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continued on the back inside cover

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COMMUNICATION

Nesting dynamics of Red-wattled Lapwing *Vanellus indicus* Boddaert, 1783 in urban and rural regions of Indore, India

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Abstract: With their ground-nesting habits, the Red-wattled Lapwing *Vanellus indicus* are particularly vulnerable to urbanization, which affects their nesting behaviour, reproductive success, and habitat use. The present study was designed to explore the adaptation strategies of the species in rural (Jamli), peri-urban (Rau) and urban (Holkar Science College) habitats of Indore, Madhya Pradesh, India. Forty-five nests were monitored for nesting success (March–July 2024), along with predation risks and microclimatic conditions during the breeding season. Nest site, clutch size, incubation, and fledgling success were observed. Nesting success was highest (93%) in peri-urban and rural areas (90%), but lowest (70%) in urban areas; a similar pattern was observed for reproductive success, which was highest in peri-urban and rural habitats and lowest in urban regions. Primarily found on rooftops, urban nests avoided many risks associated with terrestrial predators but introduced new risks, including high levels of human disturbance, altered predator communities, and extreme microclimates that negatively affected reproductive success. Nesting in rural areas provided optimal conditions, with less human interference, improved natural camouflage, and constant dynamics of the environment. Peri-urban areas showed great success, reflecting a balance between natural and anthropogenic influences. We, therefore, conclude that urban areas do show the adaptability of the species. To mitigate the impacts of urbanization, conservation efforts should prioritize protecting rural and peri-urban habitats, reducing human disturbance, and supporting artificial nesting platforms in urban areas.

Keywords: Anthropogenic disturbance, breeding ecology, breeding phenology, ground-nesting birds, habitat adaptation, nesting ecology, nest-site selection, nesting success, reproductive success.

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Author contributions: KP: fieldwork, study design, observations, manuscript drafting. VKS: conceptualization, supervision, review, and proofreading.

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INTRODUCTION

Life-history trait estimates are integral to predicting population growth rates, assessing species' sensitivity to environmental changes, supporting conservation planning, and informing management decisions (Stahl & Oli 2006; Sládeček et al. 2021). In birds, life-history traits are key to understanding maximum population growth potential, and this knowledge is essential for evaluating species' responses to changing environments and for developing effective, targeted conservation strategies (Stahl & Oli 2006; Sládeček et al. 2021). The Red-wattled Lapwing *Vanellus indicus* (Image 1) is a wader in the family Charadriidae, widely distributed across the Indian subcontinent, and currently assessed as ‚Least Concern' by IUCN. The Red-wattled Lapwing serves as an important ecological component of the habitat due to its role as both a predator and prey: it feeds on insects such as beetles, ants, termites, caterpillars, and small invertebrates, helping regulate insect populations, while its eggs, chicks, and occasionally adults are preyed upon by predators such as kites, crows, mongooses, dogs, snakes, and monitor lizards (Ali & Ripley 1998) and is characterized by its bold black-and-white plumage and familiar loud calls. When urbanization start to encroach natural habitats, Red-wattled Lapwings nest on rooftops and under-construction building, which indicates habitat shift as traditional rural nesting sites are being lost due to landscape disturbances such as agricultural intensification, land-levelling, road and building construction, sand and soil extraction, removal of vegetation, heavy machinery movement, and increasing human activity (Kumar et al. 2022).

Red-wattled Lapwings predominantly nest in open, semi-arid habitats such as agricultural fields, riverbanks, fallow lands, and grasslands, as widely reported from different regions of India (Ali & Ripley 1998; Choudhary & Chishty 2022). Within these habitats, eggs are typically laid in shallow ground depressions or simple scrapes that closely resemble the surrounding substrate, providing camouflage against predators (Ali & Ripley 1998). Similar nesting preferences and ground-scrape nest structures have also been documented in recent regional studies across agro-ecosystems and semi-natural landscapes, reinforcing the species' dependence on open habitats for successful breeding (Arya et al. 2023; Gupta & Saxena 2023; Kadam & Jadhav 2023).

