of PNKB NP and some adjacent areas (buffer zone) in Bo Trach, Minh Hoa and Quang Ninh Districts of Quang Binh Province.

3.3 Study methods

All 7 target species have a low and very abundance in PNKB NP, this makes it very difficult to collect field data on their population status. Therefore, in this study, following study methods were used to obtain the data.

3.3.1 Questionnaire survey

The questionnaire form was designed simple, easy understandable to local villagers and with the colour pictures of 7 target species printed on back page of the form (figure 1). Totally, 750 questionnaire copies were distributed to 11 Forest Ranger Stations and the Mobile forest ranger team No.2 of PNKB NP. The forest rangers filled the questionnaire forms by their own information/data (if they have) or they interviewed local villagers to get the information/data to fill the forms. Results obtained from questionnaire survey provides the first information/data about the status of the target species and help us to design plan of other method application.

PHIẾU ĐIỀU TRA THÔNG TIN VỀ 7 LOÀI THÚ LỚN QUAN TRỌNG

Người cung cấp thông tin: Dân tộc: Tuổi: Nghề nghiệp:

Địa chỉ:ĐT:

Người thực hiện điều tra: Ngày thực hiện điều tra:/...../2018

Các loài cần điều tra: 1) hổ, 2) saola, 3) chó sói, 4) gấu ngựa, 5) mang lớn, 6) voi, 7) bò tót (xem hình ảnh các loài ở trang cuối)

Thứ tự	Tên loài	Hình thức bắt gặp (nhìn thấy động vật, vết chân, phân, vết cào,...)	Thời gian (ngày/tháng/năm)	Số lượng cá thể	Địa điểm gặp (thôn, xã, tiểu khu, khu rừng,...)	Họ tên người khác cùng biết (tối đa 3 người)

(Frontpage)

ẢNH NHẬN DẠNG 7 LOÀI THÚ LỚN QUAN TRỌNG Ở VQG PHONG NHA - QUẢNG BÌNH



Hổ



Bò tót



Chó sói



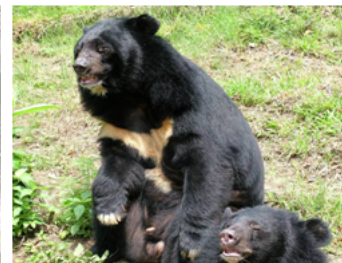
Voi châu Á



Mang lớn



Saola



Gấu ngựa

(Backpage)

Figure 1. Sample of Questionnaire form used for investigation of the 7 target species

3.3.2 Direct semi-structural interview of local villagers

Based on analysis of filled questionnaire forms, we compiled a list of informants that provided valuable information/data, and also identified possible mistakable information /data due to wrong species identification (for example, mistaking Large-antlered Muntjak by Common Muntjak, Tiger by Leopard, Saola by Serow, etc.). Then we conducted direct interview the informants to correct the information/data and get more detailed information about the target species. Totally, 102 informants from 12 villages in Hoa Son, Thuong Hoa, Thuong Trach and Son Trach communes were interviewed (Annex 1).

3.3.3 Transect survey

The selection of areas for transect survey was based on results of questionnaire survey, direct interview local villagers and experience of forest rangers of PNKB NP in each stations. The survey transects are old trails and forest patrolling routes of the forest rangers with some side

not be checked for whole survey duration because human presence at the camera trapping site might prevent animals from visiting this area. At each survey sites, the camera-trapping duration was from 15 - 30 days depending of the site conditions. The used camera traps are of Bushnell and Terra 8 trade marks made in China. There are 12 camera-trapping sites including Ma Rinh, Dai A - Dai Cao, Doong - Hang En- Ha Cong Vien, Doong - Km40, Khe Van, old Forest ranger station Km37, Habada, Rao Con, Cay Truong - Cop Bo Binh, Hung Nha, Hung Lau - Gieng Vooc, Hung Xuong - Khe Gat - Ca Can. At each site, 10 - 18 camera traps were put for duration of 25-30 days. Total active time of the camera trapping is 4, 860 hours.



Figure 3. Putting up the camera traps

IV. STUDY RESULTS

4.1 Current status of 7 important large mammal species in PNKB NP

4.1.1 Tiger *Panthera tigris*

- *Conservation status*: IUCN Red List (2018): EN - endangered; Red Data Book of Vietnam (2007): CR- critically endangered; Decree 32/2006/NĐ-CP: Group IB, Decree 160/2013/NĐ-CP: Annex I
- *Population status and distribution areas in PNKB NP*

The existence of Tiger in PNKB NP area was recorded by previous studies through observation of Tiger footprints in forests (Le Xuan Canh et al. 1997, Nguyen Xuan Dang et al. 1998, Do Tuoc et al. 1999) or interviewing local residents (WWF Indochina -VRTC 1999). The localities of previous records of Tiger are Ca Roong village, Co Do village (near Vietnam-Laos border), Road No. 20 (from km 24 to km 27), Co Khu area, Rao Thuong valley, stream in North entrance of Hang En Cave. The Tiger was also recorded in Truong Son State Enterprise in southern buffer zone of PNKB NP (Do Tuoc et al. 1999). It is extremely difficult to obtain direct sighting of Tiger in the wild because Tiger is very sensitive to human encroachment. Actually, so far, there has no survey teams observing the Tiger in the wild in PNKB NP. The camera trapping survey conducted in PNKB NP from May to September 2012 could obtain 1,590 images of 17 mammal species, but no image of Tiger was obtained (Nguyen Manh Ha et al. 2012).

In this study (2018), the results of the questionnaire survey show that during recent 6 years (2013-2018) there are 20 cases of Tiger records at 13 sites within buffer zone and core zone of PNKB NP, of which there are 3 cases of direct Tiger sighting in forest (table 2). Every year, there was 2 -4 cases of tiger records

Table 2. The cases of Tiger records from questionnaire survey

Date	Information	No. individual	Locality	Name and address of informants
2013	Footprints	1	Ba Sap area	Nguyen Van Cuong, Chay Lap Village, Phuc Trach Com., Bo Trach District
2013	Footprints, vocalization	1	Ma Rinh Moi area	Dinh Minh Luc, Hoa Luong Village, Hoa Son Com., Minh

				Hoa District
2013	Footprints	1	Ma Rinh area	Cao Tien Chi, Hoa Luong Village, Hoa Son Com., Minh Hoa District
2014	Sighting	1	Ma Rinh area	Dinh Vu Tuan, Dang Hoa Village, Hoa Son Com., Minh Hoa District
2014	Sighting	1	Hung valley	Le Xuan Hieu, Village 3, Xuan Trach Com., Bo Trach District.
2015	Footprints	1	Cop Thanh area close to Vietnam - Lao border	Nguyen Van Hoan, Village 3, Xuan Trach Com., Bo Trach District.
2015	Footprints	1	Ba Sao area close to Vietnam -Lao border	Truong Van Thanh, Bai Dinh Village, Dan Hoa Com., Minh Hoa District
2015	Footprints	1	Lo O stream near Zin Zin village, Truong Son Com.	HoVan Son, But Village, Thuong Trach Com., Bo Trach District.
2015	Footprints	1	Nam Giang mountain, near Zin Zin village, Truong Son Com.	Ho Van Giang, Zin Zin Village, Truong Son Com., Quang Ninh District.
2015	Footprints	1	Nam Giang mountain, near Zin Zin village, Truong Son Com.	Ho Van Quang, Zin Zin Village, Truong Son Com., Quang Ninh District.
2016	Footprint, Vocalization	1	Ma Rinh Moi area	Dinh Xuan Nhi, Thuan Hoa Village, Hoa Son Com., Minh Hoa District
2016	Footprint	1	Near Doong Village, Tan Trach Com.	Nguyen Soai Trac, Doong Village , Tan Trach Com., Bo Trach District
2016	Sighting	1	Ba Sap, Gieng Hanh	Nguyen Van Binh, Chay Lap Village, Phuc Trach Com., Bo Trach District
2017	Footprint	1	Near Doong Village, Tan Trach Com.	Ho Thi Vai, Doong Village , Tan Trach Com., Bo Trach District
2017	Footprint	1	Near Doong Village, Tan Trach Com.	Ho Thi Thu, Doong Village , Tan Trach Com., Bo Trach District
2017	Footprint	1	Hung Giang valley (Ma Xang mountain)	Dinh Xuan Duc, Tang Hoa Village, Hoa Son Com., Minh Hoa District
2017	Footprint	1	Near post 535 in Vietnam-Lao border	Cao Van Hien, Mo O O Village, Thuong Hoa Com., Minh Hoa District
2017	Sighting	1	Hung Ma Nghi valley	Cao Thanh Xuan, Mo O O Village, Thuong Hoa Com., Minh Hoa District
1/2018	Footprints, Vocalization	1	Ka Xach area	Cao Xuan Van, On Village, Thuong Hoa Com., Minh Hoa

				District
3/2018	Footprint	1	Da Noi - Lan Ha area	Dinh Xuan Duc, Tang Hoa Village, Hoa Son Com., Minh Hoa District

Direct interview of selected informants obtains following additional information:

- In 2015, Mr. Cao Xuan Huong (Tang Hoa Village, Hoa Son Com.), while staying in his camp in Lan Ha mountain (Hoa Son Commune) sighted a adult tiger crossing nearby his camp.
- In March 2017, Mr. Dinh Xuan Duc from Tang Hoa Village, Hoa Son Com., found a Tiger track (many footprints) in Hung Giang valley (Ma Xang mountain, Hoa Son Com.), the footprints have a size of about 20 cm wide.
- In October 2017, Mrs. Ho Thi Vai, HoThi Thu and Hoang Thi Tim (Doong Village, Tan Trach Com.) observed a Tiger track near the Ban Doong stream, the footprints has a size of about 20 cm wide. Residents from Doong village reported that the Tiger came to this area almost every 1-2 years, once the Tiger even caught the cows of Doong Village.
- In December 12/2017, Mr. Cao Xuan Tung and Mr Cao Xuan Duong (On Village, Thuong Hoa Com.) while working in forest in Ka Xach area (Thuong Hoa Com.) saw a Tiger catching a monkey.
- In March 2018, Mrs. Cao Quan (Hoa Luong Village, Hoa Son Com.) saw a Tiger track in Lan Ha mountain (Hoa Son Com.), the size of the footprints is about 20 cm wide.
- In July 2018, Mr. Ho Xoong and Mr. Ho Thiet (Ploang Village, Truong Son Com.) observed the Tiger footprints (about 20 cm wide) and heard the Tiger call in Xa Bien area (forest compartment 283 in core zone of PNKB NP). Many residents from Ploang Village (Truong Son Com.) also reported to hear the Tiger call in Xa Bien - Nui Nam Giang area (Compartments 283-285 in PNKB NP) during 2016-2017.

Transect survey and camera trapping survey has not obtained more information about Tiger in PNKB NP, this indicates the Tiger is very rare in PNKB NP.

Final note: Although transect survey and camera trapping survey have not yet obtained information/data on Tiger existence in PNKB NP, however, results of questionnaire and direct interview survey indicates that there is a small number of Tiger surviving in PNKB NP area. During period from 2015 - 2018, the Tiger existence was recorded in 12 sites including Ba Sao (Dan Hoa Com.), Ma Rinh Moi (Hoa Son Com.), Hung Giang (Hoa Son Com.), Post No. 535 of Vietnam-Lao Border (Thuong Hoa Com.), Hung Ma Nghi (Thuong Hoa Com.), Ka Xach (Thuong Hoa Com.), Da Nui - Lan Ha (Thuong Hoa Com.), Ba Sap (Phuc Trach Commune), Cop Thanh (Xuan Trach Commune), Near Doong Village area (Tan Trach Com.), Xu Bien - Nam Giang Mountain (Truong Son Com.) (figure 4). It is worth to note that the forest habitat in PNKB NP is connected with those in Hin Nam No National Biodiversity Conservation Area (NBCA) and Nakai -Nam Theun NBCA in Laos, therefore, the Tiger may move between these areas and thus Tiger conservation require a close collaboration of the 2 countries.

