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Current Status of Asian Elephants in Peninsular Malaysia

Salman Saaban[1], Nasharuddin Bin Othman[2], Mohd Nawayai Bin Yasak[1], Burhanuddin Mohd Nor[3], Ahmad Zafir[4] and Ahimsa Campos-Arceiz[5]*

[1]Div. of Biodiversity Conservation, Dept. of Wildlife and National Parks, Kuala Lumpur, Malaysia
[2]National Elephant Conservation Centre, Dept. of Wildlife and National Parks, Pahang, Malaysia
[3]Consultancy Division, Department of Wildlife and National Parks, Kuala Lumpur, Malaysia
[4]Insitute for Environment and Development (LESTARI), Univeriti Kebangsaan Malaysia, Selangor
[5]School of Geography, University of Nottingham Malaysia Campus, Selangor, Malaysia
**Corresponding author's e-mail: ahimsa@camposarceiz.com*

Introduction

The Department of Wildlife and National Parks (DWNP) Peninsular Malaysia under the Ministry of Natural Resources and Environment (NRE) is the government agency responsible for the management and conservation of wildlife in Peninsular Malaysia, including elephants (*Elephas maximus*). In Peninsular Malaysia, the status of elephants was elevated from *protected* species in 1972 to *totally protected* species in 2010. According to the new status, it is an offence to hunt, take, or keep any part or derivative of an elephant without special permit; offenders are liable to a fine not exceeding RM 100,000 (USD1 ~ RM3), to imprisonment for a term not exceeding 3 years, or both. If the elephant is a female, the maximum fine is RM 300,000 or imprisonment for a term not exceeding 10 years, or both. Any person who imports, exports or re-exports an elephant or any part of an elephant without special permit commits an offence and shall, on conviction, be liable to a fine of not less than RM 30,000 and not more than RM 100,000, and to imprisonment for a term not exceeding 3 years. While, anyone who uses elephants for a zoo, circus, exhibition or for captive breeding without special permit, commits an offence and shall, on conviction, be liable to a fine not exceeding RM 100,000 or to imprisonment for a term not exceeding 3 years or to both.

Wild elephant distribution and population size estimates

The current elephant population in Peninsular Malaysia is estimated as 1223-1677 individuals (Table 1), distributed widely from the state of Kedah in the north to Johor in the south, and from Negeri Sembilan in the west to Terengganu in the east (Fig. 1). During the 19th century, elephants occurred throughout Peninsular Malaysia, except in Penang Island (Olivier 1978a). In the 1940s, elephants had almost disappeared from the west coast; only pocketed herds remained west of the railway between Gemas to Penang (Foenander 1952). By states, elephants disappeared first from Melaka, then from Perlis and Selangor.

Currently, elephants occur in seven of the 11 states of Peninsular Malaysia. The states of Perak, Kelantan, Terengganu, Pahang, and Johor sustain the bulk of the elephant population, Kedah has a smaller number of them (Table 1), and Negeri Sembilan might be the next state to lose its elephant population after one male elephant, suspected to be the last one in the state, was captured and relocated to Taman Negara National Park in February 2011.

By protected areas, Taman Negara National Park holds the largest population with at least 290-350 elephants as estimated by the DWNP (although a dung-count survey estimated this population as 631, with a 95% CI of 436-915; WCS 2008). This is mainly because Taman Negara is the largest protected area (4343 km^2), including vast extensions of lowland primary forest, and has been the main release area for translocated conflict elephants since 1983. The estimated elephant populations in other protected areas are 26 in Endau Rompin Johor National Park (489

Table 1. Past and present elephant distribution and population estimate.

