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STATUS OF ELEPHANTS IN NGHE AN AND HA TINH PROVINCES, VIETNAM

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INTRODUCTION

A field survey team survey team comprising scientists from World Wide Fund for Nature (WWF), Forest Inventory & Planning Institute (FIPI) and the Institute of Ecology & Biological Resources (IEBR) initiated a national review of the conservation status of wild elephant populations, between December 1992 and March 1993. In addition to gathering field data in selected locations, the team compiled through interviews, discussions with provincial and federal authorities and literature search, an overview of the present status of elephant distrubution, population estimates and human-elephant conflict in Vietnam (Dawson *et. al.* 1993). The conclusions from this national overview drew specific recommendations, two of which were the objectives of the study being reported here, namely, to carry out more thorough elephant densities surveys and population estimates in protected areas which were considered to hold viable elephant populations; and to assess quality of habitat between Vu Quang and Khe Thoi Nature Reserves in the north-central provinces of Nghe An and Ha Tinh with a view to establishing an elephant corridor.

In May 1992 a scientific mission, comprising members from WWF and the Ministry of Forestry (MOF) surveyed Vu Quang Nature Reserve and during the course of their field work discovered a species of large mammal new to science, which was subsequently described and named *Pseudoryx nghetinhensis* (Dung *et al.* 1993) Further surveys by scientists from FIPI found that the geographic range of this new bovid extended into the adjacent province of Nghe An Detailed surveys were recommended to ascertain distribution and density data in the two protected areas of Vu Quang and Phu Mat (formerly known as Khe Thoi) found in the provinces of Ha Tinh and Nghe An, respectively. Furthemore, basic studies of the species' ecology and behaiour were required to assist in planning a long-term strategy for its conservation.

With a view to carrying out the recommendations of both these previous projects in the two provinces of Nghe An and Ha Tinh, and as time suitable for field work in this region is limited by the rains it was decided (after discussions with the country representative and project administrator) to combine the work for both species, but for administrative reasons were kept

separate with different contracts and terms of reference. For the same reasons the results of the survey as it applies to elephants and other large mammals excluding *Pseudoryx nghetinhensis* is reported here. Field work was carried out between November 1993 - December 1994.

OBJECTIVES

1. Complete surveys of forest areas along the Lao border region in Nghe An and Ha Tinh provinces with a view to extending the protected areas system and maintaining corridors for the migration of elephants and other large mammals.

2 Conduct surveys of elephants and large mammals in the region and analyze results and present status report.

3. Make notes of signs of the Vu Quang ox *(Pseudoryx nghetinhensis)* and identify possible sites for follow-up long-term monitoring and field studies.

4. Prepare consultancy report for WWF and MOF on the findings.

METHODS

The surveys were carried out in the provinces of Nghe An and Ha Tinh in north-central Vietnam. In Nghe province several forest reserves were visited, while in Ha Tinh the field survey concentrated on Vu Quang Nature Reserve. In Nghe An intensive field work was carried out from December 1993 to January 1994, and again in October-November 1994. In this period several forest reserves were visited to ascertain the distribution of elephants and other large mammals. Habitat quality around the reserve was evaluated with a view to recommending establishment of forest corridors to link fragmented elephant populations. These included the forest near the communes Thien Phong, Thong Thu and Hanh Dich in Quy Phuong district. Parts of the proposed nature reserve Phu Mat were surveyed to assess distribution of elephants and the sao -la and included the forests of Khe Thoi in Tuong Duong district, Pu Noong in Con Cuong district and Cao Veu in Anh Son district. Reported incidents of human-elephant conflict were investigated in this province including areas in Quy Chau and Quy Hop districts, and Cao Veu in Anh Son district.