Urbanisation has a pronounced influence on nesting behaviour, egg viability, and habitat selection in birds, particularly among ground-nesting species. For the Red-wattled Lapwing, rural nests are generally rudimentary scrapes on bare ground or gravelly substrates that blend with stones and soil. While this strategy enhances camouflage, it also exposes eggs and chicks to substantial risks from common predators such as mongooses, kites, crows, dogs, snakes, and monitor lizards, in addition to nest destruction caused by agricultural activities and livestock grazing (Hart et al. 2002; Whittingham & Evans 2004).

Urbanisation also alters ecological communities associated with Red-wattled Lapwing breeding habitats. While natural landscapes support relatively stable prey assemblages dominated by insects such as beetles, ants, termites, caterpillars, and other ground-dwelling invertebrates, urban habitats often experience changes in prey availability and composition due to surface sealing, pesticide use, artificial lighting, and modified vegetation structure (Newton 1998; Chen et al. 2023). Similarly, predator communities shift from predominantly terrestrial predators in rural areas to a greater influence of aerial predators such as crows and kites in urban settings, creating a distinct predation regime that can negatively affect egg viability and chick survival. Comparable patterns have been reported in other ground-nesting shorebirds in India, including the Little Ringed Plover *Thinornis dubius*, Hanuman Plover *Anarhynchus seebohmi*, and Crab Plover *Dromas ardeola*, where breeding success is increasingly constrained by habitat modification, human disturbance, and altered predator pressure in coastal and human-dominated landscapes (Byju et al. 2023a,b,c). These parallels highlight the broader vulnerability of ground-nesting birds to anthropogenic pressures and provide a comparative framework for interpreting the nesting adaptations and reproductive outcomes of the Red-wattled Lapwing across urban–rural gradients.

Image 1. Red-wattled Lapwing with its chick showing camouflage.

Although the Red-wattled Lapwing is currently listed as ‚Least Concern' by the IUCN (IUCN 2025), its breeding habitats are increasingly subjected to pressures such as habitat degradation, urban expansion, agricultural intensification, and broader environmental change. Rather than indicating population declines, these pressures manifest as localised threats to nesting sites, breeding success, and habitat quality, underscoring the need to understand reproductive performance and habitat-specific responses of the species.

In the present study, we assessed new information on key aspects of Red-wattled Lapwing nesting ecology, including nest-site selection, clutch size, incubation characteristics, causes of nesting failure, and overall breeding success. Specifically, we examine differences in nesting and reproductive success across rural, peri-urban, and urban landscapes to assess how anthropogenic environments influence reproductive outcomes. By evaluating nesting success in relation to predation pressure and microclimatic conditions at nest sites, this study aims to identify habitat-specific factors that govern nest survival and breeding performance. Given the limited research on urban adaptations of ground-nesting birds in central India, this work addresses an important knowledge gap by examining how rapid land-use change in and around Indore, Madhya Pradesh, shapes the reproductive strategies of the Red-wattled Lapwing. The findings provide insights into life-history traits and habitat-specific constraints that can inform targeted conservation and habitat-management strategies in rapidly urbanising landscapes.

MATERIALS AND METHODS

Study Area

The study focused on three sites around Indore (Images 2–4), Madhya Pradesh, India, representing urban, peri-urban, and rural landscape types. The urban site was Holkar Science College (22.695° N, 75.871° E; 587 m elevation), characterised by dense built-up structures, high human activity, and frequent landscape modification typical of an urban environment. The peri-urban site, Rau (22.639° N, 75.803° E; ~587 m elevation), represents a low-density urban fringe dominated by agricultural fields interspersed with residential development, roads, and construction activity, reflecting a transitional landscape influenced by both natural and anthropogenic factors. The rural site was Jamli Village (22.524° N, 75.694° E; 577 m elevation), consisting primarily of agricultural farmland with limited infrastructure and minimal human disturbance, representing a predominantly natural rural setting. Together, these three sites form a gradient of increasing human influence, allowing assessment of how urbanisation affects the nesting ecology of the Red-wattled Lapwing.

Field Observations and Data Collection

During the breeding season (March–July 2024), field observations were conducted on alternate days. Study areas were systematically scanned using binoculars to locate nests, which were identified based on nesting cues such as adult incubation behaviour, alarm calls, or repeated site use. This visual scanning approach is

Image 2. Government Holkar Science College, Indore.

Image 3. Jamli Village Map.

