Ambuluwawa Biodiversity Complex

Biodiversity Assessment Report

September 2025

IEPSL
Institute of Environmental Professionals
Sri Lanka

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2025

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Contents

Letter from the President

The Institute of Environmental Professionals Sri Lanka (IEPSL) is proud to publish the Biodiversity Assessment of the Ambuluwawa Biodiversity Complex. This nationally and internationally significant publication represents the first comprehensive scientific study of one of Sri Lanka's most unique ecological and cultural landscapes.

Commissioned by IEPSL, the assessment systematically documents the flora, fauna, and ecosystems of Ambuluwawa through GIS-based habitat mapping, detailed species inventories, and science-based conservation recommendations. It highlights Ambuluwawa's exceptional ecological value where wet, intermediate, and dry climatic zones converge to create a rich mosaic of habitats—and its cultural significance as Sri Lanka's first multi-religious sanctuary and a leading eco-tourism destination.

Importantly, this study strengthens Sri Lanka's commitments under the National Biodiversity Strategic Action Plan (NBSAP), the National Red List (2020), and key national policies such as the National Environmental Act and the National Climate Change Policy. It also contributes to international frameworks, including the Convention on Biological Diversity (CBD) and the UN Sustainable Development Goals; specifically Goal 13 (Climate Action), Goal 14 (Life Below Water), and Goal 15 (Life on Land).

By providing a robust ecological baseline and evidence-based guidance, the report serves as a vital foundation for future conservation, land-use planning, and sustainable tourism development. The launch of this assessment marks a milestone in biodiversity research and policy, reaffirming IEPSL's role in promoting science-based environmental management for both national and global benefit.

Mr Asela Iddawela

President

Institute of Environmental Professionals Sri Lanka (IEPSL) and Research and Publications Committee, Institute of Environmental Professionals Sri Lanka (IEPSL)

Acknowledgments

The Institute of Environmental Professionals Sri Lanka (IEPSL) wishes to extend its sincere gratitude to all those who contributed to the successful completion of the Ambuluwawa Biodiversity Assessment Report. We gratefully acknowledge the IEPSL Council for accepting this important challenge and providing their continuous guidance and encouragement throughout the process. Our heartfelt appreciation also goes to the IEPSL Research Team, who undertook this task with dedication and commitment, ensuring the scientific quality and credibility of the work. We extend our thanks to the internal and external reviewers, whose valuable comments and constructive suggestions greatly enhanced the clarity, accuracy, and overall quality of the report.

Special recognition is given to Mr. Pubudu Weerarathna and his research team for their tireless efforts in conducting the fieldwork and preparing the technical components of the report.

We wish to place on record our deep appreciation to Ansell Lanka (Pvt) Ltd., who sponsored this project under their Corporate Social Responsibility (CSR) initiatives. Ansell Lanka's CSR projects place strong emphasis on environmental conservation, sustainable energy, and community development, while also supporting education and economic well-being. As part of the global Ansell network a leading international provider of protection solutions the company has demonstrated its commitment to advancing sustainability and community empowerment worldwide. Their generous sponsorship made this nationally significant project possible, and IEPSL is proud to partner with an organization that shares our vision for a more sustainable and environmentally responsible future.

We also wish to acknowledge the support provided by the Ambuluwawa Religious Centre and the Biodiversity Complex Trust Fund, whose cooperation and assistance were vital in facilitating this study. Our thanks are extended to all the government and non-government organizations that actively participated in stakeholder meetings and shared their valuable insights and recommendations, which significantly enriched the findings and outcomes of this report.

Finally, IEPSL recognizes the role of its committees in bringing this project to completion: the Academic and Examination Committee, which coordinated the project activities, and the Research and Publication Committee, which managed the review and publication process of this report.

We extend our gratitude to everyone who, in numerous ways, contributed their time, expertise, and support to make this project a success.

List of Tables

List of Figures

List of Abbreviations

ABC – Ambuluwawa Biodiversity Complex

CBM – Community-Based Monitoring

CBD – Convention on Biological Diversity

CHA – Critical Habitat Assessment

CR – Critically Endangered

DD – Data Deficient

EDRR – Early Detection and Rapid Response

END – Endemic

EN – Endangered

EXO – Exotic

GIS – Geographic Information System

GPS – Global Positioning System

IAS – Invasive Alien Species

IEPSL – Institute for Environmental Professionals Sri Lanka

IND – Indigenous

LC – Least Concern

LWEF – Lowland Wet Evergreen Forest

NB SAP – National Biodiversity Strategic Action Plan

NE – Not Evaluated

NRL – National Red List of Sri Lanka

NT – Near Threatened

NWSDB – National Water Supply and Drainage Board

SpS – Species Status

TOR – Terms of Reference

VCP – Variable Circular Plots

VES – Visual Encounter Survey

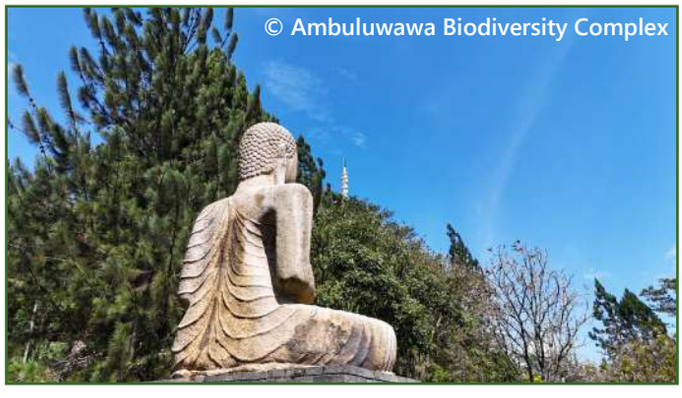
VU – Vulnerable

1. Introduction

The Ambuluwawa Biodiversity Complex (ABC) is a unique ecological and cultural landscape situated in the Udapalatha DS Division, Kandy District, Central Province, Sri Lanka. Rising to an elevation of approximately 1,070 m above sea level, the mountain and its associated landscapes cover around 207 hectares, comprising 112 ha of the core complex and about 95 ha of surrounding forest cover. Its geographical position at the intersection of Sri Lanka's wet, intermediate, and dry climatic zones creates a distinctive ecological mosaic within a compact area. This overlap generates a high level of species richness and habitat diversity, ranging from evergreen and montane forest patches to scrublands, rock outcrops, pine and tea plantations, cultivated home gardens, and ornamental landscapes. The complex is home to numerous endemic, rare, and threatened species of flora and fauna, while also containing culturally significant plant species used in traditional medicine and rituals.

1. Overhead shot of cultural and religious built environment

Ambuluwawa is not only ecologically important but also holds deep religious, cultural, and recreational significance. The peak is home to a multi-religious sanctuary that brings together Buddhist, Hindu, Islamic, and Christian shrines, symbolizing interfaith harmony and coexistence. Its architectural landmark, the spiral Ambuluwawa Tower, together with panoramic views, has transformed the site into a major tourism destination, attracting thousands of local and foreign visitors each year. This dual role as both an ecological refuge and a tourism hub underscores the importance of managing the landscape in a way that safeguards biodiversity while allowing sustainable use. However, the growing visitor footprint, coupled with development pressures such as a proposed cable car project, have increased ecological vulnerabilities and highlighted the urgent need for a robust scientific assessment.



2. Site features built statues and shrines

Despite its prominence, Ambuluwawa remains insufficiently documented in terms of biodiversity. Scattered surveys and environmental assessments have noted the presence of endemic and threatened species, but there is no comprehensive, systematic inventory of the site's biological resources. Key knowledge gaps include the absence of a complete species inventory across habitats and elevations, limited information on habitat condition and connectivity, and inadequate understanding of ecosystem services such as water regulation, soil conservation, and cultural values. Without this baseline information, conservation priorities cannot be effectively identified and management interventions risk being ad hoc or ineffective. In response, the Institute of

3. Tourist features include road network, cafes and activities

Environmental Professionals Sri Lanka (IEPSL) has commissioned a detailed biodiversity assessment under clear Terms of Reference (TOR), which require systematic surveys of flora and fauna, stratified sampling across elevation and habitat gradients, preparation of GIS-based habitat maps, and evidence -based conservation recommendations.

The assessment also aligns with Sri Lanka's broader environmental policy commitments. It directly contributes to the National Biodiversity Strategic Action Plan (NBSAP 2016–2022), which emphasizes conservation of ecosystems and species while promoting sustainable use. It supports the National Red List (2020) by providing updated occurrence data on threatened and endemic species and complies with the National Environmental Act (NEA) requirements for sensitive area assessments. The study further links with the National Climate Change Policy (2012) and aligns with the Sustainable Development Goals—particularly Goal 13 (Climate Action), Goal 14 (Life Below Water), and Goal 15 (Life on Land)—as well as Sri Lanka's obligations under the Convention on Biological Diversity (CBD). By embedding the assessment within these national and international strategies, the study ensures that the findings are not only locally relevant but also globally significant.

Recent informal surveys have begun to illuminate Ambuluwawa's rich biodiversity, though they have not yet filled all the data gaps. For example, a faunal survey reported approximately 123 species across mammals, birds, reptiles, amphibians, and butterflies, including 23 endemic species, with many being nationally threatened. Similarly, preliminary botanical inventories suggest a large variety of plant families, many of which are used in traditional medicine or hold cultural significance for local communities [1]. These findings affirm that while Ambuluwawa has been partially studied, the majority of habitats—especially microhabitats at varying elevations and those less accessible—remain under-surveyed. This underlines the urgency of a comprehensive, methodical approach so that management strategies have a robust empirical base.

Furthermore, the local ecosystem services provided by the complex are increasingly recognized as critical in the face of climatic changes and land use pressures. Ambuluwawa plays a vital role in water regulation, as the vegetation cover helps to reduce runoff and soil erosion on slopes; it also contributes to maintaining microclimates through shade, evapotranspiration and canopy cover. The scenic and spiritual values of Ambuluwawa also translate into substantial recreational use, contributing to the local economy through tourism, which in turn places pressures for infrastructure, facilities and visitor management. With proposals such as the cable car project under consideration, there is the risk that without careful planning and monitoring, the integrity of habitat connectivity, species occupancy, and ecological services could be compromised. The current assessment thus serves not only academic and conservation interests but also provides necessary evidence to guide policy, land-use planning, and sustainable development efforts in the region.

4. Ambuluwawa's iconic tower

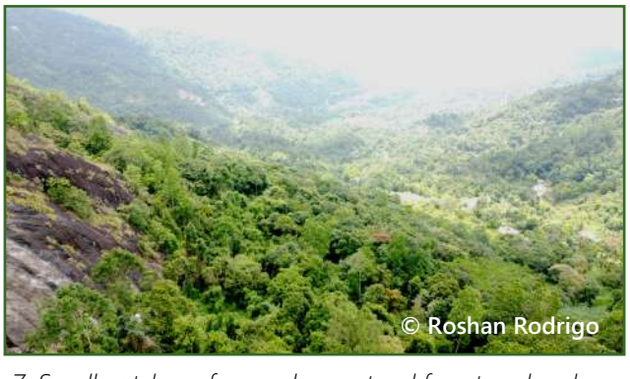
2. Historical Background

Ambuluwawa Tower stands atop the forested Ambuluwawa Mountain, symbolizing the site's blend of biodiversity conservation and multi-religious heritage. The Ambuluwawa Biodiversity Complex is recognized as the country's first multi-religious sanctuary, featuring a striking spiral tower whose levels are dedicated to Buddhism, Hinduism, Islam, and Christianity [2]. This multifaith design reflects Sri Lanka's diverse religious landscape and promotes interfaith harmony. Surrounding the tower is a reforested botanical garden teeming with native plants, a testament to the project's mission to restore and protect the mountain's natural ecosystem [2]. To understand Ambuluwawa's importance, one must examine its ecological history, cultural heritage, and the visionaries behind its establishment.

2.1 Ecological History

5. Clearly defined Pine stand planted prior to ABC establishment

6. Inside pine stand, original monoculture now mixed with some natives and IAS



7. Small patches of secondary natural forest and rocky outcrops

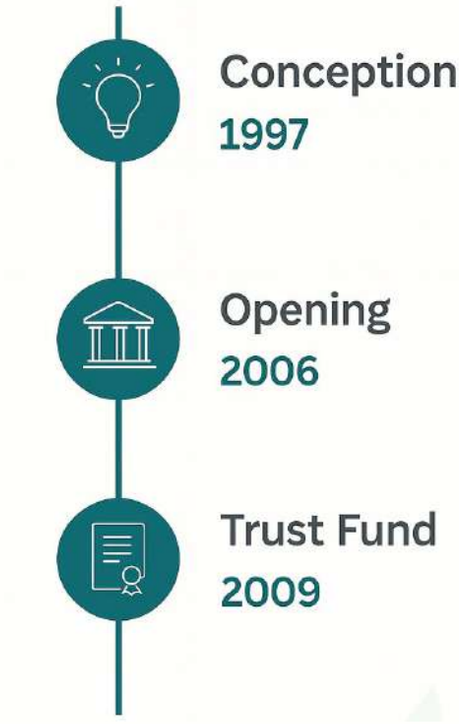
Historically, Ambuluwawa Mountain was part of Sri Lanka's mid-country forest zone. Over the centuries, much of the original evergreen forest was cleared or degraded due to human land use. By the late 20th century, the mountain's landscape comprised a patchwork of forest remnants and altered habitats – pockets of lowland rainforest survived amid expanses of open grassland (known locally as Patana) and stands of non-native pine trees planted during mid-1900s reforestation programs [3][4] (fig 5 and 6). These Patana grasslands and pine plantations indicated that the hill's natural forest cover had been significantly reduced prior to its conservation.

Despite this habitat fragmentation, Ambuluwawa's environmental setting is exceptional. The mountain sits at the intersection of Sri Lanka's wet, intermediate, and dry climatic zones, creating a mosaic of micro-ecosystems in a compact area [5]. Even before any formal conservation efforts, this convergence of climates endowed Ambuluwawa with notable biodiversity and varied vegetation. Small lowland evergreen forest patches persisted on the slopes and rocky outcrops, harbouring indigenous flora and fauna (fig 7). However, without protected status, the area remained vulnerable – used for occasional Cena cultivation, pine timber, or left as scrub and grassland – until the late 1990s when a new vision for its restoration emerged.

The ecological turnaround began with the establishment of the Biodiversity Complex.

Conservation work in the early 2000s focused on habitat restoration and reforestation. Native tree species were planted to re-green the slopes that had long been grassland, and degraded areas were landscaped into gardens and ponds to support wildlife. Today, Ambuluwawa hosts a small in-situ botanical garden showcasing roughly 200 plant species across 80 families [6]. The recovering forests and shrublands now provide refuge for a thriving array of fauna. Surveys have documented 126 animal species (including 29 endemics) in the area, ranging from mammals and birds to reptiles, amphibians, and butterflies [7]. This rich biodiversity underscores the ecological value that spurred Ambuluwawa's conservation. At the same time, it highlights the ongoing need for careful management – early studies in 2003 noted that construction activity and increased visitors posed new challenges for wildlife, calling for mitigation of habitat disturbance [8]. Overall, the Ambuluwawa project transformed a partially denuded hill into a regenerating biodiversity sanctuary, reversing decades of forest cover loss and serving as a model for ecological restoration in Sri Lanka's highlands.

2.2 Establishment and Development Timeline



Conception (1997): The idea of converting Ambuluwawa into a biodiversity conservation site and sanctuary was first advanced in 1997 by D. M. Jayaratne, then Minister of Agriculture and Lands, who envisioned the site as a botanical garden fused with a multi-faith center [9,10]. The rationale behind this initiative was twofold: to conserve and showcase the unique ecological setting of Ambuluwawa Hill, and to create a landmark of cultural unity and public education. According to contemporary reports, Jayaratne's Cabinet proposal in November 1997 highlighted Ambuluwawa and its surrounding villages as priority areas for development [9]. Construction commenced the same year, beginning with road access, landscaping, and reforestation efforts to restore degraded slopes [10]. Media accounts note that the project aimed to integrate conservation with cultural infrastructure, blending ecological restoration with visitor facilities [10]. By the late 1990s, government support formalized the project's scope, which included replanting schemes and garden development in partnership with technical experts from the Royal Botanic Gardens in Peradeniya, under the guidance of Dr. D.S.A. Wijesundera [11]. The architectural design and spatial planning of the complex were led by Tilak Palliyaguru, a renowned Sri Lankan architect and artist, ensuring that the conservation goals were balanced with cultural and educational functions [12].

The formal opening of the Ambuluwawa Biodiversity Complex to the public took place in December 2006, marking a landmark event in Sri Lanka's conservation and cultural landscape [13]. This opening represented the culmination of nearly a decade of planning and restoration work that sought to transform a once-degraded hill into a functioning multi-faith sanctuary and biodiversity hub. At the time of its inauguration, the site featured newly established gardens, trails, and the now-iconic Ambuluwawa Tower, alongside early efforts to restore forest patches and establish thematic areas for different groups of flora. For many visitors, the opening provided a unique combination of religious, educational, and ecological experiences, symbolizing a new model of conservation that embraced both cultural and environmental values. The event also signaled a growing recognition of the need to integrate biodiversity protection into the broader public consciousness, drawing both local communities and international tourists to the site.

A few years later, in 2009, the complex achieved full legal and institutional recognition through the passage of the Ambuluwawa Dissanayake Mudiyanselage Jayaratne Religious Centre and Bio-Diversity Complex Trust Fund Act, No. 44 of 2009 [14, 15].

3. Site Description

The Ambuluwawa Biodiversity Complex is located in the Kandy District, Central Province, Sri Lanka (fig. 10). Administratively, it falls under the Udapalatha DS Division, within the Gampola urban and surrounding four Grama Niladhari Divisions, Ambalawa, Godagama, Sinhapitiya North and Wallahagoda. The mountain itself rises prominently above the town of Gampola, located approximately 3 km away.

The main access route to Ambuluwawa is from Gampola town, which is well connected by rail and road. From Colombo: Ambuluwawa is reached via the Colombo–Kandy (A1) highway up to Peradeniya and then the Kandy–Nuwara Eliya (A5) road to Gampola, a distance of approximately 120 km. Travel time is about 3.5–4 hours by road.

3.1 Legal Background

The Ambuluwawa Biodiversity Complex is governed under multiple national laws and a site-specific Act of Parliament. The area is not designated as a National Park or Reserved Forest, but its management and protection fall under Sri Lanka's environmental and biodiversity legislation. The National Environmental Act (NEA) requires that any major development (such as the cable car project) undergo an environmental assessment. The Forest Ordinance and the Fauna and Flora Protection Ordinance apply indirectly, as they regulate the conservation of indigenous flora, fauna, and forest patches in the surrounding 95 ha of natural forest cover.

In 2009, the Government of Sri Lanka formally recognised the site through the Ambuluwawa Dissanayake Mudiyanselage Jayaratne Religious Centre and Biodiversity Complex Trust Fund Act, No. 44 of 2009. This Act established a Board of Trustees and created a statutory body to oversee the site's management, conservation, and development. The Trust is legally empowered to administer the biodiversity complex and associated multi-religious sanctuary facilities.

In terms of ownership, the land and facilities of the Ambuluwawa Biodiversity Complex are vested in this Trust Fund. The Board of Trustees manages the site on behalf of the Government of Sri Lanka, ensuring that it is maintained as a public charitable institution dedicated to biodiversity conservation, religious harmony, and sustainable tourism.

3.2 Landscape and Soil Structures

Ambuluwawa is part of the western quarter of Sri Lanka's Central Highlands, situated on a prominent mountain ridge near Gampola. The terrain is moderate to steep, with slope gradients ranging from 0° to nearly 90°. Elevations within the complex vary between 570 m and 1,071 m above mean sea level. The micro-region is characterized by a series of hills sloping east and west, with valleys aligned along the northwest–southeast axis. Hydrologically, Ambuluwawa lies on the catchment divide between the Mahaweli River (east slope) and Ma Oya (west slope). A dendritic drainage network, with small 1st- and 2nd-order perennial and seasonal streams, flows in both directions to join these major rivers. Artificial lakes and ponds have also been created within the development area. The landscape is notable for its scenic aesthetic value, with panoramic cloud-level views that have contributed to Ambuluwawa's popularity as a cultural and eco-tourism destination. Geologically, Ambuluwawa belongs to the Highland Complex, one of Sri Lanka's oldest and most prominent crustal units. The bedrock is dominated by charnockitic gneisses, with occurrences of garnet-sillimanite gneiss, hornblende-biotitic gneiss, quartzite, and marble.

Due to prolonged tropical weathering, these rocks have produced thick regoliths and saprolite profiles. Typical soil stratigraphy observed includes:

- Organic layer (5–30 cm thick, depending on past land use).
- Mobilized soil layer (~30 cm, reddish brown in colour).
- Saprolite layer (1.5–4.5 m thick, reddish brown, clay-rich, developed on weathered bedrock).

The soils are enriched in secondary clay minerals, while quartz dominates the sand fraction.

Ambuluwawa falls within the mid-country wet zone (WM2b) agro-ecological region. The dominant soil groups are Red-Yellow Podzolic soils, typically found on steeply dissected hilly and rolling terrain of humid tropical highlands, and Reddish-Brown Latosolic soils. These soils are generally fertile but prone to erosion and instability due to the steep slopes, high rainfall (>1,800 mm annually), and land use pressures. In some areas, soils are sandy and gravelly with low cohesion, increasing susceptibility to erosion and small landslides, especially along cut slopes.

3.3 Hydrological Features

The Ambuluwawa Biodiversity Complex is situated on the catchment boundary of two major rivers – the Mahaweli River on the eastern slope and the Ma Oya on the western slope. Its terrain is classified as moderate to steep.

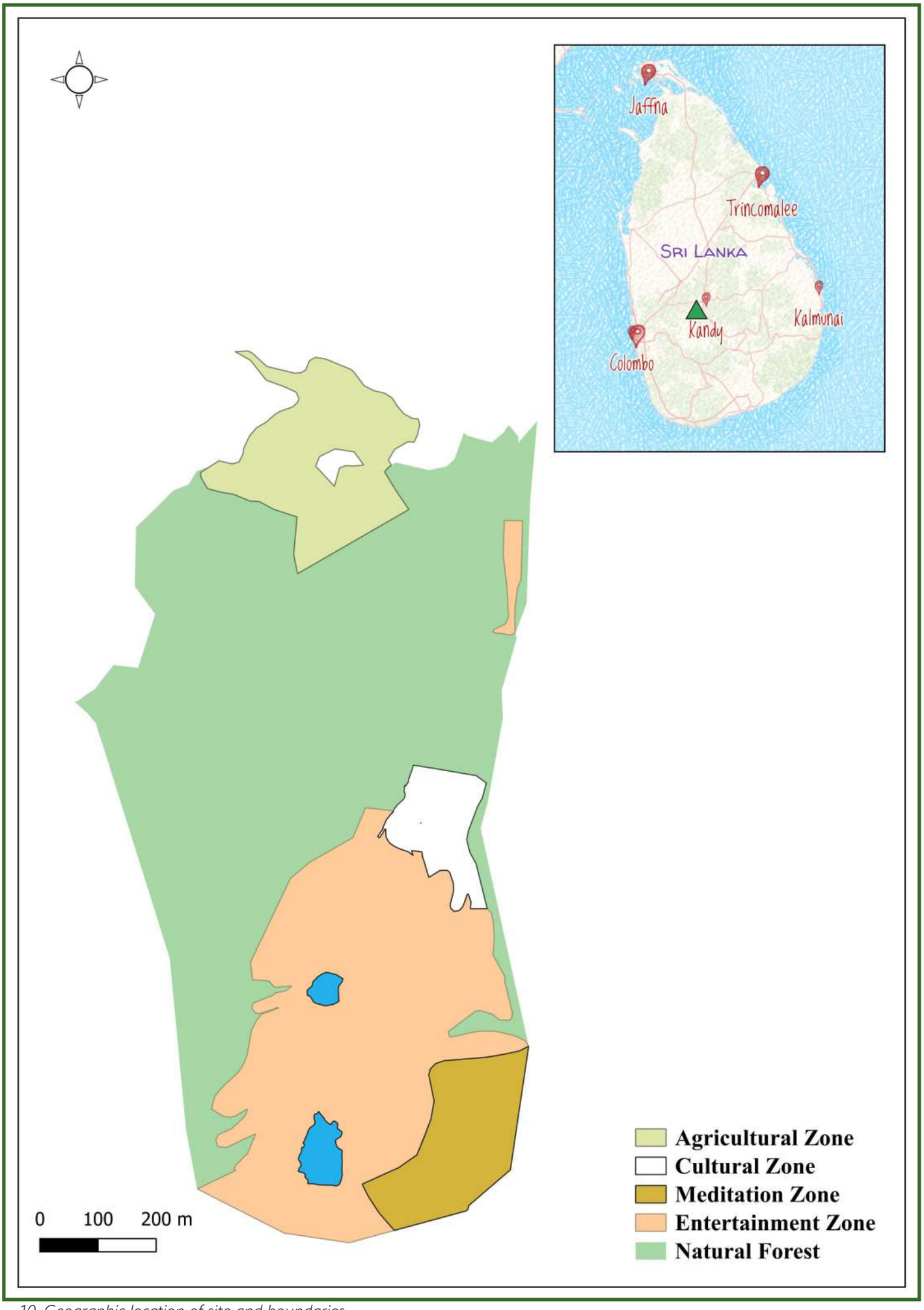
The area supports a dendritic drainage pattern that has developed on the uniform lithology of garnet–sillimanite–biotite gneiss. Several first and second order perennial and seasonal streams originate from Ambuluwawa and flow eastwards and westwards before joining the Mahaweli River and Ma Oya (fig 8). These streams are activated during the southwest monsoon, with increased runoff in the rainy season.

Within the biodiversity complex, there are also a few artificially created lakes and ponds (fig 9), established to support water retention and landscape enhancement. One large lake, located near the southern end of the site close to the heli-pad, is a key water source. A well constructed near this lake supplies water to the complex, and its conservation is considered vital since it serves as the main water source for the area.

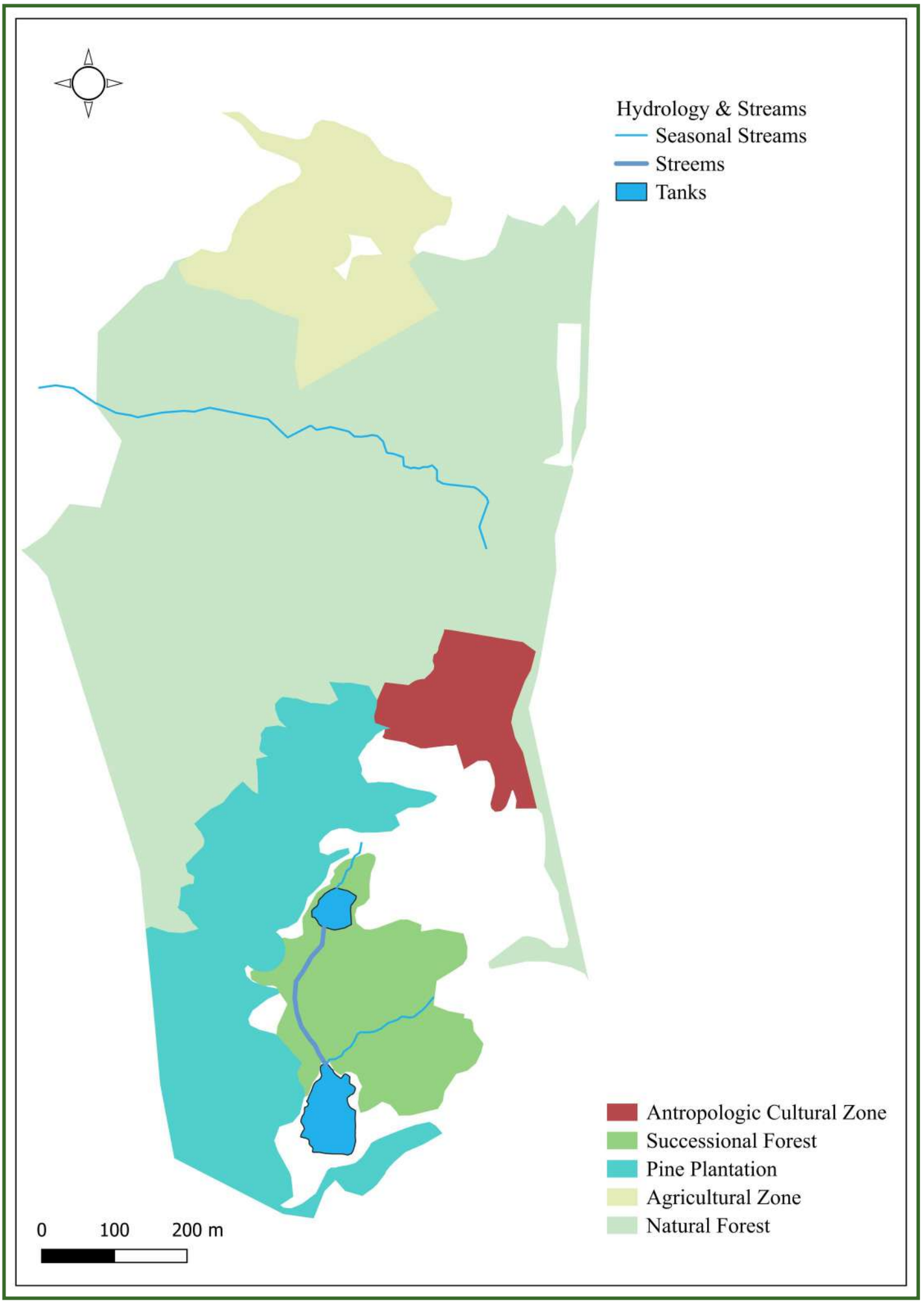
Downstream, many local users depend on springs and dug wells along the drainage pathways for domestic and agricultural needs, especially in areas where National Water Supply and Drainage Board (NWSDB) services are limited. A Hydrological map was produced for this assessment (fig 11)

8. Perennial stream on site

9. Overhead shot of one of Jaya tank in the complex



10. Geographic location of site and boundaries



11. Hydrological map of ABC

3.4 Existing Zoning Plan

TABLE 1: OVERVIEW OF ZONING PLAN

Zone	Area (ha)	Location / Elevation	Key Features	Management Focus	Visitor Presence
Agriculture Zone	35	North-west corner, near main entrance (~500 m)	Agroforestry system with areca nut, pepper, cinnamon, and other spices	Agricultural production, livelihoods support	Low–Medium
Natural Forest	47	Belt between Agriculture and upper zones	Patches of natural forest and pine monocultures	Biodiversity conservation, ecological buffer	None (restricted)
Cultural Zone	2	Highest point of site (+1,000 m)	Ambuluwawa Tower and multi-religious monuments, heavily built environment	Cultural/ religious functions, tourism	High
Entertainment Zone	23	Upper slopes, adjacent to Cultural Zone	Activity park, children's park, horse paddock, ponds, and lawns	Recreation, eco-tourism	Medium–High
Meditation Zone	5	Former tea land with regenerating forest	Shrines and statues interspersed with forest patches	Spiritual use, quiet recreation	Low–Medium

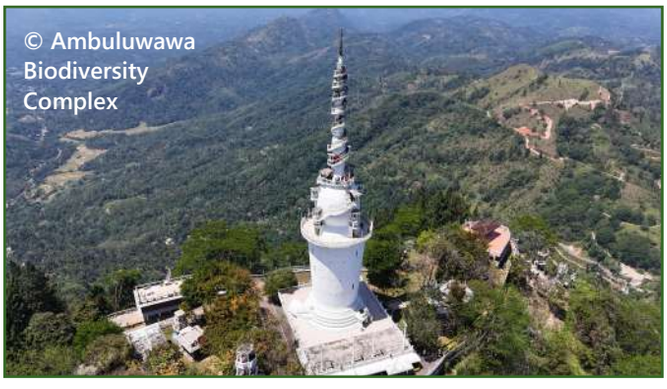
The zoning plan of the ABC provides a framework for balancing conservation, cultural, and recreational objectives while accommodating agriculture and community needs. Lands within the 207 ha site are classified into distinct management zones based on their ecological significance, land use potential, and cultural or recreational functions. The zoning plan acknowledges that while some areas have high biodiversity value and limited visitor access, others are heavily modified landscapes designed to support tourism, religious practices, or agricultural production.

