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HISTORICAL REVIEW OF HUMAN-ELEPHANT CONFLICT IN PENINSULAR MALAYSIA

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ABSTRACT

Human-wildlife conflict has become a major issue in wildlife conservation which has turned to be a global conservation priority. Conflict with wildlife has caused direct and indirect effects to both humans and wildlife populations. In Peninsular Malaysia, one of the major wildlife conflict issue is human-elephant conflict (HEC). HEC and habitat loss has affected the distribution of elephants in Peninsular Malaysia. HEC started to become serious in Peninsular Malaysia when mass forest conversions were carried out for large scale agriculture programs. Millions of ringgits were loss due to conflict with elephants and the problem continues to persist. Even until today, elephants are facing the threat of habitat loss which would certainly cause escalation of HEC incidents. In term of direct intervention by the wildlife authority to mitigate HEC, there are few main actions that could be taken depending on site suitability and the elephant population involved. Hence, it is important to understand the causes of HEC in order to reduce HEC incidents in Peninsular Malaysia.

Keywords: HEC, HWC, conflict, forest loss, wildlife, elephant

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INTRODUCTION

Human-wildlife conflict occurs when wildlife and human are present in the same area and forced to share the limited resources available (Raihan Sarker & Røskaft, 2010). Conflict incidents increase when forces such as human population, land use transformation, forest degradation and fragmentation escalate (Sukumar, 2003). HEC is also associated with the behavioural pattern of elephants in search for food or other resources such as water and minerals (Hoare, 1999). In many parts of the world, human-wildlife conflict has become a major concern in conservation biology that warrants urgent attention (Sukumar, 1991; Osborn & Parker, 2003; Treves & Karanth, 2003). Generally, human-wildlife conflict incidents involve crop raiding, livestock depredation and human mortality where the latest is the least common but the most controversial (Woodroffe *et al*., 2005).

Besides the direct economic loss, human-wildlife conflict causes indirect economic loss in term of money and time spent to mitigate the conflict. Furthermore, the affected local communities may develop negative attitudes towards conservation policies (de Boer *et al*., 1998; Woodroofe *et al*., 2005). Among the conflict causing animals, not all wild species get as much attention and mixed emotions from humans as the elephants. Their large size, high level of intelligence and complex social behaviour attracts admiration, while their tendency to raid crops and becoming aggressive instils fear and aggression (Fernando *et al*., 2008).

Human-elephant conflict (HEC) has occurred in many countries which include India, Sri Lanka, Bhutan, Bangladesh, Nepal, Indonesia, Malaysia, Vietnam and Cambodia (Fernando & Pastorini, 2011). HEC issue is increasing and becoming a major concern among conservationist and state authorities. In most cases, elephants extend their range into human dominated areas to feed on a wide variety of cultivated food and cash crops. Sometimes these elephants damage food stores, water installations or fences and barriers, and occasionally cause injury or fatality to human (Fernando *et al*., 2005). Thus, this mammal species causes great fear among people who live in elephant range areas and perceived as a major threat to livelihood and lives (Naughton-Treves, 1998).

Currently, HEC pose a difficult challenge to wildlife managers who must face the trade-off between the interests of affected people and the elephants. Hence, to better understand the issue that will enable better management of HEC, this paper will examine elephant populations now and in the past as well as historical background of habitat loss and HEC in Peninsular Malaysia. Finally, this paper reviews the effectiveness of mitigation steps that have been adopted by the

authority to mitigate HEC in Peninsular Malaysia and provide recommendations in mitigating HEC in the country.

Elephants in Peninsular Malaysia

The Asian elephant (*Elephas maximus*) is categorised as 'Endangered' by the IUCN Red List status (IUCN, 2014). Meanwhile, Department of Wildlife and National Parks has listed it as 'Vulnerable' in the Peninsular Malaysia Red List (DWNP, 2010b). The Asian elephant is also listed in Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In term of protection, in 2010 the status of elephants in Peninsular Malaysia was elevated from 'Protected Species' in the 1972 Wildlife Protection Act to 'Totally Protected Species' in the new Wildlife Conservation Act 2010. These statuses show that the Asian elephant is in a threatened situation with an estimation between 1564 to 1674 individuals left in Peninsular Malaysia (Saaban *et al*., 2011) (Table 1).

