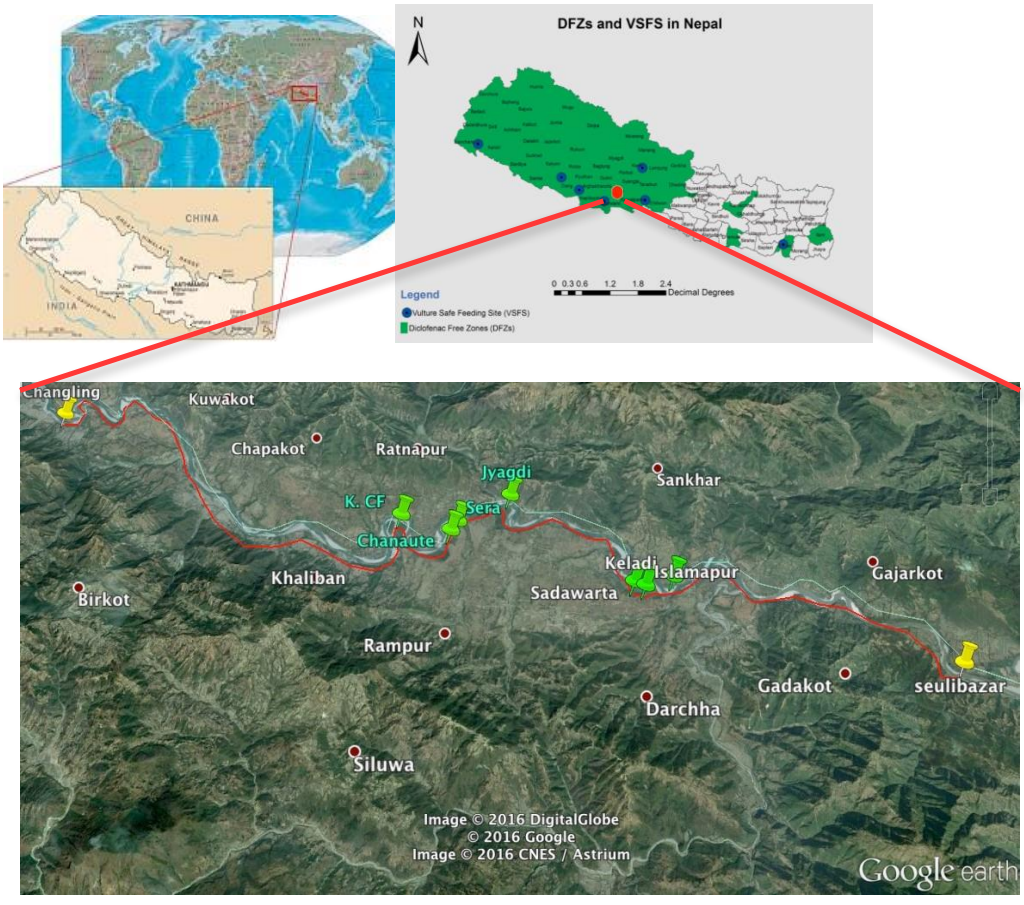
Project Update: July 2016

The project entitled "*The population Status and Breeding Ecology of endangered vulture species found in Rampur valley, Nepal*" was commenced from March 2016. Before the fieldwork, all the primary and secondary information were collected through literature reviews and preliminary field survey. The entire present and historical nesting and roosting sites as well as carcass dumping sites were visited twice to assess the presence of nests and roosting habitat for proper assessment of population status of all the species of vultures.

After the preliminary survey, there was a change in my scheduled program as it is being observed that there were nestlings of White Rumped Vultures in the nest. Hence, population of all the species including nestlings was successfully assessed which enables me to find out the population dynamics over the year, as I will be counting the population twice; i.e., before the breeding season starts and again after the breeding season next year.

RESEARCH METHODS



Map 1: Study area

(From left: Position of Nepal in World map, position of Rampur, Palpa in diclofenac free zone and vulture safe feeding sites map of Nepal and extensive study area. The red line indicates extensive study area and green placeholders indicate the historical and present nesting sites.)