The Agriculture Zone (35 ha) is situated in the north west corner of the site, near the main entrance, at the lowest elevation of approximately 500 m above sea level. This zone is currently managed as an agroforestry system, with crops such as areca nut, pepper, cinnamon, and other spices, contributing both to livelihoods and site-level income. Adjacent to this lies the Biodiversity Zone (47 ha), which functions as an ecological belt between the agriculture zone and the upper cultural and entertainment areas. This zone is not designated for visitor activities and contains patches of natural forest interspersed with pine monocultures, offering opportunities for species conservation, ecological restoration, and connectivity.

At the upper elevations, the site transitions into zones more focused on tourism and cultural values. The Cultural Zone (2 ha) represents the most intensively developed area, featuring the iconic Ambuluwawa Tower and multi-religious monuments. As the highest point of the site, this heavily built

environment attracts the highest number of visitors, and its management is oriented towards cultural and tourism objectives rather than biodiversity conservation. The Entertainment Zone (23 ha) includes a children's park, activity park, horse paddock, ponds, and lawns, accommodating high levels of visitor use, though generally lower than in the cultural core. Finally, the Meditation Zone (5 ha), established on a former tea plantation, combines shrines and statues with regenerating forest patches. Visitor presence here is moderate compared with other zones, making it a transitional area where spiritual and ecological functions coexist.

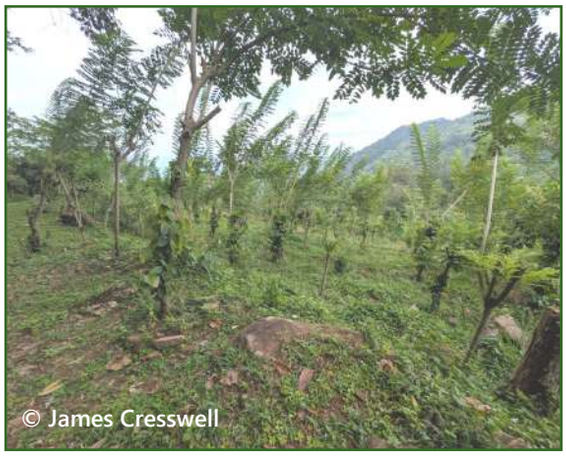
Taken together, these existing zones reflect a mosaic of management priorities ranging from biodiversity protection to religious, recreational, and agricultural use. However, the fact that the upper elevations are primarily geared toward cultural and tourism objectives, rather than ecological conservation, highlights the need for clear strategies to reduce ecological pressures in these heavily visited areas while reinforcing conservation functions in the biodiversity belt and lower slopes.



12. Cultural zone featuring tower and religious monuments—heavily built environment

13. Agriculture zone—agro-forestry system

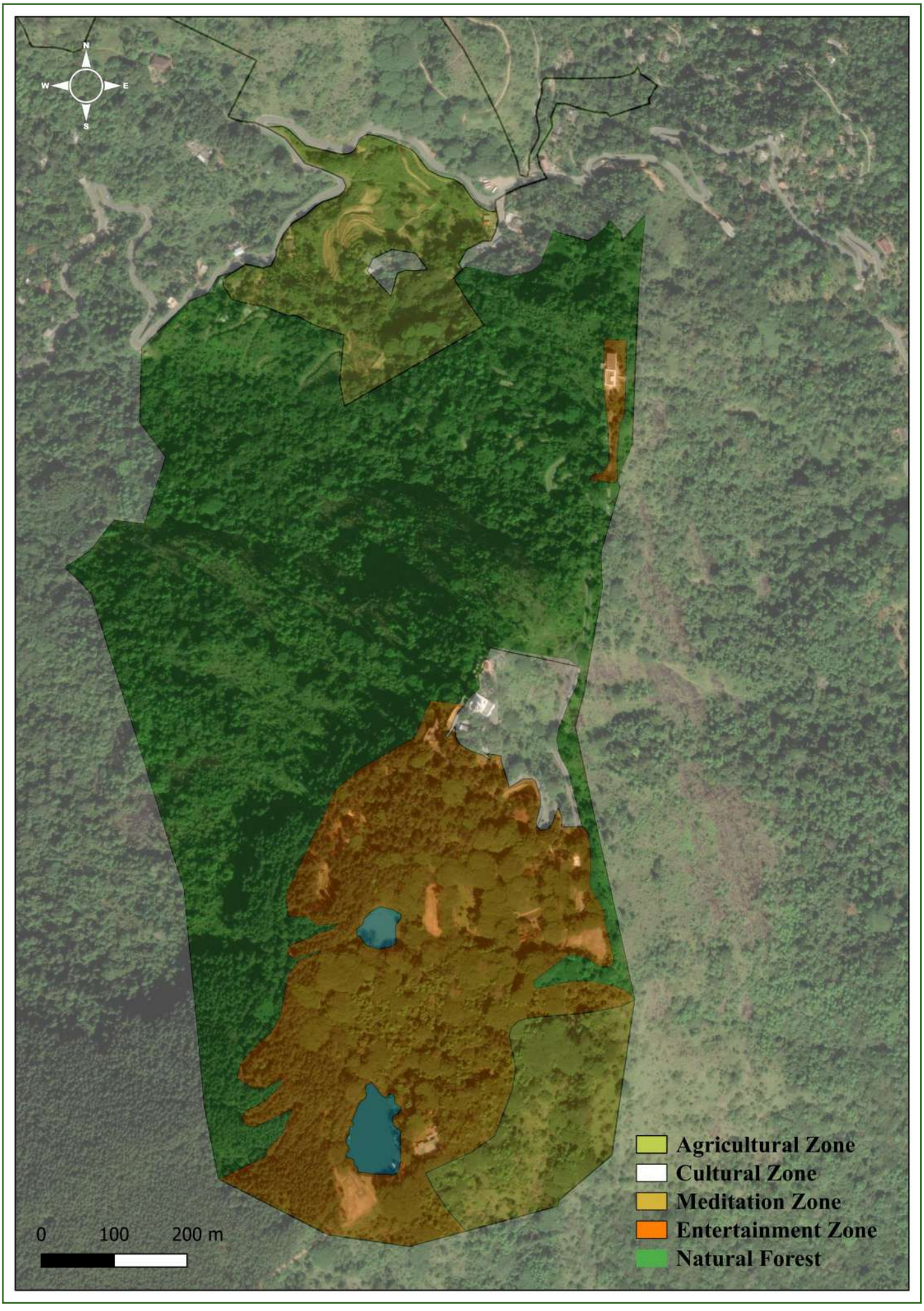
14. Cultural zone showing high numbers of visitors and potential human-animal conflict



15. Agriculture zone—recently establish pepper plantation using gliricidia as support plant

16. Entertainment zone—horse paddock, highlighting

17. Entertainment zone—Adventure park



18. GIS Zoning Map Layered onto Google Earth

4. Objectives

1. To systematically document the flora and fauna diversity within the 207 ha of the Ambuluwawa Biodiversity Complex

2. To classify and map the major habitat types within the complex

3. To apply Geographic Information System (GIS) analysis for spatial documentation and interpretation of biodiversity and habitat distribution

4. To assess the current ecological condition and conservation status of the habitats and species present.

5. To provide science-based recommendations for conservation and management of the biodiversity complex

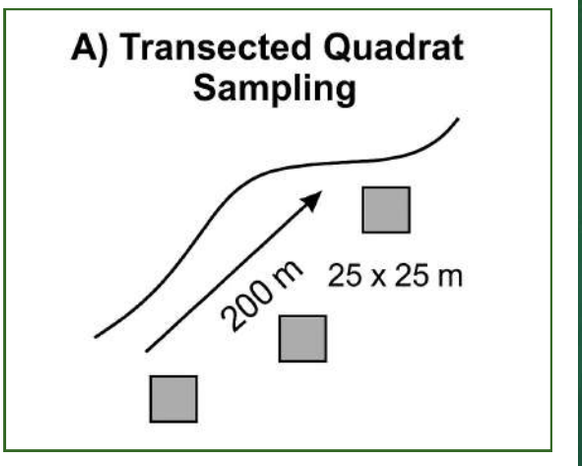
The primary objectives of this biodiversity assessment are to systematically document the diversity of flora and fauna within the Ambuluwawa Biodiversity Complex, with special emphasis on endemic, threatened, and ecologically significant species; classify, map, and characterize habitats and microhabitats while evaluating ecological connectivity and degradation; analyze biodiversity distribution across altitudinal and habitat gradients using stratified survey methods; and develop GIS maps of biodiversity hotspots and habitat zones. In addition, the study seeks to evaluate the ecosystem services provided by the site, including water regulation, soil conservation, carbon sequestration, and cultural and religious values, thereby highlighting its benefits to local communities and national development. Ultimately, the assessment aims to provide evidence-based management recommendations for conservation, habitat restoration, and sustainable tourism development, while contributing to national and international biodiversity databases and strengthening Sri Lanka's capacity for biodiversity monitoring and reporting.

Building on these priorities, the assessment also intends to generate a comprehensive ecological baseline that can serve as a reference point for long-term monitoring and adaptive management of the site. By integrating field-based species inventories, habitat mapping, and GIS analysis, the study will provide spatially explicit insights into biodiversity patterns and pressures, supporting more precise decision-making for conservation and sustainable use. Furthermore, the documentation of ecological conditions and conservation status will not only highlight immediate management needs but also facilitate the alignment of local conservation actions with broader national and global biodiversity strategies, such as Sri Lanka's commitments under the Convention on Biological Diversity and the Sustainable Development Goals.

5. Sampling Methodology

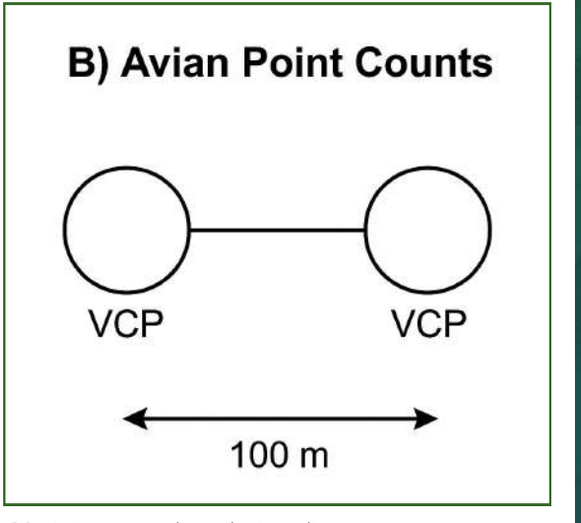
The biodiversity assessment employed a stratified sampling design conducted over a period of five consecutive days and nights during September 2025. This temporal scope was chosen to ensure representation of both diurnal and nocturnal species activity, while the spatial design incorporated five ecologically distinct zones identified based on land use and vegetation cover: (1) natural forest, (2) successional forest on former tea lands, (3) pine plantations, (4) agroforestry/agricultural lands, and (5) anthropogenic or cultural zones. Each zone was sampled systematically to ensure comparability and representation of microhabitat variability.

Within each zone, fixed transects of approximately 200 m were established, following contour lines where possible to minimize erosion and optimize observer visibility. Along each transect, 25 × 25 m quadrats were positioned at regular intervals (fig 19). These quadrats served as the primary unit for quantitative sampling of vascular plants. All woody and herbaceous plant species present within each quadrat were recorded. Herbaceous species were documented by presence/absence, while canopy and understory species were identified and logged with associated abundance estimates when feasible. Species identification relied on standard floras (e.g., Dassanayake and Fosberg, 1980–2002) [16] and national herbarium references, with conservation statuses assigned using the National Red List of Sri Lanka (2020).



19. Transect and quadrat diagram

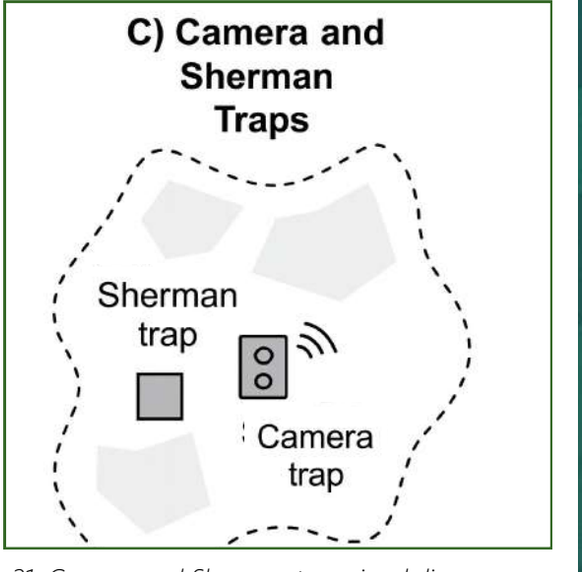
Qualitative floral data were also collected. Observers recorded additional species encountered between quadrats along the transects and in surrounding areas within each sampling zone. This approach was essential for capturing rare, scattered, or transient species that might be overlooked in quadrat-only sampling.



20. Avian sampling design diagram

Faunal surveys employed a multi-method approach tailored to specific taxonomic groups. For birds, Variable Circular Plots (VCPs) were placed at the beginning and end of each 100 m segment of the transects. At each VCP, observers conducted 10-minute stationary counts, recording species by direct sighting and vocalization (fig 20). Bird surveys were conducted during early morning and late afternoon hours, aligned with peak avian activity. Additional spot counts and opportunistic records supplemented the VCP data.

Amphibians and reptiles were surveyed using Visual Encounter Surveys (VES) along transects, both during day and night. Quadrat-clearing methods were applied within selected vegetation plots, with careful inspection of ground cover, leaf litter, tree trunks, rock crevices, and aquatic edges to detect cryptic species. Night-time herpetofaunal sampling employed headlamps and handheld torches along the same transects used during the day. Methodology followed established protocols outlined by Heyer et al. (1994) [17], adapted for Sri Lankan montane systems.



21. Camera and Sherman trap visual diagram

Butterflies and dragonflies were recorded using line transects and targeted circular plots near aquatic habitats. Observers used direct visual identification and net capture for photographic documentation. These surveys occurred during peak solar radiation hours, coinciding with the flight activity of most taxa. Additional observations were logged opportunistically during movement between zones.

To sample small mammals, 20 Sherman live traps were deployed along each transect during night-time hours. Traps were spaced at regular intervals and set both at ground level and elevated microhabitats where feasible. Traps were baited with burnt coconut and checked at dawn. Captured animals were identified to species level using external morphological traits, photographed, and released at the point of capture. Trap effort was standardized per trap-night to allow future estimation of capture rates. In addition, indirect sampling through scat and pug mark identification were employed to assess small and large mammals.

Passive infrared camera traps were also deployed to capture medium to large mammals, nocturnal birds, and large reptiles. Two camera units were deployed per night in different zones, rotated nightly to maximize habitat coverage (fig 21). Cameras were mounted approximately 1 m above ground and programmed for continuous motion-triggered recording throughout the night. Image data included timestamps and metadata for temporal analysis.

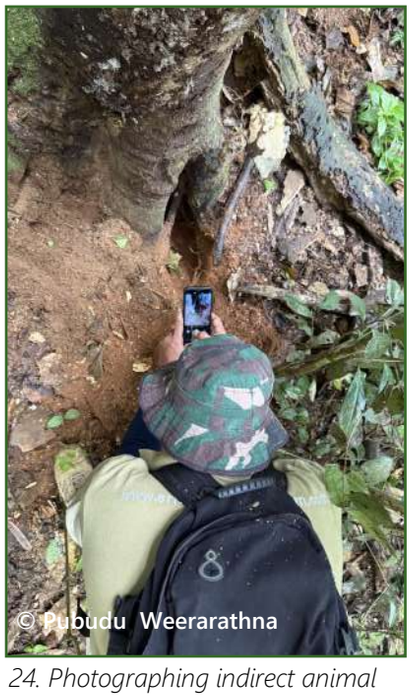
Habitat classification and mapping were conducted using both remote sensing and ground-based methods. A DJI Mavic drone was flown over the study area to obtain high-resolution imagery. Concurrently, GPS coordinates were collected at habitat boundaries, quadrat corners, transect lines, camera trap locations, and VCPs using handheld GPS units. The drone imagery was ground-truthed against field observations and integrated into GIS software (QGIS) to generate habitat polygons. These polygons were categorized according to vegetation type, canopy cover, fragmentation status, and visible anthropogenic features.

Supplementing formal survey methods, opportunistic sampling was conducted throughout the assessment period. All incidental wildlife observations made during travel between zones, rest periods, and other non-survey times were logged. Additionally, semi-structured interviews were held with site staff and long-term residents to collect anecdotal records of fauna observed over time. These qualitative data were used to contextualize field results and identify species or behaviours not observed during the formal sampling window.

Together, this integrative methodology provided a robust dataset across multiple taxa, temporal periods, and habitat types, forming the baseline for biodiversity inventory and ecological analysis at the Ambuluwawa Biodiversity Complex.

22. Setting and baiting Sherman traps

23. Collecting flora samples for identification



24. Photographing indirect animal signs such as track marks and burrows

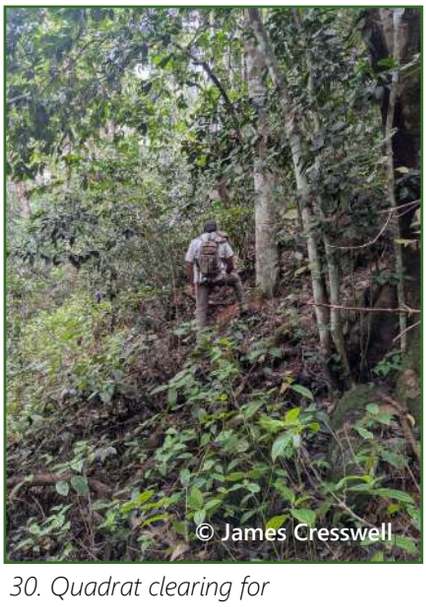
25. Positioning and setting camera traps

26. Documenting animal scat—Lutra lutra (Eurasian Otter)

27. Checking Sherman traps in early morning

28. Recording flora along line transects

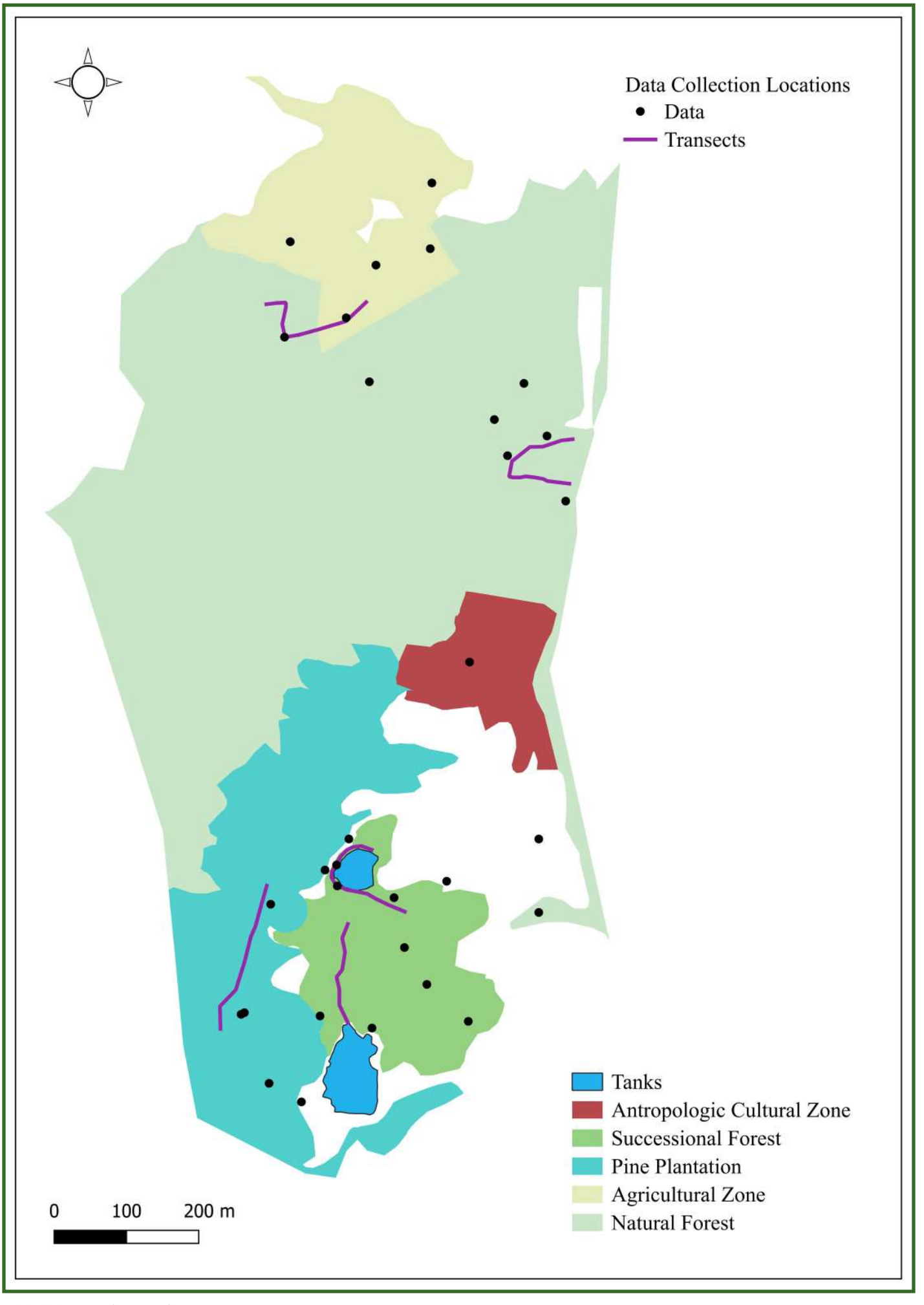
29. Opportunistic sampling conducted in between transects



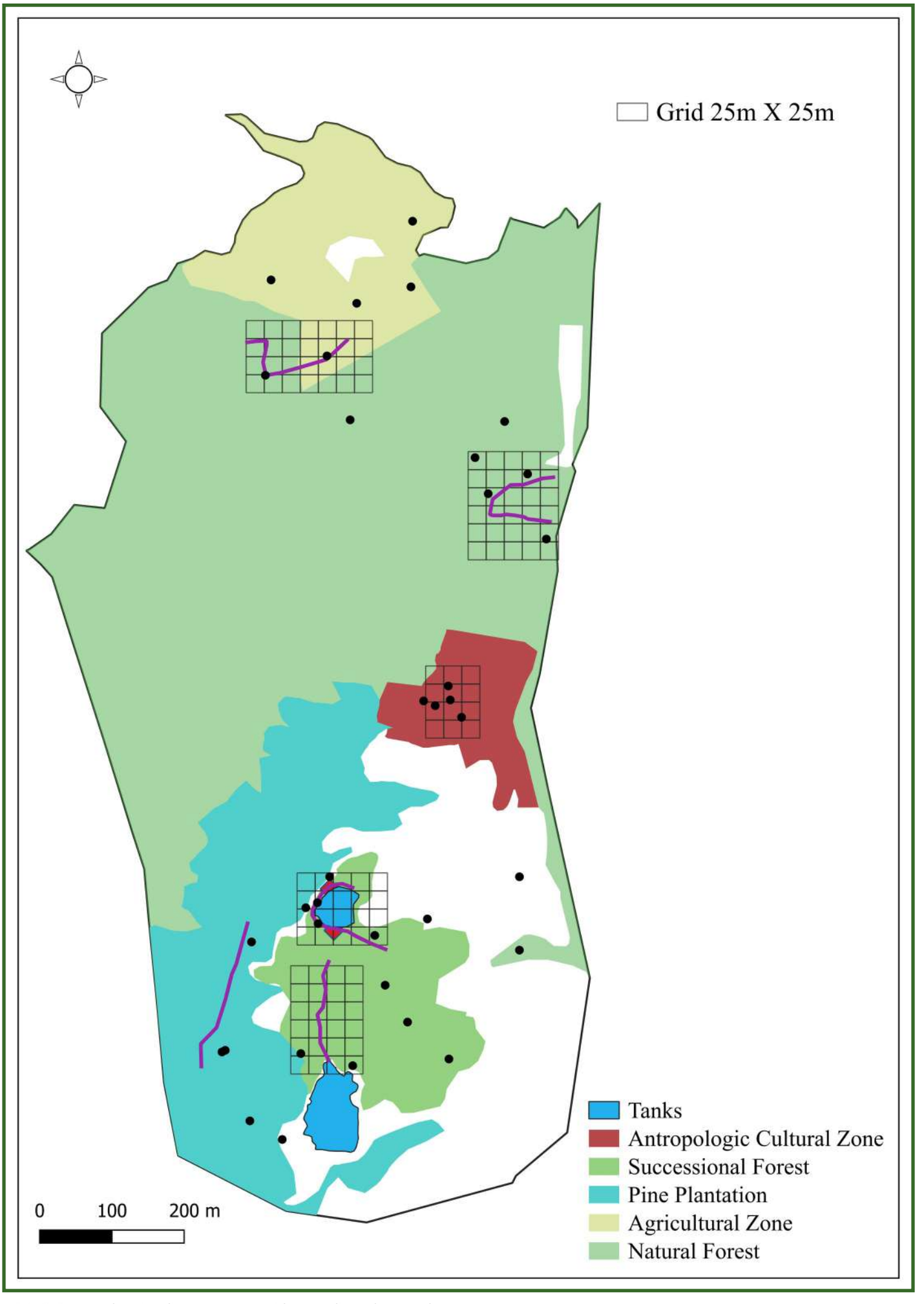
30. Quadrat clearing for herpetofauna

31. Baited and set Sherman trap

32.. Drone flights for habitat type and extent assessment



33. GIS map showing line transects



34. GIS map showing line transects with sampling plot quadrats

6. Results

6.1 Major Natural Habitats of Ambuluwawa

The Ambuluwawa Biodiversity Complex supports a mosaic of natural and secondary habitats shaped by topography and historical land use. The dominant ecosystem is the Lowland Wet Evergreen Forest, a wet-zone forest type below 900 m, rich in endemic flora such as *Cinnamomum verum* and *Syzygium rubicundum* [4]. Rock outcrop forests, an edaphic variant, occur on exposed slopes [18]. In addition, secondary forests on abandoned tea lands and pine plantations transitioning into mixed stands provide novel habitats, while agroforestry mosaics integrate native and exotic species. These habitats sustain high biodiversity but are increasingly threatened by invasive alien species [19].

6.1.1 Lowland Wet Evergreen Forests

The ABCs ecosystems reflect a complex interplay between natural forest cover, historical land use practices, and edaphic conditions. Notably, extensive areas have been influenced by former pine plantations, tea cultivation, and agriculture, creating a landscape matrix where remnant forest patches persist within a human-modified environment. Despite these disturbances, the region retains floristic elements strongly representative of Sri Lanka's Lowland Wet Evergreen Forests (LWEFs)—one of the country's most ecologically significant forest types, as defined in the Sri Lanka National Biodiversity Strategic Action Plan [17].

LWEFs are typically found in the southwestern wet zone below 900 m elevation and are characterized by high rainfall (>2,500 mm annually), multi-layered canopies, and extremely high species richness and endemism. The Ambuluwawa forest, although situated at the ecotone between lowland and montane zones, contains key LWEF indicator species, suggesting ecological connectivity. Further, rock outcrop forests—recognized in the NBSAP as an edaphic variant of LWEFs—are present in the complex and contribute to the habitat heterogeneity. These rocky outcrops support specialized plant assemblages adapted to shallow soils and exposure, thereby enhancing the biodiversity value of the area.

Floristic surveys within Ambuluwawa have recorded numerous species emblematic of LWEFs, including *Cinnamomum verum* and *Litsea ligustrina* (Lauraceae), *Mallotus philippensis*, *Mallotus rhamnifolius* (Euphorbiaceae), and *Syzygium rubicundum* (Myrtaceae). Several of these species are endemic or near-endemic and are considered of conservation concern. The presence of understorey taxa like *Psychotria nigra* (Rubiaceae), canopy dominants such as *Palaquium canaliculatum* (Sapotaceae), and structural species like *Calamus thwaitesii* (Arecaceae) illustrate the compositional and vertical complexity typical of lowland rainforests.

35. Patch of natural Lowland Wet Evergreen Forest

The forest also acts as a refuge for threatened species that are increasingly rare in the more fragmented lowland wet zone. As highlighted by floristic studies, nearly 85% of tree species in these habitats exhibit restricted altitudinal distributions, with endemism and vulnerability increasing at both low and high elevations [20].

Given the patchy distribution of primary vegetation and strong anthropogenic legacy, conservation of this forest mosaic is critical. The NBSAP emphasizes protecting such transitional and edaphic habitats, which serve as genetic reservoirs, buffers against climatic shifts, and nodes of ecological connectivity [17].

