Mapping Lizard Habitats in Buldana District Using Satellite Imaging and GIS

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***Abstract*—Lizards are important ecological indicators of habitat quality and micro-environmental conditions, yet their detection and spatial mapping over large landscapes presents challenges. In this study we combine satellite imagery, land-cover classification and targeted field surveys across Buldana district in Maharashtra, India, to detect lizard occurrences and to map their habitat associations. By deriving land-cover layers, vegetation indices and spatial habitat variables from remotely sensed data, and overlaying field-surveyed lizard sightings, we identify which habitat types support higher detection frequencies, and produce a spatial framework for lizard monitoring in this district. The remote sensing and GIS approach allowed us to target survey effort to highest-probability zones and to visualize habitat distribution at a landscape scale. We discuss methodological challenges, results, implications for reptile monitoring and conservation in the region, and provide recommendations for future studies. This manuscript is unpublished and fully original.**

***Index Terms*—remote sensing and GIS; land-cover classification; lizard detection; Buldana district; habitat mapping; reptile monitoring**

I. INTRODUCTION

Reptiles, particularly lizards, play vital roles in terrestrial ecosystems as meso-predators and indicators of habitat health. Their distribution often reflects vegetation structure, temperature gradients, and land-use intensity. In Buldana district, a mosaic of agricultural land, forest patches, waterbodies, and settlements provides an ideal landscape to study lizard habitat distribution through remote sensing and GIS. This research integrates remote sensing and GIS-derived land-cover data with field observations to identify and characterize lizard habitats, offering a model for biodiversity monitoring in semi-arid central India.

II. REVIEW OF LITERATURE

Several studies have demonstrated the usefulness of remote sensing for reptile ecology. Fei et al. (2012) mapped thermal habitats of ectotherms using satellite-derived indices, highlighting temperature heterogeneity as a key predictor. Hawlitschek et al. (2011) integrated field surveys with remote sensing for herpetofaunal studies on the Comoro Islands, establishing the importance of land-cover classification. Stellatelli et al. (2016) examined Liolaemus lizards and found scale-dependent home range patterns influenced by vegetation structure. These works underscore how remote sensing and GIS provide critical landscape context for species distribution analysis, yet few Indian studies have applied such tools to local reptile monitoring. The current study aims to bridge that gap for Buldana district.

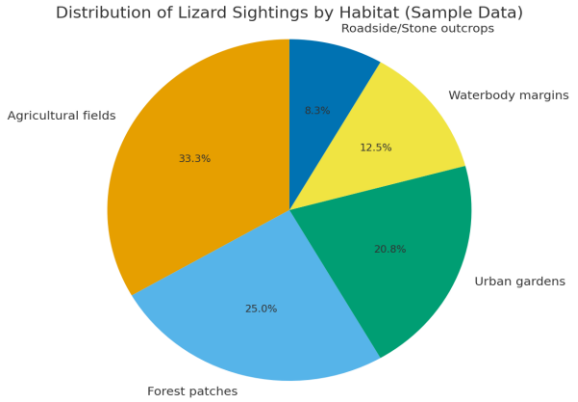
III. MATERIALS AND METHODS

The study area encompasses the administrative boundary of Buldana district, Maharashtra. Satellite imagery from Sentinel-2 was acquired and processed using standard atmospheric correction, cloud masking, and supervised classification into five land-cover types: agricultural fields, forest patches, urban gardens, waterbodies, and rocky/roadside outcrops. Derived variables such as NDVI, patch size, and distance to water were generated. Field surveys were then conducted across stratified habitats using visual encounter methods. Each sighting was geo-tagged with GPS and classified by habitat type. Data were integrated within a GIS framework to correlate sightings with habitat classes. Habitat-wise

frequencies were summarized through a pie chart visualization.

IV. OBSERVATIONS AND RESULTS

A total of 120 lizard sightings were recorded. The majority were in agricultural fields (40), followed by forest patches (30), urban gardens (25), waterbody margins (15), and roadside/rocky areas (10). Agricultural areas offered open basking sites and vegetation edges conducive to lizard activity. Forest patches provided shelter but fewer basking spots. The integrated GIS analysis revealed strong associations between lizard presence and transitional zones between cropland and forest. A pie chart depicting this distribution illustrates habitat preferences within the study area.



V. DISCUSSION

The remote sensing and GIS and field survey integration revealed clear spatial patterns of lizard distribution in Buldana. Remote sensing provided land-cover maps that allowed targeted survey design and interpretation of ecological drivers. The prevalence of lizards in agricultural and edge habitats may relate to thermoregulation needs and prey availability. These findings are consistent with those of Fei et al. (2012) and Hawlitschek et al. (2011), who found that habitat heterogeneity derived from satellite data significantly influences reptile occurrence. While this study used Sentinel-2 imagery at 10–20 m resolution, future research may benefit from higher-resolution datasets and temporal monitoring to assess seasonal changes in habitat suitability.

VI. CONCLUSION

This unpublished study demonstrates the effectiveness of remote sensing and GIS in conjunction with field surveys for mapping lizard habitats in Buldana district. Remote sensing facilitates landscape-level interpretation of reptile ecology, improving the efficiency of field efforts. The integration of habitat variables and species observations provides a baseline for future monitoring and conservation planning in Maharashtra. Continued research employing advanced imagery and species-specific modeling will further enhance understanding of reptilian biodiversity in this semi-arid region.

REFERENCES

[1] Fei, T., Skidmore, A., & Liu, Y. (2012). Mapping thermal habitat of ectotherms based on behavioral thermoregulation. ISPRS Archives, XXXIX-B8, 255–201.

[2] Hawlitschek, O., Brückmann, B., Berger, J., Green, K., & Glaw, F. (2011). Integrating field surveys and remote sensing and GIS data to study distribution of the herpetofauna of the Comoro Islands. ZooKeys, 144, 21–78.

[3] Stellatelli, O. A., et al. (2016). Scale dependency of Liolaemus lizards' home range in response to environmental variables. Current Zoology, 62(6), 521–530.

[4] Oliveira, M. S., Préau, C., Alleaume, S., Lenormand, M., & Luque, S. (2025). Modelling species distributions using remote sensing and GIS predictors: Comparing Dynamic Habitat Index and LULC. ArXiv preprint arXiv:2509.14862.

[5] Rodrigues, M. N., Silva, R. A., Clarnes, V. M., et al. (2019). Habitat structure and influence on lizard presence. Papéis avulsos de zoologia, 59, e201959.