The surveys in Vu Quang Reserve were done in three parts. A reconnaissance survey for elephants and sao-la was carried out in November 1993. Based on the results of the reconnaissance more detailed census of elephants was carried out in January and March 1994. Detailed surveys for the sao-la and other large mammals were done between March and May 1994, and again from September to November 1994. These surveys included several visits to Kim Quang and Long Cao villages as well as visits to Huong Khe and Huong Forest Enterprise. Several weeks were spent surveying the uninhabited forests in the northern part of the nature reserve towards the border of Laos. Several locations were visited and assessed for suitability to erect a research

camp during January 1994. A temporary camp was set up at the site selected for the erection of the research camp and this was the base for the last phase of field work in Vu Quang (March-November 1994).

Elephant density and distribution

In order to obtain information on the presence of elephants, their past and present distribution in an area, two methods were used. First interviews of local hunters and other villagers were conducted to obtain subjective information on elephant distribution. To ascertain elephant distribution in the field reconnaissance surveys were carried out on foot using existing paths and roads, as well as cutting paths along random compass bearings. All walks were done at steady pace of approximately 2 km per hour. Signs of all large mammals were noted, in addition to paying particular attention to signs of elephants such as tracks, dung and feeding. Measurements were made of the circumference of the forefoot to estimate shoulder height of individuals and to infer from these their age. When signs of elephants were found, records were also made on the habitat and its condition. All signs of human activity encountered were recorded and particular attention was paid to this aspect in nature reserves.

In Vu Quang a detailed study was carried out to estimate the density of elephants using the indirect sampling technique described by Dawson & Dekker (1992). The method uses line transect sampling (Burnham *et al.* 1990) to estimate dung density, while data from the literature was used for two other parameters required to estimate elephant density, namely rate of dung decay and rate of dung deposition by elephants per day. Elephant densities are calculated using the program ELEPHANT (Dekker & Dawson 1992).

Human-elephant conflicts

To be able to assess the level and cause of human-elephant conflicts, a previously prepared questionnaire was used in interviews with the local people. Attempts were made to talk to the people who were directly involved. The actual location of conflict and the forests in it was surveyed to determine the quality of habitat and cause of conflict. Economic loss due to this conflict was assessed.

RESULTS

Elephant density and distribution

Nghe An Province

The total elephant population in the province of Nghe An is the highest found in northern Vietnam. However, as elsewhere in the country this provincial population is highly fragmented. Three distinct elephant populations have been identified. They are: the Quy Phuong population found in the forests of Thong Thu and Hanh Dich; the Phu Mat population found in the forests

of Khe Thoi and Cao Veu; and the Pu Huong population found in the forests that straddle the districts of Quy Hop and Quy Chau in the central region of the province. In addition elephants are found seasonally in the northern parts of Quy Chau district on the border to Thanh Hoa province. The distances between these populations are great (though not in terms of distances elephants can move) and the areas in between are not forested and have high human population densities. The possibilility of protected elephant corridors to link these populations, therefore, are non-existent.

Quy Phuong elephant population

The habitat available for the *Quy Phuong population* is small being between 50-70 km^2. This area is legally protected against logging and managed as a forest reserve by provincial authorities as it is the watershed for two major rivers. The habitat in this area is rich and diverse. Vegetation comprises mainly of primary evergreen and semi-evergreen forests, and mixed bamboo forests. Water is not scarce and the tall canopy provides adequate shade making this area highly suitable for elephants. The topography is undulating in the area which has an altitudinal range between 1000- 1200 m asl. This small patch of excellent habitat has a high biodiversity value. Floral diversity includes two endangered species of dipterocarp and 12 other tree species that are listed as threatened.

Based on elephant dung encountered in ratio to distance walked, measurements and distribution of tracks,the population is estimated to comprise between 15-20 individuals. While this density (0.3-0.4) appears to be quite high compared to other parts of Vietnam, compared to other parts of the Asian elephant's range this is a moderate estimate. The habitat available to the *Quy Phuong population* on the Vietnamese side is very small, but these forests are contiguous with Laos in the west, where they are quite extensive as seen by satellite images. So the *Quy Phuong population* is expected to be much greater, since on the Laotion side the topography is less steep and habitat extensive. The reason for the high quality of habitat in this area is obviously due to the logging ban imposed by the provincial authorities to protect this important watershed. However, some signs of illegal logging were recorded were recorded especially in the more accessible areas to the south near Hanh Dich commune. On the Thong Thu side, the protected forest is relatively inaccessible due to its steep ascent from 600 m, which is possibly the main (and only) deterrent against illegal logging!

