An assessment of the breeding population of the Himalayan Vulture *Gyps himalayensis* in the Shimla Forest Division (Rural), Himachal Pradesh, India

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Abstract

The Himalayan Vulture *Gyps himalayensis*, a Near Threatened species under the IUCN Red list, is a cliff-nester in the Himalaya and is one of the lesser impacted vultures from the Asian *Gyps* population crash. In this study, we mapped nesting sites of the Himalayan Vulture in the Shimla Forest Division (Rural) from May to September 2024 to arrive at an estimate of the breeding population in the division. We recorded 69 nests across 21 nesting sites, of which 53 nests had juveniles. The mean nests per nesting site was 3.29±0.47 SE; the largest site held eight active nests. The estimated breeding population in this division was 138 individuals. Qualitative threats recorded during the surveys included changes in the burial practice of livestock and decline in livestock rearing. Regular monitoring of nest sites can act as a good metric to detect population decline of this species.

Introduction

The Himalayan Vulture *Gyps himalayensis* is a Near Threatened (BirdLife International 2021) bird of prey that occurs in the mountainous regions of the Himalaya, spanning across northern Pakistan and India through Nepal, Bhutan, and Tibet, extending to parts of western China, the Pamir and Tian Shan ranges and possibly also into the Tarbagatai and Altai mountainous regions (Lu et al. 2009; Clark et al. 2020). It is the largest vulture among the eight vultures found in Himachal Pradesh (India), which also include: White-rumped Vulture *G. bengalensis*, Slender-billed Vulture *G. tenuirostris*, Griffon Vulture *G. fulvus*, Bearded Vulture *Gypaetus barbatus*, Red-headed Vulture *Sarcogyps calvus*, Egyptian Vulture *Neophron percnopterus*, and Cinerous Vulture *Aegypius monachus* (Sharma 2022). All these vultures have been reported in the Shimla District except for the White-rumped- and Slender-billed Vulture. Their preferred habitat features rugged, high-altitude terrain, including cliffs, rocky outcrops, and open areas above the tree line (Botha et al. 2017; Karmacharya et al. 2025). While the species is not as threatened as other Asian *Gyps* vultures, it still faces significant threats that could impact its long-term survival, with the primary threats being poisoning from the ingestion of carcasses contaminated with veterinary drugs like diclofenac (Acharya et al. 2009; Botha et al. 2017). Other documented threat includes collision with high voltage transmission lines, scavenging upon unintentionally poisoned carcasses that are dumped near forest areas or open grounds, and road kills (Botha et al. 2017).

Long-term nest monitoring provides key insight into population dynamics and their drivers, especially for species that may be undergoing a decline (Srinivasan et al. 2024; Hussain et al. 2025). The Himalayan Vulture breeds between November and May, coinciding with the dry season in the Himalaya when weather conditions are more stable (Bhusal et al. 2021). They are colonial breeders and make nests on steep north-facing with low direct sunshine areas, close to suitable water sources and human settlements (Thakur 2014; Wagley et al. 2020).

Here, we assess the status and distribution of the breeding sites of Himalayan Vulture in the Shimla Forest Division (Rural) of Himachal Pradesh.

Study Area

The Shimla Forest Division (Rural) (30.948°N–31.297°N, 77.003°E–77.035°E) lies between Karsog Forest Division in the north, Theog Forest Division in the east, Kunihar Forest Division in the west, and the forest divisions of Rajgarh and Solan in the south. It is administratively divided into five forest ranges: Taradevi, Dhami, Koti, Bhajji, and Mashobra, covering a total geographical area of 683 sq.km with a forest area of 325 sq. km. The forest is mainly classified as dry tropical, montane subtropical, and montane temperate, with Chir Pine *Pinus roxburghii*, Deodar *Cedrus deodara*, Kail *P. wallichiana*, and Bank Oak *Quercus leucotrichophora* being the common tree species. The altitude ranges from 500–2,867 m asl and the climate vary with elevation; temperate at higher altitudes and subtropical at lower altitudes. Monsoon starts from July and remains till the end of September, receiving an annual average rainfall of 90 mm. This division has moderate to steep slopes, particularly in the northern portion, dominated by Jutog, Shalli, Junsar, and Shimla group of rocks. The main ridges that fall within the division are Kufri, Sanjuali, Jakhu, and Taradevi. Most of the soil is clayey and sandy loam. Ridges and spurs have numerous outcrops of bare rocks and denuded slopes (Guleria & Thakur 2026).