- **Reconnainance Survey**

The study area was visited twice, in the month of February and March, from east (Seulibazar) to the west (Changling) following the riverbelts. Informal group discussions and questions were asked to local people about the historical nesting places and existing nesting and roosting sites if any. After successful primary field information, the study was focused on riverine ecosystem of rampur valley which was our extensive study area (map 1). After the Nesting and roosting sites were found, Nest Counting along with nesting characteristics and nest site selection was done followed by population count and Habitat analysis.

- **Status and Distribution of Nests of White-rumped Vultures**

Based on local information and existing knowledge, careful observations of potential vulture nesting habitat were made. Nesting vultures were thoroughly searched for by scanning potential cliffs and nesting trees in open areas. Nests were monitored in the month of February 2016 using binoculars for the correct identification of species, number of individuals and status (nesting/roosting/perching).

- **Nest Site Selection and Nest Characteristics**

Nest observations were made from the ground, and assessments of nest status were recorded. Climbing on possible nesting trees was avoided to minimize disturbance to the breeding pairs. Also, we kept a sufficient distance between the study team and nesting spot. Data regarding the nesting characteristics such as geographical coordinate, location of nest, approximate height of nesting tree and nest, location of nests in the canopy, direction of nest, nesting materials and shape of nests were accessed.

- **Breeding Success of White-rumped Vulture**

In order to study breeding ecology and nesting characteristics, nests were counted and nest occupancy, presence of active and passive nests along with geographical location, number of hatchlings, terrain preferred to build nest and distance of nesting tree from nearest water body were recorded. Nesting sites were visited and nests were carefully monitored to differentiate between active nests, passive (abandoned) nest. To find out the breeding success number of successful hatchlings was divided by total number of active nest and times by 100.

- **Status of Vulture Population in Rampur, Palpa Nepal**

All the birds seen on nests and perched on roosts during the specified times were recorded between 12-13 and 29-31 of March 2016. Absolute counts were followed to count the population of different vulture species. All the roosting and nesting sites were monitored early in the morning (0630-0930 hours) and late in the evening (1730-1930 hours).

- **Population Estimation**

For accurate and authentic estimation of vulture population found in the valley, Jacknife Technique (cited in Baral & Gautam, 2007) was followed. The underlying assumption of this method is that with repeated counts theoretically there is the probability of counting all the birds in the area at one time. The method requires at least five repeated absolute counts. The method uses the difference between the highest count (N_{max}) and the second highest count (N_{max-I}) to calculate the estimated total number (N), where $N = (2\ N_{max} - N_{max-I})$. No immigration to, or

emigration from the area is assumed.

- **Nesting and Roosting Habitat of Vultures in Rampur Valley, Palpa Nepal**

Vegetation analysis was undertaken in the nesting site of White-rumped vulture in the month of May 2016 to understand the vegetation composition of the area, which is favorable for nesting and roosting for other species of vultures too.

As the study found out that nests of vultures were only present in Khaireni community forest (28.16 Ha.) in this year; vegetation survey was carried out by laying 15 m radius plots for trees and 5m*5m plots for shrubs inside each circular plots. All the trees and shrubs were carefully identified and enumerated. Diameter of all the vegetation excluding herbs was measured with the help of measuring tape for trees and digital caliper for shrubs.

Species area curve was prepared to find out the minimum number of circular plots needed to survey the area adequately. In this curve, the data is plotted with number of plots on x-axis and number species on y-axis. The point at which the curve flattens will indicate the minimum number of plots required.

Once number and size of quadrate was fixed, the plots were randomly distributed in the forest. The geographic location of the center of each circular plot was noted. (Map 2) In each plots the number of species, corresponding number of individuals and diameter of each individual trees exceeding 10 cm diameter at breast height (dbh, at 1.37 m above the ground) was measured. The data obtained in each plot was arranged properly for further analysis.

Map 2: Khaireni Community Forest

(The red line in the map indicates boundary of Khaireni Community Forest and green Place marks are the randomly selected circular plots.)