State / National Park	1960-3[1]	1970-4[2]	1978[3]	1985[4]	1991[5]	2002-8[6,7,8]
Taman Negara NP	-	-	-	166	120	290-350 (631[7])
Kelantan	115	61	-	92	173	250-300
Perak	87	105	-	126	130	230-280
Johor	43	74	-	94	138	130-180 (113[8])
Pahang	236	287	-	212	205	150
Terengganu	57	43	-	37	171	120-140
Kedah	90	10-33	-	44	54	50-60
N. Sembilan	38	14	-	13	11	3
Selangor	14	9	-	6	6	0
Perlis	12	5	-	5	0	0
Melaka	0	0	-	0	0	0
TOTAL	682	601	3000-6000	795	1008	1223-1463 (*1564-1677)

Sources: [1] Medway (1965); [2] Khan & Olivier (1974); [3] Olivier (1978a); [4] Khan (1985); [5] Khan (1991); [6] Salman (2002); [7] WCS (2008); [8] WCS (2009). Estimates for [1-2] and [4-6] are based on DWNP biodiversity inventories; [3] derived from densities and available elephant range; and [7-8] from dung-count surveys.

km^2), 22 in Endau Rompin State Park Pahang (402 km^2) and 87 in the contiguous Permanent Forest Reserve (1609 km^2) (WCS 2009). There is no estimate of the elephant population in Royal Belum State Park and the contiguous Temengor Forest Reserve in Perak. Elephants are no longer present in Krau Wildlife Reserve (600 km^2, Pahang) after the remaining individuals were captured and relocated in 1991.

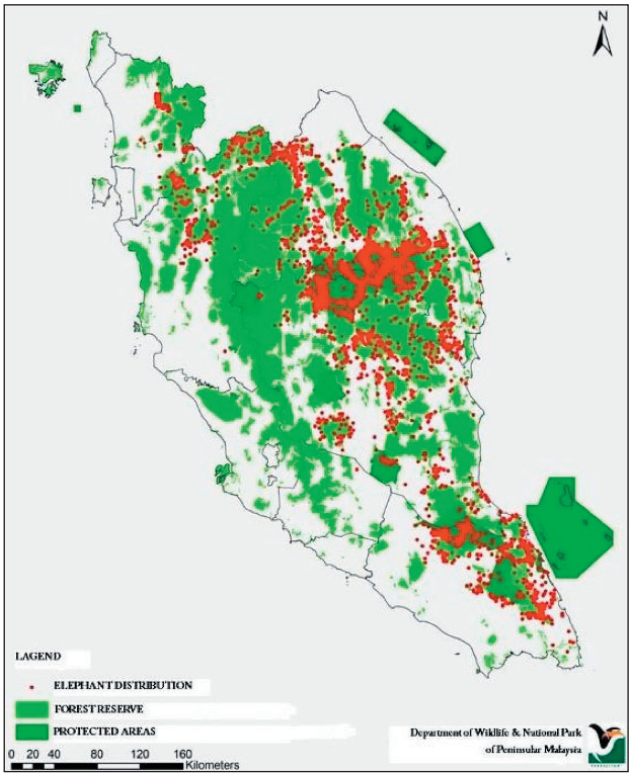

Figure 1. Distribution of elephants in Peninsular Malaysia, 2011. Elephant presence is based on footprints and HEC incident records.

The DWNP uses a combination of methods to estimate elephant population sizes. The most important method is the biodiversity inventory, conducted annually in each district (the immediate smaller administrative unit after state). Every year, the DWNP office in each district estimates its elephant population using a combination of footprint counts (tracking elephant herds and estimating group size based on the diversity of footprint sizes) and data from HEC complaint reports. State and Peninsular-level populations are estimated by adding the numbers of elephants in each district plus estimates for protected areas.

The DWNP has also conducted three large-scale dung-count surveys in collaboration with the Wildlife Conservation Society (WCS), Malaysia Program. The first of these dung-counts took place in 2007 in Gua Musang, a 1397 km^2 MIKE (CITES's Monitoring the Illegal Killing of Elephants) area in the state of Kelantan. The second dung-count survey covered the whole of Taman Negara National Park (WCS 2008), in what is to date the most complete dung survey conducted in Asia. The third survey took place in the Endau Rompin Park complex and contiguous Permanent Forest Reserves (ca. 2500 km^2; WCS 2009). The results of dung-count surveys suggest that biodiversity inventories might underestimate elephant numbers (e.g. 290-350 vs. 631 elephants, for Taman Negara). From 2012 onwards, the DWNP is planning to use non-invasive genetic

mark-recapture methods to estimate elephant numbers.