Historically, during the 19th century the Asian elephants were found throughout Peninsular Malaysia (Olivier, 1978). In 1898, elephants were even observed in the Kuala Lumpur area (Hubback, 1905) which is now considered as a concrete jungle. In the early 1900s, Pahang and Negeri Sembilan were reported to have the highest elephant population whereas Perak and Selangor to have the least. However, there were no elephant population reported in the Penang Island in the 1900s. By 1940s due to forest conversions and culling of elephants in mitigating HEC, elephants had almost disappeared from the west coast and certain areas south of Peninsular Malaysia where forest conversion had started the earliest and most rapid i.e. Selangor, Perak, Negeri Sembilan and Johor (Olivier, 1978). It was estimated that the remaining elephant population then was less than one tenth of the original population (Hubback, 1942). The last elephants from Perlis and Selangor were captured and translocated to the Belum forest in Perak in 1991.

As of 2011, the remaining elephant populations are found in areas where large tracts of forest still exist except a few states where the elephants have locally extinct (Saaban *et al*., 2011). Most of the elephant herds have been recorded in the forested areas in the eastern side of the Titiwangsa range; i.e. in the states of Pahang, Kelantan, and Terengganu. However, there could be more elephants in these three states due to the translocation of hundreds of conflict elephants to the northern and eastern states, which have taken place for decades (Daim, 2002). States like Johor, Kedah and Perak show moderate number of elephants. Negeri Sembilan will be a new addition to the group of states which have no

more elephants i.e. Perlis, Penang, Selangor and Melaka when the last elephant from the state was captured and translocated by the Department of Wildlife National Parks after it was reported destroying crops by villagers in February 2011 (Saaban *et al*., 2011). In areas where elephants still roam and the wildlife habitat borders agricultural sites, HEC incidents continue to be reported.

Table 1 Latest estimation of elephants in each state of Peninsular Malaysia (Source: Saaban *et al*., 2011).

State	Number of elephants
Perlis	0
Kedah	50-60
Perak	230-280
Kelantan	250-300
Terengganu	120-140
Pahang	150
Selangor	0
Negeri Sembilan	0
Johor	113*
Taman Negara	631*
Total	1564-1674

* based on dung count estimates by Wildlife Conservation Society (WCS, 2008; 2009)

Habitat loss in Peninsular Malaysia

Many studies revealed that this region has the highest rate of deforestation among the tropics (Sodhi *et al*., 2004; Sodhi & Brook, 2006). Due to the forest conversions and the ever increasing demand for land, almost all lowland habitats which historically were available in the past for elephants to roam have been eliminated (Leimgruber *et al*., 2003). According to Clements *et al*. (2010), habitat loss remains as one of the major threats in conserving elephants in Peninsular Malaysia. Habitat losses have also been identified as the main reason that causes HEC (Sitati *et al*., 2003; Linkie *et al*., 2004; Rood *et al*., 2008).

The economic development in Malaysia has highly been contributed by agricultural activities but its growth has caused a great loss of forested areas in Peninsular Malaysia (Gillis, 1988). Until the early 19th century, nearly the whole of Peninsular Malaysia was still covered by natural habitat (Maxwell, 1907). However, during the early colonial period, forest destruction in Peninsular Malaysia started with the expansion of tin mining and rubber estates, which have caused the drastic forest loss (Kathirithamby-Wells, 2005). By the 1940s about 102,000 km^2 of Peninsular Malaysia was covered by forest (Kathirithamby-Wells, 2005). But, since the country gained independence in 1957, large tracts of lowland dipterocarp forest, which is the preferred habitat for Asian elephants and other large mammals, were rapidly converted to agricultural plantations (Aiken & Leigh, 1985). Vast areas of the forest were converted to agricultural use by the Federal Land Development Authority (FELDA), Federal Land Consolidation and Rehabilitation Authority (FELCRA) and other state agencies such as Southern Kelantan Development Board (KESEDAR) and Central Terengganu Development Authority (KETENGAH) (Aiken & Leigh, 1985).