For quantitative analysis of the vegetation density, frequency, basal area and their relative values and importance value index (IVI) of tree species were calculated following (Mueller- Dombois D. & Ellenberg H., 1974). For the assessment of vegetation diversity (excluding herbs) of nesting sites, Shannon-Weiner Diversity index was used. Species diversity has two separate components i.e., the number of species present (species richness); and their relative abundances (termed dominance or evenness). Shannon-Weiner Diversity Index is calculated in the following way:

$$H' = -\sum p_i \ln p_i$$

Where: p_i is the proportion of individuals found in species ***i***. For a well-sampled community, we can estimate this proportion as $p_i = ni / N$, where ni is the number of individuals in species ***i*** and **N** is the total number of individuals in the community. Since by definition the p_is will all be between zero and one, the natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum. Typical values are generally between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4. The Shannon index increases as both the richness and the evenness of the community increase. (Magurran, A.E., 2004).

RESULTS

This phase of field study was conducted between "February and May 2016" in Rampur municipality covering five VDCs. The study was made comparing (Baral, Gautam, & Tamang, 2005) to analyze the population trend, present population status and diversity, nesting characteristics, habitat preference and ethno-vulture relationship in the study area.

After successful primary reconnainance conducted in early February, nesting and roosting sites were located in Khaireni Community Forest. The other nesting sites found in 2005 were absent of nesting colony in this year, however vulture nests had been seen by local people in Sera, Islamapur and Jygdi two years earlier (in 2014). Nests of only White-rumped vultures were recorded in this study period.

Status of Vulture Population in Rampur, Palpa Nepal

- The Khaireni community forest can be called as a safe breeding ground and most of the vulture species were found there at the time of study. After successful primary reconnainance and informal group discussions all the nesting and roosting sites were visited in order to count population. Five repeated counts were done in the month of March (12, 13, 29,30and 31march). We found five species of vultures at the time of study namely; white-rumped vulture (WRV), slender-billed vulture (SBV), Red-headed vulture (RHV), Eurasian Griffon (EG) and Egyptian vulture (EV). The population of white-rumped vulture was estimated maximum followed by Eurasian griffon.

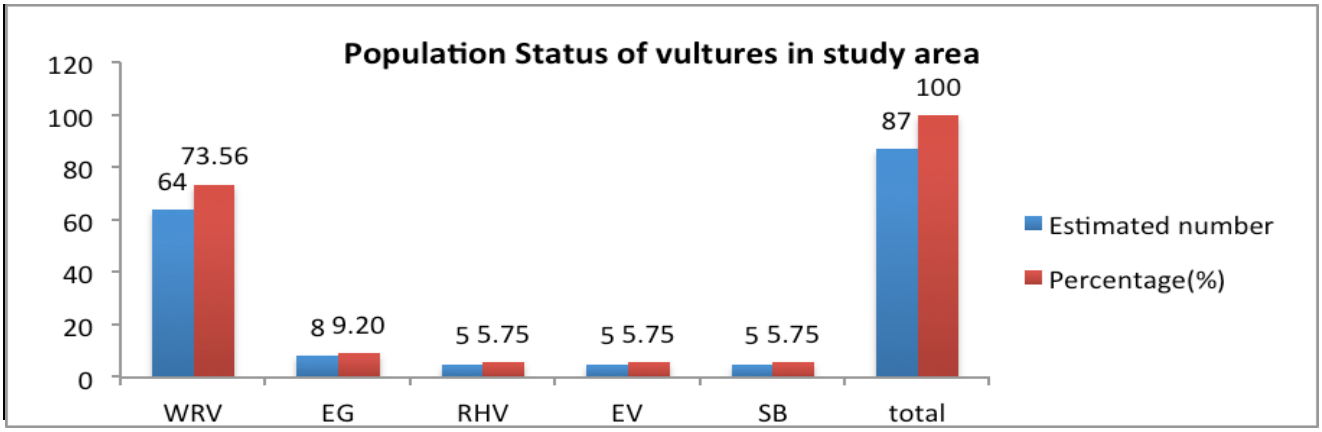


Figure 1: Population Status of Vultures in the study area

- Since the study was made in breeding season of white rumped vulture, we could distinguish between immature and adults. So the age structure of the vulture population could be assessed.

