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First Record of *Thelyphonus sepiaris indicus* (Stoliczka, 1873) and Rare Hymenopteran Species from Jharkhand, Eastern India

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ABSTRACT

Jharkhand, situated in eastern India, represents a biologically diverse region that remains insufficiently explored for invertebrate fauna, particularly arachnids and hymenopterans. The present study documents the first confirmed record of the whip scorpion *Thelyphonus sepiaris indicus* from Jharkhand State, recorded from Kaliyam, Jamshedpur, East Singhbhum district. In addition, rare and noteworthy distributional records of five hymenopteran species belonging to the families Sphecidae, Vespidae, Megachilidae, and Apidae are reported from different localities of Jharkhand, including Dalma Wildlife Sanctuary. Field observations were carried out through random surveys between January 2023 and December 2023. These records extend the known geographical distribution of the documented species and emphasize the ecological significance of forested and semi-urban habitats in sustaining invertebrate diversity in eastern India.

Keywords: First record, Whip scorpion, Hymenoptera, Biodiversity, Dalma Wildlife Sanctuary, Jharkhand

1. INTRODUCTION

Invertebrates constitute a major component of terrestrial biodiversity and play essential roles in ecosystem functioning through predation, pollination, decomposition, and nutrient

cycling (Prather et al., 2013; Kitching et al., 2020; McCary & Schmitz, 2021). Arachnids and hymenopterans, in particular, play pivotal roles in maintaining ecological balance through predation, pollination, and complex food-web interactions (Janssen et al., 1998; Benvenuti, 2022; Raj, 2024). Despite their importance, these groups remain inadequately studied in many regions of India, including Jharkhand, where biodiversity assessments have traditionally emphasized vertebrate fauna. Understanding the ecological roles and environmental significance of these taxa is essential for interpreting ecosystem health and resilience (Sharma et al., 2023; Verma et al., 2023; Cardoso et al., 2025).

Whip scorpions (Order: Uropygi) are specialized predatory arachnids that occupy the forest floor and soil strata of tropical and subtropical ecosystems (Beron, 2018; Schmidt & Schmidt, 2022; Hénaut et al., 2024). As nocturnal and fossorial predators, species of *Thelyphonus* actively regulate populations of insects and other small arthropods, thereby influencing prey dynamics and contributing to the control of potential pest species (Hénaut & Machkour-M'Rabet, 2020; Sahayaraj & Hassan, 2023). Their presence reflects intact leaf-litter systems and healthy soil conditions, as they depend on moist substrates, stable microclimates, and undisturbed ground cover (Bagyaraj et al., 2016; Menta & Remelli, 2020). Through their feeding activities, whip scorpions form an integral link in forest floor food webs, transferring energy from lower trophic levels to higher-level predators such as birds, reptiles, and small mammals (Seigel & Mullin, 2009).

Hymenopterans, particularly wasps and bees, play multifaceted ecological roles that extend beyond their numerical abundance (Fabian et al., 2013; Huber, 2017; Elizalde et al., 2020; Brock et al., 2021). Predatory wasps belonging to the families Sphecidae and Vespidae occupy higher trophic levels and exert top-down control on insect populations (Feldhaar, 2011). By preying upon herbivorous and nuisance insects, these wasps contribute to natural biological control, reducing the likelihood of pest outbreaks and limiting the need for chemical interventions in agricultural and semi-natural landscapes (Holland et al., 2016; Southon et al., 2019). Their nesting and foraging behaviors also influence habitat structure and nutrient cycling (Richter, 2000; Mayr et al., 2020; Antoine & Forrest, 2021).

Bees, especially members of the families Megachilidae and Apidae, are among the most important pollinators in terrestrial ecosystems (Muller, 1996; Thakur, 2012; Raina et al., 2024). Solitary bees such as *Megachile lanata* facilitate pollination of a wide range of native flowering plants and crops, thereby enhancing plant reproductive success, genetic diversity, and ecosystem productivity (Kline et al., 2022; Dar et al., 2025). The giant honey bee *Apis dorsata* serves as a keystone pollinator in forest ecosystems, pollinating canopy trees, shrubs, and agricultural plants (Oldroyd & Nanork, 2009; Kahono et al., 2023). Its foraging activity supports forest regeneration processes and sustains food production systems, linking natural ecosystems with human livelihoods (Arnold et al., 2011; Reed et al., 2017).