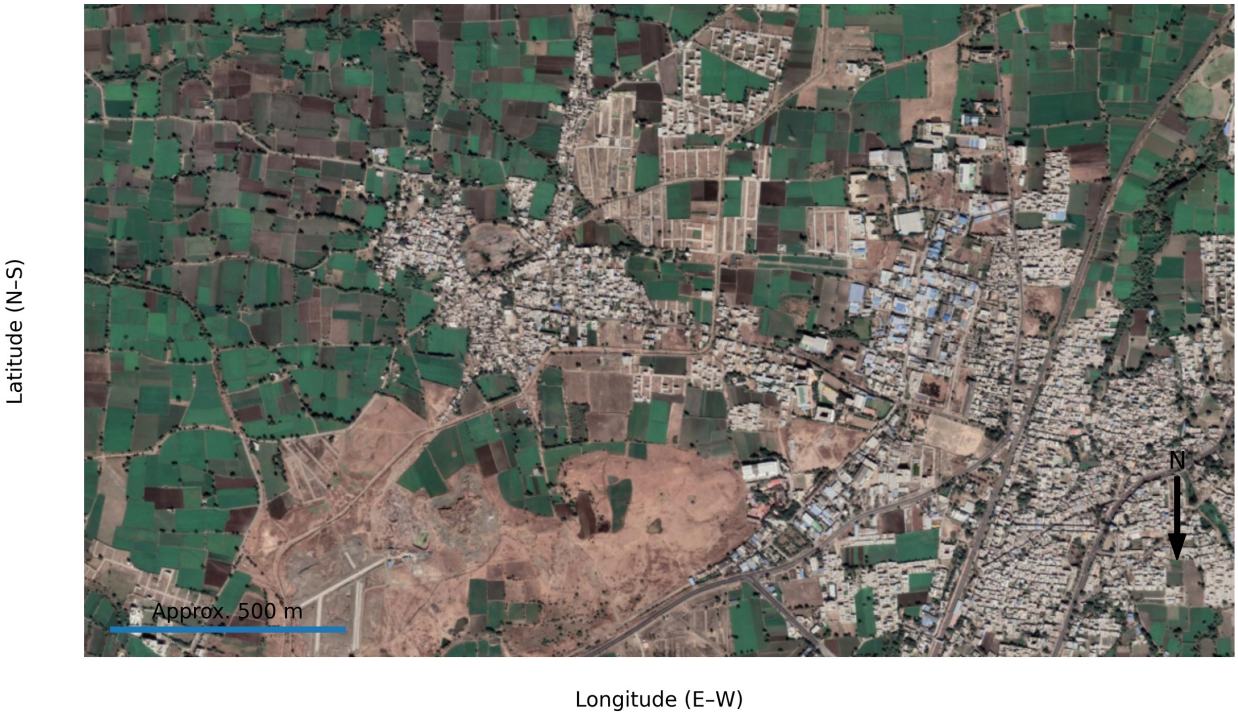

Image 4. Rau Region Map.

commonly employed for ground-nesting or exposed-nesting birds (Escalona-Segura et al. 2022). A total of 45 nests were monitored during the study period, including 20 nests at Jamli, 15 at Rau, and 10 at Holkar Science College. Various breeding parameters, including nest size, egg size, and nest depth, were recorded (Figure 1), following methodologies comparable to those used by Vanadzina et al. (2022). Nest and egg dimensions were measured using a 15-cm ruler carefully placed near the nest, ensuring minimal disturbance and prioritising the safety of eggs and chicks. These measurements allowed comparison of egg length and width across

Image 5. Eggs placement of Red-wattled Lapwing.

nests and habitats. Nests and eggs were photographed using a Nikon Coolpix P1000 camera to document nest structure, egg placement, and site characteristics for visual records (Image 5).

Data Analysis

Apparent nesting success was calculated for each habitat by dividing the number of successful nests by the total number of nests observed at each site. Reproductive success was assessed as the proportion of fledged chicks relative to the total number of eggs laid, following established methods described by Vijayan (1980) and Jehle et al. (2004). To obtain a more robust estimate of nest survival, Mayfield's (1975) method was applied to calculate daily survival rates (DSR) and overall nest survival across the incubation and nestling periods. Variance and standard errors of survival estimates were calculated following the approaches outlined by Johnson (1979) and Hensler (1985) to assess the precision of survival probabilities. Correlation analysis (Pearson's correlation coefficient) was used to examine the relationship between nest size, egg size, and fledgling success (see Data Analysis section). Reproductive performance metrics, including nesting success, reproductive success, and survival estimates, were summarised using descriptive statistics (mean, median, and range) and presented in tables and graphical form to facilitate comparison among rural, peri-urban, and urban habitats.