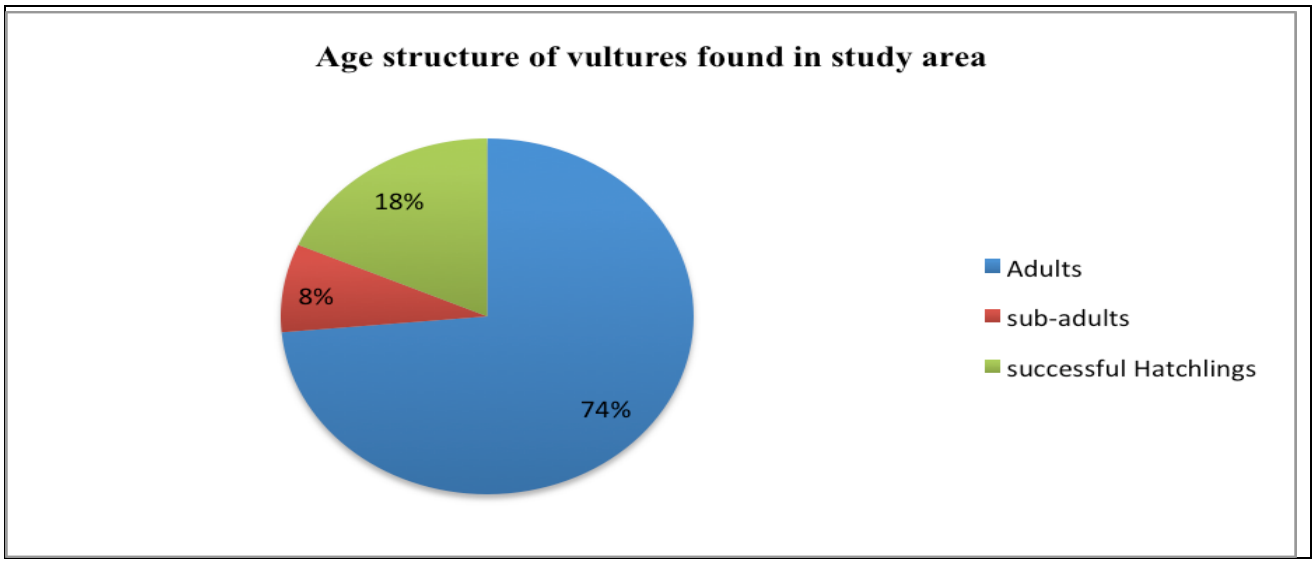


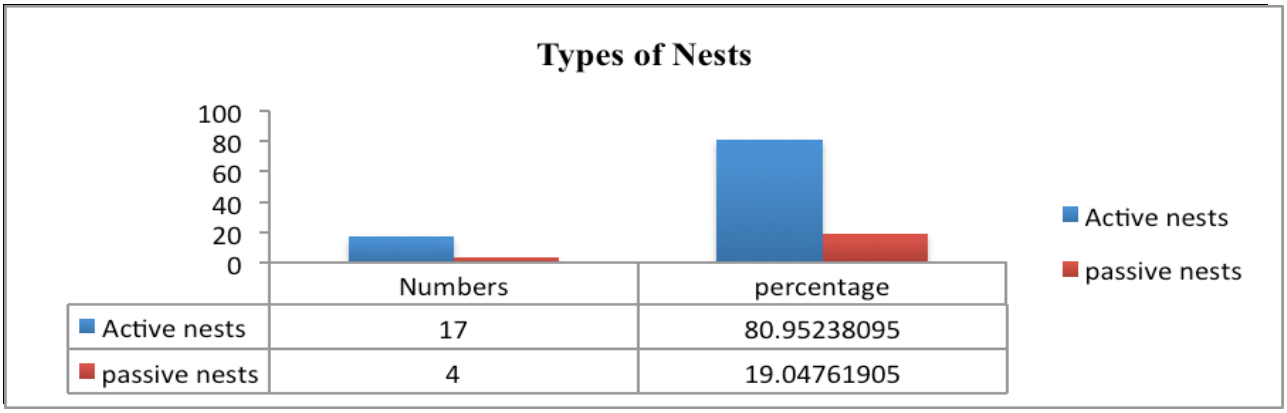
Figure 2: Age structure of vultures found in study area

- A total of 7 adult dead WRV were recorded, the reason of mortality could not be found. There was no record of 'head drooping behaviour' in study period.