Methodology

It is difficult to estimate the population of raptors like vultures that have large home ranges. However, breeding raptors offers a rare opportunity to study and monitor their population once their nests have been discovered. This is particularly true for raptors

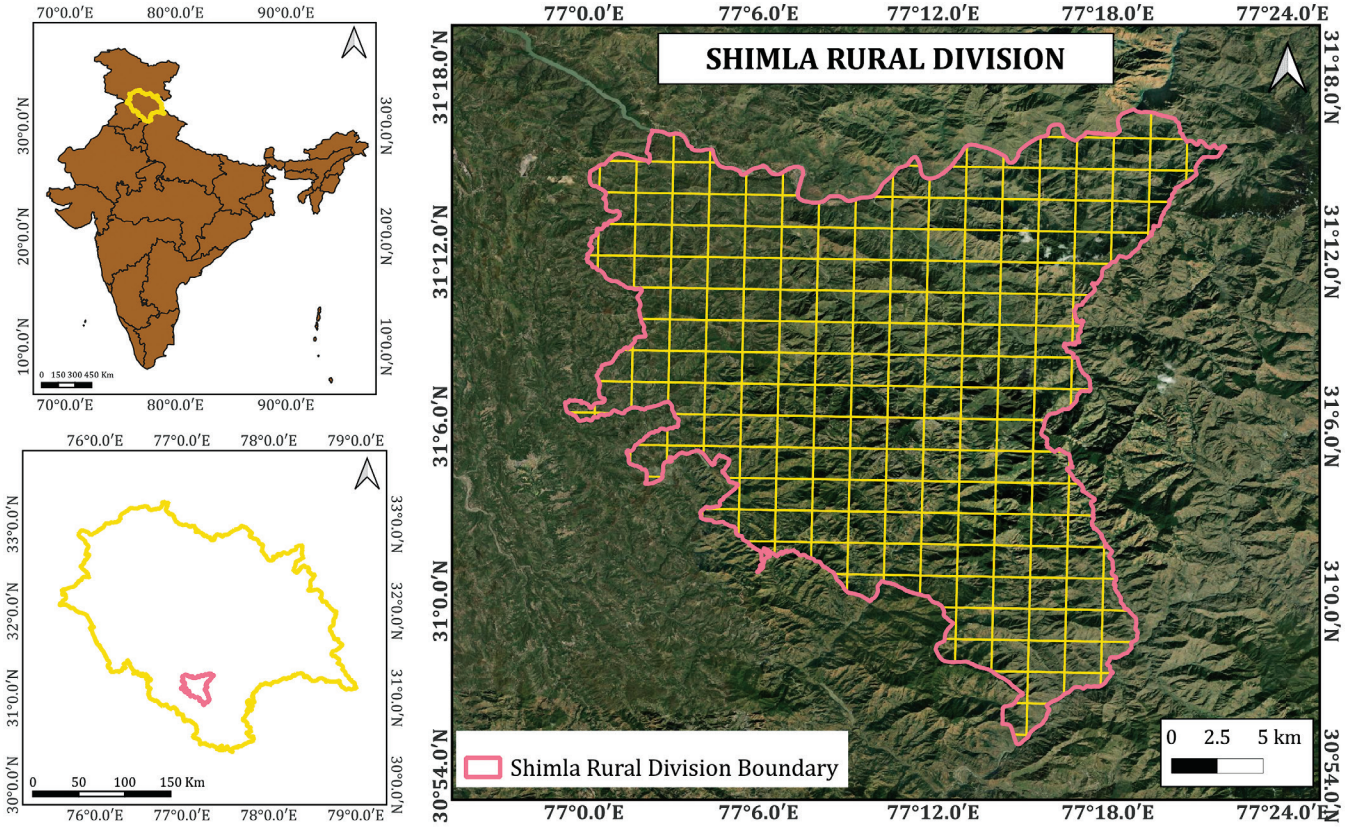

Fig. 1. Map showing the location of Shimla Forest Division (Rural)

where nests are easy to locate, and watch. In addition, if the birds demonstrate a high nest-site fidelity, year-round monitoring of breeding adults at these nests offers an easy monitoring protocol to calculate population trends. Hence, the intent of this study was to create such a baseline methodology that can be repeated after a few years to understand the population trends of Himalayan Vulture in the Shimla Forest Division (Rural); a replicable mechanism for Himalaya regions, if found successful.

Himalayan Vultures have the longest nesting period amongst all *Gyps* vultures. Eggs are usually laid in January with an incubation period lasting up to 50–55 days. The fledglings stay at the nest until it turns six to seven months old (Bhusal et al. 2021). Thus, we selected the period of May to September period to record nesting-sites and growing fledglings **[77]** and assess the population status (Bhusal et al. 2021; Ranade et al. 2023). Within this species, the adult and juvenile vultures can be easily distinguished by their plumage: adults have a pale, creamy-white body, which sharply contrasts with darker flight feathers, while juveniles are dark with light brown streaks (Alström 1997), thus clearly distinguishing a breeding pair at nest. Further, no other vulture species is known to breed within the study area, and hence the likelihood of confusing a Himalayan Vulture nest or fledgling with another vulture species nest, a real practical problem in its winter quarters, is minimal.

Our prime objective was to identify breeding pairs rather than estimate the full age-structure of the population. Thus, the survey was conducted during the period when the fledglings were clearly observable, allowing us to distinguish active and inactive nesting sites. When opportunity presented, we also attempted to assess human-related threats by discussing with locals as well as noting any physical threats we observed to the nesting sites. This was not a formal threat assessment, but were qualitative in nature, and hence subject to bias.