Threats

Forest loss and fragmentation

The loss and fragmentation of forest is the main cause for elephant decline in Malaysia. Southeast Asia has the highest relative deforestation rate in the tropics and Malaysia is no exception to this (Hansen *et al*. 2008). Prehistoric Peninsular Malaysia was completely covered with a mosaic of different types of natural forest. Even in the early 1950's records show that 90% of the total land area was covered by forest (FDTCP, 2007). In 2010, forest cover had been reduced to just 37.7% (Miettinen *et al*. 2011). Prior to the 1980s, vast areas of lowland forests – prime elephant habitat – were converted into oil palm and rubber plantations (Wan 1985). Further, several government agriculture land schemes such as FELDA (Federal Land Development Authority, 1956), RISDA (Rubber Industry Smallholding Development Authority, 1973) and FELCRA (Federal Land Conversion and Rehabilitation Authority, 1966) were established. The main objective of these schemes is to develop and rehabilitate the land as well as to eradicate poverty, especially in rural areas. From only 540 km^2 in 1960, oil palm plantations expanded to more than 16,000 km^2 in 1987 (NPP 2005), and over 21,870 km^2 in 2002 (Abdullah 2003). Agricultural development was accompanied by the establishment of new settlements and infrastructures (e.g. roads, highways, and large dams) that further fragmented elephant habitat.

From the 1990s, the pattern of forest conversion changed slightly as large areas of forest have been converted to other landuses, especially housing and urban areas (Abdullah & Hezri 2008). Moreover, the recent expansion of Latex-Timber Clone rubber plantations poses an emerging threat for the forests and elephants of Peninsular Malaysia (Clements *et al*. 2010).

Selective logging is another factor contributing to the degradation of elephant habitat. As demand for raw materials, including wood, increased after the World War II, the production of timber increased in Malaysia. This led to the formulation of the Malayan Uniform System (MUS) in 1948, which allowed the removal of mature timber trees in one single felling of all trees down to 45 cm dbh (diameter at breast height) for all species, which allowed selected natural regeneration of varying ages particularly in lowland forest (Anonymous 1995). Although selective logging might have a positive effect on elephant habitat by creating open spaces and promoting food-rich secondary growth, logging generally occurs in association with detrimental habitat alterations, such as the construction of roads and the increased presence of people in the forest.

Human-elephant conflict

The human-elephant conflict (HEC) is an ancient phenomenon that occurs wherever elephants and human agricultural societies coincide (Sukumar 2003). In Peninsular Malaysia it was reported as early as the 1900s (Maxwell 1907) and is currently considered a major human-wildlife conflict, second only to the conflict with long-tailed macaques. As more forests are cleared, traditional elephant ranges become fragmented and elephants have no choice but to encroach into plantations in their search for food, water, and mates. Moreover, elephants inhabiting the forest fringes neighbouring plantations find that these plantations, usually oil palm, rubber, and banana, offer easy pickings. These crop-raiding elephants cause large financial losses to plantation owners.

Between 1998 and 2010 the DWNP received 10,759 HEC complaints (mean ± SD = 828± 183 per year; Fig. 2a). The number of HEC complaints per year decreased from 1998 to 2001, and subsequently it showed a steep increase until 2009 (Fig. 2a). The reasons for these trends are unknown and it is important to note that HEC complaints recorded are not the result of systematic data collection but depend on voluntary reporting by individual farmers. Crop raiding (72.8%, N=5,218) was the most commonly reported cause of HEC reported between 2006 and 2011, followed by situations in which elephants wandered into plantations, created unsafe situations, or even entered villages

and settlements (Fig. 2b). Property damage incidents consisted of 2.6% of the complaints. In this period, 7 attacks on humans were recorded, resulting in 4 human casualties and 3 people injured (Fig. 2b). Altogether, 9 people lost their lives to elephants in Peninsular Malaysia between 2001 and 2011 (~0.85 per year). Most HEC incidents reported between 2006 and June 2011 occurred in rubber and oil palm plantations (39.5%, N=5,218), smallholder farms (33.2%), and villages (17.5%; Fig. 2c). The Orang Asli (indigenous people) reported 2.8% of HEC cases (Fig. 2c).