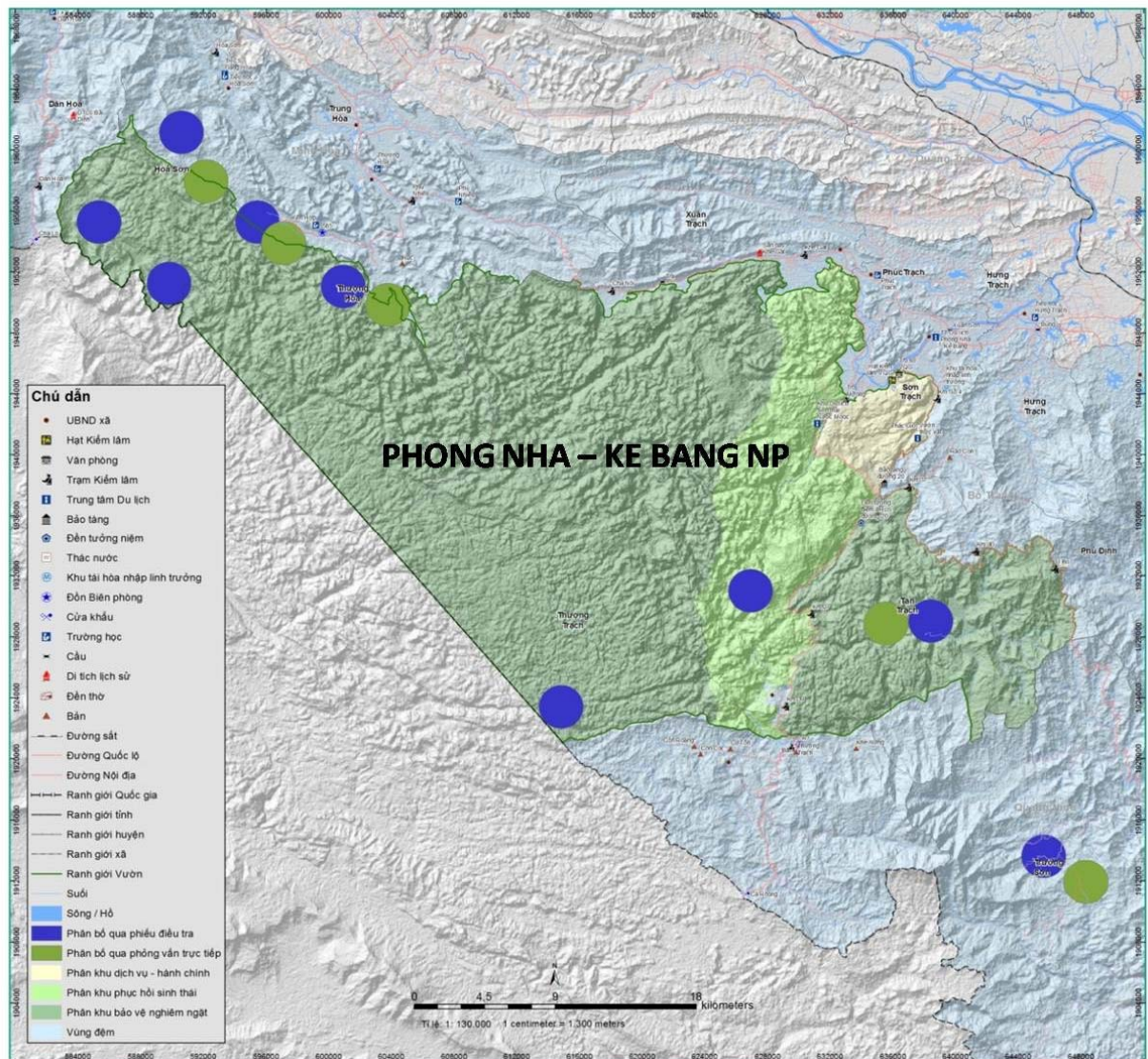


Figure 4. The sites of Tiger records during period 2015 -2018
(Blue cycle: records from questionnaire survey, Green cycle: records from direct interview)

4.1.2 Asiatic Black Bear *Ursus thibetanus*

- **Conservation status:** IUCN Red List (2018): VU - Vulnerable; Red Data Book of Vietnam (2007): EN - endangered; Decree 32/2006/NĐ-CP: Group IB, Decree 160/2013/NĐ-CP: Annex I
- **Population status and distribution areas in PNKB NP**

The existence of Asiatic Black Bear in PNKB NP was recorded by precious surveys through observation of the species footprints/ scratches on trees and specimens caught by local hunters (Le Xuan Canh et al. 1997, Nguyen Xuan Dang et al. 1998, Do Tuoc et al. 1999, Timmins et al. 1999) or through interviewing local residents (WWF Indochina -VRTC 1999). Forest Protection Department of PNKB NP also confiscated several dead and living specimens of Asiatic Black Bear caught by local hunters in core zone and buffer zone of PNKB NP. The sites of the Bear records were Ba Giang Valley, Stream in North entrance of Hang En Cave, Thuong Doong stream, Stream 24 and Co Khu area. Like the Tiger, it is very difficult to obtain direct sighting of Asiatic Black Bear in wild. There was no survey teams sighting the Bear in wild in PNKB NP. The camera trapping survey in 2012 in PNKB NP did not obtain any image of the Bear (Nguyen Manh Ha et al. 2012).

In this study (2018), results of questionnaire survey show that during 5 recent years (2014-2018) there are 51 cases of the Bear existence records and 35 sites in buffer zone and core zone of PNKB NP, of which 14 cases of the Bear direct sighting in the forest (Table 3). From 2014 to 2018, there are 8 - 25 Bear records every year.

Table 3. Cases of Asiatic Black Bear records from questionnaire survey

Date	Information	No. animals	Locality	Name and address of informants
2014	Foot scratches on tree	1	Ma Rinh	Phan Van Chien, Dang Hoa Village, Hoa Son Com. Minh Hoa District
2014	Bear sighting	1	Duong Cau	Cao Van Minh, Nang Luong Village, Hoa Son Com. Minh Hoa District
2014	Foot scratches on tree	1	Near Vietnam-Laos border	Cao Tien Que, Bai Dinh Village, Dan Hoa Com., Minh Hoa District
2014	Foot scratches on tree	1	Hung Dang valley	Nguyen Van Hoan, Village 3, Xuan Trach Com., Bo Trach District
2014	Footprints on ground	1	Khe Che stream in Hung Hung valley	Le Xuan Hien, Village 3, Xuan Trach Com., Bo Trach District
2014	Scratches on tree	1	Nam Giang mountain near Zin Zin Village, Truong Son Com.	Ho Cam Son, But Village, Thuong Trach Com., Bo Trach District
2014	Bear sighting	1	Area near the Km 46 close to Doong Village	Ho Van Kien, Rao Con Village, Son Trach Com., Bo Trach District
2014	Foot scratches on tree and excrements	1-4	Nuoc la vang stream	Nguyen Van Cuong, Chay Lap Village, Phuc Trach Com., Bo Trach District
2015	Bear sighting	2	Yellow- Leaf stream	Nguyen Tam, Chay Lap Village, Phuc Trach Com., Bo Trach District
2015	Foot scratches on tree	2	Hung Dang Valley	Le Van Dung, Village 1, Xuan Trach Com., Bo Trach District
2015	Foot scratches on tree	1	Vung Dau	Nguyen Van Ha, Village 2, Xuan Trach Com., Bo Trach District
2015	Foot scratches on tree	1	Binh Cau	Nguyen Ngoc Thach, Village 3, Xuan Trach Com., Bo Trach District
2015	Foot scratches on tree	1	Bo Ro	Dinh Minh Do, Tang Hoa Village, Hoa Son Com., Minh Hoa District
2015	Bear sighting	1	Area adjacent to Dan Hoa Commune	Cao Bach Duyet, Hoa Luong Village, Hoa Son Com., Minh Hoa District
2015	Sighting bear breaking the tree branches	1	Ba Sao area near Vietnam-Laos border	Truong Van Thanh, Bai Dinh Village, Dan Hoa Com., Minh Hoa District

2016	Bear sighting	1	Hung Roi valley	Hoang Quyet Thang, Village 4, Xuan Trach Com., Bo Trach District
2016	Bear sighting	1	Duong Cau	Cao Tien Chi, Luong Nang Village, Hoa Son Com., Minh Hoa District
2016	Foot scratches on tree	1	Ma Rinh	Dinh Minh Phuong, Thuan Hoa Village, Hoa Son Com., Minh Hoa District
2016	Foot scratches on tree	1	Ka Xai	Dinh Xuan Phuong, Cha Lo Village, Dan Hoa Com., Minh Hoa District
2016	Foot scratches on tree	1	Ka Xai	Cao Tien Cong, Cha Lo Village, Dan Hoa Com., Minh Hoa District
2016	Foot scratches on tree	1	Ka Xai	Ho Phuong, Cha Lo Village, Dan Hoa Com., Minh Hoa District
2016	Foot scratches on tree	1	Ka Xai	Ho Hien, Cha Lo Village, Dan Hoa Com., Minh Hoa District
2016	Foot scratches on tree	1	Ka Xai	Dinh Son Ha, Cha Lo Village, Dan Hoa Com., Minh Hoa District
2016	Foot scratches on tree	1	Ka Xai	Ho Don, Cha Lo Village, Dan Hoa Com., Minh Hoa District
2016	Foot scratches on tree	1	Duong Cau mountain	Cao Xuan Thu, Luong Nang Village, Hoa Son Com., Minh Hoa District
2016	Foot scratches on tree	1	Ka Xai	Ho Ca, Cha Lo Village, Dan Hoa Com., Minh Hoa District
2016	Foot scratches on tree	1	Ka Xai	Ho Thong, Cha Lo Village, Dan Hoa Com., Minh Hoa District
2016	Foot scratches on tree	1	Ka Xai	Dinh Trong Luc, Bai Dinh Village, Dan Hoa Com., Minh Hoa District
2016	Foot scratches on tree	1	Hung Dang valley, Ca Tot valley	Nguyen Huu Manh, Village 3, Xuan Trach Com., Bo Trach District
2016	Bear sighting	1	Nam Giang mountain near Zin Zin Village, Truong Son Com.	Ho Van Giang, Ploang Village, Truong Son Com., Quang Ninh District
2016	Sighting a female and baby	2	Nam Giang mountain near Zin Zin Village, Truong Son Com.	Ho Van Quang, Ploang Village, Truong Son Com., Quang Ninh District
2016	Foot scratches on tree	1	Khe Bun area near Doong Village	Nguyen Van Chieu, Doong village, Tan Trach Com., Bo Trach District
2016	Foot scratches on tree	1	Bo stream, compartment 232	Ho Van Kien, Rao Con Village, Son Trach Com., Bo Trach District

2017	Foot scratches on tree	1	Ca Tot valley, Cha Noi area	Le Xuan Dang, Village 2, Xuan Trach Com., Bo Trach District
2017	Foot scratches on tree	2	Cau Toa	Do Anh Son, Village 3, Xuan Trach Com., Bo Trach District
2017	Bear sighting	2	Ba Sap	Nguyen Van Lam, Village 4, Xuan Trach Com., Bo Trach District
2017	Foot scratches on tree	2	Cau Tra	Nguyen Huu Manh, Village 3, Xuan Trach Com., Bo Trach District
2017	Foot scratches on tree	1	Hung Trong Valley	Nguyen Van Hoan, Village 2, Xuan Trach Com., Bo Trach District
2017	Foot scratches on tree	1	Compartment 567, Ma Rin	Nguyen Thanh Hoa, Tang Hoa Village, Hoa Son Com., Minh Hoa District
2017	Foot scratches on tree	1	Duong Cau Mountain	Cao Minh Chien, Luong Nang Village, Hoa Son Com., Minh Hoa District
2017	Foot scratches on tree	1	Ma Rin	Dinh Thanh Hoa, Thuan Hoa Village, Hoa Son Com., Minh Hoa District
2017	Foot scratches on tree	1	Duong Cau Mountain	Cao Van Hien, Hoa Luong Village, Hoa Son Com., Minh Hoa District
2017	Foot scratches on tree	1	Ma Rin	Dinh Xuan Hau, Dang Hoa Village, Hoa Son Com., Minh Hoa District
2017	Foot scratches on tree	1	Ka Xai	Ho Don, Cha Lo Village, Dan Hoa Com., Minh Hoa District
2017	Foot scratches on tree	1	Ka Xai	Ho Ca, Cha Lo Village, Dan Hoa Com., Minh Hoa District
2017	Foot scratches on tree	1	Ka Xai	Ho Thong, Cha Lo Village, Dan Hoa Com., Minh Hoa District
2017	Foot scratches on tree	1	Ba Sao area close to Vietnam-Laos border	Cao Thuy, Bai Dinh Village, Dan Hoa Com., Minh Hoa District
2017	Sighting Bear eating young rattan	1	Bear Post 535 of Vietnam - Laos border	Cao Xuan Hien, Mo O O Village, Thuong Hoa Com., Minh Hoa District
2017	Footprints	1	Hung Chuong Valley	Cao Xuan Manh, Yen Hop Village, Thuong Hoa Com., Minh Hoa District
2017	Foot prints	1	Hang Ong are on Da Lat 3 trail	Cao Thanh Xuan, Mo O O Village, Thuong Hoa Com., Minh Hoa District
2017	Bear sighting	1	Duong Dom area Close Mr Luat crop field	Tran Xuan Vinh, On Village, Thuong Hoa Com., Minh Hoa District
2017	Footprints on stream	1	Ma Nghi area	Dinh Xuan Bang, Yen Hop Village, Thuong Hoa Com., Minh Hoa District

2017	Foot scratches on tree	1	Phu Ninh Village forest	Cao Quy Nong, Phu Minh Village, Thuong Hoa Com., Minh Hoa District
2017	Footprints	1	Khai stream in Cha Noi area	Do Anh Son, Village 3, Xuan Trach Com., Bo Trach District
2017	Foot scratches on tree	1	Ka Xach area	Nguyen Nam Dinh, Cha Noi Forest ranger Station
2017	Foot scratches on tree	1	Ba Giang area	Nguyen Van Trieu, Doong Village, Tan Trach Com., Bo Trach District
2017	Foot scratches on tree	2	Dua stream, Nuoc Vang stream	Nguyen Van Quan, Chay Lap Village, Phuc Trach Com., Bo Trach District
2017	Foot scratches on tree	1	Ma Rin area	Cao Quoc Huy, Thuan Hoa Village, Hoa Son Com., Minh Hoa District
3/2018	Foot scratches on tree	1	Chop Ngop mountain (Hoa Son Commune)	Cao Luan, Hoa Luong Village, Hoa Son Com., Minh Hoa District
5/2018	Bear sighting	1	Bo stream, compartment 232	Ho Van Quang, Rao Con Village, Son Trach Com., Bo Trach District
6/2018	Sighting bear eating young rattan	1	Mountain 31 near Doong Village	Ho Thi Vai, Doong Village, Tan Trach Com., Bo Trach District

Direct interview survey indicates that the information/data provided by villagers in the questionnaire are believable, there is no mis-identification of Asiatic Black Bear. However, the fact that only 3 records of the Bear in 2018 is un-normally low. This can be explained as following: most of Bear records were obtained by villagers when they in forest to search for bee honey. During recent years, PNKB NP conducts strict ban of bee honey collection in the Park, therefore, only few villagers continue encroach the PNKB NP for the bee honey, consequently, few records of the Bear in the Park were obtained. The most valuable information collected by direct interview survey is as following: During 2017-2018, Mrs Dinh Thi, Dinh Dai, Dinh Hiet (Ban Village, Thuong Trach Com., Bo Trach District) and Mr. Dinh Thung (Khe Lo Village, Thuong Trach Com., Bo Trach District) saw footprints of 1 and 2 Bear in Khe Thi area (Tan Trach Commune). Camera trapping survey did not obtain any image of the Bear, however, transect survey could observe some Bear foot scratches on trees in forest (table 4, figure 5) and an image very likely of Bear (poor image quality) was taken by camera trap in Dai Cao area.