6.1.2 Successional Forest on Former Tea Land

The successional forest community documented on former tea land represents a transitional ecosystem type best described as a Secondary Successional Lowland Wet Evergreen Forest. These forests emerge on abandoned plantations or degraded agricultural landscapes in Sri Lanka's wet zone, where natural regeneration and species colonization gradually reconstitute forest cover. According to the NBSAP, secondary forests are vital components of the island's biodiversity mosaic, functioning as ecological buffers, wildlife corridors, and reservoirs of genetic diversity [17].

The checklist from the study site reveals a mixture of pioneer colonizers, native canopy species, exotic ornamentals, and invasive alien species (IAS). Endemic and native taxa such as *Centella asiatica* (Apiaceae), *Cyathula prostrata* (Amaranthaceae), *Lannea coromandelica* (Anacardiaceae), and *Ichnocarpus frutescens* (Apocynaceae) reflect natural regeneration typical of successional wet evergreen forests. These species play crucial ecological roles by stabilizing soils, facilitating nutrient cycling, and preparing conditions for later-successional dominants.

Alongside these, several exotic species—including *Odontonema tubaeforme*, *Thunbergia erecta* (Acanthaceae), and *Dieffenbachia seguine* (Araceae)—were recorded. While many exotics are remnants of horticultural or plantation introductions, their persistence within regenerating forests reflects the altered ecological trajectories of secondary succession. The Sri Lanka Biodiversity Profile notes that exotic ornamentals and fruit trees often integrate into forest regrowth, influencing both structure and species interactions.

A particularly significant finding is the dominance of IAS such as *Alstonia macrophylla*. Originally introduced for timber, *A. macrophylla* has spread widely across disturbed wet-zone forests, often reaching canopy dominance. Although it can act as a nurse tree in early successional stages, facilitating shade and microclimate regulation, its proliferation risks suppressing native late-successional species, thereby altering forest composition and long-term resilience [21]. Similar impacts have been documented in secondary forests beneath pine plantations, where IAS like *Miconia crenata* dominate the understory [22].

The ecological significance of these successional assemblages is underscored by national conservation frameworks. The NBSAP emphasizes that secondary forests, despite their altered floristics, are critical for sustaining ecosystem services and biodiversity outside protected areas. Furthermore, studies on Sri Lankan successional landscapes demonstrate that such forests contribute to carbon sequestration, soil conservation, and provision of habitats for pollinators and frugivores [23].

Thus, the successional forest on former tea land illustrates both the opportunities and challenges of forest recovery in anthropogenic landscapes. Its species composition reflects a hybrid ecosystem: native regeneration intertwined with exotic remnants and IAS pressures. Active management—particularly IAS control—will be crucial to guide these forests towards functional analogues of natural lowland wet evergreen forests, safeguarding biodiversity and ecosystem resilience.

36. Former tea lands as a secondary successional forest featuring IAS A. Macrophylla

37. Secondary successional forest bisected by road

6.1.3 Lowland-to-midland agroforests

Agroforestry systems in Sri Lanka—especially home gardens—are multifunctional landscapes that integrate trees, crops, and sometimes livestock, contributing both to rural livelihoods and biodiversity conservation. The flora recorded in this study's "agroforestry site" represents a species composition typical of lowland-to-midland home garden agroforests. Such systems act as a buffer between natural forests and intensive agriculture, fostering a mosaic of species across canopy layers.

38. Overhead of lowland-midland agroforestry showing mosaic canopy layers

The recorded flora includes native and endemic species such as ***Centella asiatica***, ***Calamus thwaitesii,*** and ***Caryota urens***, which provide traditional food, medicine, and materials. Species like ***Cynometra cauliflora*** (Fabaceae) and ***Glycosmis pentaphylla*** (Rutaceae) further indicate the persistence of native biodiversity elements in this modified landscape. The presence of these species reflects the ecological resilience of Sri Lankan agroforests, especially in wet and intermediate climatic zones.

39. Ground herb layer featuring IAS

A distinctive feature of the list is the dominance of exotic species, including ***Citrus maxima***, ***Artocarpus heterophyllus***, and ***Mangifera indica***, which are widely cultivated for fruit production. These exotics, while non-invasive in many cases, shape the economic utility of the homegarden and are deeply embedded in traditional agroecosystems.

However, several IAS were also observed, such as ***Chromolaena odorata***, ***Tithonia diversifolia***, and ***Austroeupatorium inulifolium***. These fast-growing species are known for their aggressive colonization of disturbed soils and can suppress native regeneration and reduce plant diversity. According to Bambaradeniya (2002), ***Chromolaena odorata*** and ***Tithonia diversifolia*** are among Sri Lanka's most ecologically disruptive IAS, often forming dense monocultures in abandoned or disturbed agro-ecological niches [24]

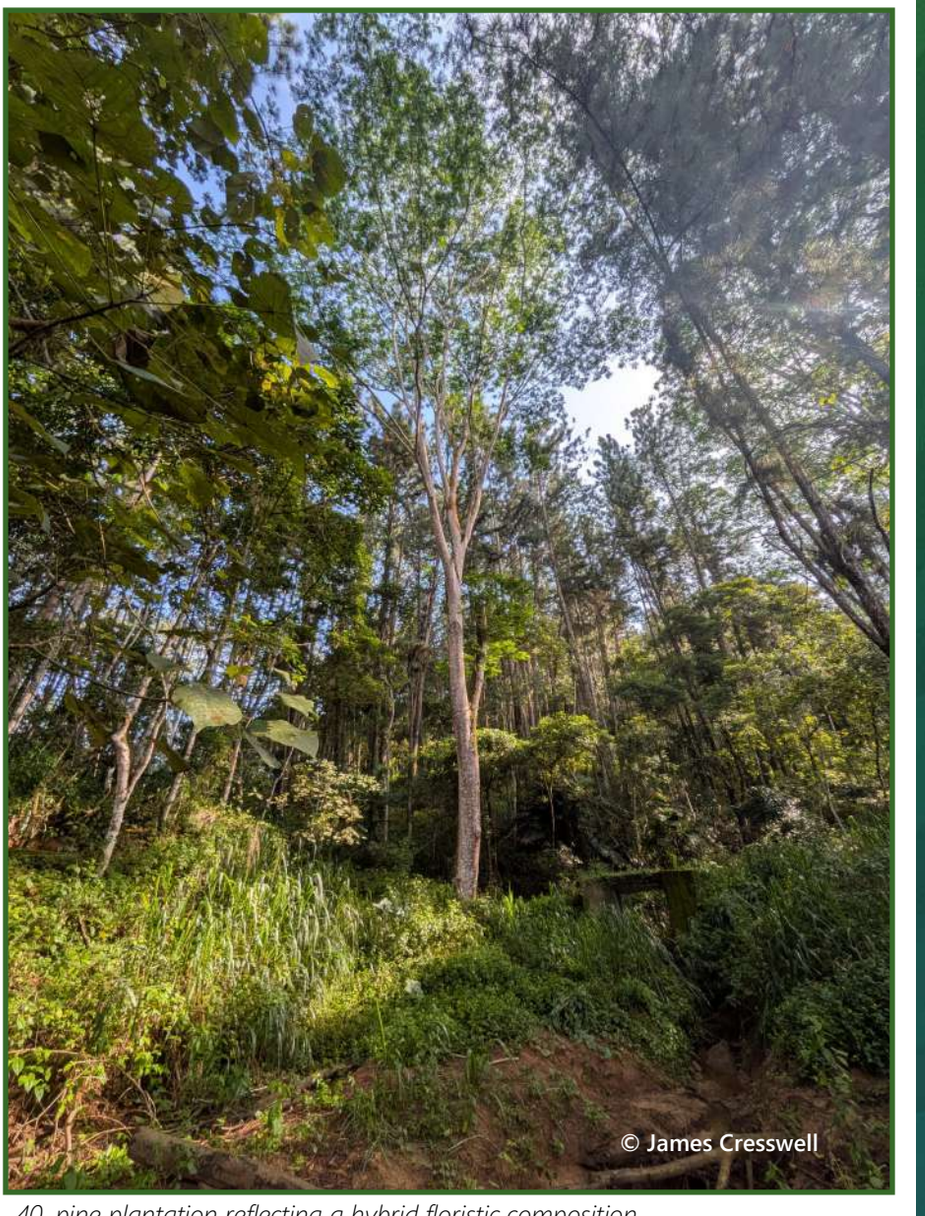
The composition observed aligns with descriptions of agroforests provided in the Sri Lanka Biodiversity Profile. The profile highlights how agroforests provide ecological services such as erosion control, pollinator support, and carbon sequestration, while hosting a diversity of over 70 plant species in a single home garden landscape [25].

From a policy standpoint, the NBSAP (2016–2022) recognizes agroforestry systems as a priority for biodiversity conservation outside of protected areas. These systems enhance climate resilience, especially in smallholder landscapes facing erratic rainfall and temperature shifts [23]

6.1.4 Pine Plantation Forest

Pine plantations in Sri Lanka, established mainly during the mid-20th century for timber and soil stabilization in degraded uplands, represent an artificial forest type with complex successional dynamics. Over time, many plantations have developed into mixed secondary forests due to natural regeneration and undergrowth colonization. The NBSAP recognizes such modified ecosystems as ecologically significant, despite their anthropogenic origin, because they provide habitats for native flora and fauna, serve as buffer zones, and contribute to landscape connectivity [17].

The species checklist from the pine plantation reflects a hybrid floristic composition, where native, exotic, and invasive alien species coexist (fig 40). Among the notable native and endemic species are *Cyathula prostrata* (Amaranthaceae), a medicinal herb; *Calamus thwaitesii* (Arecaceae), a climbing rattan endemic to Sri Lanka; and *Psiadia ceylanica* (Asteraceae), a shrub adapted to moist forests. These species indicate ongoing natural regeneration beneath the pine canopy, where microhabitats allow colonization of shade-tolerant understory plants.



40. pine plantation reflecting a hybrid floristic composition

In contrast, the list also includes exotic species such as *Pinanga coronata*, a palm introduced from Southeast Asia, and *Mikania cordata*, a fast-growing vine. These species, while non-native, are commonly integrated into Sri Lankan novel ecosystems. The persistence of exotics within pine plantations reflects altered successional pathways where introduced plants exploit ecological niches not filled by native taxa.

Of particular ecological concern is the proliferation IAS. *Alstonia macrophylla* (Apocynaceae), initially introduced for timber, has become a dominant invasive in wet-zone forests, altering canopy dynamics. Similarly, *Mimosa pigra* and *Miconia crenata* are aggressive invaders known for displacing native vegetation, while *Sphagneticola trilobata* forms dense ground cover that suppresses native herbs and seedlings. These IAS reduce biodiversity and compromise the recovery of natural forest structure, a trend highlighted in Sri Lanka's Biodiversity Profile and national IAS management reports.

Interestingly, the mixed species structure of pine plantations also shows affinities with agroforestry systems, where native trees, exotics, and economic species coexist in layered canopies. Like homegarden agroforests, pine plantations undergoing succession contribute to ecosystem services such as soil stabilization, carbon sequestration, and provision of non-timber forest products (e.g., rattan from *Calamus thwaitesii*).

6.1.5 Cultural Area Vegetation

The flora documented in the cultural area of the Ambuluwawa Biodiversity Complex reflects a highly modified vegetation type that integrates native, exotic, and invasive species within a cultural and semi-managed setting. Unlike natural forests, these habitats are shaped by religious, aesthetic, and utilitarian planting traditions, often forming novel agroforestry-like ecosystems. According to the NBSAP, such systems, although anthropogenic, contribute significantly to biodiversity conservation, ecological connectivity, and cultural ecosystem services in human-modified landscapes (fig 41).

The checklist reveals the coexistence of native and endemic species alongside exotics. *Centella asiatica* (Apiaceae), an indigenous herb widely used in traditional medicine, and *Corypha umbraculifera* (Arecaceae), a culturally significant palm, represent native elements that persist in these landscapes. These species demonstrate the ecological resilience of cultural areas, which often act as reservoirs for useful and medicinal plants.

A dominant component of the flora consists of exotic cultivated species, such as *Mangifera indica* (mango), *Cocos nucifera* (coconut), *Elaeis guineensis* (oil palm), *Phoenix dactylifera* (date palm), and *Plumeria rubra/obtusa* (frangipani). These species, frequently planted around temples and settlements, contribute food, materials, or ornamental value (fig 42). The Sri Lanka Biodiversity Profile notes that such exotics, though not native, are embedded in cultural traditions and form part of rural biodiversity mosaics. Their widespread presence reflects both colonial introductions and longstanding agro-cultural practices.

However, the list also highlights the presence of IAS, most notably *Pistia stratiotes* (water lettuce). This floating aquatic plant is recognized as a major IAS in Sri Lanka, capable of rapidly colonizing water bodies, impeding native aquatic biodiversity, and disrupting ecosystem functions [24]. The incorporation of IAS into cultural areas underscores the ecological risks associated with uncontrolled introductions and management gaps.

Structurally, the species assemblage resembles agroforestry systems, where canopy layers are formed by palms (*Cocos nucifera, Elaeis guineensis*), fruit trees (*Mangifera indica*), and ornamentals (*Plumeria spp*.), while ground cover includes medicinal herbs like *Centella asiatica*. This layered vegetation provides multiple ecological services, such as shade, microclimate regulation, soil retention, and resources for pollinators. Studies on Sri Lankan homegardens demonstrate similar structural parallels, with more than 60–80 species recorded in culturally managed plots [26].

From a conservation perspective, these cultural landscapes cannot substitute for intact Lowland Wet Evergreen Forests but play a vital complementary role. The NBSAP highlights their importance as ecological buffers and stepping stones that enhance habitat connectivity in fragmented landscapes. Additionally, they sustain plant species of religious, cultural, and medicinal significance, contributing to both biodiversity conservation and local livelihoods.

The cultural area vegetation of Ambuluwawa represents a novel agroforestry-like ecosystem, shaped by cultural values and human management. Its floristic composition combines native medicinal plants, exotic economic species, and IAS, creating both opportunities and challenges for biodiversity management. Integrating these cultural landscapes into national conservation planning will be critical for sustaining biodiversity, ecosystem services, and cultural heritage in Sri Lanka's human-modified environments.

41. novel agroforestry-like ecosystems, contributing significantly to biodiversity conservation, ecological connectivity, and cultural ecosystem services in a human-modified landscape

42. Planting around temples and settlements, contributes food, materials, or ornamental value

6.2 Flora diversity in Ambuluwawa Biodiversity Complex

The flora of Ambuluwawa represents a diverse assemblage of 211 plant species belonging to 69 families, reflecting the ecological heterogeneity of the landscape. Of these, 14 species are endemic to Sri Lanka, emphasizing the conservation value of this area as a refuge for unique floral elements. Indigenous species form the majority (109), while 81 are introduced exotics and seven are identified as invasive alien species, indicating both native richness and human-mediated alterations. Among the nationally threatened flora, 1 Critically Endangered, 2 Endangered, and 10 Vulnerable species have been documented, alongside 7 Near Threatened taxa. The Critically Endangered species, *Shorea stipularis*, is particularly noteworthy, as it represents a rare and restricted component of Sri Lanka's Dipterocarp forests. The highest species richness is recorded in cultural sites (99 species) and agriculture (82 species), followed by successional forests (80 species) and natural forests (67 species), with pine plantations harboring only 11 species. These patterns indicate that while modified landscapes support high species counts due to exotics, the natural and successional forests sustain the greatest concentrations of endemics and threatened flora, highlighting their critical role in biodiversity conservation.

TABLE 2: SUMMARY STATUS OF FLORA SPECIES RECORDED IN THE AMBULUWAWA BIODIVERSITY COMPLEX

Taxa	Number of Families	Number of Species	Species Status (SpS)				National Red List of Sri Lanka (NRL)						
			END	IND	IAS	EXO	CR	EN	VU	NT	LC	DD	NE
Flora	69	212	14	110	7	81	1	2	11	7	94	1	7

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

TABLE 3: SUMMARY STATUS OF FLORA SPECIES RECORDED IN THE SAMPLING LOCATIONS IN AMBULUWAWA BIODIVERSITY COMPLEX

Location	Number of Families	Number of Species	Species Status (SpS)				National Red List of Sri Lanka (NRL)						
			END	IND	IAS	EXO	CR	EN	VU	NT	LC	DD	NE
Cultural	50	99	2	40	4	53	0	1	1	2	33	1	
Natural Forest	38	67	9	50	4	3	1	1	7	3	45		3
Successional Forest on Former Tea	41	80	3	42	6	29	0	0	4	2	36		
Agriculture	38	82	4	42	7	29	0	1	3	1	37	1	
Pine plantation	8	11	1	3	4	3	1	0	2	0	1		

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

TABLE 4: TOTAL SUMMARY OF FLORA SPECIES RECORDED IN THE NATURAL FORESTS IN AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	Scientific Name	Common Name (NRL 2020)		NRL	SpS
			English name	Sinhala Names		
1	Anacardiaceae	*Lannea coromandelica (Houtt.) Merr*		Hik	LC	IND
2	Anacardiaceae	*Mangifera zeylanica (Blume) Hook.f.*		Atamba, Wal atamba, Wal Amba	LC	END
3	Anacardiaceae	*Nothopegia beddomei Gamble*		Bala, Andum Teageddi, Homepenela, Kaluthella, Wal Amba	LC	IND
4	Apocynaceae	*Alstonia macrophylla Wall. ex G.Don*		Hawari Nuga, Yakadamaran, Attoniya, Gini-kuru gas		IAS
5	Apocynaceae	*Hunteria zeylanica (Retz.) Gardner ex Thwaites*		Mediya, Wal-mediya, Wal waraka	NT	IND
6	Arecaceae	*Calamus thwaitesii Becc.*		Kath wel, Ma wewel, Puwak wel, Wanduru wel	VU	IND
7	Arecaceae	*Oncosperma fasciculatum Thwaites*		Katu Kithul	VU	END
8	Aristolochiaceae	*Aristolochia indica L.*		Sapsanda, Sas sanda, Sananda	LC	IND
9	Aristolochiaceae	*Thottea siliquosa (Lam.) Ding Hou*		Wisa-Kumba, Thapasara Bu-lath, Kepum keeriya	LC	IND
10	Asparagaceae	*Chlorophytum laxum R.Br.*			VU	IND
11	Asphodelaceae	*Dianella ensifolia (L.) Redouté*		Monara-petan, Dutu Sathutu, Monara Pahuru, Atan Pahuru	LC	IND
12	Calophyllaceae	*Mesua ferrea L.*	Ceylon iron-wood			IND
13	Cannabaceae	*Celtis philippensis Blanco*		Meditella	LC	IND
14	Cannabaceae	*Celtis timorensis Span.*		Gurenda	LC	IND
15	Connaraceae	*Rourea minor (Gaertn.) Merr.*		Goda-kirindi, Kirindi wel	LC	IND
16	Cornaceae	*Alangium hexapetalum Lam.*		Rukkanguna, Ruk Anguna, Kotalanga, Path Anguna	VU	IND
17	Dioscoreaceae	*Dioscorea pentaphylla L.*		Katu-ala, Katu-wala-ala	LC	IND
18	Elaeocarpaceae	*Elaeocarpus serratus L.*	Ceylon olive	Weralu	LC	IND
19	Euphorbiaceae	*Homalanthus populifolius Graham*		Gini-kenda, Kanda		EXO
20	Euphorbiaceae	*Mallotus philippensis (Lam.) Müll.Arg.*		Hamparilla, Mo-labe, Kampilla, Kuduwelanga	LC	IND
21	Euphorbiaceae	*Mallotus rhamnifolius (Willd.) Müll.Arg.*		Molabe, Bulu-hulu-keppetiya	LC	IND
22	Gentianaceae	*Fagraea ceilanica Thunb.*		Etamburu, Etamuru	NT	IND
23	Lamiaceae	*Clerodendrum infortunatum L.*		Gas Pinna, Pin-na,	LC	IND
24	Lauraceae	*Cinnamomum verum J.Presl*	True cinna-mon	Kurundu, Path Kurundu	VU	END
25	Lauraceae	*Litsea ligustrina (Nees) Fern.- Vill*		Rat Keliya	LC	IND
26	Lauraceae	*Neolitsea cassia (L.) Kosterm.*		Dawul Kurundu, Kadu dawula, Nika Dawula, Wal Kurundu	LC	IND

27	Malpighiaceae	*Hiptage benghalensis (L.) Kurz*	Hiptage	Puwak-Gediya-wel, Puwak Gediya wel	LC	IND
28	Malvaceae	*Bombax ceiba L.*	Red silk-cotton tree	Katu Imbul, Ela Imbul	LC	IND
29	Malvaceae	*Cullenia ceylanica (Gardner) Wight ex K.Schum.*		Katuboda	LC	END
30	Malvaceae	*Cullenia rosayroana Kosterm.*		Katuboda, Ma-hanatu Katubo-da	LC	END
31	Malvaceae	*Grewia carpinifolia Juss.*		Wel-keliya, Wel -mediya	LC	IND
32	Malvaceae	*Hibiscus surattensis L.*		Hin-napiriththa	LC	IND
33	Malvaceae	*Microcos paniculata L.*		Kelia, Kohu-kirilla, Kohikiril-la	LC	IND
34	Malvaceae	*Pterospermum suberifolium (L.) Rae-usch.*		Welang, Welan, Gal-welang, Katu-welanga, Ee	LC	IND
35	Melastomataceae	*Miconia crenata (Vahl) Michelang.*		Katakalu-Bovotiya		IAS
36	Melastomataceae	*Osbeckia octandra DC.*		Bowitiya. Heen bovitiya	LC	END
37	Menispermaceae	*Anamirta cocculus (L.) Wight & Arn.*		Titta-wel	LC	IND
38	Menispermaceae	*Cyclea peltata (Lam.) Hook.f. & Thomson*		Kehipiththan, Kaha-Pittan, Kehi-pittan, Kessi-pissan	LC	IND
39	Moraceae	*Ficus nervosa*		Kalu Maduwa, Kala-madu, Kiri Mediya		IND
40	Myristicaceae	*Myristica fragrans Houtt.*	Nutmeg	Sadikka		EXO
41	Ochnaceae	*Campylospermum serra-tum (Gaertn.) Bittrich & M.C.E.Amaral*		Bo-kera, Go-kera	LC	IND
42	Oleaceae	*Jasminum angustifoli-um var. sessiliflorum (Vahl) P.S.Green*			EN	IND
43	Oleaceae	*Jasminum flexile Vahl*			LC	IND
44	Poaceae	*Megathyrsus maximus (Jacq.) B.K.Simon & S.W.L.Jacobs*	Guinea grass	Gini tana / Rata tana		EXO
45	Rhamnaceae	*Ziziphus rugosa Lam.*		Maha Eraminia, Maha Era	NT	IND
46	Rubiaceae	*Canthium coromandelicum (Burm.f.) Alston*		Kara	LC	IND
47	Rubiaceae	*Mussaenda frondosa L.*		Mussenda, Mus -Wenna, Wel-Butsarana	LC	IND
48	Rubiaceae	*Psydrax dicoccos var. dicoccos*			LC	IND
49	Rubiaceae	*Wendlandia bicuspidata Wight & Arn.*		Rawan idala, Wana-idala, Rath veni dala	LC	IND
50	Rutaceae	*Acronychia pedunculata (L.) Miq.*		Ankenda	LC	IND
51	Rutaceae	*Atalantia ceylanica (Arn.) Oliv.*		Yakinaran, Wal-dehi, Yati-naran, Yak dehi	LC	IND
52	Rutaceae	*Glycosmis pentaphylla (Retz.) DC.*		Dodan Pana	LC	IND
53	Sapindaceae	*Dimocarpus longan subsp. lon-gan Lour.*	Longan	Mora, Rasa-mora, Peni Mo-ra	LC	IND
54	Smilacaceae	*Smilax perfoliata Lour.*		Maha Kabarasa	LC	IND
55	Smilacaceae	*Smilax zeylanica L.*		Kabarossa / Heen kabaros-sa, Katu Dalu	LC	IND

56	Staphyleaceae	*Turpinia malabarica Gamble*		Eta-hirilla, Kankumbala, Geria, Kukul gatha, Etahirilla, Etahiriya	LC	IND
57	Thymelaeaceae	*Gyrinops walla Gaertn.*	Agarwood	Patta walla, Walaha / Walla patta, Walla,	VU	IND
58	Thymelaeaceae	*Wikstroemia indica (L.) C.A.Mey.*				IND
59	Verbenaceae	*Lantana camara subsp. aculeata (L.) R.W.Sanders*	Lantana	Ganda pana,		IAS
60	Vitaceae	*Leea indica (Burm.f.) Merr.*		Burulla, Gurulla	LC	IND
61	Celastraceae	*Euonymus walkeri Wight*		Namahonda	LC	END
62	Moraceae	*Ficus diversiformis Miq.*			LC	IND
63	Asteraceae	*Sphagneticola trilobata (L.) Pruski*	Singapore daisy	Udaya kumari, Kaha karabu, Arunadevi		IAS
64	Rubiaceae	*Tarenna asiatica (L.) Kuntze ex K.Schum.*		Tarana, Maha Tarana, Tarani	LC	IND
65	Rutaceae	*Zanthoxylum asiaticum*		Kudu Miris, Kudu Mirisa, Kudu Miriya	LC	IND
66	Acanthaceae	*Strobilanthes walkeri var. walkeri Arn. ex Nees*			VU	END
67	Convolvulaceae	*Argyreia hancorniifolia Gardner ex Thwaites*			CR	END

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

TABLE 5: TOTAL SUMMARY OF FLORA SPECIES RECORDED IN THE SUCCESSIONAL FOREST ON FORMER TEA LAND IN AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	Scientific Name	Common Name (NRL 2020)		NRL	SpS
			English name	Sinhala Names		
1	Acanthaceae	*Asystasia gangetica (L.) T.Anderson*		Puruk, Rila puruk	LC	IND
2	Acanthaceae	*Odontonema tubaeforme (Bertol.) Kuntze*				EXO
3	Acanthaceae	*Thunbergia erecta (Benth.) T.Anderson*		Kothala, Padikkam Mal, Neela Warna		EXO
4	Amaranthaceae	*Cyathula prostrata (L.) Blume*		Bin karal heba	VU	IND
5	Anacardiaceae	*Lannea coromandelica (Houtt.) Merr*		Hik	LC	IND
6	Apiaceae	*Centella asiatica (L.) Urb.*	Asiatic pennywort	Gotukola, Hin-Gotukola	LC	IND
7	Apocynaceae	*Alstonia macrophylla Wall. ex G.Don*		Hawari Nuga, Yakadamaran, Attoniya, Ginikuru gas		IAS
8	Apocynaceae	*Alstonia scholaris (L.) R.Br.*	Devil's tree	Ruk Attana, Eth mada, Gas rukaththana, Eht Demata, Rukattana	LC	IND

9	Apocynaceae	*Ichnocarpus frutescens (L.) W.T.Aiton*		Gerandi-Dul, Gopi, Kiri-wel, Priyawarna, Maha Ira-musuwel, Kalu Iramusu	LC	IND
10	Araceae	*Dieffenbachia seguine (Jacq.) Schott*				EXO
11	Arecaceae	*Areca catechu L.*	Betel-nut palm	Puwak		EXO
12	Arecaceae	*Areca triandra Roxb. ex Buch.-Ham.*		Len teri, Leen-beri , Lena Pu-wak, Dotalu, Dotalu puwak, Very Eta (වෙරි ඇට),		EXO
13	Arecaceae	*Calamus thwaitesii Becc.*		Kath wel, Ma wewel, Puwak wel, Wanduru wel	VU	IND
14	Arecaceae	*Caryota urens L.*	Fishtail palm	Kithul	LC	IND
15	Aristolochiaceae	*Aristolochia ringens Vahl*		Gurulu Raja		EXO
16	Asparagaceae	*Dracaena fragrans (L.) Ker Gawl.*		Bothal Gaha, Madara		EXO
17	Asphodelaceae	*Dianella ensifolia (L.) Redouté*		Monara-petan, Dutu Sathutu, Monara Pahu-ru, Atan Pahu-ru	LC	IND
18	Asteraceae	*Austroeupatorium inulifoli-um (Kunth) R.M.King & H.Rob.*		Pathan Palu, Podisinnoma-ran, Patas,		EXO
19	Asteraceae	*Cyanthillium cinereum (L.) H.Rob.*		Maugul-Kumburu-venna, Mono-rakudumbiya, Watu-palu	LC	IND
20	Asteraceae	*Psiadia ceylanica (Arn.) Grierson*		Pupula, Kaha Pupula	LC	IND
21	Asteraceae	*Tithonia diversifolia (Hemsl.) A.Gray*		Wal-sooriyakantha,		IAS
22	Balsaminaceae	*Impatiens balsamina L.*		Kudalu-kola, Badarath kudalu, Kudalu		EXO
23	Calophyllaceae	*Mesua ferrea L.*	Ceylon iron-wood			IND
24	Cannabaceae	*Trema orientale (L.) Blume*	Trema	Gadumba	LC	IND
25	Clusiaceae	*Clusia rosea Jacq.*		Gal Goraka, Gal Pilila,		IAS
26	Combretaceae	*Terminalia catappa L.*	Indian almond	Kottamba / Kottan		EXO
27	Euphorbiaceae	*Croton laccifer L.*		Gas-Keppetiya, Keppetiya		IND
28	Euphorbiaceae	*Euphorbia hirta L.*		Bu dada kiriya, Budadakiriya, Kepumkiriya		EXO
29	Euphorbiaceae	*Macaranga indica Wight*		Kenda, Bu Kenda, Wavul Kenda	LC	IND

