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CAMBODIA VULTURE ACTION PLAN

2016-2025

EXECUTIVE SUMMARY:
This Action Plan is written as a guiding document detailing the required activities to be implemented between 2016 and 2025 in order to prevent the extinction of Cambodia's vulture population.

There are three resident species of Vulture in the dry forest landscape of Cambodia: White-rumped Vulture *Gyps bengalensis*, Slender-billed Vulture *G. tenuirostris* and Red-headed Vulture *Sarcogyps calvus* (all Critically Endangered). The populations of all three species have been declining throughout their range during the 20th century and have been at an extremely low level in Cambodia for more than 15 years.

The principal threats to vulture populations in Cambodia's dry forest landscape are believed to be 1) deliberate poisoning of domestic and wild animals leading to secondary poisoning of vultures 2) limited food supply as a result of low wild ungulate populations. Other lower priority threats include loss of nesting sites and habitat loss, and direct persecution. Diclofenac is currently not available for veterinary purposes and there is no evidence that it is affecting Cambodia's vulture populations.

Priority actions to mitigate these threats include 1) Education and awareness campaigns to reduce the deliberate use of poisons, 2) Improved management of protected sites 3) supplementary feeding in the short to medium term to compensate for depressed wild ungulate populations. 4) Research to improve knowledge of key threats and impacts of conservation interventions.

Compilers
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List of contributors

This action plan is the result of extensive consultation including questionnaire surveys in all vulture range provinces in Cambodia about the possible availability of diclofenac and a national workshop held on January 15th 2016; including representatives from the Ministry of Environment, Ministry of Agriculture, Forestry and Fisheries, BirdLife International, Royal Society for the Protection of Birds, Royal University of Phnom Penh, Royal University of Agriculture, Panasastra University of Cambodia, Wildlife Conservation Society, World Wide Fund for Nature, Angkor Centre for Conservation of Biodiversity, Sam Veasna Centre, IUCN Bangladesh, Forestry department Bangladesh, Chaktomuk Bird Club, Save Cambodia's Wildlife. The drafting of the action plan was led by the Sum Phearun and Robin Loveridge, with several rounds of comments from the Cambodia Vulture Conservation Project core members. In particular we would like to thank all workshop participants including Bou Vorsak, Jonathan Eames, Eang Samnang, Ty Srun, Khoy Bona, Ross Ream, Lung Sienghay, Oliver Gray Read, Chao Lengthol, Marthen Malo, Gerry Ryan, Rachel Crouthers, Alistair Mould, Dr. Tom Gray, Moul Phat, Thong Sokha, Dr. Mathieu Pruvot, Simon Mahood, Sok Ko, Prum Sovanna, Phan Channa, Yang Phyrum, Dr. Keo Omalliss, Ou Sothy, Kry Masphal, Ny Naiky, Dr. Ith Saveng, Dr. Srey Sunleang, Vorn Monin, Chris Bowden, Alam Sorowar, R.S.M.Manirul Islam, Dr. Haseed Irfanullah, Say Ngim, Orn Johnny, Sar Senkethya, Suy Senglim, Michael Meyerhoff, Yim Sothan, Ly Kang, Sun Sereyath, Sophatt Reaksmey, Sek Pisey, Loch Kalyan, Soun Visak, Chhin Navin, Thi Sothearen, Chhuoy Kalyan, Sau Satya, Ten Hos, Peng Borin

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The Critical Ecosystem Partnership Fund is a joint initiative of l'Agence Française de Développement, Conservation International, the Global Environment Facility, the Government of Japan, the MacArthur Foundation and the World Bank. A fundamental goal is to ensure civil society is engaged in biodiversity conservation."

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Photograph credit: Phearun Sum

Acronyms

ACCB	Angkor Centre for Conservation of Biodiversity
CVCP	Cambodia Vulture Conservation Project
CR	Critically Endangered
ELCs	Economic Land Concessions
EPL	Eastern Plains Landscape
FA	Forestry Administration
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
KPWS	Kulen Promtep Wildlife Sanctuary
LWS	Lomphat Wildlife Sanctuary
MoE	Ministry of Environment
MPF	Mondulkiri Protected Forest
NGO	Non-Governmental Organization
PPWS	Phnom Prich Wildlife Sanctuary
PVPF	Preah Vihear Protected Forest
SAVE	Saving Asia's Vultures from Extinction
SPF	Seima Protection Forest
UTM	Universal Transverse Mercator
WCS	Wildlife Conservation Society
WSPF	Western Siem Pang Forest
WWF	World Wide Fund for Nature

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1. Background

Taxonomy

There are three resident species of vulture in the dry forest landscape of Cambodia: Two species from the same genus; the White-rumped Vulture *Gyps bengalensis* and Slender-billed Vulture *G. tenuirostris* and the Red-headed Vulture *Sarcogyps calvus*.

Policies

International conservation and legal status

All three Vulture species are considered globally Critically Endangered because they have an extremely small population, which has undergone a rapid decline. They are therefore classified under IUCN Red List criteria A2cd+3cd+4cd and C2a(i) (BirdLife 2015). All three species are listed on CITES appendix II (http://checklist.cites.org).

National policies and legislation

The three Cambodian vulture species were listed as Critically Endangered in the Sub-Decree (*Anukret*) by the Ministry of Agriculture, Forestry and Fisheries on the 25th January 2007 and under protection of 2002 forest law which was promulgated by Royal Decree (*Preah Reach Kram*) on 31 August 2002, Protected Area Law 2008 and Law on Environmental Protection and Natural Resource Management 1996 of the Ministry of Environment. Hunting any of these three vulture species was prohibited by declaration No. 359 dated August 01, 1994 issued by the Ministry of Agriculture, Forestry and Fisheries. The use of Diclofenac for veterinary purposes is not currently outlawed, although in Cambodia it does not currently seem to be in use by veterinary practitioners (Sum 2015b). Priority sites for vulture conservation include Protected Forests and Wildlife Sanctuaries which are protected under the Environmental Protection and Natural Resources Management Law of 24th December 1996 and the Royal Decree on the establishment and designation of Natural Protected areas on 1st November, 1993 and other legislations.

Conservation situation

Distribution, population size and trend

Fourteen of the twenty-three extant Vulture species are listed as "Critically Endangered" in the IUCN Red List of threatened species (Ogada, Keesing, & Virani, 2012; BirdLife International., 2015), three of these species, the White-rumped Vulture *Gyps bengalensis*, Slender-billed Vulture *Gyps tenuirostris*, and Red-headed Vulture *Sarcogyps calvus* are native to Cambodia and resticted to dry forest habitat in north and northeastern Cambodia (Clements *et al*., 2012);

Early accounts suggest that these species were once abundant across most of their ranges, having adapted well to anthropogenic modification of their natural habitats *(Prakash et al.,* 2001; Clements *et al.,* 2012).

Vulture populations in South-East Asia and southern China gradually declined during the 20th century, and the species are now extinct or extremely rare in most parts of the region due to the loss of habitat and lack of natural food sources (Pain *et al.* 2003, 2008a, Duckworth *et al.* 2004, Clements *et al.,* 2012). In South-East Asia, the three species now occur only in two locations, one in northern Myanmar (Hla *et al.* 2011), and a second location in northern and eastern Cambodia measuring approximately 300 km east-west and 250 km north-south and including border areas in Lao PDR and Vietnam (see Figure 5, appendix 1) (Clements *et al*., 2012). These populations are considered irreplaceably globally significant and represent the only long-term chance for in situ conservation in South-East Asia (BirdLife International Cambodia Programme, 2012, Clements *et al.,* 2012; Sum, 2015a).

Distribution in Cambodia

Historically the White-rumped Vulture was widely distributed across Cambodia, with records from Kampot (Thomas and Poole 2003), Kompong Chhang (Carr 1993), Kompong Thom (Delacour and Jabouille 1931) and Kandal (Thomas and Poole 2003). However the species is now centred on an area 300 by 250 km in northern and north-eastern Cambodia; Kulen Promtep Wildlife Sanctuary, Preah Vihear Protected Forest, Western Siem Pang Forest, Sesan, Lomphat Wildlife Sanctary, Mondulkiri Protected Forest, Phnom Prich Wildlife Sanctuary and Mekong Flooded Forest Kratie, and including adjacent parts of Vietnam and Laos (Appendix 1 Figure 5a, Clements *et al.* 2012).