Field visits: The geographical area of Shimla Forest division (Rural) of 683 sq. km was divided into 183 grids, each measuring 2 km x 2 km (4 sq. km). We discussed the boundaries of our grids with forest staff and local community and geo-referenced nest coordinates from past literature into these grids. We also worked upon access paths within these grids and identified those that were completely inaccessible due to steep cliffs. We selected 75 grids that have a reasonable access and there is high

Photo: Archi Sehgal

77. A young Himalayan Vulture with an adults at its nest.

likelihood of finding nesting sites of vultures. Some of them had well-known nesting sites, either documented in the literature or known to our local contacts, while others had potential cliffs that could be occupied as nesting sites. Each of the accessible grids were visited by a three-member survey team. The survey team composition and size were constant throughout the surveys. AS led all the field surveys and was assisted by one field assistant and one forest guard, the latter two members changed based on the sites. All the grids were visited between May and September in 2024. In each grid, the team walked a trail of *c.*4–5 km for the survey specifically looking out for cliffs that may host nesting sites of vultures. Every trail was visited only once. The presence of whitewash marks on steep cliffs due to excreta deposition was treated as an indication of a nesting or a roosting site (Thakur 2014). We waited long enough at a site, to confirm signs of breeding like a brooding adult at nest, or juveniles. A nest site is classified as active if we find juveniles or a brooding adult. Sites with two or more adults perched on cliff edges with no nesting activity like juveniles or brooding adults were classified as a roosting site. Cliffs with obvious signs of excreta whitewash but no birds were deemed to be inactive sites. Each nesting site was observed using Hawke binoculars (8x42) and GPS Coordinates were recorded with the help of handheld GPS (Garmin eTrex 30). At each active nesting or roosting site, we noted down the number of nests, number of adults and juveniles. Though the intention was also to assign individuals to specific nests, we were unable to accurately do this due to crowding of birds and hence we focused on nesting sites as a whole. No nesting site was visited a second time during this study. As the distance from the nests and the observers were at least 300m and there was little opportunity to get closer, the breeding adults or young were not disturbed due to the presence of observers. Hence, the guidelines of *Indian BIRDS* nesting biology guidelines (Barve et al. 2020) were met.

