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Biodiversity Records of Selected Faunal Groups (Oligochaeta, Lepidoptera, Arachnida, Orthoptera, and Pisces) by Undergraduate Students in and around Maa Manikeshwari University Campus, Kalahandi, Odisha, India

Swagatika Mishra[1], Rakesh Kumar Acharya[2], Bhaktisudha Dandasena[2], Barsha Baishakhi Sahu[2], Raj Kumar Behera[2], Arpita Nayak[2], Smruti Ranjan Parida[2], Punyatoya Panda[2], and Subrat Kumar Panigrahi*[2]

[1]*Department of Forest, Environment & Climate Change, Government of Odisha, Bhubaneswar, Odisha, 751015, India*
[2]*Department of Zoology, Maa Manikeshwari University, Bhawanipatna, Kalahandi, Odisha, 76001, India*

ABSTRACT

This present study documents the first comprehensive biodiversity inventory of selected faunal groups (Oligochaeta, Lepidoptera, Araneae, Orthoptera, and Pisces) at the Maa Manikeshwari University campus in Bhawanipatna, Kalahandi district, Odisha, India. The survey was conducted from November 2024 to October 2025. The study across cropland, swamp, vegetated, and adjacent aquatic habitats revealed rich faunal diversity amid ongoing climate and anthropogenic pressures. Three earthworm species, such as Perionyx millardi, Drawida calebi, and Lampito mauritii were collected from cropland and swamp areas. Lepidoptera surveys recorded 31 butterfly species across 4 families and 25 genera, with Nymphalidae dominating (18 species), followed by Pieridae (5), Lycaenidae (4), and Papilionidae (4). Araneae assemblages featured Araneidae as the most abundant (~40% of specimens), succeeded by Salticidae (~30%), Pholcidae (~20%), Oxyopidae (~7%), and Theridiidae (~3%), underscoring the prevalence of orb-weavers and jumping spiders in campus vegetation. Orthoptera included 9 grasshopper species and 1 cricket species. From the nearby Pipal Nala stream, 8 indigenous freshwater fish species were identified: Ompok bimaculatus, Mystus gulio, Channa punctata, Puntius sophore, Puntius chola, Mastacembelus armatus, Salmosoma bacaila, and Rasbora daniconius.

Keywords: *Biodiversity, Oligochaeta, Lepidoptera, Araneae, Orthoptera, Pisces.*

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Corresponding Author: *Subrat Kumar Panigrahi*

E-mail Address: *subratkumarpanigrahi@gmail.com*

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INTRODUCTION

University and college campuses sustain remarkable faunal diversity, particularly among invertebrates, within their varied natural settings [1]. These environments often include landscaped gardens, ponds, and occasionally conserved zones that support groupings of birds, mammals, diverse insects (including butterflies and moths), soil biota, and aquatic fish communities. Among soil macrofauna, earthworms (Oligochaeta: Annelida) dominate biomass in many terrestrial ecosystems. Over 8,300 species exist globally, distributed across 38 families and 811 genera [2]. In India, 469 species and subspecies span 9 families and 72 genera [3][4]. Butterflies (Lepidoptera) exemplify ecological keystones, undergoing complete metamorphosis from caterpillars to short-lived adults that pollinate plants, channel energy through trophic levels, and bolster habitat biodiversity. India boasts ~1,501 species, with the Western Ghats hosting 330, including 48 endemics in the Nilgiri Biosphere Reserve [5].

As the largest Arachnid order (Araneae), spiders function as voracious predators across terrestrial biomes, curbing pest populations and stabilising food webs at intermediate trophic positions. Their sensitivity to habitat shifts positions them as prime bioindicators for ecosystem integrity and responses to disturbance [6][7][8]. Grasshoppers (Orthoptera: Caelifera), ubiquitous herbivores, integrate deeply into terrestrial food webs and excel as sentinels for environmental stressors like land-use intensification and climatic shifts [9][10]. Globally, Orthoptera encompass 29,434 species in 5,263 genera and 83 families [11]; India's tally includes 1,274 species (698 native) across 442 genera and 23 families. Freshwater habitats, and biodiversity hotspots under acute threat from degradation, exploitation, invasives, and climate-driven hydrology [12][13][14], host 37,109 fish species worldwide out of 18,896 freshwaters [15]. India contributes ~3,247 species (7.7% of the global total) from 1,044 genera, 256 families, and 57 orders [16][17][18].