Historical sightings of the Slender-billed Vulture include Kampot, Siem Reap and the Tonle Sap flood plain and Takeo (Thomas and Poole 2003). The current range is restricted to the north of Cambodia and adjacent parts of Laos (Figure 6 (b), Clements *et al.* 2012).

The Red-headed Vulture was previously sighted from Phnom Penh to Siem Reap (Delacour and Jabouille 1925), and Kampot to Stueng Treng and Ratanakiri (Timmins and Men 1998) and Seima Protected Forest (Walston *et al.* 2001). The present day distribution, whilst having contracted from the species' historical range, is slightly more widespread than the two *Gyps* species, occurring from southern Mondulkiri Province through to Siem Reap Province, although individuals of the species are less wide-ranging (Appendix 1 Figure 5c).

Since 2010 a worrying trend has emerged that the vulture distribution has become increasing focused on two sites in the north of Cambodia – Western Siem Pang and Preah Vihear, with

significant reductions in the Eastern Plains of Cambodia and no recent records from the north-west.

Population size and trend

Species monitoring efforts have been undertaken over the last 10 years at vulture restaurants. The minimum population estimate for the vulture population in Cambodia is generated by an annual census of coordinated vulture restaurant counts at all sites. Two repeat census counts are made in June; the larger of these two counts is used to provide a minimum population estimate for each species[1].

The total counts of all three species show an increasing trend between 2004 and 2008, a leveling off between 2008 and 2010, then a decreasing trend from 2010 to 2015 (Figure 3 and Table: 1 in Appendix II). In 2015 the minimum estimate for the total Cambodian vulture population was 153 vultures; the lowest annual estimate since records began in 2004.

Since 2004 the number of vulture restaurant sites has remained fairly constant over the ten year survey period at seven restaurants. However the location of restaurants has changed over the years and in 2015 the number of sites implementing restaurants has decreased to six. In general the regularity of restaurants has improved since 2004. This may allow vultures to locate carcasses more easily and therefore contribute to the increase in the census count between 2008 and 2008, as a higher proportion of the total population may begin attending restaurants. Therefore this may not indicate an increase in the true vulture population, only an increase in the proportion of the population attending restaurants. However the frequency of carcass provision has remained fairly constant in recent years. Therefore it is likely that the decreasing trend identified since 2010 represents a true decline (Figure 1). However exact population trend interpretation is confounded by this variation in carcass provisioning effort and the data is used to make only coarse assessments of population trends.

In most years there is a large amount of variation between the numbers of vultures recorded at the two censuses in June in any given year (Table 1). The variation between successive June census counts indicates that not all vultures attend every restaurant in the month of census. It is currently impossible to determine what percentage of the vulture population is recorded during a census. Although methods are currently being developed to estimate the proportion of vultures which do not attend restaurants (Ryan *et al.* in prep).

[1] Trends in species populations are difficult to determine, in part owing to the paucity of data. From 2014 the frequency of census restaurants was increased to five times per year, with the restaurants in March, June (two times), September and December. However in this summary the interpretation of trends has been limited to the June census counts as this allows comparison with the long-term census data.

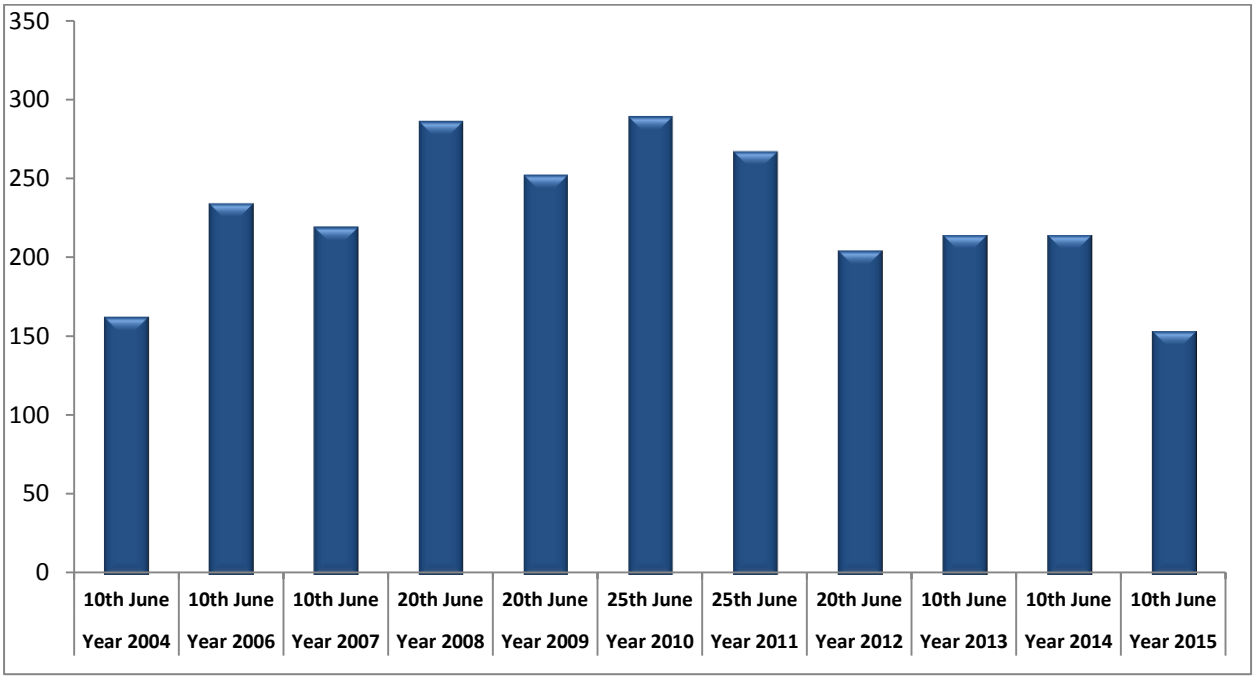

Figure 1: The total number of vultures recorded from all restaurant sites in the higher of the two June census counts between 2004 to 2015

White-rumped Vultures attend vulture restaurants in greater numbers than the other two species. The number of White-headed Vultures attending restaurants has increased steadily from 88 in 2004 to a high in 2009 of 209 vultures, before decreasing to 91 individuals in 2015; the second lowest since the project started in 2004 (Figure 2).

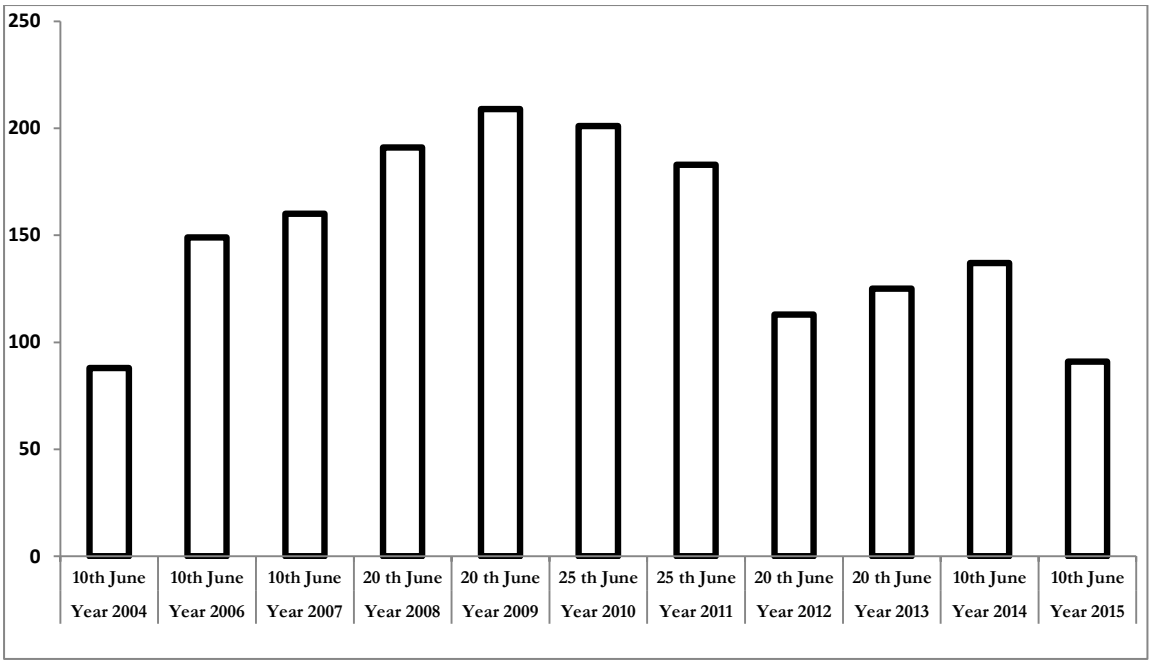

Figure 2: Census population trend of White-rumped Vulture across all restaurant locations in Cambodia.

