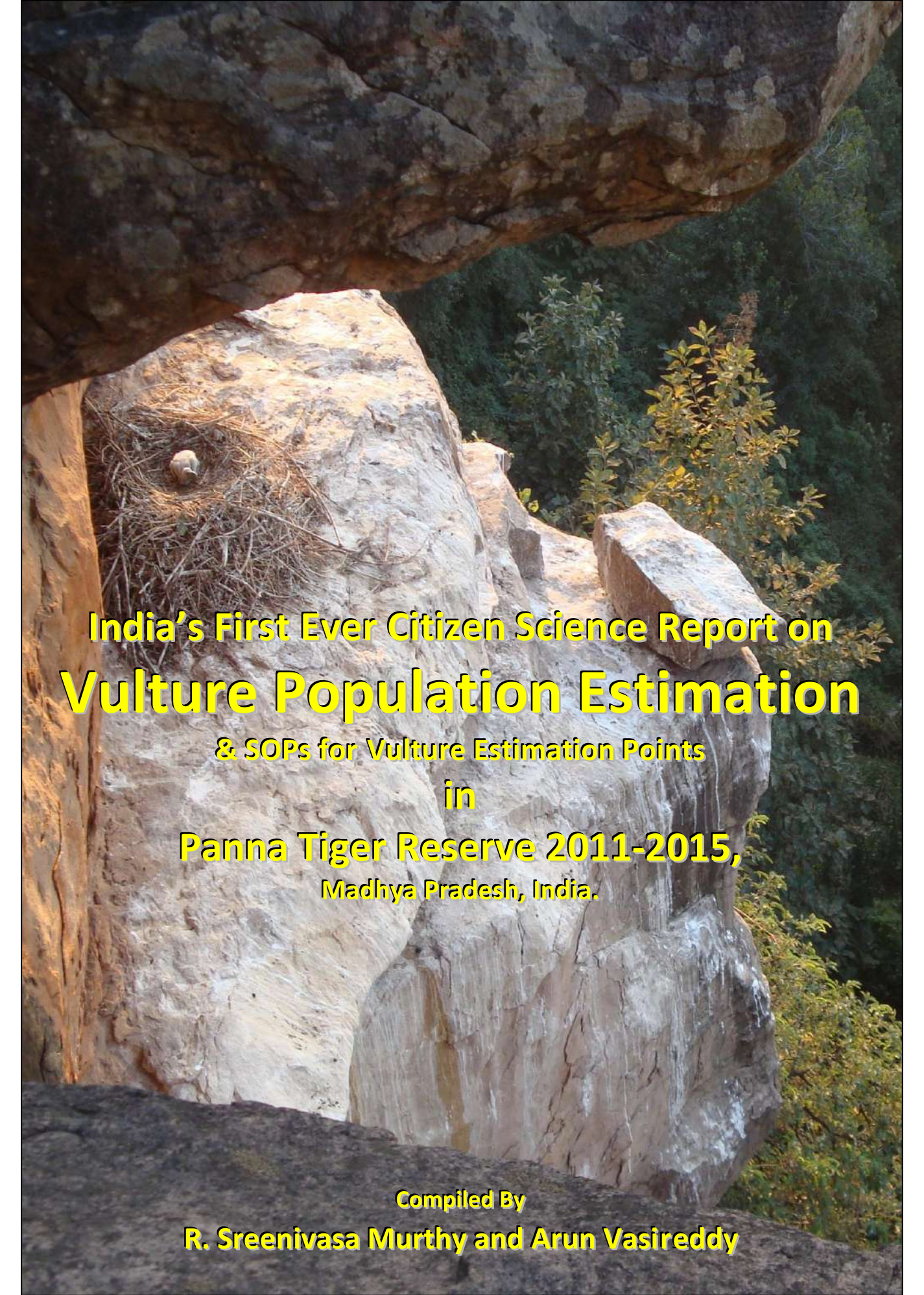




India's First Ever Citizen Science Report on Vulture Population Estimation

**& SOPs for Vulture Estimation Points
in
Panna Tiger Reserve 2011-2015,
Madhya Pradesh, India.**

**Compiled By
R. Sreenivasa Murthy and Arun Vasireddy**

Title of the Publication:

India's First Ever Citizen Science Report on

Vulture Population Estimation in & SOPs for Vulture Estimation Points in Panna Tiger Reserve 2011-2015

Compiled By R. Sreenivasa Murthy¹ and Arun Vasireddy³

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Cover Photo: Chick of Egyptian Vulture - Chandra Shekar Patel,

Back Cover: Soaring Long billed vulture -Sajit Ponnappa, Ken River valley famously christened as Vulture Valley of PTR (India?!!) with Typical Rock cliffs that are safe heavens of rock nesting vultures (Indian and Egyptian) -Chandra Shekar Patel

Vulture Poster: Chandra Khuchibotla (2013)

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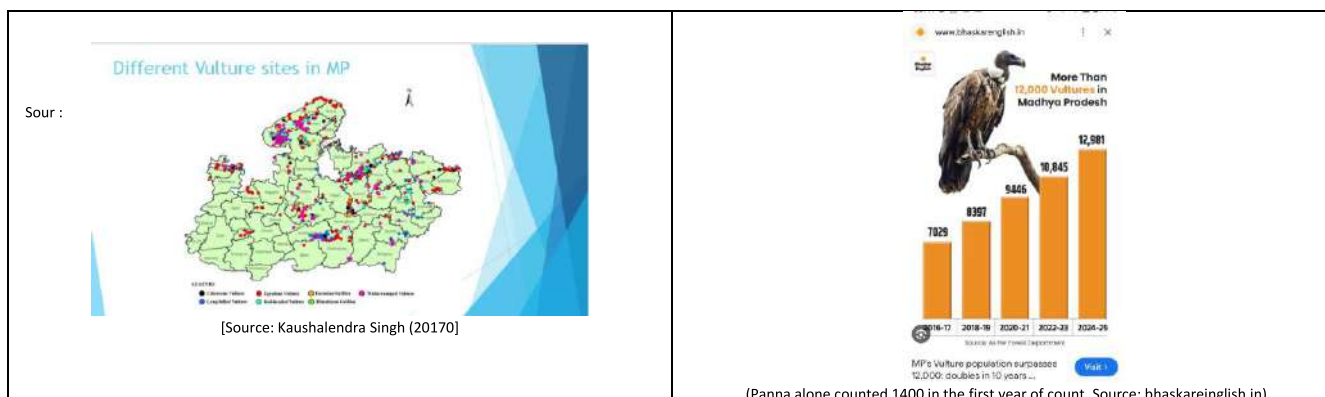
Preface

Vulture Story of Panna

India's First Ever Citizen Science Report on Vulture Population Estimation in Panna Tiger Reserve 2011-2015
(How a small sincere step transforms into a mega conservation saga of Vulture)

R. Sreenivasa Murthy, IFS Retd,
Panna & Bhopal, April 2013 and Jan 2025

I realized the importance of Vultures as biological indicators of a predator (here in this case tiger -*Tigris tigris*) of the region in the sky or on land when Panna TR's founder male tiger T3 moved out of the park just after he was translocated into the tiger reserve in 2009. Radio telemetry equipment we were using was not trailered for Indian region and for Indian conditions. Thus, it was a big failure in serving the purpose then in real terms and 'challenge' in scientific diplomatic vocabulary because of the terrain, broad leaved forests and synchronization of satellite timings that were odd for India and for a nocturnal animal. Had there been good vulture populations then in the landscape the struggles of my Team Panna with this new technology must have had been overcome. They must have been helped in tracking the tiger easily in the landscape and reduced the troubles and agony in securing his safety and recapturing him. But it was not so because the landscape was devoid of these important biological indicators of a natural predator (besides they devouring upon wild ungulate kills and domestic cattle kills by a predator or natural death) that announces a healthy predator population of any given predator rich ecologically functional forest habitat. But Panna TR was fortunate enough to have retained the last major vulture breeding populations despite the national decline even during those worst patch of *diclofenac tsunami* times. This was because here people rarely used any medicines for their cattle care because of their poor economic status and ignorance. And thus, Vulture populations of Panna TR remained unaffected to great extent and in due course filled up the landscape with vulture populations very fast. MP state level annual vulture population estimations based on the Panna model of Vulture estimation that evolved between 2011 and 2015 proved this fact with < 13,000 wild vulture populations in 2024-25 in the state.



This report discusses the vulture census conducted at Panna Tiger Reserve, Madhya Pradesh from 2010 to 2015. The first vulture count was done in Jan 2010 during the AITE. Since we were knowing the tigers to be counted in Panna (just three founder tigers) I concentrated to do a vulture count with the help of our ground staff. But let me confess it was a crude count with identification done with colours of vulture heads and body. From here rest of the vulture estimation journey started. Since, PTR in specific, Forest Department in general lacked the vulture identification skills I opted for a public participation for vulture identification and count in Panna TR in PPP mode. I as Field Director Panna TR in 2011 floated a pan India paper advertisement inviting the skilled birders to join the annual vulture count in Panna TR. From here actual and real Citizen Science vulture population estimations in any TRs or NPs in India started without realizing what we had done. Thus, with internet research I came to know with the help of Arun Vasi Reddy, that we Team Panna Vulture team between 2011 and 2015 done India's first ever citizen science vulture count and publishing this report in 2026 brought out this fact thither to unknown truth and fact. A great feeling to know now at least.

Mr. Vikram Singh Parihar, my Deputy Director between 2010-2014 who was Assistant Director in the mid-1990s at Panna TR took an initiative to count vultures at in 16 different sites across Panna Tiger Reserve in 1996 (Personal Communication). Till then the bird check list of the park showed the presence of only the resident species of vultures (*Sukra and Jasbir Singh Chauhan [2002,2004]*). Raju Lal Gurjar during his short study in 2009 missed the Griffon vultures in PTR despite their presence in the reserve and thereby could not add these migratory vultures to the list of existing vultures of the park. In 2010, a voluntary team of eight people (Research Scholars from WII, Bird experts from

Pugdundee Cell, Madla, IRA, Bhopal and PTR Guides) along with 200 field personnel of the Panna Tiger Reserve tried to count vultures. The teams recorded the presence of 640 vultures belonging to six species and most of them were cliff-nesting Long-billed vultures. The 2010 vulture count recorded the presence of Himalayan Griffon vultures and Cinereous Vultures (both seasonal migrants) to the list of vulture species recorded at Panna Tiger Reserve. (Ref: Panna TR 2010 census report or AITE Phase IV documentation.)

Better Citizen Science surveys were carried out in January/February every year when the park can accommodate the resident, breeding resident, and visiting vulture population from 2011 onwards till 2015. The objective of the survey is to establish vulture abundance and understand conservation requirements, and is not an academic endeavour. After the dramatic decline of vulture population in the last 20 years, Panna has come up as one of the last diverse strong holds of vultures of at least seven different species. The resident species include *Gyps bengalensis* (White-rumped vulture), *Gyps indicus* (Long-billed vulture), *Sarcogyps calvus* (Red-headed vulture), and *Neophron percnopterus ginginianus* (Indian Egyptian Vulture). The winter visitors are *Gyps fulvus* (Eurasian Griffon Vulture), *Gyps himalayensis* (Himalayan Griffon Vulture), *Aegypius monachus* (Cinereous Vulture) and *Neophron percnopterus percnopterus* (European Egyptian Vulture). The park has, over the years, sustained the population of both the resident and the migratory vultures successfully but no considerable increase has been observed in the number of vultures in the last five years. The 37 sites in the park and its buffer zone sustain a total of at least 738 non-resident visiting vultures and 786 resident nesting adult vultures, of which 356 active nests are of the Long-billed vulture, 6 active nests of the King Vulture, 5 active nests of the White-rumped vulture and 26 active nests of Egyptian vultures are recorded as per the survey in February, 2015. The survey area, covered strategically, is only 30% of the total area in and around the park till 2014 and is now more than 50% of the park in 2015 with sites chosen more strategically where vultures are expected to thrive. A major source of dead biomass available for vultures includes carcasses of wild animals, drought domestic livestock, and fertile domestic livestock within a radius of 30 km. The carcasses are a result of predation by tigers, leopards, dholes and wolves, due to droughts in some years, due to disease or other natural causes. The terrain is abundant in tall trees, cliffs, and streams offering suitable nesting and foraging opportunities. This report reports the vulture roosting and nesting sites at the Panna Tiger Reserve and the methods employed for the census.

Identifying vultures accurately and counting their numbers accurately is a complex process. Thus, the Vulture count 2010 was treated as a crude exercise. To overcome this short coming of 2010, in 2011, knowledgeable volunteers from all over the country were invited to participate in the vulture census at Panna Tiger Reserve in a true PPP (Public Private Participation) model using the platform of 'Friends of Panna'. The selected 54 participants took part in the count held between 20th and 23rd January 2011. By clubbing park guides and volunteers, 25 teams of 2 each were made and one independent observer nominated by the Chief Wildlife Warden was included in the vulture count. A Vulture Identification booklet was produced by the PTR management to help participants to identify the vultures accurately. Potential vulture resting/nesting sites were identified along with their GPS locations. Volunteers camped adjacent to the identified sites and reached the vulture resting places by 7.30 am. Between 7.30-9.30am, when the vultures basked in the sun the participants identified the species and noted live nests with eggs/chicks and abandoned nests. Vultures use thermal currents (after full quota of basking in the sun) to gain lift and this allowed observers to count the actual numbers of vultures in air. Most of the pre-identified vulture sites yielded vultures. Since 2011, a continuous effort is being made to identify and obtain data from as many sites as possible, within and around the park's area. In 2013, census is increased to 5 days resulting in good behavioral data. In 2014, the PPP model vulture census is partially hindered by severe climatic variations and the data is therefore not included in this report. But with some faulty data emerging that year because of weather conditions and procedural variations I decided to constitute a core team to develop a SOPs (Standard Operating Procedures) who did this noble task under the able Citizen Science leader Arun Vasireddy, Hyderabad. This resulted in adding Part II to the report that was initially written in April 2013. In 2015, a 3-day census is carried out with improved methods by following a set operating procedure for each site based on site specifications, reduced trek distances, addition of new sites, better equipment and increased training time. But data of 2015 could not be analyzed and processed systematically. Only part of this data is represented in maps 3.2 and 3.3. If future vulture estimations in Panna TR followed these SOPs it will result in successful surveys covering more areas of the park with greater accuracy and more reliable data. I suggest even State may develop such SOPs for all important Vulture areas of the State. We hope the base line data we provide interests and encourage researchers to get involved in studying and offering better ways to conserve endangered vultures in Panna and other similar sites in future as a way forward to initiate better studies of surveys and conservation approaches with the help of IT and satellite systems.

This Citizen Science Report got delayed to attain a publication status because of multiple reasons of pressures of job while in service and lack and choice of opportunities to get it published. Finally, *kshetra rakshak* /क्षेत्र रक्षक of Panna

(The God of Panna) *Kherrayya Mata and Devra Dev/ खरैया माता एवं देवरा देव (कांतारा जैसा बुंदेलखंडी देवी देवताएं - Bundelkhandi Kantara Devi-Devta)* had given me a nod to move ahead and I am following their dictum.

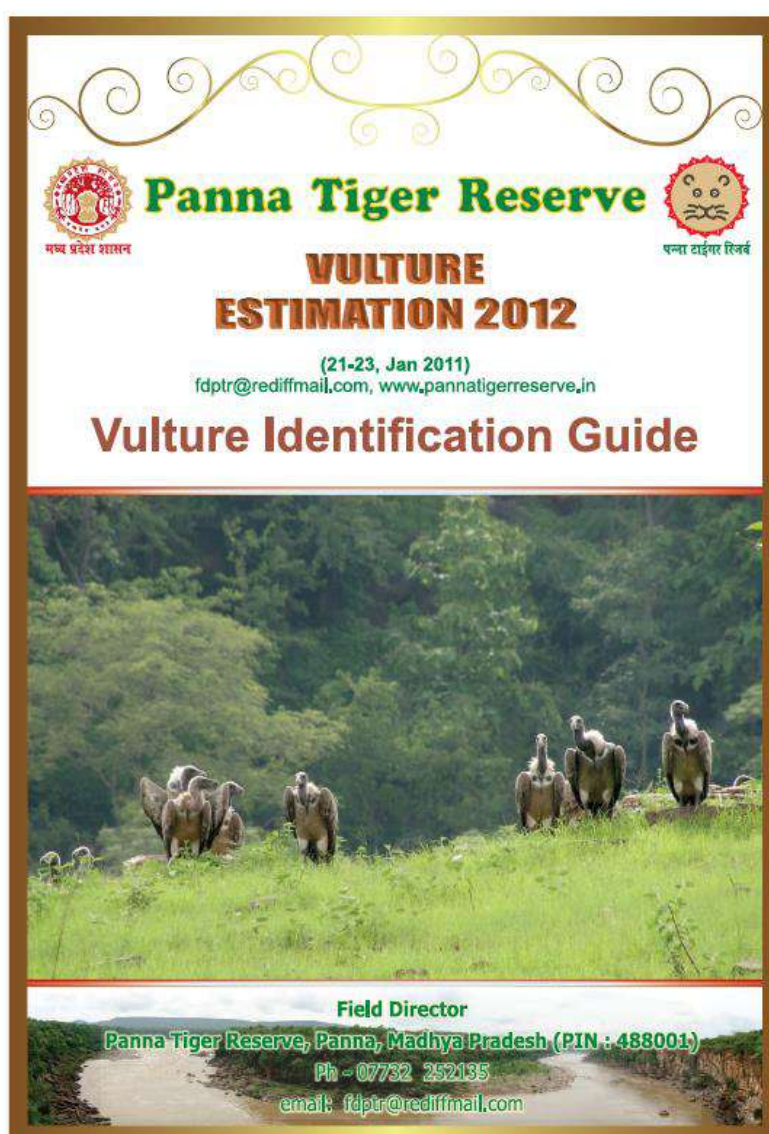
This Citizen Science Report in two parts. **Part I** tells about the process, procedures and shares the data of three years chiefly and raw data from 2010 and part data of 2015. The processes and data evolved from raw in 2010 to a better refined/standardized procedures and data between 2011 and 2015 with the participation of pan India Citizen Science Volunteers. **Part II** shares the summery and detailed SOPs developed for each of the 25 of total 28 vulture points. The entire process of Panna Vulture Estimation from 2010 to 2015 developed into a unique Panna Model of Vulture Estimation in PPP mode. Big thanks to the then Chief Wildlife Warden Mr. Ravi Shrivastav in 2015 who adopted the Panna Model of Vulture Estimation for the entire Madhya Pradesh and started State level Vulture Count when Panna topped the list with 1400 vultures (TOI Report - Desh Deep/TNN/ Nov 24,2015). PTR and WII tagged 25 vultures with GPS devises in 2022 and this study revealed that vultures at Panna travel up to Kuno just for foraging. This study revealed lot many details of resident and migratory vulture's ecological aspects in time and space (News Letter PTR May 2022). Recently a small intervention of State CWLW Mr. Subhoranjan Sen by treating a wounded Eurasian Griffon Vulture and releasing him back into the wild Satellite-tagged Griffon Vulture under Operation Marich travelled ~15,000 km roundtrip to Kazakhstan (PTI, Nov 19, 2025). *Operation Marich* revealed that this one vulture travelled up to Kazakhstan last year and returned to the State this year after travelling 15,000 km both the ways (Nov 19, 2025 (PTI) The Week). Thus, a simple story of Panna TR Vulture identification difficulties with the help of forest ground staff (Chowkidars and Fgs) in 2010 had evolved into invention of vulture count methods, developing SOPs for PTR vulture count points, adoption of the model for the entire state from 2015 onwards and satellite tagging and finding the migratory routes of all resident and migratory vultures and their ecology in a detailed way which otherwise was not known to the world before. I am happy that a small step of Panna Vulture Count that transformed into a Panna Model of Vulture Estimation process 2010-2015 and shown the way forward to all nature lovers and vulture conservation practitioners across the country. I salute each and every Citizen Science Volunteers who participated in the programme between 2011-2015 by initiating a significant contribution to the Vulture conservation at local, regional (state) and national level. Today I am happy to know that the entire Team of Panna Vulture Estimation including our staff, Citizen Science Volunteers and Panna TR Guides created a history by becoming part of India's first ever citizen science Vulture count in a TR and this report is seeing the light of the day after 12 years of its first draft as the **India's First Ever Citizen Science Report on Vulture Population Estimation in Panna Tiger Reserve 2011-2015**



Jai Jatayu.