30	Euphorbiaceae	*Macaranga peltata (Roxb.) Müll.Arg.*		Kenda, Pat-Kena, Pat-Kenda, Ambalan (Monaragala)	LC	IND
31	Euphorbiaceae	*Microstachys chamaelea (L.) Müll.Arg.*		Rat-pitawakka	LC	IND
32	Fabaceae	*Acacia auriculiformis A.Cunn. ex Benth.*				EXO
33	Fabaceae	*Acacia mangium Willd.*		Acacia		EXO
34	Fabaceae	*Arachis pintoi Krapov. & W.C.Greg.*				EXO
35	Fabaceae	*Calliandra houstoniana var. calothyrsus (Meisn.) Barneby*				EXO
36	Fabaceae	*Crotalaria multiflora Benth.*			VU	IND
37	Fabaceae	*Mimosa pudica L.*	Sensitive plant	Nidikumba		EXO
38	Gentianaceae	*Exacum trinervium (L.) Druce*		Binara, Ginihiriya, Bindara,	NT	END
39	Heliconiaceae	*Heliconia psittacorum L.f.*	Parrot's beak heliconia			EXO
40	Lamiaceae	*Clerodendrum chinense (Osbeck) Mabb.*				EXO
41	Lamiaceae	*Clerodendrum infortunatum L.*		Gas Pinna, Pinna,	LC	IND
42	Lamiaceae	*Tectona grandis L.f.*		Thekka, Takku		EXO
43	Lauraceae	*Litsea ligustrina (Nees) Fern.- Vill*		Rat Keliya	LC	IND
44	Lauraceae	*Neolitsea cassia (L.) Kosterm.*		Dawul Kurundu, Kadu dawula, Nika Dawula, Wal Kurundu	LC	IND
45	Lecythidaceae	*Careya arborea Roxb.*	Ceylon oak	Kahata	LC	IND
46	Malvaceae	*Hibiscus surattensis L.*		Hin-napiriththa	LC	IND
47	Malvaceae	*Microcos paniculata L.*		Kelia, Kohu-kirilla, Kohikirilla	LC	IND
48	Malvaceae	*Urena lobata subsp. lobata*	Caesar weed	Patta-epala, Epala	LC	IND
49	Melastomataceae	*Melastoma malabathricum subsp. malabathricum*	Indian rhododendron	Bovitiya, Katakalu-Bowitiya, Maha Bowitiya,	LC	IND
50	Melastomataceae	*Miconia crenata (Vahl) Michelang.*		Katakalu-Bovotiya		IAS
51	Melastomataceae	*Osbeckia aspera Blume*		Bowitiya, Gal Bovitiya	NT	IND
52	Melastomataceae	*Osbeckia octandra DC.*		Bowitiya. Heen bovitiya	LC	END
53	Meliaceae	*Cipadessa baccifera (Roth) Miq.*		Hal Bembiya, Baderuda, Re venna, Hal Beri, Bara gas, Lihiniya	LC	IND
54	Meliaceae	*Toona sinensis (Juss.) M.Roem.*	Chinese mahogany	Rathu Toona		EXO

55	Moraceae	*Ficus callosa Willd.*		Wal Gona, Gonna, Kiri Gonna, Kos Gonna, Wal Attikka	LC	IND
56	Moraceae	*Ficus racemosa L.*	Cluster fig	Attikka, Aththikka, Udumbara, Dimbul	LC	IND
57	Muntingiaceae	*Muntingia calabura L.*	Jamaican cherry	Jam		EXO
58	Oleaceae	*Jasminum flexile Vahl*			LC	IND
59	Phyllanthaceae	*Antidesma bunius (L.) Spreng.*		Karawala-Kebella	LC	IND
60	Phyllanthaceae	*Breynia vitis-idaea (Burm.f.) C.E.C.Fisch.*		Gas kayila	LC	IND
61	Phyllanthaceae	*Phyllanthus myrtifolius (Wight) Müll.Arg.*		Gangawerella, Walas Andiriya	VU	END
62	Pittosporaceae	*Pittosporum ferrugineum W.T.Aiton*		Kaputu, Wal Handun		EXO
63	Poaceae	*Megathyrsus maximus (Jacq.) B.K.Simon & S.W.L.Jacobs*	Guinea grass	Gini tana / Rata tana		EXO
64	Proteaceae	*Grevillea robusta A.Cunn. ex R.Br.*	Silk oak	Sabukku		EXO
65	Rubiaceae	*Mussaenda frondosa L.*		Mussenda, Mus-Wenna, Wel-Butsarana	LC	IND
66	Sapindaceae	*Dimocarpus longan subsp. longan Lour.*	Longan	Mora, Rasa-mora, Peni Mora	LC	IND
67	Symplocaceae	*Symplocos acuminata (Blume) Miq.*		Bobu,Bombu, Wal bombu	LC	IND
68	Theaceae	*Camellia sinensis var. assamica (J.W.Mast.) Kitam.*	Assam tea	TEA		EXO
69	Thymelaeaceae	*Wikstroemia indica (L.) C.A.Mey.*				IND
70	Verbenaceae	*Lantana camara subsp. aculeata (L.) R.W.Sanders*	Lantana	Ganda pana,		IAS
71	Sapindaceae	*Filicium decipiens (Wight & Arn.) Thwaites*	Fern tree	Pihimbiya	LC	IND
72	Asteraceae	*Crassocephalum crepidioides (Benth.) S.Moore*		Iththeweriya, Wal Thampala		EXO
73	Asteraceae	*Sphagneticola trilobata (L.) Pruski*	Singapore daisy	Udaya kumari, Kaha karabu, Arunadevi		IAS
74	Euphorbiaceae	*Mallotus tetracoccus (Roxb.) Kurz*		Bu kenda	LC	IND
75	Rutaceae	*Melicope lunu-ankenda (Gaertn.) T.G.Hartley*		Lunu Ankenda	LC	IND
76	Rutaceae	*Murraya paniculata (L.) Jack*	Orange jessamine	Etteriya, Sinsapa	LC	IND
77	Acanthaceae	*Aphelandra sinclairiana Nees*				EXO
78	Acanthaceae	*Ecbolium ligustrinum (Vahl) Vollesen*		Kawu thumba, Ek Weraniya	LC	IND
79	Acanthaceae	*Hypoestes phyllostachya Baker*	Polka dot plant			EXO
80	Pinaceae	*Pinus caribaea Morelet*	Caribbean pine			EXO

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

TABLE 6: TOTAL SUMMARY OF FLORA SPECIES RECORDED IN THE AGRICULTURAL LAND IN AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	Scientific Name	Common Name (NRL 2020)		NRL	SpS
			English name	Sinhala Names		
1	Anacardiaceae	*Semecarpus nigroviridis Thwaites*		Geta badulla	LC	END
2	Apiaceae	*Centella asiatica (L.) Urb.*	Asiatic pennywort	Gotukola, Hin-Gotukola	LC	IND
3	Apocynaceae	*Alstonia macrophylla Wall. ex G.Don*		Hawari Nuga, Yakadamaran, Attoniya, Ginikurugas		IAS
4	Apocynaceae	*Alstonia scholaris (L.) R.Br.*	Devil's tree	Ruk Attana, Eth mada, Gas rukaththana, Eht Demata, Rukattana	LC	IND
5	Apocynaceae	*Ichnocarpus frutescens (L.) W.T.Aiton*		Gerandi-Dul, Gopi, Kiri-wel, Priyawarna, Maha Iramusuwel, Kalu Iramusu	LC	IND
6	Arecaceae	*Areca catechu L.*	Betel-nut palm	Puwak		EXO
7	Arecaceae	*Calamus thwaitesii Becc.*		Kath wel, Ma wewel, Puwak wel, Wanduru wel	VU	IND
8	Arecaceae	*Caryota urens L.*	Fishtail palm	Kithul	LC	IND
9	Asteraceae	*Austroeupatorium inulifolium (Kunth) R.M.King & H.Rob.*		Pathan Palu, Podisinnomaran, Patas,		EXO
10	Asteraceae	*Chromolaena odorata (L.) R.M.King & H.Rob.*		Podi singno maran		EXO
11	Asteraceae	*Cyanthillium cinereum (L.) H.Rob.*		Maugul-Kumburu-venna, Monorakudumbiya, Watu-palu	LC	IND
12	Asteraceae	*Tithonia diversifolia (Hemsl.) A.Gray*		Wal-sooriyakantha,		IAS
13	Cannabaceae	*Trema orientale (L.) Blume*	Trema	Gadumba	LC	IND
14	Cannaceae	*Canna hybrids*				EXO
15	Cleomaceae	*Cleome rutidosperma*			LC	IND
16	Clusiaceae	*Clusia rosea Jacq.*		Gal Goraka, Gal Pilila,		IAS
17	Clusiaceae	*Garcinia quaesita Pierre*		Goraka, Rat Gorka, Kana Goraka, Honda Goraka	LC	END
18	Combretaceae	*Terminalia arjuna (Roxb. ex DC.) Wight & Arn.*	Arjun	Kumbuk, Kumbalu	LC	IND
19	Combretaceae	*Terminalia catappa L.*	Indian almond	Kottamba / Kottan		EXO
20	Convolvulaceae	*Xenostegia tridentata (L.) D.F.Austin & Staples*		Hawari-madu, Heen-madu, Apasu madu	LC	IND
21	Dioscoreaceae	*Dioscorea alata L.*	Greater yam	Angili-ala, Dadndila		IND
22	Euphorbiaceae	*Croton laccifer L.*		Gas-Keppetiya, Keppetiya		IND

23	Euphorbiaceae	*Ricinus communis L.*	Castor oil plant	Endaru, Beth Endaru		EXO
24	Fabaceae	*Acacia mangium Willd.*		Acacia		EXO
25	Fabaceae	*Calliandra houstoniana var. calothyrsus (Meisn.) Barneby*				EXO
26	Fabaceae	*Crotalaria pallida Aiton*			LC	IND
27	Fabaceae	*Gliricidia sepium (Jacq.) Steud.*	Gliricidia	Albizia, Giridesiya,		EXO
28	Fabaceae	*Mimosa pigra var. pigra*		Yoda nidikumba, Gas Nidikumba		IAS
29	Fabaceae	*Mimosa pudica L.*	Sensitive plant	Nidikumba		EXO
30	Lamiaceae	*Clerodendrum chinense (Osbeck) Mabb.*				EXO
31	Lamiaceae	*Hyptis capitata Jacq.*		Fanta Gedi, Yaka hadu		EXO
32	Lamiaceae	*Leucas zeylanica var. walkeri (Benth.) Hook.f.*		Geta-Thumba	EN	IND
33	Lamiaceae	*Rotheca serrata (L.) Steane & Mabb.*		Kan henda, Narijja, Kenhinda, Kenhida	LC	IND
34	Lamiaceae	*Tectona grandis L.f.*		Thekka, Takku		EXO
35	Lamiaceae	*Vitex altissima L.f.*		Milla,Kaha-Milla, , Miyan-milla, Sapu-milla, Niyan-milla	NT	IND
36	Lauraceae	*Cinnamomum verum J.Presl*	True cinnamon	Kurundu, Path Kurundu	VU	END
37	Lauraceae	*Litsea ligustrina (Nees) Fern.- Vill*		Rat Keliya	LC	IND
38	Lauraceae	*Neolitsea cassia (L.) Kosterm.*		Dawul Kurundu, Kadu dawula, Nika Dawula, Wal Kurundu	LC	IND
39	Lauraceae	*Persea americana Mill.*	Avocado	Aligeta-pera, Ali-pera, Eth Pera		EXO
40	Lecythidaceae	*Careya arborea Roxb.*	Ceylon oak	Kahata	LC	IND
41	Loranthaceae	*Dendrophthoe falcata (L.f.) Ettingsh.*		Delum pilia, Dimi Kehel	LC	IND
42	Malvaceae	*Durio zibethinus L.*	Durian	Duriyanga, Durian		EXO
43	Malvaceae	*Hibiscus mutabilis L.*				EXO
44	Malvaceae	*Hibiscus rosa-sinensis L.*	Chinese hibiscus	Sapaththu Mal, Wada, Pokuru wada		EXO
45	Malvaceae	*Microcos paniculata L.*		Kelia, Kohu-kirilla, Kohikirilla	LC	IND
46	Melastomataceae	*Melastoma malabathricum subsp. malabathricum*	Indian rhododendron	Bovitiya, Katakalu-Bowitiya, Maha Bowitiya, Katakaluwa	LC	IND
47	Melastomataceae	*Miconia crenata (Vahl) Michelang.*		Katakalu-Bovotiya		IAS
48	Meliaceae	*Swietenia macrophylla King*	Big-leaf mahogany	Mahogani, Loku kola mahogani		EXO
49	Moraceae	*Artocarpus heterophyllus Lam.*	Jackfruit	Kos		EXO
50	Moraceae	*Ficus callosa Willd.*		Wal Gona, Gonna, Kiri Gonna, Kos Gonna, Wal Attikka	LC	IND

51	Orchidaceae	*Arundina graminifolia subsp. graminifolia (D.Don) Hochr.*			DD	IND
52	Oxalidaceae	*Averrhoa carambola L.*	Star fruit	Kamaranga		EXO
53	Phyllanthaceae	*Antidesma bunius (L.) Spreng.*		Karawala-Kebella	LC	IND
54	Phyllanthaceae	*Breynia vitis-idaea (Burm.f.) C.E.C.Fisch.*		Gas kayila	LC	IND
55	Piperaceae	*Piper nigrum L.*	Black pepper	Gam-Miris		EXO
56	Poaceae	*Cymbopogon nardus (L.) Rendle*	Citronella grass	Heen-pengiri, Lena -batu	LC	IND
57	Poaceae	*Megathyrsus maximus (Jacq.) B.K.Simon & S.W.L.Jacobs*	Guinea grass	Gini tana / Rata tana		EXO
58	Rhamnaceae	*Ziziphus oenopolia (L.) Mill.*		Hin Eraminia, Heen Eraminiya	LC	IND
59	Rubiaceae	*Coffea arabica L.*	Arabica coffee	Kopi		EXO
60	Rubiaceae	*Mussaenda frondosa L.*		Mussenda, Mus-Wenna, Wel-Butsarana	LC	IND
61	Rubiaceae	*Wendlandia bicuspidata Wight & Arn.*		Rawan idala, Wana -idala, Rath veni dala	LC	IND
62	Rutaceae	*Citrus reticulata Blanco*	Mandarin orange	Hin Naran, Jambu naran, Konda naran,Naran		EXO
63	Rutaceae	*Micromelum minutum*		Wal Karaphincha	LC	END
64	Sapindaceae	*Nephelium lappaceum var. lappaceum*	Rambutan	Rambutan		EXO
65	Solanaceae	*Solanum torvum Sw.*	Turkey berry	Gonabatu / Thibbatu		IND
66	Symplocaceae	*Symplocos acuminata (Blume) Miq.*		Bobu,Bombu, Wal bombu	LC	IND
67	Thymelaeaceae	*Gyrinops walla Gaertn.*	Agarwood	Patta walla, Wal aha / Walla patta, Walla,	VU	IND
68	Verbenaceae	*Lantana camara subsp. aculeata (L.) R.W.Sanders*	Lantana	Ganda pana,		IAS
69	Vitaceae	*Leea indica (Burm.f.) Merr.*		Burulla, Gurulla	LC	IND
70	Amaranthaceae	*Alternanthera sessilis (L.) R.Br. ex DC.*	Sessile joyweed	Mukunuwenna	LC	IND
71	Asteraceae	*Ageratum conyzoides L.*	Billygoat-weed	Hulan tala, Hulantala		EXO
72	Asteraceae	*Mikania cordata (Burm.f.) B.L.Rob.*	Heartleaf mikania	Gam palu, Kehel palu, Lokapalu		EXO
73	Asteraceae	*Sphagneticola trilobata (L.) Pruski*	Singapore daisy	Udaya kumari, Kaha karabu, Arunadevi		IAS
74	Euphorbiaceae	*Mallotus tetracoccus (Roxb.) Kurz*		Bu kenda	LC	IND
75	Fabaceae	*Grona triflora (L.) H.Ohashi & K.Ohashi*		Heen-undupiyaliya	LC	IND
76	Fabaceae	*Senna spectabilis (DC.) H.S.Irwin & Barneby*		Kaha Kona		EXO
77	Moraceae	*Ficus hispida L.f.*	Hairy fig	Kota Dimbula, Kota Simbula	LC	IND
78	Phyllanthaceae	*Bridelia retusa (L.) A.Juss.*		Keta Kela	LC	IND
79	Rutaceae	*Melicope lunu-ankenda (Gaertn.) T.G.Hartley*		Lunu Ankenda	LC	IND

80	Rutaceae	*Murraya paniculata (L.) Jack*	Orange jessamine	Etteriya, Sinsapa	LC	IND
81	Rutaceae	*Zanthoxylum asiaticum*		Kudu Miris, Kudu Mirisa, Kudu Miriya	LC	IND
82	Acanthaceae	*Aphelandra sinclairiana Nees*				EXO

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

TABLE 7: TOTAL SUMMARY OF FLORA SPECIES RECORDED IN THE PINE PLANTATION FOREST IN AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	Scientific Name	Common Name (NRL 2020)		NRL	SpS
			English name	Sinhala Names		
1	Amaranthaceae	*Cyathula prostrata (L.) Blume*		Bin karal heba	VU	IND
2	Apocynaceae	*Alstonia macrophylla Wall. ex G.Don*		Hawari Nuga, Yakadamaran, Attoniya, Ginikuru gas		IAS
3	Arecaceae	*Calamus thwaitesii Becc.*		Kath wel, Ma wewel, Puwak wel, Wanduru wel	VU	IND
4	Arecaceae	*Pinanga coronata (Blume ex Mart.) Blume*	Ivory Cane Palm			EXO
5	Asteraceae	*Psiadia ceylanica (Arn.) Grierson*		Pupula, Kaha Pupula	LC	IND
6	Fabaceae	*Mimosa pigra var. pigra*		Yoda nidikumba, Gas Nidikumba		IAS
7	Melastomataceae	*Miconia crenata (Vahl) Michelang.*		Katakalu-Bovotiya		IAS
8	Asteraceae	*Mikania cordata (Burm.f.) B.L.Rob.*	Heartleaf mikania	Gam palu, Kehel palu, Lokapalu		EXO
9	Asteraceae	*Sphagneticola trilobata (L.) Pruski*	Singapore daisy	Udaya kumari, Kaha karabu, Arunadevi		IAS
10	Convolvulaceae	*Argyreia hancorniifolia Gardner ex Thwaites*			CR	END
11	Pinaceae	*Pinus caribaea Morelet*	Caribbean pine			EXO

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

TABLE 8: TOTAL SUMMARY OF FLORA SPECIES RECORDED IN THE CULTUURAL AREA VEGETATION IN AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	Scientific Name	Common Name (NRL 2020)		NRL	SpS
			English name	Sinhala Names		
1	Anacardiaceae	*Mangifera indica L.*	Mango	Amba		EXO
2	Apiaceae	*Centella asiatica (L.) Urb.*	Asiatic pennywort	Gotukola, Hin-Gotukola	LC	IND
3	Apocynaceae	*Plumeria obtusa L.*	White frangipani	Araliya, Sudu araliya		EXO
4	Apocynaceae	*Plumeria rubra L.*	Red frangipani	Araliya		EXO
5	Araceae	*Pistia stratiotes L.*	Water lettuce	Diya-paradel	LC	IND

6	Arecaceae	*Cocos nucifera L.*	Coconut palm	Pol , (Thembili, Kundira, Navasi)		EXO
7	Arecaceae	*Corypha umbraculifera L.*	Talipot palm	Thala		IND
8	Arecaceae	*Elaeis guineensis Jacq.*	Oil palm	Katu pol		EXO
9	Arecaceae	*Phoenix dactylifera L.*	Date palm	Rata indi		EXO
10	Asteraceae	*Austroeupatorium inulifolium (Kunth) R.M.King & H.Rob.*		Pathan Palu, Podisinnomaran, Patas,		EXO
11	Asteraceae	*Elephantopus mollis Kunth*				EXO
12	Asteraceae	*Tithonia diversifolia (Hemsl.) A.Gray*		Wal-sooriyakantha,		IAS
13	Balsaminaceae	*Impatiens balsamina L.*		Kudalu-kola, Badarath kudalu, Kudalu		EXO
14	Calophyllaceae	*Calophyllum inophyllum L.*	Alexandrian laurel	Domba , Tel-domba	LC	IND
15	Calophyllaceae	*Mesua ferrea L.*	Ceylon ironwood			IND
16	Cannabaceae	*Trema orientale (L.) Blume*	Trema	Gadumba	LC	IND
17	Cannaceae	*Canna hybrids*				EXO
18	Cleomaceae	*Cleome rutidosperma*			LC	IND
19	Clusiaceae	*Clusia rosea Jacq.*		Gal Goraka, Gal Pilila,		IAS
20	Combretaceae	*Terminalia arjuna (Roxb. ex DC.) Wight & Arn.*	Arjun	Kumbuk, Kumbalu	LC	IND
21	Convolvulaceae	*Evolvulus glomeratus Nees & Mart.*				EXO
22	Elaeocarpaceae	*Elaeocarpus serratus L.*	Ceylon olive	Weralu	LC	IND
23	Euphorbiaceae	*Codiaeum variegatum (L.) Rumph. ex A.Juss.*		Croton		EXO
24	Euphorbiaceae	*Euphorbia hirta L.*		Bu dada kiriya, Budadakiriya, Kepumkiriya		EXO
25	Euphorbiaceae	*Homalanthus populifolius Graham*		Gini-kenda, Kanda		EXO
26	Euphorbiaceae	*Macaranga indica Wight*		Kenda, Bu Kenda, Wavul Kenda	LC	IND
27	Euphorbiaceae	*Macaranga peltata (Roxb.) Müll.Arg.*		Kenda, Pat-Kena, Pat-Kenda, Ambalan (Monaragala)	LC	IND
28	Fabaceae	*Bauhinia racemosa Lam.*		Maila, Leema ?	LC	IND
29	Fabaceae	*Calliandra houstoniana var. calothyrsus (Meisn.) Barneby*				EXO
30	Fabaceae	*Mimosa pigra var. pigra*		Yoda nidikumba, Gas Nidikumba		IAS
31	Fabaceae	*Mimosa pudica L.*	Sensitive plant	Nidikumba		EXO
32	Heliconiaceae	*Heliconia psittacorum L.f.*	Parrot's beak heliconia			EXO
33	Lamiaceae	*Hyptis capitata Jacq.*		Fanta Gedi, Yaka hadu		EXO

34	Lamiaceae	*Leucas zeylanica var. walkeri (Bent h.) Hook.f.*		Geta-Thumba	EN	IND
35	Lamiaceae	*Rotheca serrata (L.) Steane & Mabb.*		Kan henda, Narijja, Kenhinda, Kenhida	LC	IND
36	Lauraceae	*Cinnamomum verum J.Presl*	True cinnamon	Kurundu, Path Kurundu	VU	END
37	Lauraceae	*Litsea ligustrina (Nees) Fern.- Vill*		Rat Keliya	LC	IND
38	Lauraceae	*Neolitsea cassia (L.) Kosterm.*		Dawul Kurundu, Kadu dawula, Nika Dawula, Wal Kurundu	LC	IND
39	Lauraceae	*Persea americana Mill.*	Avocado	Aligeta-pera, Ali-pera, Eth Pera		EXO
40	Lecythidaceae	*Careya arborea Roxb.*	Ceylon oak	Kahata	LC	IND
41	Malvaceae	*Hibiscus mutabilis L.*				EXO
42	Malvaceae	*Hibiscus rosa-sinensis L.*	Chinese hibiscus	Sapaththu Mal, Wada, Pokuru wada		EXO
43	Meliaceae	*Swietenia macrophylla King*	Big-leaf mahogany	Mahogani, Loku kola mahogani		EXO
44	Meliaceae	*Toona sinensis (Juss.) M.Roem.*	Chinese mahogany	Rathu Toona		EXO
45	Menispermaceae	*Anamirta cocculus (L.) Wight & Arn.*		Titta-wel	LC	IND
46	Menispermaceae	*Cyclea peltata (Lam.) Hook.f. & Thomson*		Kehipiththan, Kaha-Pittan, Kehi-pittan, Kessi-pissan	LC	IND
47	Moraceae	*Ficus racemosa L.*	Cluster fig	Attikka, Aththikka, Udumbara, Dimbul	LC	IND
48	Moraceae	*Ficus religiosa L.*	Sacred fig	Bo, Bodhi		EXO
49	Moraceae	*Ficus tsjakela Burm.f.*		Kiripela, Kiripella, Pulila , Kalaha, Kiri Vavula	LC	IND
50	Muntingiaceae	*Muntingia calabura L.*	Jamaican cherry	Jam		EXO
51	Orchidaceae	*Arundina graminifolia subsp. gramini folia (D.Don) Hochr.*			DD	IND
52	Orchidaceae	*Polystachya concreta (Jacq.) Garay & H.R.Sweet*			LC	IND
53	Oxalidaceae	*Oxalis barrelieri L.*				EXO
54	Oxalidaceae	*Oxalis corniculata L.*	Creeping woodsorrel	Heen-embul-embiliya		EXO
55	Phyllanthaceae	*Breynia retusa (Dennst.) Alston*		Wal-Murunga, Wa	LC	IND

56	Phyllanthaceae	*Phyllanthus urinaria L.*		Rat-pitawakka	LC	IND
57	Pittosporaceae	*Pittosporum ferrugineum W.T.Aiton*		Kaputu, Wal Handun		EXO
58	Poaceae	*Cymbopogon nardus (L.) Rendle*	Citronella grass	Heen-pengiri, Lena-batu	LC	IND
59	Poaceae	*Megathyrsus maximus (Jacq.) B.K.Simon & S.W.L.Jacobs*	Guinea grass	Gini tana / Rata tana		EXO
60	Rhamnaceae	*Ziziphus rugosa Lam.*		Maha Eraminia, Maha Era	NT	IND
61	Rubiaceae	*Mitracarpus hirtus (L.) DC.*		Polkatu Pala		EXO
62	Rubiaceae	*Mussaenda frondosa L.*		Mussenda, Mus-Wenna, Wel-Butsarana	LC	IND
63	Rubiaceae	*Richardia brasiliensis Gomes*				EXO
64	Rubiaceae	*Spermacoce latifolia Aubl.*				EXO
65	Rubiaceae	*Wendlandia bicuspidata Wight & Arn.*		Rawan idala, Wana-idala, Rath veni dala	LC	IND
66	Rutaceae	*Citrus maxima (Burm.) Merr.*	Pomelo	Jambola, Jambu naran, Rata jambola, Ela Jambola		EXO
67	Santalaceae	*Santalum album L.*	Indian sandalwood	Handun, Sudu handun		EXO
68	Sapindaceae	*Nephelium lappaceum var. lappaceum*	Rambutan	Rambutan		EXO
69	Sapotaceae	*Madhuca longifolia var. longifolia*	Mahua	Mi, Gam-mi, Galu -pushpa, Tel-mi, Illipi	LC	IND
70	Solanaceae	*Brugmansia suaveolens (Humb. & Bonpl. ex Willd.) Sweet*		Rata Attana, Thunbo attana		EXO
71	Thymelaeaceae	*Wikstroemia indica (L.) C.A.Mey.*				IND
72	Urticaceae	*Pilea microphylla (L.) Liebm.*		Parippu Gas		EXO
73	Verbenaceae	*Stachytarpheta cayennensis (Rich.) Vahl*	Blue snakeweed	Sudu Balu Nakuta, Mithuru Sammettiya, Sathuru Sammettiya		EXO
74	Zingiberaceae	*Alpinia calcarata (Andrews) Roscoe*	Lesser galangal	Kala kiriya, Katu kiriya		EXO
75	Celastraceae	*Euonymus walkeri Wight*		Namahonda	LC	END
76	Bignoniaceae	*Tecoma stans var. stans*	Yellow trumpetbush	Kelani tissa		EXO
77	Fabaceae	*Peltophorum pterocarpum (DC.) Backer ex K.Heyne*	Copperpod	Kaha Mara, Ayawaka		IND
78	Sapindaceae	*Filicium decipiens (Wight & Arn.) Thwaites*	Fern tree	Pihimbiya	LC	IND

79	Amaranthaceae	*Alternanthera sessilis (L.) R.Br. ex DC.*	Sessile joyweed	Mukunuwenna	LC	IND
80	Apocynaceae	*Nerium oleander L.*	Oleander	Kaneru		EXO
81	Asteraceae	*Ageratum conyzoides L.*	Billygoat-weed	Hulan tala, Hulantala		EXO
82	Asteraceae	*Crassocephalum crepidioides (Benth.) S.Moore*		Iththeweriya, Wal Thampala		EXO
83	Asteraceae	*Mikania cordata (Burm.f.) B.L.Rob.*	Heartleaf mikania	Gam palu, Kehel palu, Lokapalu		EXO
84	Asteraceae	*Sphagneticola trilobata (L.) Pruski*	Singapore daisy	Udaya kumari, Kaha karabu, Arunadevi		IAS
85	Bignoniaceae	*Spathodea campanulata P.Beauv.*	African tulip tree	Kudella gas, Hujja Gas		EXO
86	Bignoniaceae	*Tabebuia rosea (Bertol.) Bertero ex A.DC.*	Pink trumpet tree	Rosa Thebebua		EXO
87	Euphorbiaceae	*Mallotus tetracoccus (Roxb.) Kurz*		Bu kenda	LC	IND
88	Fabaceae	*Grona triflora (L.) H.Ohashi & K.Ohashi*		Heen-undupiyaliya	LC	IND
89	Fabaceae	*Pongamia pinnata (L.) Pierre*	Indian beech	Magul Karanda, Karanda, Gal karanda	LC	IND
90	Fabaceae	*Senna spectabilis (DC.) H.S.Irwin & Barneby*		Kaha Kona		EXO
91	Moraceae	*Ficus pumila L.*	Creeping fig	Thappa Wel		EXO
92	Myrtaceae	*Syzygium samarangense*	Wax apple	Pini-Jambo		EXO
93	Oleaceae	*Jasminum grandiflorum L.*	Spanish jasmine	Saman Pichcha		EXO
94	Phyllanthaceae	*Bridelia retusa (L.) A.Juss.*		Keta Kela	LC	IND
95	Rubiaceae	*Spermacoce remota Lam.*				EXO
96	Rutaceae	*Melicope lunu-ankenda (Gaertn.) T.G.Hartley*		Lunu Ankenda	LC	IND
97	Acanthaceae	*Hypoestes phyllostachya Baker*	Polka dot plant			EXO
98	Acanthaceae	*Megaskepasma erythrochlamys Lindau*				EXO
99	Araliaceae	*Hydrocotyle javanica Thunb.*		Maha gotukola	NT	IND

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

43. Endemic Species: Euonymus walkeri (Namahonda)

44. Critically Endangered and Endemic Species: Argyreia hancorniifolia

45. Endemic Species: Euonymus walkeri (Namahonda)

46. Vulnerable Species: Utricularia striatula (Nilmonaressa)

6.3 Fauna Diversity in Ambuluwawa Biodiversity Complex

The fauna of Ambuluwawa recorded a total of 216 species belonging to 81 families across dragonflies, butterflies, amphibians, reptiles, birds, and mammals. Of these, 55 species are endemic to Sri Lanka. Amphibians (13 of 18 species endemic) and reptiles (20 of 36 species endemic) are particularly significant, as these groups contain species with extremely restricted ranges and high sensitivity to habitat disturbance. The bird community is the most species-rich, with 66 species from 34 families, including 15 endemics, while mammals contribute 19 species, many of which are native but also alongside several domestic species such as the domestic dog (*Canis familiaris*) and domestic cat (Felis catus) that occur in association with human settlements.