According to Aiken and Leigh (1985) and Jomo *et al*. (2004), monocultures of oil palm and rubber are both the two most important crops for commercial purpose that has replaced vast areas of species rich forests in Peninsular Malaysia. From only 113 km^2 in 1904, rubber plantations increased tremendously to 4,100 km^2 in 1920 (Kathirithamby-Wells, 2005). By 1934, about 8,000 km^2 of natural forest were converted into rubber plantations and the area has almost doubled in 1940 (Figure 1). By the 1970s, when oil palm plantations started to be established in Peninsular Malaysia, areas planted for rubber stopped expanding. From only about 500 km^2 in 1975, oil palm plantation area in Peninsular Malaysia had increased to almost 30,000 km^2 in 2004 (Agriculture Department of Malaysia, 2008). It is expected, with the growing global demand for edible oils, lowland natural forests will continue to come under pressure for conversion (Corley, 2009). Agricultural development do not only affects the Asian elephants by destroying their habitat, but also makes forest and rural areas more accessible to poachers, disturbs the animals' movement around forest edges and triggers an increase in elephant crop raids (Nyhus & Tilson, 2004; Clement *et al*., 2010).

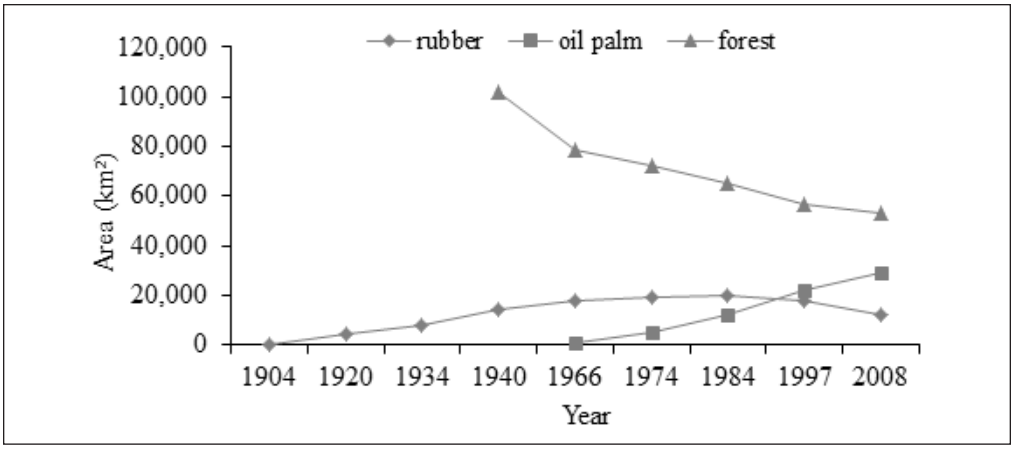

Figure 1 Trend of forest cover change in Peninsular Malaysia compared to rubber and oil palm plantation. Data for forest cover is only available starting from the year 1940 (Sources: Kathirithamby-Wells, 2005; Agriculture Department of Malaysia, 2008).

Starting in the 1990s, conversions of large forested areas in Peninsular Malaysia have been more for other land uses besides large scale agriculture; mostly for housing and urban areas (Abdullah & Hezri, 2008). The development of hydroelectric dams as an example has resulted in the loss of wildlife habitats; their construction involve extensive submergence of land under natural forests (and unnecessary logging of surrounding catchment areas) in Peninsular Malaysia (Sharma, 2008). Economic growth also brings increased road densities (Wilkie *et al*., 2000). According to Fahrig and Rytwinski (2009) roads have a significant adverse result on animal abundance and species richness, especially for large mammals. For animals like elephants, besides intensifying forest degradation and loss, the constructions of roads could also obstruct their movement, cause behavioural avoidance of traffic and habitats along the roadside, increase the risk of accidents and road kills, and could potentially lead to increased poaching (Clements *et al*., 2014).

Together with the increase of human population and continuous economic demand, the extent of natural forest available for elephants has been greatly reduced. This has resulted a greater pressure towards the conservation of elephants is Peninsular Malaysia as well as resulting higher incidents of HEC in the country.

