

Chapter 6

Naturalized Invasive Plants and Their Pollinators: Shaping the Future of Urban Habitats

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Abstract: Urban ecosystems are increasingly shaped by naturalized invasive plant species that thrive in disturbed habitats and altered landscapes. While invasive plants are often viewed through the lens of biodiversity loss, their ecological interactions, particularly with pollinators, remain underexplored. The present study documents a diverse assemblage of pollinators associated with major invasive plant species in urban and peri-urban habitats. Based on field observations, the study highlights how invasive plants such as *Chromolaena odorata*, *Lantana camara*, *Parthenium hysterophorus*, *Cleome viscosa*, *Croton bonplandianus*, *Pontederia crassipes* and *Spathodea campanulata* support a wide range of insects and birds. The findings emphasize the dual role of invasive plants as ecological threats and functional resources, shaping pollination networks and influencing the future structure of urban habitats.

Keywords: Ecosystem services, invasive flora, plant-pollinator interactions, pollination networks, pollinator diversity, urban biodiversity

Introduction

Urban ecosystems are undergoing rapid transformation due to expanding human populations, land-use change and continuous disturbance of natural habitats (Zhang et al., 2025). Within this dynamic setting, naturalized invasive plants have emerged as dominant components of urban vegetation, colonizing roadsides, abandoned lands, wetlands, gardens and semi-natural green spaces (Divišek et al., 2025). Their remarkable adaptability, prolonged flowering periods and high reproductive potential allow them to persist and spread in environments where many native species struggle to survive (Yang et al., 2025). As a result, these plants increasingly shape the structure and functioning of urban habitats (Liu et

al., 2025). Pollinators are fundamental to ecosystem stability, mediating plant reproduction, genetic diversity and food-web integrity (Katumo et al., 2022). In urban landscapes, however, pollinator communities face severe challenges, including habitat fragmentation, declining native floral resources and environmental stress (Prokop, 2024). In this context, invasive plants often become reliable and abundant sources of nectar and pollen (Drossart et al., 2017). By attracting butterflies, bees, flies, beetles, ants and even birds, invasive plants actively participate in urban pollination networks, redefining plant-pollinator interactions in human-dominated environments (Silva et al., 2021). The relationship between naturalized invasive plants and their pollinators is complex and multifaceted (Vilà et al., 2009). While invasive species are widely recognized for their negative impacts on native flora and ecosystem balance, they may simultaneously support pollinator survival in urban settings (Buchholz and Kowarik, 2019). These interactions can reshape pollinator foraging behavior, alter visitation patterns and influence reproductive success of both invasive and native plants (Kaiser-Bunbury and Müller, 2009). Consequently, invasive plants may function as ecological filters or hubs, redirecting pollination services and modifying the trajectory of urban biodiversity (Albrecht et al., 2014). Understanding how invasive plants and pollinators interact is therefore critical for envisioning the future of urban habitats. Rather than viewing invasive plants solely as ecological threats, it is essential to examine their functional roles within altered ecosystems. Through documenting pollinator diversity associated with invasive plant species, the present study seeks to provide insights into how these interactions contribute to urban ecosystem resilience. Such knowledge is vital for developing sustainable urban management strategies that integrate invasive species control with pollinator conservation, ultimately shaping healthier and more biodiverse urban landscapes.

Methodology

Field observations were conducted from August 2025 to November 2025 in Cuttack, near the Mahanadi River areas, Odisha, India, across urban and peri-urban habitats where invasive plants occurred abundantly along roadsides, wastelands, wetlands, gardens and semi-natural patches. Pollinators visiting flowers were recorded through direct visual observations during peak flowering periods. Pollinators were identified using standard field guides and taxonomic keys (Grimmett et al., 2011; Kehimkar, 2016). The authors identified and compiled a comprehensive dataset of invasive plant species and their associated pollinators (Kumar et

al., 2022), which was used to analyse diversity patterns and plant-pollinator associations.