The immediate vicinity of this patch of protected forest is inhabited by people belonging primarily to the Tai ethnic group. Shifting cultivation is way of life to these inhabitants and all forests close to or relatively accessible to the villages have been cleared for planting "dry paddy" which is a staple for the community. This makes the Thung Thu-hanh Dich forest a small is land surrounded by human activity, with no habitat contiguity on the Vietnamese side of the border.

The difficult access acts as a deterrent to hunters, but the scale of hunting that does take place poses the most immediate threat to faunal diversity of this small forest reserve. As the area is on the border to Laos , patrolling soldiers constantly hunt mainly as subsistence while on duty.

During the survey several gun shots were heard from the Laotion side where it is reported that the H'mong hunt regularly. It is reported that four elephants were poached on the Loa side during 1993. This could not be substantiated and no remains of elephant were recorded during the survey on the Vietnamese side. Even if this is not true, hunting is a potential threat for elephants and other large mammals in the area as the human expands in its immediate surroundings. Forest reserves or protection forests are primarily designated to prohibit logging; hunting is not a banned activity in such areas.

Phu Mat elephant population

The *Phu Mat population* is found in the forests of Khe Thoi in Tuong Duong district of Nghe An province. These forests form the western extremity of the proposed Phu Mat Nature Reserve. The reserve covers an area of 92,000 ha of forest and is found in the south of the province where it shares its border with Laos. It is located across the three southern districts of the province namely Tuong Duong, Con Cuong and Anh Son.

This large nature reserve is highly undulating and ha s an altitudinal range between 700 to 1,840 m asl. The north Troung Son mountain range acts as the natural international boundary between the two countries. Its shape and geography ensures a climatic range where precipitation increases sharply towards the east with relatively drier areas in the west.

Primary forests are found in the highly mountainous areas and cover an area of approxi mately 88,000 ha. While potentially this entire area is available as habitat for the Phu Mat population topography is a limiting factor where steep, rocky valleys are a deterrent to movement of elephants to the east. However a small, separate population of elephants is found in the eastern extremity of the reserve in Anh Son district.

The elephant population in Khe Thoi is substantial, and is possibly the largest single population in northern Vietnam. Based on frequency of elephant dung, tracks and feeding signs seen in relation to the distance covered during the survey, it is estimated that the Phu Mat population in Khe Thoi is at a minimum, 50 individuals. Signs of dung on peaks as high as 1,652 m asl (Phu Xam Liem) indicate a movement of elephant between Vietnam and Laos and the strong possibility that these elephants are part of a larger herd.

Habitat available for elephants is excellent in this part of the nature reserve, comprising a mixture of secondary and primary evergreen and semi evergreen forest and mixed forests with extensive stands of bamboo at lower altitudes. Water and shade are plentiful , while the local terrain is gently undulating. The forests in the area are a fair distance from human habitation, and while some illegal logging is taking place in flatter, accessible areas, it is not considered a threat to elephants. What is a threat however, is the massive collection of bamboo which is floated down in great masses, possibly seriously depleting the food resource of elephants. Gold panning is destroying the waterways and while this is not a direct threat to elephants, this does mean an influx of people and with it the threat of hunting.

There have been no reports of elephants being killed by people in this area and as such no conflict between people and elephants. The elephant population in the eastern extremity of the Phu Mat Nature Reserve in Anh Son district was found to be using the area between the upper Yen (a small river) and the hills to its north-west whose highest peak is 1343 m. The topography in this area is gently undulating and habitat quality in terms of contiguity and availability of food and shelter is assessed to be low.