The ecological significance of arachnids and hymenopterans is further reflected in their sensitivity to environmental changes (Reitz & Trumble, 2002; Thomson et al., 2010). Habitat degradation, deforestation, urban expansion, and pesticide use directly impact their populations, making these groups effective bioindicators of environmental health (Boháč & Jahnova, 2024). The presence of diverse predatory and pollinating invertebrates indicates relatively stable ecosystems with functional trophic interactions and sufficient habitat complexity (Srivastava, 2006; Morse et al., 2019).

From a food relationship perspective, arachnids such as whip scorpions and predatory wasps occupy crucial intermediate trophic levels, connecting primary consumers to higher

predators (Potapov et al., 2022; Fei et al., 2023). Pollinating bees facilitate energy transfer from plants to herbivores and ultimately to higher trophic levels by ensuring successful plant reproduction and biomass production (Price et al., 1980; Nicholls & Altieri, 2013). Together, these groups contribute to ecosystem resilience, nutrient flow, and long-term sustainability (Cock et al., 2012).

In this context, documenting the occurrence of whip scorpions and hymenopterans in Jharkhand is of considerable significance. The present study not only fills important knowledge gaps regarding species distribution but also underscores the functional importance of invertebrates in forested and semi-urban ecosystems of eastern India, emphasizing the need for their conservation and inclusion in biodiversity management strategies.

2. MATERIALS AND METHODS

Study Area

The present study was conducted across selected locations in Jharkhand, eastern India, encompassing a heterogeneous landscape that includes protected forests, semi-urban settlements, and rural habitats. These sites collectively represent the ecological variability of the region and provide suitable microhabitats for diverse arachnid and hymenopteran fauna.

The primary locality, Kaliyam, Jamshedpur, East Singhbhum district (22.35668°N, 86.45199°E), is characterized by a mosaic of forest patches, scrub vegetation, agricultural fields, and human habitations. The area experiences a tropical monsoon climate with warm summers, moderate winters, and high humidity during the monsoon season, creating favorable conditions for soil-dwelling and nocturnal invertebrates such as whip scorpions.

Dalma Wildlife Sanctuary, situated in East Singhbhum district, represents one of the most important forested ecosystems in the state. The sanctuary is dominated by dry deciduous forest, with *Shorea robusta* (sal) forming the principal canopy species, accompanied by mixed deciduous associates. The terrain comprises rocky hills, valleys, and seasonal streams, providing diverse microhabitats such as leaf litter, loose soil, fallen logs, and crevices that support a rich assemblage of arthropods. Minimal anthropogenic disturbance within core areas of the sanctuary enhances habitat suitability for sensitive and cryptic species.

The remaining study sites - Bandhdih of East Singhbhum district, Circuit House Area of Jamshedpur, Sonari (Jamshedpur), Horeya of Hazaribagh, and Khokro of Saraikela Kharsawan - represent semi-urban and rural landscapes influenced by varying degrees of human activity. These areas consist of residential zones, roadside vegetation, gardens, agricultural lands, and fragmented forest patches. Despite anthropogenic pressures, such habitats support diverse hymenopteran communities by providing nesting substrates, floral resources, and prey availability.

The combination of protected forest habitats and human-modified landscapes across the study area offers a comprehensive representation of ecological conditions in Jharkhand, enabling effective documentation of invertebrate diversity and distribution patterns in the region.

Field Methods

Random field surveys were carried out from January 2023 to December 2023. Surveys involved opportunistic searches during both daytime and nighttime hours. Arachnids were

searched under stones, logs, leaf litter, and moist soil, while hymenopterans were recorded during active foraging or nesting on vegetation, soil banks, and man-made structures. Species were documented through direct observation and photography. Geographic coordinates were recorded using GPS-enabled mobile devices. First-record status was confirmed through an extensive review of existing literature on the fauna of Jharkhand and adjoining regions.