Results and discussion

Present study revealed pollinators associated with invasive plant species revealed a high diversity of floral visitors spanning multiple taxonomic groups, including butterflies (Lepidoptera), bees and ants (Hymenoptera), flies (Diptera), beetles and bugs (Coleoptera and Hemiptera), spiders and birds (Table 1). Among the recorded invasive plants, *Chromolaena odorata* and *Lantana camara* supported the richest assemblage of pollinators, particularly butterflies. *C. odorata* alone attracted more than a dozen butterfly species from families Nymphalidae, Papilionidae, Pieridae and HesperIIDae, along with the giant honey bee (*Apis dorsata*), highlighting its role as a major nectar source in urban and peri-urban habitats. *L. camara* exhibited similarly high pollinator diversity, with numerous butterfly species such as *Papilio polytes*, *Danaus chrysippus*, *Junonia lemonias*, *Catopsilia* spp. and *Acraea terpsicore* frequently visiting its flowers. The presence of both specialist and generalist butterflies indicates that *L. camara* provides accessible floral rewards across a wide range of pollinator guilds. In contrast, *Cleome viscosa* and *Croton bonplandianus* supported a more functionally diverse but taxonomically mixed assemblage, including bees, ants, flies, beetles, moths and butterflies, suggesting generalized pollination systems. *Parthenium hysterophorus*, despite its well-documented allelopathic and allergenic properties, was visited by several insect pollinators, including honeybees (*Apis mellifera*), butterflies (*Danaus chrysippus* and *Belenois aurota*) and flies (*Musca domestica*). Aquatic invasive *Pontederia crassipes* supported bee and hoverfly visitors, reflecting its importance in wetland and waterlogged urban environments. Notably, bird pollination was observed in *Spathodea campanulata*, which attracted bulbuls and starlings, indicating its role in supporting avian nectarivores within urban green spaces.

Table 1: Pollinators of invasive plants

Common name	Scientific name	Plant name
Angled castor	<i>Ariadne ariadne</i>	<i>Chromolaena odorata</i>
Chocolate pansy	<i>Junonia iphita</i>	
Common crow	<i>Euploea core</i>	
Common jezebel	<i>Delias eucharis</i>	
Common leopard	<i>Phalanta phalantha</i>	
Common mormon	<i>Papilio polytes</i>	

Common rose	<i>Pachliopta aristolochiae</i>	
Common yellow-breasted flat	<i>Gerosis bhagava</i>	
Crimson rose	<i>Pachliopta hector</i>	
Giant honey bee (Figure 1)	<i>Apis dorsata</i>	
Lemon pansy	<i>Junonia lemonias</i>	
Mottled emigrant	<i>Catopsilia pyranthe</i>	
Plain tiger	<i>Danaus chrysippus</i>	
Striped tiger	<i>Danaus genutia</i>	
Tawny coster	<i>Acraea terpsicore</i>	
Cabbage white	<i>Pieris brassicae</i>	
Dwarf honey bee	<i>Apis florea</i>	<i>Cleome viscosa</i>
Giant honey bee	<i>Apis dorsata</i>	
Housefly	<i>Musca domestica</i>	
Indian black ant	<i>Camponotus compressus</i>	
Monarch	<i>Danaus plexippus</i>	
Sweat bee	<i>Halictus albescens</i>	
Beet webworm moth (Figure 2)	<i>Spoladea recurvalis</i>	<i>Croton bonplandianus</i>
Common pierrot	<i>Castalius rosimon</i>	
Green jewel bug	<i>Chrysocoris stollii</i>	
Indian black ant	<i>Camponotus compressus</i>	
Red pumpkin beetle	<i>Coridius ianus</i>	
Striped lynx spider (Figure 3)	<i>Oxyopes salticus</i>	
Striped pierrot	<i>Tarucus nara</i>	<i>Lantana camara</i>
Blue pansy	<i>Junonia orithya</i>	
Common crow	<i>Euploea core</i>	
Common emigrant	<i>Catopsilia pomona</i>	
Common grass yellow	<i>Eurema hecabe</i>	
Common jezebel	<i>Delias eucharis</i>	
Common leopard	<i>Phalanta phalantha</i>	
Common mormon	<i>Papilio polytes</i>	
Common rose (Figure 4)	<i>Pachliopta aristolochiae</i>	
Danaid eggfly (Figure 5)	<i>Hypolimnas misippus</i>	
Lemon pansy	<i>Junonia lemonias</i>	
Lime swallowtail	<i>Papilio demoleus</i>	