Based on tracks and other signs it is estimated that the relative density of elephants in this area is fairly high. However no measurements were possible to estimate absolute density. It is evident that there is a lot of movement of elephants between several patches of forest that are found here. Fragmented habitat is causing increasing conflict between people and elephants in this part of the reserve. Although no one has been killed, elephants have destroyed sugar cane and paddy crops, and destroyed huts and mud houses. No evidence was found to suggest that this elephant population's range was contiguous with that found in the Khe Thoi area. Extensive highly undulating terrain, and in flatter areas large human settlements are factors that may constrain the movement of this small group of elephants towards the west. No evidence of elephants was found in the mid-region of the Nature Reserve, i.e. in parts of Con Cuong district it is reported that elephants were last seen here well over 20 years earlier.

Pu Huong elephant population

Habitat available for the Pu Huong population is highly fragmented and small. The forest area that is proposed to be made into a nature reserve is a forest enterprise with a small portion of protected forests to conserve the watershed in the area. The area demarcated for protection is only a proposal and includes vast areas of human population. The majority of people living in the area belong to the Thai ethnic group who practice shifting cultivation. This together with logging activities has further fragmented the habitat of the Pu Hong population.

The fragmented habitat is causing increasing human/elephant conflict in the area. Several cases of crop depredation and one case of human fatality were reported in Nam Son commune in Quy Hop district. Interviews revealed that crop raiding has increased since during the last two years. While previously elephants were only seen in this part of the district seasonally, a small population was reported to be resident in a small patch of mixed bamboo forest approximately two kilometres from the main village of the commune. From our field investigation (size of fresh tracks, dung and direct sightings) it is estimated that the group of elephants residing in this forest patch numbers between 5-8 individuals including a very young calf. Two elephants were sighted by the survey team, one of which was a tusker.

Interviews of villagers who had encountered crop-raiding elephants the previous night about 1 kilometre from the forest patch revealed that they saw 7 individuals. Fortunately neither the hunt or the people in them were harmed, although the crop was destroyed extensively.

The incident of human fatality was a case of accident when an old woman guarding a rice field along with her husband heard elephants and ran out to chase them with a fire torch in her hand. Approximately 10-15 ha of hill rice were destroyed by this herd of elephants during the year 1993. No compensation was given either for the case of human fatality or crop depredation by the provincial authorities. More incidents of human - elephant conflict have been reported during the year 1994 and were investigated by us in the same district but different commune(Mon Son) where elephant presence was reported for the first time, an indication that this fragmented herd is moving around in search of suitable habitat Several human abodes have been desroyed by crop raiding elephants, and the lack of experience of the local peple in dealing with elephants will invariably lead to human deaths if proper precautions are not taken. This experience is very reminiscent of how the situation escalated in southern Vietnam where several people were killed by elephants.

It was estinated that a small herd of four elephants recently destroyed harvested crops, and in theprocess destroyed several houses, and killed one old woman just before the lunar new year of 1995. In retaliation the villagers have killed three elephants.

Ha Tinh province

There are primarily two areas that have elephants in this province. The forested areas in Huong Khe district and in the Ho Khe Go Nature Reserve, and a small population in the Vu Quang Nature Reserve. Interviews with provincial authorities in Ha Tinh revealed that there has been an in creasing number of incidents of conflict between people and elephant, especially in Huong Khe district adjacent to Vu Quang Nature Reserve. Reportedly 48 elephants have been hunted during the previous four years, seriously depleting the populating in the province.

Extensive interviews with hunters has revealed that elephants are still reguarly killed for ivory, meat and hide in the province. Hunting expeditions are conducted across provincial and international borders, deep into adjacent forests in Laos and even as far south as Cambodia. These hunters are primarily former soldiers who are very familiar with the lay of the land, and have heavy weapons. A number of them have reportedly got killed during their forays into neighbouring countries.