Findings

1) *Thelyphonus sepiaris indicus* (Stoliczka, 1873)

Order: Uropygi

Family: Thelyphonidae

Locality: Kaliyam, Jamshedpur, East Singhbhum

Coordinates: 22.35668°N, 86.45199°E

Status: First record from Jharkhand

Species Characteristics

Thelyphonus sepiaris indicus is a large, robust whip scorpion distinguished by its dark brown to blackish body coloration and heavily sclerotized exoskeleton. The body is dorsoventrally flattened and distinctly segmented, comprising a broad prosoma and a segmented opisthosoma. The cephalothorax bears a pair of prominent, powerful pedipalps modified into raptorial pincers, which are used for prey capture and defense.



Figure 1. *Thelyphonus sepiaris indicus* (whip scorpion) photographed in its natural habitat on the forest floor at Kaliyam, Jamshedpur, East Singhbhum district, Jharkhand, India

The first pair of legs is elongated and antenniform, functioning primarily as sensory organs rather than for locomotion. These sensory legs are highly flexible and continuously probe the surroundings, aiding in navigation and prey detection, particularly under low-light conditions. The remaining three pairs of legs are well developed and adapted for walking on the forest floor.

A characteristic feature of the species is the long, segmented, whip-like flagellum extending from the posterior end of the abdomen. When disturbed, the species exhibits defensive behavior, raising its pedipalps and flagellum. It is also capable of ejecting a spray of acetic acid-like secretion from abdominal glands, which serves as an effective chemical defense against predators.

The species is nocturnal and fossorial in habit, spending daylight hours concealed under stones, logs, leaf litter, or within shallow burrows. Morphological adaptations such as strong pedipalps, sensory antenniform legs, and cryptic coloration enable *T. sepiaris indicus* to thrive in moist, shaded forest habitats.

Habitat and Ecology

The individual was observed in a moist microhabitat with loose soil and leaf litter, indicating a preference for shaded forest floors. The species is nocturnal and predatory, feeding on insects and other small invertebrates.

Distribution

Previously reported from southern and central India, this observation represents a significant eastward extension of its known distribution.

2) *Thelyphonus sepiaris* (Butler, 1873)

Species Characteristics

Thelyphonus sepiaris is a medium to large-sized whip scorpion characterized by a robust, elongated body with a dark brown to black coloration. The prosoma is broad and flattened, bearing a pair of strong, raptorial pedipalps armed with spines, which are used effectively for grasping and subduing prey. The chelicerae are relatively small but functional in tearing prey tissues.

The first pair of legs is highly elongated and antenniform, functioning as sensory appendages rather than for locomotion. These legs are extremely sensitive to vibrations and chemical cues, aiding in prey detection and environmental awareness, particularly under nocturnal conditions. The remaining three pairs of legs are well developed and adapted for walking on uneven substrates.

A distinctive feature of the species is the long, slender, segmented flagellum extending posteriorly from the abdomen. This whip-like structure is flexible and often held elevated during movement. When threatened, *T. sepiaris* adopts a defensive posture by raising its pedipalps and flagellum and is capable of ejecting an acetic acid-like defensive secretion from abdominal glands, giving rise to the common name “vinegaroon.”

Habitat and Ecology

Thelyphonus sepiaris is primarily nocturnal and fossorial in habit. It inhabits moist, shaded environments such as forest floors, leaf litter, under stones, fallen logs, and soil crevices.

The species is commonly associated with deciduous and semi-evergreen forests but may also occur in scrublands and forest edges with adequate ground cover and soil moisture.

Ecologically, the species is an important predator of small invertebrates, including insects, arachnids, and other soil-dwelling arthropods. By regulating populations of these organisms, *T. sepiaris* contributes to maintaining ecological balance within forest floor ecosystems. Its presence often indicates relatively undisturbed habitats with good litter accumulation and soil structure.



Figure 2. *Thelyphonus sepiaris* (Butler, 1873) photographed during a nocturnal observation in study area.