Mottled emigrant	<i>Catopsilia pyranthe</i>	
Pioneer	<i>Belenois aurota</i>	
Plain tiger (Figure 6)	<i>Danaus chrysippus</i>	
Striped tiger	<i>Danaus genutia</i>	
Tawny coster (Figure 7)	<i>Acraea terpsicore</i>	
Blister beetle	<i>Hycleus lugens</i>	<i>Parthenium hystrophorus</i>
European honey bee	<i>Apis mellifera</i>	
Housefly	<i>Musca domestica</i>	
Pioneer	<i>Belenois aurota</i>	
Plain tiger	<i>Danaus chrysippus</i>	
Tiny Acraea	<i>Acraea uvui</i>	<i>Pontederia crassipes</i>
Asian honey bee	<i>Apis cerana</i>	
European honey bee	<i>Apis mellifera</i>	
Hoverfly	<i>Eristalinus arvorum</i>	<i>Spathodea campanulata</i>
Asian pied starling (Figure 8)	<i>Gracupica contra</i>	
Chestnut-tailed starling	<i>Sturnia malabarica</i>	
Red-vented bulbul	<i>Pycnonotus cafer</i>	
Red-whiskered bulbul	<i>Pycnonotus jocosus</i>	

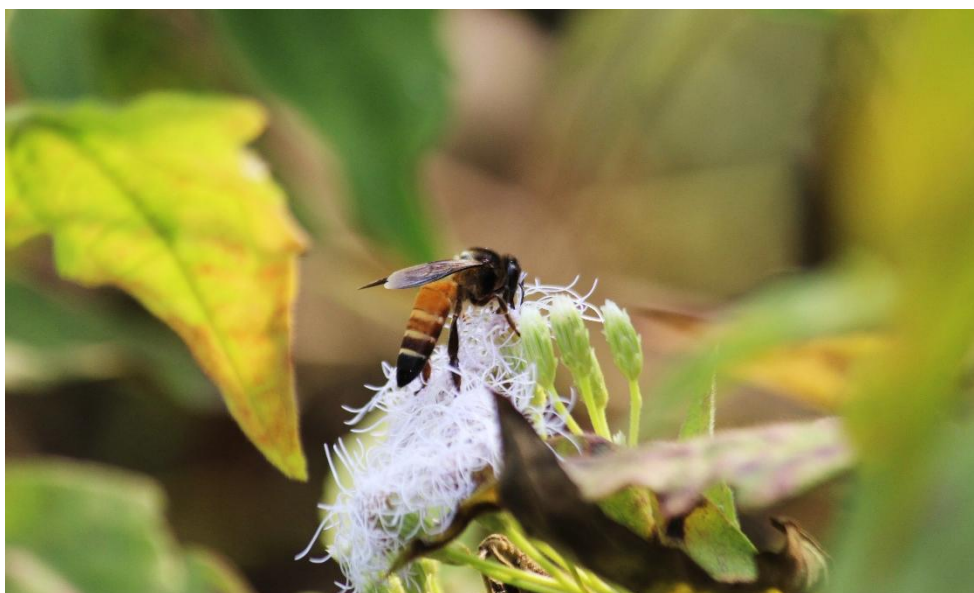


Figure 1: Giant honey bee sucking nectar from *Chromolaena odorata* flowers



Figure 2: Beet webworm moth sucking nectar from *Croton bonplandianus* flowers



Figure 3: Striped lynx spider pollinating *Croton bonplandianus* flowers



Figure 4: Common rose butterfly sucking nectar from *Lantana camara* flowers

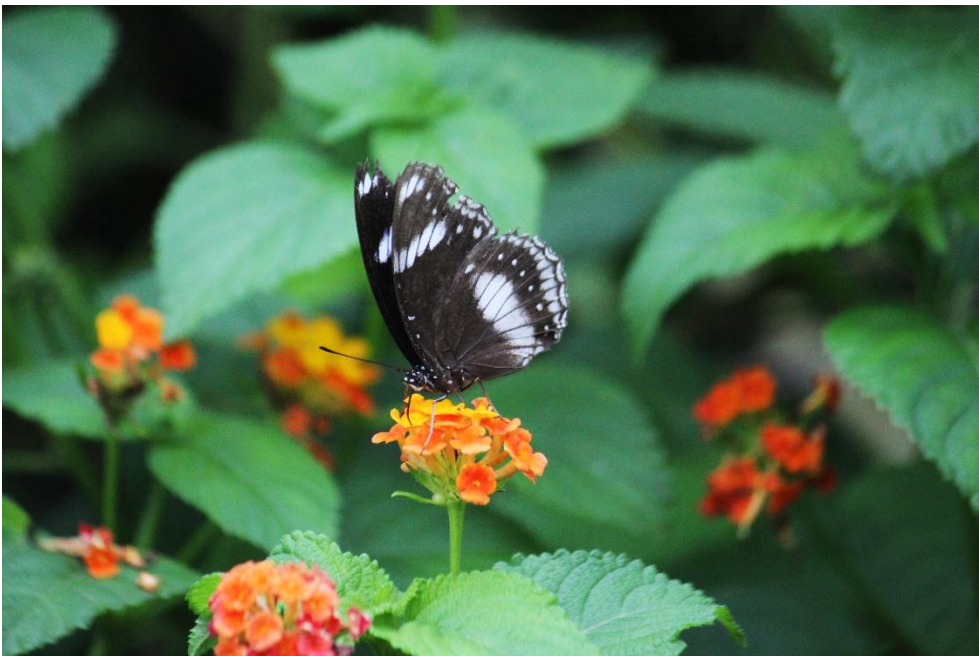


Figure 5: Danaid eggfly butterfly taking nectar from *Lantana camara* flowers

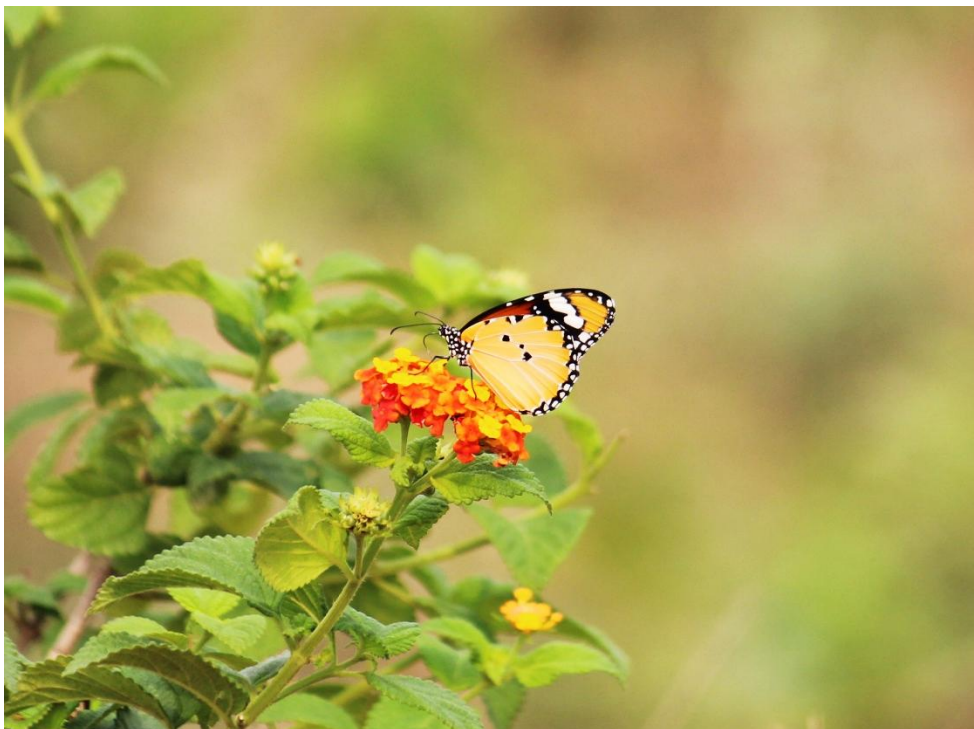


Figure 6: Plain tiger butterfly visiting *Lantana camara* flowers for nectar

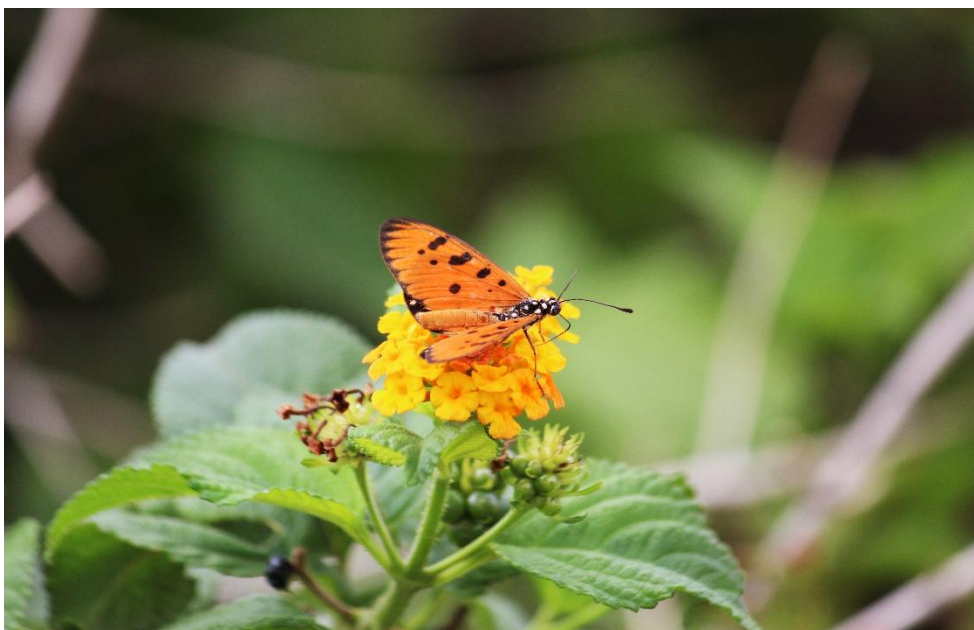


Figure 7: Tawny coster butterfly pollinating *Lantana camara* flowers



Figure 8: Asian pied starling visiting *Spathodea campanulata* for nectar