Overall the number of Slender-billed Vultures attending vulture restaurants has increased over the 11 year survey period. The minimum population estimate of Slender-billed Vultures recorded at the

census in 2015 (47) is lower than the results from 2014 (52) and 2013 (64), but higher than the mean value for the entire survey period (35) (Figure 3).

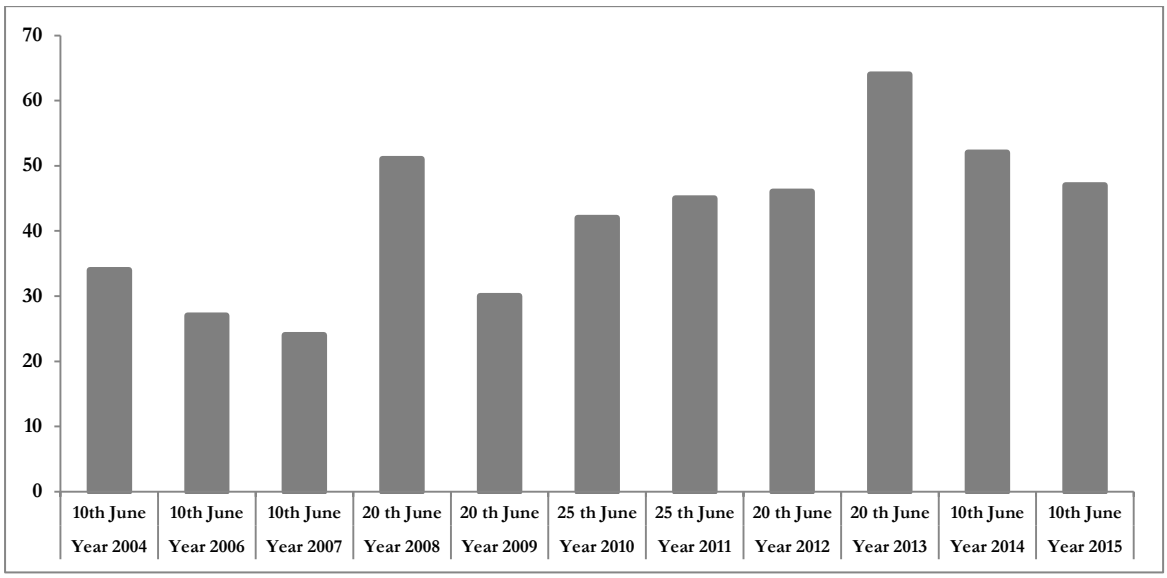

Figure 3: Census population trend of Slender-billed Vulture across all restaurant locations in Cambodia

The number of Red-headed Vultures attending restaurants fluctuated widely between 2004 and 2010. Since 2010 there appears to be a general decreasing trend of Red-headed Vultures attending restaurants (Figure 4). The minimum population estimate of Red-headed Vultures in 2015 (18) is lower than the mean for the 11 census years (35).

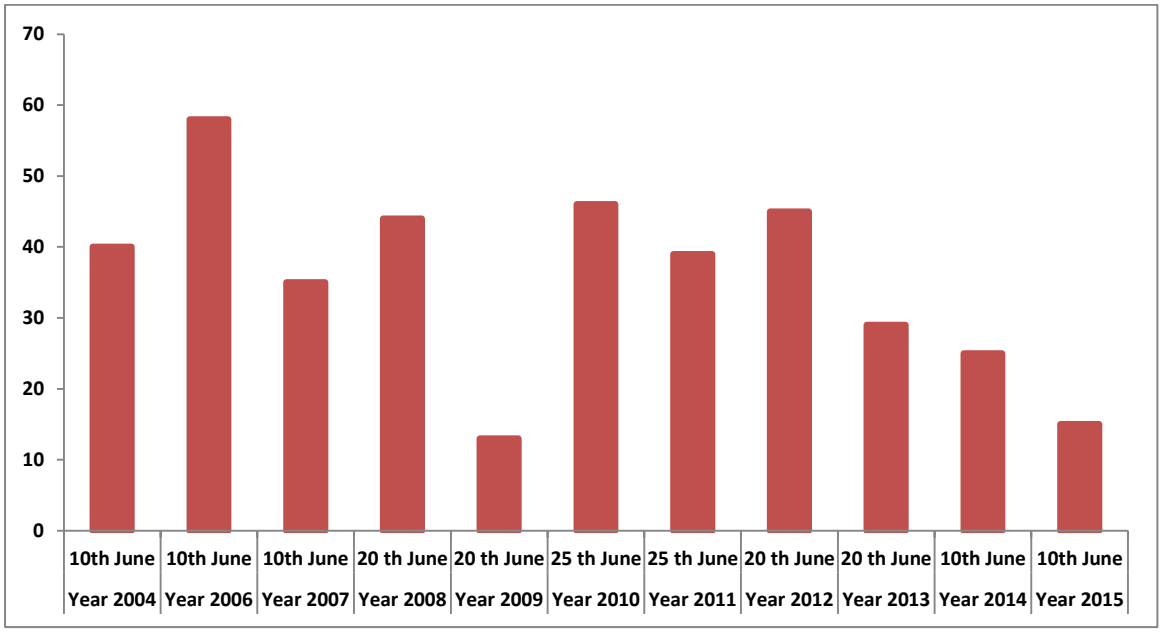

Figure 4: Census population trend of Red-headed Vulture across all restaurant locations in Cambodia

Habitat requirements

The three vulture species are now confined to open deciduous Dipterocarp forest in the remotest parts of Cambodia. Although vultures cannot occupy evergreen forest because the dense canopy inhibits both the finding of carrion and the descent to the carcass, they can forage over open areas and even human habitation. Their absence from these habitats in modern times and from the large swathes of apparently suitable deciduous forest is probably due in part from the extremely low density of wild prey species except in remote and well-protected areas. However, since the birds frequently forage on dead free-ranging domestic animals which are abundant in such areas, this cannot be the only reason. A long history of human persecution has pushed vultures to the most remote parts of their range, close to the international borders. Although at least in theory fairly catholic in their choice of foraging habitat, vultures prefer to nest in tall trees.

Species tend to nest between November and March. White-rumped Vultures have been observed nesting in colonies and singly, often beside rivers or on small hills, preferring Dipterocarpacae species (Goes 2013). In all cases only one chick per nest was observed.

2) Priority Issues

General overview

The reasons for the decline in vulture numbers varies from region to region across Asia. Diclofenac and other forms of non-steroidal anti-inflammatory drugs (NSAIDs) are a major threat in South Asia, having wiped out more than 95% of the vulture population in the Indian sub-continent between 1990 and 2007 (Prakash *et al.* 2003, 2012).

In contrast to South Asia, the vulture populations in South-East Asia declined much earlier. The three species resident in Cambodia bred commonly in the first half of the 20th century, ranging from Myanmar across Thailand and Indochina reaching Yunnan province in China and extending south to Peninsular Malaysia (Pain *et al.* 2003). By the 1980s, however, Thai populations of all three species had plummeted (Round and Chantrasmi 1985, Round 1988), and they had disappeared from Malaysia largely as a result of hunting and habitat loss (Wells 1999) and Yunnan (Zheng Guangmei and Wang Qishan 1998; BirdLife International. 2015).