Status and Distribution of Nests of White-rumped Vultures

Study shows that, a WRV has a span of over 6 months from December to May for breeding behaviors (Ali and Ripley, 1978). Hume and Oates (1889–1890) observed that the October–January was the peak-breeding season of vultures in south Konkan district, Maharashtra. Egg laying starts in the month of December. It takes about 45 days for an egg to hatch. The nestling then grows up to the fledgling in a period of 3 months approximately (Ali and Ripley, 1978).
Since this field study was conducted between February and April, breeding displays, nest construction, mating, egg-laying, cultch size and incubation period could not be observed. However, following records on nesting characteristics were successfully recorded.

- 21 nests of white-rumped vultures were recorded in Khaireni Community Forest among which 17 (81%) were active and 4 (19 %) were passive nests. The less number of passive or abandoned nests may be due to the repetitive use of an old nest. All the nests were found in *Bombax ceiba* trees except one in *Toona ciliate.* Active nest was referred to as a nest where young was being raised at the time of study.



	Numbers	percentage
Active nests	17	80.95238095
passive nests	4	19.04761905

Figure 3: Types of Nests

- Out of 17 active nests found, 16 nestlings were successfully raised to fledglings whereas one nestling was found dead in the nest (27°52'44"N 83°50'54"E) on 29th March 2016. The reason of mortality could not be found. The breeding success for White- rumped vultures in the valley thus becomes 94%.

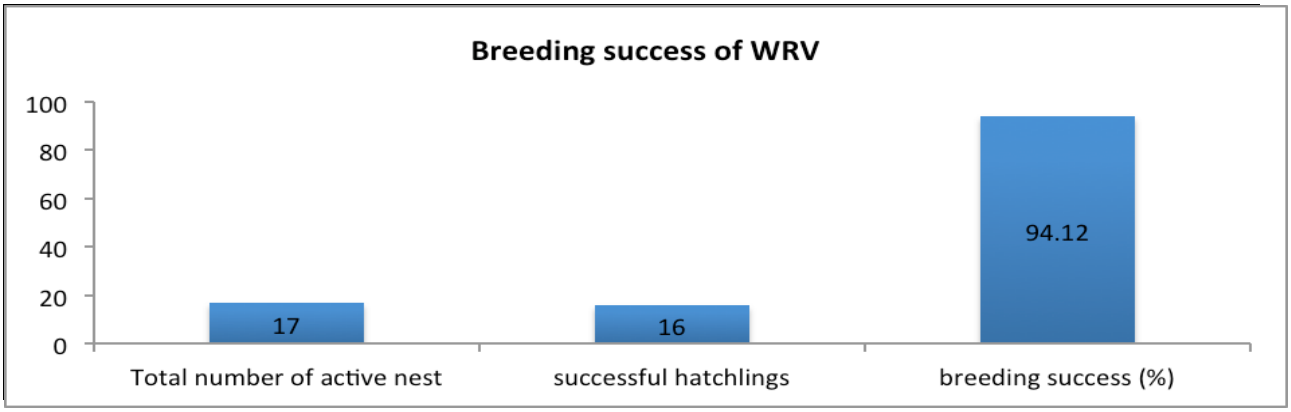


Figure 4: Breeding success of WRV

- Nests were found in different terrain, but mostly flat terrain was preferred. It had been noted that white rumped vultures prefer building nests near water-body. The landscape is forested and it was observed that WRV do not prefer plantations for nesting.