The history and current scenario of human-elephant conflict in Peninsular Malaysia

In Peninsular Malaysia, HEC has started even before the mass forest conversion took place. The indigenous people were among the first to experience crop damage by elephants when they were practicing shifting cultivation (Schebesta, 1973). But when more habitat conversions took place, HEC cases intensify. In the late 1800s, elephants were reported being attracted to durian orchards in Selangor (Kathirithamby-Wells, 2005). HEC was also recorded from the early 1900s in Pahang where elephants destroyed banana and coconut plantations (Maxwell, 1907). During the same period, elephants were mainly a problem to paddy fields and rubber plantations (Wildlife Commission of Malaya, 1932). In general, elephants were only identified as pests in Peninsular Malaysia when rubber plantations rapidly replaced natural forest in the early 1900s (Olivier, 1978). However, as crop commodities in Peninsular Malaysia diversify, HEC affects other crops too. Elephants started to destroy oil palm when the plant was introduced to Peninsular Malaysia in 1930 (Kathirithamby-Wells, 2005). HEC started to become more serious in the 1950s when more and bigger agricultural based activities were introduced in Peninsular Malaysia. The conflict became worse in 1970s when more lowland forest were opened for agricultural schemes by federal and state land development schemes (Saaban & Othman, 2006).

Loss of habitat due to agriculture attracted displaced elephants to new feeding areas where the elephants could feed on rubber sapling, oil palm, banana and other planted crops. Elephants that roam near the forest fringes, adjacent to plantations, would find that these plantations offer higher abundance of potential food (Saaban *et al*., 2011). This would certainly give the elephants higher benefits; getting more food with less effort.

The Game Department raised concerns back in late 1920s about people who were killing conflict causing animals such as seladang, wild pigs, sambar deer and elephants, which they believe being a threat to their welfare and activities (Wildlife Commission of Malaya, 1932). During this period, there was no legal protection given to elephants. Before 1960, due to inadequate wildlife protection and conservation efforts, number of elephants in herds had been greatly reduced to ensure large plantations and their economic well-being were protected. Only by 1960, the law adequately protected the species in Peninsular Malaysia (Hislop, 1961).

Crop-raiding elephants have caused large financial losses to plantation owners. As an example, between 1925 until 1930, Plus Valley plantation in Perak experienced a loss of £200,000 which is currently equivalence to RM 1,318,000 (currency

exchange rate used; 1£ equals to RM6.59). This was really a huge loss to endure during that period. Another example, between 1975 and 1978 FELDA, FELCRA and other private companies reported that they experienced over RM78 million in losses due to HEC (Monroe & England, 1978). Table 2 shows the number of trees damaged by elephants in FELDA and FELCRA plantations in the 1970s. Most of the affected plantations were in Pahang, as most of the new plantations were established in the state. With the cost of RM25.00 for an oil palm tree and RM3.00 for a rubber tree in the 1970s, the estimated lost calculated was RM3.5 million for FELCRA and RM43.5 mil for FELDA (Zainol Rashid, 1979). Only in the early 1980s, the loss started to decline when electrified fence was introduced to assist in mitigating the problem of elephants raiding plantations.

Table 2 Number of trees damaged by elephants in the 1970s in FELDA, FELCRA and other private companies (Source: Jalaluddin, 1979)

State	Agriculture schemes affected	Number of trees damaged		
		Rubber	Oil Palm	Total
Pahang	55	328,361	811,211	1,139,482
Johor	15	-	400,470	400,470
Terengganu	5	-	103,369	103,369
Perak	3	-	81,016	81,016
Total	78	328,361	1,395,976	1,724,337

Currently HEC is considered as one of the major wildlife conflict issue in Peninsular Malaysia, second after the long-tailed macaques (Saaban *et al*., 2011). The most HEC affected areas are villages and small-scale oil palm plantations. Johor, Pahang, Kelantan, Terengganu, Perak and Kedah are the states that experience HEC incidents (Saaban *et al*., 2011). Generally, in recent years records show that the numbers of HEC reports show an increasing pattern from 2001 to 2009 (Figure 2). Clements *et al*. (2010) reported that from 2001 to 2007, in five states within Peninsular Malaysia that encompass most of the confirmed elephant habitats (Perak, Kelantan, Terengganu, Pahang and Johor) there have been an 8-22% increase of HEC incidents every year. However, the reported incidents decreased in 2010 and 2011. In term of monetary lost in the recent years due to HEC, between 2005 and 2010 the calculated lost reported was approximately RM 18.8 million for the whole Peninsular Malaysia (Saaban *et al*., 2011). However, this data only estimated the amount of the actual lost

which didn't include other hidden costs such as opportunity cost, delay cost and replanting cost of the affected crops.