This study presents the first biodiversity inventory for selected faunal groups (Oligochaeta, Lepidoptera, Arachnida, Orthoptera, Pisces) at Maa Manikeshwari University campus. Compiled by undergraduate students in collaboration with the Centre for Environmental Studies (CES), Bhubaneswar, and the Department of Forest, Environment & Climate Change, Government of Odisha, it establishes baseline species profiles to guide conservation and monitoring efforts.

MATERIALS AND METHODS

Study area

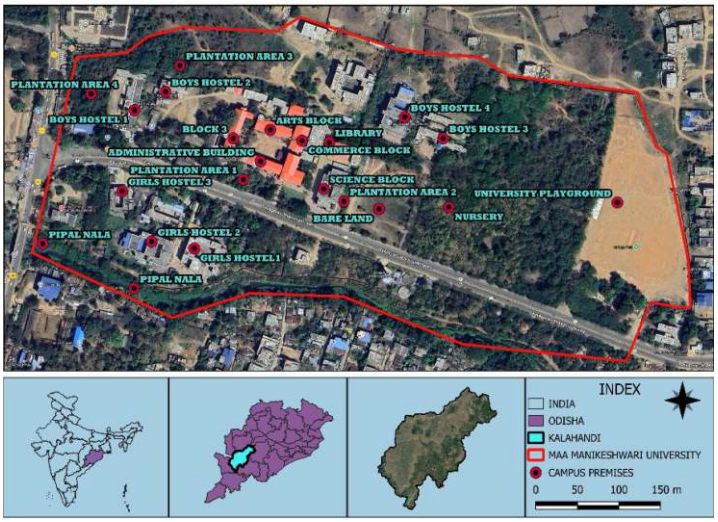

Figure 1. Collection sites at Maa Manikeshwari University, Bhawanipatna, Kalahandi, Odisha, India

Research on biodiversity was conducted at the Manikya Vihar Campus of Maa Manikeshwari University in Bhawanipatna, Kalahandi District, Southern Odisha (19°55′09″N, 83°10′27″E). Samples were gathered from various location across the university campus in Bhawanipatna, Odisha, Eastern India (Fig. 1). The campus, which yielded the highest species diversity, features dense vegetation, lush greenery, and numerous flowering plants and trees that create ideal habitats for spiders, grasshoppers, and butterflies.

Butterfly larvae thrive on host plants within this environment, while the thick foliage offers prime shelter for adult butterflies.

Methods

Hand-sorting entailed excavating soil blocks (typically 25 × 25 × 25 cm or 50 × 50 × 25 cm; Fig. 2) and manually inspecting for earthworms, a labour-intensive approach effective for detecting shallow-dwelling species. Butterfly adults were captured with aerial nets during peak flight activity. Orthopterans, including grasshoppers, were gathered from selected sites via insect nets, and hand-picking, with identifications relying on morphological traits such as colouration, size, wing patterns, and antennal structure, guided by established keys. Spiders were sampled through hand-picking, sweep netting, the umbrella method, and visual census techniques [19].

Identifications of butterflies were made from standard references, including Evans (1932) [20], Gupta and Majumdar (2012) [21], and Mohapatra et al. (2012) [22]. Spider taxonomy utilized key literature [23] [24], the World Spider Catalog (2025) [25], and the Indian Biodiversity Portal. Fishes were netted from the Pipal Nala stream traversing the campus and verified against pertinent taxonomic resources.

Figure 2. (a–b) Earthworm collection sites; (c) hand-sorting collection method; (d) earthworm at collection site

Processing and Preservation

Specimens were photographed using a stereo zoom binocular microscope equipped with a digital camera. Rare and live individuals were released into their natural habitats post-examination, while select samples were preserved in 70% ethanol and deposited in the animal museum of the Zoology Department at Maa Manikeshwari University.