Part I

India's First Ever Citizen Science Report on Vulture Population Estimation in Panna Tiger Reserve 2011-2015



Facsimile of
Vulture Identification Guide produced by PTR in 2012

Executive Summary

In 1996, Vikram Singh Parihar, the then ACF at Panna Tiger Reserve (PTR) took an initiative to count vultures at 16 different sites across Panna Tiger Reserve. Till then the bird check list of the park showed the presence of only the resident species of vultures. Raju Lal Gurjar, during his short study in 2009, missed the Griffon vultures in PTR despite their presence in the reserve and thereby could not add these migratory vultures to the list of existing vultures of the park. In 2010, a voluntary team of eight people (Research Scholars from WII, Bird experts from Pungdunde Cell, Madla, IRA, Bhopal and PTR Guides) along with 200 field personnel of the Panna Tiger Reserve tried to count vultures. The teams recorded the presence of 640 vultures belonging to six species and a majority of them were cliff-nesting Long-billed vultures. The 2010 vulture count recorded the presence of Himalayan Griffon vultures and Cinereous Vultures (both seasonal migrants) to the list of vulture species recorded at Panna Tiger Reserve.

Identifying vultures accurately and counting their numbers is a complex process. Thus, the Vulture count 2010 was treated as a crude exercise. In 2011, knowledgeable volunteers from all over the country were invited to participate in the vulture estimation at Panna Tiger Reserve in a true PPP model using the platform of 'Friends of Panna'. The selected 54 participants took part in the count held between 20-23 January 2011. By clubbing park guides and volunteers, 25 teams of 2 each were made and one independent observer nominated by the Chief Wildlife Warden was included in the vulture count. A Vulture Identification booklet was produced by the PTR management to help participants to identify the vultures accurately. Potential vulture resting/nesting sites were identified along with their GPS locations. Volunteers camped adjacent to the identified sites and reached the vulture resting places by 7.30 am. Between 7.30-9.30am, when the vultures basked in the sun the participants identified the species and noted live nests with eggs/chicks and abandoned nests. Vultures use thermal currents (after full quota of basking in the sun) to gain lift and this allowed observers to count the actual numbers of soaring vultures. Most of the pre-identified vulture sites yielded vultures. Since 2011, a continuous effort is being made to identify and obtain data from as many sites as possible, within and around the park's area. In 2013, estimation is increased to 5 days resulting in good behavioral data. In 2014, the 3 day vulture estimation is hindered by severe climatic variations, due to which data was collected from a survey taken later by a 4 experienced participants and 5 park guides over 10 days. In 2015, a 3 day estimation is carried out, with improved methodology, by following a set operating procedure for each site based on site specifications, reduced trek distances, addition of new sites, better equipment and increased training time. This resulted in a successful survey covering more areas of the park with greater accuracy and more reliable data. We hope the base line data we provide interests and encourage researchers to get involved in studying and offering ways to conserve endangered vultures in Panna and other similar sites.

In PTR, Long-billed vultures are the most abundant resident vulture species, followed by White-rumped vultures, Egyptian Vultures, and Red-headed vultures. The numbers of the migratory Griffon vultures and Cinereous Vultures recorded in the reserve area can vary each day as these vultures constantly move across the larger Vindhyan landscape. The Cinereous vultures' numbers are lowest of the entire vulture species recorded in Panna Tiger Reserve. All the White-rumped vulture nesting sites were found within 200m of human habitations and within 1 km of large water bodies. All Long-billed Vultures are observed to nest on cliffs which are mostly facing away from the rising sun or are well shaded.

The 2013 vulture estimation added one more species - the subspecies of the Egyptian Vulture (*Neophron percnopterus*) to the list of migratory vultures recorded at PTR. As on 2015, PTR recorded 7 out of 9 vulture species of India, which is a unique position for any Tiger Reserve or Protected area of the country. More importantly, the buffer zone of the park which bears a striking resemblance with the vulture-rich Khaimur hills of Satna district is a potential area for vulture conservation. The newly created buffer zone is currently being surveyed and all new findings will be appended to this report.

Besides existing numbers of vultures and nesting sites, Panna provides hope for these fast-dwindling important natural scavengers. Vultures are also important biological indicators of Tiger presence and their growth, the ultimate symbol of a healthy forest and a healthy ecosystem. Site specific abundance of vultures

is also obtained from the estimation process along with subjective data about vulture behavior. One of the participants admiringly called the Ken River valley of Gehri Ghat as the Vulture Valley and Dr. Munir Virani, who visited the vulture nesting sites in 2011, christened Panna Tiger Reserve as Peregrine Heaven. Other than the vultures, recording is being carried out for Shaheen Falcons which are the primary predators of vulture chicks in PTR.

Last but not least, without knowing We, the Panna Vulture Estimation Team between 2011-2015 had done an India's first ever Citizen Science Exercise to find out the Vulture Populations in Panna. Research by Mr. Arun Vasi Reddy, Hyderabad brought out this fact and truth to me. It's a great feeling to know that we have done something without knowing it.

Highlights:

1. Panna Tiger Reserve, Panna, Madhya Pradesh, India is the first PA to go to public on a pan India scale in the year 2011 for a Vulture Estimation in a TR with PPP model and Panna TR continued this model till 2015 which is otherwise known as Citizen Science based Survey. Thus We, the **Panna Vulture Estimation Team between 2011-2015** had emerged as India's **first ever Citizen Science Exercise in a TR or NP** to find out the Vulture Populations. Rest of such surveys across the State and Nation got inspiration from Panna TR.
2. Enormous cliffs and shelves in the Panna TR due to unique geological table top topography at two levels makes Panna a unique vulture habitat. *Sehas*- closed gorges on the rear end of the every nala flowing towards ken river within the park creates such a unique vulture and wildlife habitat adds to the richness of vultures in the park.
3. Panna TR is blessed with the one of the best and unique vulture habitats of the State and Nation.
4. All Seven vulture species of peninsular India are available in Panna TR.
5. Ken river valley from *Sakrey Ki Tungi* to M.Level (including *Sundi ghat-Geharar* start point- *Sundi ghat-Geharar* end point, *Chita Ghati*, *Gehari ghat* camp start point- *Sundi ghat- Gehari ghat* camp end point, *Chita ghat*, *Macherao* point) is the unique Vulture Valley encompassing with 338 live nests in one stretch in 2015 (See Map 3.3). And total vulture live nests in the PTR is touching 400 but may cross this figure also if one counts all the sites. This richness of live nests makes the Panna TR a unique **"Vulture Nursery"** for in the entire landscape that filled this part of the state with new vulture populations. To be frank I had seen only one vulture during my 30 days sojourn with T3 in Nov-Dec 2009 when he walked out of the park in the entire landscape.
6. Dhundhwa seha in Hinauta range is the best vulture sighting point of the State (perhaps in the country also) without disturbing them at eye level. When vultures fly and soar with thermal currents in the morning hrs between 9 to 11 am, they fly just before you at the eye level (see the pic on the back cover)
7. Panna Vulture Estimation process 2010-2015 inspired MP's statewide annual vulture census from 2015 [MPFD press release or TOI article (Nov 24, 2015)]. Presently MP holds the Vulture State title also.

PANNA VULTURE ESTIMATION[©]



VULTURE SCULPTURE

(Official Logo of Panna Vulture Estimation)



Panna Tiger Reserve

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fdptr82@gmail.com, www.pannatigerreserve.in



Concept & Design : R. Sreenivasa Murthy Photo Courtesy : Chandra Kuchibhotla (Long Billed Vulture)

Introduction to Study Area - Panna Tiger Reserve

Panna Tiger Reserve (PTR) is located in the Vindhyan ranges that extend from south west to north east in the civil districts of Panna, Chattarpur and Damoh. Landscape of the PTR is characterized with a 'Table Top' topography. Two plateaus run parallel to each other from south-west to northeasterly direction. The Ken River enters the reserve from the southern end and passes through it for almost 55 km. Nestled in northern most areas of Vindhyan range of Central India this is the only Tiger Reserve in the entire Bundhelkhand region. The Reserve is under the administrative control of Field Director with his headquarters located at Panna. The Tiger Reserve consists of the three conservation entities, namely, Panna National Park, Gangau WLS and Buffer.

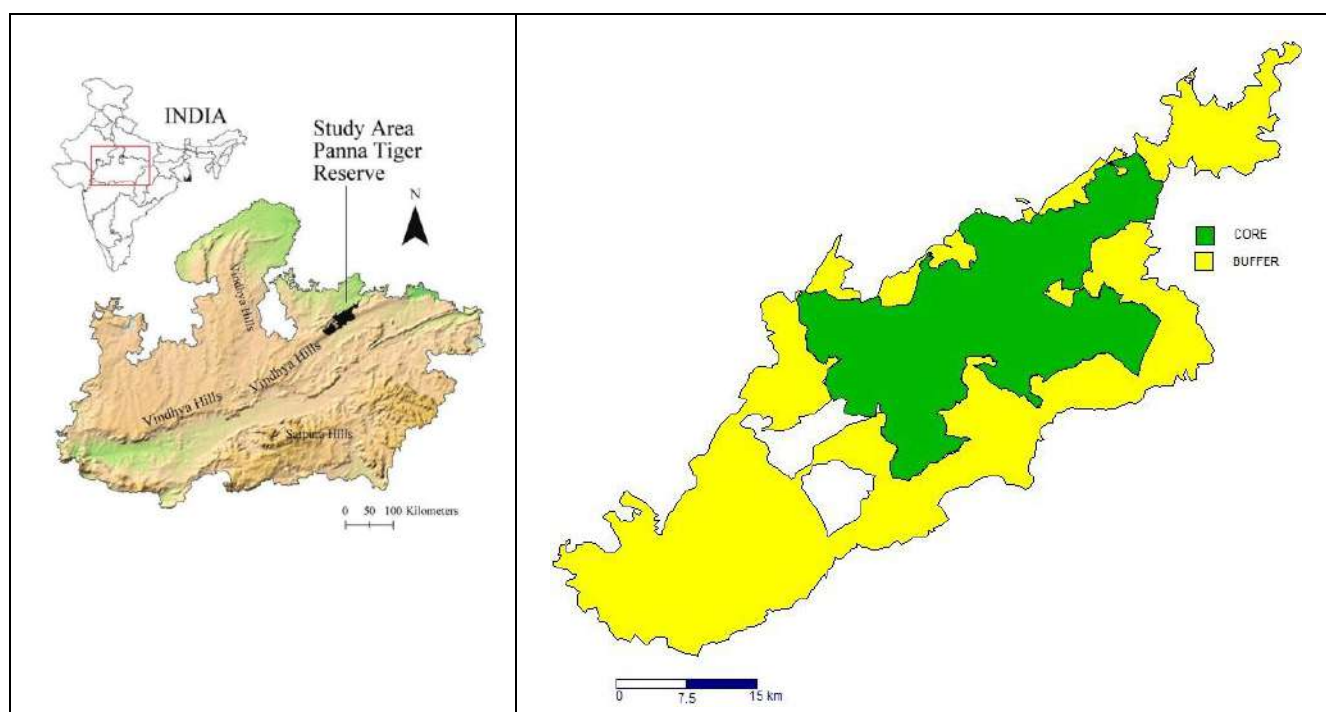
Area of the Tiger Reserve

Core/Critical Tiger Habitat: 576.13 sq km

Buffer: 1002.42 sq km

Total: 1578.55 sq km

Location and Panna Tiger Reserve Map



Location:

Latitudes: 24.17 to 24.55 N Longitudes: 79.30 to 80.17

Panna TR and entire landscape is a rockscape beyond imagination. Another unique geological feature of Panna is table top topography with two parallel plateaus moving along the river Ken on her right bank with varying widths. This gives a special advantage for humans to monitor the area in a most convenient way and offers rock nesting vultures an excellent habitat of cliffs and shelves to rest, nest and take off. *Sehas* (local term) are another unique habitat features of Panna TR. They are unique rocky geological features formed when a rivulet crosses an abrupt 90 degree fall while flowing from one plateau to another or one plateau to Ken valley. They are actually a river/rivulet rocky gorge closed on one side with rocky cliffs and creates waterfalls during monsoon that are ephemeral. Continuous weathering due to water, heat and cold conditions add to the falling of rocky cliffs into the bottom of the gorge immediately below the fall creating callus habitat that is a heaven to all wild life of the park. Here tigers den their cubs peacefully. Panthers and sloth bears sneak through because they are the only water points during summer. Of course, vultures and Shaheen falcons predate on vulture chicks when vulture parents slightly relax on their security net over the live nests.

Panna Tiger Reserve (PTR) is located in the Vindhyan hill ranges of Madhya Pradesh. The tiger reserve's total area is approximately 2000 sq. km. The terrain of PTR comprises of high plateaus, deep rocky gorges and grasslands with a unique geology. Sandstone, Conglomerates, and Sedimentary rocks create a bench topography divided into three distinct tablelands: the Talgaon plateau, the middle Hinauta plateau and the Ken valley at the lowest. The terrain continues on to the buffer zone, more effectively, with many more complex gorges and steep valleys. Most vultures are seen in the gorges formed in the Hinauta plateau along the river systems. The banks of R. Shyamri, R. Ken, and their tributaries that flow through the forest, are rich in vulture breeding and roosting sites, and potential future sites. Clear water pools in the gorges help maintain a cool temperature in the gorge and resulting thermals above them provide ideal climate for the nesting sites of the Long-billed vulture from January to early-April when they nest. These rocky cliffs and wind conditions also suit the roosting needs of Griffon vultures. Munir Virani, during his short visit to assist Panna Tiger Reserve on vulture count process advised to count the breeding sites (vulture sites with live nests) twice per year to assess and monitor the breeding potential of vultures in the area.

Panna's forests are mixed dry deciduous and are among the northernmost tracts of Teak forests in India. The forest abounds in *Terminalia arjuna* (Arjun), *Ficus religiosa* (Peepal), *Ficus benghalensis* (Banyan), *Madhuca indica* (Mahua), *Lannea coromandelica* (Indian Ash), *Annogeissus latifolia* (Dhau), *Diospyros melanoxylon* (East-Indian Ebony), and *Buchnania latifolia* (Chilla) to name a few medium tall trees where the vultures perch or roost. Arjun trees are recorded as the most preferred tree for the White-rumped vulture, a resident of PTR. An observation made during the vulture estimation in 2013 records White-rumped vultures dispute over a roosting site for an Arjuna tree with a flock of *Phalacrocorax carbo* (Great Indian Cormorant).

The keystone species in Panna Tiger Reserve and species that gets most conservation attention is *Panthera tigris tigris* (Bengal Tiger). Tigers and co-predators like Dholes, Leopards, Wolves, Magar Crocodiles and others generate plenty of dead biomass. Such biomass includes *Axis axis* (Chital), *Tetracevos quadricornis* (Chowsingha), *Cervus unicolor* (Sambar), *Boselaphus tragocamelus* (Nilgai), *Gazella gazelle* (Chinkara), and stray cattle.

Stray animals include Cows, Water Buffalo, Sheep, Donkeys, Mules and Goat. A good population of native Indian Cows whose killing or selling is forbidden by religion and law form a majority of stray cattle. All unproductive and old cattle of the region are left to roam feral in the buffer zone areas or in some area within the park. Once dead, they add to the available biomass both for predators and scavengers alike. Most cattle deaths occur during the peak winters or summers which is when vultures need food most. Qualification and seasonal changes in dead biomass with PTR needs assessment.