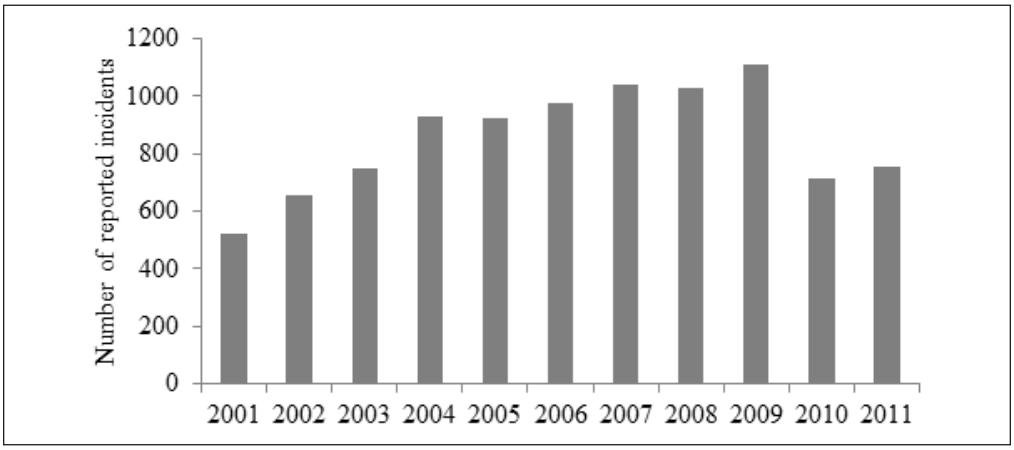

Figure 2 Number of reported HEC incidents in Peninsular Malaysia (Sources: MNRE, 2007; DWNP, 2007, 2008, 2009, 2010, 2011)

A new emerging threat in Peninsular Malaysia causing habitat loss is the clearance of areas within selectively logged forests in Permanent Reserved Forests (PRF) for Latex-Timber Clone (LTC) rubber plantations. LTCs are basically rubber trees that provide high latex production and yield timber (Tan, 2009). This type of monoculture plantation may eventually take over natural forest as timber resources in the remaining logged forests of Peninsular Malaysia continue to decline (Aziz *et al*., 2010). From 2004 to 2010, the total area of PRF designated for LTC had an increase from 23.17 km^2 to 224.01 km^2 a nearly ten-fold increase (Forestry Department of Peninsular Malaysia, 2013). By 2013, a total of 403.72 km^2 of the rubber clone have been planted in Peninsular Malaysia. Among all the states that have planted LTC, Kelantan has 165.36 km^2 of LTC plantation which is about 41% of the total LTC planted in Peninsular Malaysia. As a matter of concern, in 2011 the state of Kelantan has actually demarcated 1,993.52 km^2 (32%) of the total 6,230 km^2 of PRF for LTC plantations (Kelantan Forestry Department, 2011). Indeed, the Malaysian government has established a target of 3,750 km^2 of timber plantations for the year 2020 (Tan, 2009). Areas currently scheduled for conversion in Peninsular Malaysia include those identified as important habitats and key ecological corridors for important species such as the Asian elephant. Apart from diminishing forest biodiversity, the expansion of plantation monocultures would also lead to increased HEC.

Today, besides the actions taken by the authorities to mitigate HEC, local communities are still discreetly killing conflict elephants as what have the farmers in the past did. Both the actions would certainly effect the population of elephants. A study in India has shown that the impact of elephant killing due to HEC via shooting or electrocution carried out by farmers in protecting their crops; combined with the effect of poaching has significantly caused decline in elephant population (Sukumar, 1989). The same pattern was also reported in Africa in 1997 where killing of elephants due to HEC was as same as the level of mortality due to ivory poaching (CITES, 1997).