These two contrasting paradigms that are responsible for the respective population declines in the Indian subcontinent and South East Asia illustrate the need to understand the localized reasons for decline.

Key threats

Throughout this section "Current threat level" refers to the predicted severity of each threat between 2015 and 2025. Where threats are driven by more than one process "driver", each process has been described separately.

Threat levels were determined by combining rankings for scope of threat (percentage of total population affected by each threat) and severity (estimated impact on population). Scope and severity rankings are detailed below:

Scope: 1- all of population (>90% of population), 2- most (50-90%), 3- some (10-50%), 4- few

(<10%).

Severity: 1- rapid (rapid deterioration causing >30% over 10 years or 3 generations), 2- moderate (10-30%), 3- slow (1-10%), 4- none (<1%).

1) Poisoning

Current threat level: Scope 1, Severity 1

In South East Asia, there is little evidence for or against the role of poisoning in historical vulture declines (Pain *et al.* 2003). However studies of recent vulture mortalities suggest that poisoning is a serious threat to present day Cambodian Vulture populations. Long-term research of Cambodian Vultures between 2004 and 2011 revealed that the principal cause of vulture mortality was poisoning, accounting for 73% of all mortality (Clements *et al.* 2012). For clarity the severity of the poisoning threat has been subdivided into thre categories:

A) Deliberate poisoning of domestic animals and wildlife leading to secondary poisoning of vultures

Current threat level: Scope 1, Severity 1.

The deliberate use of poisonous chemicals on domestic and wild animals has led to several documented cases of secondary poisoning of vultures in Cambodia. Due to the potential for a single poisoned carcass to be fed on by multiple vultures and cause a mass mortality event, this threat has been scored as the highest threat level.

Poisons are used for a variety of reasons including hunting, pest control and crime. Examples of contrasting incidents are detailed below:

- In 2015 the guard dogs of a village chief in Western Siem Pang District were poisoned to allow thieves to steel a motorbike. This resulted in the secondary poisoning and death of six Slender-billed Vultures.
- In February 2014 a total of 16 vultures (11 White-headed Vultures, three Slender-billed Vultures and two Red-headed Vultures) were found dead close to a rice field in Antreh Village, Mondulkiri Protected Forest. The deaths are thought to be caused by the vultures feeding on a poisoned cow carcass.
- In March 2010 in Western Siem Pang a local villager deliberately poisoned a dog. A total of eight vultures (six White-rumped Vultures, one Red-headed Vulture and one Slender-billed Vulture) fed on the poisoned dog and subsequently died.
- In Phnom Prich Wildlife Sanctuary a case was reported in June 2010 of a farmer putting out poisoned rice to keep pests from his rice field. This rice was eaten by a cow. The cow died and was fed on by Vultures. This resulted in the deaths of four White-rumped Vultures and one Red-headed Vulture.

B) Use of veterinary drugs to care for domestic livestock leading to secondary poisoning of vultures

Current threat level: Scope 4, Severity 4

Non Steroid Anti-Inflammatory Drugs (NSAIDs) have been proven to cause catastrophic vulture population declines in India, Bangladesh and Nepal due to secondary poisoning (Prakash *et al.* 2012). CVCP undertook a pharmacy survey in January 2015 to assess the presence of harmful drugs. A total of 1,450 families and 74 pharmacies were interviewed. The survey revealed that only 27% of respondents give sick livestock drugs and that Diclofenac was not available for sale in pharmacies in veterinary form. However Diclofenac is available for human consumption in lower concentrations. Therefore these drugs are not considered a threat to vultures at present, but repeat surveys are recommended every few years (Sum 2015b). If veterinary Diclofenac or other NSAIDs were discovered in Cambodia, this threat level would be raised. A preemptive ban on the use of these drugs is also advocated.

Since diclofenac in veterinary form was not recorded during the pharmacy survey we conclude that diclofenac is not responsible for the recorded vulture poisoning incidents. This is in contrast to the model for vulture declines across the rest of Asia, which are largely attributed to poisoning from diclofenac (Green *et al.* 2004, 2006, Prakash *et al.* 2012, BirdLife 2013).

C) Deliberate poisoning of vultures
Current threat level: Unknown

In Khmer culture vultures are considered unlucky, and are negatively perceived. A single, though unconfirmed case has been reported from Mondulkiri where poison was reportedly put out with the specific goal of killing vultures. One means of locating large mammal carcasses is to search for groups of vultures circling overhead. In Africa carcasses of illegally hunted large mammals are regularly deliberately poisoned in order to poison the vultures that come to feed on the carcass and thereby make it more difficult for law enforcement authorities to locate the carcass (Ogada *et al.* 2015). The extent of this behaviour is suspected but unknown in Cambodia.

2) Low food availability
Current threat level: Scope 1, Severity 1
All three vulture species are carrion feeders, feeding on carcasses of a range of species, including ungulates. Pain *et al.* (2003) state that food shortage in the latter part of the 20th century may have played a major part in vulture declines in South East Asia. Comprehensive field surveys at three key vulture sites over areas of approximately 500 km^2 indicated that one carcass is available every 22–36 days (Clements *et al.* 2012). At least two birds, a Red-headed Vulture and a tagged White-rumped Vulture recovered in Quang Nam province in Vietnam are thought to have died due to starvation. The poor body condition of both birds and location far outside the normal range is perhaps indicative of the difficulty vultures face in finding food (Clements *et al.* 2012).

Based on a broad assumption that vultures require 300g food/day, then 1 cow has approximately sufficient meat to sustain 1 vulture/year. The number of domestic cattle that were lost/died in the forest in eastern Preah Vihear province in 2003 [36] is approximately the same as the population of vultures consistently recorded [30- 45]. This suggests that the vulture population is in equilibrium and limited by the availability of ungulate carcasses. This threat has been subdivided into three causes:

A) Hunting pressure reducing wild ungulate populations and available wild carrion food resource
Current threat level: Scope 1, Severity 1

The plains of northern and eastern Cambodia were formerly described as one of the 'great game-lands of the world; a Serengeti of Asia', supporting a diverse and abundant megafauna of ungulates, predators and scavengers (Wharton 1957, Tordoff *et al.* 2005). However, Cambodia suffered considerable political instability and conflict throughout the 20th century intensifying during the Lon Nol (1970-1975) and Pol Pot (1975-1979) regimes (Chandler 2000). During this period, there is evidence of large declines in the regional population and distribution of large mammal species (Duckworth & Hedges 1998, Loucks *et al.* 2008). These declines were associated with the development of an international market and local demand for wildlife products and increased availability of guns, leading to an increase in hunting. This hunting pressure possibly led to the global extinction of one large ungulate species endemic to Indochina: the Kouprey *Bos sauvelli* (Gray *et al.* 2012).

Few rigorous studies of wild ungulate populations exist in Cambodia with exception from Mondulkiri Protected Forest and Phnom Prich Wildlife Sanctuary. FA and MoE in collaboration with WWF have been conducting distance sampling line transects in these two protected areas to estimate ungulate densities since 2010. Approximately 40 line transects per Protected Area were surveyed during 2010, 2011 and 2014, although 5 species of large ungulates were detected during surveys, there was only sufficient number of encounters to estimates densities for three species (banteng, wild pig and muntjac). Overall results have shown that populations of banteng, wild pig and muntjac have remained stable within both protected areas. Despite stable populations over the last four years, overall densities of large ungulates are lower than their carrying capacity should be based on available resources. This is probably due to historical hunting pressures reducing populations of other large ungulates (Gaur, Eld's deer and Sambar)(Gray *et al.* 2012).

Recent reports of hunting of large ungulates in the national press suggest that regular hunting and trade in animal products continue to cause the decline of ungulate populations:
http://www.phnompenhpost.com/national/duo-flee-wildlife-raid
http://www.phnompenhpost.com/national/wild-gaur-poached-protected-forest

B) Habitat Loss causing a decline in available wild carrion food resource

Current threat level: Scope 1, Severity 2

Recent data released by the World Resources Institute shows that Cambodia is experiencing faster acceleration in the rate of tree cover loss than any other country in the world (WRI, 2015). This decrease in the extent of natural habitats reduces the availability of suitable habitat for mammal species and is likely having a consequent impact on population sizes.