Vu Quang elephant population

Extensive reconnaissance surveys in Vu Quang during two periods o f field work revealed that only a small portion of the Reserve is occupied by elephants. Evidence of elephant presence in Vu Quang was found only in the Dan Thai area (north-eastern parts of the he reserve) in degraded, secondary mixed bamboo forests, encompassing about 80-1000 km^2. As part of the reconnaissance fresh tracks of elephants were followed. After two days of tracking part of a herd was sighted in thick forests very close to a village. A second sighting of elephants in a different location about 2 km away from the first site revealed a mother and young calf, indicating that

the population is breeding and possibly a second herd. Based on the reconnaissance a detailed systematic dung count census was designed for Vu Quand and was carried out in March 1994. Transects were laid out at 0.5 km intervals using a 1:50,000 topographic map. Roads and rivers on the north-south axis were used as the baseline and transects ran at right-angles to these.

A total of 26 transects of two kilometres each was traversed during which a total of 86 samples were seen and measured in an average strip width of 15 metres, indicating the degree of visibility in the forest.Dung distribution indicated that the seasonal range of elephants during and immediately prior to the census (i.e., period of at least two months prior to census- based on age of dung encountered) was limited to approximately 40 km² in the central and western portions of the annual range identified during the reconnalssance.

It was impossible to find the requisite sample size to conduct the dung decay rate experiment. Elephant presence was extremely hard to detect and when seen it was only glimpses as the vegetation was very dense, and the elephants were very wary of human presence. These factors did not enable us to follw them to estimate rate of dung deposition. Therefore estimates for these parameters were taken from the literature, from areas as closely representative of Vu Quang in terms of climate and habitat. Data analysis reveals that the mean density of elephants in Vu Quang is 0.38/ km2 (0.2 - 0.56/km²), and by extrapolation this would give a population estimate of between 8-22 individuals with a mean of 15 elephants. There were no reports of elephants damaging crops or people hunting elephants in the Nature Reserve, although it is reported that people often encounter them close to their villages.

OTHER LARGE MAMMALS AND BIRDS

Large mammals

In all 37 mammal species were recorded either directly, or through indirect evidencesuch as tracks, dung/pellets, hunting trophies, carcasses and skins. Significant records of some large mammals are described below.

Nghe An Province

The forest reserve in Thung Tu & Hanh Dich in Que Phoung district comprises excellent habitat and has a high biodiversity value. Floral diversity includes two endangered species of dipterocarp and 12 other tree species that are listed as threatened.

During the survey the term came across live, remains or tracks and signs of 26 mammal species including globally threatened species such as *Selenarctos thibetanus, Cuon alpinus.* Signs of *Bos gaurus* were abundant, while *Hylobates leocogenys* were frequently heard and sighed on two occasions.

In Khe Thoi of Phu Mat Nature Reserve a troop of 12-15 individuals of Phayre's langur *(Presbytis phayrei)* were sighted and observed for more than 30 mins. The troop included serveral young individuals. In Con Cuong district, several skulls of *Megamuntiacus vuquangensis* were found during field work in October/ November 1994.

A new deer which was found by the FIPI survey team in Phu Mat, not described but named the Slow-running or Mr. Chinh's deer, has been confirmed as not being a new species. DNA tests have revealed that it is a sambar deer. The shape and size of antlers which were the characteristics that set this animal apart are apparently an aberration.

Vu Quang

Interviews with hunters and inspection of trophies in Kim Quang village in Vu Quang Nature Reserve revealed that there were two species of *Muntiacus* species found in the area, the second one being of a very large size with large antlers on short pedicels. Serveral skulls were collected and after comparative measurements and DNA examination it was described as a new species. Further analysis juistified the creation of a new genus. A description was published of the new animal which was named *Megamuntiacus vuguangensis*. Hunting data collected reveal that *Megamuntiacus vuquangensis* is as abundant as the smaller *Muntiacus muntjak* found in the area, but found in slightly higher altitudes. During the snaring season of 1993 / 94 we have records of 27 barking deer caught, of which 13 were *Megamuntiacus*. The only other area where two sympatric barking deer speciesare found is in Borneo.

