VULTURES

Wed 12:30 Java.
meet Tom

Vultures in Cambodia

Tom Clements, WCS - Cambodia Program

Background

Status of Vultures in the Indian Subcontinent

white rumped vulture, slender-billed

does it persist, go 10 days

The recent dramatic declines in *Gyps bengalensis, G. tenuirostris* and *G. indicus* populations in South Asia are caused by the veterinary drug diclofenac. Diclofenac is a non-steriodal anti-inflamatory drug (NSAID) similar to ibruprofen or tylenol. The evidence for this cause is compelling: (1) around 85% of vulture mortalities examined have visceral gout; (2) visceral gout is caused by kidney failure; (3) some NSAIDs are known to cause kidney failure in mammals and birds; (4) diclofenac was found in all birds with visceral gout (and was not found in those that did not); (5) if tissue from a dead vulture is given to another the bird lives - i.e. the cause is not a transmissible disease; (6) if diclofenac is given to vultures they die with visceral gout and pathology identical to that found in field cases All these facts are contained in Oaks et al. (2004).

Further, diclofenac was licensed (for veterinary use) in Nepal in 1989, India in 1994 and Pakistan in 1998 - *i.e.* it is a new drug. Vultures are almost extinct in Nepal (and civil war may have prevented spread of drug-use), have declined by over 97 per cent in India since 1993 (Prakash 1999) and are declining at 30-40 per cent per year in Pakistan. Given present rates of decline all three species will be extinct within 1-5 years. *G. indicus* appears to be less affected, although remnant populations are found in more remote areas where drug use may be less widespread. Rates of decline, at least for *G. bengalensis*, are increasing each year, and this species (which was once the commonest) will probably be extinct sooner. Very little is known about *G. tenuirostris*, which has also undergone steep declines (the species was only split from *indicus* in 2000, separate counts of *indicus* and *tenuirostris* have been made since 2001, and have shown that the species is the less abundant than the other two and is possibly declining faster). This species is so rare that only isolated nests are known and counts in most areas in its range are 1-8 birds (some counts of 15-20 have been recorded in Nepal, in an area occupied by Maoist rebels). *G. himalayensis*, found only in the Himalayas and *G. fulvus*, juveniles and sub-adults of which migrate to the Indian subcontinent from breeding sites in Central Asia, appear not to be affected. However monitoring data for these species is patchy. Since only the populations wintering on

the subcontinent are almost all juveniles any declines in breeding populations would be less severe and therefore harder to detect (as they would relate to low recruitment into the adult population rather than mortality of breeding age birds).

Mathematical models (Green, unpublished) show that diclofenac presence in only 0.1-0.4% of carcasses is sufficient to cause the observed decline of c.30%/year (and hence vulture extinction). That is, very few carcasses need to contain diclofenac for vultures to go extinct. 2.5 million doses were sold in India last year alone (for 502 million cattle).

There are two important conclusions from the above -

(1) Diclofenac alone is sufficient to cause the observed dramatic declines in vulture populations.

(2) Even a very small amount of diclofenac in veterinary use is sufficient to cause strong annual vulture declines - vulture populations in countries where diclofenac is presently used (Nepal, India, Pakistan) will go extinct.

A new herpes virus has been identified from tissue from one dead vulture, and a new mycoplasma agent from another. The novel Mycoplasma was cultured from a juvenile vulture in Pakistan (with gout), PCR analyses on further tissues found the same mycoplasma in ~35% of the vultures examined (similar frequency in gout and non-gout birds). Transmission experiments conducted in Pakistan were successful in transmitting the Mycoplasma, but were unable to induce sickness, death or gout. Although diseases might contribute to the vulture declines this does not alter the two conclusions above - especially (1) - evidence shows that diclofenac alone is a sufficient cause.

Two groups are presently working on vultures - the Peregrine Fund, with the Ornithological Society of Pakistan and Bird Conservation Nepal (BCN) in Pakistan and Nepal, and the RSPB/ZSL/BNHS (Royal Society for the Protection of Birds, Zoological Society of London and Bombay Natural-History Society), principally in India and with BCN in Nepal, funded by the Darwin Initiative (UK Department of Education).

The PF have, through a government meeting in Kathmandu, produced a declaration stating that (1) diclofenac must be banned as soon as possible, and (2) regardless of this vultures must be urgently taken into captivity as the only means of ensuring survival. The PF will be capturing 25-50 pairs each of *G. indicus* and *G. bengalensis* for export to a captive breeding facility in the United Arab Emirates, it being judged that Pakistan does not have sufficient facilities. Activities beyond this will be limited to recording the declines and possibly some work in Nepal (yet to be decided).