Habitat conversion through logging, the development of Economic Land Concessions (ELCs) and small-scale agricultural expansion of rice fields by local people all increase the number of people living in close proximity to the forest and this likely has a synergistic effect, whereby greater human proximity to wildlife leads to increased hunting.

C) Agricultural mechanisation resulting in fewer domestic ungulate carcasses.

Current threat level: Scope 1, Severity 3

The low wild ungulate population may be offset, to some degree, by the availability of domestic livestock carcasses. Research undertaken by WCS in Preah Vihear (Clements *et al.* 2004) suggests that wild ungulate populations are low, and probably considerably smaller than domestic livestock populations (camera-trapping at forest pools has a higher number of encounters with domestic animals).

Traditional practices allow livestock to range freely across the deciduous forest during the dry season, and this could increase the carrion available to vultures if mortalities go undetected by

people. Financial insecurity and intensification of agriculture have led to a reduction in this practice in many Cambodian provinces (e.g. around the Tonle Sap and the Mekong floodplain), and consequently in carrion available for vultures from domestic livestock. Remaining vulture populations are found entirely in those provinces where livestock are still allowed to range freely. For example, Western Siem Pang contains the largest remaining vulture population (Sum 2015a). By 2014 in Western Siem Pang, 32% of households (707 households) owned domestic cattle, with each household owning between three and seven cows (median total cattle estimate of 3,500). While 44% of households owned buffalo, accounting for 2,500 animals and representing a significant potential additional food source for vultures if animals occasionally die in the forest and are undetected by people (Bou and Yam 2014).

However widespread agricultural mechanisation over the last five years has meant that farmers have increasingly preferred to sell their livestock in order to purchase 'hand-tractors' to plough their fields. As a result livestock ownership has decreased. By 2014, 529 hand-tractor units were owned by 45% of households in rural villages within Western Siem Pang IBA (Bou and Yam 2014). Furthermore changes in livestock management practices to more intensive management of herds may result in fewer livestock carcasses being left for vultures (BirdLife International 2003).

3) Loss and disturbance of nests and nesting habitat;
Current threat level: Scope 1, Severity 2

Little information exists on the characteristics of *Gyps* vulture nesting sites in Cambodia. Vultures have adapted well to anthropogenic habitat modifications (BirdLife International 2003), and abundant suitable habitat remains in the eco-region. However, commercial logging and human activities do represent a threat to vultures, insofar as they can lead to increased levels of hunting and disturbance to the species, and increased pressure on wild ungulate populations.

Nests of all three species have been located, primarily at the LWS, PVPF, Seasan, WSPF and MPF sites. Nest monitoring by CVCP has provided some anecdotal evidence of threats to nests. Causes of nesting failure included raiding by macaques *Macaca fascicularis* (10 White-rumped Vulture nests destroyed in the 2007–2008 nesting season) or disturbances such as fire.

Nesting trees tend to be large and tall, often of the Dipterocarpaceae family. Large, tall trees are also preferentially targeted by selective logging. For example in between the 2014-15 and 2015-16 breeding season the nesting trees of vultures were cut from Sesan and in the latter year no new vulture nests in the vicinity were observed. Therefore selective logging may force vultures to relocate and impact vulture nesting success. As human populations increase around protected sites, forest use and disturbance around vulture nesting sites is predicted to increase over the ten year period of this action plan.

4) Lack of research on key threats limiting ability of CVCP to design targeted conservation interventions

Current threat level: Scope 1, Severity 3

Much of the data about key threats facing vulture populations are anecdotal. In the absence of comprehensive assessments the ability of CVCP to design targeted conservation interventions is limited. Some key factors and data gaps are:

- Absence of toxicology facilities in Cambodia. Consequently the costs of sending suspected

poisoned vultures for toxicology testing is often prohibitive and this hinders a better understanding of what chemicals are being used and how they result in vulture mortality.

- Ungulate population trends in priority locations including Western Siem Pang and Preah Vihear.
- Ranging behaviour- How far and where are vultures travelling to find carcasses- are they food stressed? Is there a need for a transboundary approach to vulture conservation in Southeast Asia?
- Identification of new breeding sites.
- Lack of true understanding of why people have a negative perception of vultures – attitude surveys needed in order to design effective awareness and perception changing campaigns
- No clear information on illegal wildlife trade

4) Ongoing conservation strategies

The Cambodian Vulture Conservation Project aims to implement site based conservation activities including protecting core vulture habitat, advocacy to change negative attitudes towards vultures, population monitoring and research to develop a deeper understanding of the threats facing vultures in Cambodia, learn from the experiences in the Indian Sub-continent and other regions and assess the effectiveness of conservation measures to refine and improve vulture conservation in Cambodia.

Long term monitoring suggests that all three-vulture species currently occur at low numbers across Indochina's dry forest landscape. However, individual animals have large home range sizes, as was evidenced by a vulture wing-tagged in Preah Vihear Province and observed in two separate locations in Mondulkiri Province, and may potentially use all available habitat. Since individuals are wide-ranging, conservation actions do not have to be prescriptive for particular areas, and all actions across the landscape are beneficial.

5) Action strategy

Vision

In 10 years vultures will exist across Cambodia's dry forest landscape at levels consistent with their long-term survival.

Aim

Prevent the extinction of Cambodia's vulture populations, restore their population size to levels consistent with their long-term survival by mitigating threats throughout their range.

Principal recovery actions

The most important areas where current and future conservation activities should focus on are 1) reducing the incidences of vulture poisoning, 2) supporting sustainable forest management of priority sites including Western Siem Pang Forest, Preah Vihear Protected Forest, Mondulkiri Protected Forest and Lomphat Wildlife Sanctuary, including supporting the recovery of wild ungulate populations, thereby increasing the carcass food supply for vultures. These actions must ultimately be guided by the results of scientific research and their effectiveness evaluated through monitoring.

Priority actions and budget
(drafted in the CVCP workshop on December 4th 2015). Actions are prioritized using the following criteria:

- **Priority:**

essential (recovery highly unlikely without this action – only one in the research/monitoring section),
high (action required in short-term for recovery; rank 1, 2 etc within each section),
medium (action required in long-term for recovery),
low (action useful, but recovery can continue without it).

- **Timescale:**

now (happening/required now),
short (within the next 4 years),
long (beyond 4 years);

Table 1: Proposed actions framework including all actions ranked as either essential or high priority. Actions have been grouped by the threat that they propose to mitigate. Lower priority actions have been included in appendix IV.

Threat	Action to mitigate threat	Priority	Timescale	Organisations	Total Costs ($)
Objective 1: Strengthen in-situ conservation					
Poisoning	1.1 Education and outreach- Implementation of a high profile anti-poisoning campaign including: - Contracting the consultancy guidance of a professional advertising company - Production of a short film - Talk shows about vultures on popular TV channels such as the rarest birds programme - Social media – establishing a Vulture Conservation Project Facebook page. - Establishment of a poisoning hotline - Develop collaborations with Ministry of Health and pharmacies to provide awareness raising and provide clear instructions about drug use. - Local radio - School education sessions - Working with religious leaders - Posters - Community meetings	Essential	Now	ALL, Ministry of Health	50,000
	1.2 Training field personnel to manage poisoning incidents effectively, including emergency vulture care, neutralising poison sites and collecting reliable data on incidents so that preventative actions can be focused	High	Now	BLI, WCS Veterinary team	10,000
	1.3 Carry out toxicology analysis of all vulture poisoning cases to determine cause of poisoning events	High	Now	BLI, WCS, Department of Agriculture	80,000
	1.4 Establish preemptive national ban on veterinary Diclofenac use	High	Short	WCS, MoE, FA	50,000
	1.5 Periodic surveys to test for use of poisons, including veterinary	High	Short	All	30,000