Table 4. Sites of Bear foot scratches on trees found by transect survey

No.	Locality	VN2000 coordinates	Information
1.	Ma Rin area	0486392/1959638	Scratches of more than 3 months old
2.	Ma Rin area	0486035/1959037	Scratches of more than 3 months old
3.	Ma Rin area	0486004/1958975	Scratches of more than 3 months old
4.	Ma Rin area	0485568/1958572	Scratches of more than 3 months old

5.	Ma Rin area	0484832/1958319	Scratches of more than 3 months old
6.	Ma Rin area	0484862/1959400	Scratches of more than 3 months old
7.	Hung Dai area	0532115/1926258	New scratches of about 1 months old
8.	Hung Dai area	0532083/1925652	Scratches of more than 3 months old



Figure 5. Scratches of Bear on trees observed in Ma Rin and Hung Dai areas

Final note: Results of all questionnaire survey, direct interview survey and transect survey confirm existence of Asiatic Black Bear in PNKB NP. There is not enough data now to make reasonable estimate of the Bear number in PNKB NP, however, relatively high number of records obtained in this study indicates that Asiatic Black Bear remains relatively wide-spread in PBKB NP, but their abundance has been significantly reduced in comparison with those before year 2000 .

During period from 2015 - 2018, the existence evidence of the Bear were found in 33 sites including Ba Sao (Dan Hoa Com.), Ka Xai (Dan Hoa Com.), Ma Rin (Hoa Son Com.), Ma Rin Moi (Hoa Son Com.), Duong Cau (Hoa Son Com.), Chop Ngop Mountain (Hoa Son Com.), Bo Ro (Hoa Son Com.), Post 535 of Vietnam-Laos border (Thuong Hoa Com.), Hung Chuong Valley (Thuong Hoa Com.), Hang Ong area on Dalat 3 trail (Thuong Hoa Com.), Duong Dom (Thuong Hoa Com.), Ma Nghi (Thuong Hoa Com.), Hung Dang (Xuan Trach Com.), Cha Noi (Xuan Trach Com.), Cau Toa (Xuan Trach Com.), Ba Sap (Xuan Trach Com.), Cau Tra (Xuan Trach Com.), Hung Trong (Xuan Trach Com.), Khe Khai - Cha Noi (Xuan Trach Com.), Ka Xach (Xuan Trach Com.), Vung Dau (Xuan Trach Com.), Binh Cau (Xuan Trach Com.), Hung Roi (Xuan Trach Com.), Hang Ca Tot (Xuan Trach Com.), Trai Nuoc Vang (Phuc Trach Com.), Dua Stream - Nuoc Vang (Phuc Trach Com.), Bo stream, compartment 232 (Son Trach Com.), Bun stream near Doong Village (Tan Trach Com.), Ba Giang near Doong Village (Tan Trach Com.), Mountain 37 near Doong Village (Tan Trach Com.), Nam Giang Mountain (Truong Son Com.), Hung Dai valley (Tan Trach Com.), Khe Thi stream (Tan Trach Com.) (figure 6).

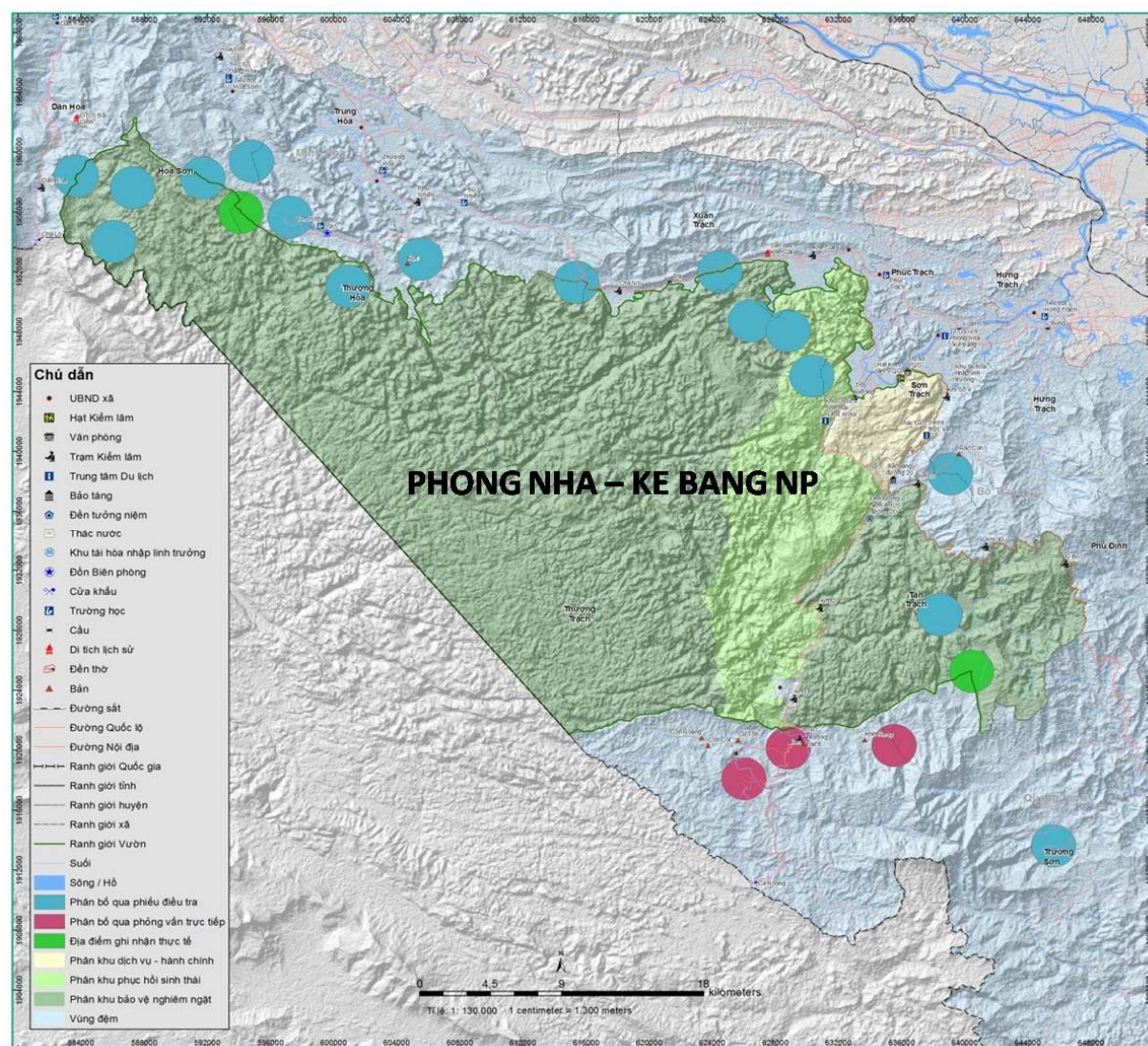


Figure 6. Sites of Asiatic Black Bear Records during 2015 -2018
(Blue cycle: records from questionnaire survey, Red cycle: records from direct interview, Green cycle: records from transect survey)

4.1.3 Dhole *Cuon alpinus*

- **Conservation status:** IUCN Red List (2018): EN - endangered; Red Data Book of Vietnam (2007): EN - endangered; Decree 32/2006/NĐ-CP: Group IB, Decree 160/2013/NĐ-CP: Annex I
- **Population status and distribution areas in PNKB NP**

Existence of Dhole in PNKB NP was recorded by previous studies through observation of the species footprints, excrements, hunted specimens and animals (Le Xuan Canh et al. 1997, Nguyen Xuan Dang et al. 1998, DoTuoc et al. 1999) or through interview information (WWF Indochina -VRTC 1999). The sites of previous records of Dhole are Road 20 (from km16 to km27), Co Khu area, Dai Cao area, So Dua stream, Ba Giang stream, Hung Lau valley, and parts of PNKB NP in Dan Hoa, Hoa Son and Thuong Hoa Communes. Camera trapping survey in 2012 did not record the image of Dhole in PNKB NP.

In this study (2018), very few information on Dhole was received. Questionnaire survey obtained only 8 cases of Dhole records in PNKB NP and majority of the records were in 2013, 2014 (table 5). In 2014, there is only 2 records, years 2016 and 2016 have only 1 record

each. There is no records in 2015 and 2018. This data clearly indicate very low density of Dhole in PNKB NP.

Table 5. Records of Dhole in PNKB NP

Date	Information	No. Animal	Locality	Name and address of informants
2013	Vocalization heard	1	Khe Trieng, Tan Trach Com. Bo Trach District	Nguyen Van Toa, Ploang Village, Truong Son Com., Quang Ninh District
2013	Vocalization heard	3	Nam Giang mountain near Zin Zin Village, Truong Son Com.	Ho Van Giang, Ploang Village, Truong Son Com., Quang Ninh District
2013	Vocalization heard	3	Nam Giang mountain near Zin Zin Village, Truong Son Com.	Ho Van Quang, Ploang Village, Truong Son Com., Quang Ninh District
2013	Sighting	1	Hung Nhang Valley near Thien Duong Cave	Ngo Phong, Phong Nha Village, Son Trach Com., Bo Trach District
2014	Footprints, excrements	1	Head of stream 12 near Zin Zin Village, Truong Son Com.	Ho Van Son, But Village, Thuong Trach Com. Bo Trach District
2014	Sighting	2	Khe Ro Near Ranger station 21	Nguyen Van Hoan, Village 2, Xuan Trach Com., Bo Trach District
2016	Sighting	4	Ba Tanh area	Nguyen Soai Trac, Doong Village, Tan Trach Com., Bo Trach District
2017	Sighting	2	Near Post 535 Vietnam-Laos border	Cao Xuan Hien, Mo O O Village, Thuong Hoa Com., Minh Hoa District

Direct interview survey could obtain following additional information/data:

- Many villagers from Dan Hoa, Hoa Son and Thuong Hoa Com. report that in the past 15 years, Dhole was often seen in Ma Rinh - Ma Rom area (Hoa Son Com.), however, now, they are very rarely seen in this area.
- In 2015, Mr Cao Quoc Huy from Thuan Hoa Village, Hoa Son Com. saw one individual of Dhole in Ma Rinh area.
- Many residents of Ploang Village (Truong Son Com.) report Dhole still occur in Pha Tha - Xa Bien area of PNKB NP (Tan Trach Com.), in the past the species was very often seen in this area.
- In 2015, Mr Dinh Trap (A Rem Village, Thuong Trach Com., Bo Trach District) when collecting bamboo shoots in forest saw one individual of Dhole in Khe Ri stream (Thuong Trach Com.)
- In December 2016, Mr. Ho Van Bong (Ploang Village) heard the vocalization of Dhole in Xa Bien Area (Truong Son Com.).

Transect survey and camera trapping survey did not obtain information/data on existence of Dhole in PNKB NP. According to many interviewees, the fact that there is so few records of Dhole in PNKB NP during recent years can be explained as following: 1) Abundance of

Dhole in PBKB NP has been significantly reduced due to illegal hunting and degradation of their prey stock; 2) Dholes has now moved to more remote areas of PNKB NP due to more human disturbance in their previous habitat areas.

Final note: Results of this study indicate that Dhole still survive in PNKB NP at very low density and in more remote areas of the Park. Dhole is nearly expatriated in some previous habitat areas such as Ba Giang, Co Khu, Dai Cao areas. During period from 2015 - 2018, existence of Dhole was recorded in 4 areas inside PNKB NP including Ba Tanh area (Tan Trach Com.), near Post 535 of Vietnam - Laos border and Pha Tha - Xa Bien area (Tan Trach Commune) (figure 7).