RESULT AND DISCUSSION

Breeding Phenology

The breeding season of the Red-wattled Lapwing began in March and continued until July across all habitats, consistent with reports from other regions of India (Ali & Ripley 1998; Kabir & Iqbal 2018; Arya et al. 2023). Egg-laying peaked in April at all sites, but the timing varied across habitats. In the rural site (Jamli), peak laying occurred in early April, whereas in the peri-urban (Rau) and urban (Holkar Science College) sites, it occurred in mid-April.

Previous studies indicate that egg laying in this species usually starts from late March to early April, with peak activity in April or early May, depending on regional conditions (Ali & Ripley 1998; Kabir & Iqbal 2018; Choudhary & Chishty 2022). The earlier peak observed in Jamli, therefore, corresponds to the expected breeding period under relatively undisturbed conditions. In contrast, the delayed peak in peri-urban and urban habitats likely reflects the influence of anthropogenic disturbance and altered microclimates. Similar habitat-related shifts in breeding timing have been reported in semi-urban and agricultural landscapes (Gupta & Saxena 2023; Kadam & Jadhav 2023). Earlier breeding in rural habitats may provide advantages by reducing exposure of eggs and chicks to extreme summer temperatures and disturbance later in the season (Chen et al. 2023).

Nesting Strategies

Red-wattled Lapwings showed different nesting strategies in the three habitats. Nests in rural Jamli were usually scraped into the ground in open fields or along riverbanks, where the eggs and chicks were camouflaged by soil, stones, and surrounding vegetation. This habitat had low human disturbance and relatively stable environmental conditions, which provided favourable conditions for nesting and chick survival. In suburban Rau, nests were recorded mainly in agricultural fields located near residential areas, roads, and construction sites (Table 1). This indicates an intermediate nesting strategy between rural and urban habitats. The presence of farmland provided suitable nesting sites, but increased human activity and higher predation pressure created additional risks compared to rural areas.

Urban nesting by Red-wattled Lapwings at Holkar Science College showed a clear behavioural adaptation, with several nests observed on rooftops and other elevated structures. This shift was likely due to increased pressure from terrestrial predators such as stray dogs and mongooses. Rooftop nesting introduced