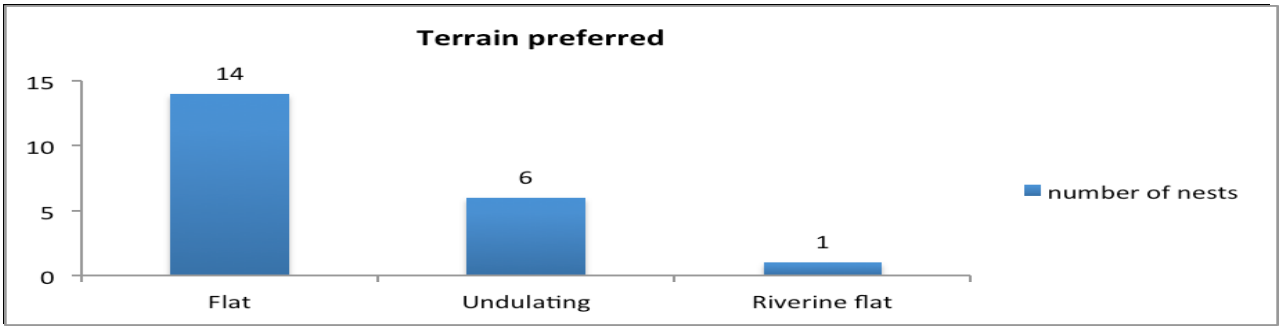


Figure 5: Terrain preferred for nesting

- Nests were carefully scanned to know the nesting materials with the help of binocular. Mostly small branches and twigs with dry leaves were being used for nesting material.

However, grasses and shrubby materials were also observed. White-rumped vultures build its nest mostly at the center of the canopy followed by east and southeast sides.

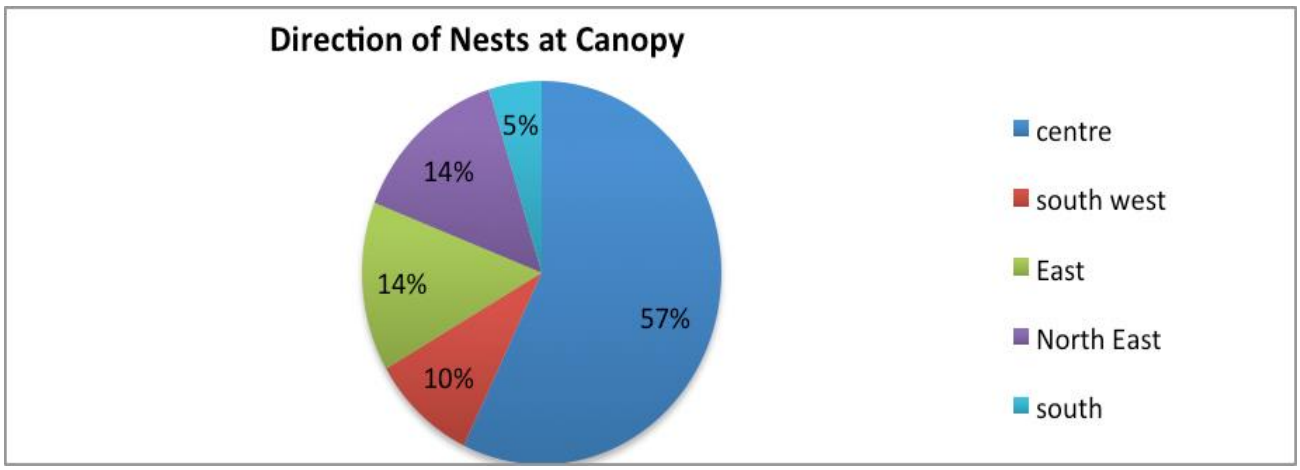


Figure 6: Direction of Nests at Canopy

- The nests were generally found near the water-body and the mean distance of nests from nearest water-body, i.e., Kali River is 186 meters, the distance ranging from 50 meters to 300 meters. It had been observed that White-rumped vultures build two or more nests a tree, however, maximum nests were found in a single tree. Upto two nests were recorded a tree but maximum (81%) nests were in a single tree.