Analyses: We obtain the total number of nests in the forest division as the sum total of all active nests we recorded during the survey. We also summed the number of adults and juveniles across sites to get total number vultures encountered. The total breeding population is assumed to be double the number of nests, with each nest being occupied by a pair. This assumes that some of the adults of pairs we are counting were not at the nest while the survey was carried out. We discuss the caveats and limitations of our approach.

Results

We identified a total of 24 sites, comprising three roosting site and 21 active nesting sites (Table 1). We did not record any inactive sites. The total number of nests recorded in the study area was 69. The mean number of nests per nesting site was

Table 1. List of Himalayan Vulture nesting sites with details of nest locations and nest numbers

Sl No.	Nesting site	Latitude	Longitude	Nest	Date	Total	Adult	Juvenile	Site activity
1	Kamyana 1	31.142°N	77.164°E	3	20 June 2024	8	5	3	Active
2	Malyana 2	31.086°N	77.186°E	1	11 May 2024	4	3	1	Active
3	Malyana 1	31.089°N	77.193°E	2	11 May 2024	3	2	1	Active
4	Mehli	31.080°N	77.185°E	1	20 May 2024	1	0	1	Active
5	Shogi 2	31.057°N	77.133°E	1	07 June 2024	3	2	1	Active
6	Shogi 1	31.054°N	77.135°E	3	07 June 2024	3	3	0	Roosting
7	Anandpur 1	31.050°N	77.153°E	2	18 June 2024	2	1	1	Active
8	Anandpur 2	31.046°N	77.158°E	3	18 June 2024	8	5	3	Active
9	Kamyana 2	31.148°N	77.165°E	2	20 June 2024	5	3	2	Active
10	Seri Dhank	31.023°N	77.284°E	4	14 July 2024	10	6	4	Active
11	Khatnol 1	31.181°N	77.280°E	4	21 July 2024	11	7	4	Active
12	Khatnol 2	31.184°N	77.265°E	3	21 July 2024	8	5	3	Active
13	Thailla	31.150°N	77.283°E	3	22 July 2024	9	6	3	Active
14	Lambi Dhar	31.221°N	77.217°E	3	03 Aug 2024	7	4	3	Active
15	Bagh Sandoha	31.235°N	77.319°E	2	04 Aug 2024	6	4	2	Active
16	Lodhi ki Dhak	31.237°N	77.274°E	3	04 Aug 2024	4	1	3	Active
17	Palia Dhank	31.243°N	77.308°E	1	07 Aug 2024	1	0	1	Active
18	Jajjedh	31.189°N	77.220°E	1	07 Aug 2024	1	0	1	Active
19	Kanadaghat (Koti)	31.153°N	77.286°E	8	12 Aug 2024	15	9	6	Active
20	Kandii	31.174°N	77.303°E	8	17 Aug 2024	12	5	7	Active
21	Tikkar (Ghannati)	31.167°N	77.101°E	0	08 Sept 2024	2	2	0	Roosting
22	Ghannti	31.146°N	77.077°E	0	14 Sept 2024	9	9	0	Roosting
23	Kallihatti	31.182°N	77.029°E	6	16 Sept 2024	2	0	2	Active
24	Cheolva	31.167°N	77.115°E	5	16 Sept 2024	1	0	1	Active
	Total			69		131	82	53	