The RSPB/ZSL/BNHS recently held a meeting to produce a 'recovery plan'. Although the plan has yet to be released it will probably recommend similar actions to the PF, particularly (1) diclofenac should be banned from veterinary use, (2) at least three facilities with minimum of 25 pairs of each species should be established as soon as possible, and (3) disease research should continue. The RSPB/ZSL/BNHS will support the construction of at least 2 facilities in India and 1 in Nepal to hold the birds. However, they will need to get permission before captures can begin (and this may take time).

In summary, both groups are recommending that the drug is banned, however the timescale for this is relatively long (e.g. 5 years?). With the combined resources of the two groups there should be sufficient capacity, at least in the short-term, to house the required number of birds (75 pairs of each

species). However, there is considerable doubt as to whether they can capture enough *G. tenuirostris*, since this species is of very low density, and highest numbers are in an inaccessible part of Nepal.

The most obvious 'gap' in the present activities is that insufficient *G. tenuirostris* will be taken into captivity for a successful breeding program before diclofenac causes its local extinction.

Gyps *Vultures in Cambodia*

The status of *Gyps* vultures in Indochina has been described by Poole et al. (2004). The map shows all recent records for the 3 extant species from 1997-2003 - *Gyps tenuirostris, Gyps bengalensis* and *Sarcogyps calvus*, taken from that publication. The remnant population is focused on northern and eastern Cambodia, an area approximately 300 km east-west and 250km north-south and including border areas in Laos PDR and Vietnam. Prior to 2003 the largest numbers recorded were from Koh Nek, Mondulkiri, where 4 *tenuirostris* 13 *bengalensis* and 10 *S. calvus* were seen in June 2000. On this occasion all birds were adults with the exception of 2 *bengalensis* juveniles.

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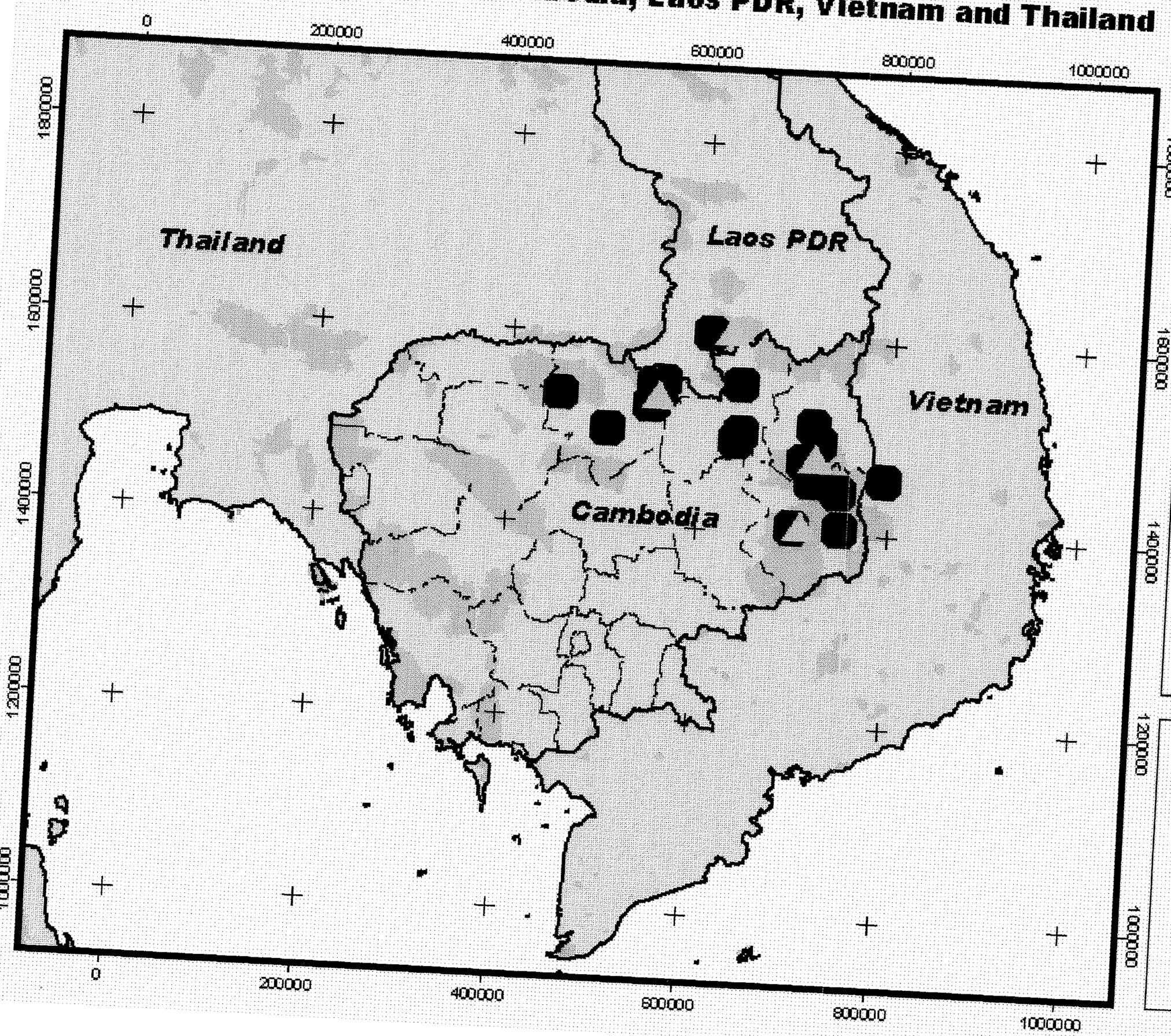
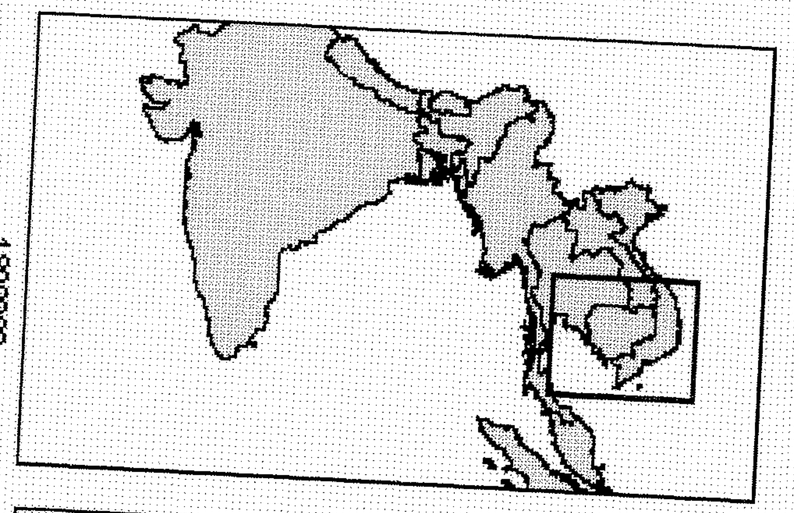
Status of Gyps Vultures in Cambodia, Laos PDR, Vietnam and Thailand