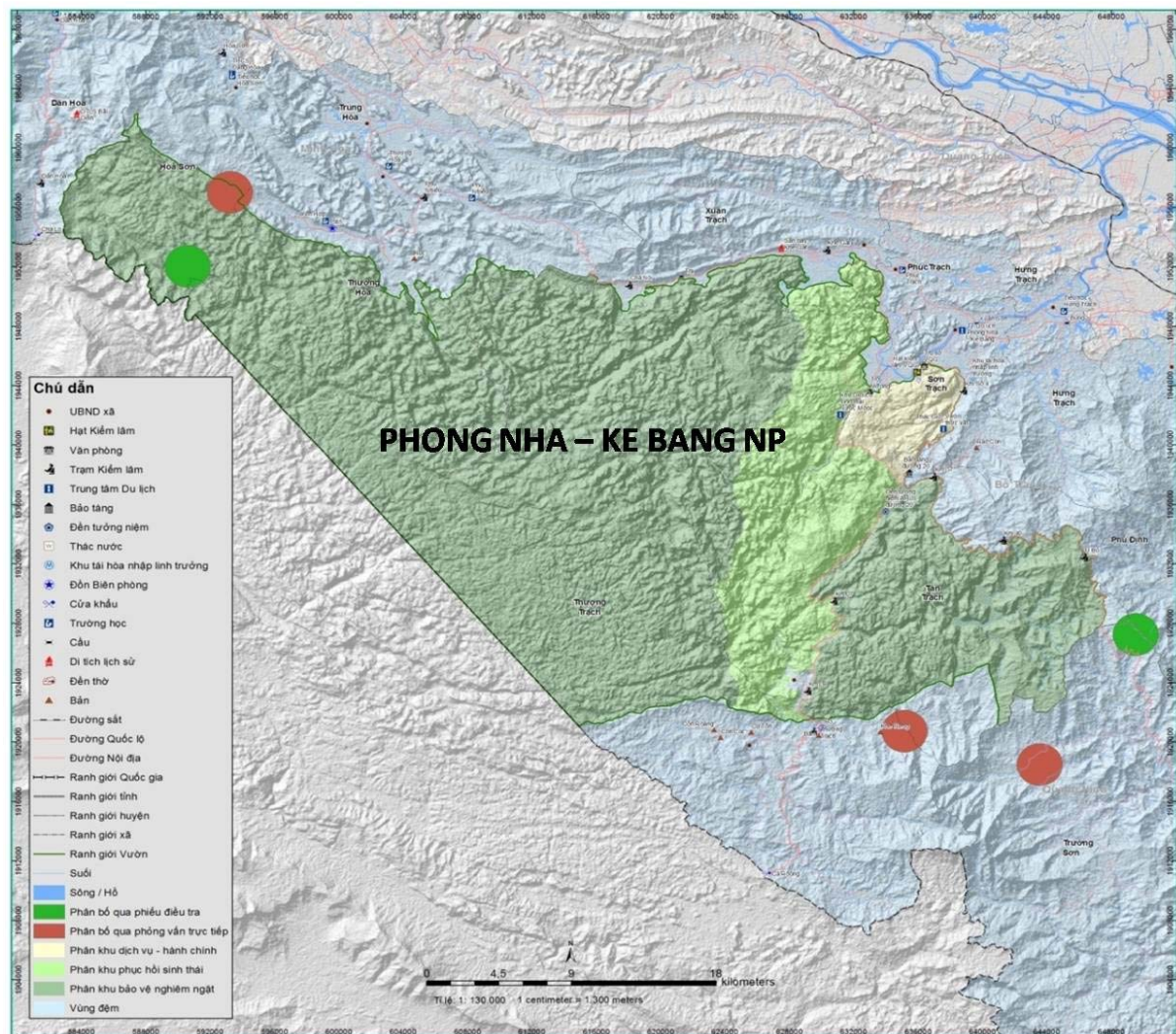


Figure 7. Sites of Dhole records during period 2015 -2018

(Green cycle: records from questionnaire survey;
Red cycle: records from direct interview survey)

4.1.4 Asian Elephant *Elephas maximus*

- *Conservation status:* IUCN Red List (2018): EN - endangered; Red Data Book of Vietnam (2007): CR - critically endangered; Decree 32/2006/NĐ-CP: Group IB, Decree 160/2013/NĐ-CP: Annex I
- *Population status and distribution areas in PNKB NP*

Previous studies report about small group of Asian Elephant lived in buffer zone of PNKB NP in Thuong Trach, Thuong Hoa and Trung Hoa Communes (Le Xuan Canh et al. 1997, Do Tuoc et al. 1998).

In this study (2018), no evidence of Asian Elephant existence is found in PNKB NP. Residents from Thuong Trach, Thuong Hoa and Trung Hoa Commune report that in the past, a group of 4-5 elephants often came for feeding in their land. The elephants stayed for about a month then crossed the Ho Chi Minh road and moved further to Tan Hoa Com. of Minh Hoa District and Cao Quang Com. of Tan Trach District, both theses communes are outside the buffer zone of PNKB NP (figure 7). Since 2016, the elephants have not come back.

Final note: It is very likely that the Elephant group has moved to live in other area far away from PNKB NP and would not return. Possibly, the ever-increasing traffic on Ho Chi Minh Road and other roads crossing Thuong Trach, Thuong Hoa and Trung Hoa Communes has prevented the Elephant Group return back to PNKB NP.

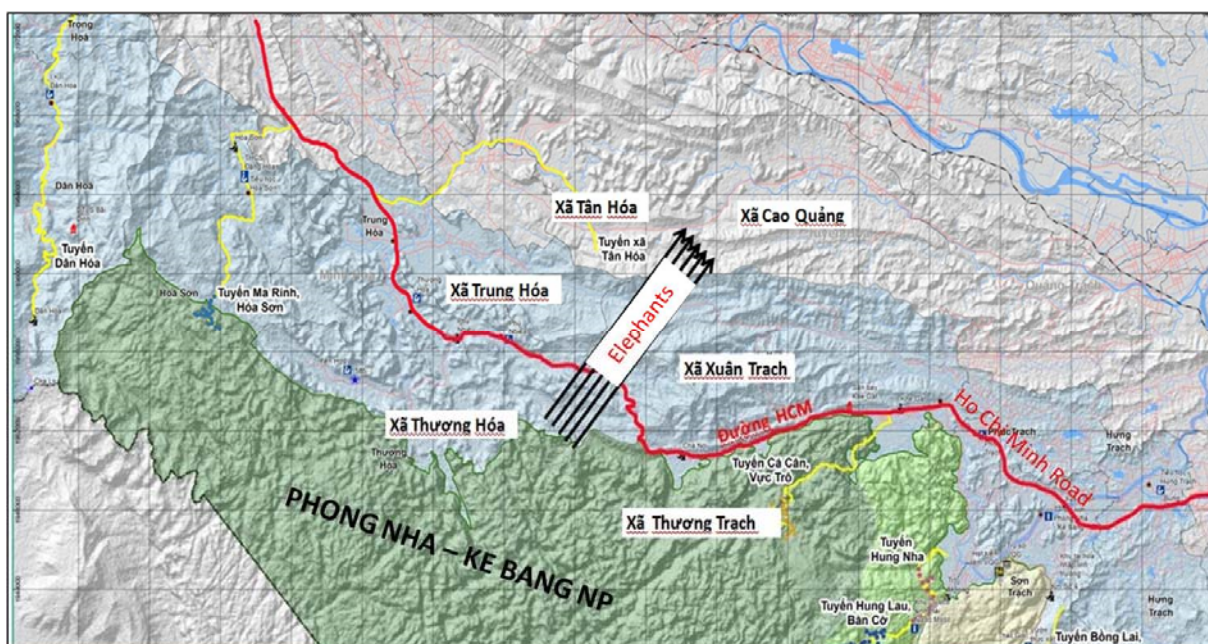


Figure 8. The movement route of Asian Elephant group outside PNKB NP

4.1.5 Gaur *Bos frontalis*

- *Conservation status:* IUCN Red List (2018): VU - vulnerable; Red Data Book of Vietnam (2007): EN - endangered; Decree 32/2006/NĐ-CP: Group IB, Decree 160/2013/NĐ-CP: Annex I
- *Population status and distribution areas in PNKB NP*

The existence of Gaur in PNKB NP area was reported in previous studies. Le Xuan Canh et al. (1997) based on interview information reported 2 Gaur groups lived in U Bo mountain and Len Tinh mountains. Do Tuoc et al. (1999) based on observation of Gaur tracks estimated 3 groups of Gaurs in PNKB NP including a group of 7-10 individuals in Rao Con area, a group of 4 individuals in U Bo mountain and a group of 10 individuals in Doc May area. WWF Indochina -VRTC (1999) reported existence of Gaur in PNKB but no location was identified. Meijboom et al. (2002) reported in July 2001 local residents saw a Gaur female and baby near Khuong Ha Village (Hung Trach Com.).

In this study (2018), questionnaire survey obtained 13 cases of Gaur records in core zone and buffer zone of PNKB NP during period from 2013 - 2018 (table 6).

Table 6. Records of Gaur in PNKB NP area from questionnaire survey

Date	Information	No. Animal	Locality	Name and address of Informants
2013	Gaur	4	May Slope, May	Cao Van Trieu, Zin Zin

	sighting		Village, Truong Son Com.	Village, Truong Son Com., Quang Ninh District
2013	Gaur sighting	9-10	May Slope, May Village, Truong Son Com.	Ho Van Giang, Zin Zin Village, Truong Son Com., Quang Ninh District
2013	Gaur sighting	6-7	Forest near Rao Con Village, Son Trach Com.	Ho Van Kien, Rao Con Village, Son Trach Com., Bo Trach District
2013	Tracks	5	Agricultural field of Ploang Village, Truong Son Com.	Ho Van Bong, Ploang Village, Truong Son Com., Quang Ninh District
2015	Gaur sighting	3	Forest near Rao Con Village, Son Trach Com.	Ho Nghiem, Rao Con Village, Son Trach Com., Bo Trach District
2015	Tracks	3	Tru and Trieng stream area, Phuc Trach Com.	Nguyen Van Binh, Chay Lap Village, Phuc Trach Com., Bo Trach District
2015	Gaur sighting	4	Tru and Trieng stream area, Phuc Trach Com.	Nguyen Van Tam, Chay Lap Village, Phuc Trach Com., Bo Trach District
2016	Gaur sighting	5-6	Forest near Rao Con Village, Son Trach Com.	Ho Van Duet, Rao Con Village, Son Trach Com., Bo Trach District
2017	Tracks	10-15	Rao May stream, Truong Son Com.	Nguyen Khac Dung, U Bo Forest Protection Post, Truong Son State Enterprise
2017	Gaur sighting	2	Forest near Rao Con Village, Son Trach Com.	Ho Thau, Rao Con Village, Son Trach Com., Bo Trach District
2017	Gaur sighting	5-6	Forest near Rao Con Village, Son Trach Com.	Ho Van Quyen, Rao Con Village, Son Trach Com., Bo Trach District

Direct interview survey obtains following additional information/data:

- In 2014, Mr. Dinh Dai and Mr. Dinh Lien (Ban Village, Thuong Trach Com., Bo Trach District) saw one Gaur in Khe Thi stream (Tan Trach Com.) in core zone of PNKB NP
- In 2015, Mr. Dinh May (Khe Lo Village, Thuong Trach Com., Bo Trach District) saw 2 Gaurs near Khe Thi - Ban Lo area (Tan Trach Com.).
- Mr Nguyen Van Tam and Mr Nguyen Van Binh (Chay Lap Village, Phuc Trach Com., Bo Trach District) reported a group of 4-5 Gaurs lived in Khe Tru - Khe Trap area (Phuc Trach Com.) in core zone of PNKB NP. In 2015, he saw 3 individuals and other time he saw 4 individuals. Since 2016, he has not come to this area, however, local resident reported continue to see the Gaur tracks in this area.
- In April 2018, Mr. Cao Tie Khue (Bai Dinh Village, Dan Hoa Com.) saw many tracks of Gaur (about 5-6 individuals) on summit of Giang Man Mountain in Vietnam-Laos border. This group frequents between Vietnamese Giang Man Mountain and Nakai - Nam Theun NBCA of Laos
- In September 2018, Mr. Ho Van Kien, Mr. Ho Thau and some villagers from Rao Con Village saw a group of 7-10 Gaurs foraging in a mountain near Rao Con Village just in

boundary between PNKB NP and Bong Lai State Enterprise. This group often frequents between PBKB NP and Bong Lai State Enterprise

Transect survey found the tracks, excrements, resting site of a group of 7-10 Gaurs in a mountain near Rao Con Village (Son Trach Com.) and camera trap put up in this area obtained 3 images of one Gaur (figure 9).