From a conservation perspective, 44 species are nationally threatened, consisting of 2 Critically Endangered, 15 Endangered, and 27 Vulnerable species. The Critically Endangered species documented include Kohukumbure's Day Gecko (*Cnemaspis kohukumburai)* and the Rock Dove (*Columba livia*). One species was also identified as an IAS, highlighting the additional pressures posed by introduced fauna on the native biodiversity of the complex.

Beyond threatened and endemic species, the dataset demonstrates a wide distribution of taxa across conservation categories. Butterflies, for instance, are represented by 64 species, the majority (55) classified as Least Concern, but also include 6 Endangered and 3 Vulnerable species, underscoring the value of this group as sensitive indicators of habitat quality. Similarly, reptiles show the broadest spread across Red List categories, with representatives in every threatened level: 1 Critically Endangered, 5 Endangered, 8 Vulnerable, and 3 Near Threatened species. This highlights the conservation urgency within this taxon, which is particularly vulnerable to habitat loss and fragmentation in Sri Lanka's mid-elevation ecosystems.

The high diversity of dragonflies and birds further reflects the ecological heterogeneity of Ambuluwawa. Dragonflies, with 13 species including 3 endemics, are strongly tied to aquatic habitats, meaning their presence indicates functioning freshwater ecosystems within the complex. Birds, meanwhile, not only dominate species richness but also display a wide ecological range, from forest specialists to generalist and edge-adapted species. The presence of 51 breeding residents highlights Ambuluwawa's role as a key refuge for resident bird populations, while migratory and opportunistic records reinforce its importance as a biodiversity hotspot. Together, these results illustrate how Ambuluwawa harbors both a rich species assemblage and a concentration of conservation priorities, making it an important site for long-term biodiversity monitoring and management.

TABLE 9: TOTAL SUMMARY OF FAUNAL SPECIES RECORDED IN THE AMBULUWAWA BIODIVERSITY COMPLEX

Taxa	Number of Families	Number of Species	Species Status(SpS)					National Red List of Sri Lanka (NRL)						
			END	IND	BrR	IAS	EXO	CR	EN	VU	NT	LC	DD	NE
Dragonflies	5	13	3	10					1	2	3	6		1
Butterflies	6	64	2	62						6	3	55		
Amphibians	7	18	13	5					6	5	1	6		
Reptiles	13	36	20	16				1	5	8	3	19		
Birds	34	66	15		51			1	2	4	4	55		
Mammals	16	19	2	14		1	2		1	2	2	12		2

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

TABLE 10: SUMMARY STATUS OF FAUNA SPECIES RECORDED IN THE SAMPLING LOCATIONS IN AMBULUWAWA BIODIVERSITY COMPLEX

No	Name of the Habitat	Taxa	No Families	No species	SpS					National Red List of Sri Lanka (NRL)						
					END	IND	BrR	IAS	EXO	CR	EN	VU	NT	LC	DD	NE
1	Cultural site / Anthropo-genic modified habitat	Dragonflies														
		Butterflies														
		Amphibians	4	5	2	3						2		3		
		Reptiles	1	5	3	2				1	2			2		
		Birds	6	7			7							7		
		Mammals	5	5	1	3			1					4		1
2	Natural Forest	Dragonflies	3	4	2	2					1			2		1
		Butterflies	3	7	0	7								7		
		Amphibians	4	10	10						5	3	1	1		
		Reptiles	12	20	14	6				1	4	5	2	8		
		Birds	15	22	10		12				1	2	1	18		
		Mammals	9	12	1	10		1				1		11		
3	Successional Forest on Former Tea Land	Dragonflies	5	11	2	9					1	2	3	5		
		Butterflies	6	43	1	42						6	2	35		
		Amphibians	4	7	7						2	3	1	1		
		Reptiles	9	17	13	4					5	3	2	7		
		Birds	29	52	14		38				2	4	4	42		
		Mammals	12	15	2	12		1				2	2	11		
4	Agriculture zone	Dragonflies	3	4	2	2					1			2		1
		Butterflies	6	31	1	30						4	1	26		
		Amphibians	5	6	2	4						1	1	4		
		Reptiles	9	16	3	13						2	1	13		
		Birds	21	31	5		26			1			1	29		
		Mammals	12	15	1	11		1	2		1		1	11		2
5	Pine plantation	Dragonflies	2	3		3							1	2		
		Butterflies	5	36	1	35							3	33		
		Amphibians	0	0												
		Reptiles	1	1		1								1		
		Birds	21	32	5		27			1			1	30		
		Mammals	5	5	1	2			2					3		2

6.3.1 Dragonflies and Damselflies

A total of 13 species of dragonflies and damselflies representing 5 families have been recorded from Ambuluwawa. The assemblage includes both widespread indigenous species, such as the Painted Waxtail (*Ceriagrion cerinorubellum*) and the Indian Duskhawker (*Gynacantha dravida*), as well as highly localized endemics. Notably, three endemic species—the Bordered Knob-tipped Shadowdamsel (*Ceylonosticta submontana*, EN), the Sri Pada Shadowdamsel (*Ceylonosticta sripadensis*), and the Jungle Threadtail (*Elattoneura caesia*, VU)—highlight the conservation significance of this group. Their distribution is closely linked to successional forests and streams and waterbody habitats.

In addition to their conservation value, dragonflies and damselflies serve as excellent bioindicators of ecosystem health due to their reliance on freshwater systems for breeding and larval development. The presence of both widespread species such as the Painted Waxtail (*Ceriagrion cerinorubellum*) and more habitat-sensitive taxa like the Sri Pada Shadowdamsel (*Ceylonosticta sriapadensis*) suggests that Ambuluwawa supports a gradient of aquatic habitat quality. Streams, ponds, and seepages within the site not only provide essential breeding grounds for these insects but also sustain the diversity of associated plant and animal communities. Their sensitivity to water quality and forest integrity underscores the need for maintaining unpolluted aquatic habitats within the complex.

Equally important is the role of dragonflies and damselflies in maintaining ecological balance within these habitats. As voracious predators of mosquitoes and other small insects, both at larval and adult stages, they contribute directly to regulating insect populations, while also serving as prey for birds, reptiles, and amphibians. The coexistence of endemic shadowdamsels with more cosmopolitan skimmer species illustrates how Ambuluwawa functions as a microcosm of Sri Lanka's odonate diversity. Protecting these communities not only conserves unique species but also preserves the intricate ecological processes they underpin, making them vital indicators and contributors to overall biodiversity resilience in the region.

TABLE 11: LIST OF DRAGONFLIES AND DAMSELFLIES RECORDED IN THE AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	*Scientific Name*	English Name	SpS	NRL
1	Coenagrionidae	*Agriocnemis pygmaea*	Wandering Wisp	IND	LC
2	Coenagrionidae	*Ceriagrion cerinorubellum*	Painted Waxtail	IND	LC
3	Coenagrionidae	*Ceriagrion coromandelianum*	Yellow Waxtail	IND	LC
4	Platystictidae	*Ceylonosticta submontana*	Bordered Knob-tipped Shadowdamsel	END	EN
5	Platystictidae	*Ceylonosticta sripadensis*	Sri Pada Shadowdamsel	END	
6	Platycnemididae	*Elattoneura caesia*	Jungle Threadtail	END	VU
7	Platycnemididae	*Copera marginipes*	Yellow Featherleg	IND	LC
8	Aeshnidae	*Anax immaculifrons*	Fiery Emperor	IND	NT
9	Aeshnidae	*Gynacantha dravida*	Indian Duskhawker	IND	NT
10	Libellulidae	*Orthetrum chrysis*	Spine-tufted Skimmer	IND	VU
11	Libellulidae	*Orthetrum glaucum*	Asian Skimmer	IND	NT
12	Libellulidae	*Neurothemis tullia*	Pied Parasol	IND	LC
13	Libellulidae	*Trithemis aurora*	Crimson Dropwing	IND	LC

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

47. Endemic is a newly described species (2025), Ceylonosticta sripadensis (Sri Pada Shadow Damsel). Because it is newly described, it does not yet have an assigned conservation status under the IUCN Red List. There is no published assessment for C. sripadensis as of now.

48. Endemic and Endangered Species: Ceylonosticta submontane (Bordered Knob-tipped Shadow Damsel)

6.3.2 Butterflies

A total of 64 butterfly species representing 6 families were recorded across Ambuluwawa's diverse habitats, with richness highest in successional forests, followed by agricultural areas, natural forest patches, pine plantations, and cultural sites. The assemblage includes two endemic species: the Sri Lanka Albatross (*Appias galane*) and the Ceylon Cerulean (*Jamides coruscans*), both restricted to Sri Lanka. Several taxa are of conservation concern, including Vulnerable species such as *Jamides coruscans*, *Rohana parisatis* (Black Prince), *Nacaduba kurava* (Transparent Six-Lineblue), and *Tagiades litigiosa* (Water Snow Flat), and Near Threatened species such as *Papilio helenus* (Red Helen) and *Junonia orithya* (Blue Pansy). These findings emphasize the conservation significance of heterogeneous habitats in sustaining butterfly diversity.

TABLE 12: LIST OF BUTTERFLIES RECORDED IN THE AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	*Scientific Name*	English Name	Sinhala Name	SpS	NRL
1	Papilionidae	*Graphium agamemnon*	Tailed Jay	kola papila	IND	LC
2	Papilionidae	*Graphium doson*	Common jay	podu papilia	IND	LC
3	Papilionidae	*Graphium teredon*	Blue bottle	Nil papilia	IND	LC
4	Papilionidae	*Pachliopta aristolochiae*	Common rose	Podu rosa papilia	IND	LC
5	Papilionidae	*Pachliopta hector*	Crimson rose	Maha rosa papilia	IND	LC
6	Papilionidae	*Papilio helenus*	Red helen	Maha kela papilia	IND	VU
7	Papilionidae	*Papilio polymnestor*	Blue mormon	Maha nilaya	IND	LC
8	Pieridae	*Appias galane*	Sri Lanka albatross	Kuda sudana	END	LC
9	Pieridae	*Catopsilia pyranthe*	Mottled emigrant / African emigrant	Thith-piya piyasariya	IND	LC
10	Pieridae	*Delias eucharis*	Jezebel	Pilarisiya	IND	LC
11	Pieridae	*Eurema blanda*	Three-spot grass yellow	Thun-thith kahakolaya	IND	LC
12	Pieridae	*Eurema hecabe*	Common grass yellow	Maha kahakolaya	IND	LC
13	Pieridae	*Eurema hecabe*	Common grass yellow	Maha kahakolaya	IND	LC
14	Nymphalidae	*Cethosia nietneri*	Ceylon lace wing	Lanka seda-piyapatha	IND	LC
15	Nymphalidae	*Cirrochroa thais*	Tamil yeoman / Yeoman	Kela raththiya	IND	LC
16	Nymphalidae	*Elymnias hypermnestra*	Common palmfly	Podu thal-dumburuwa	IND	LC
17	Nymphalidae	*Euthalia aconthea*	Baron	Achchilaya	IND	LC
18	Nymphalidae	*Hypolimnas bolina*	Great eggfly	Maha alankarikya	IND	LC
19	Nymphalidae	*Junonia atlites*	Grey pansy	Aluwan alankarikya	IND	LC
20	Nymphalidae	*Junonia iphita*	Chocolate soldier	Podu alankarikya	IND	LC
21	Nymphalidae	*Junonia orithya*	Blue pansy	Nil alankarikya	IND	NT
22	Nymphalidae	*Kaniska canace*	Blue admiral	Nil seneviya	IND	LC
23	Nymphalidae	*Melanitis leda*	Common evening brown	Podu dumburuwa	IND	LC
24	Nymphalidae	*Moduza procris*	Commander	Maha selaruwa	IND	LC
25	Nymphalidae	*Mycalesis mineus*	Dark-brand bushbrown	Anduru panduru-dumburuwa	IND	NT
26	Nymphalidae	*Mycalesis patnia*	Gladeye bushbrown	Visithuru panduru-dumburuwa	IND	LC
27	Nymphalidae	*Mycalesis perseus*	Common bushbrown	Podu panduru-dumburuwa	IND	LC
28	Nymphalidae	*Neptis hylas*	Common sailor	Gomara selaruwa	IND	LC
29	Nymphalidae	*Neptis jumbah*	Chestnut-streaked sailor	Thambala-iri selaruwa	IND	LC
30	Nymphalidae	*Orsotriaena medus*	Medus Brown /Nigger	Maha-iri panduru-dumburuwa	IND	LC
31	Nymphalidae	*Phalantha phantha*	Leopard	Podu thith-thambiliya	IND	LC

32	Nymphalidae	*Polyura athamas*	Nawab	Kaha kumaraya	IND	LC
33	Nymphalidae	*Rohana parisatis*	Black prince	Kalu kumaraya	IND	VU
34	Nymphalidae	*Ypthima ceylonica*	White four-ring	Podu heen-dumburuwa	IND	LC
35	Riodinidae	*Abisara echerius*	Plum Judy	Kela Rathambalaya	IND	LC
36	Lycaenidae	*Actyolepis puspa*	Common Hedge Blue	Mal Panduru-nilaya	IND	LC
37	Lycaenidae	*Castalius rosimon*	Common Pierrot	Podu Mal-nilaya	IND	LC
38	Lycaenidae	*Chilades lajus*	Lime Blue	Podu Panu-nilaya	IND	LC
39	Lycaenidae	*Chilades pandava*	Plains Cupid	Lanka Panu-nilaya	IND	LC
40	Lycaenidae	*Deudorix epijarbas*	Cornelian	Podu Kirana-nilaya	IND	VU
41	Lycaenidae	*Everes lacturnus*	Indian Cupid	Indiyanu Panduru-nilaya	IND	LC
42	Lycaenidae	*Jamides bochus*	Dark Cerulean	Anduruwan Seru-nilaya	IND	LC
43	Lycaenidae	*Jamides celeno*	Common Cerulean	Podu Seru-nilaya	IND	LC
44	Lycaenidae	*Jamides coruscans*	Ceylon Cerulean	Lanka Seru-nilaya	END	VU
45	Lycaenidae	*Loxura atymnus*	Yamfly	Kaha gas-nilaya	IND	LC
46	Lycaenidae	*Megisba malaya*	Malayan	Podu Dumburu-nilaya	IND	LC
47	Lycaenidae	*Nacaduba kurava*	Transparent 6-Lineblue	Sudu Haya-iriya	IND	VU
48	Lycaenidae	*Neopithicops zalmora*	Quaker	Maha thith Dumburu-nilaya	IND	LC
49	Lycaenidae	*Prosotas nora*	Common Lineblue	Podu Nil-iriya	IND	LC
50	Lycaenidae	*Rathinda amor*	Monkey-puzzle	Visituru vanduru nilaya	IND	LC
51	Lycaenidae	*Spalgis epeus*	Apefly	Wanduru nilaya	IND	LC
52	Lycaenidae	*Surendra vivarna*	Common acacia blue	Podu gas-nilaya	IND	LC
53	Lycaenidae	*Tajuria cippus*	Peacock Royal	Monara Raja-nilaya	IND	LC
54	Lycaenidae	*Talicada nyseus*	Red pierrot	Rathu Panduru-nilaya	IND	LC
55	Lycaenidae	*Zesius chrysomallus*	Redspot	Rathu-thith gas-nilaya	IND	LC
56	Lycaenidae	*Zizina otis*	Lesser Grass Blue	Podu Thruna-nilaya	IND	LC
57	Lycaenidae	*Zizula hylax*	Tiny Grass Blue	Punchi Thruna-nilaya	IND	LC
58	Hesperiidae	*Borbo cinnara*	Wallace's Swift	Wolassariya	IND	LC
59	Hesperiidae	*Iambrix salsala*	Chestnut Bob	Guru talagobaya	IND	LC
60	Hesperiidae	*Pelopidas agna*	Little Branded Swift	Podi-irisariya	IND	NT
61	Hesperiidae	*Spialia galba*	Indian skipper	Indupimma	IND	LC
62	Hesperiidae	*Suastus gremius*	Indian Palm Bob	Indu talagobaya	IND	LC
63	Hesperiidae	*Tagiades japetus*	Ceylon Snow Flat	Hima-kunchika	IND	LC
64	Hesperiidae	*Tagiades litigiosa*	Water Snow Flat	Diya-kunchika	IND	VU

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

49. Indigenous and Near Threatened Species: Junonia orithya (Blue pansy, Nil alankarikya)

50. Indigenous Species: Cethosia nietneri (Ceylon lace wing, Lanka seda-piyapatha)

51. Indigenous Species: Tagiades japetus (Ceylon Snow Flat, Hima-kunchika)

52. Indigenous Species: Lambrix salsala (Chestnut Bob, Guru talagobaya)

53. Indigenous Species: Surendra vivarna (Common acacia blue, Podu gas-nilaya)

54. Indigenous Species: Polyura athamas (Nawab, Kaha kumaraya)

55. Indigenous Species: Moduza Procris (Commander, Maha selaruwa)

56. Indigenous Species: Ypthima ceylonica (White four-ring, Podu heen-dumburuwa)

6.3.3 Amphibians

The survey documented 18 amphibian species across 7 families, of which 13 are endemic. Species richness is highest in natural forests (10 species) and successional forests (7 species), with fewer in agricultural and cultural areas. Six species are Endangered, including the Ceylon streamlined toad (*Nannophrys ceylonensis*) and Kirtisinghe's shrub frog (*Pseudophilautus cavirostris*). Five are Vulnerable, such as the Corrugated water frog (*Lankanectes corrugatus*) and Ceylon caecilian (*Ichthyophis glutinosus*). One species, the Common shrub frog (*Pseudophilautus popularis*), is Near Threatened, underscoring the importance of intact forest habitats for amphibian persistence.

The high proportion of endemism within the amphibian community at Ambuluwawa, particularly among shrub frogs of the genus Pseudophilautus, highlights the site's importance as a refuge for species that are globally restricted to Sri Lanka. Several of these, such as *P. cavirostris* and *P. rus*, are listed as Endangered on the National Red List, reflecting both their narrow distributions and vulnerability to habitat loss. The concentration of multiple threatened Pseudophilautus species within a single locality underscores the critical role of montane and submontane habitats in maintaining Sri Lanka's unique amphibian diversity. Conservation of these areas is therefore essential not only for preserving species richness, but also for safeguarding evolutionary lineages that have little to no representation outside the island's central highlands.

TABLE 13: LIST OF AMPHIBIANS RECORDED IN THE AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	*Scientific Name*	English Name	Sinhala Name	SpS	NRL
1	Bufonidae	*Duttaphrynus melanostictus*	Common house toad	Sulaba geai gemba	IND	LC
2	Microhylidae	*Uperodon taprobanicus*	Common bull frog	Visituru ratu madiya	IND	LC
3	Microhylidae	*Uperodon obscurus*	Grey-brown pugsnout frog	Alu-dumburu motahombu madiya	END	VU
4	Ranidae	*Indosylvirana temporalis*	Gunther's golden-backed frog		END	VU
4	Nyctibatrachidae	*Lankanectes corrugatus*	Corrugated water frog	Vakarali madiya	END	VU
5	Dicroglossidae	*Euphlyctis cyanophlyctis*	Skipper frog	Utpatana madiya	IND	LC
6	Dicroglossidae	*Minervarya kirtisinghei*	Montain paddy field frog	Kandukara vel-madiya	END	VU
7	Dicroglossidae	*Minervarya agricola*	Common paddy field frog	Sulaba vel madiya	IND	LC
8	Dicroglossidae	*Nannophrys ceylonensis*	Sri Lanka rock frog	Lanka galpara madiya	END	EN
9	Rhacophoridae	*Pseudophilautus cavirostris*	Hollow snouted shrub frog	Hirigadu panduru mediya	END	EN
10	Rhacophoridae	*Pseudophilautus pleurotaenia*	Side stripped shrub frog	Pati therathi paduru mediya	END	EN
11	Rhacophoridae	*Pseudophilautus popularis*	Common shrub frog	Sulaba paduru mediya	END	NT
12	Rhacophoridae	*Pseudophilautus rus*	Kandian shrub frog	Nuwara padurumadiya	END	EN
13	Rhacophoridae	*Pseudophilautus reticulatus*	Reticulated thigh shrub frog	Jalaba paduru mediya	END	EN
15	Rhacophoridae	*Pseudophilautus zorro*	Gannoruva shrub frog	Gannoruva paduru mediya	END	EN
16	Rhacophoridae	*Polypedates cruciger*	Common hour-glass tree frog	Sulaba pahimbu gas madiya	END	LC
17	Rhacophoridae	*Polypedates maculatus*	Spotted tree frog	Pulli gas madiya	IND	LC
18	Ichtheophiidae	*Ichthyophis glutinosus*	Common Yellowband cecillian	Kaha hiri danda	END	VU

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

57. Endemic and Near Threatened Species: Pseudophilautus popularis (Common shrub frog, Sulaba paduru mediya)

58. Endemic and Endangered Species: Pseudophilautus rus (Kandian shrub frog, Nuwara padurumadiya)

59. Endemic and Endangered Species: Pseudophilautus pleurotaenia (Side stripped shrub frog, Pati therathi paduru mediya)

60. Endemic and Endangered Species: Pseudophilautus zorro (Gannoruva shrub frog, Gannoruva paduru mediya)

61. Endemic and Vulnerable Species: Minervarya kirtisinghei (Mountain paddy field frog, Kandukara vel-madiya)

62. Endemic and Vulnerable Species: Nannophrys ceylonensis (Sri Lanka rock frog Lanka galpara madiya)

63 Endemic and Vulnerable Species: Lankanectes corrugatus (Corrugated water frog, Vakarali Madiya)

64. Endemic and Vulnerable Species: Ichthyophis glutinosus (Common Yellowband cecillian, Kaha hiri danda)

6.3.4 Reptiles

Ambuluwawa supports 36 reptile species from 13 families, with 20 endemics, making this one of the most distinctive faunal groups. Natural forests harbor the highest richness (21 species), followed by successional forests and agriculture. The Kohukumbure's Day Gecko (*Cnemaspis kohukumburai*) is Critically Endangered. Five species are Endangered, including the Sri Lanka Kandian Day Gecko (*Cnemaspis kandiana*) and the Sri Lanka Gecko (*Cyrtodactylus fraenatus*). Eight species are Vulnerable, such as the Whistling Lizard (*Calotes liolepis*) and the Ceylon Krait (*Bungarus ceylonicus)*. This high endemism and threat profile highlights forest ecosystems as reptile strongholds.

TABLE 14. LIST OF REPTILES RECORDED IN THE AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	*Scientific Name*	English Name	Sinhala Name	SpS	NRL
1	Geoemydidae	*Melanochelys trijuga*	Parker's black turtle	Parkerge gal ibba	IND	LC
2	Trionychidae	*Lissemys ceylonensis*	Flapshell turtle	Kiri ibba	END	VU
3	Agamidae	*Calotes calotes*	Green garden lizard	Pala katussa	IND	VU
4	Agamidae	*Calotes liolepis*	Whistling lizard / Forest lizard	Sivuruhandena katussa	END	VU
5	Agamidae	*Calotes versicolor*	Common garden lizard	Gara katussa	IND	LC
6	Agamidae	*Lyriocephalus scutatus*	Lyre head lizard / Hump snout lizard	Gatahombu katussa / Karamal bodiliya	END	VU
7	Agamidae	*Otocryptis wiegmanni*	Sri Lankan kangaroo lizard	Gomu talikatussa / Pinum katussa /	END	LC
8	Gekkonidae	*Cnemaspis kohukumburai*	Kohukumbures' day gecko	Kohukumburege diva-seri hoona	END	CR
9	Gekkonidae	*Cnemaspis kandiana*	Kandyan day gecko	Kandukara divasarihuna	END	EN
10	Gekkonidae	*Cyrtodactylus fraenatus*	Great forest gecko	Maha halae huna / Mukalam huna	END	EN
11	Gekkonidae	*Cyrtodactylus triedrus*	Spotted bow-finger gecko	Pulli vakaniyahuna	END	NT
12	Gekkonidae	*Gehyra mutilata*	Four-claw gecko	Caturanguli huna	IND	LC
13	Gekkonidae	*Hemidactylus frenatus*	Common house-gecko	Sulaba gehuna	IND	LC
14	Gekkonidae	*Hemidactylus pieresii*	Pieres's gecko	Pimburu huna	END	EN
15	Mabuyidae	*Eutropis lankae*	Common Sri Lanka skink	Sulaba lak hikanala	END	LC
16	Ristellidae	*Lankascincus dorsicatenatus*	Catenated litter skink	Damwal singitihikanala	END	EN
17	Ristellidae	*Lankascincus fallax*	Common lanka skink	Sulaba lakhiraluva	IND	LC
18	Ristellidae	*Lankascincus taylori*	Taylor's lanka skink	Telorge lakhiraluva	END	VU
19	Lygosomidae	*Lygosoma punctatus*	Dotted skink	Tit hiraluhikanala	IND	LC
20	Scincidae	*Nessia monodactylus*	Toeless snake skink	Ananguli sarpahiraluva	END	EN
21	Varanidae	*Varanus bengalensis*	Land monitor	Talagoya	IND	NT
22	Pythonidae	*Python molurus*	Indian rock python	Pimbura	IND	NT
23	Colubridae	*Ahaetulla nasuta*	Green vine snake	Ahaetulla	END	LC
24	Colubridae	*Boiga ceylonensis*	Sri Lanka cat snake	Nidi mapila	END	LC
25	Colubridae	*Lycodon aulicus*	Wolf snake, house snake	Alu radanakaya	IND	LC
26	Colubridae	*Oligodon arnensis*	Common kukri snake/ Banded Kukri	Arani dath ketiya	IND	LC
27	Colubridae	*Oligodon sublineatus*	Dumerul's kuki snake	Pulli dath ketiya	END	VU
28	Colubridae	*Ptyas mucosa*	Rat snake	Gerandiya.	IND	LC
29	Colubridae	*Amphiesma stolatum*	Buff striped keelback	Aharukuka	IND	LC
30	Colubridae	*Aspidura brachyorrhos*	Boie's roughsided snake	Le madilla	END	VU
31	Colubridae	*Fowlea unicolor*	Tikiri Keelback	Diya bariya	END	LC

32	Elapidae	*Bungarus ceylonicus*	Sri Lanka krait / Ceylon krait	Mudu karawala/ Hath karawala	END	VU
33	Elapidae	*Naja naja*	Indian cobra	Naya	IND	LC
34	Viperidae	*Daboia russelii*	Russell's viper	Tith polonga.	IND	LC
35	Viperidae	*Hypnale hypnale*	The Merrem's hump nose viper	Polon thelissa	IND	LC
36	Viperidae	*Craspedocephalus trigonocephalus*	Green pit viper	Pala polonga	END	LC

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

65. Endemic and Vulnerable Species: Lyriocephalus scutatus (Lyre head lizard/Hump snout lizard, Gatahombu katussa / Karamal bodiliya)

66.. Endemic and Near Threatened Species: Cyrtodactylus triedrus (Spotted bowfinger gecko, Pulli vakaniyahuna)

67. Endemic and Critically Endangered Species: Cnemaspis kohukumburai (Kohukumbures' day gecko, Kohukumburege diva-seri hoona)

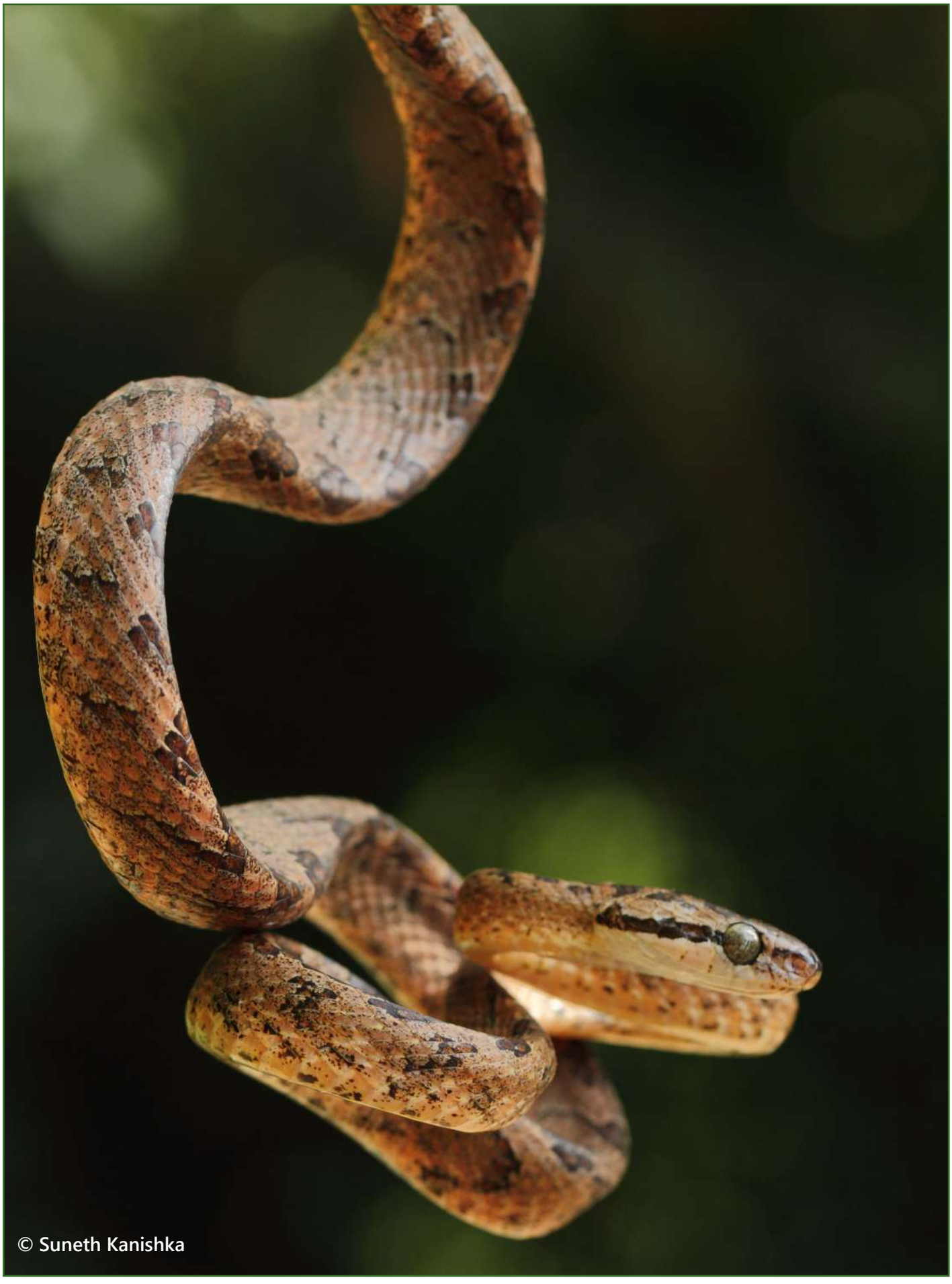
68. Endemic and Endangered Species: Cnemaspis kandiana (Kandyan day gecko, Kandukara divasarihuna)

69. Endemic and Vunerable Species: Calotes liolepis (Whistling lizard/Forest lizard, Sivuruhandena katussa)

70. Endemic and Vulnerable Species: Aspidura brachyorrhos (Boie's roughsided snake, Le madilla)

71. Indigenous Species: Amphiesma stolatum (Buff striped keelback, Aharukuka)

72. Endemic Species: Fowlea unicolor (Tikiri Keelback, Diya bariya)



73. Endemic Species: Boiga ceylonensis (Sri Lanka cat snake, Nidi mapila)

74. Endemic Species: Ahaetulla nasuta (Green vine snake, Ahaetulla)

75. Indigenous Species: Hypnale hypnale (Merrem's hump nose viper , Polon thelissa)

76. Endemic and Vulnerable Species: Oligodon sublineatus (Dumerul's kukri snake, Pulli dath ketiya)

6.3.5 Birds

A total of 66 bird species from 34 families were recorded, including 15 endemics. Successional forests supported the highest diversity (52 species), followed by agricultural lands and natural forests. The Rock Dove (*Columba livia*) is listed as Critically Endangered. Two species are Endangered, including the Chestnut-backed Owlet (*Glaucidium castanotum*) and Black-throated Munia (*Lonchura kelaarti)*. Four species are Vulnerable, such as the Ceylon Junglefowl (*Galloperdix bicalcarata*) and Sri Lanka White-eye (*Zosterops ceylonensis*). These findings emphasize the value of forest–agriculture mosaics in maintaining both endemic and threatened birds.