Need for concern: The catastrophic decline in the vulture population of the Indian subcontinent in the last 20 years (Prakash et al. 2007, Prakash et al. 2003) has pushed the once abundant *Gyps indicus* (Long-billed vulture), *Gyps bengalensis* (White-rumped Vulture) and *Sarcogyps calvus* (Red-headed Vulture) to near extinction. Today they are listed in the 'Critically Endangered' category of IUCN Redlist (Ref. Version 2012.2). *Neophron percnopterus ginginianus* (Egyptian vulture) has also been listed 'Endangered' as per IUCN Red List (Ref. Version 2012.2). Due to their feeding habits, these vultures are vulnerable and there is an extremely high threat to their survival in the wild.

Vultures of the Indian sub-continent have suffered a catastrophic decline (>97%) since 1990 (Prakash et al. 2003). The main identified reason for the reduction in vulture population is the use of non-steroidal anti-inflammatory drug (NSAID) diclofenac in domestic cattle which when consumed by cultures led to renal failure (Oaks et al. 2004, Swan et al. 2006). Vulture population in the sub-continent continues to deplete by 16% - 44% every year (Green et al. 2004, Prakash et al. 2007). It is possible that competitive exclusion from the carcasses has saved the Egyptian Vulture population for a considerable time before its alarming fall in the last 10 years (Cuthbert et al. 2006). An estimated ratio of 1:130 – 1:760 contaminated carcasses per dead carcasses can cause the observed vulture mortality rate (Green et al. 2004). This has put human health at risk

due to the increase of rats (*Rattus* spp.) as the primary scavengers which could result in the bubonic plague. Vultures probably also helped to control livestock diseases, such as brucellosis, tuberculosis, and anthrax by disposing of infected carcasses (*Swan et al. 2004, De Vos V 1994, Houston & Cooper 1975*). The society also benefits from the rapid and hygienic removal of dead livestock by vultures, a flock of which can pick a cow carcass clean in a matter of minutes (*Ali and Ripley 1983*).

Levels of diclofenac use in livestock are observed to vary across India most likely influenced by the promotion and use by veterinary practitioners. Use of diclofenac also depends on the ability of the owners' to afford treatment for their animals (*Senacha et al. 2008*). Female cattle are known to be injected much higher levels of diclofenac content than males, as observed in Madhya Pradesh mainly because the lactating females are commonly given NSAIDs in combination with antibiotics to treat mastitis (*Taggart et al. 2007b*). Livestock provides supplemental income for the relatively poor farmers around the park area. For some communities like the Yadavs, livestock is the primary source of income. When deprived of other income sources and dependency on the forests, livestock helps absorb shock due to crop failure and seasonal unemployment (*Birthal and Ali, 2005*). Thus, keeping livestock is an indispensable asset to the villagers. This also paves way for a symbiotic relationship of the vultures with humans. As the vultures thrive on the dead cattle, they also clean human habitats. The White-rumped vulture's nesting traits observed during the survey reaffirms its close association with humans.

It is a fact that a large number of feral cows that live in the Panna Tiger Reserve and many village cattle around the reserve are not treated with veterinary drugs. This means that diclofenac that has been identified as a threat to vulture survival is never brought into the food chain. This is probably one good reason vultures survive in considerable numbers at Panna. Much more is required to conserve vultures than stopping the usage of diclofenac. Other measures include strategies to improve their nesting, feeding success, and maintaining low disturbance around their roosting sites for which more research on vulture behavior and wildlife management is necessary.

Methods for Vulture Estimation: The distribution of a diverse population of vultures over multiple similar subdivisions in a dense protected forest called for choosing a different sampling technique for each phase of the survey. As in most raptor surveys, multiple methods are used. A complex pattern of *stratified random sampling, cluster sampling, and point count* is used for the surveys. Sites were first assigned based on known relative abundance of vultures in the sites over random non-overlapping areas. These are the major sites of vulture abundance. Ex: Dhundhuwa Seha, Gehra Nala, &c. But as vultures are distributed based on social behavior (*Newton 1979*), the results cannot be accurate by this method alone. To avoid randomly selected units to fall in high- or low-density areas, multiple sites are added to the main site but a general park estimate is not taken based on the average from these sites alone. Micro-sites around the main sites are selected on the basis of major nesting areas to form non-overlapping clusters. This enables searching in nearby sample units before traveling a longer distance to reach the next cluster. This procedure allows precision when calculating sub-divisions of population and relative abundance of each sample. Mutual exclusion is maintained in the survey to avoid duplication of nesting/resting sites. A manual method of count selection based on time of counting is used for sites of the same cluster. Data of flying birds is separated based on time of recording from adjoining clusters, if available. Ex: KN2 Tower, Kakra Seha, Chunayi Ghati are non-overlapping parts of a cluster. Point count method is used for surveying, where the surveyor moves through random points selected by expected vulture behavioral traits within his designated area. The time spent at each point is usually small, and if not due to different circumstances, duplication is removed by neglecting all other estimates (flying, resting birds) within the day except the maximum taken at a single time. The samples are spread over a variable trek of 10 km-20 km, over a best of 2 days for surveys in 2011 and 2012, and a best of 5 days for the survey in 2013, for greater precision. The area in which detection is made is of an unlimited radius around the point; usually 5 km. Trek routes are standardized in March, 2014 and implemented as procedures for each site in 2015. A 3 day survey is found to best suit the PPP model for maintaining adequate participants' number and quality along with conducting a reliably validated survey.

The drawback of these methods is that when each point count is treated as a sample, the survey of flying birds is prone to duplication. This cannot be avoided in some of the data collected. As the buffer zone of the park possibly harbors more birds than within, due to more suitable cliffs and trees, the estimate is impossible to be contained to a specific region and thereby the duplication of flying birds is unavoidable to an extent. Sex differentiation and individual identification are not deemed possible in visual surveys of vultures. Another drawback found in any foot method for a raptor survey is the duplicated count of flying birds moving from one site to another, especially within close lying clusters or survey areas. The quality of erroneous data in flying birds is estimated to be considerably lessened by 2013 based on data available at important sites. The exact amount of duplication is hard to decipher but it is expected to not be beyond a 10% confidence interval within the number of flying birds in 2013. Further, a time check is carried with respect to the abundance at other near-by sites at the same time. Each live nest is given only one count for the entire survey and the multiple entries are removed. For resting birds, the data available w.r.t time is filtered by counts on multiple days. For the count of flying birds, a maximum number seen at a particular instant of the entire survey time is taken as a surely possible count aligning it with the primary objective of the survey.

The advantage of such a survey is in the usefulness of it in covering maximum area in important areas thereby observing threats, behaviour, and adopting conservation practices where required, which is the primary objective of the survey rather than the high levels of accuracy normally found in research work. In future, a highly accurate survey must be carried out with the help of conservationists and a biometrician. Further advantage is in obtaining quantifiable site based data in a varied landscape for raptors placed randomly in unreachable groves and visiting from close areas (buffer zones and villages). The biggest advantage though is the ability to conduct a survey in topographically dense and complex areas. Almost all the vultures that are resting or roosting or nesting are not disturbed at all during the survey largely due to the distance of observation being at least 25m or more. Optical instruments are used to reach out to the furthest distances from the opposite side of the cliff. All readings are taken from the next higher plateau level on the opposite side of the nesting area except by teams near Gehri Ghat who observed the cliffs from a lower level. This methodology is tested to be the most efficient for counting cliff-nesting vultures on large cliff faces.

The objective of the survey is to identify and number the vultures at Panna Tiger Reserve and an accessible part of its buffer zone with a crude manual estimate and not a statistical estimate based on a strip survey. Sources of variation are observed to be wind velocity, day-to-day temperature during the survey, annual precipitation, fog, availability of cliffs, visibility hindrances from tall trees, availability of tall roosting trees and dead biomass. The number of nests of resident species is considered as the most reliable indicator of the health of vulture population in the park.

The size of each sample area is approximately a trek of 10 km to 20 km till 2014, and about 5 km to 10 km in 2015 for an average person per day. Samples are separately collected in the morning and in the evening to the extent possible by visibility and reachability. This is repeated on the second day for validation and observation. On the third day, a simple observable analysis is carried upon the site by the participant in the morning. All samples are taken on foot. The site selection is based on local knowledge and pilot studies taken in 2009 and 2010 (Gurjar and Gawande 2011). Further, a continuous feedback mechanism is used to improve the method and materials involved. Most samples are taken using an 8x40/10x50 porro prism binoculars or a camera with a 20x to 40x optical zoom or both. Further, a 20x Dobsonian telescope is used to reach out to cliffs that are farther than 400m. Classification of nesting status is based on Postupalsky 1974, where in 'occupied nests' are those in which substantial nest-building activity is observed, but egg-laying is not necessarily confirmed. The participants are amateur to expert bird watchers from different parts of the country accompanied by the local field guides who are experts in the knowledge of local flora and fauna, and

a forest guard. It is to be understood that the quality of identification is not 100%. Multiple surveyors in each site helped minimize errors in identification. All identifications of vultures are based on Ali & Ripley 1983.

The surveys were conducted on 16-17 January, 2011; 20-21 January, 2012; 16-20 January, 2013; 7-9 February 2014/14-23 March, 2014; and 6-8 February 2015 between 7 am and 5 pm every day. Training, practice, and discussion of survey procedures are useful to increase consistency among observers (Mikol 1980, Kepler and Scott 1981) and these are all improved recently in the park. Present training includes live identification training at Dhundhua Seha's roosting spot, booklet usage and data transfer from experienced surveyors, usage of GPS devices, detailed explanation of site-wise procedures, a presentation about Panna and its vultures, preparing an experienced lead in each group, site visits by experts during the survey, on-site training to shramiks and forest guards and training on filling user-friendly survey sheets. The dates were chosen so as to facilitate counting of as many nesting sites and winter visitors as possible. Dates are shifted to February to allow some seasonal foliage loss in most trees for increased visibility of cliffs and an extended day for observations. The park retains all types of its vultures, non-resident and resident, at least till mid-February before which the surveys are conducted. The survey is informally extended to cover Perigrine Falcons which are the primary predators of vulture chicks. The presence of 16 Perigrine Falcons, likely Black Shaheen Falcons, has been recorded in the areas of vulture abundance. Threats from humans and animals are observed at each vulture nesting site and taken care of. These include clearing honeycombs, restricting human movement, creating local awareness, making changes to some village practices and other park management issues. The number of vultures in the reserve is found to be consistent throughout the five years with a healthy increase in nesting rates in the sites covered. Considerable growth and fall of nesting/roosting numbers are observed in major nesting areas but not in the park as a whole. With increased number of sites, survey methods, participant experience and reaching out, there is a regular increase in the number of vulture nests in the park. The slow recovery, if any, in the vultures can be attributed to the low survival rate (~55%) (Oaks et al. 2004) of the single chick a pair breeds each year, except Egyptian vultures which produce 2 chicks and have a healthier survival rate. Like in any random sampling, a good estimate can only be obtained over a larger sample of multiple years to identify phenomenon and plan long-term strategies. The survey can thus be summarized to be in a developing stage with data from future years possibly yielding more new insights.

Findings & Discussion: Refer Appendix I, Graph 1 and 2. By the end of 2012, 19 major nesting sites (14 Long-billed Vulture, 4 White-rumped Vulture, and 1 Red-headed Vulture) and at least 4 major roosting sites are identified within PTR core zone and parts of the adjoining buffer zones.

In 2011, A total of 744 vultures (of seven species) are recorded in 23 sites of which 684 are resident vultures and only 60 birds were seasonal migrants. The survey in 2012 was completed in two phases and included 37 sites. A second count was made to cross-verify the reliability of the first count. In the second count, a total of 27 sites were re-surveyed and the data was used to determine the number of vultures in 2012. The first survey covered almost the entire core zone of the PTR and included all the previous sites visited in 2011. The count estimated a total of 989 vultures, of which 217 were migratory vultures and 791 resident vultures. In 2013, 1074 birds were recorded from 37 sites. The counts were made over a 5 day period. In all, 237 migratory and 837 resident vultures were recorded. The fluctuations in the data are due to inconsistent filling of data sheets, large sampling times, and lack of a separate procedure for assessing roosting sites. These were overcome in 2015, with operating procedures (Appendix II) for each site. This yielded a total of over 1140 nesting adult vultures and chicks. An upward spike is observed in the total nesting number of long-billed vultures due to addition of important extensions to the vulture valley on R. Ken. 356 active nests are of the Long-billed vulture, 6 active nests of the King Vulture, 5 active nests of the White-rumped vulture and 26 active nests of Egyptian vultures are observed in 2015 (Ref. Table 5 and Graph 2). Data collected of flying vultures is used as an estimate to observe density of vultures and movement patterns in the park. A maximum possible estimate is taken in a single time frame on a particular day for all around the park, usually

around 9 am. All major soaring sites within the park are recorded with GPS readings and presented in Appendix 4.

Long-billed Vulture: All the Long-billed Vulture nests are located in cliffs at gorges, river beds, and hill ridges. Most of these are located in perpetual shade in cliffs facing away from the rising sun (mostly NW). Just under the first overhang of the cliff seems to be the favorite nesting site of these vultures. Interesting behavior of a neighbor Long-billed vulture standing on an incubating parent just before the egg hatching is observed and photographed. The Long-billed vultures are the most widely spread vultures in the park and seems to have the highest potential to increase their population in terms of nesting sites, dead biomass availability, communal roosting sites, and the closeness of roosting sites to food. The number of nests has maintained consistently over the last 5 years. Some ridges are still unchecked owing to a lack of an opportunity to reach up to a visible distance to observe the nests in dark shadowed regions of the cliffs obscured by tall trees. There is a plan in place to observe them using telescopes in 2016 for which a successful pilot work is finished in 2014/2015. Observing chicks is not common till the first few weeks of chick birth, usually late January, as at least one of the parents keep incubating the egg and protects the chick till it is at least a few weeks old.

As expected, surveys taken over larger areas and longer time frames yield a larger number of resting bird counts due to increased access to identification. This can be clearly seen in Graph 1's entries of LBV R, EV R, and WRV R. Larger surveys also enhance the numbers of flying vultures which is usually error prone due to duplication within and around the site. An estimate upon a short fixed time span, decided upon soaring times of a given day, is taken in such cases and not an additive sum.

Egyptian Vulture: The small number of Egyptian vulture nests observed within the park is most likely because the surveys taken are completed just before the mating rituals of the breeding pair. Their nesting times vary yearly by about 2 months at times. The number of these vultures does not represent the full count due to surveys taken during the changing patterns of the vultures and there by missing most behavioral traits useful for identifying vultures. A non-resident pair of Egyptian vultures was also photographed recently in the buffer zone. There is evidence that migratory *Neophrone percnopterus sacrogyps* (Egyptian Vulture - African) is seen in the park.

White-rumped Vulture: All the White-rumped Vulture nests are observed on trees of medium height such as Arjuna, Peepal &c. and close to human habitation within a distance of 200m from the nearest farm or village. At Sakra in 2013, the nests are within 200m of an abandoned village and farms, indicating that the choice of nesting site is based upon the proximity to a satellite view of the surroundings rather than human presence. The number of White-rumped Vultures in the park is minimal owing to their stronger relationship with human habitations and cattle which are found right at the ends of the park. The number of nests of the White-rumped vulture has been consistent over the last four years. In 2015, there is sharp fall in the number of nesting vultures and their movement in these areas. These are assumed to be abandoned sites, which is a common practice to White-rumped vultures which are expected to move from their nesting sites every few years. The number of flying vultures in other routes has remained constant. More work must be immediately done to understand these critically endangered vultures which are the closest to human habitats.

Red-headed Vulture: Red-headed Vultures (King Vulture) are observed almost entirely resting on trees or flying high above the rest. They live in near isolation, except for their mate, and only one of their nesting sites is recorded within the reserve till 2012. Now there are at least 6 active nests recorded in 2015 within PTR and parts of Ken Gharial Sanctuary.

Cinereous Vulture: Cinereous vulture(s) are rarely seen, and are mostly around Gehri Ghat. Usually, only 1 flying Cinereous vulture is seen in the park during the survey. It was pictured at Kushmaila Nala in 2015.

The largest number of variation observed is in the population of migrant Griffons. Due to the lack of knowledge of the history of migrant vultures at roosting points, all interpretation counts are erroneous. Migrants are from broad geographic ranges holding potential for regional and continental population monitoring, but presently they are not useful for localized monitoring (Fuller and Mosher 1988). The fluctuation in the population of Eurasian Griffons and Himalayan Griffons is not answerable with the present day knowledge about these vultures. A large number of adult and juvenile birds visit Dhundhuwa seha and other roosting sites every year taking a long trip from the Himalayas. They are observed in smaller numbers at different parts of the buffer zone's cliffs. Being large, these vultures usually need a cliff to take-off and have always been observed on the cliffs of the Hinauta plateau. The observed consistency in the number of nesting sites of Long-billed vulture and White-rumped vulture, and the unavailability of dead vulture corpses during the survey suggests sustenance for vulture populations within and just outside the park. Roosting numbers affirm the park's importance in the migratory route of Griffons and Cinereous vulture.

Two Himalayan Griffons were found dead in 2013, and one Himalayan Griffon was found dead in 2012, all at Dhundhua Seha outside the dates of the survey process. All are suspected to be Jackal kills. Jackals were observed and photographed while hunting vultures at the top of roosting cliffs.

Future Work: High breeding failure is one of the reasons for the vulture populations to not pick up their strength in numbers. Although the mortality rate of vultures around the park is presumably high, more research and efforts are required to increase the breeding success of the vultures. Every single White-rumped vulture, with the exception of those around Sakra, is potentially threatened by tree logging and cutting branches of large trees for fodder. The root of the problem is both in greed and necessity, and therefore hard to work with. The buffer zone must be added to the main park and must be protected. Awareness programs must be conducted in important villages like Bhourkuha for the conservation of the White-rumped Vultures.

Vultures roost communally during the non-breeding season. The number of vultures counted may vary considerably on a daily basis due to prey abundance, disturbances, and weather variations (Sykes 1985). Research must be done to count effectively the non-breeding portion of the nesting population. Count can be made when the roost site is small and all the nests are counted. Relative abundance, such as the survey being taken of, can be obtained from repeated observations of large colonies. Information from the surveys must be extended to include temperature and weather patterns at each particular site to understand the changes in population counting and in predicting flight magnitude. Birds must be ringed to obtain differential data about their behavior over the years. These are important areas of study to obtain statistical variance for estimating the population of the park effectively.