Figure 9. Image of Gaur taken by camera trap in Rao Con area on 29 October 2018

Final note: Results of this survey show that there is 3 groups of about 13-17 Gaurs living in buffer zone and core zone of PNKB NP (the animals frequent between buffer zone and core zone). A group of 7-10 individuals lives in mountain near Rao Con village (Tan Trach Com.), the second group of 4-5 individuals lives in Khe Tru - Khe Trieng area (Phuc Trach Com.) and the third group of 2 individuals lives in Khe Thi area (Thuong Trach Com.). Except for this, 2 other groups of Gaur also recorded : one groups of 5-6 individuals lives in Giang Man mountain and another group of 11-15 individuals lives in Rao May - Doc May area (Truong Son Com.), however, these area is outside buffer zone of PNKB NP and these Gaur groups have now communication with other Gaur groups in PNKB NP (figure 10)

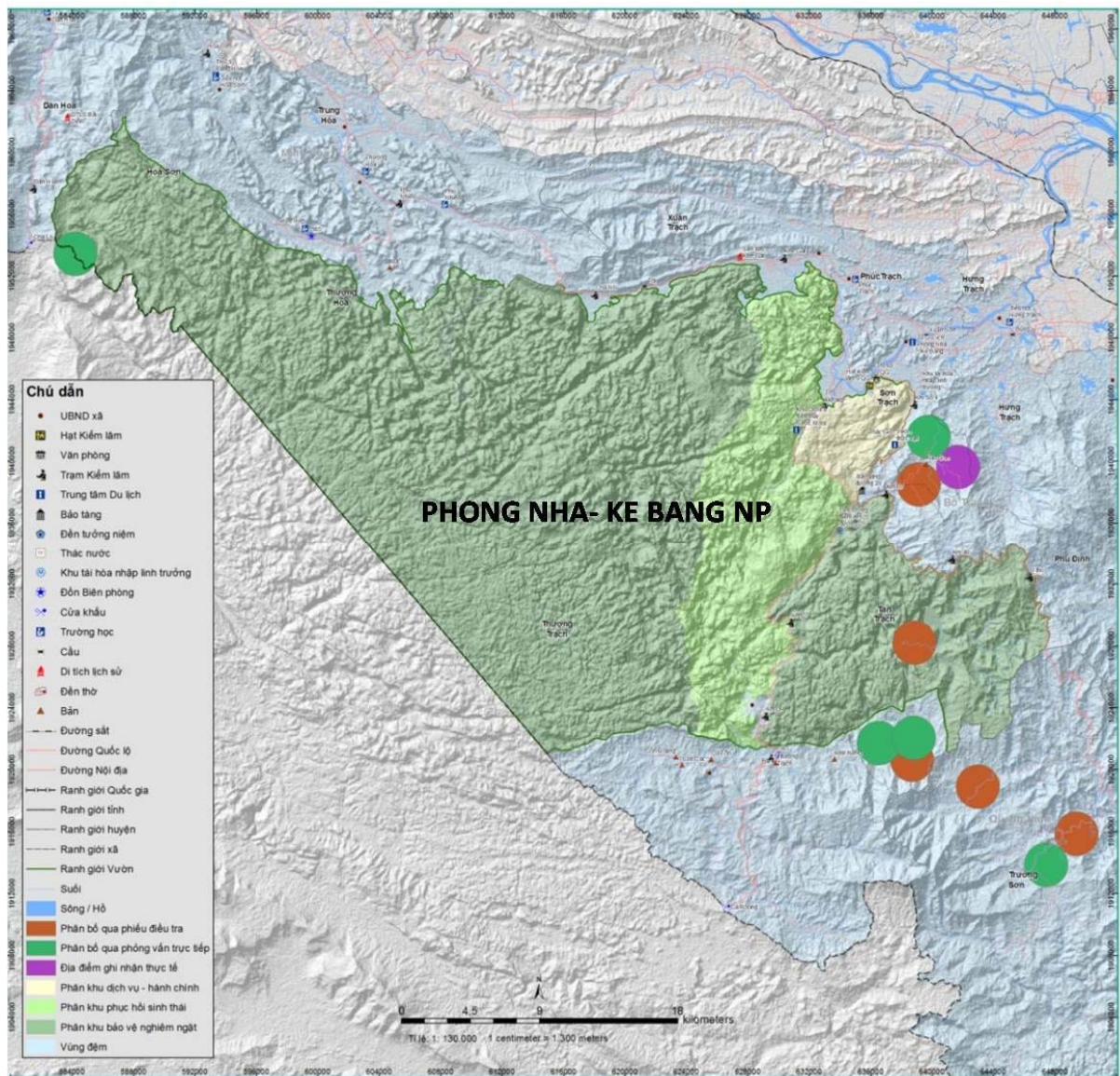


Figure 10. Sites of Gaur records during period 2015 - 2018
(Red cycle: records from questionnaire survey; Green cycle: records from interview survey, Purple cycle: records from transect survey)

4.1.6 Large-antlered Muntjak *Muntiacus vuquangensis*

- *Conservation status*: IUCN Red List (2018): CR - critically endangered; Red Data Book of Vietnam (2007): VU - Vulnerable; Decree 32/2006/NĐ-CP: Group IB, Decree 160/2013/NĐ-CP: Annex I
- *Population status and distribution areas in PNKB NP*

Existence of the Large-antlered Muntjak in PNKB NP was recorded by previous studies though interview information and observation of skulls/ antlers of the species in villages (Le Xuan Canh et al. 1997, Nguyen Xuan Dang et al. 1998, Do Tuoc et al. 1999, WWF Indochina -VRTC 1999). All previous studies remarked low abundance of Large-antlered Muntjak in PNKB NP. The Large-antlered Muntjak skulls/antlers were found Phu Minh Village (Thuong Hoa Com.), Tang Hoa Village (Hoa Son Com.), and Son Trach Com. (village not showed in report). There is no surveys obtained direct sighting of Large-antlered Muntjak in the wild and camera trapping survey in 2012 in PNKB NP also did not obtain image of this species (Nguyen Manh Ha et al. 2012).

In this study (2018), questionnaire survey receives large number of Large-antlered Muntjak records. However, double check through direct interview shows that majority of these records are wrong because the informants mis-identified Large-antlered Muntjak *Muntiacus vuquangensis* with Common Muntjak *Muntiacus muntjak*. Large-antlered Muntjak is very rare in PNKB NP, therefore, not many villagers know this species. Direct interview survey obtained following additional information:

- Mr. Ho Va, 60 year-old man from Cha Lo Village (Dan Hoa Com.) informs there are 2 species of Muntjaks in Dan Hoa forest. Common muntjak is smaller, red body and commonly seen in forest edge while Large-antlered Muntjak (Mang moc as he named) is larger, darker body, lives in deep forest and never seen in forest edge. Before 2015, he saw Large-antlered Muntjak several times in Ka Sai area in core zone of PNKB NP. Since 2015, he has not come to Ka Sai area, but he believe that Large-antlered Muntjak is still in the area. Since year 2000, no Large-antlered Muntjaks has been hunted in this area.
- Large-antlered Muntjak is also reported to live in other areas inside PNKB NP such as valleys near Yen Hop and Mo O O Villages (Thuong Hoa Com.), forest area near Doong Village (Tan Trach Com.) and Xa Bien area (Tan Trach Com.)
- In May 2017, Mr Dinh Khua from Khe Lo Village (Thuong Trach Com.) saw one individual of Large-antlered Muntjak in Khe Thi area (Tan Trach Com.). Recently in April 2018, another individual was seen in this area by Mr. Dinh May (Khe Lo Village, Thuong Trach Com.).

Camera trapping survey and transect survey did not obtain evidence of Large-antlered Muntjak in PNKB NP. This fact indicates very low density of this species in PNKB NP.

Final note: Results of this study indicate that Large-antlered Muntjak still exists in PNKB NP but at very low density. This study could identify only 6 areas in PNKB NP where the Large-Antlered Muntjak survives including Ka Sai area (Dan Hoa Com.), forest valley near Mo O O and Yen Hop Villages (Thuong Hoa Com.), forest area near Doong Village (Tan Trach Com.), Khe Thi and Xa Bien areas (Tan Trach Com.) (figure 11).

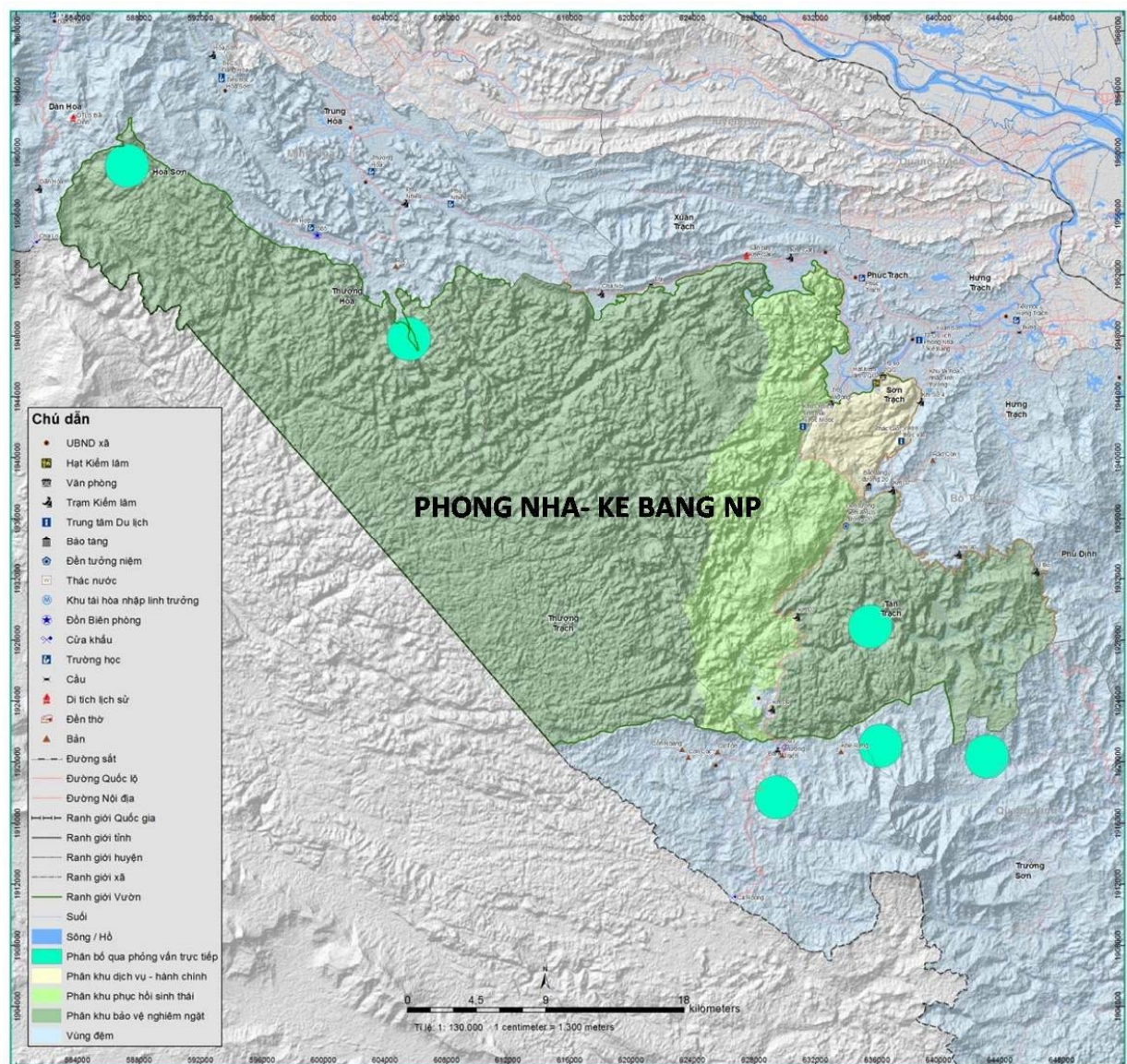


Figure 11. Localities of Large-Antlered Muntjak records during period 2015 -2018
(Green cycle: records from direct interview survey)

4.1.7 *Saola Pseudoryx nghetinhensis*

- *Conservation status:* IUCN Red List (2018): CR - critically endangered; Red Data Book of Vietnam (2007): EN - endangered; Decree 32/2006/NĐ-CP: Group IB, Decree 160/2013/NĐ-CP: Annex I
- *Population status and distribution areas in PNKB NP*

The Saola was reported to exist in core zone and buffer zone of PNKB NP by previous studies (Le Xuan Canh et al. 1997, Nguyen Xuan Dang et al. (1998), Le Khac Quyet (2002), Le Manh Hung et al. 2002, Tham Ngoc Diep et al. 2004, Nguyen Xuan Dang et al. (2007, 2011, etc.). Le Xuan Canh et al. (1997) reported existence of Saola in Dan Hoa and Hoa Son Communes. Nguyen Xuan Dang et al. (1998) reported that in 1986, Mr Cao Tiep from Yen Hop Village (Thuong Hoa Com.) hunted a adult Saola in Hung Trau valley (Thuong Hoa Com.), the authors witnessed one Saola antler (43.5 cm long) hunted by Mr Dinh Tai in 1978 in Duong Ngui area (Dan Hoa Com.) and another Saola antler (41.3 and 41.6 cm long) hunted by Mr Dinh Xuan in Giang Man mountain (Thanh Hoa Com., Tuyen Hoa District).