In addition to their taxonomic and conservation importance, the avifaunal assemblage at Ambuluwawa represents a broad range of ecological guilds. Frugivores such as the Sri Lanka Grey Hornbill (*Ocyceros gingalensis*) and Green Imperial-pigeon (*Ducula aenea*) play a vital role in seed dispersal, while insectivores like the drongos (*Dicrurus caerulescens*) and flycatchers (*Cyornis tickelliae*) contribute to natural pest regulation. Nectarivores such as the sunbirds (*Leptocoma zeylonica, Cinnyris lotenius*) provide pollination services, linking bird diversity directly to the maintenance of forest dynamics and agricultural productivity. The coexistence of these functional groups across forest, edge, and agricultural habitats highlights the resilience of the bird community in landscapes shaped by both natural and human influences.

At the same time, the persistence of threatened and endemic species within this landscape underscores the fragility of these ecological interactions. Species such as the Sri Lanka Woodpigeon (*Columba torringtoniae*) and the Sri Lanka Spurfowl (*Galloperdix bicalcarata*), both forest-dependent endemics, are particularly vulnerable to ongoing habitat modification. The occurrence of multiple raptors, including the Crested Serpent-eagle (*Spilornis cheela*) and the Black Eagle (*Ictinaetus malaiensis*), indicates healthy trophic structures but also points to the need for intact forest cover to sustain apex predators. Taken together, these patterns suggest that the long-term conservation of Ambuluwawa's avifauna will rely on maintaining habitat heterogeneity and connectivity between forest patches, ensuring that both common and rare species can persist within this multifunctional landscape.

TABLE 15. LIST OF BIRDS RECORDED IN THE AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	Scientific Name	English Name	Sinhala Name	SpS	NRL
1	Phasianidae	*Galloperdix bicalcarata*	Sri Lanka Spurfowl	Sri Lanka Haban-kukula	END	VU
2	Phasianidae	*Gallus lafayettii*	Sri Lanka Junglefowl	Sri Lanka Vali-kukla	END	LC
3	Columbidae	*Chalcophaps indica*	Emerald Dove	Neela-Kobeiyya	BrR	LC
4	Columbidae	*Columba livia*	Rock Dove	Podu Paraviya	BrR	CR
5	Columbidae	*Columba torringtoniae*	Sri Lanka Woodpigeon	Sri Lanka Mayila Paraviya	END	VU
6	Columbidae	*Ducula aenea*	Green Imperial-pigeon	Nil Mahagoya	BrR	LC
7	Columbidae	*Spilopelia suratensis*	Western Spotted Dove	Alu Kobeiyya	BrR	LC
8	Picidae	*Picoides nanus*	Indian Pygmy Woodpecker	Bora Esasi Gomara-karela	BrR	LC
9	Picidae	*Picus chlorolophus*	Lesser Yellownape	Heen Kaha-gelasi Karela	BrR	NT
10	Picidae	*Dinopium psarodes*	Lesser Sri Lanka Flameback	Sri Lanka Ginipita Pili-karela	END	LC
11	Picidae	*Chrysocolaptes stricklandi*	Greater Sri Lanka Flameback	Sri Lanka Lepita Maha-karela	END	LC
12	Megalaimidae	*Psilopogon zeylanicus*	Brown-headed Barbet	Polos Kottoruwa	BrR	LC
13	Megalaimidae	*Psilopogon flavifrons*	Sri Lanka Yellow-fronted Barbet	Sri Lanka Kahamunath Kottoruwa	END	LC
14	Megalaimidae	*Psilopogon rubricapillus*	Sri Lanka Barbet	Sri Lanka Kottoruwa	END	LC
15	Bucerotidae	*Ocyceros gingalensis*	Sri Lanka Grey Hornbill	Sri Lanka Alu Kandaththa	END	LC
16	Alcedinidae	*Halcyon smyrnensis*	White-breasted Kingfisher	Gelasudu Madi-pilihuduwa	BrR	LC

17	Cuculidae	*Centropus sinensis*	Greater Coucal	Maha Ati-kukula	BrR	LC
18	Psittacidae	*Loriculus beryllinus*	Sri Lanka Hanging-parrot	Sri Lanka Giramaliththa	END	LC
19	Psittacidae	*Psittacula krameri*	Rose-ringed Parakeet	Rana Girawa	BrR	LC
20	Psittacidae	*Psittacula cyanocephala*	Plum-headed Parakeet	Pakshu Girawa	BrR	NT
21	Apodidae	*Apus affinis*	Little Swift	Punchi Thurithaya	BrR	LC
22	Strigidae	*Ketupa zeylonensis*	Brown Fish owl	Bora Kewul-bakamoona	BrR	LC
23	Strigidae	*Glaucidium castanotum*	Sri Lanka Chestnut-backed Owlet	Sri Lanka Pitathambala Upabassa	END	EN
24	Caprimulgidae	*Caprimulgus asiaticus*	Indian Nightjar	Indu Bimbassa	BrR	LC
25	Accipitridae	*Pernis ptilorhyncus*	Oriental Honey-buzzard	Silu Bambarakussa	BrR	VU
26	Accipitridae	*Haliastur indus*	Brahminy Kite	Bamunu Piyakussa	BrR	LC
27	Accipitridae	*Spilornis cheela*	Crested Serpent-eagle	Silu Sarapakussa	BrR	LC
28	Accipitridae	*Accipiter badius*	Shikra	Kurulugoya	BrR	LC
29	Accipitridae	*Ictinaetus malaiensis*	Black Eagle	Kalukussa	BrR	NT
30	Chloropseidae	*Chloropsis jerdoni*	Jerdon's Leafbird	Jerdon Kolarisiya	BrR	LC
31	Oriolidae	*Oriolus xanthornus*	Black-hooded Oriole	Kahakurulla	BrR	LC
32	Dicruidae	*Dicrurus caerulescens*	White-bellied Drongo	Kawuda	BrR	LC
33	Rhipiduridae	*Rhipidura aureola*	White-browed Fantail	Bama-sudu Pawanpenda	BrR	LC
34	Campephagidae	*Lalage melanoptera*	Black-headed Cuckoo-shrike	Kalu-his Saratiththa	BrR	LC
35	Campephagidae	*Pericrocotus cinnamomeus*	Small Minivet	Punchi Miniviththa	BrR	LC
36	Campephagidae	*Pericrocotus flammeus*	Scarlet Minivet	Dilirath Miniviththa	BrR	LC
37	Vangidae	*Hemipus picatus*	Bar-winged Flycatcher-shrike	Wairapiya Masi-saratiththa	BrR	LC
38	Aegithinidae	*Aegithina tiphia*	Common Iora	Podu Iorawa	BrR	LC
39	Muscicapidae	*Cyornis tickelliae*	Tickell's Blue-flycatcher	Layaran Nil-masimara	BrR	LC
40	Muscicapidae	*Copsychus saularis*	Oriental Magpie-robin	Polkichcha	BrR	LC
41	Sturnidae	*Gracula religiosa*	Common Hill Myna	Podu Salalihiniya	BrR	LC
42	Sittidae	*Sitta frontalis*	Velvet-fronted Nuthatch	Villuda Yatikuriththa	BrR	LC
43	Paridae	*Parus major*	Great Tit	Maha Tikiriththa	BrR	LC
44	Hirundinidae	*Cecropis hyperythra*	Sri Lanka Swallow	Sri Lanka Laklihiniya	END	LC
45	Pycnonotidae	*Pycnonotus melanicterus*	Sri Lanka Black-capped Bulbul	Sri Lanka Kalu Isasi Kondaya	END	LC
46	Pycnonotidae	*Pycnonotus cafer*	Red-vented Bulbul	Kondaya	BrR	LC
47	Pycnonotidae	*Acritillas indica*	Yellow-browed Bulbul	Bamakaha Guluguduwa	BrR	LC
48	Pycnonotidae	*Hypsipetes leucocephalus*	Black Bulbul	Kalu Piri-kondaya	BrR	LC
49	Cisticolidae	*Prinia hodgsonii*	Grey-breasted Prinia	Layalu Priniya	BrR	LC
50	Cisticolidae	*Prinia socialis*	Ashy Prinia	Alu Priniya	BrR	LC
51	Cisticolidae	*Prinia inornata*	Plain Prinia	Sarala Priniya	BrR	LC
52	Cisticolidae	*Orthotomus sutorius*	Common Tailorbird	Battichcha	BrR	LC
53	Zosteropidae	*Zosterops ceylonensis*	Sri Lanka White-eye	Sri Lanka Sithasiya	END	VU
54	Zosteropidae	*Zosterops palpebrosus*	Oriental White-eye	Peradigu Sithasiya	BrR	LC
55	Timalidae	*Pomatorhinus melanurus*	Sri Lanka Scimitar-babbler	Sri Lanka Da-demalichcha	END	NT
56	Timalidae	*Dumetia hyperythra*	Tawny-bellied Babbler	Kusakaha Landu-demalichcha	BrR	LC
57	Timalidae	*Rhopocichla atriceps*	Dark-fronted Babbler	Wathanduru Panduru-demalichcha	BrR	LC
58	Pellorneidae	*Pellorneum fuscocapillus*	Sri Lanka Brown-capped Babbler	Sri Lanka Boraga Piri-demalichcha	END	LC
59	Leiotrichidae	*Turdoides affinis*	Yellow-billed Babbler	Demalichcha	BrR	LC

60	Dicaeidae	*Dicaeum erythrorhynchos*	Pale-billed Flowerpecker	Lathudu Pililichcha	BrR	LC
61	Nectariniidae	*Leptocoma zeylonica*	Purple-rumped Sunbird	Nithamba Dam Sutikka	BrR	LC
62	Nectariniidae	*Cinnyris lotenius*	Loten's Sunbird	Digthudu Dam Sutikka	BrR	LC
63	Motacillidae	*Anthus rufulus*	Paddyfield Pipit	Keth Varatichcha	BrR	LC
64	Estrididae	*Lonchura striata*	White-rumped Munia	Nithamba Sudu Weekurulla	BrR	LC
65	Estrididae	*Lonchura kelaarti*	Black-throated Munia	Gelakalu Weekurulla	BrR	EN
66	Estrididae	*Lonchura punctulata*	Scaly-breasted Munia	Laya Kayuru Weekurulla	BrR	LC

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient

77. Breeding Resident and Near Threatened Species: Ictinaetus malaiensis (Black Eagle, Kalukussa)

78. Breeding Resident: Spilornis cheela (Crested Serpent-eagle, Silu Sarapakussa)

79. Endemic and Endangered Species: Glaucidium castanotum (Sri Lanka Chestnut-backed Owlet, Pitathambala Upabassa)

80. Endemic Species: Loriculus beryllinus (Sri Lanka Hanging-parrot, Sri Lanka Giramaliththa)

81. Endemic and Near Threatened Species: Pomatorhinus melanurus (Sri Lanka Scimitar-babbler, Sri Lanka Da-demalichcha)

82. Endemic Species: Psilopogon flavifrons (Sri Lanka Yellow-fronted Barbet, Sri Lanka Kahamunath Kottoruwa)

83. Endemic and Vulnerable Species: Zosterops ceylonensis (Sri Lanka White-eye, Sri Lanka Sithasiya)

84. Breeding Resident and Endangered Species: Lonchura kelaarti (Black-throated Munia, Gelakalu Weekurulla)

6.3.6 Mammals

The mammalian fauna comprises 19 species across 16 families, including 2 endemics. Species richness is greatest in abandoned tea land and agricultural areas (15 species each), followed by natural forests (12 species). Threatened taxa include the Endangered Giant Flying Squirrel (*Petaurista philippensis*) and Vulnerable species such as the Eurasian Otter (*Lutra lutra*) and the Sri Lanka pigmy mouse-deer (*Moschiola kathygre*). Two species are Near Threatened, including the Indian Pangolin (*Manis crassicaudata*).

The assemblage represents a wide range of ecological roles, from fruit bats (*Pteropus medius, Rousettus leschenaulti*) that aid seed dispersal and forest regeneration, to carnivores like mongooses (*Urva smithii*) and civets (*Viverricula indica*) that regulate prey populations. Herbivores such as the Barking Deer (*Muntiacus malabaricus*) and Wild Boar (*Sus scrofa*) shape understory dynamics, while arboreal species like the Giant Squirrel (*Ratufa macroura*) highlight the value of canopy connectivity for forest-dependent mammals.

Human–wildlife interactions are prominent, particularly conflicts between the endemic Toque Macaque (*Macaca sinica*) and local communities over crop raiding. Species such as the Pangolin and Sri Lanka pigmy mouse-deer are also threatened by hunting and habitat loss. These patterns underline the need for strategies that reduce conflict while conserving vulnerable species in a human-dominated landscape.

TABLE 16. LIST OF MAMMALS RECORDED IN THE AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	*Scientific Name*	English Name	Sinhala Name	SpS	NRL
1	Manidae	*Manis crassicaudata*	Indian Pangolin	Kaballewa	IND	NT
2	Pteropodidae	*Pteropus medius*	Flying fox	Ma-vavula	IND	LC
3	Pteropodidae	*Rousettus leschenaulti*	Fulvous fruit bat	Rath dumburu pala vavula	IND	LC
4	Cercopithecidae	*Macaca sinica*	Sri Lanka toque monkey	Sri Lanka Rilawa	END	LC
5	Herpestidae	*Urva smithii*	Black-tipped or Ruddy mongoose	Rath Mugatiya / Hothambuwa	IND	LC
6	Mustelidae	*Lutra lutra*	Otter	Diya-balla	IND	VU
7	Viverridae	*Viverricula indica*	Ring-tailed civet	Urulewa	IND	LC
8	Cervidae	*Muntiacus malabaricus*	Barking deer	Olu Muwa / Weli Muwa	IND	NT
9	Suidae	*Sus scrofa*	Wild boar	Wal Ura	IND	LC
10	Tragulidae	*Moschiola kathygre*	Sri Lanka pigmy mouse -deer	Sri Lanka Kuru Meminna	END	VU
11	Hystricidae	*Hystrix indica*	Porcupine	Ittewa	IND	LC
12	Muridae	*Bandicota indica*	Malabar bandicoot	Uru-miya	IND	LC
13	Muridae	*Rattus rattus*	Common rat	Podu Ge Miya	POT_IAS	LC
14	Peromyidae	*Petaurista philippensis*	Giant flying squirrel	Ma-hambawa	IND	EN
15	Sciuridae	*Funambulus palmarum*	Palm squirrel	Leena	IND	LC
16	Sciuridae	*Ratufa macroura*	Giant squirrel	Dandu-leena	IND	LC
17	Leporidae	*Lepus nigricollis*	Black-naped hare	Wal Hawa	IND	LC
18	Canidae	*Canis familiaris*	Doestic dog	Balla	Dom	NE
19	Felidae	*Felis cattus*	Domestic cat	Balala/ Pusa	Dom	NE

END - Endemic, **IND** – Indigenous, **IAS** – Invasive Alien Species, **EXO** - Exotic, **POT_IAS**—Potentially Invasive Species, **DOM**—Domesticated, **CR** - Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** - Near Threatened, **LC** - Least Concern, **NE** - Not Evaluated, **DD** - Data Deficient,

85. Indigenous and Near Threatened Species: Manis crassicaudata (Indian Pangolin, Kaballewa)

86. Indigenous Species: Pteropus medius (Flying fox, Ma-vavula)

87. Endemic and Vulnerable Species: Moschiola kathygre (Sri Lanka pigmy mouse-deer, Sri Lanka Kuru Meminna)

88. Potential Invasive Species: Rattus rattus (Common rat, Podu Ge Miya)

89. Indigenous and Near Threatened Species: Muntiacus malabaricus (Barking deer, Olu Muwa / Weli Muwa)

90. Indigenous Species: Ratufa macroura (Giant squirrel, Dandu-leena)

6.4 Critical Habitat Assessment (CHA)

Critical habitat assessment is a systematic approach used to identify areas that are of exceptional importance for biodiversity conservation. It focuses on habitats that support globally or nationally threatened species, high concentrations of endemic or range-restricted taxa, or unique ecosystems that provide vital ecological functions. By evaluating species distributions, habitat quality, and conservation status, a critical habitat assessment highlights those areas that, if lost or degraded, would result in disproportionate impacts on biodiversity.

In practical terms, this process provides clear guidance on which habitats require the highest levels of protection and management. It allows conservationists, planners, and land managers to distinguish between areas of general ecological value and those that are truly irreplaceable. Such assessments often reveal overlaps between zones of high species richness and habitats that are essential for threatened or endemic species, thereby informing conservation priorities, restoration strategies, and land-use decisions.

For a landscape such as Ambuluwawa, critical habitat assessment is particularly valuable. The site harbors a mixture of natural forest, successional habitats, pine plantations, agroforestry areas, and cultural landscapes, each supporting different components of biodiversity. Several threatened and endemic species—such as the Sri Lanka Mouse Deer (*Moschiola kathygre*), the Chestnut-backed Owlet (*Glaucidium castanotum*), and a range of restricted-range amphibians—depend on specific habitats within this mosaic. Identifying which zones qualify as critical habitats ensures that management actions can be prioritized where they will have the greatest impact on safeguarding biodiversity. (fig 91) In this context, critical habitat assessment provides a framework for balancing ecological conservation with human use, ensuring that sites like Ambuluwawa continue to function as refuges for Sri Lanka's unique and threatened flora and fauna.

6.4.1 Critical Habitat Assessment—Flora

The CHA for flora at Ambuluwawa was evaluated using four weighted criteria: threatened species (30%), endemism (30%), species richness (20%), and ecological uniqueness (20%), the latter reflecting the combined proportion of endemic and indigenous species. Based on these indicators, natural forests (CHA 93.54%) emerged as the most critical habitats, supporting 67 species from 38 families, including 9 endemics and the only Critically Endangered species, *Shorea stipularis*. Their high concentration of threatened and range-restricted flora underscores their irreplaceable conservation value. Successional forests (50.65%) ranked second, with 80 species, 3 endemics, and 4 Vulnerable species, demonstrating their role as secondary refuges and promising targets for ecological restoration. Agricultural landscapes (53.53%) performed moderately, hosting 82 species with 4 endemics and 4 threatened taxa; although dominated by exotics, these areas highlight the potential for biodiversity persistence within mosaic habitats. Cultural sites (40.81%) displayed the highest richness (99 species) but were dominated by exotics (53) and invasives (4), lowering their conservation value. Pine plantations (40.78%), with only 11 species and minimal endemism, scored the lowest. Overall, the CHA emphasizes the need to prioritize natural and successional forests, while recognizing the supplementary role of agriculture in sustaining flora diversity.

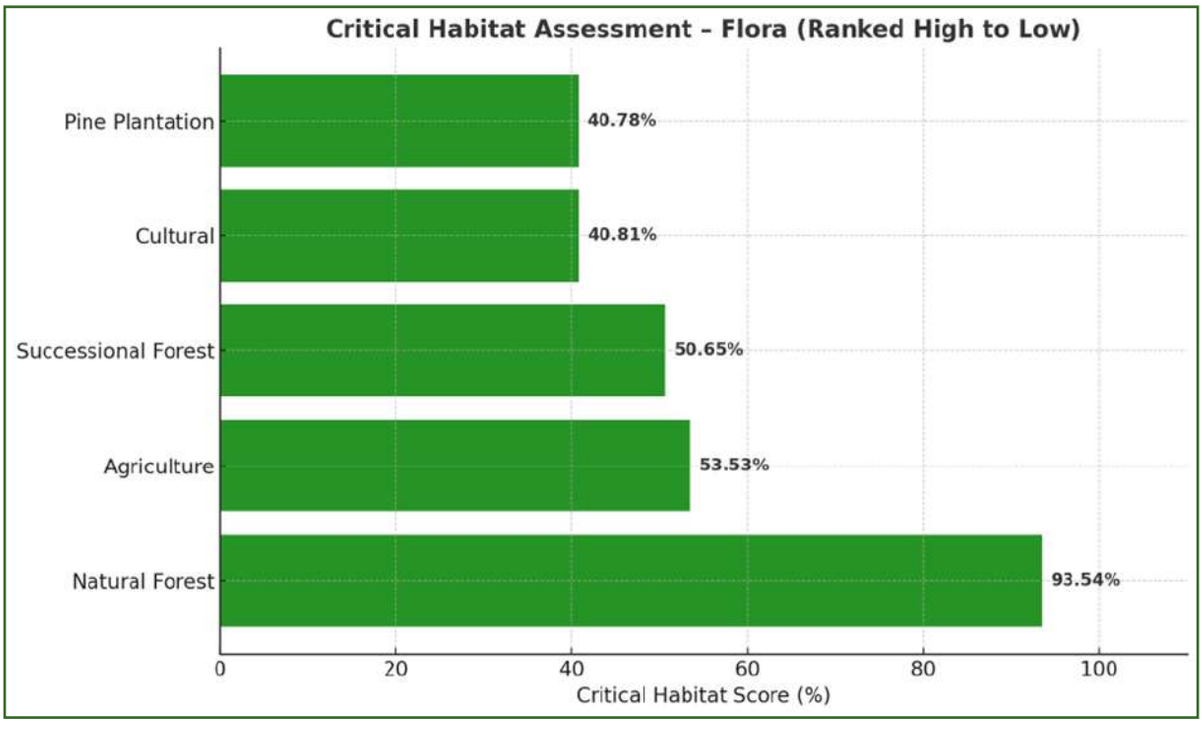
6.4.2 Critical Habitat Assessment—Fauna

The Critical Habitat Assessment conducted across five habitat types—Natural Forest, Successional Forest, Agriculture Zone, Pine Plantation, and Cultural/Anthropogenic Areas—provides a data-driven evaluation of their ecological importance. This assessment integrated four key criteria: (1) species conservation status based on the number of Critically Endangered, Endangered, and Vulnerable

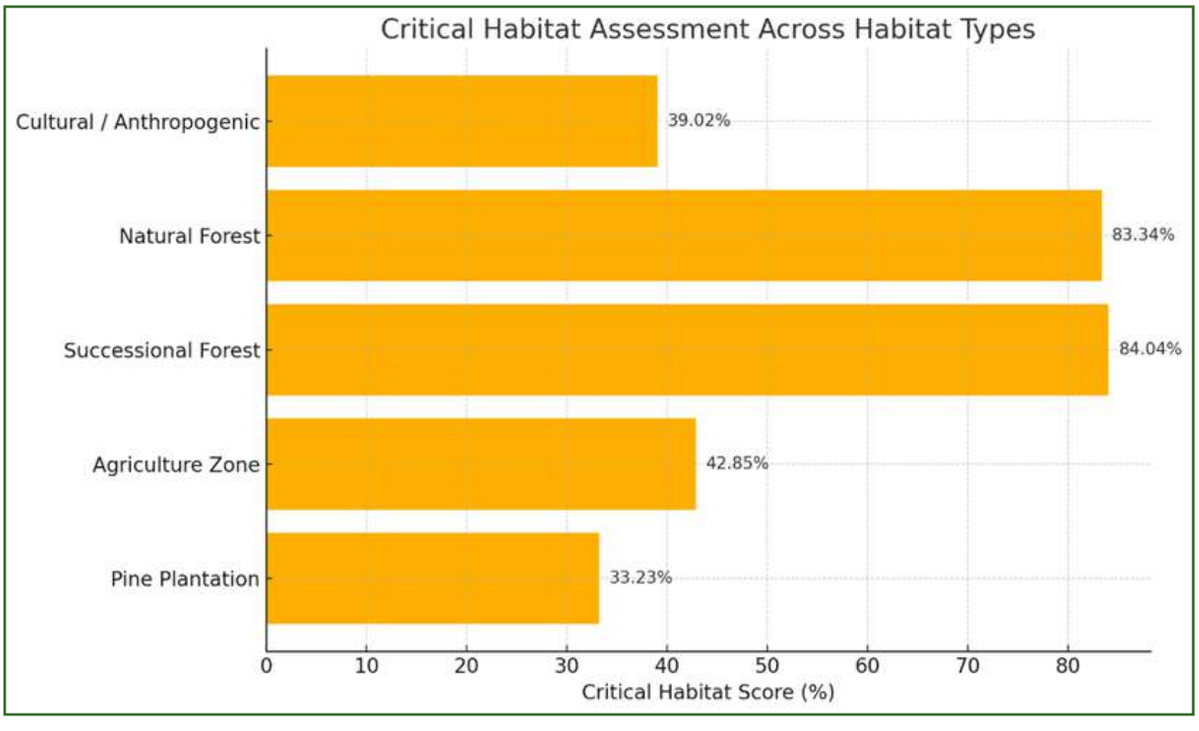
species; (2) endemism, measured as the proportion of endemic species; (3) population concentration, using total recorded species richness; and (4) ecological uniqueness, estimated by combining endemic and indigenous species proportions.

The findings revealed that Successional Forests on Former Tea Lands and Natural Forests are the most critical habitats, with scores of 84.04% and 83.34% respectively. These areas support the highest biodiversity, including large numbers of endemic and threatened species, highlighting their role as both biodiversity reservoirs and ecological refuges. Agricultural Zones scored moderately (42.85%), reflecting their support for indigenous species despite human modification. Cultural/Anthropogenic habitats and Pine Plantations, with scores below 40%, showed limited conservation value due to low endemism and higher presence of generalist or exotic species.