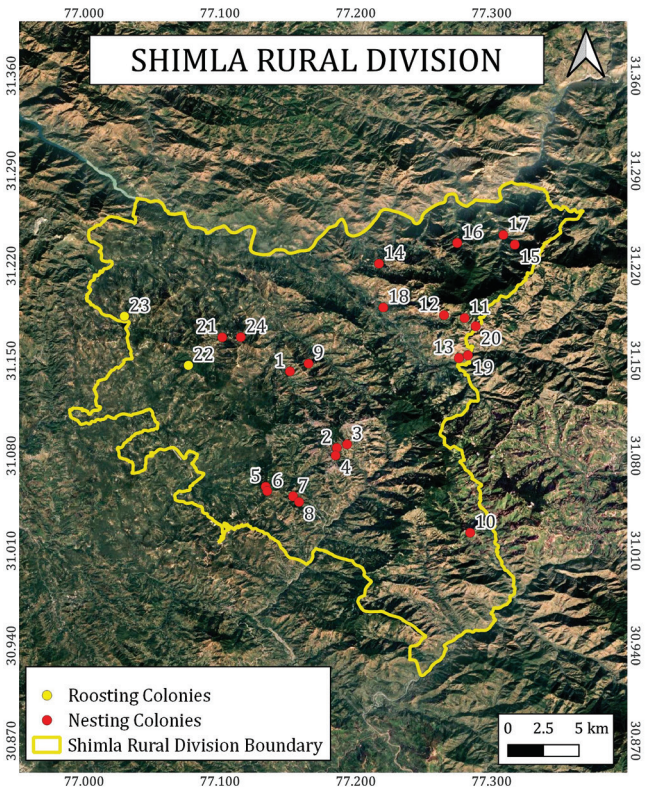

Fig. 2. Location of Vulture nesting sites within the Shimla Forest Division (Rural).

3.29±0.47 (SE), with a range of 1 to 8 nests per site (Table 1). Out of 69 nests, 53 nests had juveniles. The average number of juveniles per nest was 0.77. The mean number of juveniles per nesting site was 2.52±0.36 (SE), ranging from one to seven juveniles (Table 2). The total number of adult vultures recorded across all nesting sites was 82. The mean number of adults per nesting site was 3.90±0.60 (S.E.) (Table 2). Hence, we estimate the breeding population of Himalayan Vultures in the Shimla Forest Division (Rural) to be 138 as twice the nest count though we only detected 121 adults at the active nest sites.

Discussion

This represents the first systematic baseline survey covering nesting sites of most parts of the forest division, and consequently our estimate of 138 breeding individuals is higher than previous efforts that partially covered this landscape. For example, road surveys by Thakur (2014) reported five nesting sites (Khatnol, Shogi 1/Taradevi, Thailla, Kalihatti, and Nagjubber). Of these, the first four sites were included in our study, while Nagjubber fell outside our study boundary. In comparison, we documented 21 nesting sites and 69 nests, including 53 nests with fledglings. Thakur (2014) found large nesting sites in Shimla (Khatnol and Tradevi) with eight nests each at both sites. We report three larger nesting sites, each comprising of six to eight nests. Similar large nesting sites have been reported from Nepal by Wagley et al. (2020), where they reported a total of 78 Himalayan Vulture across 13 nesting sites, having 2–15 nests per site. The higher number of nesting sites in the present study likely reflects increased survey coverage and systematic search effort.

Our breeding population estimates of Himalayan Vulture for the Shimla Forest Division (Rural) are conservative. The caveats and limitations of this estimate are listed below.

(a) We did not survey 59% of the grid cells, often due to inaccessibility of terrain, where some additional nesting sites could occur. Our estimates therefore likely represent a minimum count.