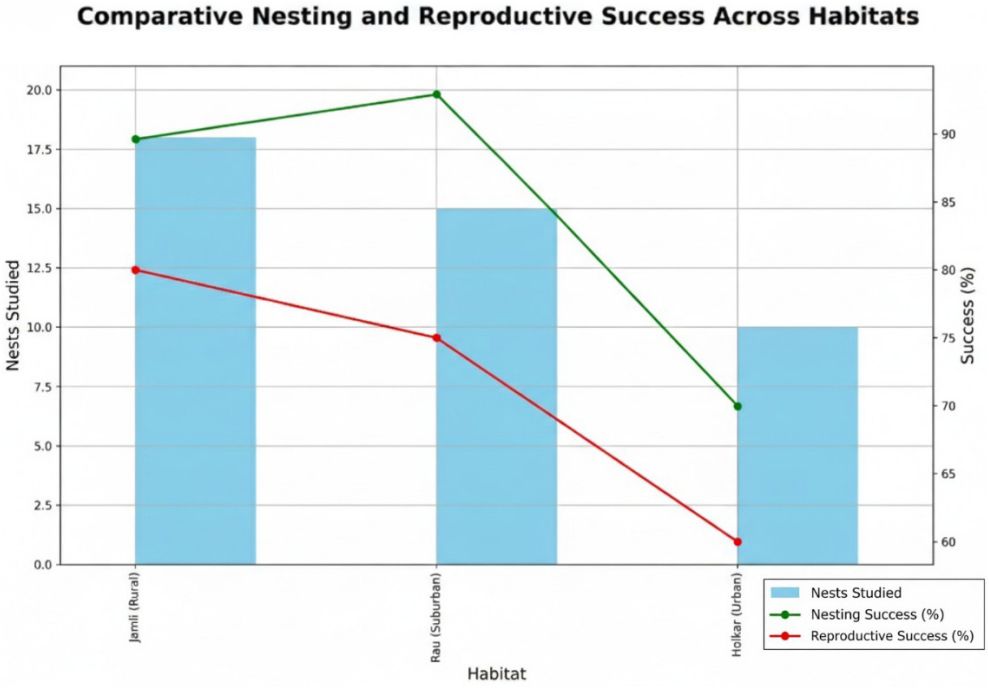

Figure 1. Nesting and reproductive success by habitat.

Table 1. Habitat-specific challenges and adaptations of Red-Wattled Lapwing.

Habitat	Challenges	Adaptations Observed
Jamli (Rural)	Minimal challenges, stable environment.	Traditional ground scrapes for natural camouflage.
Rau (Suburban)	Moderate human disturbance, increased predation pressure.	Nesting near transitional zones to balance rural and urban impacts.
Holkar (Urban)	Human interference, aerial predation, extreme microclimates, and the risk of eggs falling.	Rooftop nesting, use of pebbles to stabilize eggs.

Table 2. Comparative nesting and reproductive success across habitats.

Habitat	Nests studied	Nesting success (%)	Eggs laid	Chicks fledged	Reproductive success (%)
Jamli (Rural)	20	90	80	64	80
Rau (Suburban)	15	93.33	60	45	75
Holkar (Urban)	10	70	40	24	60

new threats, including frequent human disturbance, high surface temperatures, reduced shade, and strong exposure to sunlight, which together create extreme microclimatic conditions. In addition, urban nests were more vulnerable to aerial predators such as crows and kites. Behaviour such as placing pebbles around eggs to prevent them from rolling off the roof indicated the species' ability to adjust to urban conditions. Despite these adaptations, urban habitats remained less suitable for successful nesting due to continued disturbance, predation, and harsh microclimatic conditions (Gering & Blair 1999; Sethi et al. 2014).

Reproductive Performance and Nest Success

Habitat type clearly influenced nesting and reproductive success (Table 2, Figure 2). In rural Jamli, nesting success was 90%, with 18 successful nests out of 20, and reproductive success was 80%, indicating favourable conditions for chick survival. Clutch size was generally four eggs per nest, and no damaged eggs or dead chicks were observed during monitoring. In suburban Rau, nesting success was slightly higher

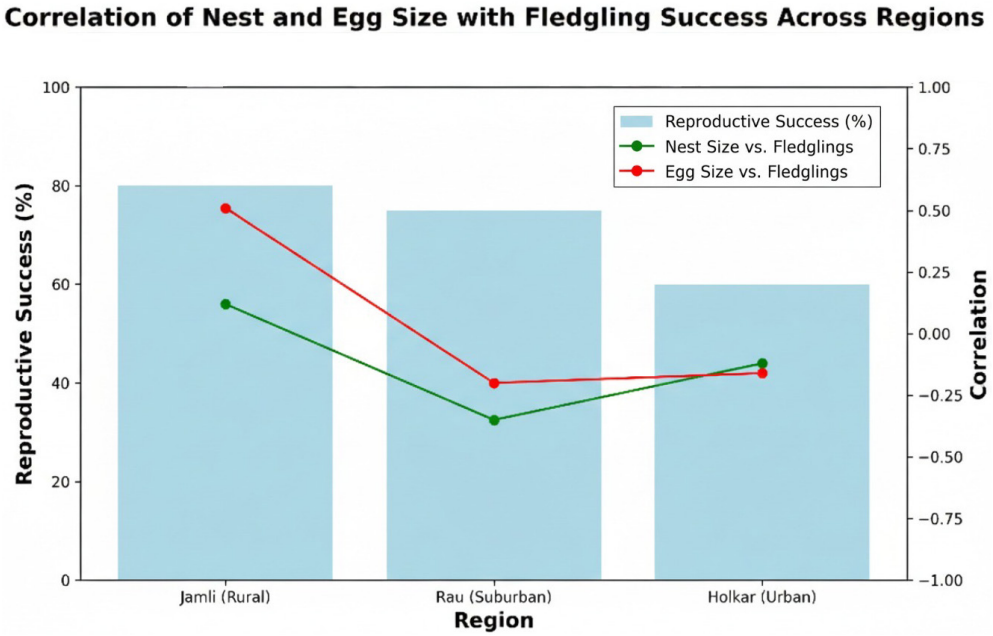

Figure 2. Correlations of nest and egg size with fledglings.