RESULTS

Three earthworm species such as *Perionyx millardi*, *Drawida calebi*, and *Lampito mauritii* were collected from cropland and swamp habitats at the Maa Manikeshwari University campus (Fig. 3).

Figure 3. Three captured earthworm species

A total of 31 butterfly species, belonging to 4 families and 25 genera, were recorded (Fig. 4). Nymphalidae dominated with 18 species followed by Pieridae (5 species), Lycaenidae (4 species), and Papilionidae (4 species).

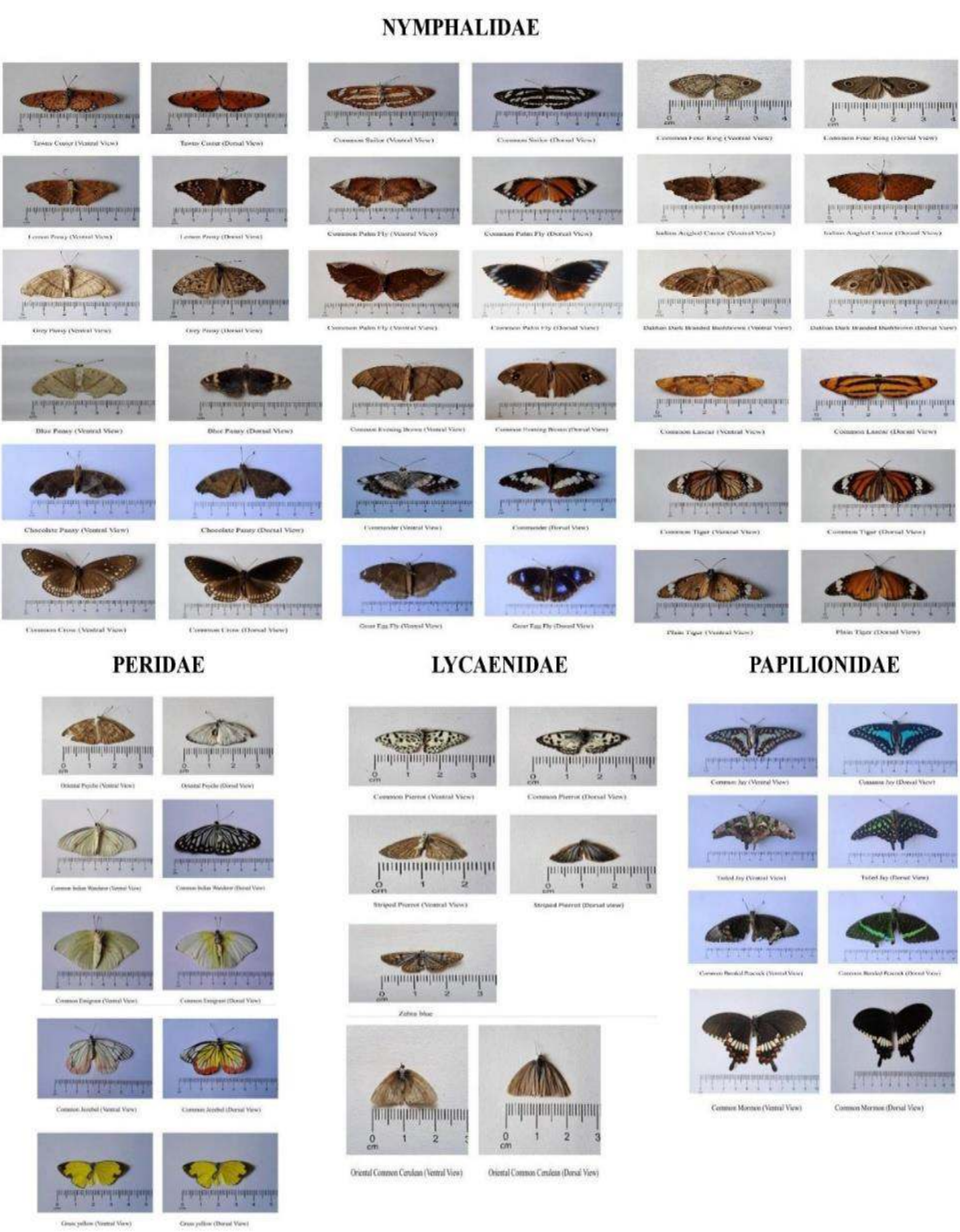

Figure 4. Thirty-one butterfly species collected from the Maa Manikeshwari University campus

Figure 5. Selected spider species collected from the Maa Manikeshwari University campus

Araneidae was the most abundant family, comprising approximately 40% of specimens, followed by Salticidae (~30%), Pholcidae (~20%), Oxyopidae (~7%), and Theridiidae (~3%).
This composition highlights the prevalence of orb-weaving and jumping spiders in the campus' vegetated habitats.