Human-elephant conflict mitigation in Peninsular Malaysia

As HEC continues to happen, the most important task for the wildlife authority is to take actions in mitigating the conflict. Various types of HEC mitigation steps are available and have been implemented to reduce conflict incidents. Some of these mitigations are only for short-term solution while others have long-term benefits. The effectiveness of these mitigation steps also varies, depending on the site as well as the conflict causing elephants. In Peninsular Malaysia, the major mitigation steps are as follows:

Culling

During the colonial period, elephant killing was the main strategy to reduce HEC. Not much elephant catching/trapping was done as there was no one trained in the Game Department to carry out the duty and it was then easier to kill elephants that destroy crops. Elephant killing has drastically changed the distribution and number of elephants in Peninsular Malaysia. As an example, 96 animals were killed by the department between 1948 and 1969 in Perak (Khan, 1969). Medway (1965) recorded that 127 elephants were killed by the Game Department from 1960 to 1963 for the whole peninsula. Up to 1974, elephant killing was still chosen by the Game Department as the main method to mitigate HEC. The annual rate of 15 to 20 elephants being killed by the Game Department continued until 1970 (Olivier, 1978). Between 1970 and 1976, number of elephants killed was reduced to 36 elephants as the Game Department started to focus on conservation. Nevertheless, there was still pressure to the department to continue elimination of pests to crops. In response to this, the Game Department initiated the Elephant Welfare Unit which was in charge of translocating conflict elephants.

Nowadays, culling is the last option taken in mitigating HEC. It is important to note that culling would only be effective in mitigating HEC if the whole heard is being eliminated. If the purpose of culling is just to reduce the number of

elephants in a herd, the conflict caused might only stop for a while before continue recurring. Culling of elephants should not be taken as the main method to mitigate conflict. It has been recorded that lethal control have caused extinction in few species. As examples, the marsupial wolf (*Thylacinus cynocephalus*) (extinct in 1939) and the Falkland Island wolf (*Dusicyon australis*) (extinct in 1876) were totally extirpated due to farmers retaliating by killing the conflict animals (Woodroffe *et al*., 2005).

Trenches as barriers

To deter elephants from coming into plantations, some plantation owners choose to dig trenches. These trenches were dug at borders between plantation plots and elephant habitats. However in wet conditions such as in Peninsular Malaysia, trenches are subtle to failure due to soil erosion. Besides that, waterlogging in the trenches and obstruction of rock boulders in digging up the trenches have made it more difficult. There were also reports of elephants using their front feet to dig soil, partly fill in the trench, and walk across into the plantation (Sukumar, 1989). Due to the challenges, ineffectiveness and the high cost involved in maintaining trenches, FELDA stop digging trenches in their plantations (Blair & Noor, 1979).

Elephant drive

Elephant drive is the term generally used which means to chase elephants that are found in human areas back to their natural habitat. It usually involves wildlife rangers (sometimes includes villagers) making noise to frighten the elephants and directing them to a certain direction. It usually involve making noise through shouting, burning firecrackers and using their gun shooting into the air. Currently this technique is the most widely used by the Department of Wildlife National Parks staffs (pers. obs.). Upon getting reports from the locals, wildlife rangers would wait at strategic locations within the conflict site waiting for the elephants at night. Upon seeing the elephants, these rangers would start the elephant drive. Result of this mitigation varies depending on the site as well as the conflict elephants and it only provides temporary solution.

Electrified fence

According to Nelson *et al*. (2003) electrified fences have been perceived as the best solution in mitigating HEC. However, it has been shown that these fences would only work if it is planned properly and has a good maintenance system in place. According to Monroe and England (1978), electrified fencing has been used to deter elephants entering plantations in Peninsular Malaysia since 1940 at different scales and not all the fences worked successfully. Cost for erecting

an electrified fence system varies depending upon materials and sophistication of design. In 2009 and 2010, Saaban *et al*. (2011) reported that about RM4.9 million was spent in Perak, Kelantan and Johor to erect 95.3km of electrified fence. More recently, the Department of Wildlife National Parks staffs have allocated RM1.5 million to erect 27 km of electrified fence in Pahang to stop elephants entering villages (DWNP, 2015).