Improvements can be made to the survey to ensure more reliable data. The survey must be done strictly by point count method for each area at which the population of flying vultures must be taken at short intervals only. Participants, especially the local guides, require more training with GPS equipment. The survey must be extended into the buffer zone in March/April, especially on river banks. The timing of the survey in January is not suitable to capture the Egyptian Vulture's nesting sites and must be carried in February, when almost all the Egyptian vultures have started building their nests and when the chicks of the Long-billed Vultures and White-rumped Vultures are at least 2 weeks old. Focus must be primarily on the 'Critically Endangered' resident species of the park rather than the migrant species. Migrant species must be ringed and observed as well. Time of arrival and departure of migrant species must be measured, and with collaborated with meteorological data to understand winds that are used by the Griffons and Cinereous vulture. Along with the survey, novel conservation strategies must be employed for the nesting sites to increase social nesting and breeding success.

Outcome

1. Panna Tiger Reserve is the one among the best PAs to have a secured habitat for the highly endangered vultures of the country. Along with the buffer zone, the park may be the most important nesting site for the thriving endangered vultures in Asia. The Ken River valley around Gehri Ghat is a unique piece of natural heritage site for Long-billed vultures that must be preserved at all costs.
2. As the number of villages within the core area of the park deplete, the number of White-rumped Vultures within protected area fall down due to the symbiotic nature of the vulture with villages. Further, White-rumped vultures might be shifting their nesting site every few years for reasons that must be researched. A lot more research is required to understand the behavior of these vultures.
3. There is no apparent and actual threat of diclofenac menace to vultures of the region. Still, awareness programs must be carried out to veterinary centers, pharmacists, and locals.
4. Black Shaheen Falcons are the most important predators of vulture chicks. Scenes of falcons chasing adult vultures are not uncommon. No such behaviour is noticed from other animals in the park.
5. Almost all the resident and migratory vultures of the region are available in the Panna Tiger Reserve. Ken river valley's cliffs of the park are important vulture nesting areas which could easily extend to the entire Vindhyan landscape, particularly the *Khaimur* hills' regions like *Pavai*.
6. Panna Tiger Reserve being a good tiger country helps vultures get good food. Vultures are often seen gorging on tiger kills and are good bio-indicators of all large cats.
7. Around the periphery of the park, several species of trees preferred by White-rumped Vultures for nesting are under the attack from axing by the villagers; urgent measures, including creation of awareness and eliciting local peoples' support are needed to protect these tree species. Ex: Arjuna.
8. The survey in 2013 identified and photographed the nests of 76 Long-billed vultures, 21 White-rumped Vultures, and 1 Red-headed vulture. Nesting sites of Egyptian vultures were seen a few months later. An Egyptian vulture is seen nesting at the NW top of the *Kandariya Mahadeo* temple in Khajuraho.
9. Efforts are being made to study the nesting, roosting, and soaring behavior of the Long-billed vultures. These must be carried out for at least 10 years or more using latest IT tools to crack vulture foraging and migratory paths and distances with serious conservation strategies implemented in the park to sustain healthy vulture population. Panna TR shall be declared as a National Vulture Heritage Site.
10. There is a great need to take up comprehensive research on these excellent biological indicators of tigers in the entire PTR landscape.
11. We, the Team Panna Vulture Estimation between 2011-2015 had done an India's first ever Citizen Science Exercise to find out the Vulture Populations in Panna and this is the India's first ever Citizen Science Report on Vulture Estimation in a Tiger Reserve.

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Appendix I: Tables (Survey Reports)

Table 1: Vulture Estimation Report – 2011

L.Nos	LBV N	LBV R	LBV C	LBV F	EV N	EV R	EV F	RHV	WRV N	WRV R	WRV C	WRV F	EG	HG	CV
546	1	3	1				1								
493				15			9	1	1						
540		10						11		2					
240				5			2								
266				12		2		2						6	
P 552				3									25	7	
538				6			3			1					
Buffer									18	18	7				
496 B	2	4	2	1			2	1							
1276, 1277				20			2							17	
524	3	56	2	2									28	32	
P495, P497	12	12	12	11		2		1							
P 484				26				1					1	14	
479, 480				3			8	2					8	4	
539							16	13		14			5		
505	2	2	1	9	2		3	2							
685				4			1	1				3		1	
496 A		5		3				2					2		
P 483	2	1	2				5					21			
504	4	3	3												
510				3			3								
508															
237	6	6		4			1	1		2		3	6	1	
Buffer		2					8	7		8				1	
663, 660		12						2	1						
486 A				15			8	3					10		
536, 537									4	8	4				
553				27				2					7	17	
164								3					2		
Buffer		29		8			2								
P 1279	4	4	4	20			3							2	
658				2			1	2		1					1
486 C	2	2	2	2									3	1	
654				4											
P 499	8	8	8												
P 1287				2			1	1						3	
486 B	12	6	5	2										5	
498	6	8													
T: 38	66	175	44	216	2	4	87	58	24	54	11	27	105	111	1

Table 2 : Vulture Estimation Report – 2012 (cumulatively from surveys taken from 20-22 Jan 2012 and 27-29 Jan, 2012)

Location Number	LBV N	LBV R	LBV C	LBV F	EV R	EV F	RHV	WRV N	WRV C	WRV R	WRV F	EG	HG	CV
540				21									10	
240	3	3	3	2		4	2				4			
266				10								5		
545				2								4		
1345				12		2							5	
524		20				6	4					3	16	
536-539						6	1	4		4	9	4		
499		13		11		5	8				8			
495	8	76	5	63		4								
1276, 1277	5	11		20	2		3	5		5	14			
663, 660				7				1		1	2	2		
505	1	1			1		2							
502, 503	4		2						2					
P 483	8	8		7		6	2	3		3	26			
504	2	2		5		1								
237				5		3	3				2	2		
553				2			1					2		
164, 166				2			4					2		
654							5				4	2		1
P 499	5	27		18	2						2	1		
1276, 1277	2	1		2			1					1		
498, 499	14	56	8	40	2	6	2							
T: 22	52	218	18	229	7	43	38	13	2	13	71	28	31	1

Table 3: Vulture Estimation Report – 2013 (from survey taken on 16-21 Jan 2013)

L.Nos	LBV N	LBV R	LBV C	LBV F	EV R	EV F	RHV N	RHV	WRV N	WRV R	WRV C	WRV F	EG	HG	CV
546	6	6		14		2		1					1	2	
493	6	10		3		3		3							
540															
240	4	15				2		3						1	
266		9		1									2	7	
P 552								1					5	15	
538				8		2		2		2		2		1	
Buffer				3		2			11	24	5	2	5		
545	1	1		1		2									
496 B	4	6		2											
1276, 1277				18		2		2				4	4	5	2
1345, 1331															
524	4	18	2					3					5	90	
539 B (536,537)				13		2			4	13		8			
P 495, P 497	5	20	2	34		8		3				4	7	2	
479, 480				5		4		2				2	1	3	
539 A															
505	5	4	3	19	4										
685		8			3		1	8					2	15	
496 A															
P 483	11	11	1	23		6		4							
504	4	6		16		7									
510	1	1	1		1					1					
Buffer						4		4	3	19				2	
663, 660				8				2						4	
486 A	4	4	2	33				2							
553		2				2		1					10	12	
164		4						1							
P 1279		31			1	4		4							
658		12						4					4	4	
486 C						3								6	
654						10			3	23					
P 499	4	33	2			3							3	2	
P 1287	4	7	2	1	3			1							
486 B	6	14	2		1	4									
498	7	20		18		6		3		6			14	1	
T: 36	76	242	17	220	13	78	1	54	21	88	5	22	63	172	2

Table 4: Vulture Estimation Report – 2014 (cumulatively from surveys taken from 6-9 Feb 2014 and 13-22 Mar, 2014)

L.Nos	LBV N	LBV R	LBV C	LBV F	EV N	EV F	RHV N	RHV	WRV N	WRV R	WRV C	WRV F	EG	HG	CV
546	4	3	3	2											
493	8	5	3	6		4						1			
240	1	12		10		6		1					1	1	
266				4		3		2							
538				12		4		1		2					
Buffer				3		2			12	16	4	8	7	2	
545	1	1		1		1									
496 B		2													
1276, 1277				2		4							6	2	
524	5	21	5	60								1	31	11	
539 B (536,537)				13		2			14	14		2	1		
495, 497	31	53	27	50	2	9		2				6			
479, 480				2											
539 A				5				1							
505	5	5	5	11	1	6						2			
685		8			1		2	2							
496 A															
P 484		14		12	2			1							1
P 483				5		11								2	
504				8	2	4									
510	3	3		15		11				1		2		6	
Buffer		5		2		4		1	4	7			12	2	
663, 660				2									3	3	
486 A	2	2	2	5		2		1							
553		28		12		2							16	2	
P 1279	17	23	5	40	3	7		1				1			
658		5		17				2					2		
486 C	12	16	4	24	2										
654				7						2			2		
P 499	27	29	2	63	1	8		1	3						
P 1287	4	3	3	5				1							
486 B	8	10	2									2	1		
T: 31	128	248	61	398	14	90	2	17	33	42	4	25	31	172	1

Table 5: Vulture Estimation Report – 2015 (cumulatively from surveys taken from 5-8 Feb 2015 and 13-22 Mar, 2015)

Name	LBV (All)	(J)	REV	WRV	KV	EUG	HYG	NREV	CV	UV	Nests	Chicks	SF
524	85	15	3		4	184	146						6
P 484	25				8		3			7			
498	74	7	4								27	27	2
P 1279	59		4								19	15	4
P 1287	23				2	2					2	2	
510	54		4	1							9	5	2
Devradev	99		3	4									3
654			2										
237			4			25		3	1	12			
266	16		4		1	10				3			4
546	11	2	6		4					1	4	3	
240	15		9		4	10				242	4		7
Buffer – Bhou.				16							5	1	
663, 660	19										1		
539 B (536/537)	2		2		3		8						
553	1						105						
Buffer – Sukhwaha	5		2	1	3	1							
493	3										3	1	
P 483	31										37	26	
495	92		2								3	2	4
505	30	4	2								8	8	
486 A	42		9								5	2	2
486 C	29		3								8	8	
486 B	40	13	1		1						3	1	1
P 499	126		2			5				4	40	40	1
685 A					4	20	30				2	1	
685 B	29	2	4	7		25	15			1			
Buffer – Powai	62		46	1	41	69	12	60	4				
Buffer – Macherao/Chita Ghati	493		9		3						212	212	4
Total: 30 Sites	1465	43	125	30	78	351	319	63	5	270	392	354	40

Table 6: Sites (2011-2015) and their respective location numbers

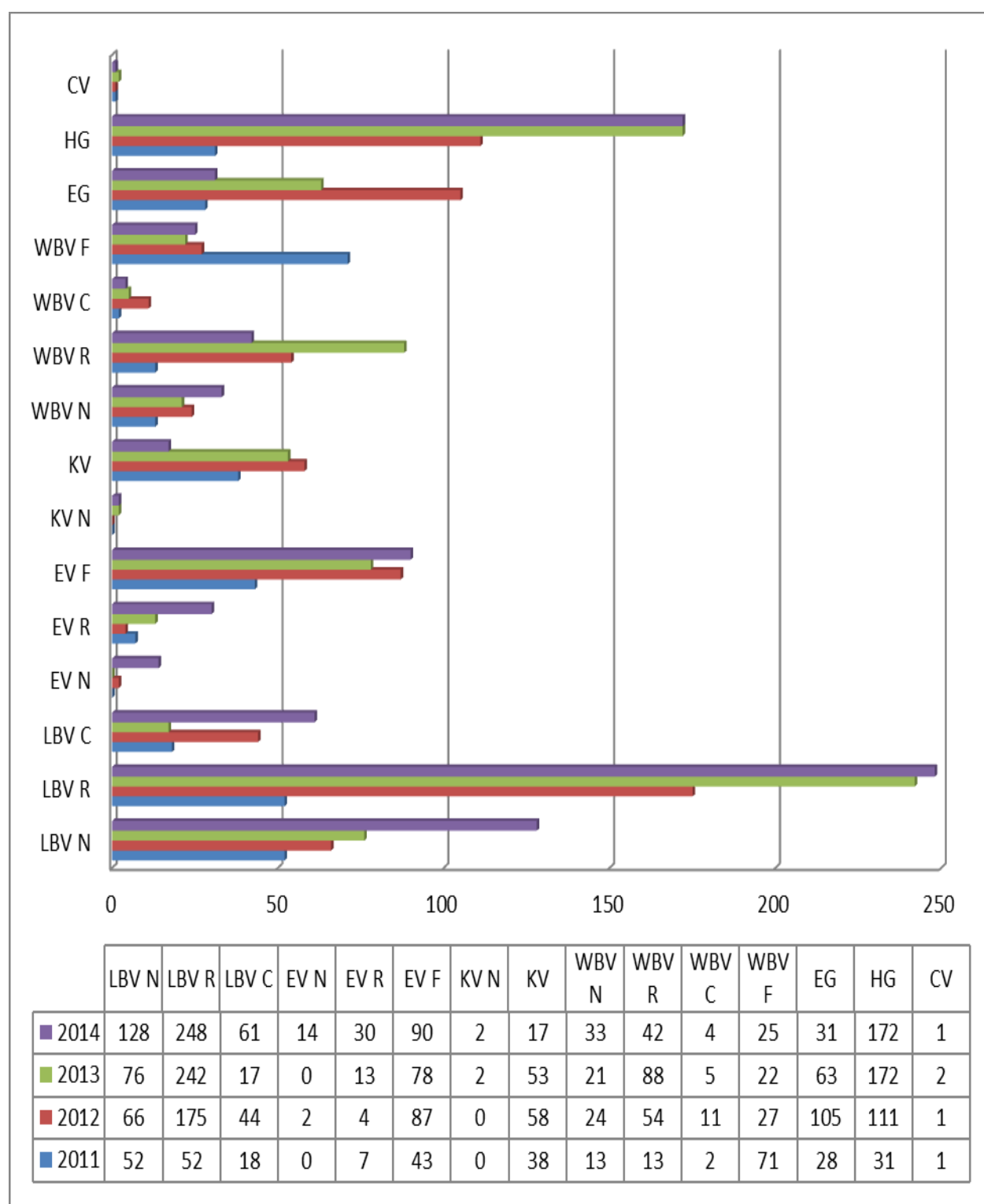
Name	Location Number
Amarkanth	546
Bada Pahad of Budena Nala	493
Badagao Seha	540
Badaur Seha	240
Balaiya Seha	266
Bans Pahadi	P 552
Basgan Nala of Palkoha	538
Bhourkhua	Buffer
Chauka Khera	545
Chita Ghati	Buffer
Chunhai Ghati	496 B
Dhavada Nala, Imliya Seha	1345, 1331
Dhundhuwa Seha	524
Gad Pahad	536-539
Nagadiya Nala	539 B (536,537)
Gehra Nala Bank	495
Gehranala, Gehra ki tungi	495, 497/ P 495, P 497
Gehrighat	P 484
Girhao Ghati	1276, 1277
Hariya Teliya Ari	479, 480
Jatana Ki Matiya Pahad	663, 660
Kaimasan Seha	539
Kakra Seha	505
Kathvarahar, Ghughrrahar	685
Khadan Ghati Tapakana	496 A
Khariyani Ghat	502, 503
KN1 Tower	P 483
KN2 Tower	504
Majholi/Koni Seha	510
Kudiya Seha of Brujpura	508
Kushmaila Nala	237
Macherao East and West Bank	Buffer
Marka Seha	486 A
Padam Ki Dodi	553
Pandata Binochi Ghat	164, 166
Panghata Ghati	164
Patori Buffer	Buffer
Powai	Khaimur Hills
Putariyan Ghati	P 1279
Raipura	658
Sakariya Tor	486 C
Sakra Tower	654
Sakrey ki Tungi/Sakro	P 499
Seja Beat	
Sheetal Parua	P 1287
Sukhator ki ari	486 B
Sundi Ghat	498
Sukhwaha Village	Buffer

Table 7: GPS readings of important observation points (taken at sites of 2015 estimation) of vulture nesting sites of PTR