Distribution based on Observations made from 1997-2003
WCS, WWF, FFI data

Legend

- Slender-billed Vulture
- White-rumped Vulture
- Cambodian Provinces
- Country Boundaries
- Protected Areas

Wildlife Conservation Society - Cambodia Program

N

0 50 100 150 Kilometers

Indian Thailand
UTM Zone 48

Research Topics for South-East Asian Vultures

Conservation interventions in South Asia have been considerably informed by extensive research since 1993. By contrast, the South-East Asian populations are relatively little understood. It is difficult to recommend conservation interventions without basic information regarding population sizes and trends, and major threats. Indeed it is possible that no intervention is required for the maintenance of South-East Asian populations.

In particular, the following key factors are comparatively unknown:

- Population trends. There are no historical data sets that could be used to measure population trends and no system currently exists to estimate future changes.
- Population size. All current datasets are anecdotal only, and have been collected in different years. The total population size is unknown.
- Nesting sites. Despite occasional anecdotal records no breeding sites have been identified. In South Asia birds historically nested in colonies, however lower densities in South-east Asia may promote individual breeding. Immatures have been recorded, so breeding has occurred within the past 5 years.
- Diclofenac usage. Limited surveys in Preah Vihear province have indicated that the drug is not available for veterinary use, although is found in human pharmacies. Human diclofenac can be given to livestock, but is considerably more expensive. It is essential that the extent of diclofenac usage is understood before threats to the vulture populations can be assessed.

It is therefore proposed that the focus of 2004-2005 vulture activities in Cambodia should be focused around these research needs, in particular:

- Use of a range-wide vulture restaurant program to estimate population size in different provinces, and to establish a baseline dataset for a future monitoring program. Replication of the restaurants in subsequent years would collect data suitable for following population trends. WCS has already developed the appropriate methodology.
- Capture-mark-resighting program. Marked vultures can be used to follow individual mortality, estimate range sizes, and through using mark-resighting models to estimate population size. WCS has trialled a capture-marking program in December 2003 and this could be easily replicated and extended.
- Ground breeding site surveys by staff. If at all possible satellite tags could also be fitted to adult vultures and used to identify breeding sites.
- Diclofenac survey throughout range provinces. WCS has developed suitable datasheets that can be used during market surveys, and has completed the work in Preah Vihear province.