Results of later intensive survey during 2002-2011 show that Southwestern part of Quang Binh Province (Quang Ninh and Le Thuy Districts) harbors a a number of small groups of

Saola . The sites of the Saola groups inhabited are Khe Nuoc Trong stream (Kim Thuy Com., Le Thuy District), Lo O mountain (Truong Son Com., Quang Ninh District) and some other sites are near Vietnam - Laos border in Le Thuy and Quang Ninh Districts. Especially, during 2006-2011, Nguyen Xuan Dang et al. (2007, 2011) conducted intensive Saola surveys in Le Thuy and Quang Ninh Districts and identified several small groups of Saola (3-4 individuals each) living in several stream heads in the districts such as Rao May - Khe Cat streams (Trung Son Com.), Le Nghi - Lo O streams (Trung Son Com.), Rao Reng stream (Lam Thuy Com.), Chut Ngut stream (Lam Thuy Com.), Bach Dan stream (Lam Thuy Com.), Khe Bun - Khe Dan stream (Kim Thuy Com.), Suoi Vang stream (Kim Thuy Com.) and Khe Nuoc Trong stream (Kim Thuy Com.). Summarily, Saola was found to live both in core zone and buffer zone of PNKB NP, however, they are more abundant in buffer zone and adjacent areas belonging to Quang Ninh and Le Thuy Communes (figure 12)

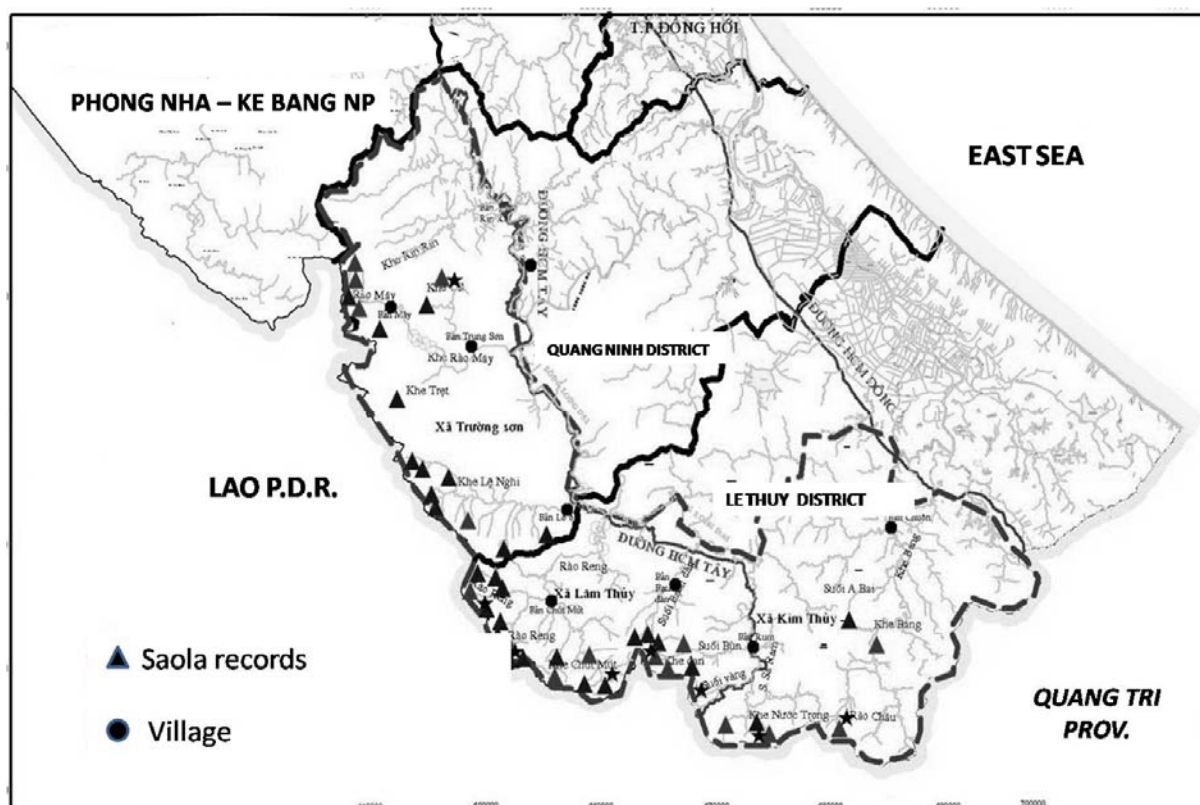


Figure 12. Distribution of Saola groups in Southwestern Quang Binh Province
(Source: Nguyen Xuan Dang et al. 2011)

Results of this study (2018) show that, until 2012, the areas of previous Saola records in buffer zone of PNKB NP (in Thuong Hoa, Dan Hoa and Hoa Son Com.) had not been allocated to PNKB NP management. Consequently, the forest in these areas have been seriously degraded due to forest clearing for agricultivation fields and cattle raising grounds, and no more suitable for Saola to inhabit. In core zone of PNKB NP, questionnaire survey receives only 3 records of Saola existence and all in the same area - forest area near Doong Village (Tan Trach Com.), but in different years (2013, 2016 and 2018) (table 7).

Table 7. Saola records from questionnaire survey

Date	Information	No. Animals	Locality	Name and address of informants
2013	Sighting	3	Thuong Doong stream near Doong Village (Tan Trach Com.)	Ho Van Nho, Doong Village, Tan Trach Com., Bo Trach District
2016	Sighting	1	Cemetery Hill near Thuong	Ho Thi Vai, Doong

			Doong stream (Tan Trach Com.)	Village, Tan Trach Com., Bo Trach District
1/2018	Sighting	2	Cemetery Hill near Thuong Doong stream (Tan Trach Com.)	Ho Thi Vai, Doong Village, Tan Trach Com., Bo Trach District

Direct interview of Mrs Ho Thi Vai and other villagers from Doong Village (Tan Trach Com.) obtained following additional information: In Thuong Doong stream area (the Cemetery hill) near Doong Village, exists a group of Saola. Every year, before lunar new year festival, people from Doong Village often come to this area to collect "dong" leaves for sale and use (these leaves are used for making traditional new-year cakes and some other food items) and sometimes they met the Saola coming here to feed young "dong" leaves (*Stachyphrynium placentarium*). The most recently, in January 2018, Mrs Ho Thi Vai came to this area for "dong" leaves collecting and met a Saola mother and her baby eating young "dong" stem. Doong villagers are Van Kieu ethnic tribe and they call Saola as "Rotang". Transect survey did not find data on Saola and camera trapping survey did not obtain any image of the Saola. This fact indicates very low abundance of Saola in PNKB NP.

Final note: Transect and camera trapping surveys did not find evidence of Saola, however, results of questionnaire and direct interview surveys indicate small groups of Saola still survive in forest area near Doong Village (Tan Trach Com., Bo Trach District) inside PNKB NP (figure 13). Based on the fact that at each stream-head area usually only 4-5 individuals of Saola lives, we estimate only 4-5 Saola surviving in Thuong Doong stream area.

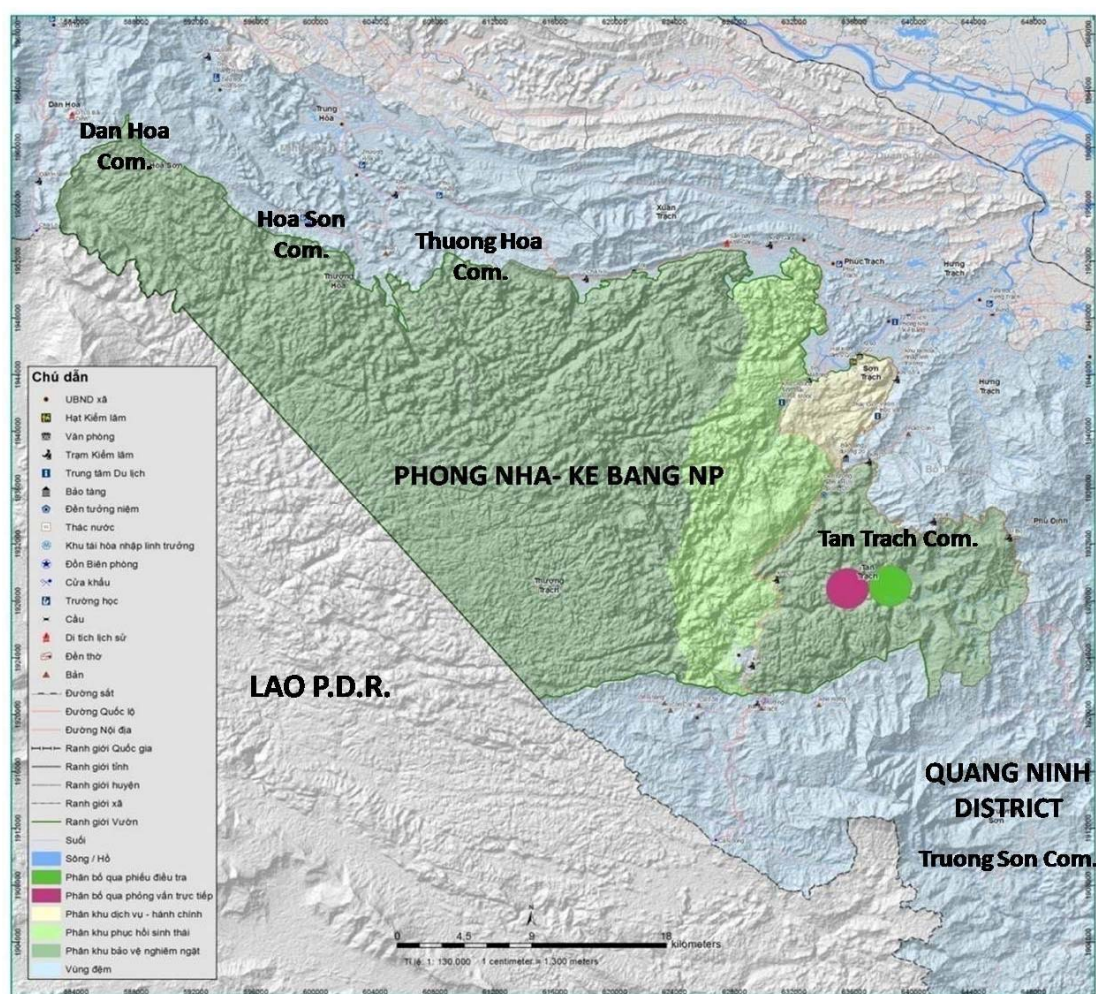


Figure 13. Localities of Saola records during period 2015 -2018

(Green cycle: records from questionnaires survey; Purple cycle: records from direct interviews)

4.2 Threats to the 7 important large mammal species and mammal fauna in PNKB NP

Recent studies (Le Trong Trai et al. 2012, Nguyen Manh et al. 2012, Nguyen Xuan Dang et al. 2012,...) have identified following key threats to the Mammal fauna (including the 7 target large mammal species) and general biodiversity in PNKB NP:

- Gun hunting and snaring of wild animals leading to decrease of mammal abundance, especially, species of high economic values
- Free-ranging raising of domestic cattle in forest leading to competition for food sources, feeding grounds, and disease transmitting to wild animals in PNKB NP, especially to ungulate species
- Illegal timber logging leading to degradation of animal habitats, limitation of locomotion substrate for arboreal species, decrease of food source (fruits, leaves) for wild animals in PNKB NP
- Large encroachment of local resident into PNKB NP for fishing, collecting of bee honey and other non-timber forest products (young bamboo shoots, mushrooms, orchids, etc.) and for agricultural production leading to disturbance of animal habitats and reduction of food sources for many wild animals in the National Park.

During recent years, due to considerable intensification of forest patrolling as well as strict violation trial and prosecution, the threats to wildlife and biodiversity in PNKB NP has been considerably reduced. At present, the above mentioned threats occur mainly in buffer zone and small parts of core zone of PNKB NP located close to villages. In the core zone, wildlife hunting / snaring, illegal timber logging and free-ranging cattle raising have been strictly controlled and significantly reduced; there is only illegal encroachment of residents from nearby villages into forests for collecting of honey and some non-timber forest products. Meanwhile, wildlife hunting/snaring, illegal timber logging, non-timber forest products collecting and free-ranging cattle raising remained un-controlled in buffer zone. Therefore, there is a high risk of these threats happened again in core zone of PNKB NP if enforcement activities of PNKB NP would not remain at high intensity in future. It is of great concern now is forest disturbance by large illegal encroachment of people into core zone of PNKB NP for collecting bee honey and other non-timber forest products and increase of ecotourism inside PNKB NP. These large human encroachment (illegal and legal) cause the loss of habitat security, that negatively affect the normal life of wild animal species in the Park, especially, endangered species which are naturally very sensitive to human encroachment. In addition, global climate change also leads to more strong storms and heavy floods happening inside the PNKB NP causing significant negative impact on many endangered species. For example, during survey in Ka Sai area (Dan Hoa Com.) and Ma Rin area (Hoa Son Com.), we observed large number of trees and big tree branches broken by strong storms in 2016 and 2017. This made the Asiatic Black Bear moved away to other areas to live, very few Bear scratches on trees were found in these areas after the storms. The threats to each of 7 target large mammal species can be assessed as following:

Tiger: Wildlife hunting / snaring is the most serious threat to Tiger survival. This threat can directly reduce the number of the Tiger or even completely eliminate the Tiger from PNKB NP. The reason is that Tiger has a vast activity area including both core zone and buffer zone and has very high economic value. Significant decrease of prey animals abundance (especially, ungulates) is the second most serious threat to Tiger in PNKB NP. At present, there is no systematic assessment of Tiger prey resource (ungulates and other species) in PNKB NP, however, their significant reduction can be easily adjusted by their low encounter frequencies in forest. In addition, increases of human encroachment into core zone and buffer

zone of PNKB NP also makes the Tiger moved away from PBKB NP to other safe habitats to live (for example, they may move to large forests in Laos).

Dhole: Like the Tiger, wildlife hunting /snaring is the most serious threat to survival of Dhole in PNKB NP. This threat can directly reduce the number of Dhole because Dhole has vast activity area covering both buffer zone and core zone of PNKB NP. At present, the gun hunting is strictly controlled but snaring is still common in buffer zone and some parts of core zone close to villages. Significant decrease of abundance of Dhole prey species (ungulates, primates, etc.) is second most serious threat to Dhole population in PNKB NP. In addition, the loss of security in many parts of Dhole habitat caused by regular encroachment of local residents into forests also chased the Dhole from their usual habitat. Development/ improvement of road systems in/nearly buffer zone makes it easier for local residents to access the remote parts on PNKB NP for illegal hunting, forest products collecting, etc. Dhole is very sensitive to human existence, therefore, they may move away to more remote areas to live to avoid the human disturbance.