Table 3. Mean nest and egg parameters across habitats.

Habitat	Mean nest size (cm)	Mean egg size (cm)	Mean clutch size	Mean nest depth (cm)
Jamli (Rural)	11.18 ± 0.96	4.50	4.0 ± 0.00	1.14 ± 0.39
Rau (Suburban)	11.23 ± 1.45	4.30	4.0 ± 0.00	1.32 ± 0.27
Holkar Science College (Urban)	10.85 ± 0.88	4.00	4.0 ± 0.00	1.31 ± 0.32

Table 4. Correlation of nest and egg size with fledgling success across regions.

Region	Correlation (Nest Size vs. fledglings)	Correlation (Egg size vs. fledglings)	Reproductive success (%)
Jamli (Rural)	Weak positive (0.12)	Moderate positive (0.51)	80
Rau (Suburban)	Weak negative (-0.35)	Weak negative (-0.20)	75
Holkar (Urban)	Weak negative (-0.12)	Weak negative (-0.16)	60

(93.33%), with 14 successful nests out of 15, but reproductive success was lower (75%), suggesting higher chick loss before fledging. Clutch size in most nests was also four eggs, and no direct egg damage or chick mortality was recorded in the field, although human disturbance and predator presence were more frequent than in rural areas. Urban Holkar Science College showed the lowest nesting success (70%), with seven successful nests out of 10, and reproductive success was 60%. Most nests contained four eggs, with one nest having three eggs. Although no dead chicks or damaged eggs were directly observed, urban nests experienced greater human disturbance, higher exposure to aerial predators (mainly crows and kites), and extreme microclimatic conditions such as high surface temperatures and direct sunlight. These results indicate that urban habitats are less suitable for successful reproduction than rural and peri-urban areas.

How Nest Size, Egg Size, and Fledgling Success Correlate

Nesting factors showed variable relationships with fledgling success depending on habitats (Table 3–4, Supplementary Tables S1–S3, Figure 2). In the rural site (Jamli), a moderate positive correlation was observed between egg size and fledgling success (r = 0.51), suggesting that larger eggs were associated with higher

chick survival under stable environmental conditions. A weak positive correlation was also found between nest size and fledgling success (r = 0.12), indicating that slightly larger nests may provide minor benefits in terms of protection and microclimate stability. Similar associations between egg size and chick survival have been reported in Red-wattled Lapwing and other ground-nesting birds, where larger eggs produce heavier and more viable chicks (Kabir & Iqbal 2018; Yadav & Sharma 2022).

In the suburban site (Rau), weak negative correlations were found between nest size and fledgling success (r = −0.35) and between egg size and fledgling success (r = −0.20). These results suggest that the potential advantages of larger nests or eggs may be offset by higher levels of human disturbance and predation pressure in peri-urban environments. In the urban site (Holkar Science College), weak negative correlations were observed between nest size and fledgling success (r = −0.12) and between egg size and fledgling success (r = −0.16). This indicates that environmental stressors in urban habitats, such as high surface temperatures, frequent human activity, and increased aerial predation, may reduce the benefits normally associated with larger nests and eggs. Similar reductions in reproductive advantages under urban conditions have been reported for other ground-nesting species, where microclimatic stress and disturbance limit chick survival regardless of egg or nest size (Gering & Blair 1999; Chen et al. 2023).

Conservation Implications

The Red-wattled Lapwing represents a clear example of how a ground-nesting bird has adapted to high levels of stress caused by urbanisation. However, urban habitats also pose considerable risks, including lower reproductive success and increased exposure to human disturbance and other environmental pressures. As nesting success was higher in rural and peri-urban habitats than in densely urbanised areas, these landscapes should be given priority in conservation planning to ensure long-term population persistence. Protection of natural nesting sites in farmlands and grasslands is essential, along with the restoration of degraded habitats within cities. In urban areas, management actions such as providing rooftop nesting platforms that mimic natural ground conditions may help reduce risks associated with human disturbance and extreme microclimatic conditions. Long-term monitoring of food availability, predator dynamics, and levels of human activity is necessary to better understand how the species responds to ongoing environmental change and urban expansion (Sethi et al. 2014; Chen et al. 2023; Anand et al. 2025). Incorporating these factors into conservation strategies may improve breeding success and overall survival of the Red-wattled Lapwing across different habitat types.