Subsequent sections explain methodologies trialled by WCS at one site in Cambodia, with preliminary results.

Pilot Methodologies for Vulture Research

Vulture Restaurants in the Northern Plains

Introduction

WCS commenced work on vultures in the Northern Plains of Cambodia in January 2003, as part of the UNDP/GEF-funded CALM (Establishing Conservation Areas through Landscape Management) project. The first priority was to develop techniques to survey populations and their distributions. At

project. The first priority was to develop techniques to survey populations and their distribution. At least three methods are suitable for this purpose:

1. Road surveys, counts of numbers of vultures seen whilst driving along a road transect, or counts at carcasses seen beside roads.
2. Colony surveys, counts of the number of breeding pairs at each colony.
3. Restaurant surveys, counts of the number of vultures visiting a carcass.

Although road surveys were used historically with great success in India, trials in Cambodia concluded that overall vulture numbers were too low for this technique to be effective, and there are relatively few suitable roads bisecting the region. Counting nesting pairs yields extremely useful data (e.g. breeding success etc.), however no confirmed nesting sites are known in Cambodia. Juvenile birds are seen, so isolated nests must exist. It is probable that the Cambodian population is sufficiently low that the density is below that which encourages colonial breeding - hence birds are expected to breed in isolated nests. Collecting information on nesting behaviour remains an important priority for field research.

The survey technique chosen was a program of 'vulture restaurants'. Appendix 1 explains the methodology used. A series of 8 restaurants were completed across the eastern Northern Plains' landscape, since this was the area where vultures had been recorded before. Multiple restaurants were completed in each area, separated by a several weeks, in order to make robust conclusions about species' distributions.

In addition, in December 2003 two juvenile *Gyps bengalensis* were caught using a 4 × 2.5 metre remote controlled trap. Birds were marked with numbered wing tags and unique combinations leg-rings. The colour of the wing-tag can easily be seen from the ground and identifies the site where the bird was captured; numbers can be read over shorter distances and identify the individual. Since wing-tags can be removed by birds, unique combinations of leg-rings were also attached to birds to also allow individual identification. The combinations that have been designed are leg-independent (i.e. it is not necessary to identify if the left or right leg has the coloured ring) – since studies have shown that observers do not consistently record which leg has a particular coloured ring (ref..).

Results

Table 1 shows the data collected from the first 8 restaurants completed in 2003, and from a further carcass monitored in March 2003. The Map shows the results from the completed restaurants, and all vulture records from the Northern Plains in 2000-2003.

Results reveal a strong increase in total numbers of vultures towards the east ($F = 42.5$, d.f. = 1,8, $P <$ 0.001). Red-headed vulture, *Sarcogyps calvus*, was the only species recorded at all restaurants. White-rumped vulture, *Gyps benglensis*, was seen at two locations. Immature birds were only found at one

site – Veal Boeungtol – and this was also the only site where Slender-billed vultures, *G. tenuirostris*. The only exception is a single immature *G. bengalensis* recorded from Trapeang Kanseng.

The trap caught two juvenile *Gyps bengalensis*. The first vulture was marked with yellow wing-tags (black number '1') and a blue ring on the left leg. It weighed 6.4 kg. The second vulture was marked with yellow wing-tags (black number '2') and a black ring on the left leg. It weighed 5.8 kg.

Conclusions

The vulture restaurant program revealed a surprisingly small area with a high vulture density, where immature birds and adults of all three species were present. However, there was little habitat difference between the restaurant sites – all were open grasslands in deciduous forest. Vultures are known to be wide-ranging, however unpublished satellite-tagging studies in Pakistan have shown that birds' movements are strongly affected by food supply – and if food is sufficient in one area they may restrict their movements to this area.