Distribution

Thelyphonus sepiaris is widely distributed in the Indian subcontinent. Within India, it has been reported from several southern and central states, including parts of the Western Ghats, Deccan Plateau, and central Indian regions. The present observations from eastern India, particularly Jharkhand, represent an important extension of its known distribution range. Outside India, the species has also been recorded from parts of South and Southeast Asia, reflecting its adaptability to tropical and subtropical environments.

Ecological Roles

The hymenopteran species recorded during the present study play vital ecological roles and contribute significantly to ecosystem stability in Jharkhand. Members of the families Sphecidae and Vespidae are predominantly predatory wasps that regulate populations of various insect groups, including agricultural pests and other arthropods. By controlling prey abundance, these wasps contribute to natural biological control processes and help maintain

trophic balance within both forested and semi-urban ecosystems. Species belonging to the family Megachilidae are solitary bees that function as efficient pollinators of native and cultivated plant species. Through their foraging activities, they facilitate cross-pollination, thereby enhancing plant reproductive success, genetic diversity, and overall vegetation health. Their presence is particularly important in fragmented and rural landscapes where wild pollinators often compensate for the decline of managed pollinator populations.

The giant honey bee, *Apis dorsata* (family Apidae), acts as a keystone pollinator in forest and agricultural ecosystems. It plays a crucial role in pollinating a wide range of flowering plants, including trees, shrubs, and crops, thereby supporting forest regeneration and agricultural productivity. The ecological services provided by *A. dorsata* are indispensable for sustaining biodiversity, ecosystem resilience, and local livelihoods dependent on pollination services.

Table 1. List of hymenopteran species recorded from different localities of Jharkhand, eastern India, showing family-wise distribution, geographic coordinates, and remarks highlighting first state records, rare distributional records, and ecological significance.

Family	Species	Locality	Latitude	Longitude	Remarks	Figure
Sphecidae	<i>Isodontia edax</i>	Bandhdih, East Singhbhum	22.9113°N	86.17594°E	First record from Jharkhand	
Vespidae	<i>Delta pyriforme pyriforme</i> (Fabricius, 1775)	Sonari, Jamshedpur	22.8113°N	86.18729°E	Rare distributional record	
Vespidae	<i>Vespa affinis</i>	Sonari, Jamshedpur	22.8113°N	86.18709°E	Poorly documented in Jharkhand	

Vespidae	<i>Vespa orientalis</i> (Linnaeus, 1771)	Dalma Wildlife Sanctuary	22.89109°N	86.21091°E	Poorly documented in Jharkhand	No image capture of this species.
Vespidae	<i>Vespa tropica</i> (Linnaeus, 1758)	Dalma Wildlife Sanctuary	22.87117°N	86.31134°E	Poorly documented in Jharkhand	No image capture of this species.
Megachilidae	<i>Megachile lanata</i>	Horeya, Hazaribagh	24.1387°N	85.31815°E	Rare regional record	
Apidae	<i>Apis dorsata</i>	Khokro, Saraikela Kharsawan	22.9014°N	86.19905°E	Important wild pollinator	

3. DISCUSSIONS

The first confirmed record of *Thelyphonus sepiaris indicus* from Jharkhand highlights the limited exploration of cryptic arachnid taxa in the region. The presence of this species suggests suitable microclimatic conditions and relatively undisturbed soil habitats in parts of East Singhbhum.

The hymenopteran records further emphasize the ecological richness of both protected areas and semi-urban environments. The occurrence of rare and poorly documented species indicates that Jharkhand serves as an important transitional zone between central and eastern Indian faunal regions. The lack of earlier records is likely attributable to insufficient targeted surveys rather than true absence.

4. CONCLUSIONS

The present study provides baseline information on the arachnid and hymenopteran diversity of Jharkhand. The first state record of *Thelyphonus sepiaris indicus* and the documentation of rare hymenopteran species underline the need for systematic and long-term invertebrate surveys.

Such efforts are essential for understanding species distributions, assessing ecosystem health, and developing conservation strategies in eastern India.

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