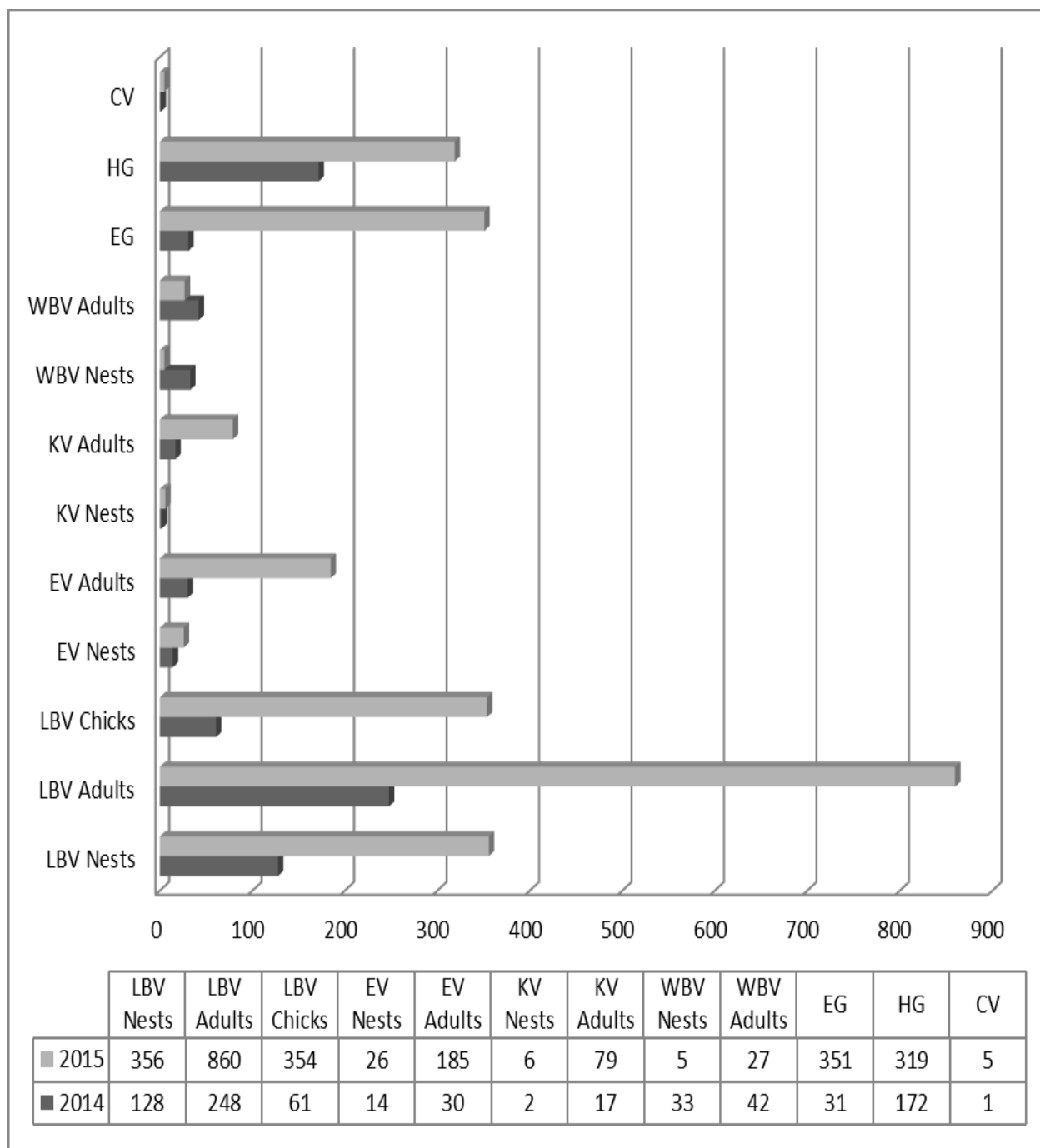
Site Name	Longitude	Latitude
Amarkanth	80.09666667	24.65905556
Bada Pahad	79.8195	24.50105556
Badaur seha	80.06155556	24.67311111
Balaiyya Nala	80.10025	24.746
Bhaurkuha	79.753	24.56047
Chita Ghati	79.8693	24.4532
Devradev	79.88016667	24.49941667
Dhundhua Seha	79.96575	24.624
Gehrar	79.86257	24.50261
Gehri Ghat	79.8854	24.47625
Gehrighat Gate Camp	79.8604	24.4558
Gugrahar	80.02698056	24.86613333
Kakra Seha	79.82333333	24.51263889
Katwarhar	80.03455556	24.87627778
Koni Seha	79.9015	24.5365
Kushmaila Nala	80.05647222	24.71002778
Macherao East Bank	79.8849	24.439
Macherao West Bank	79.8788	24.4366
Majhouli	79.89861111	24.53641667
Maniagad	79.93811111	24.71025
Marka Seha	79.80240972	24.47613
Nagadiya Nala	79.77338889	24.57388889
Padam ki Ghodi	79.74530556	24.63161111
Povai	80.18361667	24.22747222
Putariyan Ghati	79.8692	24.4617
Sakariya Tor	79.84016667	24.47547222
Sakrey ki tungi	79.88075	24.51755556
Sheethal Parua	79.90461111	24.48825
Sukathor ki ari	79.864	24.4776
Sukhwaha	79.73400972	24.60939
Sundi Ghat-Gehrar	79.87722222	24.51452778

Appendix 2: Graphs

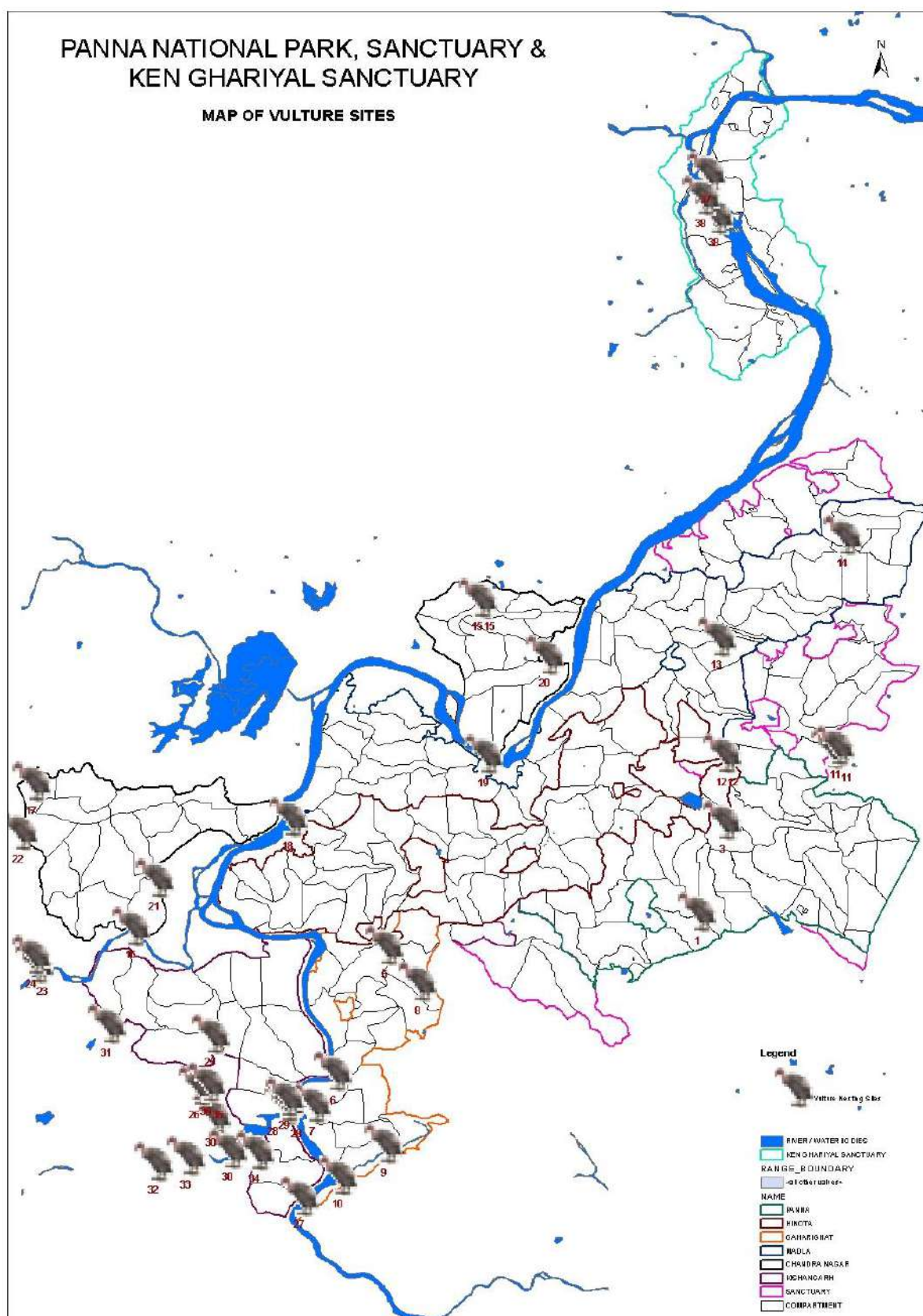
Graph 1: Comparison of observations for the surveys taken in 2011, 2012, 2013 and 2014 (For abbreviations, refer Appendix I; Flying LBV numbers are not compared in this chart)



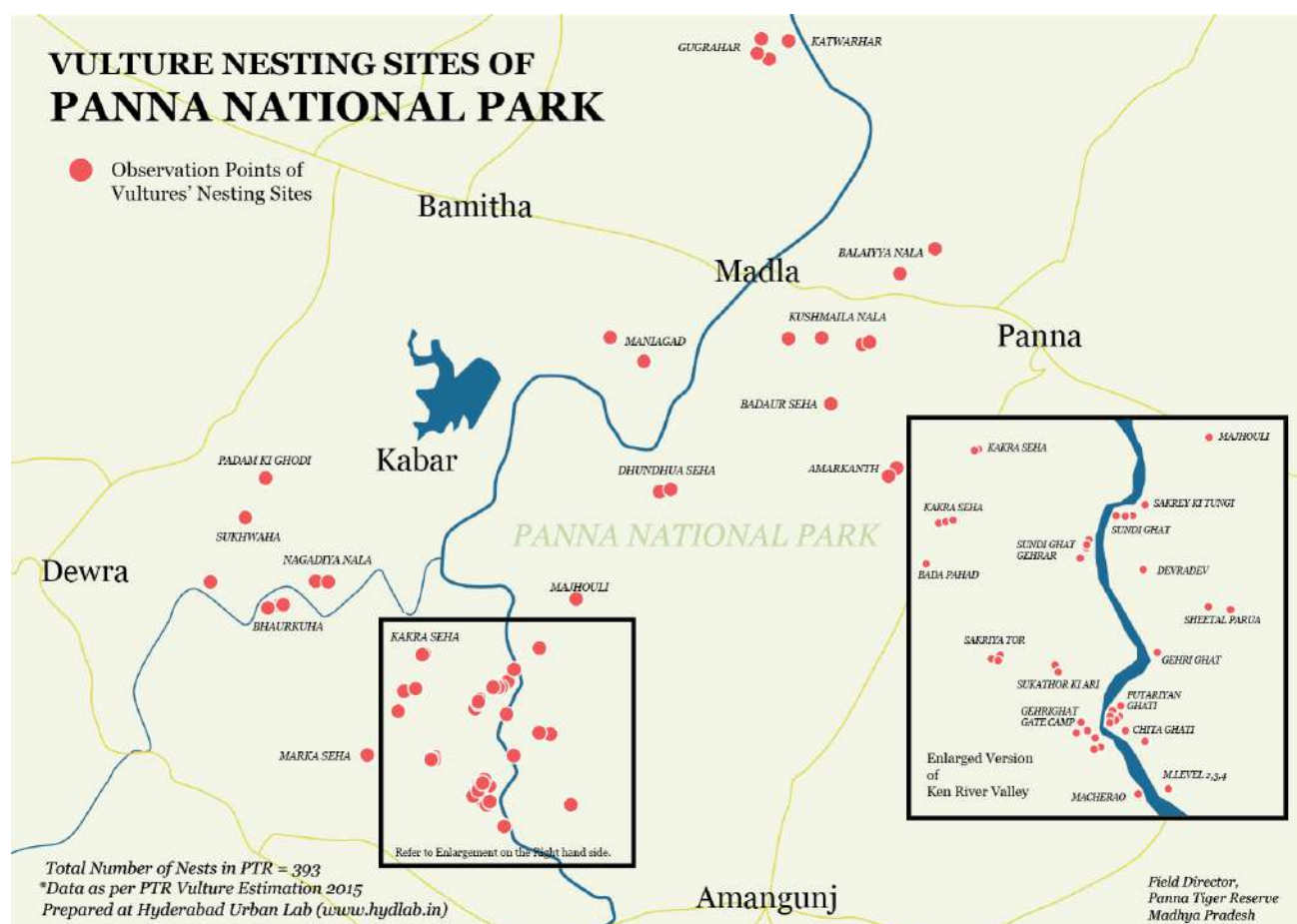
Graph 2: Comparison of observations for the surveys taken in 2014 and 2015 (The chart does not include the count of vultures soaring/flying, it includes only nesting, resting and roosting vultures)



Appendix 3: Map 3.1 of the Vultures Sites of Panna Tiger Reserve 2011-2013



Appendix 3: Map 3.2 Unique Vultures Site Live Nest Count 2015 in Panna Tiger Reserve



Pictures:

Picture 1 (Above): Picture1 is of important observation points of vulture nesting sites of Panna Tiger Reserve

Picture 2 (Left): Density of vulture nests of the Ken River Valley that has up to 86% of the nests in PTR on cliffs at river banks

Appendix 3: Map 3.3 Unique Vultures Site Live Nest Count 2015 in Panna Tiger Reserve



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First ever PPP model Panna Vulture Estimation briefing to participants on 21.01.2011



Registration of participants



Part II

Site Wise Standard Operation Procedure of Vulture Count Points of Panna TR



Why SOP for Panna Vulture Counting Points:

In Panna TR concentration of vultures especially rock nesting ones is very high in suitable sites where rock cliffs with proper shelves and water is available in the nearby vicinity. East facing rock cliffs are preferred ones by vultures because of sunlight basking that is an imminent biological requirement of vulture daily routine. The vulture nest sites along the Ken river valley starting from *Sakara* after *Jahlar* village towards Geharighat and beyond in the southern direction are located too high and inaccessible (except by one- or two-foot paths) because river becomes narrow in these stretches and guarded by rocky cliffs measuring 100 to 200 mts on both the sides. Being at very acute angles both from the top and from the river bed it becomes really difficult to make a reasonably better count of vulture nests and vultures nearer to the actuals in all these sites. One needs to be placed in a near by camp, so that the counting parties reach the spot before 8 am to start counting the nesting birds before they start soaring in the thermals anywhere after 9 am.

So, these SOPs were thought off to help the volunteers and PTR management to follow them for better count attempts. Volunteer teams led by Arun Vasi Reddy from Hyderabad spent some 15-20 days on voluntary basis and took pains to make these SOPs. They were successful in making 25 out of 28 identified sites, but could not make for the three points. But their selfless service to conservation of vultures in PTR is highly commendable. To make the things clear, Mr. R. Sreenivasa Murthy had written this small introduction to Part II to put real need of these SOPs. Trust the SOPs will help one and all who will do vulture study and counts in PTR in the times to come. Bringing out this publication even after 11 years of the process is to help PTR management in counting the vulture rich points at PTR in an effective way.

S. No.	Name	Division	Camp	Type of Site	Importance	Breakfast	Lunch	Dinner	GPS Need	Participant	Guide	Beat	Compartment	SOP	Rec. for Women	Work Pending	Season
1	Dhundhua Seha	Hinauta	Thithri Tower	Change in camp	Extreme	6:30	1230	1900			Yes	Pipartola	524	Yes	Yes		Sum/Win
2	Gehri Ghat	Gehri Ghat	Gehrighat Patrol Camp	New - Camp in use	Low	6:30	1230	1900				Dakshin Khamri	1278	Yes	Yes	Beat, Compartment data	Sum/Win
3	Sundi Ghat - Gehrar	Gehri Ghat	Jhalar Camp	New - Camp in use	Extreme	6:30	Packed	1900	Important	Experienced	Yes	Jhalar	P500	Yes	Yes	Beat, Compartment data	Sum/Win
4	Putariyan Ghati	Gehri Ghat	Gehrighat Patrol Camp	Old	High	6:30	Packed	1900	Important	Trekker	Yes	Dakshin Khamri	P1279	Yes	Yes		Sum/Win
5	Sheetal Parua	Gehri Ghat	Bandarha Tower	Old	Medium	6:00	1230	1900	Useful			Dakshin Khamri	P1287	Yes	Yes		Sum/Win
6	Majholi	Gehri Ghat	Majholi Camp	Old (Koni Seha removed)	Low	6:30	1230	1900				Majholi	511	Yes	Yes	Beat and Compartment name	Sum/Win
7	Devradev	Gehri Ghat	Gehrighat Patrol Camp	Old	Medium	6:30	1230	1900				Uttar Khamri	1276, 1277	Yes	Yes		Sum/Win
8	Sakra Tower	Gehri Ghat	Sakra Tower	Old Site - New Camp	Low	6:30	1230	1900	Important					No	Yes	What to study? How to?	Win' 15
9	Kushmaila Nala	Madla	MN7 Tower	New Location - New Camp	Low	6:30	1230	1900	Useful	Trekker		Umraon	237	Yes	Yes		Win' 15
10	Balaiya Nala	Madla	Bardhau Camp	Old	Low	6:30	1230	1900	Useful			Bardhau	266	Yes	Yes		Sum/Win
11	Amarkanth	Gangau Abhayaranya	Katariya Camp	Old	Low	6:30	1230	1900	Useful			Katariya	546	Yes	Yes	Photos, Route	Sum/Win
12	Badaur Seha - Kaymasan Seha	Gangau Abhayaranya	Badaur Seha Camp	Old	Low	8:30	1230	1900				Badaur Seha	240, 539	Yes	Yes		Sum/Win
13	Bhourkhua	Chandra Nagar	Sukhwaha	Old	Extreme	6:30	1230	1900	Important	Trekker	Yes	Aamdabar	524	Yes	No	Compartment Number	Sum/Win
14	Maniyagad	Chandra Nagar	Raipura Patrol Camp	Old Site - New Camp	Medium	6:30	1230	1900				Khsetriya Jungle	663	Yes	Yes		Sum/Win
15	Nagadiya Nala	Chandra Nagar	Sukhwaha	Old Site (Gad Pahad) - New Camp	Medium	6:30	1230	1900				Rajgad	663	Yes	No	Beat, Compartment data	Sum/Win
16	Padam Ki Ghodi	Chandra Nagar	Pandavan Camp	Old	High	5:30	Packed	1900	Important	Trekker, Photographer		Seja	553	Yes	No		Sum/Win
17	Sukhwaha	Chandra Nagar	Sukhwaha	Old	Extreme	6:30	1230	1900	Important		Yes	Padam Ki Ghodi	553	No	No	Identifying trees and locations	Sum/Win
18	Sardari Ki Ari	Chandra Nagar			High	6:30	1230	1900		Trekker		Kshetriya Jungle		No	No	Camp and Photos	Sum/Win
19	Bada Pahad	Kishangarh	Jamun Dawra	Old Site - New Camp	Medium	6:30	1230	1900	Useful	Experienced	Yes	Kshetriya Jungle	493	Yes	Yes		Sum/Win
20	Gehri Ghat	Kishangarh	Gehrighat Gate Camp	Old	High	6:00	Packed	1900	Important		Yes	Patauri	P483	Yes	Yes		Sum/Win
21	Gehrar	Kishangarh	Gehrar Nigrani Tower	Old	Low	6:30	1230	1900		Photographer		Gehrighat	495, 497	Yes	Yes		Sum/Win
22	Kakra Seha	Kishangarh	Naroli Patrol Camp	Old	Medium	7:00	1230	1900		Photographer		Bhujpuri	505	Yes	Yes		Sum/Win
23	Marka Seha	Kishangarh	Patauri Patrol Camp	Old	High	6:30	1230	1900				Patauri (Buffer)	505	Yes	Yes		Sum/Win
24	Sakariya Tor	Kishangarh	Gehrighat Gate Camp	Old	High	6:30	1230	1900	Useful	Trekker	Yes	Patauri (Buffer)	486	Yes	Yes		Sum/Win
25	Sukhator Ki Ari	Kishangarh	Patauri Patrol Camp	Old	High	6:30	1230	1900		Experienced	Yes	Patauri (Buffer)	486	Yes	Yes		Sum/Win
26	Sakrey Ki Tungji	Kishangarh	KN2 Tower of Kishangarh	New Site - New Camp	Extreme	6:30	1230	1900		Experienced	Yes	Patauri (Buffer)	486	Yes	Yes		Sum/Win
27	Gughrahaar	Khajuraho	Moharey ghat	Old	High	6:30	1230	1900	Important		Yes	Barahi	685	Yes	Yes		Sum/Win
28	Kathwarhaar	Khajuraho	KN2 Tower of Moharey Ghat	Old	Medium	6:30	1230	1900	Important			Barahi	685	Yes	Yes	Photos, Route	Sum/Win

New camps must be prepared for stay with the right shramiks who knows the area

Old Camps with new sites or type of work must be informed to follow the participants

4 supervisory teams must be maintained : Chandranagar, Kishangarh, Gehri Ghat-Hinauta and Madla-Khajuraho

Breakfast and lunch must be prepared on time. Participants must not be allowed to the base camp before the time specified on their SOP sheets.