CONCLUSION

The results show that outcomes of nest site selection in the Red-wattled Lapwing differ according to habitat type, reflecting how the species adjusts its breeding strategy across rural, peri-urban, and urban environments. The present findings underline the importance of conserving rural and semi-urban habitats through the protection of farmlands and grasslands and by restoring degraded sites. In urban areas, the development of wildlife-friendly structures such as artificial nesting platforms and green roofs may help support breeding populations. Beyond its relevance to this species, the study contributes to a broader understanding of how ground-nesting birds respond to human-dominated landscapes and limited adaptations. Given the continued loss of natural habitats, conservation measures that focus on maintaining suitable breeding environments are essential for sustaining biodiversity in increasingly urban regions.

REFERENCES

Ali, S. & S.D. Ripley (1998). *Handbook of the birds of India and Pakistan* Vol. 2, Oxford University Press, UK, 277 pp.

Anand, J., H. Byju, S. Sheela & H. Maitreyi (2025). A comprehensive review of the three uncommon breeding shorebirds in peninsular India. *Journal of Experimental Zoology India* 28(1): 1–13. https://doi.org/10.51470/jez.2025.28.1.13

Arya, A.K., K.K. Joshi, D. Kumar & A. Bachheti (2023). A study on the breeding habits of Red-wattled Lapwing (*Vanellus indicus* Boddaert, 1783) (Aves: Charadriiformes: Charadriidae) in the agricultural landscape of Muzaffarnagar District, Uttar Pradesh, India. *Journal of Threatened Taxa* 15(4): 23119–23122. https://doi.org/10.11609/jott.8066.15.4.23119-23122

Byju, H., Y. Natarajan, N. Raveendran & R. Kishore (2023a). Breeding record of Little Ringed Plover *Charadrius dubius jerdoni* Legge, 1880 (Charadriidae: Charadriiformes) from Tamil Nadu, India. *Journal of Threatened Taxa* 15(4): 23136–23138. https://doi.org/10.11609/jott.8333.15.4.23136-23138

Byju, H., N. Raveendran & K.M. Aarif (2023b). From the Arabian Peninsula to Indian shores: Crab Plover *Dromas ardeola* Paykull, 1805 (Aves: Charadriiformes: Dromadidae) breeding at Point Calimere, India. *Journal of Threatened Taxa* 15(10): 23990–23995. https://doi.org/10.11609/jott.8680.15.10.23990-23995

Byju, H., N. Raveendran, S. Ravichandran & R. Kishore (2023c). Additional breeding records of Hanuman Plover *Charadrius seebohmi* E. Hartert & A. C. Jackson, 1915 (Aves: Charadriiformes: Charadriidae) from southeastern coast of India. *Journal of Threatened Taxa* 15(4): 23114–23118. https://doi.org/10.11609/

jott.8317.15.4.23114-23118

Chen, S., Y. Liu, S.C. Patrick, E. Goodale, R.J. Safran & E. Pagani-Núñez (2023). A multidimensional framework to quantify the effects of urbanization on avian breeding fitness. *Ecology and Evolution* 13(7): e10259. https://doi.org/10.1002/ece3.10259

Choudhary, N.L. & N. Chishty (2022). Breeding behavior and threats of survival of Red-wattled Lapwing (*Vanellus indicus*) in Udaipur district, Rajasthan, India, pp. 27–45. In: *Current Research on Zoology and Entomology Sciences Vol. 2*. Scripown Publications, Delhi.

Escalona-Segura, G., M.M. Borges-Ramírez, V. Estrella-Canul & J.R. Osten (2022). A methodology for the sampling and identification of microplastics in bird nests. *Green Analytical Chemistry* 3: 100045. https://doi.org/10.1016/j.greeac.2022.100045

Gering, J.C. & R.B. Blair (1999). Predation on artificial bird nests along an urban gradient: Predatory risk or relaxation in urban environments? *Ecography* 22(5): 532–541.