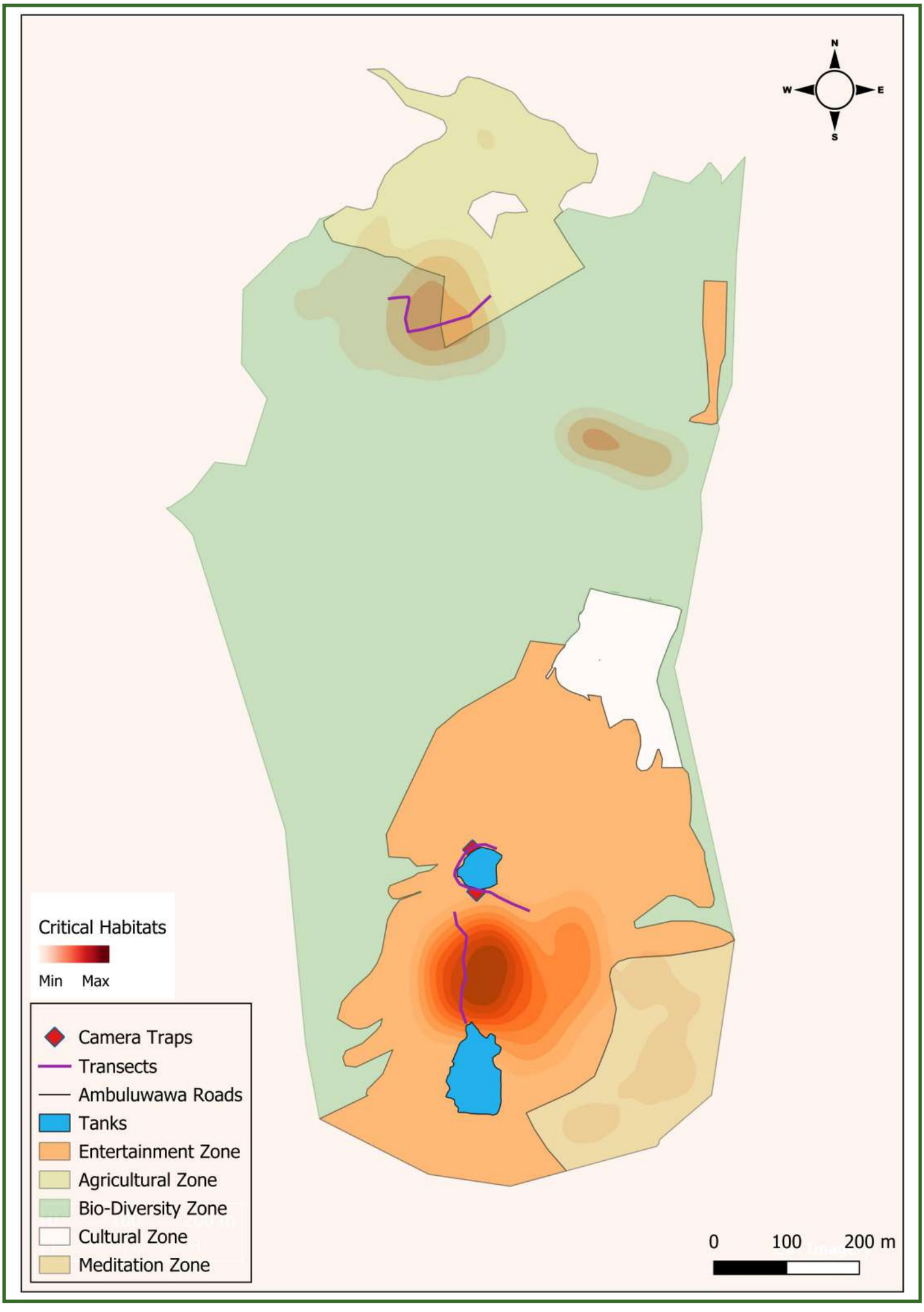
This assessment justifies prioritizing natural and regenerating forest ecosystems in conservation planning while recognizing the potential of modified landscapes to contribute to biodiversity recovery through restoration and ecological connectivity



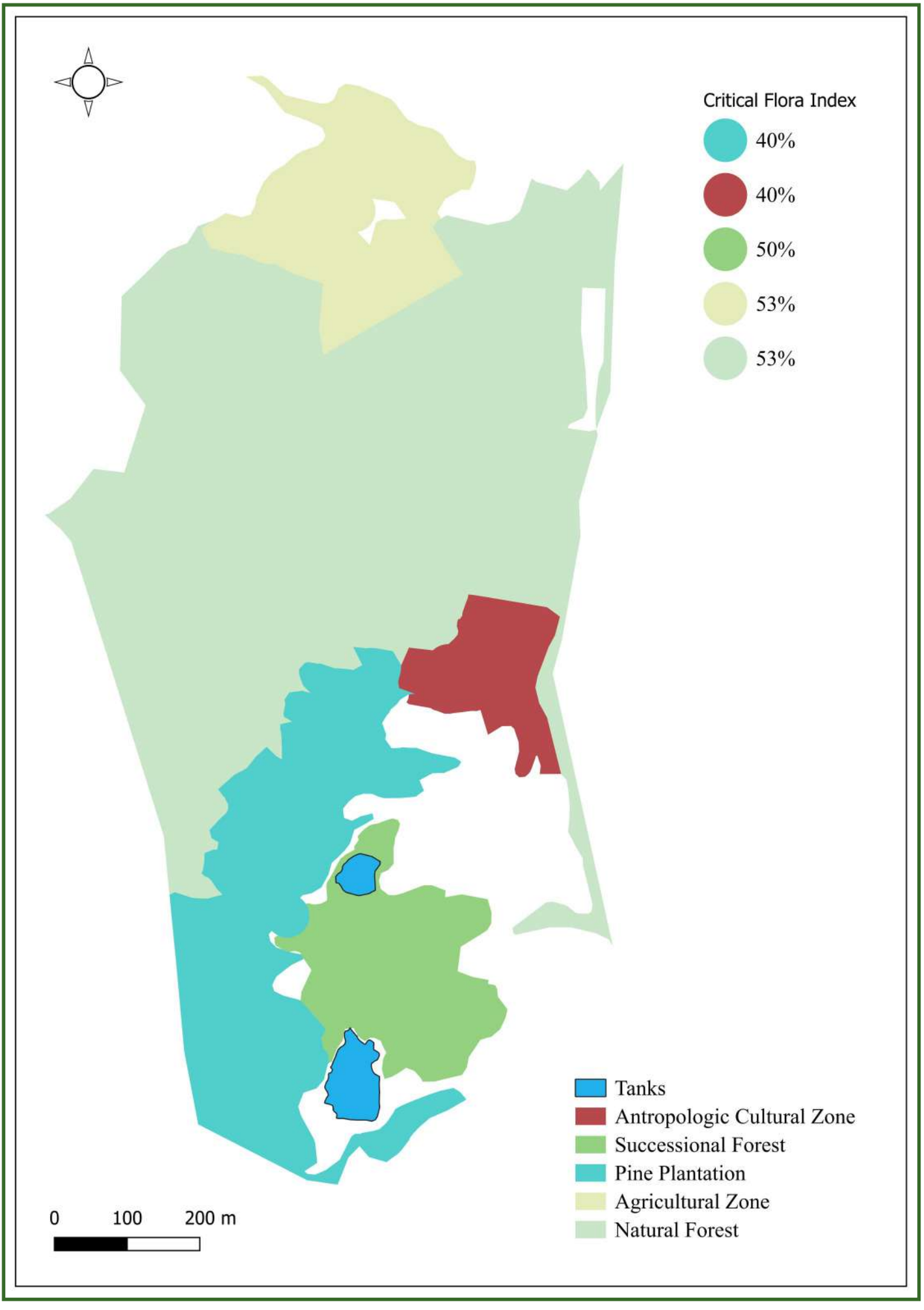
91. Critical Habitat Assessment - Flora by site zone



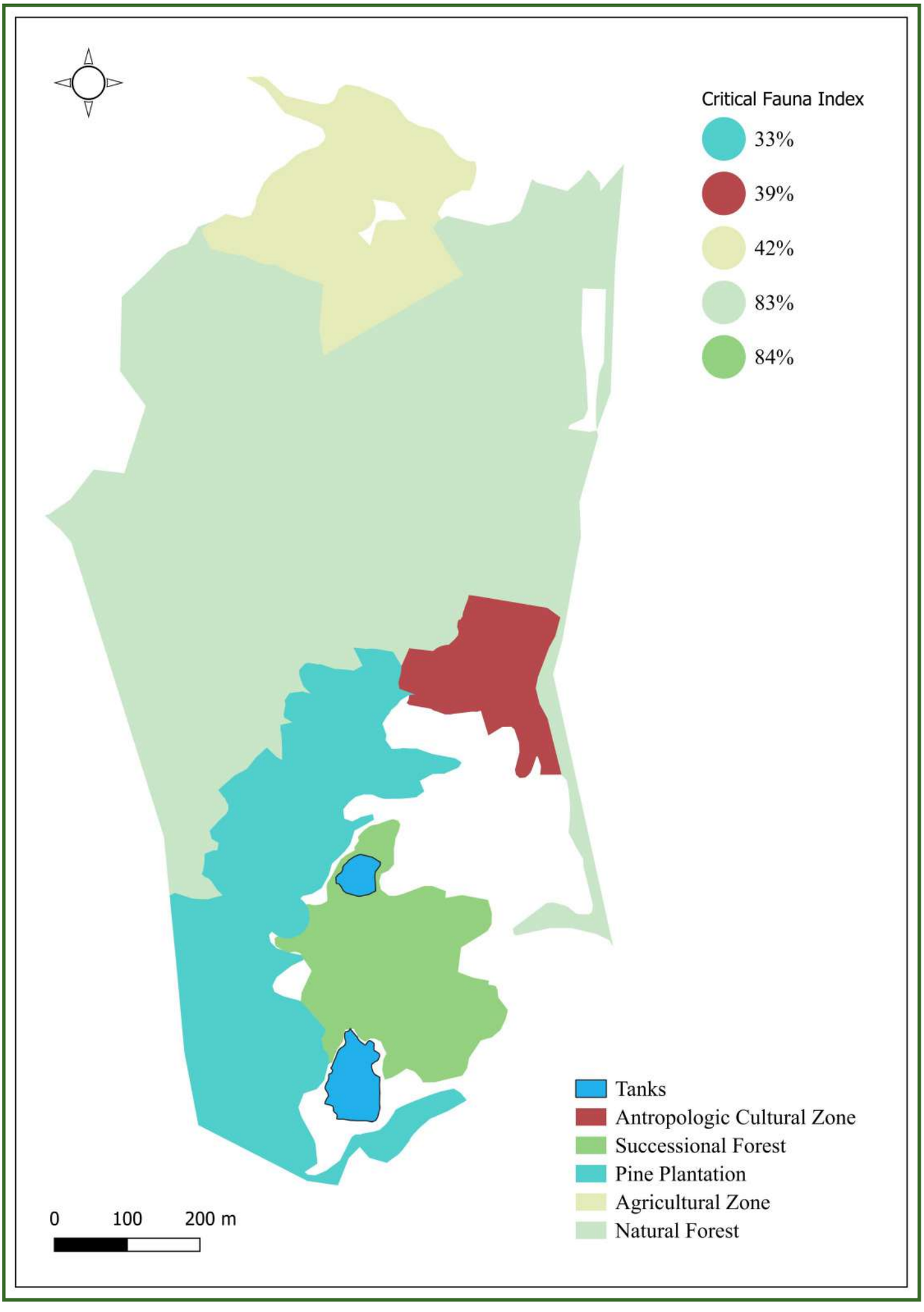
92. Critical Habitat Assessment - Fauna by site zone



93. Critical Habitat GIS Map by Zone



94. Critical Habitat GIS Map —Flora



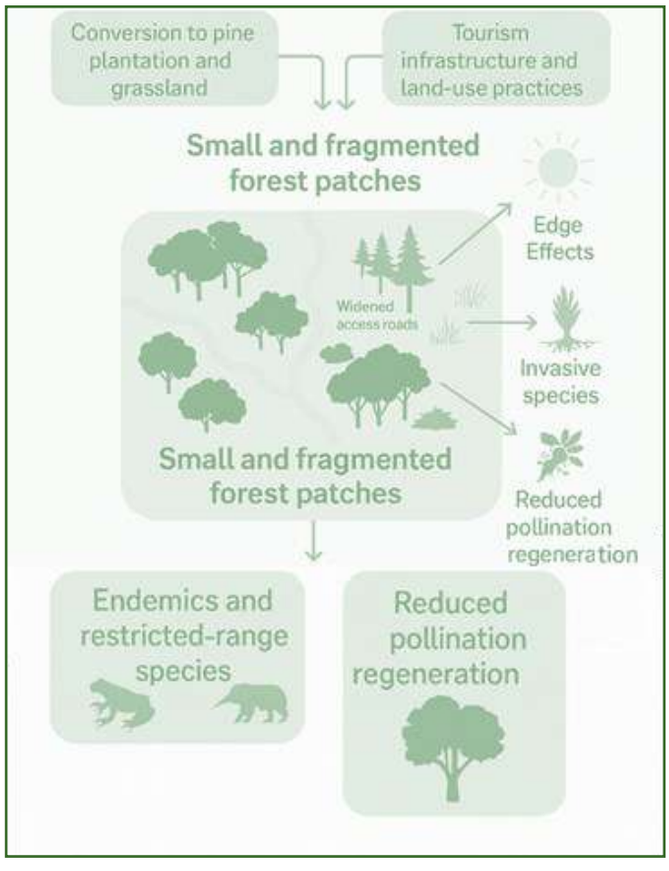
95. Critical Habitat GIS Map—Fauna

6.5 Threats and Vulnerabilities

ABC's status as both a conservation sanctuary and tourism hub introduces complex pressures that undermine ecological stability, biodiversity persistence, and the long-term viability of restoration initiatives.

6.5.1 Habitat Fragmentation and Degradation

Historically cleared for plantation and agriculture, much of the native forest at Ambuluwawa has been replaced by pine plantations and patana grasslands. Although partial reforestation has occurred, forest patches remain small and highly fragmented, particularly along ridge tops and steep slopes. Edge effects such as increased light penetration, desiccation, and exposure to invasive species are evident in many of these patches. Habitat degradation is further intensified by expanding tourism infrastructure (e.g., parking zones, cafes, widened access roads) and unsustainable land-use practices in surrounding villages.



96. Summary diagram of habitat fragmentation and degradation

Fragmentation disproportionately impacts species with limited dispersal abilities, such as amphibians and small mammals, which depend on continuous canopy and moist microhabitats. For flora, reduced patch size and isolation limit pollination success and seed dispersal, thereby weakening regeneration. The persistence of high-value endemics and restricted-range species is therefore closely tied to maintaining habitat connectivity and minimizing further landscape-level fragmentation.

6.5.2 Tourism Pressure and Infrastructure Development

High visitation rates result in trail erosion, litter accumulation, and disturbance of microhabitats, particularly around sacred and recreational zones. Construction of roads, viewing platforms, and facilities contributes to forest-edge expansion, increasing exposure of interior habitats to wind stress, invasive species incursion, and anthropogenic noise. Without regulated visitor management, these pressures risk compromising both ecological integrity and the cultural value of Ambuluwawa.

6.5.3 Roadkill

Roads bisecting and bordering Ambuluwawa create direct mortality risks for wildlife. Amphibians and reptiles are particularly vulnerable (fig 97), as many species migrate across roads during nocturnal or seasonal movements in search of breeding sites or feeding grounds. Their small body size and limited mobility contribute to disproportionately high road mortality, which poses a severe risk to already fragmented populations of endemic shrub frogs (*Pseudophilautus spp.)* and skinks. Mammals and birds, including civets, squirrels, and ground-foraging species, are also frequent victims. In small, isolated populations, such mortality events accelerate local extinction risks. Mitigation measures such as wildlife crossings, speed regulation, and seasonal awareness campaigns are urgently needed to reduce losses.

97. Deceased amphibians found during field survey. Amphibian populations highly vulnerable to road kills

6.5.4 Human–Macaque Conflict

The endemic Toque Macaque (*Macaca sinica*) is a key driver of human–wildlife conflict in Ambuluwawa. Highly adaptable and opportunistic (fig 98), macaques raid crops, damage property, and frequently enter visitor facilities, creating both economic and social tension. Tourist feeding and waste mismanagement exacerbate the issue, encouraging macaques to remain in human-dominated spaces (fig 99). Beyond the economic costs to local communities, the conflict has ecological implications, as macaques increasingly abandon natural foraging behaviour in favour of anthropogenic food sources. Retaliatory harm, displacement, and stress on macaque populations reflect the urgent need for conflict-mitigation strategies, including waste management and visitor education.

6.5.5 Climate Vulnerability

Ambuluwawa's position at the boundary of three climatic zones exposes it to multiple climate risks. Increasing rainfall variability and prolonged dry spells are already affecting freshwater springs and seasonal streams, reducing water availability for both wildlife and surrounding communities. Species confined to moist microhabitats—particularly amphibians, orchids, and epiphytic ferns—are at heightened risk from drought-induced desiccation.

Temperature rise at mid-elevations further threatens species with narrow altitudinal ranges, such as endemic shrub frogs and highland understory plants, which lack the capacity for upslope migration due to the limited elevation gradient at Ambuluwawa. Extreme rainfall events accelerate soil erosion on steep Patana slopes, while storm-induced canopy damage creates further disturbance that facilitates invasive species colonization. Together, these changes may trigger long-term shifts in species composition, favoring generalists and invasive taxa over sensitive endemics.

98. Toque Macaques feeding on rice stolen from a 3-wheel vehicle left unattended

99. Toque Macaques utilizing human altered landscapes

6.5.6 Invasive Alien Species

IAS are organisms—plants, animals, or microorganisms—that are introduced beyond their natural ranges, intentionally or accidentally, and cause harm to biodiversity, ecosystems, human health, or economies. The Convention on Biological Diversity (CBD) defines IAS as species whose "introduction and/or spread outside their natural habitats threatens biological diversity." In the plant kingdom, IAS can aggressively colonize new territories, outcompeting native flora, altering soil chemistry, and disrupting ecological balances.

Sri Lanka, recognized as a global biodiversity hotspot, is particularly vulnerable to IAS due to its high rate of endemism and fragmented landscapes. One notable location illustrating this threat is Ambuluwawa, a biologically diverse area encompassing various ecosystems including natural forests, pine plantations, and abandoned tea lands undergoing succession. As revealed by the National Invasive Alien Plant Checklist for this site, several IAS species have established themselves across these varied habitats.

IAS exert their negative impact through multiple pathways. In natural forests, they compete with native understory vegetation, reduce light availability, and suppress regeneration. Species like *Tithonia diversifolia* (Mexican sunflower) form dense thickets, disrupting native plant recruitment. In agricultural areas, plants such as *Mimosa pigra* and *Lantana camara* hinder crop production and obstruct irrigation channels, leading to economic losses. Pine plantations and successional forests on former tea lands are especially vulnerable due to their disturbed soil and canopy gaps, which favour opportunistic invaders.

These species are known for their rapid growth, high reproductive capacity, and allelopathic effects (chemical suppression of other plants). Their presence not only alters plant community structures but also affects pollinator dynamics, hydrology, and soil microbial communities.

Based on the sampling data analysis, the most vulnerable area to IAS spread in Ambuluwawa is the agricultural landscape, where seven IAS were recorded. This is followed by successional forests (7 IAS), natural forests (4 IAS), and pine plantations (each with 4 IAS). These trends highlight the susceptibility of disturbed or semi-managed landscapes to invasions, especially where human activity creates openings in native vegetation (fig 100).

Moreover, the overlap of IAS across multiple habitat types indicates their ecological flexibility and the interconnected nature of their spread. Successional forests, recovering from previous land use, serve as transitional zones where both native and invasive species coexist—making them critical intervention points for IAS management.

The ecological richness of Ambuluwawa is under mounting threat from invasive alien plant species. Strategic interventions focusing on the most vulnerable areas—especially agricultural and successional landscapes—are vital. Integrated approaches involving early detection, rapid response, habitat restoration, and stakeholder participation are essential to preserve the native biodiversity and ecological integrity of this biologically significant region.

100. Mimosa pigra (Giant Mimosa, Yoda nidikumba, Gas Nidikumba) spreading along the banks of "Jaya wewa"

TABLE 17. LIST OF INVASIVE ALIEN FLORA SPECIES RECORDED IN THE AMBULUWAWA BIODIVERSITY COMPLEX

NO	Family	Scientific Name	Common Name (NRL 2020)		SpS	Cultural	Natural Forest	Successional Forest on Former Tea Land	Agriculture	Pine plantation
			English name	Sinhala Names						
1	Apocynaceae	*Alstonia macrophylla Wall. ex G.Don*	Hard alstonia	Hawari Nuga, Yakadamaran, Attoniya, Ginikuru gas	IAS		X	X	X	X
2	Asteraceae	*Tithonia diversifolia (Hemsl.) A.Gray*	Mexican sunflower, Japanese sunflower	Wal-sooriyakantha,	IAS	X		X	X	
3	Clusiaceae	*Clusia rosea Jacq.*	Autograph tree, balsam apple	Gal Goraka, Gal Pilila,	IAS	X		X	X	
4	Fabaceae	*Mimosa pigra var. pigra*	Giant Mimosa	Yoda nidikumba, Gas Nidikumba	IAS	X			X	X
5	Melastomataceae	*Miconia crenata (Vahl) Michelang.*	Soapbush	Katakalu-Bovotiya	IAS		X	X	X	X
6	Verbenaceae	*Lantana camara subsp. aculeata (L.) R.W.Sanders*	Lantana	Ganda pana,	IAS		X	X	X	
7	Asteraceae	*Sphagneticola trilobata (L.) Pruski*	Singapore daisy	Udaya kumari, Kaha karabu, Arunadevi	IAS	X	X	X	X	X
8	Arecaceae	*Pinanga coronata (Blume ex Mart.) Blume*	Ivory Cane Palm	Species with the potential to become an Invasive Alien Species (IAS)						X

Mimosa pigra **(Giant Mimosa, Yoda Nidikumba, Gas Nidikumba) is spreading rapidly along the "Jaya Wewa" area and surrounding agricultural zones. (fig 100, 101,102) Its thorny, impenetrable thickets invade irrigation paths and croplands, reducing land usability and biodiversity. The species also poses a threat to native wetland flora by outcompeting them for light and space. If left unmanaged, its expansion could severely alter ecosystem structure and limit agricultural productivity. Immediate control measures are essential to prevent further ecological and agricultural degradation.**

101. Mimosa pigra leaf structure

102. Wide shot showing extent of spread of Mimosa pigra along tank edges

103. Sphagneticola trilobata is aggressively invading the habitat of the endemic Exacum trinervium

Sphagneticola trilobata **is aggressively invading the habitat of the endemic** ***Exacum trinervium*** **in Ambuluwawa. Its fast-growing, mat-forming nature smothers native ground flora, threatening the survival of this sensitive endemic species (fig 103). The invasive also reduces light availability and alters soil conditions, creating an inhospitable environment for native seedlings. Urgent habitat management is needed to protect** ***E. trinervium*** **and maintain native plant community balance.**

104. Thick ground layer of M.crenata in previously cleared forest area

105. Fruits of M.crenata provide food source to frugivorous birds

Miconia crenata **is rapidly invading pine plantations in the Ambuluwawa region, where it forms dense undergrowth that suppresses native plant regeneration and disrupts forest dynamics. The species is particularly problematic because its thick stands reduce light penetration to the forest floor (fig 104), limiting the establishment of native herbs, shrubs, and tree seedlings. Over time, this leads to a decline in plant diversity and alters soil nutrient cycling, as the heavy litter layer from** ***M. crenata*** **decomposes differently than that of native vegetation. Such changes have cascading effects on associated fauna, including insects and small vertebrates that depend on native understory plants for food and shelter.**

The aggressive spread of ***M. crenata*** **is strongly facilitated by its bird-mediated seed dispersal system. The plant produces abundant small, fleshy fruits that are readily consumed by a variety of frugivorous birds. After ingestion, seeds are dispersed over wide areas, often deposited in disturbed or open habitats where they germinate successfully (fig 105). This dispersal strategy enables the species to colonize new sites rapidly, including forest edges, abandoned plantations, and gaps created by logging or natural disturbance. Importantly, its ability to tolerate shade under pine canopies allows it to persist even where light levels are low, giving it a competitive edge over many native species.**

The ecological implications of this invasion are significant. By monopolizing space and resources, ***M. crenata*** **undermines efforts to restore pine plantations to more diverse native forest, potentially locking these areas into long-term ecological degradation.**

The species' spread into ecologically sensitive habitats also poses a direct threat to Sri Lanka's unique montane biodiversity, which is already under pressure from habitat fragmentation and climate change. Targeted monitoring, early detection, and control measures—such as manual removal, the use of herbicides in carefully managed applications, or experimental biological control—are essential to slow its expansion and safeguard the ecological integrity of the Ambuluwawa landscape.

Invasive Tree Species:

Alstonia macrophylla **(Hawari Nuga) is the most widely spreading invasive species in the Ambuluwawa region, recorded across all major habitat types including natural forests, pine plantations, agricultural lands, and successional tea lands (fig 106). Its rapid colonization is primarily driven by its efficient wind-dispersed seeds, which are light, winged, and capable of traveling long distances. Once established, it forms dense canopies that suppress native plant regeneration by blocking sunlight. The species also exhibits allelopathic properties, further inhibiting understory growth. Its ecological dominance and adaptability make it a serious threat to biodiversity, demanding focused removal and monitoring.**

106. Alstonia macrophylla (Hawari Nuga, Yakadamaran, Attoniya, Ginikuru gas) forms dense canopies that suppress native plant regeneration

Species with the potential to become an IAS

***Pinanga coronata*, commonly known as the ivory cane palm, is an ornamental palm native to Southeast Asia. While valued for its aesthetic appeal, this species has shown invasive tendencies in tropical island ecosystems, particularly in the South Pacific. Evidence from Fiji demonstrates that *P. coronata* aggressively colonizes understory habitats, leading to significant ecological disruption.**

Research has shown that the spread of *P. coronata* correlates strongly with reduced native biodiversity. In areas of high palm density, species richness of native understory plants declined by up to 50%, alongside a 33% drop in Shannon diversity index. The palm exerts competitive pressure by filtering resident species based on functional traits, favoring those with high nutrient acquisition efficiency. This shift results in homogenized plant communities with diminished ecological function [27].

Moreover, *P. coronata* displaces ecologically important species such as native tree ferns by inhibiting seedling recruitment. This change threatens forest regeneration and may alter long-term ecosystem dynamics [27].

Given its ecological plasticity and rapid spread, *P. coronata* poses a serious threat to forest ecosystems where it is introduced and should be classified as a species with high invasive potential.

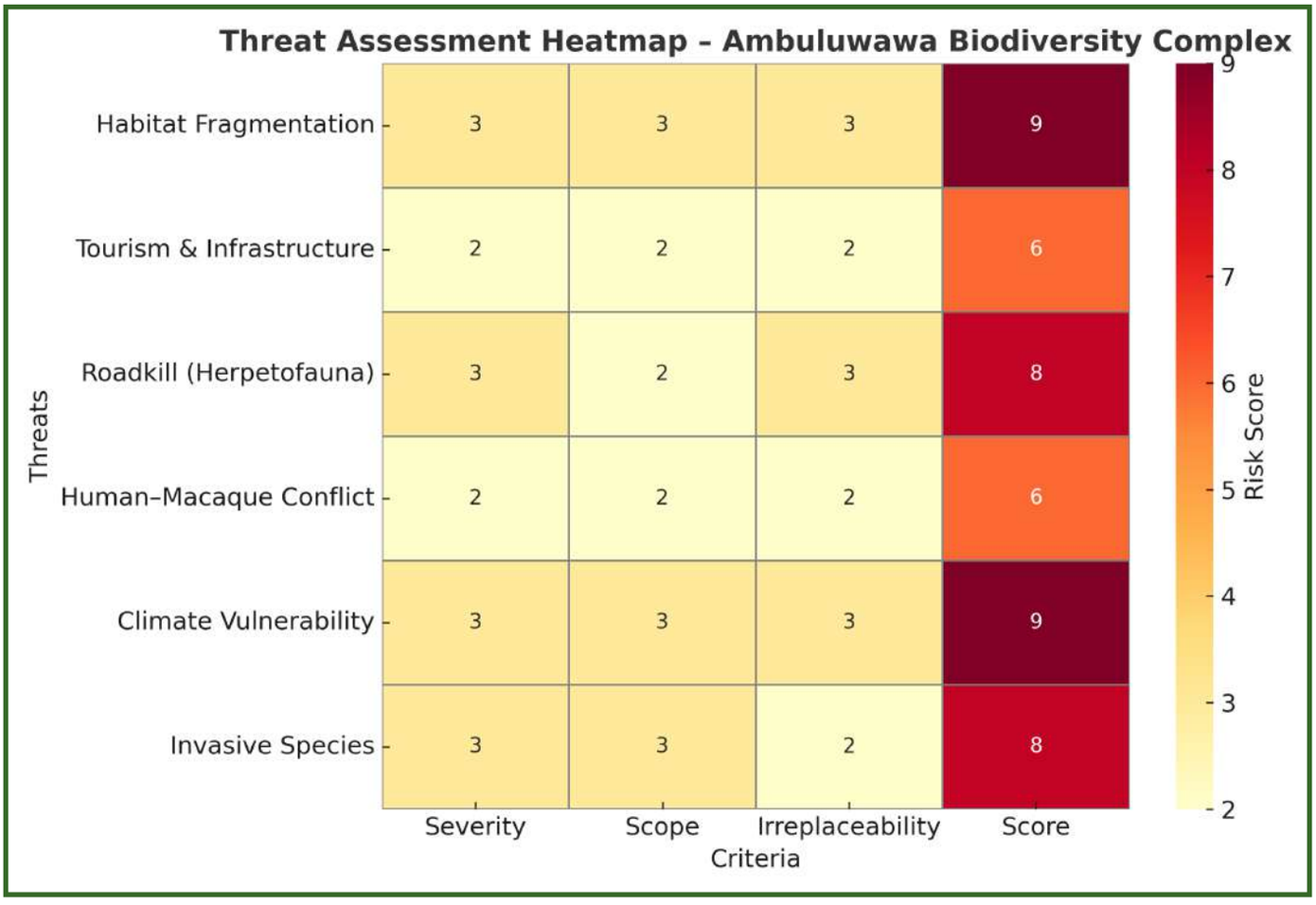
107. P. coronata is already present in the site but in very low numbers, urgent mitigation is required

In the context of Ambuluwawa, *P. coronata* is present in low numbers therefore early detection and preventative management are therefore critical to avoid the establishment of self-sustaining populations and to safeguard the integrity of native plant communities (fig 107).

6.5.7 Quantitative Threat Assessment

To complement the qualitative evaluation of threats, a semi-quantitative risk analysis was undertaken for the Ambuluwawa Biodiversity Complex. Each major threat was assessed against three conservation criteria: Severity (magnitude of ecological impact), Scope (extent of spatial coverage), and Irreplaceability (degree to which unique species or habitats are affected). Scores were assigned on a scale of 1 (low) to 3 (high), with total values categorised into Low (3–4), Moderate (5–6), and High (7–9) threat levels.

This analysis reveals that habitat fragmentation and climate vulnerability pose the highest risks (score = 9), given their pervasive influence across the site and disproportionate impact on endemic and range-restricted species. Roadkill, particularly affecting amphibians and reptiles, and the spread of invasive alien species also ranked as high threats (score = 8). In contrast, tourism and infrastructure development and human–macaque conflict were categorised as moderate threats (score = 6). While locally significant, their impacts are less site-wide compared to the systemic pressures of fragmentation and climate change.



108. Threat assessment heat map showing the 6 identified threats

This analysis underscores that threats in Ambuluwawa are not isolated but cumulative, with fragmentation, climate stress, and invasive species acting as reinforcing drivers that amplify other pressures such as roadkill mortality and tourism disturbance. Prioritising management efforts towards mitigating these high-risk drivers—by restoring habitat connectivity, controlling invasives, and implementing climate adaptation measures—will provide the greatest benefit to the persistence of Ambuluwawa's biodiversity.

6.5.8 Ecological Vulnerabilities

Beyond direct threats such as habitat loss and invasive species, the Ambuluwawa Biodiversity Complex faces a set of underlying ecological vulnerabilities that shape its long-term resilience. These vulnerabilities reflect the site's unique biophysical characteristics, including its steep terrain, transitional climatic position, and high concentration of endemic species with restricted ranges. They also highlight the ecosystem processes—such as pollination, soil stability, and hydrological regulation—that are easily disrupted by human disturbance and environmental change.

Identifying these vulnerabilities is essential because they represent the mechanisms through which external pressures are amplified, potentially leading to disproportionate biodiversity losses. For example, the dependence of many amphibians and herbs on narrow microhabitats magnifies the risk of localized extinction under fragmentation or climate stress, while the loss of pollinators or soil stability can cascade across multiple trophic levels and ecosystem services. The table below summarizes the key ecological vulnerabilities identified at Ambuluwawa.