For a convenient process, a total of 64 people, including 12 guides, are required - 44 participants, 12 guides, 8 in supervisory teams

Some beat and compartment names are missing for new camps and need updation

SOPs are not prepared for 3 sites because of Sakro Tower (Aims not complete), Sukhwaha (Did not survey), Sardari ki Ari (Did not survey)

Column1	Sites for Telescope (Camp)	Range
1	KN2 tower/Gehrar Tower	Kishangarh
2	Patauri	Kishangarh
3	Jhalar	Gehrighat
4	Gehrighat	Gehrighat
5	Sukhwaha	Chandra Nagar

Note: PTR may check or update the correct Beat name and compartment numbers.

This became obvious because of the enormous delay in report publication

SOP for Vulture Estimation Points in Panna Tiger Reserve

Standard Operating Procedure - Summary of Important Points

1 Present Progress

- 1.1 The number of sites has been reduced from 37 to 28 based on the data in the last three years and present state
- 1.2 Site-specific data (for 25/28 sites) and required route map, where necessary, are prepared
- 1.3 Site-by-site GPS readings and photographs are taken. Detail at each site is recorded and submitted on paper
- 1.4 Kushmaila Nala and Majholi are restructured for better site coverage
- 1.5 Gad Pahad has been changed to Nagadiya Nala with Sukhwaha as the new camp
- 1.6 New teams are added to count flying and bathing vultures at Gehri Ghat and Gehrar
- 1.7 Reflector telescope is tested and is found insufficient to view the cliff-nesting at PTR
- 1.8 Refractor telescope is tested and is found satisfactory, with some limitations in picture orientation
- 1.9 Summer census need not be done at the new sites - Sakra tower and Gehri Ghat (5 km from Jhalar)
- 1.10 Sakra Tower and Kushmaila Nala sites are to be reviewed post Winter 2015
- 1.11 New candidate feedback sheets are prepared for better data collection
- 1.12 New data coverage methodology is made for flying vultures. O-maps are ready for each site
- 1.13 O-Maps are tested and found to successfully advance our understanding of the movement of flying birds
- 1.14 A new survey method is tested to viewing vulture nests in gorges and recommended. Site-specific changes are done to use this new method
- 1.15 Important trees and cliffs are identified. This should bring the majority of the core (over 75%) under the census.
- 1.16 Site-specific details are listed in an excel sheet including the times for preparing food and the required standard of participants for that particular site

2 Future Work

- 2.1 List out data to be collected at each site throughout the year, by collaborating with Mr. Virani and Mr. Shekhar
- 2.2 Collect pictures and route maps for 2 sites – Katwarhar and Nagadiya Nala
- 2.3 Purchase 5 – 2”-4” refractor telescopes should be enough to cover most of PTR
- 2.4 A survey must be done to the south of Putariyan ghat (Chita ghat and beyond) for nesting sites
- 2.5 A survey must be done to find a village with easy access to Sardari ki Ari
- 2.6 Exploration must be done for new sites in the buffer zone
- 2.7 Devices must be purchased for basic temperature readings and deployed atleast at camps in Badaur Seha, Gehri
- 2.8 Ghat, Koni Seha, Padam ki Ghodi, Sukhwaha, Katwarhar, Gehrar Tower and Patauri
- 2.9 Methodologies for wind reading must be studied and one easy method must be used at crucial sites
- 2.10 A better vulture identification guide, especially for vultures in flight, must be prepared

PANNA TIGER RESERVE - VULTURE ESTIMATION

VEP No.: 1

Standard Operating Procedure: Dhundhua Seha

Beat: Peepertola (Madla), Compartment No.:524, Camp: Thithri Tower, Range: Hinauta

Objectives: To carefully count all the resting,roosting,flying and nesting vultures at various spots of Dhundhua Seha and note them on O-Map

Itinerary: 0600 Wake up, 0630 Breakfast , 0700 Start to Dhundhua, 0730 Reach Site 1, move around and observe nests and flying vultures and observe their roosting area and their behaviour, 0830 Start to Site 2, check for nesting and roosting areas and observe their behaviour carefully, 0930 Start to Site 3, observe the same, 1130 Start back to camp, 1230 Reach camp, Refresh and Lunch, 1430 Start to site, 1530 Observe nests and flying directions of the vultures and note them on the O-Map, 1800 Start back to camp, 1830 Reach camp - Redo the same on Day 2.

Watching for vultures is a task requiring great amounts of patience and conviction. Please bear to sit at a few sites without revealing your location or disturbing vulture movements. Do look out for white wash from the spot for nesting areas.

Things to do: Identify Griffons, Long Billed Vultures, Juveniles, etc and try to observe their behaviour.Count nesting vultures, Note down flying vultures using an O-Map. Shaheen falcon may be present note down their behaviour with vultures. It is important to note down take-off and arriving directions. Also note down temperature and wind readings at the top of the cliff and Carefully observe possible threats to vultures in the area.

Things to carry: Binoculars, GPS device, Survey Sheets, a good camera with optical, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Dhundhua Seha 24° 37'31.4" N 79° 58'19.5" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 2

Standard Operating Procedure: Gehri Ghat

Beat: Dakshin Khamri, Compartment No.: P1279, Camp: Gehri Ghat, Range: Gehri Ghat

Objectives: To carefully count all the flying and bathing vultures at Gehri Ghat and note them on O-Map

Itinerary: 0600 Wake up, 0630 Breakfast, 0700 Go for a tour of Gehri Ghat area to notice white marks. Find a good location from where you can cover all the white marks on rocks (bathing spots). If none are found, get to the top of Patrol Camp and count all flying vultures carefully – identify and note their directions of movement on O-maps. Do not count nests or trek anywhere else. It is important to stay at one place and count all the flying vultures at this point. Keep a close eye on the water to observe bathing vultures, 1200 Lunch, Rest, Refresh, in turns (one person shall always stay put at the site for observation not to miss any flying vultures), 1800 Back to Camp.

Redo the same on Day 2.

Watching for vultures is a task requiring great amounts of patience and conviction. Please bear to sit at a few sites without revealing your location or disturbing vulture movements. Do look out for Cinereous and King Vultures and their movements carefully, shoot them with your camera.

Things to do: Count nesting vultures, Check for available carcasses and count feeding vultures, Check trees around villages for WBV nests or resting vultures, Note down flying vultures using an O-Map and Carefully observe possible threats to vultures in the area.

Things to carry: Binoculars, GPS device, Survey Sheets, a good camera with optical zoom of 10x or more (if available), Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Marka Seha 24° 29'02.2" N 79° 48'19.8" E

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Pic: View of Gehri Ghat Waterfall from the camp area

PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 3

Standard Operating Procedure: Sundi Ghat - Gehrar

Beat: Magraila Pari, Kishangarh, Comp. No.: , Camp: Jhalar Van Chowki, Range: Gehri Ghat

Objectives: To count the live and abandoned nests at Sundi Ghat, Gehrar ki Tunggi and Gehrar.

Itinerary: 0600 Wake up , 0630 Breakfast, Refresh, 0700 Start to Sakrey ki Tunggi, Carry Packed Lunch, 0745 Reach Sakrey Ki Tunggi. *Do not count nests at Sakrey ki Tunggi or any of the nests in the East Bank* *Do not count flying or soaring vultures* Only count nests on the opposite side cliffs of the gorge, move ahead very slowly counting the nests using binoculars, spend at least 1 hr at each site – Sundi Ghat, Gehrar ki Tunggi, Gehrar, 1200 Reach Gehrar ki Tunggi. Lunch, rest , 1300 Start survey, 1400 Reach Gehrar where you will see KN4 tower right in front of you, 1500 Start back to the camp by moving NE 1-1.5” km to reach the road, 1530 Start back to Jhalar Base Camp, 1630 Reach Jhalar, Refresh and Enjoy the evening. - Redo the exact process on Day 2 – important.

Things to do: Count nesting vultures only, Do not count vultures on your side of the cliff (East Bank), Navigate very slowly and spend an hour at each of the sites observing behaviour and searching for nests repeatedly. Enjoy the vulture valley and the river. Beware of bears and leopards in the area. Carry 2-3 ltr. water per person as you will not be getting to the river.

Things to carry: Binoculars, GPS Device, Survey Sheet, 2-3x1 ltr.Water, Pen/Pencil, Eraser and a good bag.

GPS: Site 1 24° 30'52.0" N 79° 52'30.4" E

Site 2 24° 30'52.4" N 79° 52'21.5" E

Site 3 24° 30'21.2" N 79° 51'51.5" E

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Pics: Observe cliffs on the opposite bank from Sundi Ghati upto Gehrar Tower

PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 4

Standard Operating Procedure: Putariyan Ghati

Beat: Dakshin Khamri, Compartment No.: P1279, Camp: Gehri Ghat, Range: Gehri Ghat

Objectives: To count and record the nesting, roosting and resting vultures on the opposite bank (West Bank of Ken) and East Bank of Ken separately.

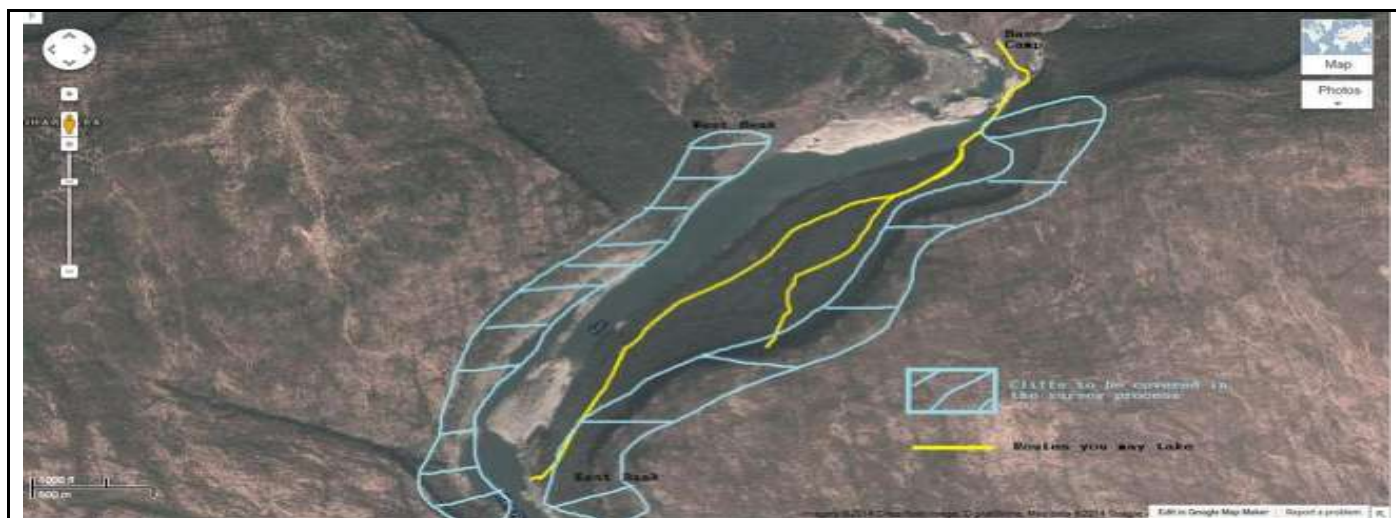
Itinerary: 0530 Wake up – 0600 Breakfast, Take packed Lunch – 0630 Trek to Bada Patthar – 0730 Reach Bada Patthar, Start counting nests on opposite bank (West bank– in Kishangarh Range), 1000 Count nests on the East bank on Gehri Ghat Range (note them down on separate sheets), 1200 Lunch, Rest, 1300 Start walking and cover each nesting site very carefully, especially the shaded rock grooves, check for Shaheen Falcons, 1600 Start back to the camp, 1700 Reach Gehri Ghat, Refresh and Enjoy Sunset, 1900 Reach Camp (Redo the exact procedure on Day 2 – important, Also try to cover as much as possible by surveying up to Chita Ghat).

Things to do: Count nesting vultures (LBV and EV) and Shaheen Falcons, Note down movement directions on the O-Map, Take temperature and wind readings, Take GPS readings and Take good photographs. Note down vultures' group take-off time. Do take some time to enjoy the rock art on the morning of Day 3.

Things to carry: Binoculars, GPS Device, 2 Survey Sheets, a good camera with 10x or more Optical Zoom, Lunch Box with packed lunch, Cap, White sheets/small book, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS:

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 5

Standard Operating Procedure: Sheetal Parua

Beat: Dakshin Khamri, Compartment No.: P1287, Camp: Bandarha Tower, Range: Gehri Ghat

Objectives: To count nests and observe vulture behaviour between Bandarha Tower and Gehri Ghat.

Itinerary: 0530 Wake up, 0600 Breakfast, 0630 Reach and observe Sheetal Parua 1, 0700 Start to Sheetal Parua 5, 0800 Reach Sheetal Parua 5 and observe vultures take-off and then move to Gehri Ghat. Also take temperature and Wind Readings, 1100 Reach Gehri Ghat, Lunch. Do not survey or count at Gehri Ghat. Enjoy the view, 1400 Start to Sheetal Parua 4, 1430 Reach Sheetal Parua 4, take temperature and wind readings, 1500 start to Sheetal Parua 3, 1515 Reach Sheetal Parua 3 and note down Temperature and Wind readings, 1545 Start to Sheetal Parua 2, 1600 Reach Sheetal Parua 2 and note down Temperature and Wind readings, 1630 Start to Sheetal Parua 1, 1700 Reach Sheetal Parua 1 and note down Temperature and Wind readings. Also observe vulture roosting site at base camp, 1830 Rest at base camp for the day - Redo the same on day two (important for consistency).

Watching for vultures is a task requiring great amounts of patience and conviction. Please bear to sit at a few sites without revealing your location or disturbing vulture movements. Be careful in the surrounding area as Bear and Hyena activities can be found.

Things to do: Check and count nests at Bandarha Tower and other sites. It is important to note down take-off and arriving directions

Things to carry: Binoculars, GPS device, Survey Sheets, O-map, a good camera for recording bathing vultures, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Sheetal Parua 4 24° 25' 10.1" N, 79° 54' 17.7" E

Sheetal Parua 5 24° 29' 06.3" N 79° 54' 14.1" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 6

Standard Operating Procedure: Majholi

Beat: Koni Seha, Compartment No.:510, Camp: Majholi, Range: Gehri Ghat

Objectives: To carefully count all the flying and nesting vultures at Majholi and note them on O-Map

Itinerary: 0600 Wake up, 0630 Breakfast , 0700 Start to Majholi Site, 0800 Reach Site, move around and observe nests and flying vultures, 1000 Start back to camp, 1100 Reach camp, Refresh , 1200 Lunch, 1430 Start to site, 1530 Observe nests and flying directions of the vultures and note them on the O-Map, 1700 Enjoy the Sunset at the site, 1800 Start back to camp, 1900 Reach camp - Redo the same on Day 2.

Watching for vultures is a task requiring great amounts of patience and conviction. Please bear to sit at a few sites without revealing your location or disturbing vulture movements. Do look out for white wash from the spot for nesting areas.

Things to do: Count nesting vultures, Check for available carcasses by enquiring from the near by village, if any, and count on feeding vultures, Note down flying vultures using an O-Map and Carefully observe possible threats to vultures in the area.

Things to carry: Binoculars, GPS device, Survey Sheets, a good camera with optical zoom of 10x or more (if available), Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Majholi 24° 32'11.1" N 79° 53'54.9" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 7

Standard Operating Procedure: Devradev

Beat: Utthar Khamhari , Compartment No.: 1276 & 1277, Camp: Gehrighat Patrol Camp, Range: Gehrighat

Objectives: To carefully count all the nests and behaviour of the vultures from the bottom of the cliff.

Itinerary: 0600 Wake up, 0630 Breakfast, 0700 Start from Gehrighat, 0745 Reach Devradev Tower, Count nests and observe take-off and other behaviour. Move around the site and try to observe as much cliff as possible, Take temperature and wind readings, 1100 Start back to Base Camp, 1200 Reach Base Camp, Rest, Refresh, Lunch, 1400 Start back to Devradev, Reach the base of the tower and observe behaviour. As the sunlight is more favourable in the evening, carefully note down any nests that are hard to see, 1630 Start back to Base Camp, 1730 Reach Gehrighat and Enjoy the sunset. Redo exactly the same on Day 2 and carefully write down behaviour on an extra plain paper.