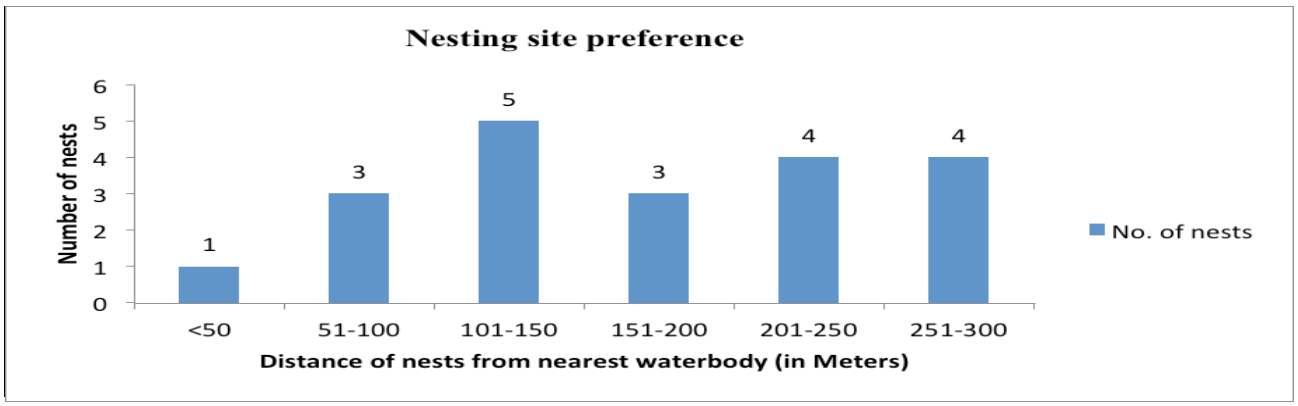


Figure 7: Nesting site preference

- The nest height of White-rumped vulture in the study area ranges from 18 meters to 26 meters with the mean height of 22 meters. Maximum nests were at the height of 21 meters.

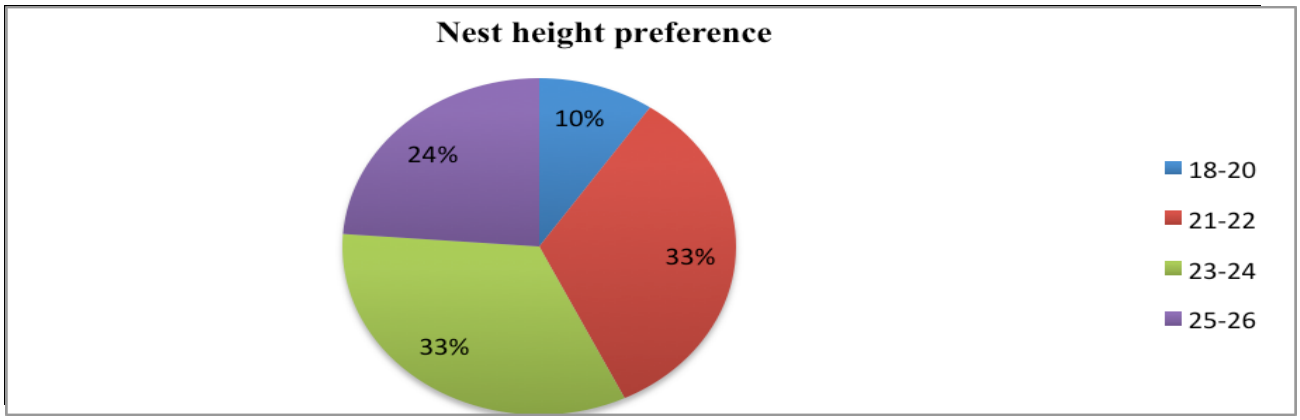


Figure 8: Nest height preference

The maximum numbers of nests were found at the top canopy of the forest, but upper middle part of the canopy was also mostly occupied.

- **Nesting and Roosting Habitat of vultures in the study area**

A total of 17 species (10 trees and 7 shrubs) were identified in this study site. The species area curve showed that maximum 12 species were present in maximum 3 plots while determining the minimum number of plots to be laid for this analysis.