The study demonstrates that invasive plant species play a significant role in shaping urban pollination networks by supporting a wide range of pollinators. The dominance of butterfly visitors on *C. odorata* and *L. camara* can be attributed to their prolonged flowering periods, high nectar availability and conspicuous floral displays. These characteristics make them highly attractive to visually oriented and generalist pollinators, especially in urban landscapes where native flowering plants are often limited. The presence of diverse insect groups such as bees, flies, beetles, ants and moths on *C. viscosa* and *C. bonplandianus* highlights the ecological flexibility of invasive plants. Such generalized pollination systems enhance the reproductive success of invasive species and facilitate their persistence and spread across disturbed habitats. Additionally, visits by non-traditional pollinators, including ants and beetles, suggest that invasive plants may exploit multiple pollination pathways, increasing their ecological resilience. Bird visitation to *S. campanulata* illuminates the importance of invasive trees in supporting higher trophic-level interactions in urban ecosystems. Nectar-feeding and opportunistic birds such as bulbuls and starlings may rely on these floral resources, especially during periods of scarcity. However, this reliance could potentially shift avian foraging behaviour away from native flowering trees, thereby altering native plant reproductive dynamics.

The findings highlight the dual ecological role of invasive plants in urban habitats. While they contribute to the maintenance of pollinator diversity by providing consistent floral resources, they may also disrupt native plant–pollinator interactions by monopolizing pollination services. These altered interactions can influence long-term urban biodiversity patterns. Therefore, understanding pollinator use of invasive plants is crucial for developing balanced urban management strategies that aim to conserve pollinators while restoring and promoting native plant diversity.

Conclusion

The study highlights the pivotal role of naturalized invasive plants in shaping urban pollination dynamics. Species such as *Chromolaena odorata*, *Lantana camara* and *Parthenium hysterophorus* act as key floral resources, attracting a diverse assemblage of butterflies, bees, flies, beetles, ants and even birds. These interactions demonstrate that invasive plants, while often considered ecological threats, can provide critical support to pollinator populations in florally impoverished urban landscapes. However, the dominance of invasive plants may also alter the native plant-pollinator networks, potentially reducing visitation to indigenous species and affecting their reproductive success. Thus, invasive plants function as both facilitators and disruptors within urban ecosystems, influencing pollinator behaviour, biodiversity patterns and ecosystem functioning. Understanding these complex interactions is essential for shaping the future of urban habitats. Urban biodiversity management should adopt a balanced approach, controlling invasive plant spread while enhancing native floral diversity to ensure the persistence of pollinators and maintain resilient, ecologically functional urban ecosystems.

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