Things to do: Count nesting vultures. Take temperature and wind readings. Write down behaviour.

Things to carry: Binoculars, Survey Sheet, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Devradev Base 24° 29'57.9" N 79° 52'48.6" E

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Pic: Devaradev tower and cliff area. It is in many spots hard to see-do your best at take-off time and evening



PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 9

Standard Operating Procedure: Kushmaila Naala

Beat: Umraavan, Compartment No.: 237, Camp: MN7 Tower, Range: Madla

Objectives: To check the number of vultures coming for a bath to Kushmaila Nalla. Also to check for nesting, roosting in cliffs and *Seha* around.

Itinerary: 0600 Wake up, 0630 Breakfast , 0700 Check Kushmaila Naala and vultures around it, also check the opposite side of the cliffs from MN7 Tower, 0730 Start to Kushmaila Naala by road, 0830 Reach Kushmaila Naala. Do not go close to the Naala. Stay little far away and observe without making any noise as it is a bathing site, 1000 Start back to camp, 1100 Reach camp, refresh and have lunch, 1400 Trek to Madaiyan Naala, 1440 Reach the site and check Madaiyana Naala Seha, Kudiyan Seha and Umraon Seha (1km). Continue to each of the subsites and check for nesting, roosting, resting , flying and bathing, 1630 Start back to MN7 Tower, 1730 Reach Tower and enjoy the Sunset - Redo the same on Day 2.

Watching for vultures is a task requiring great amounts of patience and conviction. Please bear to sit at a few sites without revealing your location or disturbing vulture movements. Do look out for white wash from the spot for nesting areas.

Things to do: Using an O-Map, note down the flying vultures. Carefully observe possible threats to vultures in the area.

Things to carry: Binoculars, GPS device, Survey Sheets, a good camera for recording bathing vultures, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Kushmaila Naala 24° 42'34.7" N 80 02'16.5" E
Madaiyan Naala Seha 24° 42'27.5" N 80 04'59.7" E
Kudiyan Seha 24° 42'20.1" N 80 04'44.6" E
Umraon Seha 24° 42'36.1" N 80 03'23.3" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 10

Standard Operating Procedure: Balaiiya Nala

Beat: Bardhau, Compartment No.: 266, Camp: Bardhau Camp, Range: Madla

Objectives: To observe cliff nesting vultures at Balaiiya Nala and Kunaitiya Nala

Itinerary: 0600 Wake up, 0630 Breakfast, 0700 Go to Balaiiya Nala, 0715 Reach Site, Start looking out for nesting and flying vultures, cover all the cliffs and sit for some time at each area with white wash, 0900 Take temperature and wind readings under the cliffs, 1030 Walk at and around the *Nala* for nests, 1230 Reach the camp, lunch, rest, refresh, 1430 Move to Kunaitiya Nala, 1500 Reach Kunaitiya Nala, count nests, resting vultures, and flying vultures. 1700 Move back to camp. Redo the same on Day 2 (important for consistency).

Watching for vultures is a task requiring great amounts of patience and conviction. Please bear to sit at a few sites without revealing your location or disturbing vulture movements.

Things to do: Count nests and take GPS readings of important nesting sites. Map flying vultures on the O-map. Enjoy the forest. Take temperature and wind readings.

Things to carry: Binoculars, GPS device, Survey Sheets, O-maps, a good camera, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Kunaitiya Nala 24° 45 35.8" N, 80 07 11.5" E
Balaiya Nala 24° 44 45.6" N, 80 06 00.9" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 11

Standard Operating Procedure: Amarkanth

Beat: Katariya, Compartment No.: 546, Camp: Katariya, Range: Gangau Abhayaranya

Objectives: To count nests and observe flying vultures in cliffs around Amarkanth

Itinerary: 0600 Wake up, 0630 Breakfast, 0700 Go to Amarkanth Site 3, 0730 Reach Site 3, Start looking out for nesting and flying vultures, cover all the cliffs and sit for some time at each area with white wash, 0900 Take temperature and wind readings under the cliffs, 1030 Move to Site 2 and start counting nests and stay at site 2, 1230 Reach the camp, lunch, rest, refresh, 1430 Move to site 1, 1500 Reach site 1, count nests, resting vultures, and flying vultures. 1600 Move to the site with the most probable vulture sightings take readings. 1800 Move back to camp. Redo the same on Day 2 (important for consistency).

Watching for vultures is a task requiring great amounts of patience and conviction. Please bear to sit at a few sites without revealing your location or disturbing vulture movements.

Things to do: Move to each of the sites briskly and try to observe nesting and flying patterns. Note down temperature and wind readings. Use O-maps to note down flying vultures' directions. All the three sites are fairly close to each other. Move as you would like but cover all the sites carefully spending at least an hour at each site. Explore.

Things to carry:

GPS: Amarkanth Site 1 24° 39 32.8" N, 80 05 49.0" E

Amarkanth Site 2 24° 39 33.9" N 80 05 49.4" E

Amarkanth Site 3 24° 39 21.1" N 80 05 31.7" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 12

Standard Operating Procedure: Badaur Seha & Kaymasan Seha

Beat: Badaur Seha, Compartment No.:240 & 539, Camp: Badaur Seha, Range: Gangau Abhayaranya

Objectives: To count and record all the nesting and flying Vultures around Badaur Seha and Kaymasan Seha.

Itinerary: 0530 Wake up , 0630 Start to Kaymasan Seha, 0700 Reach Site. Start counting from a distance and do not disturb the Vultures, 0830 Breakfast at Badaur Seha camp, 0900 Reach the site, 1000 One person move to the bottom of Badaur Seha, 1115 Start counting the vultures at the same time from both top and bottom, 1215 Reach camp, Lunch, Rest 1430 Start back to Kaymasan Seha, 1500 Reach Kaymasan Seha and survey, 1630 Start to Badaur Seha, 1700 Reach the site and observe till sunset, 1830 Start back to camp - Redo the exact procedure on Day 2 – important.

Be careful at the edge of cliffs as they are very slippery.

Things to do: Count nesting and flying vultures, Note down flying movement directions on the O-Map, Take GPS readings and Take good photographs. Enjoy the birds and landscape.

Things to carry: Binoculars, GPS Device, O-Maps, Survey Sheet, a good camera, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Badaur Seha 24° 40'18.8" N 80 03'43.3" E

Kaymasan Seha 24 09'22.9" N 80 02'55.5" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 13

Standard Operating Procedure: Bhourkhua

Beat: *Kshetriya Jungle*, Compartment No.: *KJ*, Camp: Sukhwaha, Range: Chandra Nagar

Objectives: To count and record all the nesting White-backed Vultures around Bhourkhua and the banks of Shyamri River. To note down the behaviour of the White-backed Vultures on a separate plain sheet.

Itinerary: 0600 Wake up , 0630 Breakfast , 0700 Start Trekking to Bhourkhua, 0730 Reach Site 1. Start looking at trees – medium-tall, tall and very tall trees. Mandatory to check 6 Arjuna Trees and more, 1100 Go to site 2, 1115 Check for 4 Arjuna Trees, 1 Peepal Tree and any tree else. Explore, 1300 Start back to Sukhwaha, 1330 Lunch, Rest, Refresh, 1500 Move back to Bhourkhua and explore Shyamri River banks, 1700 Start back to the camp, 1800 Reach Base Camp, Refresh and Enjoy Sunset - Redo the exact procedure on Day 2 – important. You may have to trek more based on local knowledge. Feel free to improvise the itinerary or change it as per demand but make sure that you cover these regular trees.

Things to do: Count nesting vultures (WBV), Note down movement directions on the O-Map, Take temperature and wind readings, Take GPS readings and Take good photographs. Do enjoy the forest and the grasslands.

Things to carry: Binoculars, GPS Device, O-Maps, Survey Sheet, a good camera, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Site 1 24° 33'38.1" N 79° 45'10.7" E

Site 2 24° 33'41.7" N 79° 45'15.1" E

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Pic 1: Bhourkhua Site 1, Pic 2: Some trees and the canal at Pania Nala (Site 2)



PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 14

Standard Operating Procedure: Maniyagarh

Beat: Rajgad, Compartment No.: 663, Camp: Raipura Patrol Camp, Range: Chandra Nagar

Objectives: To count and record all the nesting, roosting and flying vultures. To record on O-Maps all the flying vultures and directions. To explore Raipura Maidan for King Vulture nests.

Itinerary: 0600 Wake up, 0630 Breakfast, 0700 Start Trekking to Sugra Pani, 0745 Reach Sugrapani, Start counting nests on cliffs (approx. 50m radius), Observe the area, 1000 Start back to camp and check Maniyagarh on the way, 1200 Reach Camp, Lunch, Rest, 1400 Move to Raipura Maidan and check for King Vulture Nests on Trees, if found note down GPS readings of each tree. If device is not available please take photographs and mention the number on the survey sheet, 1630 Start back to the camp, 1715 Reach Base Camp, Refresh and Enjoy Sunset - Redo the exact procedure on Day 2 – important.

Things to do: Count nesting vultures (LBV, EV and KV), Note down movement directions on the O-Map, Take temperature and wind readings, Take GPS readings and Take good photographs. Do enjoy the forest and the grasslands.

Things to carry: Binoculars, GPS Device, O-Maps, Survey Sheet, a good camera with 10x or more Optical Zoom, Water (1-2x1L per person), Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Sugra Pani 24° 42'36.9" N 79° 56'17.2" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 15

Standard Operating Procedure: Nagadiya Naala

Beat: Amdabar, Compartment No.: P539, Camp: Sukhwaha, Range: Chandra Nagar

Objectives: To count nests and observe vulture behaviour at and around Nagadiya Nala

Itinerary: 0600 Wake up, 0630 Breakfast, 0700 Start to site, 0730 Reach Nagadiya Nala and start observing. Trees are spread in a half-kilometre radius. Check very carefully all the tall and medium-tall trees. Observe behavior carefully and check for threats from human or animal activity, 1000 Start to Panhala Nal, 1015 Start observing trees. Critical trees are Mahua and Arjuna. Observe around 500 m of area. 1130 Start back to camp. 1200 Lunch and refresh. 1400 Start back and check for more trees and nests around. 1430 Start to Shyamri river bank. 1600 Get to a nice spot and enjoy the evening view. 1700 Start back to camp. Redo the same on day two (important for consistency).

Watching for vultures is a task requiring great amounts of patience and conviction. Please bear to sit at a few sites without revealing your location or disturbing vulture movements.

Things to do: Check and count nests at Nagadiya Nala and other sites. Check for Mahua and other trees nearby. Explore for nests in cliffs and trees.

Things to carry: Binoculars, GPS device, Survey Sheets, O-map, a good camera for recording bathing vultures, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Nagadiya Nala 24° 24' 24.6" N, 79° 46' 49.4" E

Panhala Nala 24° 34' 26.0" N 79° 46' 24.2" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 16

Standard Operating Procedure: Padam Ki Ghodi

Beat: Seja, Compartment No.: 553, Camp: Pandavan, Range: Chandra Nagar

Objectives: To count and record the nesting, roosting, resting, bathing, foraging and flying vultures at the given site

Itinerary: 0500 Wake up – 0530 Breakfast, Take packed Lunch – 0600 Trek to Padam ki Ghodi – 0700 Reach Padam ki Ghodi base, Spot the roosting area (caution: maintain distance and silence. be patient) and count (be careful in identifying griffons, juveniles and others), 1000 After take-off by vultures for soaring/foraging, get to the top of Padam Ki Ghodi, 1200 Observe resting vultures, Lunch, 1230 Check the area and observe behaviour patiently, note it down on a separate sheet of paper, 1400 Start to the base of the cliff (by the same route and not via Bans Pahadi), 1500 Reach the base of the cliff. Write details on changes in numbers and behaviour in a separate sheet, 1530 Start back to base camp, 1700 Reach Base Camp and Refresh. (Redo the exact procedure on Day 2 – important)

Things to do: Count Vultures (Roosting/Resting/Flying separately), Note down movement directions on the O-Map, Take temperature and wind readings, Write down behaviour on a sheet of paper and Take good photographs. Finally, do take some time to enjoy the landscape.

Things to carry: Binoculars, GPS Device (if available), O-maps, Survey Sheets, a good camera (preferably a D-SLR), Water (2-3x1L per person), Lunch Box with packed lunch, Cap, White sheets/small book, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS Readings: Base of Padam ki Ghodi 24° 37' 58.5" N 79° 44' 42.5" E
Top Point (VP) 24° 37' 54.2" N 79° 44' 37.2" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 19

Standard Operating Procedure: Bada Pahad

Beat: Patauri, Compartment No.: 493, Camp: Jamun Dhawra, Range: Kishangarh

Objectives: To count the nests and take-off times for vultures at Bada Pahad.

Itinerary: 0600 Wake up, 0630 Breakfast, 0700 Start watching cliffs and counting nests while moving towards Patauri by road. Count the nests on both sides of the cliffs. Cover all the view points to note down various nesting areas. 1000 Move to one of the nesting areas and count carefully and try to find all the nests in the area without duplication. 1200 Start back to the camp. 1230 Reach Base Camp, Lunch, Refresh, Rest. 1430 Move to each of the nesting sites and count all the nests carefully. 1700 After counting all the sites, move to base camp and enjoy the evening. Redo the same by counting at each of the nesting sites. Stay for some time at each nesting area to understand the behaviour better and also find some nests in shadows or so.

Due to good tree density at many of the sites, it will take time to find nests and assess the health of each. Be patient and persistent.

Things to do: Identify nesting vultures in Bada Pahad. Take GPS readings of the closest points to the nesting areas. Check the direction to which vultures take-off.

Things to carry: Water, Camera, GPS, Survey Sheets, O-maps, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Viewing Site 1 24° 30 04.8" N, 79° 49 54.8" E Viewing Site 3 24° 30 15.6" N, 79° 50 19.3" E
Viewing Site 2 24° 30 11.4" N, 79° 50 13.7" E Far off view point 24° 29 25.0" N, 79° 50 15.9" E

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Pics: A couple of view points for Bada Pahad team. Usually you will have to work through tree foliage.

PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 20

Standard Operating Procedure: Gehri Ghat of Kishangarh

Beat: Gehri Ghat, Compartment No.: P483, Camp: Gehri Ghat Patrol Camp, Range: Kishangarh

Objectives: To count and record the nesting, roosting and resting vultures on the opposite bank (West Bank of Ken) and East Bank of Ken separately.

Itinerary: 0530 Wake up – 0600 Breakfast, Take packed Lunch – 0630 Start Trekking, Start observing nests on both sides of the cliffs, Start counting nests on West bank– in Kishangarh Range, 1000 Count nests on the East bank (opposite bank) on Gehri Ghat Range (note them down on separate sheets), 1200 Lunch, Rest, 1300 Start walking and cover each nesting site very carefully, especially the shaded rock grooves, check for Shaheen Falcons, 1600 Start back to the camp, 1700 Reach Gehri Ghat and Enjoy Sunset, Refresh 1900 Reach Camp (Redo the exact procedure on Day 2 – important, Also try to cover as much as possible by surveying up to Chita Ghat and Do not count any of Sakriya Tor – Discuss at the camp and clarify).

Things to do: Count nesting vultures (LBV and EV) and Shaheen Falcons, Note down movement directions on the O-Map, Note down group take-off times for vultures, Take temperature and wind readings, Take GPS readings and Take good photographs. Finally, do take some time to enjoy the rock art on Day3

Things to carry: Binoculars, GPS Device, 2 Survey Sheets, a good camera with 10x or more Optical Zoom, Lunch Box with packed lunch, Cap, White sheets/small book, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: TO BE FILLED USING FUTURE DATA

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 21

Standard Operating Procedure: Gehrar

Beat: Patauri, Compartment No.: 495, 497, Camp: Gehrar Nigrani Tower, Range: Kishangarh

Objectives: To take vital data of vulture valley, count flying vultures and photograph nesting vultures.

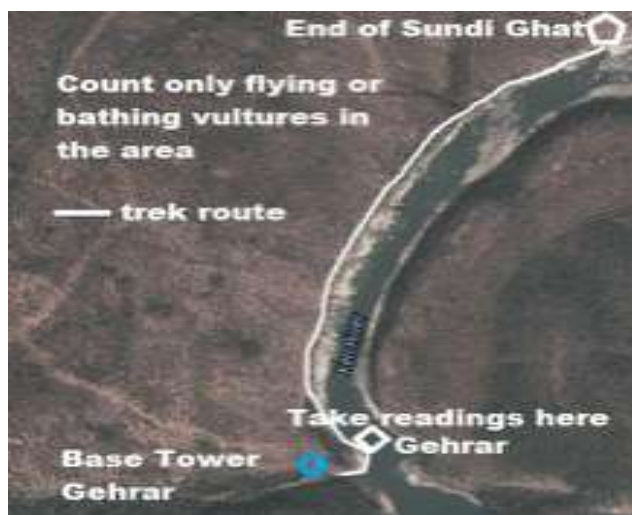
Itinerary: 0530 Wake up, 0600 Breakfast , 0610 Move to Gehrar View Point rock about 20 m from the camp site and check for the first flying vultures and mark them on the O-map, enjoy sunrise, 0800 Start to Gehrar. One person in the team should go down and the other should be at the top. At group take-off around Sundi Ghat, take temperature and wind readings at the bottom and the top of the cliff (keep watching Sundi Ghat and adjacent areas from Gehrar), 1000 After take-off and the readings are taken, start walking towards Sundi Ghat, Reach End Point. 1300 Get back to Gehrar Tower, Refresh, Rest, 1530 Take photographs and enjoy the evening. Redo the same on Day 2 (important for consistency). Do not count any nests on your side of the river (west bank and the cliffs around) – there are other teams for the task. You must count the nests on your opposite bank and those alone. Count all flying vultures carefully. Enjoy the valley.

Things to do: Identify flying vultures and mark them on the O-Maps, Take temperature and wind readings at specified points at take-off times, Walk from Gehrar to Sundi Ghat and check for bathing or roosting sites of vultures, Take good photographs of nesting and flying vultures in the valley.