Asiatic Black Bear: Asiatic Black Bear was naturally very abundant in PNKB NP, however, their current abundance is much lower. The reason of this situation is intensive Bear hunting / snaring happened widely in PNKB NP area for many years in the past. At present, wildlife hunting by guns has been under strict control, however, snaring remains widely in buffer zone and a village-close parts of core zone. This is the most serious threat to survival of Asiatic Black Bear in PNKB NP. The illegal encroachment of local residents into the National Park for collecting of bee honey and other forest products will cause reduction of food source for the Bear in the wild. Security loss in the Bear habitat caused by large human encroachment will chase the Bear to more remote area to live. In addition, climate change leading to more strong storms and heavy flood happened, causing tree and branch breaking will reduce the important food source (fruits, bee honey) of the Bears

Gaur: Gaurs has a vast activity area. They usually comes for feeding in open grasslands / bushlands, which are sometime close to villages, and become easy to be hunted. Having very high economic value, the species usually faces high pressure of hunting for meat and horns. Thus, wildlife hunting / snaring happened both in core zone and buffer zone of PNKB NP is the most serious threat to survival of the Gaur population in PNKB NP. Then, free-ranging cattle raising in core zone and buffer zone of PNKB NP caused a competition with the Gaurs for food source, resting and refuge sites is second most serious threat to the Gaur population. Increased encroachment of people into the Gaur habitat causing loss of habitat security also negatively affects the normal life of the Gaurs in PNKB NP.

Large Antlered Muntjak: Large Antlered Muntjak has naturally very low abundance and lives in very remote areas in core zone of PNKB NP, therefore, the species is less affected by wildlife hunting / snaring. However, if enforcement activities of PNKB NP fails to control over the wildlife hunting /snaring in the Park, this threat can eliminate the Large Antlered Muntjak from PNKB NP.

Saola: Saola is easy to be hunted and is very sensitive to human disturbance in their habitat. In PNKB NP, only a small group of Saola is survived in a forest area near Doong village (Tan Trach Com.). Unfortunately, human disturbance in this area caused by ecotourism development is increased (for example, the tour to Hang En Cave and the tour to Son Doong Cave are crossing nearby this area). The tourism development may negatively affect the normal life of the Saola group. Moreover, although gun hunting is under control now, but snaring is still exists threatening the survival of the Saola group.

Regarding the Saola groups living outside PNKB NP in Truong Son Commune (Quang Ninh District), Lam Thuy and Kim Thuy Communes (Le Thuy District). Because, forests in this area are designated by Government as Production and Watershed Protection forests, wildlife

protection is poorly addressed in these forest management strategies. Quang Binh Province and PNKB NP should conduct urgent measures to protect these Saola groups from extinction.

4.3 Proposed measures for conservation of the 7 important large mammal species in PNKB NP.

Results of this study indicates that the abundance of all 7 important large mammal species in PNKB NP (Tiger, Asiatic Black Bear, Dhole, Asian Elephant, Gaur, Large-Antlered Muntjak and Saola) has been seriously reduced. Asian Elephants possibly no more comes back to PNKB NP. The other 6 species has low or very low abundance. These species will be expatriated from PNKB NP soon unless following urgent conservation measures are undertaken.

1) Intensifying forest patrolling for forest and wildlife protection enforcement in PNKB NP

First of all, it needs to maintain strict control over gun possession and gun use of villagers situated in core zone and buffer zone of PNKB NP. The forest patrolling by the Park forest rangers must be intensified enough to prevent wildlife hunting/snaring happened in core zone and buffer zone of PNKB NP and that must be focused in the key areas of the 7 large mammal species occupation. Searching for and then destroying all traps / snares found in the forests, all camps / shelters of hunters and illegal encroaching people; chasing away all people illegally encroaching into the National park. All violation cases must be strictly prosecuted and brought to trial by laws to make an good examples for people who live nearby the PNKB NP

2) Conducting more education activities to increase the wildlife conservation awareness of all residents living in core zone and buffer zone of PNKB NP

PNKB NP has conducted many educational programmes for increasing conservation awareness of local residents, however, it seems not enough to make local residents understanding the extinction danger of the 7 large mammal species and Government laws on protection of endangered species. More intensive educational activities should be applied to help local residents clearly understanding the critical situation of the 7 large mammal species, the governmental laws on exploitation, use and protection of these species (such as Forestry Law, Biodiversity Law, Decree No. 32/2006/ND-CP, Decree No. 160/2013/ND-CP, etc.) and punishment systems related to violations of the wildlife protection. To persuade local residents to commit not hunting/snaring, use and trade of wildlife animals and their parts. The education must convince local residents to actively support conservation of the 7 large mammal species and other endangered species in PNKB NP

3) Intensifying patrolling and strictly prosecuting/bringing to trial violations on wildlife protection in buffer zone and its nearby areas

Five (5) of 7 target large mammal species (Tiger, Asiatic Black Bear, Asian Elephant, Gaur and Saola) have large activity area encompassing buffer zone and even outside buffer zone of PNKB NP where the key threats to wildlife are not under control. Therefore, intensifying patrolling and strictly prosecuting / bringing to trial violations on wildlife protection in buffer zone of PNKB NP is utmost important for conservation of the target species.

4) Conducting further surveys to clarify population status of Saola and Large-Antlered Muntjak in PNKB NP area using camera trapping technique.

The existence of Saola in forest area near Doong Village was recorded by interview, this information is very important because during recent decade, large effort have been spent to detect the existence of Saola both in Vietnam and Laos, but very few field confirming data was obtained. In Vietnam, hundreds of camera traps has been put up in forest for many months in Quang Nam, Thua Thien Hue, Quang Binh Provinces and Pu Mat National Park (Nghe An province), however, only one Saola in Quang Nam Saola Nature Reserve (reported

by the WWF - Vietnam) and one Saola in Dong Chau Protection Forest in Quang Binh Province (reported by the VietNature) could be detected.

The group of Saola near Doong Village is under high threat due to living near Doong village and the disturbance by ecotourism routes to Hang En Cave and Son Doong Cave in this area is ever-increased. Conducting survey to clarify population size and distribution range of this Saola group is urgent and utmost important for its effective conservation. Hundreds of camera traps should be mobilized to put up in this area to assess the population size of this Saola groups. PNKB NB should also conduct intensive forest patrol to detect and destroy all snares / traps put up in this area and reduce the people encroachment as much as possible.

The situation of Large-antlered Muntjak is very critical. The species was ranked as Vulnerable (VU) in 2007 Red Data Book of Vietnam, however, the 2018 IUCN Red List ranks the species at highest threatening category - Critically endangered (CR). Results of this study show that Large-antlered Muntjak still exists in PNKB NP, however, its population sizes is not clearly identified. Being living in deep forest areas of PNKB NP and being active at night, the camera trapping method seems the most suitable for status survey of this species. PNKB NP should mobilize large number of camera traps to put up in the Park for assessment of the species population to apply relevant conservation measures

5) Implementing monitoring programme for the important large mammal species in PNKB NP

Develop and apply programme to monitor status of the important large mammal species in PNKB NP to timely detect negative change in their population and reasons of this change to apply relevant management measures in specific areas and each specific periods of time. Camera trapping technique seems the most effective way to monitor these large mammal species. Hundreds of camera traps should be mobilized to put up in the forest areas to get the sound data on the species status and distribution range.

6) Enhancing international collaboration with Laos partners to strengthen conservation of the important large mammal species

These large mammal species all have large activity area, some of them may cross the national border to Laos. All these species are also found to inhabit in Hin Nam No NBCA and Nakai - Nam Theun NBCA. Therefore, international Vietnam - Lao collaboration is very important for protection these species from illegal poaching in both countries.

V. CONCLUSION

This study identifies the existence of 6 target important large mammal species in core zone and buffer zone of PNKB NP. They are Tiger, Asiatic Black Bear, Dhole, Gaur, Large-antlered Muntjak and Saola. During recent 4 years (2015 - 2018), the existence evidence of Tiger was recorded at 13 sites, of Asiatic Black Bear at 33 sites, of Dhole at 4 sites, of Gaur at 6 sites, of Large - antlered Muntjak at 5 sites and of Saola at one sites. The Asian Elephant has moved outside buffer zone of PNKB NP and possibly could not return back due to ever-increasing traffic on Ho Chi Minh Road and other road crossing the area.

Population size of all 6 target large mammal species surviving in buffer zone and core zone of PNKB NP is small and even very small. Meanwhile, many serious threats occur in buffer zone and village-close part of core zone of PNKB NP threatening the long-term survival of these species in PNKB NP.

The most serious threat to the large mammal species in PNKB NP is un-controlled wildlife hunting /snaring in buffer zone and village-close part of core zone of PNKB NP. Other less

serious threats includes significant reduction of prey animal sources of Tiger and Dhole, habitat degradation/ disturbance due to free-ranging cattle raising, non-timber forest products collecting, illegal encroachment of local residents and increased number of tourism visitors inside PNKB NP.

Urgent management measures should be undertaken to conserve the large mammal species in PNKB NP are: Intensifying forest patrolling for forest and wildlife protection enforcement in PNKB NP; Conducting more education activities to significantly increase the wildlife conservation awareness of all residents living in core zone and buffer zone of PNKB NP; Intensifying patrolling and strictly prosecuting/bringing to trial violations on wildlife protection happened in buffer zone and its nearby area; Conducting further surveys to clarify population status of Saola and Large-Antlered Muntjak in PNKB NP area using camera trapping technique; Implementing monitoring programme for the important large mammal species in PNKB NP; and Enhancing international collaboration with Laos partners to strengthen conservation of the important large mammal species

REFERENCE

1. Baltzer, M. C., Nguyen Thi Dao, and Shore, R. (Eds.) 2001. Towards a vision for biodiversity conservation in the forests of the Lower Mekong Ecoregion Complex. WWF Indochina/ WWF US, Hanoi and Washington, 109 pp.
2. MoST, VAST 2007. Red Data Book of Vietnam. Part 1. Animals. Natural Science and Technology Publisher, Hanoi, 315 pp. (in Vietnamese).
3. MARD 2013. Master Project of conservation of Asian Elephant in Vietnam, Period 2013 - 2020 (Decision No. 763/QĐ-TTg, dated 21 May 2013 of Prime Minister (In Vietnamese)
4. Choudhury, A., Lahiri Choudhury, D.K., Desai, A., Duckworth, J.W., Easa, P.S., Johnsingh, A.J.T., Fernando, P., Hedges, S., Gunawardena, M., Kurt, F., Karanth, U., Lister, A., Menon, V., Riddle, H., Rübel, A. & Wikramanayake, E. 2008. *Elephas maximus*. The IUCN Red List of Threatened Species 2008: e.T7140A12828813. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T7140A12828813.en>. Downloaded on **11 September 2018**.
5. Danh Huy Huynh, Cao Van Sung, Le Xuan Canh, Pham Trong Anh, Nguyen Xuan Dang, Hoang Minh Khiem, Nguyen Minh Tam 2008. The Fauna of Vietnam, Volume 21. Mammal class - Mammalia. Sci. and Techn. Publisher, Hanoi, 168-170 (in Vietnamese).
6. Do Tuoc, Truong Van La 1999. LINC - WWF Hin Nam No - Phong Nha -Ke Bang Transborder conservation project: Forest animals in Phong Nha - Ke Bang area, Quang Binh Province, a Technical Report to the LINC - WWF.
7. Garshelis, D. & Steinmetz, R. 2016. *Ursus thibetanus* (errata version published in 2017). The IUCN Red List of Threatened Species 2016: e.T22824A114252336. <http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22824A45034242.en>. Downloaded on **11 September 2018**.
8. Goodrich, J., Lynam, A., Miquelle, D., Wibisono, H., Kawanishi, K., Pattanavibool, A., Htun, S., Tempa, T., Karki, J., Jhala, Y. & Karanth, U. 2015. *Panthera tigris*. The IUCN Red List of Threatened Species 2015: e.T15955A50659951. <http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T15955A50659951.en>. Downloaded on **11 September 2018**.
9. Kamler, J.F., Songsasen, N., Jenks, K., Srivathsa, A., Sheng, L. & Kunkel, K. 2015. *Cuon alpinus*. The IUCN Red List of Threatened Species 2015:

e.T5953A72477893. <http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T5953A72477893.en>. Downloaded on 11 September 2018.