(b) Population size was inferred by doubling the number of active nests, which assumes that the Himalayan Vulture is largely monogamous. While this assumption is reasonable, it was not explicitly tested in the present study. We did not establish the association between individual birds and specific nests, and it is possible that one member of a pair was absent during counts. If the assumption of strict monogamy is violated in some cases, population size may have been slightly overestimated.

(c) Although the breeding season of Himalayan Vultures is well documented, some early or late breeders may have been missed due to the survey window, and additional nests could have gone undetected.

(d) Counts of adult individuals at nest sites were lower than expected based on nest numbers. It may also have included non-breeding individuals (floaters). Therefore, direct counts of adults do not provide a reliable estimate of breeding population size.

(e) The number of juveniles recorded has limited interpretive value, as some nests may not yet have hatched during surveys, and the study duration was insufficient to estimate hatching or fledging success. The number of juveniles recruited into the regional population (recruitment rate) therefore remain unknown.

(f) The number of juveniles should also be interpreted cautiously. While most juveniles likely represent recruits from the current breeding season—given that fledglings remain at nests for six to seven months—it is possible that a small proportion may belong to the previous breeding cycle. Such individuals are difficult to distinguish in the field and have been documented elsewhere (Ming et al. 2013).

During informal interactions with local residents, an anecdotal decline in the number of nests per colony over the past few decades was frequently reported. While such observations are not systematically verified, they may reflect broader ecological changes in the region. One possible factor is the decline in livestock populations in Himachal Pradesh, as indicated by livestock census data. Total livestock numbers decreased by 7.17% between 2007 and 2012, and further by 8.94% by 2019 (Dinesh et al. 2023). The same study also documented a decline in traditional livestock herding practices over this period, a trend similarly reported from Nepal (Wagley et al. 2020).

The Himalayan Vulture is an obligate scavenger that rely heavily on livestock carcasses and are known to preferentially forage around livestock grazing areas (Hussain et al. 2025). A reduction in livestock numbers and changes in herding practices may therefore reduce carrion availability, potentially affecting food resources for vultures over the long term.

During the study, we also gathered information from local residents on livestock carcass disposal practices. Most respondents indicated that deep burial of livestock carcasses is now commonly followed, primarily to reduce odour and to prevent attracting carnivores and stray dogs. While this practice has clear sanitary benefits, it likely reduces the availability of carrion accessible to scavengers. Reduced carcass availability may force vultures to travel greater distances to locate food, increasing

energy expenditure and potentially lowering reproductive success (Houston 1978; García-Jiménez et al. 2018; García-Macía et al. 2023). Separately, exposure to veterinary drugs such a diclofenac through contaminated carcass has been linked to renal failure and visceral gout (Styles & Phalen 1998). Vultures travelling greater distances in search of food may also face an increased likelihood of encountering carcasses contaminated with veterinary drugs.

Similar patterns have been reported elsewhere. In Europe, Griffon Vulture populations have experienced food shortages linked to stricter sanitary regulations and carcass disposal practices (Oliva-Vidal et al. 2022). In Pakistan, changing socioeconomic conditions have also been associated with reduced carcass availability for vultures, potentially leading to starvation (Abbas et al. 2013).

These observations suggest that evolving livestock management practices may have important implications for the long-term food security of the Himalayan Vulture in the region. Understanding the balance between sanitary practices and scavenger conservation will be critical for vulture management in human-dominated landscapes.

The present survey, limited to a single forest division, represents only a small portion of the breeding range of the Himalayan Vulture. Expanding monitoring efforts across a broader landscape, and integrating studies on nest-site selection, livestock dependence, and other ecological drivers, will be essential for improving our understanding of population dynamics. Effective mapping of nesting sites in rugged and forested terrain will require close collaboration with local communities and state forest departments.

Long-term monitoring of nesting sites should be prioritised, as nest-based approaches provide a robust framework for estimating population size, detecting trends, and informing conservation planning for this species.

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