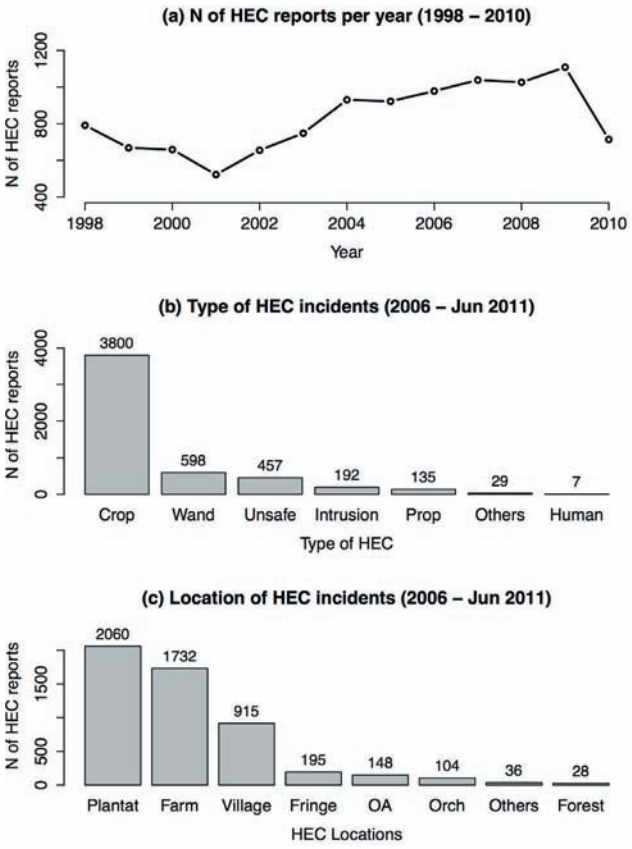

Figure 2. Characteristics of HEC in Peninsular Malaysia; (a) Number of HEC incidents reported to DWNP from 1998 to 2010; (b) Type of HEC incidents; and (c) Location of HEC incidents as reported to DWNP from 2006 to June 2011. Crop = crop damage; Wand = wandering; Unsafe = creation of unsafe situations by elephants; Intrusion = intrusion of elephants within villages and human settlements; Prop = property damage; Human = attack to humans resulting in physical injury or casualty; Plantat = Plantation; Fringe = forest fringe; OA = orang asli (aboriginal people) settlement; Orch = orchard.

Crop and property damage are the forms of HEC with the biggest economic impact. Over RM78 million in losses were reported from government-owned oil palm schemes (FELDA and FELCRA) and private companies due to HEC between 1975 and 1978 in Peninsular Malaysia (Monroe & England 1978). The loss declined in the early 1980s when initial mitigation measures were strengthened with the installation of electric fences. Salman & Nasharuddin (2003) found that the total estimated economic loss from crop damage in the state of Johor between 2001 and 2002 amounted to approximately RM 760,000 of which damage to oil palm contributed almost 94.3% of the amount. From 2005 to 2010, economic losses due to HEC were reported to be approximately RM 18.8 million. There are two approaches used to evaluate these losses: (1) the losses are reported by landowners to DWNP officers, who subsequently visit the location of the HEC incident to record and estimate the damage; and (2) crop loss assessment is done by DWNP rangers during their patrolling duty even in the absence of reports from the landowners. The economic value of the damage is estimated according to the type of crops and the extent of damage.

Legal and illegal killing of elephants

Prior to 1974, elephants were legally culled to overcome HEC (an average of 12 elephants per year were culled between 1960 and 1969; Khan 1991). Although culling was stopped in 1974, forty elephants were shot in self-defense by DWNP rangers during translocation operations in the following 28 years (i.e. 1.43 elephants per year; Salman 2002).

The illegal killing of elephants is uncommon in Peninsular Malaysia – just 18 cases have been recorded between 1974 and 2002 (i.e. 0.64 elephants per year). Frustration with repeated HEC incidents drive farmers to take actions such as poisoning and shooting elephants, of which 10 and 3 cases were reported, respectively. Wire snares used to poach wild boar and deer have resulted in the death of 3 elephants due to severe foot wounds. The removal of tusks from elephants has been reported in only 2 cases between 1974

and 2002 (Salman 2002). In spite of these low numbers, the importance of the illegal killing of elephants should not be underestimated and its monitoring needs to continue.