Even though the electrified fence is very costly and seems effective, there have been times when elephants could still find their way through the electric fence into plantations. It was shown in the Air Banun Resettlement, Gerik in the state of Perak in 2012 where elephants could still come into human areas even though the area has been fenced. To be successful, it is important for such electrified fence to be a part of an integrated HEC management strategy with proper maintenance and management. Without these, all the money invested would just be wasted.

Capture and translocation

The Elephant Welfare Unit was formed to capture and translocate elephants from conflict areas. During the early days of formation, the unit was unable to fulfil all the needs for translocation of elephants in the whole country. It was estimated, it costs up to RM40,914.40 to capture and translocate one elephant (DWNP, 2006). From 1974 to 2010, Department of Wildlife National Parks has captured more than 600 elephants from all over Peninsular Malaysia in mitigating HEC (Saaban *et al*., 2011). Most of the elephants were translocated to Taman Negara National Park, Belum-Temengor in Perak, Endau Rompin in Johor, and Sungai Deka Elephant Sanctuary in Terengganu.

When elephants are captured and taken out from a population, the smaller population left in the original habitat would have a higher risk of extinction due to demographic, environmental and genetic instability (Sukumar, 1989). A population that had become smaller would also face the consequence of inbreeding depression that may include lowered fertility, higher juvenile mortality, and depressed growth. Based on experience with domestic mammals, Franklin (1980) recommended that a minimum of 50 breeding individuals need to be maintained to minimize the risk of inbreeding. However, due to monitoring limitations, the minimum number of elephants in different populations in the country is not known. Due to translocations, elephants have gone extinct from the Krau Game Reserve as well as from the state of Perlis, Selangor and Negeri Sembilan when the last elephant from each site was captured and translocated.

In incidents where HEC is caused by a herd of elephants and translocation is required, it has been recommended that the whole herd is to be translocated (Sukumar, 1989). Before translocation can be undertaken, preliminary studies of the social structure of the elephants need to be conducted. If a male is decided to be translocated, it should be done in together with a male to areas where elephant herds already exist and established. However, choosing which animal to be captured is a big challenge in the forest of Peninsular Malaysia as most elephants are captured by chance due to the difficulty in choosing the animals, except lone bulls which are known to destroy crops. If the objective of translocation is only to reduce the elephant number in an area, the crop raiding issue might not be mitigated at all. Just as culling, without completely removing the whole population, the translocation work could be useless and crop raiding would just continue to recur. Study on the natural carrying capacity of translocation sites should also be conducted before any translocation takes place. This is to ensure that the translocation work would not harm the existing population and not detrimental to the habitat quality (Sukumar, 1989). Capture and translocation also involves risk to the captured animals as elephants could die due to stress and / or human errors.

CONCLUSION

Besides poaching, forest loss and HEC are both significant threats to the Asian elephants. Natural habitats for Asian elephants have been rapidly converted since the country gained independence in 1957. HEC and habitat loss have also drastically reduced elephant population in the country. With the increasing development, natural forests will continue to come under pressure for conversion; this threatens elephants. Furthermore, the emerging threat of LTC rubber plantations need to be carefully monitored to ensure further conversion would not happen in important wildlife habitats. As the elephant numbers has dwindled and HEC continue to cause huge economic loss to farmers and plantation owners, drastic action is needed.

It is important to understand the causes and mechanisms of conflict incidents in order to reduce HEC incidents in Peninsular Malaysia. Different sites would have different conflict causing factors that need to be understood by those who have been experiencing HEC as well as the authorities. As HEC is related to elephants' behaviour, prior knowledge about the conflict causing elephants and the conflict area would certainly assist in making the best decision in HEC mitigation. In term of mitigation steps, the local community, plantation owners

and the wildlife authority should assess the potential effective actions that could be taken in their respective area. However, maintaining the current available habitats and connecting remaining forest patches via corridors would be the upmost important task to stop HEC incidents continue to increase. Management policies and action plans targeting to mitigate and reduce HEC should really consider situation-specific details of how the interests of wildlife (elephants) and of humans overlap and identify the factors that affect these conflict incidents. By doing so, it is hoped that HEC could be mitigated and the future of elephants in the country could be secured.

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