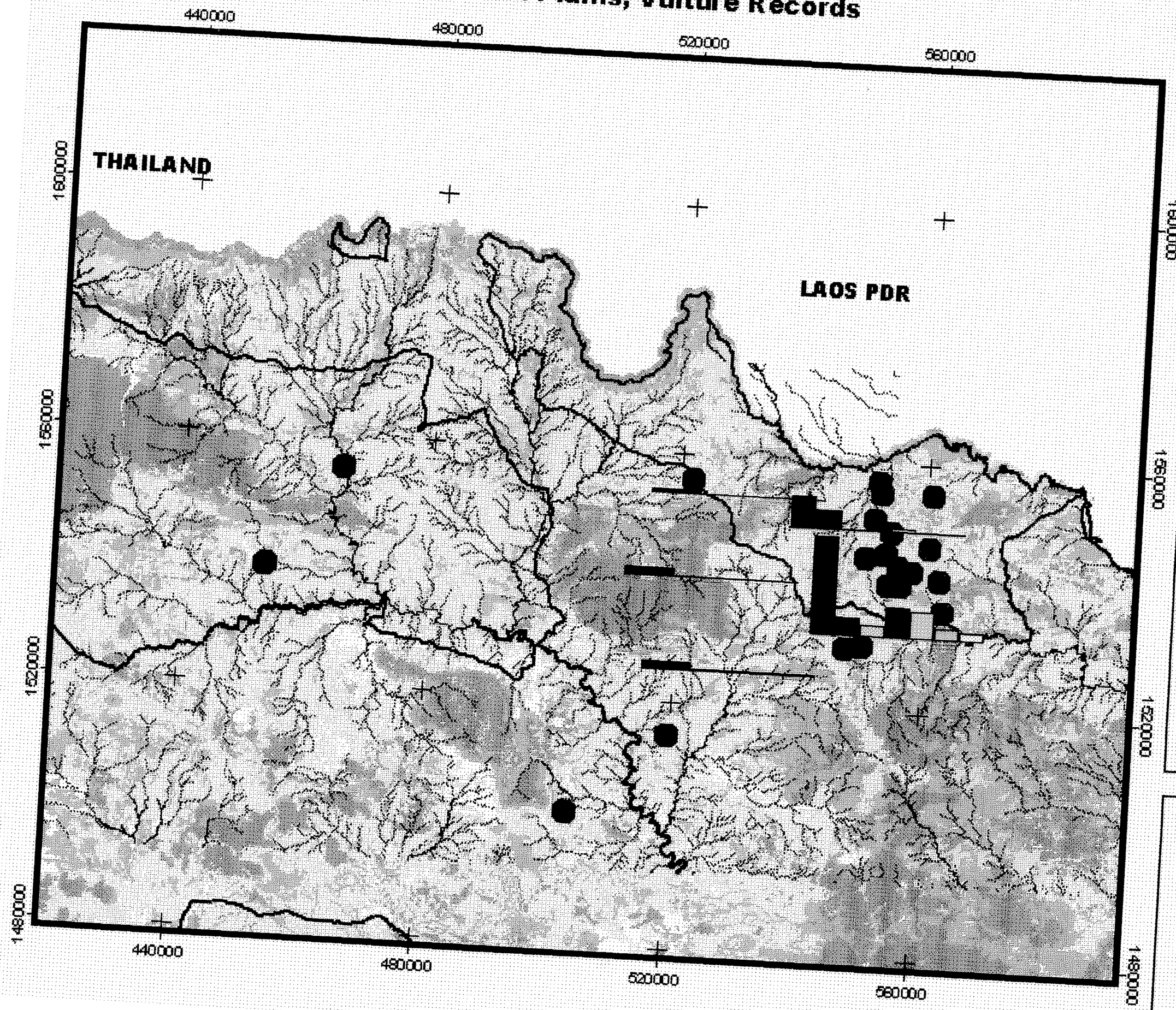
Capturing and tagging of vultures is possible, and could be used to estimate population size (capture-mark-resight), investigate mortality over time, and to measure ranging behaviour (if observers are present in other locations within the vultures' range). However the net used was not the most suitable – 20 vultures were present when the net was fired but only 2 were finally captured. Alternative techniques include a wire cage used commonly in Israel, or a bamboo 'sticky' pole used in India. However, the most feasible alternative would be a locally made net trap, of the type frequently used by local hunters for birds. This should be investigated.

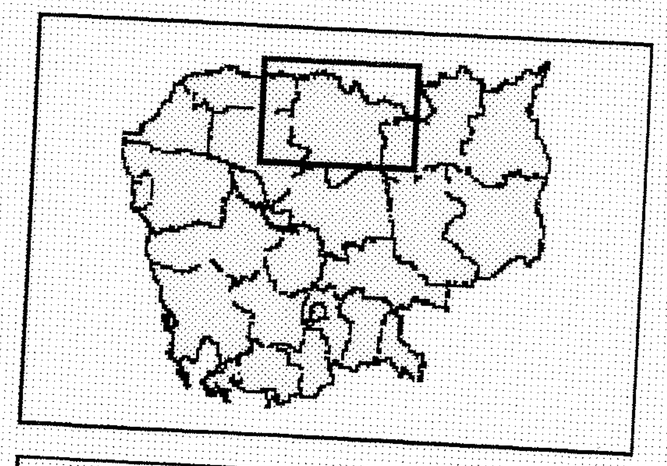
Table 1. Results from Vulture Restaurant program February - December 2003.