Further surveys done in provinces south of Ha Tinh have shown that the geographic range of this new species extends beyond the Hai Van pass. During the same period of initial "discovery", and quite separately, a second scientific team in Laos found evidence of this species. Two animals were found in captivity in Laos and photographed.

At the end of the first phase of field work in 1994, a *Megamuntiacus vuquangensis* adult male was sighted by two of us during the day, and observed for about three minutes in the southem part of the Reserve. A significant population of gaur *(Bos gaurus)* was recorded in Vu Quang in its south-eastern areas on the border to Laos. Fresh signs of feeding, tracks and dung revealed at least 20 individuals in one area.

An unusual civet pelt seen in December 1993 in the army camp at Kim Quang was found to be that of Owston's civet *(Chrotogale owstoni)*, a globally threatened species. This is the first record of this species in Annam, and a significant range extension to the south.Gibbons *(Hylobates leucogenys)* were heard frequently in most parts of the core area of Vu Quang, and one sighting confirmed that the subspecies found in this area is *H. l .siki*. Interviews with hunters revealed that two tigers had been snared in the last year at Vu Quang. Pelts, bones and claws were all sold to the Chinese market.

Threatened birds

A total of 222 bird species were seen during the field work. Forty-two new species of birds have been added to the list for Vu Quang Nature Reserve. Significant sightings and records are reported below. In the Khe Thoi area of Phu Mat Nature Reserve five species of hombill were seen namely, Great hornbill, Wreathed hombill, Oriental Pied hornbill, Brown hornbill and most significantly the Rufous - necked hornbill. A male and female of the last mentioned species were seen on the ridge - trail going up to Phu Xam Liem at approximately 750 m asl. This is a globally threatened species with a very restricted range and this record is a significant one.In Vu Quang the significant record additions were of three globally threatened or rare endemic species, namely Red-collared woodpecker *(Picus rabien)* , Short - tailed scimitar babbler *(Jabouilleia danjoui)* and Yellow-billed nuthatch (*Sitta solangiae*).

THREATS TO LARGE MAMMALS AND THEIR HABITAT

Several major threats have been identified that could affect elephant and other large mammal populations and their habitat in areas surveyed. Habitat and elephant population fragmentation in the central Nghe An and Ha Tinh provinces will contribute to the increase in human / elephant conflict, especially as these vulnerable elephant populations are found outside the protected area system.

The increasing number of incidents of human-elephant conflict occurring in the central districts of Quy Chau and Hop in Nghe An province. So far two people have been killed in different areas, and in retalition three elephants have been slaughterred. This level of conflict will make this already fragmented population very vulnerable to extinction.

Serious mining for gold in the Khe Thoi river causing disturbance and degradation in a very impotant area for elephants in North - central Vietnam. People who are involvedwith the mining are persons living outside the buffer zone of the nature reserve and belong to the majority ethnic community Kinh. In addition to indiscriminate mining, most of these people engage in hunting, with heavy weapons. Although no evidence was found of elephants hunting, other endangered species shot were regulary encountered, e.g. gibbons, red-shanked douc langurs. If elephants are encountered, they would not be spared.

Serious hunting and snaring by the local communities in Vu Quang of large mammals, if not controlled, will drastically reduce their densities very quickly. On average every family (there are 4000 of them in Vu Quang) sets 30 snares, and catch about three large mammals including sambar, wild boar, barking deer, serow, saola, tiger and leopard. A resident wildlife trader in Vu Quang provides the link between local people and the market for smaller mammals and those valuable for trade such as gibbons, Malayan and Asiatic black bears, different species of which are caught alive for trade to China. In addition, the collection of turtles, pangolins different species of snake, large birds such as hombills, was regularly encountered.