Elephant management and HEC mitigation

In Peninsular Malaysia, the DWNP is responsible for elephant conservation and management, as well as for the mitigation of HEC impact. DWNP policies are based on the Act 716, the Elephant Management Plan (2006), and the Action Plan for Wildlife Conflict Management (2010-2015). The philosophy of these documents is based on the '*people first*' paradigm according to which elephant management and HEC mitigation prioritize human interests over elephants' when dealing with conflict situations. The ultimate goal of DWNP is to achieve '*zero conflict*' where elephants and people live harmoniously – elephants in the Protected Areas designated for wildlife conservation and people elsewhere.

Elephant translocations

In 1974 elephant culling was banned and the DWNP established the Elephant Management Unit (EMU) with the objective of capturing and relocating elephants from areas of conflict to more suitable habitats. As a result of the translocation program, over 600 wild elephants have been captured by the DWNP between 1974 and 2010 and most of them were relocated to major conservation areas such as Taman Negara National Park and surrounding forests (Pulau Besar and Sungai Ketiar), Belum-Temengor, and Endau Rompin.

The elephant translocation program involves a huge expenditure for the DWNP. The total cost to translocate one elephant is about RM 40,000 of which *ca* 44% is spent during the capture itself and the rest during the relocation. The bulk of the cost goes to staff allowances. Other costs involved are fuel, immobilization drugs, elephant securing equipment, ammunitions, and food supply for working elephants (DWNP 2006). From 2001 to 2010, the DWNP spent RM 11,790,000 in operations to capture and translocate elephants.

Electric fencing

The DWNP is of the opinion that elephant translocation is not a suitable option in all conflict situations. To overcome HEC in areas adjacent to large elephant habitat, the DWNP has recently adopted the use of electric fencing (although electric fences have been used in the country since the 1940s; Monroe & England 1978). In 2009 and 2010, five DWNP electric fence projects were completed covering a total length of 95.3 km. About RM 4.9 million were spent for these projects, which are located in the states of Perak, Kelantan and Johor. Currently, two more electric fences are under construction in Pahang and Perak. The total cost to develop electric fencing ranges between RM 36,000 to RM 53,000 for a kilometer, depending on the topography and features of the terrain.

HEC mitigation by parties other than DWNP

HEC cannot be overcome by DWNP alone due to limitations such as shortage of personnel, budget allocation, logistics, etc. Therefore, the landowners also need to have their own initiatives to overcome the problem. Large-scale plantations can afford to install electric fencing or construct trenches along the perimeter of their plantations. They also use other deterrent methods such as cannon carbides, fire crackers, flash lights, and burning tires or logs at the main accesses used by elephants to encroach into plantation areas. These, however, are not always successful (or necessarily legal). Based on observations and interviews, approximately 95% of landowners combine several methods to protect their land from crop-raiding elephants. The most popular applications are a combination of trenches and electric fencing (Salman & Nasharuddin 2003).

The Lubok Bongor Conservation, Cultural, Social, and Welfare Society is an example of a community-based HEC mitigation initiative. It is a local NGO from Lubok Bongor, Kelantan, where farmers and entrepreneurs, assisted by the WWF Malaysia, united to conduct night patrols and deter crop-raiding elephants (Ong 2011). The number of community-based initiatives to mitigate HEC is likely to increase in Malaysia.

Restoring landscape connectivity

Forest loss and fragmentation are the main cause of HEC and elephant decline in Peninsular Malaysia. As the largest land mammals, elephants have huge home ranges, the size of which depends on habitat type, food and energy requirement, body sizes, water sources, barriers imposed, diversity of habitat and the composition of the elephant groups (Olivier 1978b; Hassan & Udadin 1985; Sukumar 1989; Burhanuddin *et al*. 1995; Salman 1998; Salman & Nasharuddin 2002). Since wildlife habitats are increasingly fragmented by roads and other type of land use barriers, the Government of Malaysia has produced the *Central Forest Spine (CFS): Master Plan for Ecological Linkages*, a plan to restore connectivity among the most important forest complexes in Peninsular Malaysia (FDTCP 2007). To achieve this objective, the DWNP has proposed to the relevant agencies to build viaducts to facilitate road crossing by wildlife. To date, three viaducts have been completed in the Aring-Kuala Berang Highway (Fig. 3). These viaducts were specifically designed to connect main landscapes for elephants: the Tembat Forest Reserve in the northern part of the highway and Taman Negara National Park in the southern part. Currently, another three viaducts are under construction in Kuala Lipis-Merapoh, Pahang road. When completed, these viaducts will connect two major forest complexes namely the Titiwangsa-Bintang-Nakawan Range and Taman Negara National Park-Timur Range. These two complexes are considered the most important ranges for the elephant population in Peninsular Malaysia.