10. Le Trong Trai, W. V. Bleisch (2012). Management Plan of Phong Nha - Ke Bang NP, World Heritage Site, Period 2013-2020. Quang Binh Province (in Vietnamese)
11. Le Manh Hung, Pham Duc Tien, A.W.Tordoff, Nguyen Dinh Dung (2002). Rapid biodiversity survey in Le Thuy and Quang Ninh Districts, Quang Binh Province, Vietnam. Hanoi. Birdlife International Programme in Vietnam.
12. Le Xuan Canh, Truong Van La, Dang Thi Dap, Ho Thu Cuc, Ngo Anh Dao, Nguyen Ngoc Chinh, Nguyen Quoc Dung, Pham Nhat, Nguyen Thai Tu, Nguyen Quoc Thang and Tran Minh Hien (1997). A Report on Field surveys on Biodiversity in Phong Nha - Ke Bang Forest, Quang Binh Province, Central Vietnam. UNDP - WWF Indochina - Technical Report, Hanoi, Vietnam.
13. Meijboom M., Ho Ngoc Lanh (2002). Fauna and Flora in Phong Nha -Ke Bang and Hin Nam No. LINC- WWF Project, 167 pp.
14. Decree No.32/2006/NĐ-CP dated 30 March 2006 of Government on management of forest endangered, rare and precious species (in Vietnamese).
15. Decree No.160/2013/NĐ-CP, dated 12 November 2013 of Government on criteria for identification and management regulations of endangered, rare and precious species of conservation priority. Annex 1: the list of endangered, rare and precious species of conservation priority (in Vietnamese).
16. Nguyen Manh Ha (2008). Study of biology, ecology and conservation of Gaur (*Bos gaurus* H.Smith, 1827) in Vietnam, Ph.D.thesis, 194 pp., Hanoi. (in Vietnamese).
17. Nguyen Manh Ha, Nguyen Ngoc Tuan, Le Van Dung, Do Tuoc 2012. Report of camera trap survey for mammal in Phong Nha - Ke Bang National Park' extended area. A technical survey report to PNKB NP Region Project, Quang Binh, 31 pp.
18. Nguyen Xuan Dang, Pham Nhat, Pham Trong Anh, D.K. Hendrichsen 1998. Results of mammal fauna survey in Phong Nha - Ke Bang. A technical report to Flora and Fauna International, Hanoi, (in Vietnamese).
19. Nguyen Xuan Dang et al. 2007. Final Report on results of 2006-2007 Vietnam Academy of Sci. and Techn. hosting Project "Survey for assessment of current status and some biological, ecological characteristics, factors causing degradation of Saola population (*Pseudoryx nghetinhensis*) in Vietnam and proposed measures for the species conservation. Vietnam Academy of Sci. and Techn., Hanoi, 116pp, (in Vietnamese).
20. Nguyen Xuan Dang et al. 2011. Final Report on results of 2010-2011 Vietnam Academy of Sci. and Techn. hosting Project "Survey for status assessment of Saola population (*Pseudoryx nghetinhensis*) and habitat in Southwestern area of Quang Binh Province, proposal of the Southwestern Quang Binh Saola Conservation Landscape". Vietnam Academy of Sci. and Techn., Hanoi, 98 pp, (in Vietnamese).
21. Nguyen Xuan Dang 2015. Overall assessment of wild Asian Elephant (*Elephas maximus*) in Vietnam. A technical report to WWF - Vietnam, Hanoi, 60 pp.
22. Nguyen Xuan Dang, Nguyen Tien Hiep, Nguyen Xuan Nghia 2016. Biodiversity of Phong Nha - Ke Bang and Hin Nam No. Un-published book manuscript. Phong Nha - Ke Bang Region Conservation Project. Quang Binh, 88 pp.
23. Tham Ngoc Diep, Dang Thang Long, Do Tuoc, 2004. Report on Saola survey (*Pseudoryx nghetinhensis*). In the Workshop proceeding "Re-discovery of Saola". Pu Mat NP. Con

- Cuong District, Nghe An Province, 27-28/2/2004. WWF Indochina Programme, SFNC Project and Pu Mat NP, p. 79-108.
24. The IUCN Red List of Threatened Species. Version 2018-1. <www.iucnredlist.org>. Downloaded on 11 September 2018.
 25. Timmins R.J., Do Tuoc, Trinh Viet Cuong and D. K. Hendrichsen (1999). A preliminary assessment of the conservation importance and conservation priorities of the Phong Nha-Ke Bang proposed National Park, Quang Binh Province, Vietnam. Fauna & Flora International - Indochina Program, Hanoi, Vietnam
 26. Timmins, R.J., Duckworth, J.W., Robichaud, W., Long, B., Gray, T.N.E. & Tilker, A. 2016a. *Muntiacus vuquangensis*. The IUCN Red List of Threatened Species 2016: e.T44703A22153828. <http://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T44703A22153828.en>. Downloaded on 11 September 2018.
 27. Timmins, R.J., Hedges, S. & Robichaud, W. 2016 b. *Pseudoryx nghetinhensis*. The IUCN Red List of Threatened Species 2016: e.T18597A46364962. <http://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T18597A46364962.en>. Downloaded on 11 September 2018.
 28. WWF Indochina -VRTC (1999). Results of the complex zoological-botanical expedition to the Ke-Bang area. Final Report. WWF Indochina-VRTC, Hanoi, Vietnam.

Annex 1. List of key interviewees of direct interview survey

No.	Name	Address
1.	Trương Văn Thành	Bai Dinh Village, Dan Hoa Com., Minh Hoa District
2.	Đinh Trọng Lực	Bai Dinh Village, Dan Hoa Com., Minh Hoa District
3.	Cao Thúy	Bai Dinh Village, Dan Hoa Com., Minh Hoa District
4.	Cao Tiến Lịch	Bai Dinh Village, Dan Hoa Com., Minh Hoa District
5.	Cao Tiến Quê	Bai Dinh Village, Dan Hoa Com., Minh Hoa District
6.	Cao Xuân Thường	Bai Dinh Village, Dan Hoa Com., Minh Hoa District
7.	Hồ Năm	Bai Dinh Village, Dan Hoa Com., Minh Hoa District
8.	Đinh Xuân Phụng	Cha Lo Village, Dan Hoa Com., Minh Hoa District
9.	Cao Tiến Công	Cha Lo Village, Dan Hoa Com., Minh Hoa District
10.	Hồ Phụng	Cha Lo Village, Dan Hoa Com., Minh Hoa District
11.	Hồ Hiến	Cha Lo Village, Dan Hoa Com., Minh Hoa District
12.	Đinh Sơn Hà	Cha Lo Village, Dan Hoa Com., Minh Hoa District
13.	Hồ Đon	Cha Lo Village, Dan Hoa Com., Minh Hoa District
14.	Hồ Ca	Cha Lo Village, Dan Hoa Com., Minh Hoa District
15.	Hồ Thông	Cha Lo Village, Dan Hoa Com., Minh Hoa District
16.	Ông Hồ Vá	Cha Lo Village, Dan Hoa Com., Minh Hoa District
17.	Bà Cao Quán	Hoa Luong Village, Hoa Son Com., Minh Hoa District
18.	Cao Văn Hiến	Hoa Luong Village, Hoa Son Com., Minh Hoa District
19.	Cao Luân	Hoa Luong Village, Hoa Son Com., Minh Hoa District
20.	Cao Minh Chiến	Luong Nang Village, Hoa Son Com., Minh Hoa District
21.	Cao Quốc Huy	Thuan Hoa Village, Hoa Son Com., Minh Hoa District
22.	Đinh Xuân Nhi	Thuan Hoa Village, Hoa Son Com., Minh Hoa District
23.	Đinh Minh Phụng	Thuan Hoa Village, Hoa Son Com., Minh Hoa District
24.	Đinh Thanh Hóa	Thuan Hoa Village, Hoa Son Com., Minh Hoa District
25.	Đinh Xuân Đức	Tang Hoa Village, Hoa Son Com., Minh Hoa District
26.	Cao Xuân Hường	Tang Hoa Village, Hoa Son Com., Minh Hoa District
27.	Nguyễn Thanh Hòa	Tang Hoa Village, Hoa Son Com., Minh Hoa District
28.	Cao Xuân Thu	Luong Nang Village, Hoa Son Com., Minh Hoa District
29.	Đinh Xuân Hậu	Dang Hoa Village, Hoa Son Com., Minh Hoa District
30.	Cao Xuân Tư	On Village, Thuong Hoa Com., Minh Hoa District
31.	Cao Xuân Dương	On Village, Thuong Hoa Com., Minh Hoa District
32.	Cao Xuân Tùng	On Village, Thuong Hoa Com., Minh Hoa District
33.	Cao Xuân Văn	On Village, Thuong Hoa Com., Minh Hoa District
34.	Trần Xuân Vinh	On Village, Thuong Hoa Com., Minh Hoa District
35.	Cao Thanh Xuân	Mo O O Village, Thuong Hoa Com., Minh Hoa District
36.	Cao Xuân Hiến	Mo O O Village, Thuong Hoa Com., Minh Hoa District
37.	Cao Xuân Mạnh	Yen Hop Village, Thuong Hoa Com., Minh Hoa District
38.	Đinh Xuân Bằng	Yen Hop Village, Thuong Hoa Com., Minh Hoa District
39.	Cao Thanh Uy	Yen Hop Village, Thuong Hoa Com., Minh Hoa District
40.	Trương Xuân Đức	Ri Ri Village, Tan Hoa Com., Minh Hoa District
41.	Phạm Văn Toàn	Ri Ri Village, Tan Hoa Com., Minh Hoa District
42.	Trương Xuân Hoài	Ri Ri Village, Tan Hoa Com., Minh Hoa District
43.	Phạm Văn Hải	Ri Ri Village, Tan Hoa Com., Minh Hoa District
44.	Hồ Thị Thu	Doong Village, Tan Trach Com., Bo Trach District
45.	Hồ Thị Vái	Doong Village, Tan Trach Com., Bo Trach District
46.	Nguyễn Soái Trắc	Doong Village, Tan Trach Com., Bo Trach District

47.	Hoàng Thị Tim	Doong Village, Tan Trach Com., Bo Trach District
48.	Nguyễn Văn Chiêu	Doong Village, Tan Trach Com., Bo Trach District
49.	Nguyễn Văn Triều	Doong Village, Tan Trach Com., Bo Trach District
50.	Hồ Văn Nhỏ	Doong Village, Tan Trach Com., Bo Trach District
51.	Nguyễn Văn Bình	Chay Lap Village, Phuc Trach Com., Bo Trach District
52.	Nguyễn Văn Quân	Chay Lap Village, Phuc Trach Com., Bo Trach District
53.	Nguyễn Tám	Chay Lap Village, Phuc Trach Com., Bo Trach District
54.	Nguyễn Hữu Mạnh	Village 3, Xuan Trach Com., Bo Trach District
55.	Đỗ Anh Sơn	Village 3, Xuan Trach Com., Bo Trach District
56.	Lê Xuân Đăng	Village 2, Xuan Trach Com., Bo Trach District
57.	Nguyễn Văn Hoàn	Village 2, Xuan Trach Com., Bo Trach District
58.	Nguyễn Văn Lâm	Village 4, Xuan Trach Com., Bo Trach District
59.	Nguyễn Nam Định	Cha Noi Ranger Station, PNKB NP
60.	Nguyễn Khắc Dũng	Forest Protection Station, Truong Son State Enterprise
61.	Hồ Xoong	Ploang Village, Truong Son Com., Quang Ninh District
62.	Hồ Thiết	Ploang Village, Truong Son Com., Quang Ninh District
63.	Hồ Văn Giang	Ploang Village, Truong Son Com., Quang Ninh District
64.	Hồ Văn Quang	Ploang Village, Truong Son Com., Quang Ninh District
65.	Nguyễn Văn Tóa	Ploang Village, Truong Son Com., Quang Ninh District
66.	Hồ Văn Bông	Ploang Village, Truong Son Com., Quang Ninh District
67.	Hồ Văn Anh	Ploang Village, Truong Son Com., Quang Ninh District
68.	Đinh Trấp	A Rem Village, Thuong Trach Com., Bo Trach District
69.	Đinh Thị	Ban Village, Thuong Trach Com., Bo Trach District
70.	Đinh Đại	Ban Village, Thuong Trach Com., Bo Trach District
71.	Đinh Liêng	Ban Village, Thuong Trach Com., Bo Trach District
72.	Đinh Hiệt	Ban Village, Thuong Trach Com., Bo Trach District
73.	Đinh Khưa	Khe Lo Village, Thuong Trach Com., Bo Trach District
74.	Đinh Mây	Khe Lo Village, Thuong Trach Com., Bo Trach District
75.	Đinh Thun	Khe Lo Village, Thuong Trach Com., Bo Trach District
76.	Hồ Văn Kiên	Rao Con Village, Son Trach Com., Bo Trach District
77.	Hồ Thầu	Rao Con Village, Son Trach Com., Bo Trach District
78.	Hồ Văn Duyệt	Rao Con Village, Son Trach Com., Bo Trach District
79.	Hồ Văn Quyền	Rao Con Village, Son Trach Com., Bo Trach District
80.	Hồ Nghiêm	Rao Con Village, Son Trach Com., Bo Trach District

Annex 2. Some pictures of the study activities



1. Interview in Hoa Son Commune



2. Interview in Ploang Commune



3. Interview in Thuong Hoa Commune



4. Interview in Rao Con Village



5. Survey camp in Ma Rin (Team 1)



6. Survey camp in forest (Team 2)



7. Putting up camera traps (Team 2)



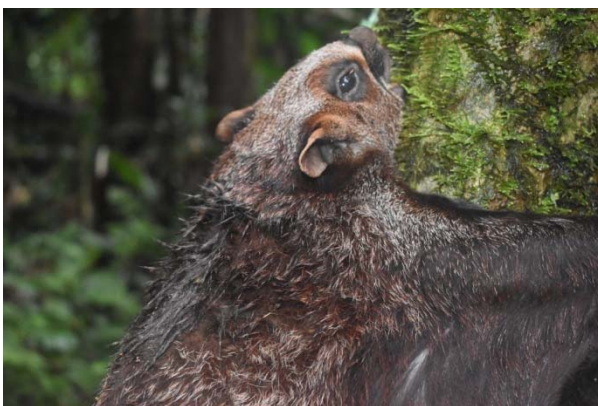
8. Putting up camera traps (Team 1)



9. Reshus macaque taken by camera trap



10. Stump-tailed macaque taken by camera trap



11. Giant flying squirrel in forest



12. Annamite Striped Rabbit taken by camera trap



13. Bear scratches on tree in Ma Rinh area



14. Bear scratches on tree in Ma Rinh area



15. Footprint of Gaur near Rao Con Village



16. Excrement of Gaur near Rao Con Village



17. Resting site of Gaur near Rao Con Village (19 Oct. 2018)
and putting up the camera trap



18. Image of Gaur tanken by camera trap near Rao Con Village at 29 Oct. 2018