CONCLUSION

The survey method used to collect density information on elephants, the dung count indirect method, is now established and widely used in rainforest areas where direct signting elephants is extremely difficult for several reasons. The indirect method is useful in areas with low densities of elephants and can provide adequate data for analysis after relatively small sampling effort, when compared to the amount of sampling that would be required if elephants were to be sighted directly. However because two other parameters have to be estimated (dung decay and deposition rate), and both of them are critically affected by local climatic and micro-habitat conditions, these have to be repeated in each site. Again, both these parameters need relatively large sample sizes and in Vietnam it has yet to be done in any site. The major difficulty being elephants are found in such low densities that adequate samples cannot be located for monitoring. The best that can be done in this situation is to use published data from other locations that resemble, as closely as possible, the site wher a census is being undertaken. Although not entirely satisfactory, resutls from such an exerise are far more acceptable than population estimates based on local information which cannot be substantiated or ground truthed.

There is no doubt that the total population size of elephants in Nghe An province is the best remaining in northem Vietnam. Although this provincial population is fragmented the habitat available to two of them is more extensive because it stretches into neighbouring Laos, thereby making them viable units. However, these two cannot be linked by a corridor because of the dense human populations and lack of habitat that can be considered to make corridor. The discovery of the Phu Mat population in Khe Thoi is particulary encouraging for several reasons. Its estimated size is one of the largest found in Vietnam, and the quality of habitat available to it on the Vietnamese side as well as its contiguity in Laos would certainly make this one of the most viable populations in the long-term. Additionally, these elephants are found in an area that is already earmarked for protection and management under international funding. This together with the relative inaccessibility into the elephant areas would be make this population safe. Once active management of the protected area comes into force, intensive management of the species would ensurre that this elephant population survives into the next century.

The worrying factor of the elephant population in Nghe An is the one found in the central parts of the province. There has been amarked increase in the number of cases of human- elephant conflict throughout the year. The amount crops destroyed both in the fields and after harvest has risen exponentially. The situation is worsened because elephants are moving around at random and are seen in areas that they have not been sighted in before. There is a very real danger of more people getting killed simply because they are not aware of how to react to the presence of elephants in their area. Constant harassment of the elephants by people when they are sighted has made the elephants lose their fear of man and made them more aggressive.

The elephant population remaining in Ha Tinh is very small and fragmented, with possibly no hope for long-term survival. However, the elephants in Vu Quang will be protected under the management of the nature reserve and is an important compnent of the faunal diversity of the area. The positive sign is that this population is in breeding condition and there is hope that given

adequate protection and no elephants are killed this population will increase in number and widen its distribution. All the information collected in these surveys will be used when the Ministry of Forestry and WWF together put together a species survival plan for the elephant.

Population pressures in the form of hunting is minimal in the Phu Mat area of Nghe an province as the human density is relatively low in the nature reserve's buffer zone. While the people living in the buffer zone (ethnic minority communities) do go out hunting in areas close to their villages, a far greater number of individual animals are hunted by people who are entering the reserve from the districts. A vast amount of people were found harvesting bamboo and mining for gold and as an additional activity hunting. People living in the buffer zones, at least in some parts of Phu Mat, are carrying out illegal logging for timber trade, seriously depleting and degrading habitat quality. In Vu Quang, however, large mammal diversity and density is being seriously affected by the very great hunting pressure exerted by the people living in the buffer zone. A lot of the hunting is done for purposes of trade and ways to combat this must be a priority when management activities begin.

RECOMMENDATIONS

* Central and provincial authorities together with WWF should as, a priority discuss and consider pragmatic solutions to the escalating conflict between people and elephants in the central district of Nghe An province.

* In order to ensure the long-term survival of the Phu Mat elephant population, active species management measures must be considered by the relevant authorities and included in the management plan of the reserve.

* In conjunction with provincial authorities of elephant range state in Vietnam and the central Forest Protection Department, the Elephant Action Plan for Vietnam should be completed as quickly as possible and funds sought for implementing the Action Plan.

* An education and awareness campaign should be launched provincially on how to deal with human-elephant conflict. While solutions are being found, in the interim people affected should be adequately compensated, and law enforced when people are caught killing elephants.

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