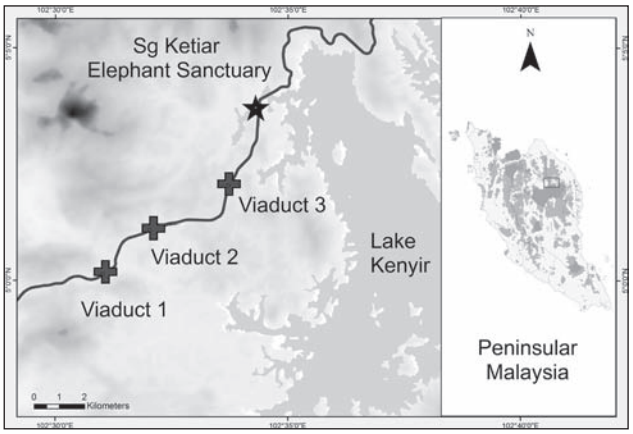

Figure 3. Location of viaducts (plus signs) and Sungai Ketiar Elephant Sanctuary (star) at Aring-Kuala Berang Highway (dark line), Terengganu.

Public conservation awareness

Public awareness regarding the importance of elephant conservation is vital to ensure that elephant management receives support from the public. Therefore, the National Elephant Conservation Centre (NECC), Kuala Gandah, the state DWNP Biodiversity Conservation Centers, and Zoo Melaka conduct wildlife conservation education and awareness programs for local communities, school children, and tourists. Moreover, at NECC an elephant-specific awareness program runs daily simultaneously with ecotourism activities (see 'Captive elephants' for more details).

Conservation research

The DWNP has conducted numerous research projects on elephants since the 1960's and continues to do so. The Management and Ecology of Malaysian Elephants (MEME) is an ongoing research project that aims to assess the effectiveness of the current elephant management strategies and to produce a scientifically sound elephant conservation strategy based on the understanding of elephant ecology and behavior as well as the human dimensions of HEC. MEME is a collaboration between DWNP, the Smithsonian Conservation Biology Institute, and the University of Nottingham Malaysia Campus. Currently, GPS satellite tracking is being used to understand the movement and habitat utilization of elephants in Peninsular Malaysia and to assess their response to translocation. Other ongoing research projects include the study of the importance of landscape configurations on the occurrence of HEC, in collaboration with Universiti Kebangsaan Malaysia; a study on the role of highway viaducts as wildlife crossing structures in the Kenyir Wildlife Corridor in collaboration with the Universiti of Malaya and James Cook University <http://myrimba.org/projects/>; and dung counts and occupancy surveys in Endau Rompin Johor State Park in collaboration with WCS Malaysia.

Captive elephants

The culture of elephant taming flourished once in Malaysia. In the 16th century, the city of Melaka was defended from the Portuguese using 20 tame elephants and, at that time, the Malay chiefs considered the possession of elephants indispensable for their dignity (Olivier 1978a). Although there is abundant evidence of mahout culture up to the 19th century, maintaining elephants in captivity eventually died out as a tradition in Peninsular Malaysia. In 1960, only two captive elephants were recorded in Malaya (Harrison 1960). This trend has reversed since the creation of EMU and the number of captive elephants increased to 20 in the mid-nineties (Daim 1995), and to as many as 62 in 2011 (Table 2). This increase is due to the policy adopted by the Malaysian Government of using elephants in ecotourism industry.