Things to carry: A very good camera, GPS device, Survey Sheets, O-maps, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Gehrar View Point 24° 30 07.4" N, 79° 51 48.4" E
Gehrar Data Point 24° 30 09.1" N, 79° 51 49.1" E
End Point 24° 31 01.3" N, 79° 52 46.4" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 22

Standard Operating Procedure: Kakra Seha

Beat: Brujpura , Compartment No.:505, Camp: Naroli Patrol Camp, Range: Kishangarh

Objectives: To count and record the vulture nesting sites around Kakra Seha and Chunhayi Ghati. To count the flying or feeding vultures in and around Pathapur and Naroli villages.

Itinerary: 0600 Wake up , 0630 Breakfast , 0700 Start Trekking to Chunhayi Ghati, 0730 Reach Pathapur Waterfall. Count the nests (hard to identify at times) on the cliffs 200 m on both sides of the waterfall. Observe and note down take-off times and resting vultures, 0930 Trek to Pathapur, 1000 Check for vultures on nearby trees in Pathapur village, 1030 Ask locals for left over carcasses etc. If any exists – immediately go to that site. 1200 Start back to Base Camp, 1230 Reach Base Camp, Lunch, Refresh, Rest, 1430 Start to Kakra Seha, 1500 Reach Kakra Seha – check for nests and Shaheen Falcon at Seha, 1600 Move to Site 2 (Seha 100 m North of Kakra Seha) and Check for nests, 1630 Move to Site 3 (50m North of Kakra Seha) and Check for nests on the other side of the cliff, 1730 Reach Kakra Seha and enjoy the sunset, 1815 Start back to Naroli Patrol Camp - Redo the exact procedure on Day 2 : important.

Things to do: Count nesting vultures and Shaheen Falcon(s), Check for available carcasses and count feeding vultures, Note down flying vultures using an O-Map and Carefully observe possible threats to vultures. **Things to carry:** Binoculars, O-Maps, Survey Sheet, a good camera, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Kakra Seha-Site 1 24° 31'59.4" N 79° 50'03.9" E
Site 2 24° 31'57.3" N 79° 49'59.2" E

Site 3 24° 32'02.3" N 79° 49'52.3" E
Pathapur Waterfall 24.512961 N, 79.824268 E

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(Below) Pic 1: Local Map, Important Sites and Trek Route. Pic 2: Site 3, observe far-off cliffs on opposite side



PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 23

Standard Operating Procedure: Marka Seha

Beat: Patauri (Buffer), Compartment No.: 486, Camp: Patauri Patrol Camp, Range: Kishangarh

Objectives: To carefully count all the nesting vultures on the cliffs from after Sukhator ki Ari up to Marka Seha

Itinerary: 0600 Wake up, 0630 Breakfast, 0700 Start Trekking to the end of Sukhator ki Ari, 0730 Reach Site and Start counting nests (Do not count any nests in Sukhator ki Ari. Speak to the Sukhator ki Ari group to eliminate nest duplication). Count the nests very carefully on the cliffs and walk towards Gehri Ghat Gate, 1130 After finishing the count, move to Base Camp, 1145 Lunch, Rest, 1400 Redo the count for areas where the density is high – evening light will be more suitable for identification in contours and grooves, 1600 Start back to Base Camp, 1700 Reach Camp, Enjoy Budhaina Nala and Rest. Redo the same on Day 2.

It is important to maintain distance of more than 200 m from the base of the cliff to be able to identify nests clearly (assuming that you have a 10x50/8x40 binoculars). Make your best efforts to observe abandoned nests and chicks, especially on Day 2. Do not focus much on flying vultures – only the group soaring times for vultures are to be noted. At the cliffs, find ways to observe cliffs from locations that are far and some others that are very near. Spend some time at areas where nesting or white wash is thick – this will give you a chance to observe behaviour and hard-to-see nests. Take GPS readings at important nesting areas.

Things to do: Count nesting vultures, Check for available carcasses and count feeding vultures, Check trees around villages for WBV nests or resting vultures, Note down flying vultures using an O-Map and Carefully observe possible threats to vultures in the area.

Things to carry: Binoculars, GPS device, Survey Sheets, a good camera with optical zoom of 10x or more (if available), Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Marka Seha 24° 29'02.2" N 79° 48'19.8" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 24

Standard Operating Procedure: Sakariya Tor

Beat: Patauri (Buffer), Compartment No.:486, Camp: Gehrihat Gate (Patauri), Range: Kishangarh

Objectives: To carefully count all the nesting vultures from the ridge just left of Gehrihat Gate up to Ambapani Mandir.

Itinerary: 0600 Wake up, 0630 Breakfast, 0700 Start Trekking to Ambapani Mandir, 0800 Reach Mandir and Start counting nests from the Mandir (Do not count any nests to the right of the mandir, assuming that you are facing the cliffs – they are a part of the Sukhator ki Ari group's area. If possible, speak to them to eliminate nest duplication). Count the nests very carefully on the cliffs and walk towards Gehri Ghat Gate, 1130 After finishing the count, move to Base Camp, 1145 Lunch, Rest, 1400 Redo the count for areas where the density is high – evening light will be more suitable for identification in contours and grooves, 1600 Start back to Base Camp, 1700 Reach Camp, Enjoy Gehri Ghat and Rest. Redo the same on Day 2.

It is important to maintain distance of more than 200 m from the base of the cliff to be able to identify nests clearly (assuming that you have a 10x50/8x40 binoculars). Make your best efforts to observe abandoned nests and chicks, especially on Day 2. Do not focus much on flying vultures – only the group soaring times for vultures are to be noted. At the tor and the cliffs, find ways to observe cliffs from locations that are far and some others that are very near. Spend some time at areas where nesting or white wash is thick – this will give you a chance to observe behaviour or hard-to-see nests. Take GPS readings at important nesting areas and at the tor.

Things to do: Count nesting vultures, Check for available carcasses and count feeding vultures, Check trees around villages for WBV nests or resting vultures, Note down flying vultures using an O-Map and Carefully observe possible threats to vultures in the area.

Things to carry: Binoculars, GPS device, Survey Sheets, a good camera with optical zoom of 10x or more (if available), Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Useful Point 24° 29'12.1" N 79° 51'13.9" E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 25

Standard Operating Procedure: Sukhator Ki Ari

Beat: Patauri (Buffer), Compartment No.:486, Camp: Patrol Camp Patauri, Range: Kishangarh

Objectives: To carefully count all the nesting vultures from Ambapani Mandir to Sukhator ki Ari up to the end of Sukhator ki Ari

Itinerary: Day 1: 0600 Wake up, 0630 Breakfast, 0700 Start Trekking to Ambapani Mandir, 0730 Reach Mandir and Start counting nests from the Mandir (Do not count any nests to the left of the mandir, assuming that you are facing the cliffs – they are a part of the Sakariya Tor group's area. If possible, speak to them to eliminate nest duplication). Count the nests very carefully on the cliffs and walk towards Sukhator ki Ari, 1300 After finishing the count, move to Patauri Camp, 1330 rest and refresh, 1530 Redo the count for areas where the density is high – evening light will be more suitable for identification, 1800 Start back to Patauri Camp, 1830 Reach Patauri Camp and Rest.

Day 2: 0600 Wake up, 0630 Breakfast, 0700 Trek to the far end of Sukhator ki Ari, 0730 Start counting the nests of previous day, survey shaded areas carefully and observe behavioural data including takeoff time, Reach Ambapani Mandir by noon, 1200 After finishing the count, move to Patauri Camp, 1230 rest and refresh, 1430 Redo the count for areas where the density is high, check for new sites carefully, 1800 Start back to Patauri Camp, 1830 Reach Patauri Camp and Rest.

It is important to maintain distance of more than 200 m from the base of the cliff to be able to identify nests clearly (assuming that you have a 10x50/8x40 binoculars). Look for bright white markings. Make your best efforts to observe abandoned nests and chicks, especially on Day 2. Do not focus much on flying vultures – only the group soaring times for vultures are to be noted.

Things to do: Count nesting vultures and Shaheen Falcon(s), Check for available carcasses and count feeding vultures, Check trees around villages for WBV nests or resting vultures, Note down flying vultures using an OMap and Carefully observe possible threats to vultures in the area.

Things to carry: Binoculars, O-Maps, Survey Sheets, a good camera with optical zoom of 10x or more (if available), Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Important Nesting Site towards the right of Sukhator ki Ari 24 28'59.6 N 79 49'23.3 E

Important Nesting Site at the middle of the Ari 24 28'59.3 N 79 49'32.4 E

Useful Assessment Point near Camp 24 29'09.5 N 79 49'41.5 E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 26

Standard Operating Procedure: Sakrey Ki Tungi

Beat: , Compartment No.: , Camp: , Range:

Objectives: To carefully count all the nesting(most important), flying and nesting vultures at Sakrey Ki Tungi and note them on O-Map

Itinerary: 0600 Wake up, 0630 Breakfast , 0700 Start to Sakrey ki Tungi, 0730 Reach Site, Settle in rock shades, do not move much. Watch the opposite (East bank) cliffs from the base of the West bank for behaviour and note take-off time. After take-off, wait for 30mins and start back to camp. Do not count nest during the morning session(very important) 1230 Have Lunch and Refresh, 1300 Start to observation point (just above the Ghat , at times through the trees) , count nests on opposite side. Separate vulture and Falcon nests. Do not go near Sundhi Ghat at any point of the day or count vultures at or above Sundhi Ghat. Feel free to enjoy other areas after 1600. Do not count any vultures there which may need to duplication (very important) , 1730 Enjoy Sunset and Start back to camp, 1800 Reach camp - Redo the same on Day 2.

Watching for vultures is a task requiring great amounts of patience and conviction. Please bear to sit at a few sites without revealing your location or disturbing vulture movements. Do look out for white wash from the spot for nesting areas.

Things to do: Count nesting vultures, Note down flying vultures using an O-Map. Shaheen falcon may be present note down their behaviour with vultures. It is important to note down take-off and arriving directions. Also note down Temperature and Wind Readings on the top and bottom of the cliff and Carefully observe possible threats to vultures in the area.

Things to carry: Binoculars, GPS device, Survey Sheets, a good camera, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Sakrey ki Tungi (On Top) 24° 51'97.5"6 N 79° 88'16.1"3 E

Sakrey ki Tungi (Bottom) 24° 51'97.2"6 N 79° 87'98 E

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PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 27

Standard Operating Procedure: Gugrahaar

Beat: Baraahi, Compartment No.:685, Camp: Moharey Ghat, Range: Khajuraho

Objectives: To count and record all the resting and flying Vultures around Gugrahar.

Itinerary: 0600 Wake up , 0630 Breakfast , 0700 Start Trekking to Gugrahar, 0730 Reach Site 1. Start looking at trees – medium-tall, tall and very tall trees. Mandatory to check Salai Trees and more. Explore the area for resting vultures on tall trees, 0845 Start to Site 2, 0900 Reach the site and look for tall trees for resting and nesting vultures, 0930 Reach Site 3, Keep looking at tall trees and also count flying, soaring and resting vultures, 1100 Start to Site 4, Count flying vultures and map them, 1200 Start back to camp, 1230 Lunch, Rest, Refresh, 1430 Move to Khariya Kheth (carry water 1 ltr. per person), 1530 Reach Khariya Kheth and check for nests on trees, 1700 Start back to camp, 1800 Reach camp and enjoy Sunset - Redo the exact procedure on Day 2 – important.

Things to do: Count nesting vultures, Note down important trees on a separate plain paper, Note down flying movement directions on the O-Map, Take GPS readings and Take good photographs. Enjoy sunset and the forest.

Things to carry: Binoculars, GPS Device, O-Maps, Survey Sheet, a good camera, Water, Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Site 1 24° 53'48.0" N 80° 02'12.8" E
Site 2 24° 53'41.4" N 80° 02'17.7" E

Site 3 24° 53'48.2" N 80° 02'20.5" E
Site 4 24° 54'01.0" N 80° 02'16.8" E

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Pic: Important sites near Gugrahar area



PANNA TIGER RESERVE - VULTURE ESTIMATION

VCP No.: 28

Standard Operating Procedure: Katwarhar

Beat: Baraahi , Compartment No.:685, Camp: KN2 Tower of Moharey Ghat, Range: Khajuraho

Objectives: To count and record all the nesting King Vultures around Katwarhar. To note down the behaviour of the White-backed Vultures on a separate plain sheet.

Itinerary: 0500 Wake up , 0530 Breakfast , 0600 Start Trekking to Katwarhar, 0630 Reach Site. Start looking at trees – medium-tall, tall and very tall trees. Mandatory to check Gunja Trees and more. Explore the area for King Vulture nests after take-off, 1130 Start back to Camp, 1230 Lunch, Rest, Refresh, 1430 Move back to Katwarhar and explore the area for nests and any other Vulture activity, 1730 Start to the river bank and Enjoy Sunset, Refresh, 1830 Reach Base Camp - Redo the exact procedure on Day 2 – important.

Things to do: Count nesting vultures, Note down movement directions on the O-Map, Take temperature and wind readings, Take GPS readings and Take good photographs. Do take sometime to enjoy at the river bank.

Things to carry: Binoculars, GPS Device, O-Maps, Survey Sheet, a good camera with 10x or more Optical Zoom, Water (1-2x1L per person), Pen/Pencil, Eraser and a good bag to carry all of these.

GPS: Important Site 24° 33'38.1" N 79° 45'10.7" E

Guidelines: Please maintain socially acceptable behavior. We are a mix group of individuals of all ages and genders. Be nice to youngsters, be courteous to women and respect elders. It is legally, and more ethically, punishable to smoke, consume alcohol or non-vegetarian products in the park. Do not litter anywhere in the park. Unacceptable litter includes food, paper, leather, cloth and non-biodegradable waste. Carry your waste in a separate cover and dispose them in the nearest village's dump yard. Avoid throwing or burning plastic or polythene in the park. Refrain yourself from debates on sex, religion, politics and other sensitive issues – we shall remain as naturalists and naturalists only when in the park. Please dress in dull colours only. Respect local customs and beliefs.



Vulture & wildlife heaven -Dhundhwah Seha in Panna TR



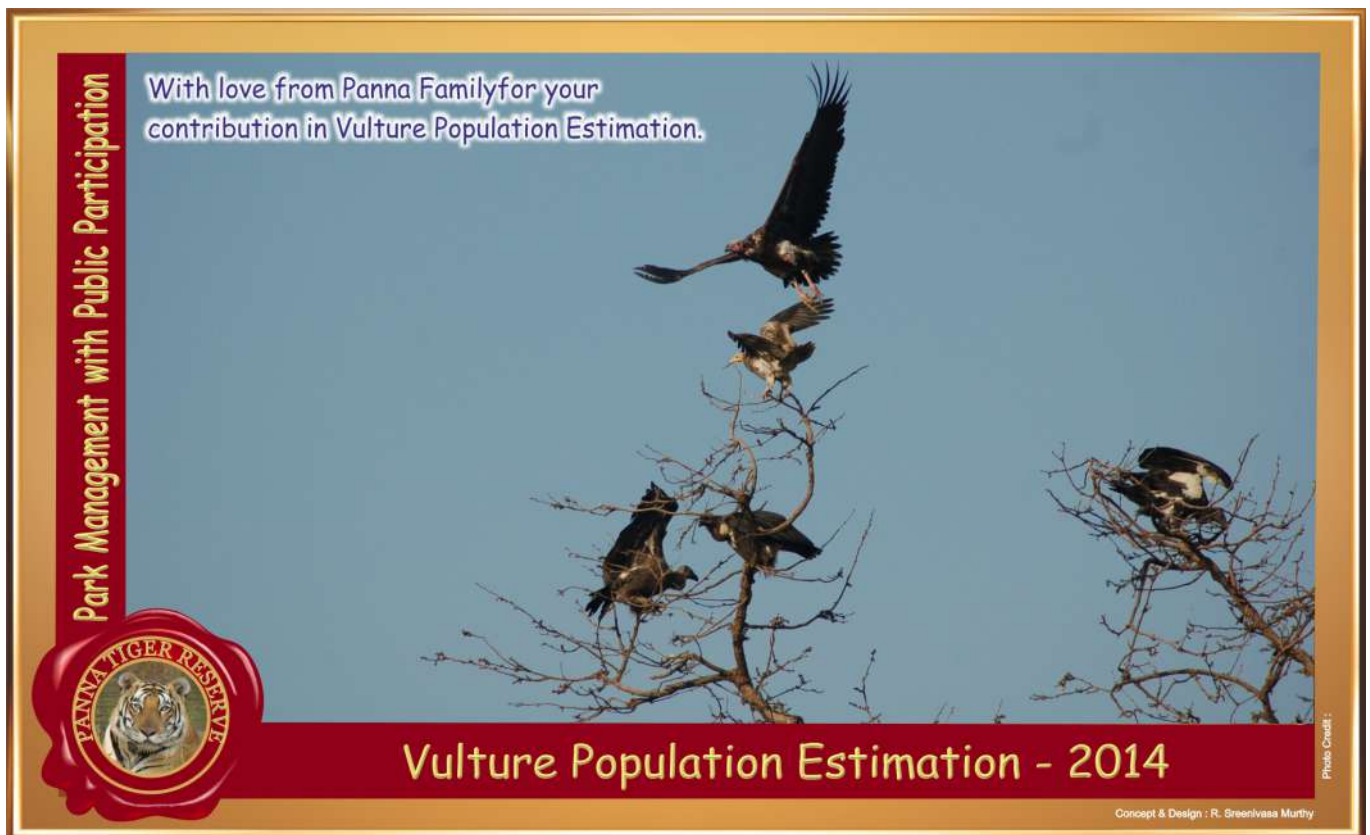
Arun Vasireddy, Co-author at Kakra Seha



Debriefing by participants on 23.01.2011 at Hinouta



Vulture Memento as a token of gift to participants





Cover Photo: Chick of Egyptian Vulture (Chandra Shekar Patel),
Back Cover: Soaring Long billed vulture (Sajit Ponnappa), Ken River with Typical Rock cliffs
(Chandra Shekar Patel)