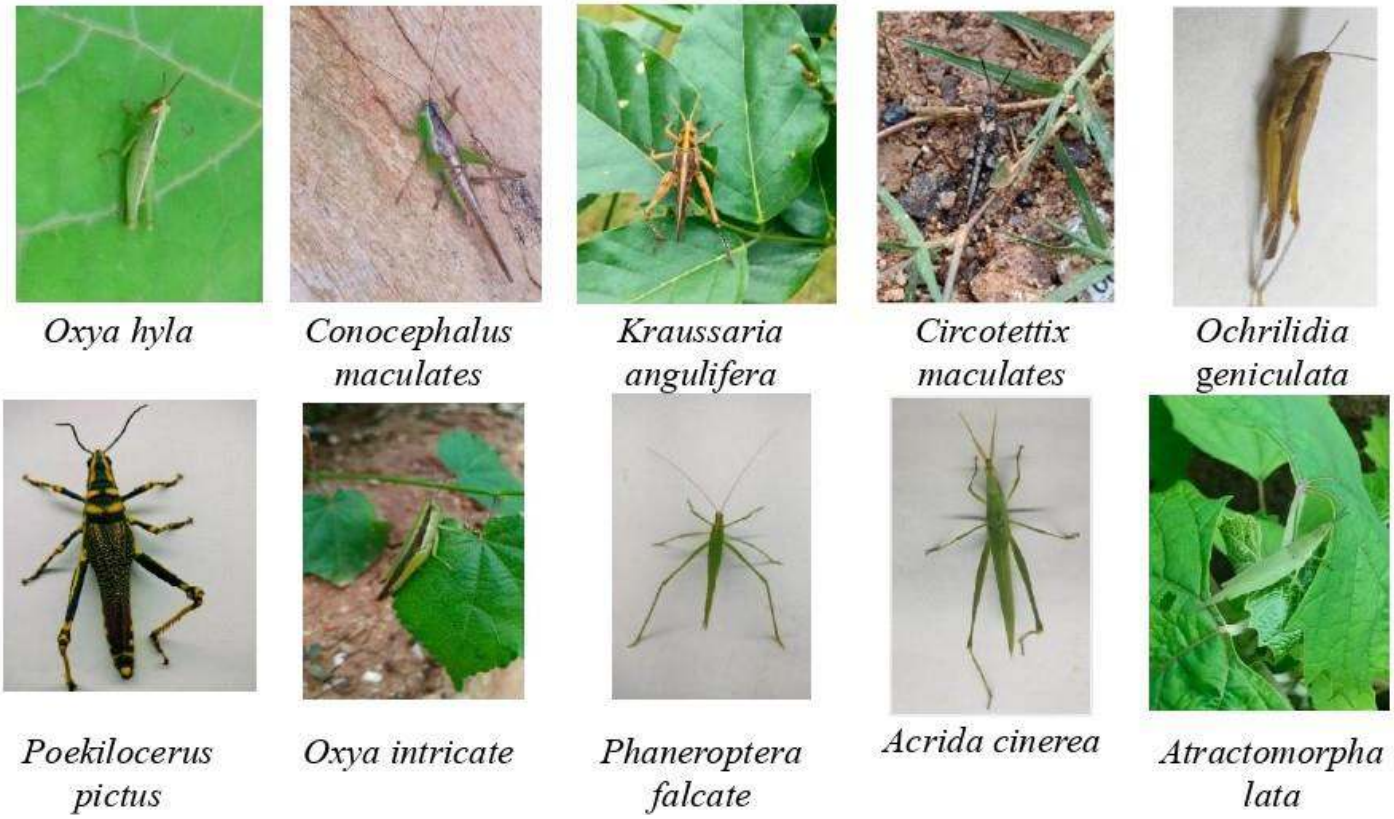

Figure 6. Selected grasshopper and cricket species collected from the Maa Manikeshwari University campus

Nine grasshopper species and one cricket species were recorded from the Maa Manikeshwari University campus during the study (Fig. 6). These species were captured across various campus microhabitats, reflecting the area's suitability for orthopteran assemblages amid grassy and vegetated zones.