	and pharmacy surveys and use of pesticides in and around ELCs				
Low food availability – due to hunting, habitat loss and reduced numbers of domestic livestock	1.6 Effective law enforcement within protected sites to halt forest conversion and hunting and targeted law enforcement patrols to protect priority nesting areas and nest guardians.	Essential	Now	MoE, FA, WWF, WCS, BLI	3,000,000
	1.7 Establish new protected area in Western Siem Pang IBA priority vulture conservation site	Essential	Now	MoE, FA, BLI	30,000
	1.8 Effective spatial planning to retain priority forest areas; undertaking thorough environmental impact assessments to ensure that regional development projects do not compromise priority sites for vulture conservation.	Essential	Short	MoE, FA	100,000
	1.9 Secure sustainable finance for vulture restaurants	High	Short	ALL	20,000
	1.10 Promote domestic livestock ownership- free vaccinations, cow bank initiatives etc.	High	Now	BLI, FA	40,000
	1.11 Zoning of protected sites, development and implementation of management plans	High	Short	MoE, FA	200,000
Objective 2: Conduct comprehensive threat and population status monitoring for all three vulture species to inform adaptive conservation management					
Lack of research limiting understanding to design targeted interventions	2.1 Vulture restaurants at priority sites to continue monitoring of priority populations	Essential	Now	ALL	100,000
	2.2 Research into ranging behaviour to assess extent of travel by individual vultures indicating effort expended in search of food, and to clarify wider priority zone for protection	High	Short	BLI, WCS	50,000
	2.3 Attitude surveys in target communities to improve understanding of why people have a negative perception of vultures and patterns of pesticide use – needed to design targeted awareness campaign	High	Short	ALL	20,000
	2.4 Robust surveys of wild ungulate populations and carcass availability in priority sites including Western Siem Pang, Preah Vihear, Lomphat Wildlife Sanctuary, Mondulkiri Protected Forest	High	Short	ALL	100,000
Total cost					**3,880,000**

Implementation plan

Action\Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Objective 1: Strengthen in-situ conservation										
1.1 Education and outreach										
1.2 Training field personnel to manage poisoning										
1.3 Carry out toxicology analysis										
1.4 Establish ban on Diclofenac use										
1.5 Periodic surveys to test for use of poisons, including pharmacy surveys and use of pesticides										
1.6 Effective law enforcement										
1.7 Establish new protected area in Western Siem Pang priority vulture conservation site										
1.8 Effective spatial planning to retain priority forest areas										
1.9 Secure sustainable finance for vulture restaurants										
1.10 Promote domestic livestock ownership										
1.11 Zoning of protected sites										
Objective 2 Conduct comprehensive threat and population status monitoring for all three vulture species to inform adaptive conservation management										
2.1 Population monitoring through vulture restaurants										
2.2 Research into ranging behaviour										
2.3 Attitude surveys in target communities										
2.4 surveys of wild ungulate populations										

6) Monitoring and evaluation

The delivery of the Cambodia Vulture Action Plan will be monitored and evaluated by CVCP.

The success of the action plan will be monitored by the following approaches:

Short-term indicators:

1) No reported cases of vulture hunting and nest destruction by 2018.
2) By 2020 the number of vulture nests found and successfully fledge has increased from 2016 baseline.
3) By 2017 the survivorship of vultures affected by poisoning events has improved through improved animal husbandry capacity of field teams in responding to poisoning events.
4) All suspected poisoned vultures sent for laboratory testing and poison identified by 2018.
5) The number of vulture poisoning incidents drops to zero by 2019.
6) Vulture ranging behaviour better understood through evidenced by a scientific paper by 2020.

Long-term indictor:

1) **Population trend of the three vulture species is stable or increasing.**

7) Conclusion

Cambodia contains globally significant sub-populations of three Critically Endangered vulture species. Since 2010 there has been a worrying trend of a decrease in two of these species: the White-rumped Vulture and Red-headed Vulture and a marked reduction in vulture numbers in the Eastern Plains of Cambodia. The conservation of these species requires an immediate and concerted effort to tackle the threat of poisoning through a high-profile awareness campaign. In the longer-term improved protected area management is required to maintain the large stretches of forest and ungulate populations required by these species.

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Appendix I

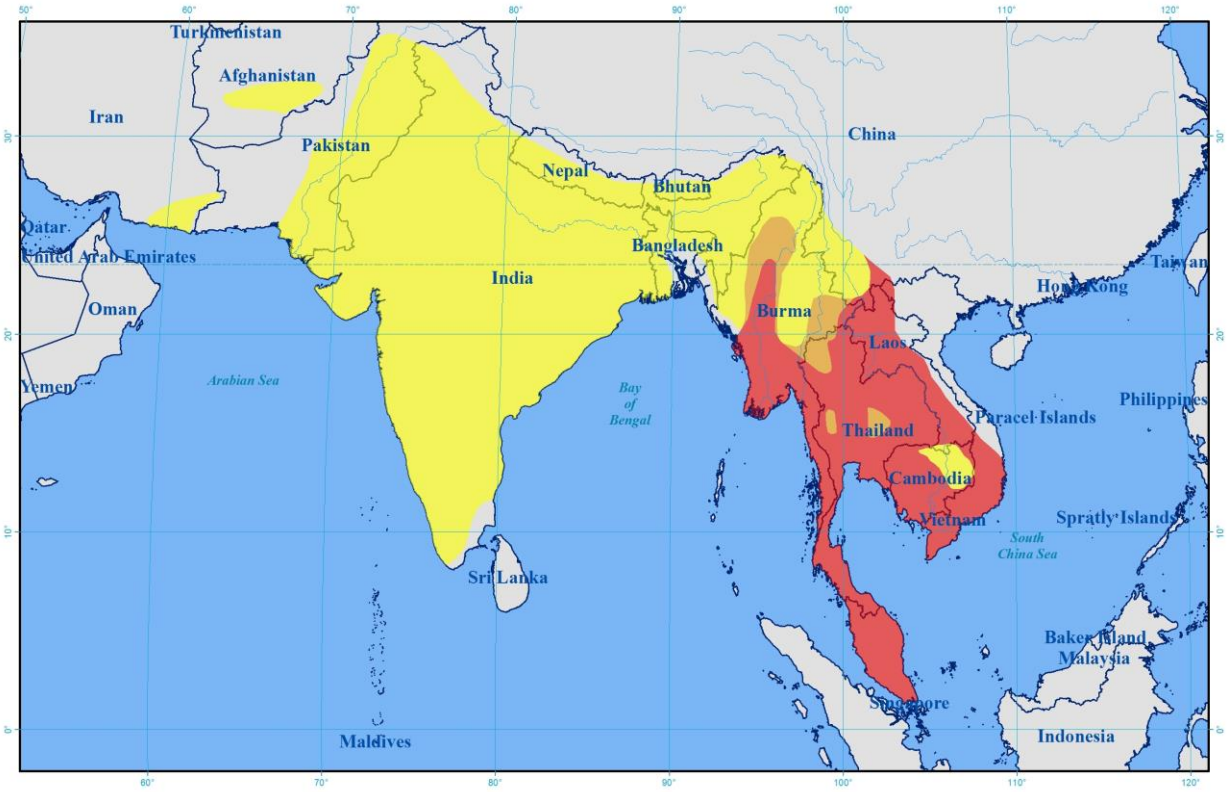

Figure 5a: Global distribution of White-rumped Vulture *(Gyps bengalensis)*. Red = possibly extinct, orange = Extant, but non-breeding, yellow = Extant, resident. BirdLife International and NatureServe (2014) Bird Species Distribution Maps of the World. 2015.