No.	Location	UTM	Date	*Sarcogyps calvus*		*Gyps bengalensis*		*Gyps tenuirostris*		Total
				Adult	Immature	Adult	Immature	Adult	Immature	
1	Trapeang.Reshey, 6 km, Southern Robunh village	0529454 1553860	23-02-03	1						1
2	Trapeang.Kanseng, 15.5 km, Northern Dangplat village	0552046 1551642	08-03-03	8		4	1			13.
3	Near O Dar, 15 km north of Moluprey village	0525632 1540611	19-03-03	3						3
Other Carcass	Near Cherndar Concession, north of Moluprey	0532910 1535980	19-03-03	1						1
4	Veal Boeungtol, 7 km, Eastern Dangplet village	0555920 1540040	27-04-03	11		10	5	4		30
5	Rice field, 1.5 km, Southern Moluprey village	0528999 1525776	09-06-03	3						3
6	Veal Boeungtol, 7 km, Eastern Dangplat village	0555920 1540040	12-07-03	12		6	5	4	2	29
7	Veal Boeungtol, 7 km, Eastern Dangplat village	0555920 1540040	21-11-03	10	2	12	9	4	2	39
8	Veal Boeungtol, 7 km, Eastern Dangplat village	0555920 1540040	03-12-03	7	4	12	11	4	2	41

* clarify species / colours
* vulture icon? → ask Long

Northern Plains, Vulture Records





Legend

Vulture Restaurants
- Total Number
- Red-headed Vulture Adults
- Red-headed Vulture Immature
- White-rumped Vulture Adult
- White-rumped Vulture Immature
- Slender-billed Vulture Adult
- Slender-billed Vulture Immature

WCS Survey Records
- White-rumped Vulture
- Red-headed Vulture

Protected Forest

Protected Areas

Rivers
- river, perennial
- river, seasonal
- river, over 18 m wide

Landuse
- Evergreen Forest
- Mixed and Riparian Forest
- Deciduous Forest
- Grassland

0 20 Kilometers

UTM Indian Thailand
Zone 48

Food Availability and threats to Vulture Populations

Vultures in Cambodia are known to face a number of threats:

- Medicinal value. *Example* – one of the White-rumped Vultures in Phnom Thmao zoo was killed for its medicinal value in November 2003.
- Wildlife Trade. Birds were historically sold in Preah Vihear to traders from Laos PDR and Thailand.
- Persecution. Shooting by armed individuals, disturbance – especially to nests – by local people.
- Disease. The other White-rumped Vulture at Phnom Thmao zoo died due to bird flu (H5N1) in December 2003.
- Food scarcity.

The individual contribution of these threats to vulture declines in the twentieth century is unknown, although direct persecution, wildlife trade and food scarcity are thought to be the main factors (Poole *et al.* 2004). In particular, the scarcity of wild ungulates means that in many areas domestic livestock (cows, buffalos etc.) may be the most important food source.

Accordingly, in north-eastern Preah Vihear a survey of domestic livestock availability and mortality was initiated. Appendix 2 gives the family questionnaire used. In addition, data was collected on the total number of livestock in each village.

Results

Communities rely upon livestock as working animals and a source of wealth (i.e. a 'bank'), and they are rarely consumed. Only male animals are used for work during the wet season – for plowing, harvesting, etc. In the dry season animals are allowed to wander through the forest, frequently unattended. During this period they may die or become lost.

Socio-economic studies in Preah Vihear have shown that the livelihoods of communities are strongly affected by the scarcity of livestock, which forces many families to accumulate debts. Survey results support these conclusions, demonstrating that most families have relatively few livestock (1-4/household). However, in the villages of Dangplat and Narong a smaller number of richer families have substantial numbers (10-40/household) and therefore the total number of livestock in these villages is higher (see Table 1a).

Only families with > 5 livestock in each village were interviewed. These accounted for 70-90% of the total livestock in the village (see Table 1b). Differences in livestock number influence the behaviour of communities. In Mluprey and Khdol villages, which are livestock-limited, the people always look after their animals. However, in Dangphlet and Narong people display much more limited livestock care. Accordingly, many more cattle and buffalo from these villages die in the forest (36 in 2003, compared with 16 in Mluprey and Khdol), especially during the dry season.

Conclusion

The vulture population is highest around the villages of Dangplet and Narong. These villages also have a greater number of domestic livestock, and this relative abundance encourages a more relaxed attitude to animal care by the communities. Many more livestock are lost or die in the forest each year from these villages.

A vulture requires on average around 300g/food per day, although it only needs to eat once every week or so. This equals 110 kg of food/year, or about 1-2 cows or buffalos. The number of vultures recorded around Dangplet and Narong, at Veal Boeungtol is 40. In 2003 the total number of livestock lost or that died in the forest around these villages was 36. The domestic food availability in each year therefore approximately equals vulture demand in around Veal Boeungtol.