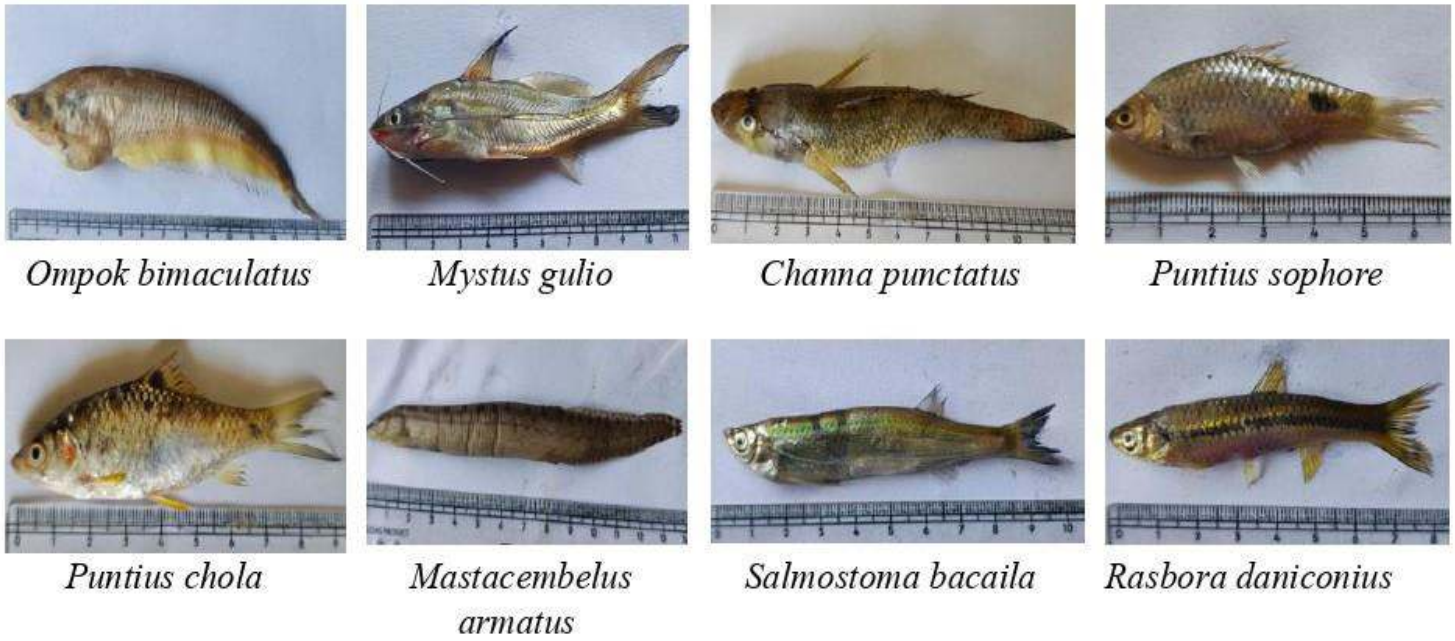

Figure 7. Eight indigenous fish species captured from Pipal Nala stream

Eight indigenous freshwater fish species, such as *Ompok bimaculatus, Mystus gulio, Channa punctata, Puntius sophore, Puntius chola, Mastacembelus armatus, Salmostoma bacaila,* and *Rasbora daniconius* were recorded from the Pipal Nala stream (Fig. 7).