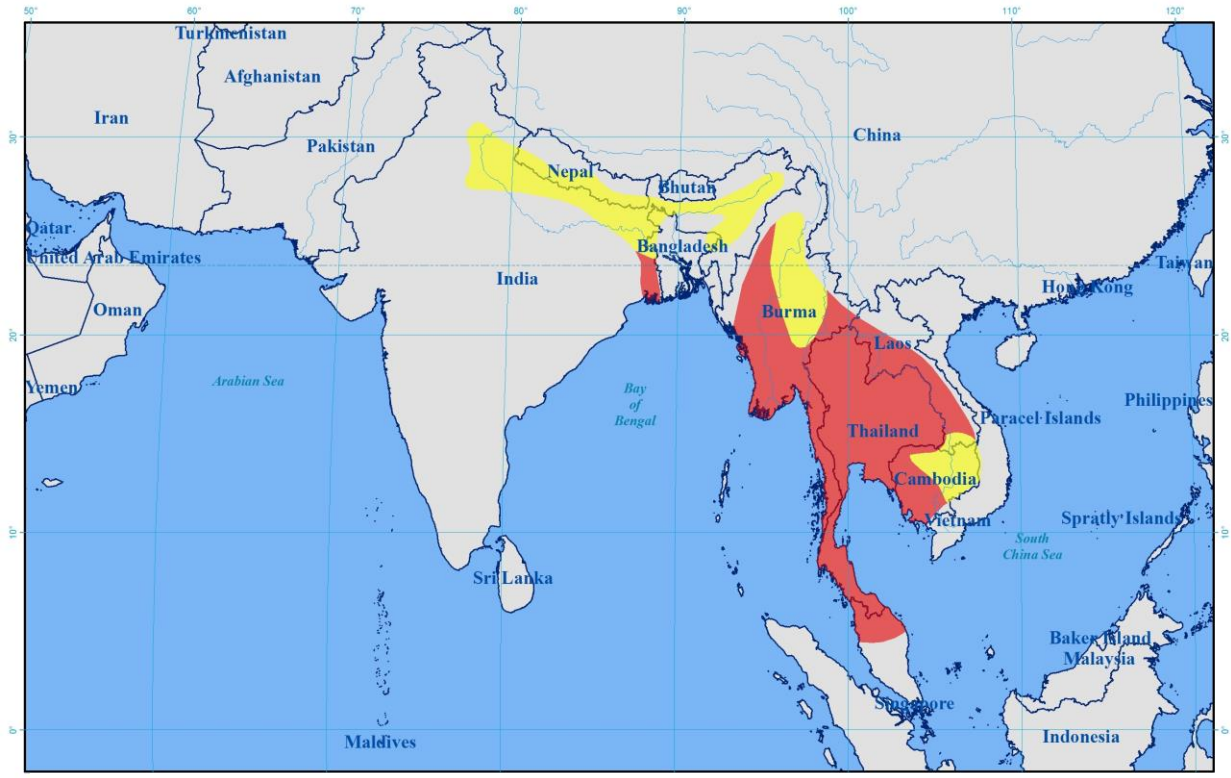

Figure 5b: Global distribution of Slender-billed Vulture *(Gyps tenuirostris)*. Red = possibly extinct, yellow = Extant, resident. BirdLife International and NatureServe (2014) Bird Species Distribution Maps of the World. 2015

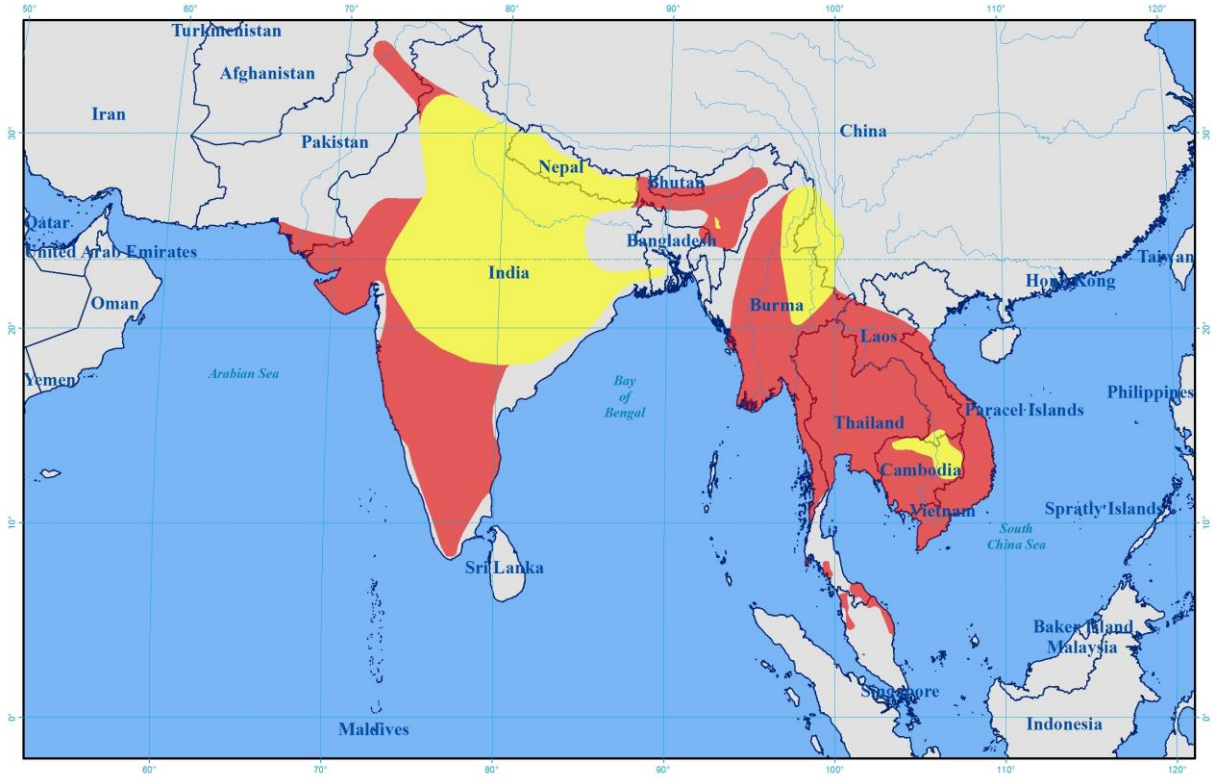

Figure 5c: Global distribution of Red-headed Vulture (*Sarcogyps calvus*) BirdLife International and NatureServe (2014) Bird Species Distribution Maps of the World. 2015. Red = possibly extinct, yellow = Extant, resident.