The NECC, Kuala Gandah, holds the largest captive population with 24 elephants. NECC was established in 1989 as a rehabilitation and training center for elephants involved in elephant translocation operations. In 2000, NECC opened its doors to the public and has rapidly become a major ecotourism destination, attracting 2000 visitors in 2000, 143,101 visitors in 2008, 158,763 in 2009 and as many as 178,600 in 2010. Entrance into NECC is free and – besides the opportunity to interact with elephants – the visit includes conservation awareness activities such as a permanent exhibit at the interpretation center and a movie about HEC in Malaysia. The NECC is located at the southern boundary of Krau Wildlife Reserve, a strictly protected area with no wild elephants since 1991. Therefore, there is no interaction between NECC and wild elephants other than the contact during translocation operations. The DWNP has recently opened a second elephant center (Sungai Ketiar Elephant Center) in northern Penisular Malaysia, which aims to follow the model developed in NECC. Captive elephants are also present in five public and three privately owned zoos and safaris (Table 2); while four elephants belong to a private owner in Kelantan (Table 2).

Elephant ownership in Malaysia is regulated by the Act 716 (which replaced Act 76). Before Act 76 was implemented (in 1972), there was no proper registration of captive elephants. The DWNP is the responsible agency in Peninsular Malaysia to look after the welfare of captive elephants. In order to ensure this welfare, the DWNP has produced Zoological Park Guidelines. Under the Act 716 there are two regulations that elephant owners have to comply with to ensure that captive elephants are well treated in terms of their condition and welfare. The two regulations are Wildlife Conservation (Operation of Zoo) Regulation 2011 and Wildlife Conservation (Supervision of Circus and Exhibition) Regulation 2011. The regulations include among others, sizes of enclosure, quarantine area, foods, cleanliness, animal show and exhibition and veterinary services. All elephant owners have to follow this guideline strictly. Private elephant owners have to renew their special permits annually. The condition of captive elephants is monitored by DWNP enforcement officers in each state and, if the condition and welfare of elephants are not satisfactory, the DWNP will recommend to the Ministry of NRE to revoke the special permit in accordance with the law.

Final remarks

The long-term survival of elephants in Peninsular Malaysia seems secured in the main protected areas, especially in Taman Negara National Park, Belum-Temengor, and Endau-Rompin forest complexes. Elephant survival outside protected areas is questionable and it will depend on the effective mitigation of HEC. The DWNP is currently drafting the National Elephant Conservation Action Plan. The aim of this plan is to develop a holistic management for the conservation of elephants in Peninsular Malaysia by considering various factors such as habitat availability, human interest, current government policies, participation of various agencies/ stakeholders in conservation work, *etc*. The priority of this plan is to establish a well-defined zonation of areas with different management strategies in relation to elephant conservation.

Table 2. Number of captive elephants in Peninsular Malaysia, 2011. M = males; F = females.

Name	Ownership	M	F	Total
National Elephant Conservation Center (NECC), Kuala Gandah	DWNP, Federal Government	7	17	24
Sungai Ketiar Elephant Center	DWNP, Federal Government	0	1	1
Zoo Melaka	DWNP, Federal Government	4	4	8
Zoo Taiping & Night Safari	Taiping Town Council, State of Perak	1	7	8
Zoo Negara	Zoological Park Society, State of Selangor	1	2	3
Zoo Johor	Johor Bahru Town Council, State of Johor	1	1	2
Kuala Krai Mini Zoo	Kuala Krai Local Council, State of Kelantan	1	0	1
Afamosa Animal Safari	A'Famosa Wonderland Pte. Ltd., State of Melaka	1	8	9
Danga Bay Petting Zoo	Private, State of Johor	1	0	1
Langkawi Elephant Adventures	Private, State of Kedah	1	0	1
Ibrahim Yahya	Private, State of Kelantan	1	3	4
Total		19	43	62

Creation of three types of areas is suggested: (1) strict conservation areas, (2) strict human areas, and (3) human-elephant coexistence areas. Strict conservation areas include Protected Areas where agricultural activities should be discouraged. In case of HEC inside a strict conservation area, no action would be taken against the elephant population. Strict human areas are those in which elephant populations are unsustainable in the long run and their presence results in a high cost in the form of HEC. Elephants in strict human areas can be relocated. Human-elephant coexistence areas are where agriculture and settlements meet large forest patches and where translocation of elephant is not suitable. In human-elephant coexistence areas, the management priority will be to minimize the impact of HEC, either by deterring elephant crop raiding or by increasing tolerance levels of local farmers to HEC.

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