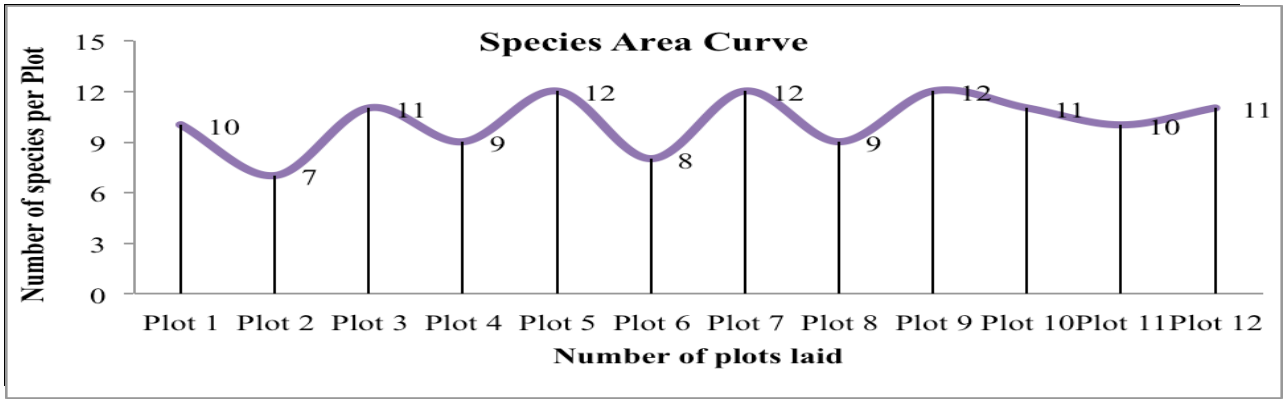


Figure 9: Species Area Curve

The data from the field after enumeration was managed to the table and IVI was calculated to find out the dominance of individual species to understand why this area is being mostly preferred for nesting and roosting. IVI was calculated summing Relative density, Relative dominance and Relative frequency as shown in the table.

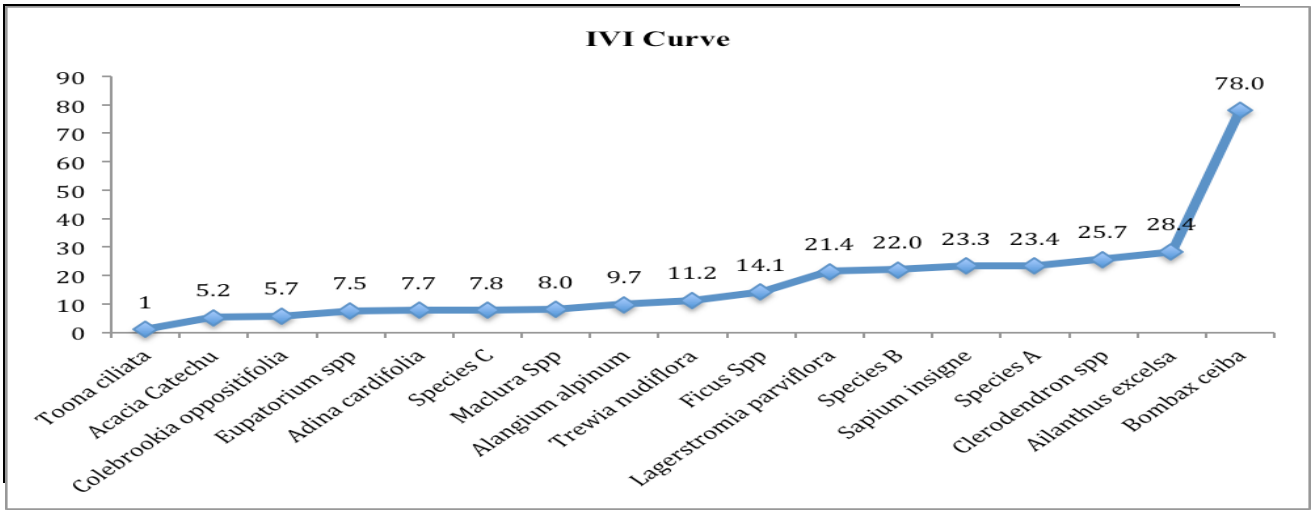


Figure 10: Important Value Index (IVI) Curve

The IVI table shows that in tree category, *Bombax ceiba* (78.01) has the highest IVI followed by *Ailanthus excelsa* (28.35) and in shrub category *Clerodendron* spp (25.65) has the highest IVI followed by species A (23.36); which infers that *Bombax ceiba* and *Clerodendron spp.* are the most dominant species of trees and shrubs respectively in the study site.

The diversity of trees and shrubs was measured with the help of Shannon-Weiner index as shown in the table. The calculated Shannon-Wiener Index from the enumerated population is 2.44. As the values are generally between 1.5 and 3.5 in most ecological studies, the higher the value, the higher the diversity. From this result it can be said that the area is fairly diverse. If there is more diversity, this indicates less competition between species. If the value is lower, this indicates that competition has narrowed down the amount of species able to make a living in that community or area.

Pictures