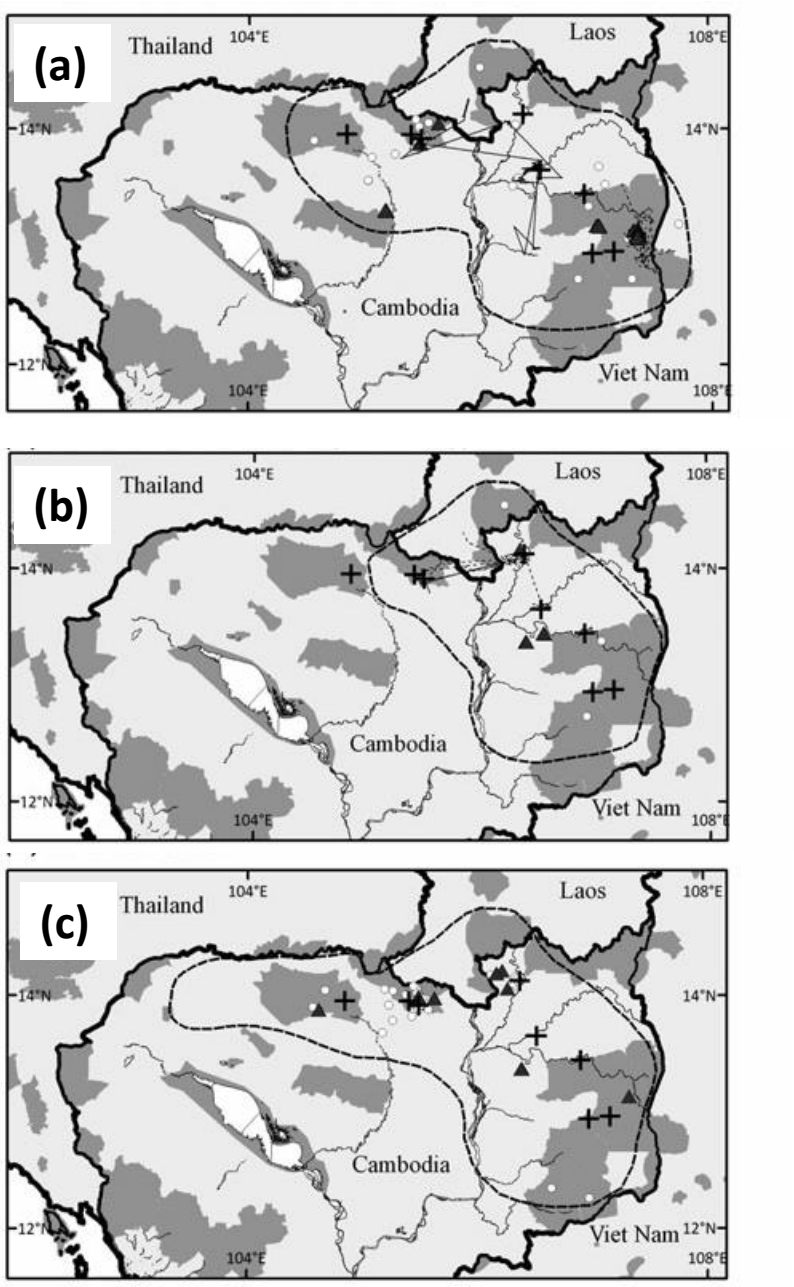

Figure 5: Distribution of (a) White-rumped Vultures, (b) Slender-billed Vultures, (c) Red-headed Vultures in Cambodia, adapted from Clements *et al.* 2012. Species' main range = dotted line, Vulture restaurants = cross (updated locations of restaurants as of 2016 is given in appendix IV), nesting colonies = triangle, protected sites = dark grey.

Appendix II

Table 2: Vulture census data between 2004 and 2015 for the two June census counts. The minimum yearly population estimate is given by the larger of the two counts.

Years	Census date	WRV	SBV	RHV	Total Count
Year 2004	**10th June**	**88**	**34**	**40**	**162**
	26th June	90	25	42	157
Year 2006	**10th June**	**149**	**27**	**58**	**234**
	24th June	83	31	32	146
Year 2007	**10th June**	**160**	**24**	**35**	**219**
	24th June	150	26	40	216
Year 2008	10th June	113	30	48	191
	20th June	**191**	**51**	**44**	**286**
Year 2009	10th June	50	84	11	145
	20th June	**209**	**30**	**13**	**252**
Year 2010	10th June	156	45	44	245
	25th June	**201**	**42**	**46**	**289**
Year 2011	10th June	146	42	27	215
	25th June	**183**	**45**	**39**	**267**
Year 2012	10th June	112	27	23	162
	20th June	**113**	**46**	**45**	**204**
Year 2013	10th June	93	46	19	158
	20th June	125	64	29	218
Year 2014	**10th June**	**137**	**52**	**25**	**214**
	20th June	133	52	17	202
Year 2015	**10th June**	**91**	**47**	**15**	**153**
	20th June	73	34	18	125

Appendix III Further discussion of poisoning events in Cambodia and possible intervention strategies

Lack of facilities to identify chemicals used in poisoning events

No toxicology facilities currently exist in Cambodia. Therefore the specific chemical used in poisoning events is often unknown and this hinders specific targeting of anti-poisoning interventions. However widely available pesticides, such as Carbofuran and cyanide, that have been shown to be highly toxic to vultures are the most likely chemical to be used (Cuthbert *et al.* 2006, Green *et al.* 2006). Poisoning as the cause of death is often inferred using field reports combined with necropsy examinations.

If the specific drugs responsible for poisoning of vultures could be identified, then key stakeholder groups involved in the manufacture and use of these chemicals may be targeted and engaged to mitigate the negative impacts of the chemicals' use.

Lessons from global vulture conservation efforts

The poisoning incidents in Cambodia related to hunting, poisoning at water holes etc. closely resemble the threats to vultures in Africa, where 61% of vulture mortality since the 1970s has been attributed to secondary poisoning resulting from hunting, including use of pesticides (e.g. carbofuran and aldicarb) or cyanide to poison water holes, and pest control (Ogada *et al.* 2015). Therefore vulture conservation in Cambodia may draw valuable lessons from efforts to conserve African vultures.

Poisoning events effecting both vultures and people

Eating of poisoned meat is not just an issue for vultures, but is also a human health issue too. In 2015 at least three people are known to have died after eating poisoned dog meat http://www.phnompenhpost.com/national/dog-carcass-kills-three-sickens-33-kratie. The seriousness of such cases may be used to help advocate for a total halt to the use of poisons in hunting, meeting both human and health and conservation priorities.

Appendix IV Low priority threats and actions

Direct persecution through the pet trade and malicious behaviour

Current threat level: Scope 2, Severity 3

Anecdotal evidence suggested that wild vultures are sometimes caught and held as pets. In 2014 photographs were circulated on Cambodian Wildlife facebook networks of a Himalayan Griffon vulture held captive. vulture parts appear not to be sort after for used in traditional Chinese medicine, although two instances are known: 1) a vulture from Phnom Tamao zoo was killed for perceived medicinal value 2) In Mondulkiri there was a report that a vulture carcass has been found with the head and feet removed likely for use in khmer medicine. There are indications that Thai or Lao buyers or middlemen have visited villages within the remaining vulture range in Siem Pang and Chhep districts, Cambodia, requesting capture of birds (Timmins et al. 2003). During 1970s-1990s the widespread abundance of firearms in Cambodia likely caused significant persecution of birds. In 2015 one Slender-billed Vulture chick was discovered abandoned at the side of a forest trail. It is assumed that people from a local village captured the chick, but then subsequently abandoned it. BirdLife International, with the help of ACCB were able to rehabilitate and successfully release the chick once it was fully grown: https://treehuggerfishlover.wordpress.com/2015/08/18/from-fluffball-to-flight-a-conservation-success-story/ . There have also been incidental reports of vultures killed for sport by gun and slingshot. This likely results from a negative cultural perception of vultures in Cambodia. Vultures are considered dirty as they eat from carcasses and a bad luck omen and may be treated as a pest stealing from hunter carcasses.

Genetic bottleneck

Current threat level: Scope 1, Severity 4

Currently Cambodian Vulture populations are estimated to be at most a few hundred individuals. This likely results in a small genetic diversity among the breeding population, which raises concerns of resistance against disease and inbreeding depression.

Table 3: Medium and low priority actions

Threat	Action to mitigate threat	Priority	Timescale	Organisations	Annual costs
1) Poisoning	Research into the supply chain for pesticides in Cambodia: who buys what? Who sells what? There may be some collaboration possible with Direction General Agriculture (DGA) who does some pesticide formulation testing	Medium		WCS Veterinary team to explore collaboration with government	
	Review legal framework for pesticide use in Cambodia in collaboration with Public Health Department, ensuring that the sale of pesticides listed on Annex III of the Rotterdam Convention (2015) and others that are widely implicated in wildlife poisoning (carbofuran) is closely regulated, with their sale only available through licensed and trained distributors with adequate training on the safe use of pesticides provided (Oganda *et al.* 2015).	Medium	Short	WCS veterinary team, WWF, MoE, FA, Public Health Department,	
	Develop alternative pest control methods e.g. use of natural predators such as barn owls	Medium	Short	ACCB	
2) Low food availability	Captive breeding and restocking of wild ungulate populations	Medium	Long	WWF, BLI	
3) Loss of nesting habitat	Targeted nest protection measures- nest guardians, baffles, targeted enforcement patrols	Medium	Now	MoE, FA, WWF, WCS	
	Assessment of vulture nesting requirements	Medium	Short		
	Targeted law enforcement patrols around known nesting hotspots	Medium	Now	FA, BLI, WCS	
4) Lack of research limiting understanding to design targeted interventions	Social surveys to assess extent and severity of illegal wildlife trade in vulture body parts	Low	Long		
5) Direct persecution e.g. Illegal Wildlife	Social surveys to assess underlying causes of negative perception	Medium	Short	RUPP	

Trade	Assessment of extent of illegal wildlife trade	Low	Long	RUPP	
6) Genetic bottleneck	Assessment of global captive stock of CR Vulture species.	Medium	Long	BirdLife	

Appendix IV Locations of vulture restaurants in 2016