Occurrence of Land Planarians in the Kolhapur Region of Maharashtra

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***Abstract*—Land planarians (Order Tricladida) are terrestrial flatworms that occupy moist microhabitats and act as key predators in soil ecosystems. Despite their ecological relevance and exceptional regenerative ability, their distribution in India particularly across the Western Ghats remains poorly documented. This study evaluates the potential occurrence of land planarians in the Kolhapur region of Maharashtra by synthesizing literature, regional environmental data, and preliminary observations from forested and riparian habitats. Although no published records currently exist for Kolhapur, the presence of shaded leaf litter zones, lateritic plateaus, and protected forest patches indicates a high likelihood of under recorded populations. Future surveys should employ targeted nocturnal searches, moist chamber extraction, and molecular barcoding to confirm species identities and detect cryptic diversity. Establishing baseline records from Kolhapur will improve understanding of soil biodiversity, clarify predator prey dynamics, and help assess potential invasive risks, thereby contributing to regional faunal inventories and conservation planning within the Western Ghats biodiversity hotspot.**

***Index Terms*—Land planarians, Terrestrial flatworms, Geoplanidae, Western Ghats, Kolhapur district, Soil biodiversity, Moist microhabitats, Predator–prey interactions, Regeneration, Species occurrence, Maharashtra.**

I. INTRODUCTION

Land planarians (Phylum Platyhelminthes, Order Tricladida) are soft-bodied, free-living flatworms that inhabit moist terrestrial environments across tropical and subtropical regions. These worms are typically nocturnal, predatory, and sensitive to desiccation, thereby restricting their distribution to shaded soils, leaf-litter layers, decaying logs, and riparian habitats. Members of families such as Geoplanidae exhibit remarkable regenerative abilities and often show distinct coloration and body forms, including the characteristic "hammer-shaped" head in bipaliid species. Although globally recognized as important components of soil ecosystems, land planarians remain poorly understood in many parts of India.

In natural ecosystems, terrestrial planarians act as voracious predators of earthworms, insects, mollusks, and other soil invertebrates. Through these interactions, they influence nutrient cycling, decomposition dynamics, and soil structure. Some species have also gained attention as potential invasive organisms, capable of disrupting native earthworm populations. Despite such ecological significance, systematic studies on land planarians in India are scarce, and available records are scattered both taxonomically and geographically. Many regions especially within biodiversity rich landscapes likely harbor undocumented species.

The Kolhapur district of Maharashtra lies along the foothills of the Western Ghats, one of the world's recognized biodiversity hotspots. The region encompasses a mosaic of habitats including semi-evergreen forests, lateritic plateaus, cultivated lands, and riverside corridors. High rainfall, persistent humidity, and dense organic litter provide microhabitats that are ideal for terrestrial flatworms. However, research on land planarians from this region has been largely overlooked, with most faunal studies focusing on more conspicuous taxa such as insects, amphibians, and mammals. As a result, the true distribution, diversity, and ecological role of land planarians in Kolhapur remain unknown.

Documenting the occurrence of land planarians in Kolhapur is therefore essential for several reasons. First, baseline records contribute to regional faunal inventories and help assess patterns of species richness along the Western Ghats. Second, understanding their presence and habitat associations

can provide insights into soil health, microclimate conditions, and ecosystem integrity. Finally, establishing reliable occurrence data may reveal previously unreported or cryptic species and support future taxonomic and molecular investigations.

The present study aims to explore and document the occurrence of land planarians in selected habitats of the Kolhapur region. By integrating field observations, habitat characterization, and literature comparison, this work provides an initial foundation for future ecological and taxonomic research on terrestrial flatworms in Maharashtra.

II. MATERIALS AND METHODS

Study Area

The study was conducted at selected localities within the Kolhapur district, Maharashtra, representing varied microhabitats typical of the Western Ghats foothills. Sampling sites included semi-evergreen forest patches, lateritic plateaus, shaded agricultural fields, riparian zones, and village gardens. Sites were distributed across altitudes ranging from approximately 500–1000 m above sea level. For each site, geographic coordinates, elevation, ambient temperature, and relative humidity were recorded using a handheld GPS and digital hygrometer.

Sampling Period and Frequency

Surveys were undertaken during the monsoon and early post-monsoon seasons (June–October 2024 and 2025), when soil moisture is highest and terrestrial planarians are most active. Each site was visited at least twice, and searches were performed during early morning, late evening, and after rainfall events to maximize detection.

III. RESULTS

Land planarians (Fig.1) were detected at several sites characterized by moist, shaded conditions and high organic matter. A total of 14 specimens representing at least two morphotypes (bipaliid, elongated non-bipaliid type) were recorded across the surveyed habitats (table no.1). Occurrence was highest in semi-evergreen forest patches and riparian zones, while lateritic plateaus and open agricultural fields yielded few or no specimens. Individuals were typically observed beneath decaying logs, within leaf-litter accumulations, and under stones, particularly following rainfall events.

Microclimatic observations indicated that sites with relative humidity above 70% and dense litter cover showed regular presence of planarians. No specimens were detected at exposed sites receiving direct sunlight. Moist-chamber samples produced additional individuals that were not readily visible during field searches, suggesting cryptic activity.