TABLE 18. SUMMARY OF THE ECOLOGICAL VULNERABILITIES IN AMBULUWAWA BIODIVERSITY COMPLEX

Ecological Factor	Vulnerability Description
Species Endemism	High extinction risk due to narrow ranges and microhabitat specialization, particularly among amphibians, reptiles, and herbs. (fig 109)
Pollinator Disruption	Declines in native insect abundance—exacerbated by invasive plants—threaten pollination networks critical to native tree and herb reproduction.
Soil Erosion	Steep terrain and exposed patana slopes are highly erosion-prone, worsened by vegetation trampling and extreme rainfall events.
Hydrological Regulation	Loss of native forest cover alters infiltration and water retention, reducing spring discharge and affecting downstream agriculture.

109. Photograph showing micro-habitat of the endemic and endangered Nannophrys ceylonensis (Sri Lanka rock frog, Lanka galpara Madiya)

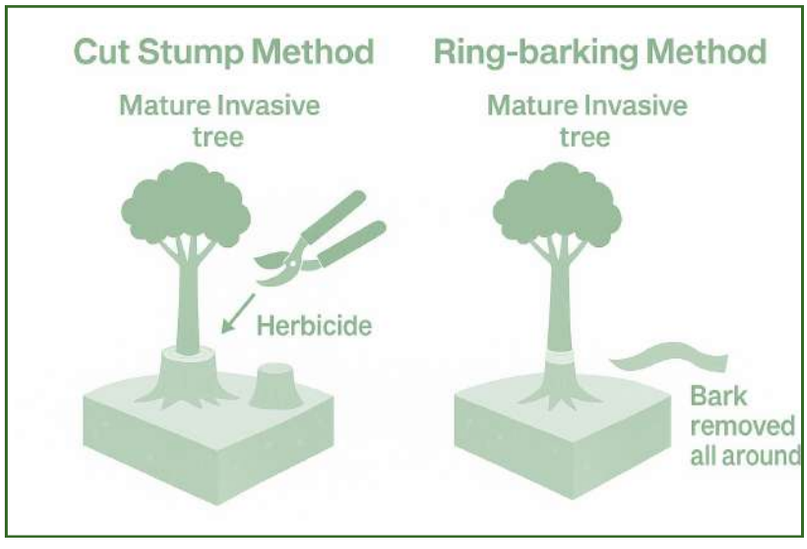
7. Management Recommendations

7.1 Short-Term Recommendations (1–3 years)

7.1.1 Invasive Species Control

7.1.1.1 Immediate removal of high-risk IAS such as *Alstonia macrophylla* (Hard Alstonia), *Miconia crenata* (Soapbush), *Sphagneticola trilobata* (Singapore Daisy), *Mimosa pigra* (Giant Mimosa), and *Lantana camara* (Lantana) across all habitats.

Effective removal of high-risk invasive alien species (IAS) such as *Alstonia macrophylla* (Hard Alstonia), *Miconia crenata* (Soapbush), *Sphagneticola trilobata* (Singapore Daisy), *Mimosa pigra* (Giant Mimosa), and *Lantana camara* (Lantana) requires integrated approaches combining mechanical, chemical, and ecological restoration techniques. Manual uprooting of seedlings and ring-barking or cut-stump methods for mature trees have proven effective for woody IAS [29] (fig 110). For sprawling herbs and shrubs, repeated slashing followed by targeted herbicide application is recommended to prevent resprouting [30]. Post-removal, enrichment planting with competitive native species is essential to suppress reinvasion and restore ecosystem resilience.



110. Diagram showing cut stump and ring barking methods for IAS removal

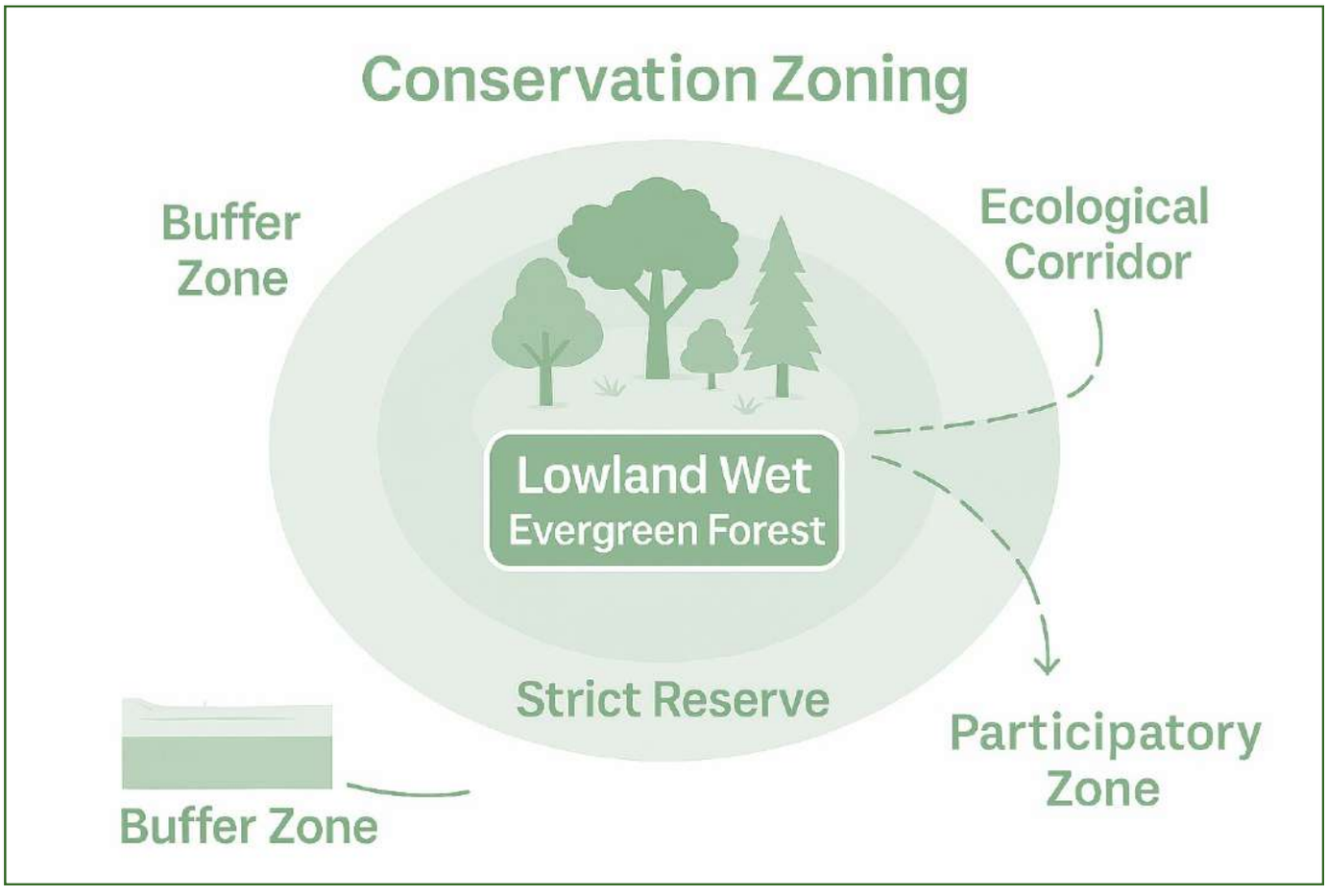
7.1.1.2 Introduce Early Detection and Rapid Response (EDRR) protocols for emerging invasives like *Pinanga coronata* (Ivory Cane Palm)

EDRR protocols are critical to prevent the establishment of emerging invasive species such as *Pinanga coronata* (Ivory Cane Palm). EDRR involves systematic surveillance, rapid identification, immediate reporting, and prompt removal before species spread beyond localized populations [31]. Monitoring should integrate community-based reporting, remote sensing, and targeted surveys in high-risk areas [31]. Removal is best achieved by manual uprooting of seedlings and saplings combined with monitoring for regrowth. Post-eradication, restoration using native species is essential to prevent recolonization and strengthen ecosystem resilience [29].

7.1.2 Habitat Protection & Restoration

7.1.2.1 Protect remaining Lowland Wet Evergreen Forest patches by establishing strict conservation zones.

Protecting remaining LWEF patches requires the establishment of strict conservation zones that limit anthropogenic disturbance while maintaining ecological processes. Conservation zoning involves mapping critical habitats, classifying areas by ecological sensitivity, and enforcing restrictions on land use, extraction, and infrastructure development [33]. Effective implementation requires buffer zones, ecological corridors, and participatory management with local communities to balance biodiversity protection with socio-economic needs [34] (fig 111).



111. Diagram showing that effective implementation of conservation zoning requires buffer zones, ecological corridors, and participatory management

7.1.2.2 Begin native species enrichment planting in successional tea lands and pine plantations to accelerate forest recovery

Enrichment planting with native species is an effective strategy to accelerate the recovery of degraded habitats such as successional tea lands and monoculture pine plantations. The methodology involves removing IAS, establishing nurseries for native species, and strategically introducing ecologically important plants that restore structural and functional diversity [36].

A native plant nursery should be established near the site to propagate seedlings of key species, prioritizing endemics and threatened taxa (e.g., *Syzygium rubicundum* – Endemic Rose Apple, *Cinnamomum verum* – True Cinnamon). Species that provide food and habitat for birds (e.g., *Ficus racemosa* – Cluster Fig, *Artocarpus nobilis* – Ceylon Breadfruit, *Elaeocarpus serratus* – Ceylon Olive) should be included to enhance avian diversity and seed dispersal functions [35].

In pine plantations, line enrichment planting between rows of pines and gap planting in open patches are recommended, while in tea lands, enrichment should be combined with soil rehabilitation and shading practices [37]. Long-term monitoring is necessary to assess survival rates, canopy development, and faunal responses. Combined with IAS control, enrichment planting creates self-sustaining secondary forests that approximate the structure and function of LWEFs.

TABLE 19. LIST OF RECOMMENDED NATIVE BIRD-FEEDING PLANTS FROM THE LOWLAND WET ZONE OF SRI LANKA

NO	Family	Scientific Name	English Name	Sinhala Name
1	Anacardiaceae	*Mangifera zeylanica*	Wild Mango	Etamba
2	Anacardiaceae	*Semecarpus gardneri*	Poison Nut	Badulla
3	Annonaceae	*Polyalthia moonii*	Moon's Polyalthia	–
4	Annonaceae	*Polyalthia korinti*	Korinti Tree	–
5	Clusiaceae	*Garcinia quaesita*	Ceylon Gamboge	Goraka
6	Clusiaceae	*Garcinia xanthochymus*	Wild Mangosteen	–

7	Clusiaceae	*Garcinia mangostana*	Mangosteen	Mangus
8	Ebenaceae	*Diospyros ebenum*	Ceylon Ebony	Kalu Kaluwara
9	Ebenaceae	*Diospyros ovalifolia*	Oval Ebony	–
10	Euphorbiaceae	*Macaranga peltata*	Macaranga	Kenda
11	Euphorbiaceae	*Mallotus philippensis*	Red Kamala	Keppetiya
12	Fabaceae	*Millettia pinnata*	Indian Beech	Kiripalu
13	Fabaceae	*Dalbergia latifolia*	Indian Rosewood	Nadun
14	Lauraceae	*Cinnamomum verum*	Ceylon Cinnamon	Kurundu
15	Lauraceae	*Cinnamomum dubium*	Ceylon Cinnamon	Wana Kurundu
16	Malvaceae	*Grewia hirsuta*	Wild Grewia	–
17	Moraceae	*Ficus racemosa*	Cluster Fig	Gas Atta
18	Moraceae	*Ficus hispida*	Hairy Fig	Gas Aralu
19	Moraceae	*Ficus benjamina*	Weeping Fig	Pandu Nuga
20	Moraceae	*Ficus exasperata*	Sandpaper Fig	–
21	Moraceae	*Ficus tsjakela*	Tsjakela Fig	–
22	Myrtaceae	*Syzygium caryophyllatum*	Clove-like Berry Tree	Kuntala
23	Myrtaceae	*Syzygium rubicundum*	Endemic Rose Apple	
24	Myrtaceae	*Eugenia mooniana*	Moon's Eugenia	Pinibaru
25	Myrtaceae	*Syzygium firmum*	Firm Syzygium	–
26	Myrtaceae	*Syzygium cumini*	Java Plum	Madan
27	Phyllanthaceae	*Aporosa lanceolata*	Aporosa	–
28	Phyllanthaceae	*Aporosa cardiosperma*	Heart-seeded Aporosa	–
29	Rubiaceae	*Psychotria nigra*	Wild Coffee	–
30	Rubiaceae	*Psychotria zeylanica*	Ceylon Psychotria	–
31	Sapindaceae	*Nephelium lappaceum*	Wild Rambutan	Wal Rambutan

7.1.3 Tourism Management

7.1.3.1 Introduce visitor guidelines to minimize habitat disturbance

Tourism in biodiversity-rich landscapes such as the ABC can generate conservation revenue but also creates risks of habitat degradation, wildlife disturbance, and invasive species introduction if unmanaged. Research indicates that introducing visitor guidelines, zoning, carrying capacity limits, and designated trails is essential to balance conservation and tourism [38].

Zoning divides landscapes into high-protection core areas, regulated buffer zones, and recreational use zones, thereby minimizing disturbance to sensitive habitats and species [39]. Carrying capacity assessments should determine the maximum number of visitors per day based on trail width, habitat sensitivity, and wildlife disturbance thresholds [40]. Designated trails reduce trampling and soil erosion while guiding tourists away from ecologically fragile areas. Visitor guidelines should prohibit feeding wildlife, littering, and off-trail walking, with enforcement through signage, ranger patrols, and awareness programs.

Community participation in eco-tourism initiatives enhances compliance and ensures local benefits [40]. Integrating environmental impact assessments into tourism planning ensures adaptive management. Together, these measures reduce biodiversity threats while promoting sustainable nature -based tourism aligned with Sri Lanka's NBSAP objectives.

7.1.3.2 Building Birdwatching Huts and Hides to Enhance Avian Observation and Conservation Awareness

It is recommended that strategically located birdwatching huts and observation hides be developed within suitable habitats to promote birdwatching as a low-impact, educational, and conservation-oriented activity (fig 112). These structures should be designed to blend naturally with the environment,

providing concealed and comfortable spaces for visitors to observe birds without causing behavioral disturbance. Such facilities not only enhance the visitor experience by allowing close-range views of feeding, nesting, and flight behaviors but also offer year-round usability through shelter from weather. Importantly, they foster public engagement in biodiversity appreciation, support environmental education, and contribute to responsible wildlife tourism and long-term avian conservation efforts.

7.1.3.3 Install well-designed signboards that display information on the flora and fauna species present in the area, while also highlighting key biodiversity hotspots

This will enhance visitor awareness, promote conservation education, and support the long-term protection of sensitive habitats. Interpretive signboards are an effective tool for enhancing visitor awareness and promoting conservation education in biodiversity-rich landscapes (fig 113). Well-designed signage should include images, scientific and common names, ecological roles, and conservation status of local flora and fauna, while also highlighting key biodiversity hotspots and sensitive habitats [41]. Placement along designated trails and viewpoints increases visibility without disturbing habitats. Research shows that interpretive materials improve visitor understanding, foster pro-conservation attitudes, and reduce harmful behaviors such as littering or wildlife feeding [42]. Culturally adapted, multilingual signage ensures accessibility and strengthens long-term support for biodiversity protection.

112. AI concept image of innovative and environmentally friendly bird hide

7.1.4 Awareness & Community Engagement

7.1.4.1 Implement awareness campaigns with local communities and pilgrims to highlight the ecological value of Ambuluwawa.

113. AI concept image of wildlife signage NB image is concept only, species may not be accurate to site

Awareness and community engagement are essential for fostering long-term stewardship of biodiversity in multi-use landscapes such as the Ambuluwawa Biodiversity Complex. Effective programs combine environmental education, participatory workshops, and culturally embedded messaging that resonate with both local communities and pilgrims [43]. Community-led campaigns using local language materials, interpretive signboards, and guided eco-walks can improve knowledge of endemic and threatened species while discouraging harmful practices like feeding wildlife or spreading invasive plants. Successful models in Sri Lanka and elsewhere highlight that inclusive participation enhances compliance and strengthens conservation outcomes [44].

7.1.4.2 Train local stakeholders in IAS monitoring and habitat management, ensuring community participation in conservation

Training local stakeholders and workers in IAS monitoring and habitat management enhances early detection, improves control efforts, and fosters long-term stewardship. Participatory approaches, such as community-based monitoring (CBM), have been shown to improve IAS detection accuracy while building local conservation capacity [45]. Training should cover species identification, survey methods, data recording, and safe removal techniques, combined with ecological restoration practices. Evidence from Sri Lanka and other tropical countries shows that locally trained stakeholders provide cost-effective, sustainable monitoring networks that complement formal conservation efforts and ensure community ownership of biodiversity protection [46].

7.1.5 Mitigating Human – Monkey Conflict (*Macaca sinica*)

7.1.5.1 Conduct targeted education programs for visitors, and staff on not feeding *Macaca sinica* (Toque Macaque; VU, NRL 2020) and proper waste disposal

Targeted awareness programs are essential to mitigate human–macaque conflict in multi-use landscapes (fig 114). Education campaigns should inform staff, visitors, and residents about the ecological role and threatened status of *Macaca sinica* (Toque Macaque; VU, [47] while emphasizing the risks of feeding and waste mismanagement. Research shows that provisioning encourages aggressive macaque behavior and dependence on human food, intensifying conflict [48]. Effective methods include signage, school -based education, and participatory workshops, combined with improved waste management. Community-focused coexistence programs have been demonstrated to reduce conflict incidents and foster tolerance for primates in shared landscapes.

114. AI concept image of awareness material to mitigate human-macaque conflict

7.1.5.2 Waste Management: Install macaque-proof garbage bins and establish strict waste collection near religious and recreational sites to reduce food attractants

Improper waste disposal is a major driver of human–macaque conflict, as open garbage creates strong attractants. Installing macaque-proof garbage bins and establishing systematic waste collection at religious and recreational sites can significantly reduce encounters. Research in urban and peri-urban areas has shown that primates quickly exploit unprotected waste, reinforcing food-conditioning and aggressive behaviour [49]. Effective waste management combines secure bin design, frequent collection, community education, and enforcement of anti-littering policies [50]. Such integrated approaches reduce provisioning opportunities, discourage habituation, and support coexistence between humans and *Macaca sinica*.

7.1.5.3 Habitat Enrichment: Enhance macaque foraging areas with native fruiting trees (e.g., *Ficus racemosa* – Cluster Fig) to reduce dependency on human food sources.

Habitat enrichment through the planting of native fruiting trees can reduce macaques' reliance on anthropogenic food sources by increasing natural foraging opportunities. Species such as *Ficus racemosa* (Cluster Fig), *Artocarpus nobilis* (Ceylon Breadfruit), and *Syzygium cumini* (Indian Blackberry) provide year-round fruit resources and support broader faunal communities. Studies indicate that provisioning conflicts decline where natural food availability is enhanced, as primates adjust foraging ranges to enriched forest patches [51]. Enrichment planting should be combined with invasive species control and long-term monitoring to ensure that restored habitats sustain macaque populations and reduce human–wildlife interactions.

7.1.6 Mitigating Road Kills

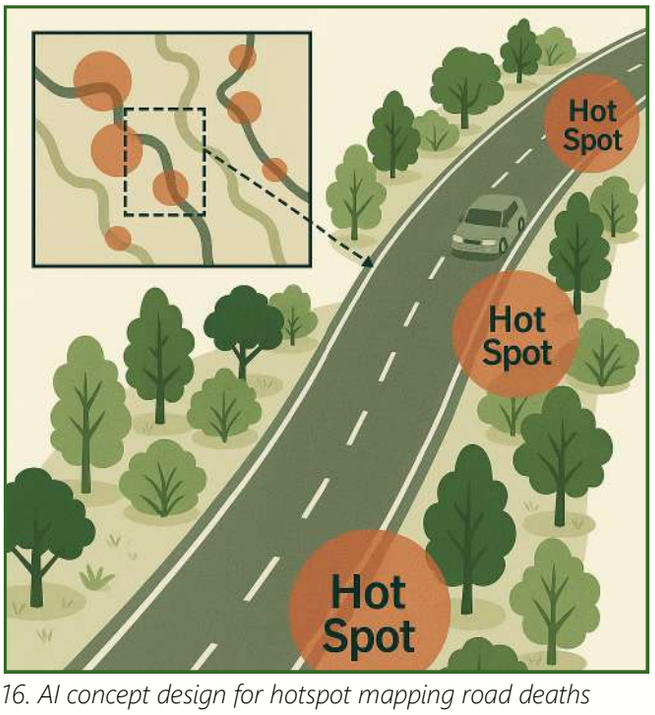
7.1.6.1 Speed Reduction Measures: Install warning signs, and rumble strips along roads traversing biodiversity-sensitive areas

Road mortality is a major threat to wildlife in biodiversity-sensitive landscapes. Installing speed reduction measures such as rumble strips, and wildlife warning signs has proven effective in reducing vehicle speed and lowering collision rates [52] (fig 115). Research demonstrates that strategically placed measures near known crossing points, combined with driver awareness campaigns, can significantly reduce amphibian, reptile, and mammal road kills [53]. Integrating speed controls with ecological monitoring and hotspot mapping ensures adaptive management. These interventions represent cost-effective, immediately implementable strategies for protecting species in multi-use landscapes.

115. AI concept design for road signs protecting reptiles and amphibians

7.1.6.2 Hotspot Mapping and Awareness Campaigns: Educate drivers, staff members, and visitors on the risk of road kills for species such as reptiles, amphibians, and mammals

Awareness campaigns targeting drivers and visitors are essential to reduce wildlife road mortality in biodiversity-sensitive landscapes. Educational tools such as roadside signage, informational brochures, can increase awareness of collision risks for reptiles, amphibians, and mammals. Research shows that well-designed campaigns improve driver compliance with speed limits and attentiveness in wildlife crossing zones [54]. Combining education with hotspot mapping ensures that awareness efforts are directed to high-risk areas, maximizing conservation benefits.



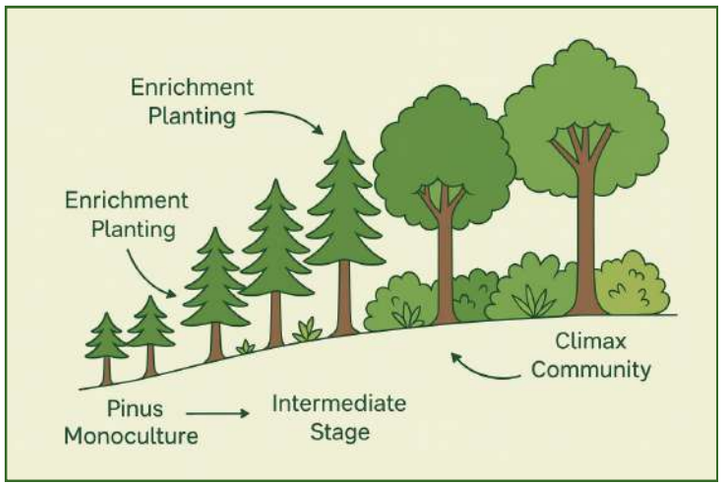
116. AI concept design for hotspot mapping road deaths

7.2 Long-Term Recommendations (5-15 yrs)

7.2.1 Ecosystem Restoration

7.2.1.1 Gradually convert pine plantations into mixed native forests by phased thinning and enrichment planting.

Gradual conversion of pine plantations into mixed native forests requires phased thinning and enrichment planting. Research in Sri Lanka shows *Pinus caribaea* can serve as a nurse crop, facilitating the establishment of late-successional species when gaps are created and natives are introduced [36] (fig 117). Similarly, restoring successional tea lands into secondary wet evergreen forests involves invasive removal, soil rehabilitation, and planting of native canopy and understory species [34]. Long-term monitoring of regeneration dynamics ensures reduced exotic dominance and enhanced native species recovery. These restoration strategies align with NBSAP objectives for forest resilience.



117. Simplified diagram showing pinus as pioneer species for succession

7.2.2 Biodiversity Monitoring & Research

7.2.2.1 Establish a long-term biodiversity monitoring program, with systematic tracking of endemic, threatened, and migratory species (fauna and flora)

Establishing long-term biodiversity monitoring requires standardized surveys, citizen-science engagement, and integration with national databases. Systematic tracking of endemic, threatened, and migratory species provides critical data for conservation status updates [55]. Monitoring should combine faunal transects, acoustic surveys, camera traps, and remote sensing for habitat change detection. Adaptive management frameworks allow conservation strategies to evolve in response to new findings, strengthening long-term biodiversity resilience in fragmented wet-zone ecosystems.

7.2.3 Hydrological and Soil Conservation

7.2.3.1 Protect watershed functions by restoring riparian buffers and reducing soil erosion on steep slopes

Protecting watershed functions requires restoring riparian buffers using native vegetation to stabilize stream banks and enhance water filtration. Studies in tropical landscapes confirm that riparian reforestation reduces erosion, regulates water flow, and improves aquatic biodiversity [56]. On steep slopes, terracing and contour planting combined with enrichment planting minimize soil degradation.

7.2.3.2 Promote agroforestry and sustainable farming in buffer areas to reduce land degradation and enhance ecological services

Promoting agroforestry systems in buffer zones enhances carbon sequestration, improves soil fertility, and reduces agricultural runoff [57]. These approaches strengthen ecological services while providing livelihoods, aligning with ecosystem-based adaptation strategies outlined in Sri Lanka's NBSAP.

7.2.4 Institutional and Policy Integration

7.2.4.1 Align site management with Sri Lanka's NBSAP (2016–2022) targets, particularly Objective 2 (ecosystem restoration) and Objective 4 (IAS management)

Effective governance requires aligning site-level management with national frameworks such as the NBSAP, particularly objectives on ecosystem restoration and IAS management. Strengthening institutional coordination ensures consistency with the Ambuluwawa Trust Act (2009) [2]. Transparent, participatory decision-making involving local stakeholders improves compliance and fosters shared ownership [44]. Evidence shows that multi-level governance frameworks combining local knowledge with national policy instruments result in more durable conservation outcomes [58]. Establishing regular reporting mechanisms to national biodiversity databases ensures accountability and alignment with international commitments such as the CBD Aichi Targets (fig 118).

118. Simplified framework for durable conservation outcomes

7.2.5 Sustainable Tourism & Education

7.2.5.1 Position Ambuluwawa as a model eco-cultural tourism site, integrating biodiversity education into visitor programs

Positioning Ambuluwawa as a model eco-cultural tourism site requires ecotourism zoning, visitor education, and interpretation centers. Evidence from protected areas shows that biodiversity interpretation enhances visitor awareness, fosters pro-conservation attitudes, and generates community benefits [41].

7.2.5.2 Develop biodiversity interpretation centers, eco-trails, and school outreach initiatives to increase awareness and support

Eco-trails and biodiversity centers should feature endemic and threatened species, combining scientific knowledge with cultural heritage narratives. School outreach programs build long-term stewardship, while ecotourism revenues can fund conservation. Sustainable tourism models stress the importance of balancing visitor experience with carrying capacity limits to prevent habitat degradation [37].

7.2.6 Mitigating Human– Toque Monkey Conflict (*Macaca sinica*)

7.2.6.1 Conflict Monitoring and Research: Develop a macaque–human conflict monitoring system to document trends and inform adaptive management

Developing a macaque–human conflict monitoring system requires systematic documentation of incidents, spatial mapping of hotspots, and behavioral studies. Research in Asia shows that conflict databases enable adaptive management by identifying trends and evaluating interventions [49]. Citizen reporting mechanisms and participatory surveys increase detection accuracy and community trust. Integration of conflict monitoring with habitat restoration helps evaluate the ecological drivers of conflict, including food scarcity and habitat loss. Findings should directly inform mitigation strategies, aligning with Sri Lanka's NBSAP goals for reducing human–wildlife conflict.

7.2.6.2 Zoning and Visitor Management: Redesign pilgrimage and tourist areas with buffer zones to reduce direct macaque–human encounters

Redesigning pilgrimage and tourist areas with buffer zones and regulated access reduces human–macaque encounters. Zoning frameworks used in protected areas designate core conservation zones, regulated buffer zones, and recreational zones to balance ecological protection and human use [37]. Incorporating visitor flow studies and carrying capacity assessments ensures zoning reflects both ecological sensitivity and visitor patterns [38]. Clear signboards, ranger enforcement, and cultural alignment with religious practices strengthen compliance. This adaptive approach enhances coexistence while safeguarding fragile habitats in multi-use landscapes such as Ambuluwawa.

7.2.6.3 Ecological Restoration: Restore degraded forest patches to improve natural food availability and reduce macaque reliance on anthropogenic resources

Long-term monitoring of dietary patterns and habitat use is necessary to evaluate restoration effectiveness.

7.2.7 Mitigating Road Kills

7.2.7.1 Wildlife Crossings: Construct canopy bridges for arboreal species (e.g., monkeys, squirrels) and underpasses for small mammals and reptiles in high-risk sections

Constructing canopy bridges and underpasses mitigates road mortality by providing safe passages for wildlife. Studies in Asia show canopy bridges reduce arboreal primate and squirrel road kills, while underpasses facilitate safe crossings for small mammals and reptiles [51][58] (fig 119). Placement should target documented roadkill hotspots, informed by long-term monitoring. Design must consider species-specific behavior, with vegetated approaches to encourage use. Integrating crossings into infrastructure planning ensures long-term ecological connectivity, a priority for fragmented wet-zone landscapes.

119. Examples of effective habitat linkages across roads. Left: An underpass for reptiles and amphibians in Doñana National Park, Spain [59]. Right: Rope bridges for monkeys and squirrels in India (source: Bridging the Gap by Ganesh Raghunathan)

7.2.7.2 Roadside Habitat Management: Maintain vegetated buffers and avoid creating open clearings that attract animals to roadsides

Maintaining vegetated roadside buffers reduces wildlife attraction to open clearings and provides safe cover for crossing species. Research indicates that roadside habitat design influences collision rates, with vegetated buffers reducing road mortality for amphibians and reptiles [60]. Native vegetation should be prioritized to prevent IAS colonization. Roadside management must integrate regular monitoring to assess effectiveness and adapt strategies accordingly. These measures enhance ecological safety while contributing to broader habitat connectivity across fragmented landscapes.

7.2.7.3 Integrated Planning: Incorporate ecological impact assessments into any future road or cable car infrastructure planning around ABC, as recommended in the NBSAP (MoMD&E, 2016)

Incorporating ecological impact assessments into future infrastructure projects, ensures biodiversity is considered in planning. EIAs should integrate species surveys, habitat mapping, and ecological modelling to assess cumulative impacts [61]. Long-term planning should emphasize maintaining ecological corridors and minimizing habitat fragmentation.

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