Gupta, S. & K. Saxena (2023). Seasonal variation and habitat role in distribution and activity patterns of Red-wattled Lapwing (*Vanellus indicus* Boddaert, 1783) (Aves: Charadriiformes: Charadriidae) in Udaipur, Rajasthan, India. *Journal of Threatened Taxa* 15(8): 23729–23741. https://doi.org/10.11609/jott.8075.15.8.23729-23741

Hart, J., T. Milsom, A. Baxter, P. Kelly & W. Parkin (2002). The impact of livestock on Lapwing (*Vanellus vanellus*) breeding densities and performance on coastal grazing marsh. *Bird Study* 49(1): 67–78. https://doi.org/10.1080/00063650209461246

Hensler, G.L. (1985). Estimation and comparison of functions of daily nest survival probabilities using the Mayfield method, pp. 289–301. In: Morgan, B.J.T. & P.M. North (eds.). *Statistics in Ornithology*, Springer-Verlag, New York.

IUCN (2025). *The IUCN Red List of Threatened Species*. International Union for Conservation of Nature. https://www.iucnredlist.org. Accessed on 25.i.2026.

Jehle, G., A.A.Y. Adams, J.A. Savidge & S.K. Skagen (2004). Nest survival estimation: A review of alternatives to the Mayfield estimator. *Ornithological Applications* 106(3): 472–484. https://doi.org/10.1093/condor/106.3.472

Johnson, D.H. (1979). Estimating nest success: the Mayfield method and an alternative. *The Auk* 96(4): 651–661.

Kabir, M.A. & T. Iqbal (2018). Seasonal variations in nest-building behaviour of the Red-wattled Lapwing (*Vanellus indicus*). *Bangladesh Journal of Zoology* 46(2): 215–222. https://doi.org/10.3329/bjz.v46i2.40391

Kadam, N. & R. Jadhav (2023). Habitat use and nesting success of Red-wattled Lapwing in agroecosystems of Western Maharashtra. *Indian Journal of Ecology* 50(1): 65–72.

Kumar, S., H. Singh & K. Chauhan (2022). Effect of temperature and predation on nesting success of Red-wattled Lapwing in semi-urban areas. *Journal of Ornithology and Ecology* 56(2): 95–104.

Mayfield, H.F. (1975). Suggestions for calculating nest success. *The Wilson Bulletin* 87(4): 456–466.

Newton, I. (1998). *Population Limitation in Birds*. Academic Press, London, 597 pp.

Sethi, V.K., D. Bhatt & A. Kumar (2014). Adaptation of Red-wattled Lapwing (*Vanellus indicus*) to urban habitats: A case study from north India. *Indian Birds* 9(3): 75–78.

Shaffer, T.L. (2004). A unified approach to analyzing nest success. *The Auk* 121(2): 526–540. https://doi.org/10.1093/auk/121.2.526

Sládeček, M., M. Šálek, T. Albrecht & T. Grim (2021). Urbanization affects life-history traits and reproductive success in birds. *Journal of Avian Biology* 52(2): e02672. https://doi.org/10.1111/jav.02672

Stahl, J.T. & M.K. Oli (2006). Relative importance of avian life-history variables to population growth rate. *Ecological Modelling* 198(1–2): 23–39. https://doi.org/10.1016/j.ecolmodel.2006.04.001

Vanadzina, K., S.E. Street, S.D. Healy, K.N. Laland & C. Sheard (2023). Global drivers of variation in cup nest size in passerine birds. *Journal of Animal Ecology* 92: 338–351. https://doi.org/10.1111/1365-2656.13815

Vijayan, V.S. (1980). Breeding biology of the Indian Black Ibis *Pseudibis papillosa*. *Journal of the Bombay Natural History Society* 77: 210–221.

Whittingham, M.J. & K.L. Evans (2004). The effects of habitat structure on predation risk of birds in agricultural landscapes. *Animal Conservation* 7(4): 283–297. https://doi.org/10.1017/S1367943004001515

Yadav, R.S. & M. Sharma (2022). Nesting ecology and chick survival of Red-wattled Lapwing in relation to environmental variables. *Journal of Avian Biology* 53(7): e02957. https://doi.org/10.1111/jav.02957

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