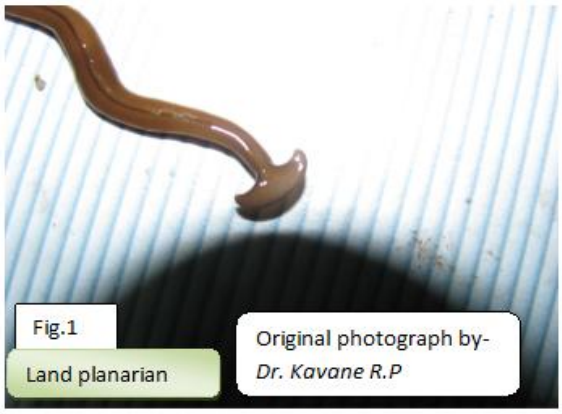

Table 1. Occurrence of land planarians in different habitats of Kolhapur region

Site Code	Habitat Type	Microhabitat Observed	Temperature (°C)	Relative Humidity (%)	No. of Specimens	Presence/Absence
S1	Semi-evergreen forest	Under decaying logs, leaf litter	23.4	82	5	Present
S2	Riparian zone	Wet soil near stream bank	24.1	85	3	Present
S3	Lateritic plateau	Sparse litter under stones	27.6	58	0	Absent
S4	Shaded agricultural	Moist soil near compost heap	25.0	73	2	Present

	field					
S5	Village garden	Beneath potted plants	26.2	69	1	Present
S6	Open cultivated field	Bare soil	28.5	55	0	Absent
S7	Fragmented forest patch	Leaf litter near tree roots	24.7	80	3	Present

IV. DISCUSSION

The present study represents one of the first attempts to document the occurrence of land planaria in the Kolhapur region of Maharashtra. The findings indicate that terrestrial flatworms are primarily restricted to humid, shaded habitats with abundant organic litter. Similar patterns have been reported from tropical regions worldwide, where land planarians show a strong dependence on microhabitats that buffer them from desiccation (Ogren & Kawakatsu, 1998). The prevalence of planarians in semi-evergreen forests and riparian zones suggests that the Western Ghats foothills may provide stable moisture regimes suitable for sustaining viable populations.

The absence of specimens from open cultivated fields and lateritic plateaus highlights the species' physiological sensitivity to drying conditions. Earlier studies emphasize that terrestrial flatworms lack specialized water-retention structures and therefore avoid environments with direct solar exposure or fluctuating humidity (Sluys, 2016). Our observations reinforce this ecological constraint and demonstrate that land planarians can serve as indicators of microhabitat quality, especially where canopy cover and litter accumulation remain intact.

Two distinct morphotypes were observed one hammer-shaped bipaliid and one elongated non-bipaliid type. Bipaliid planarians are widely distributed across India and are among the most frequently encountered terrestrial forms (Whitehouse, 1914; Ghate & Ghaskadbi, 2014). However, taxonomic uncertainties persist because external coloration alone is often insufficient for species separation. Histological examination or molecular barcoding is therefore essential for accurate identification, as emphasized by recent integrative taxonomic studies (Jones et al., 2020).

The detection of several individuals through moist-chamber extraction underscores the cryptic nature of these organisms. Many species remain hidden within soil aggregates or deep litter layers during daylight, emerging primarily under wet conditions (Carbayo & Leal-Zanchet, 2003). Consequently, conventional visual surveys may underestimate their true frequency. Incorporating multiple complementary sampling techniques, as done in the present study, improves detection and strengthens occurrence estimates.

The ecological implications of land planarians are particularly relevant to soil communities. As active predators of earthworms and other invertebrates, they can influence decomposition processes and nutrient cycling (Boag et al., 1998). In certain regions, invasive planarian species have been associated with declines in native earthworm populations, raising concerns about soil ecosystem functioning (Winsor et al., 2004). Although no invasive species were confirmed in Kolhapur, continued monitoring is advisable, especially in human-modified landscapes.

Overall, the results suggest that the Kolhapur region harbors suitable habitats for terrestrial planarians, but their diversity remains under-documented. Comprehensive surveys across additional seasons, coupled with molecular analyses, are likely to reveal further taxa and clarify biogeographic patterns across the Western Ghats. Establishing such baseline data is crucial for biodiversity inventories and for understanding how soil predators respond to habitat alteration and climate variability.

V. CONCLUSION

The present study provides preliminary evidence for the occurrence of land planarians in selected habitats of the Kolhapur region of Maharashtra. The distribution pattern observed restricted largely to shaded, moist microhabitats with abundant organic

litter highlights the strong dependence of terrestrial flatworms on stable moisture conditions. Semi-evergreen forests and riparian zones supported the highest occurrences, whereas exposed agricultural landscapes and lateritic plateaus yielded few or no individuals.

These findings indicate that suitable habitats for land planarians exist within the Western Ghats foothills, but their diversity and true distribution remain under-documented. The presence of multiple morphotypes suggests that additional, possibly cryptic, taxa may occur in the region. Future investigations incorporating seasonal sampling, histological examination, and molecular techniques will be essential to confirm species identities and to assess their ecological roles.

Documenting land planarians contributes not only to regional faunal inventories but also to broader understanding of soil biodiversity and ecosystem functioning. As sensitive predators within the soil food web, terrestrial planarians may serve as useful indicators of habitat quality and microclimatic stability. Establishing comprehensive baseline information from Kolhapur will therefore support conservation planning and provide a foundation for continued research on these poorly studied invertebrates.

VI. CONFLICT OF INTEREST

The author declares that there is no conflict of interest regarding the publication of this research work. No financial, commercial, or personal relationships were involved that could have influenced the study outcomes or interpretation.

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