The overall low numbers of livestock, the practice of removing meat from dead domestic animals, and the overall scarcity of wild ungulates indicates that populations of vultures in Preah Vihear are probably strongly food limited. This may be the principal factor currently determining population size.

Diclofenac

WCS staff have conducted preliminary surveys to record Diclofenac use in parts of Cambodia, using standardised datasheets. Preliminary results indicate that –

- Diclofenac is not generally used in livestock. Veterinary groups in Takeo, Preah Vihear, Ratanakiri, Stung Treng and Mondulkiri report that use of Diclofenac is not promoted, and formulations of the drug for veterinary use are not available. It might, however, have been used in the early 1990s.
- Diclofenac is widely available for human use – under brand names such as Diclodol, Dicloran, etc. Although the drug is the same, and therefore could potentially be used for livestock, it is packaged in smaller doses and tablets which are unsuitable or expensive for veterinary use. Nevertheless isolated incidences of human diclofenac being bought for livestock have been recorded. The extent of this remains to be assessed.

In conclusion, preliminary surveys would indicate that diclofenac use is not a particular problem in Cambodia. The principal source is drugs packaged for human use. It would probably be impossible to limit the distribution of these drugs and their incidental use in livestock.

Table 1. Results from Domestic Livestock survey, Chhep District, Preah Vihear.

(a) Total number of livestock in the village

Village	# families	# of livestock		
		cow	buffalo	Total
Mluprey	68	185	127	312
Khdol	62	158	81	239
Dangplat	150	611	169	780
Narong	84	258	152	410
Total	**364**	**1212**	**529**	**1741**

(b) Fate of livestock in villages in 2002 and 2003

Village	# of families interviewed	# of livestock owned by families			Percent-age of total livestock	# of family that sell livestock	# animals sold		# animals lost		# animals died				take meat?			
		cow	buffalo	total							in/near village		in forest		take meat		not take (bury)	
							'02	'03	'02	'03	'02	'03	'02	'03	'02	'03	'02	'03
Mluprey	34	158	105	263	84.3	11	2	10	2	1	7	9	0	0	4	9	3	0
Khdol	31	128	73	201	84.1	8	3	9	0	2	13	4	0	0	3	3	4 (6)	(1)
Dangplat	42	431	120	551	70.6	18	6	18	6	9	11	8	0	4	10	5	1	7
Narong	36	227	142	369	90.0	17	9	19	4	8	6	6	2	1	4	2	4	4 (1)
Total	**143**	**944**	**440**	**1384**		**54**	**20**	**56**	**12**	**20**	**37**	**27**	**2**	**5**	**21**	**19**	**18**	**13**

Discussion

Gyps vultures in South Asia are threatened with extinction within the immediate future due to diclofenac poisoning. There are plans to capture the remaining South Asian individuals and to captive breed them whilst diclofenac is phased out. However, numbers of *G. tenuirostris* are sufficiently low that it is possible that insufficient individuals will be captured.

Vultures are known only from 2 areas outside of South Asia –

1. Myanmar. A vulture restaurant in 2003 recorded 78 *G. bengalensis* and 9 *G. tenuirostris*
2. Cambodia and southern Laos PDR. Species known from an area approx. 300 km east-west and 250km north-south.

Much more is known about Cambodia/Laos PDR than Myanmar.

Diclofenac is not known from these countries (based upon partial market surveys), although it may be used in Thailand or Vietnam. Densities are lower than was the case 5 years ago in South Asia, although they are probably approaching comparable numbers. This is especially true for *G. tenuirostris*. SE Asia may contain the a population of *G. tenuirostris* equal to that in South Asia, and in countries where diclofenac is not thought to be available.

In Cambodia vultures are thought to be strongly food limited, due to an absence of large mammal prey, low numbers of domestic livestock, and local practices of removing the meat from dead animals (rather than the Indian practice of leaving dead animals). In Myanmar food limitation and persecution (shooting by soldiers) are thought to be the principal threats (Htin Hla 2003). There are incidental records of trade in Cambodia/Laos PDR, which are at sufficient scale to threaten the low population numbers (e.g. one White-rumped Vulture was recently killed at the Zoo for its blood).

A vulture probably requires 300g meat/day, which equals approx. 100kg/year (or 1-2 cows). Vulture Restaurants in Cambodia by WCS have revealed a minimum population of 42 individuals in one area. A survey showed that last year the communities in the area lost 20 cows in the forest and a further 32 died. Food availability, from domestic livestock, appears to be about sufficient to support the vulture population observed. Cambodian vultures are probably food limited, although persecution/trade may be a problem. Less is known about threats in Myanmar, where persecution may be higher (shooting by soldiers).