DISCUSSIONS

Three earthworm species such as *Perionyx millardi*, *Drawida calebi*, and *Lampito mauritii* exhibit distinct morphological, ecological, and physiological traits that reflect their adaptive strategies in the university's diverse soil ecosystems. Morphometrically, *P. millardi* measured 40–90 mm in length and 2–6 mm in diameter across 182–199 segments; *D. calebi* spanned 50–54 mm by 3–3.5 mm over 149–162 segments; and *L. mauritii* reaches 85–210 mm by 3–5 mm in 166–190 segments. The clitellum was ring-shaped, spanning segments xiii–xviii in *P. millardi* and *D. calebi*, but xiv–xvii in *L. mauritii*. Internally, gizzard positions varied (viii or ix in *P. millardi*, xii–xvii in *D. calebi*, and v or vi in *L. mauritii*), while typhlosole development was prominent across all species, most notably in *L. mauritii*. Ecologically, *P. millardi* was phytophagous and epigeic, favouring areas near water bodies; *D. calebi* was geophagous and endogeic, preferring forests and gardens; and *L. mauritii* was phytogeophagous and anecic, inhabiting grasslands, crop fields, and forests. These traits highlight their contributions to soil fertility, organic matter decomposition, and biodiversity, with implications for conservation and agriculture in Odisha amid climate variability. Julka et al. (1987) documented 30 earthworm species in Odisha [26]. Blakemore (2006) subsequently provided a comprehensive checklist of Indian earthworms [27], while Goswami et al. (2013) contributed detailed taxonomic records [28]. More recently, Goswami (2018) described four new species from Satkoshia-Baisipalli Wildlife Sanctuary [29]. This brings the total to 34 species, three of which occured on campus. A total of 31 butterfly species from four families were recorded (Fig. 4), with Nymphalidae dominating at 18 species. This aligns with findings by Lin et al. (2025) [30] in Dulongjiang, Yunnan, China, and Gupta and Kumar (2025) [31] in a protected area of the Shivalik Hills, India, underscoring the university campus' butterfly species richness.

Spider diversity included representatives from Araneidae, Salticidae, Oxyopidae, Theridiidae, and Pholcidae, supporting Meher et al. (2024) [32] from the same site and indicating substantial richness on campus. Acharya et al. (2025) [10] reported grasshoppers from five families in Kalahandi district, Odisha. In contrast, our study identified three families on campus, with Acrididae being the most dominant.

Several indigenous freshwater fish species inhabit Odisha's diverse water bodies, supporting local biodiversity and fisheries. *Ompok bimaculatus* (Pabda or butter catfish), distributed across the Indian subcontinent and Myanmar, is classified as "*Near Threatened*" (NT) by the IUCN due to conservation concerns [33]. *Mystus gulio* (Kantia or long whiskered catfish) is of "*Least Concern*" (LC) globally but faces local threats from overexploitation, habitat loss, and environmental change [34]. *Channa punctata* (spotted snakehead) thrives in muddy streams, lakes (e.g., Tampara), and rivers (e.g., Budhabalanga), serving as a key food fish and model for pollutant studies, including thorium nitrate effects. *Puntius sophore* (Putia-kerundi) occurs in sites like the Kolab River, Jagannath Sagar, Tampara Lake, and Sorada Reservoir, while *Puntius chola* (Chola barb) prefers shallow streams, rivers, canals, ponds, and flooded fields (Mahapatra and Mishra, 2024) [35]. *Mastacembelus armatus* (Bummi or tire-track eel) dominates the Mahanadi basin and tributaries like the Ang and Sukhtel rivers [36]. *Salmostoma bacaila* extends through the Mahanadi drainage, and *Rasbora daniconius* (Darikana) represents a typical ray-finned species in the region [37]. These species highlight Odisha's rich ichthyofauna, emphasising the need for ecological research and sustainable management amid climate and anthropogenic pressures.

CONCLUSIONS

This study establishes the first biodiversity inventory for Oligochaeta, Lepidoptera, Araneae, Orthoptera, and Pisces at the Maa Manikeshwari University campus, revealing notable diversity: three earthworm species, 31 butterflies (Nymphalidae dominant), Araneidae led spiders (~40%), 10 Orthoptera, and eight native fish in the Pipal Nala. Targeted research and conservation measures are essential to safeguard this fauna, promoting sustainable management and informing regional biodiversity strategies in Odisha.

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