WCS Cambodia has developed a number of techniques to study vultures, particularly –

- Vulture restaurants to assess population size and structure, for monitoring data and to determine distribution
- Tagging experiments to record movements and for recapture sampling
- Community surveys to determine livestock abundance and mortality, to estimate available food supply
- Market surveys for diclofenac use

Urgent priorities for future research include –

- Surveys for diclofenac within range provinces
- Population surveys
- Nesting-site surveys

In addition, an advocacy program should be initiated to inform veterinarians, NGOs and Government about the threat posed by Diclofenac, and the alternatives available.

In summary, Cambodia may represent one of only two countries where *in situ* conservation of *Gyps bengalensis* and *Gyps tenuirostris* is possible. Since insufficient numbers of *Gyps tenuirostris* may be caught in South Asia *ex situ* conservation of this species might not be achieved. *In situ* conservation in Cambodia, through permanent vulture restaurants, is not particularly expensive (in comparison with captive breeding), and in South Africa restaurants can be tourist attractions. Much greater research is required in Cambodia to understand population sizes, diclofenac availability and threats.

References

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Appendices

Appendix 1. Vulture Restaurants - a Technique to survey Vulture Populations

In India, vultures are surveyed through long transects, conducted by observers driving slowly along roads. The lack of suitable roads in the Cambodia, and the low density of vultures, means that this approach has limited applicability. An alternative population census method is to count the number of breeding pairs in vulture colonies - however no confirmed breeding sites are known in Cambodia. Vulture restaurants (a slaughtered domestic cow) might provide an alternative technique to survey and monitor populations. Key parameters might be expected to be: the time taken to discover the carcass, and the total number of feeding birds (of each species).

The restaurants can be used to collect data on population sizes and structure, and provide an opportunity to monitor vulture movements, through marking of individuals. The restaurants are not (yet) planned as measures to support vulture populations, although they might be used as such in later projects. Since the technique is standardised it could also be used as part of a monitoring program. If this approach is to give statistically analysable data it would need to be repeated a minimum of 2-3 times in each area, to give comparable data.

Location for the Restaurants

Vultures are easily scared, particularly if people are seen within 50m of a feeding site. The team should not drive to the restaurant site, and the camp should be situated about 1 km away, under some trees (so that it cannot be seen from the air). A hide should be built at the restaurant site, **before** the cow is killed. The best hide location would be to the south, so that birds can be seen easily. The hide should have routes to and away that are hidden form the restaurant, and the path to the camp should lead directly away from the restaurant.

It is important that the vulture restaurants are conducted in suitable areas. The site should be remote from villages (> 5km) and open (minimal tree cover). The carcass should be deposited in an area with no overhead tree cover, and preferably where the grass is short or burnt, the area should be at least 30 by 50 metres. There should be enough space for vultures to land and take off. Vultures like to use trees to perch, so it would be good if the area had 1 or 2 trees within 50m of the carcass.

A hide should be made to watch the carcass. This must be situated to the side of the carcass, and not down-wind, at >50 metres distance. The hide must have a roof to protect observers from the sun. If possible, the hide should be put under a tree, so that it cannot be seen from the air.

Method

The animal should be walked to the site and the hide made before the cow is killed. As soon as the animal has been humanely killed, the carcass must be continually observed. Recommendation is for two groups of two observers, to watch during daylight hours – one to watch the sky, the other the dead animal. It is important that observers remain alert (with sufficient water, sun protection etc..).

One datasheet (Vulture Restaurants: Site) should be recorded for the site, and one datasheet (Vulture Restaurants: Data) recorded for each day the carcass is watched, **even if nothing is seen**.

Observers should record for each the first vulture(s) seen: time, age and number of birds. Thereafter, observers should record the number of birds present every **15 minutes**. Birds flying (or soaring), perched on a tree, loafing (sitting on the ground) or eating should be counted separately. Counts should also be made separately for each species, and divided into the different age classes: adult / subadult / juvenile. Identification of subadults may be particularly difficult and needs to be learnt, observers should take particular care.

If observers are not sure about the status of a bird put the number in brackets (). i.e. Adults: 3 (1) means three adults, and maybe 1 more.

Video camera – used to record for 5 minutes every hour there are vultures at the carcass. In addition, every day when the vultures are present record 30 minutes of video, at a time when have a lot of vultures.

Equipment

Binoculars
Telescope
Video Camera and batteries
Tripod – two fittings
Thermometer
Laminated Sheets
Photocopies, printout sp characteristics.

Other Data

This study provides a good opportunity to collect behavioural data and other information on species. Other important things to record include:

- Size of the birds crop (a bag on the vulture's neck that is used to keep food).
- How long individual birds feed for
- How aggressive individuals are
- What vultures do after eating – fly away? Perch in a tree? Vultures that fly away may have nests.