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Floristic diversity assessment and *In Situ* conservation of selected endemic butterflies - host plant species in Pachamalai Hills of Eastern Ghats

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Abstract
The Eastern Ghats' Pachamalai Hills are teeming with abundant flora and fauna. The indigenous tribal people have long employed a number of plants for their therapeutic purposes. *Mallotus repandus (Rottler) Müll. Arg. (Euphorbiaceae) and Centranthera tranquebarica (Spreng.) Merr. (Orobranchaceae)* have been identified as new host plants for the butterflies *Rapala manea* (Hewitson, 1863) *(Lycaenidae)* and *Junonia orithya* (Linnaeus, 1758) *(Nymphalidae)* from the Pachamalai Hills in the Eastern Ghats. The deciduous tree *Schleichera oleosa (Sapindaceae)* has been identified as a new host plant for Coladenia indrani (Moore, [1866]) *(Hesperiidae)* from the Eastern Ghats' Pachamalai Hills. It is also noted that *Junonia orithya* larvae twist themselves into a tight spiral as a defensive tactic with the help of Florisitic Diversity Assesment.

Keywords: Floristic diversity, slate flash, Pachamalai Hills, *Ex Situ* conservation, host plants

Introduction
The quantity of host plants has a major influence on the range and abundance of herbivorous insects (Knops *et al*., 1999). The knowledge and conservation of these insects, a significant fraction of which are butterflies and moths, depend on the careful study of their larval host plants (Bach, 1980 [2]; Faeth *et al*., 1981 [12]; Abdala-Roberts *et al*., 2015 [1]; Hancock *et al*., 2015; New *et al*., 2021) [18]. It is also known that variations in the quality of food resources across various environments can be reflected in the number of butterflies (Dennis *et al*., 2006). Even though there has been documentation of Indian butterfly larval host plants for more than a century (Davidson & Aitken, 1890; Davidson *et al*., 1896), there are still a lot of gaps, as seen by the current explosion of papers regarding new host plants (Karmakar *et al*., 2018; Nitin *et al*., 2018; Naik & Mustak, 2020). The Eastern Ghats' Pachamalai Hills are home to a variety of biogeographic realms, including the Chhotanagpur plateau in the west, the Ganga river basin's deltaic plains and mangrove forests in the south, and the Himalaya mountain ranges and their foothills, known as Dooars, in the north (Rodgers & Panwar, 1988). The British colonial era saw the beginning of research on the local butterflies (Moore, 1866) and the plants that serve as their larval hosts (de Nicéville, 1885).

Materials and methods
Sampling Site - Pachamalai Hills of Eastern Ghats Study area
The Pachamalai Hills are a group of hills in Tamil Nadu's Salem and Tiruchirappalli districts that are part of the Eastern Ghats. The study focuses on how people and plants communicate and form connections across time and distance. The applications of plants, the determination of spices, awareness, perspective, management systems, classification systems, and verbal communication that both contemporary and traditional cultures have for plants and the aquatic and global ecological systems. This village in Trichy District is surrounded by the Eastern Ghats of the Pachamalai region. Shobanapuram, Top Sengattuppatty, Kancherimalai, Oduvampatti, Oduvampatti Pudur, Osarapalli, Reddykuttai, and other places were mostly encompassed by this village. The locals made extensive use of the therapeutic plants in the surrounding area as part of their traditional medical system.

Materials and methods
A random sampling procedure was used, paying particular attention to the nectar host plants. The butterflies were seen between 8:00 and 16:00 on a beautiful day. In addition, a number of field trips were conducted in the study region between January and September of 2024. The book of Indian Butterflies, Butterflies of Peninsular India, and checklists were used to identify the species of butterflies [9, 10, 11]. The eating habits of nine common species on Vitex negundo were regularly observed. Each species' number of visits at different times was noted, and mean values were calculated.

Floristic diversity assesment
The Eastern Ghats' vegetation can be roughly categorized as

1. Evergreen forests based on Champion and Seth's (1968) [9] taxonomy.
2. Forests of tropical semievergreens.
3. Moist deciduous woodlands in the tropics.
4. Dry deciduous woodlands in the southern tropics.
5. Dry mixed deciduous woodlands in the north.
6. Savannah woods that are dry.
7. Forests that scrub Tropical dry evergreen woods (number eight) and tropical dry evergreen scrub (number nine). The Pachamalai hills are covered in a

variety of flora types, including moist deciduous, tropical semi-dry forest, scrub jungle, and a wealth of extremely valuable medicinal plants. The value of traditional knowledge is now being recognized more and more globally. Thus, there is a lot of room for the development of novel medications based on traditional plant use. In light of the aforementioned information, an effort has been made to include every possible medicinal plant that has been discovered used in conjunction with conventional medicine and therapies in the research domains. The information was gathered from the tribe members using a questionnaire, oral interviews, and video recordings for the folklore.

Results

Taxonomic hierarchy
Class Insecta Linnaeus, 1758
Order Lepidoptera Linnaeus, 1758
Superfamily Papilionoidea Latreille, 1802
Family Nymphalidae Rafinesque, 1815
Genus Junonia Hübner, [1819]
Junonia orithya (Linnaeus, 1758)
Common name: Blue Pansy

Biology: Under the young leaves of a Centranthera tranquebarica plant (Fig. 1A) at S1 (in a dry grassland on the edge of deciduous woodland near Madhaiganj hamlet), the first researcher discovered two spherical, pale green eggs (Fig. 1B) on July 19, 2024. If it weren't for the yellowish blooms that bloom in the evening and fall throughout the day, the 12-cm-tall herb would have been difficult to identify among the grasses. The plant's stems and leaves were gathered. On July 22, 2024, the eggs hatched, and the pale yellowish green larva (Fig. 1C), whose body was coated in numerous tiny, dark tubercles, consumed the egg shell. The tubercles emitted long, black setae. The caterpillars gradually turn blackish in the sixth (last) instar after becoming darker brown in the subsequent instars (Fig. 1D). Initially black in the first and second instars, the head capsule's fronts progressively turned orange in the fourth instar. Young leaves were the only food source for the larvae, whereas the younger instars only superficially consumed the young leaves' laminae. While the older instars were located on shoots and leaf litter and frequently fed at night, the younger instars remained on the underside of the leaves (Fig. 1C). On August 12, 2024, a dark brown pupa (Fig. 1G) with pale brown wing pads and ventrally developed. The pupae around the cremaster and mid-abdomen have whitish dorsal stripes. On the same day, a female adult emerged from the other egg that had been gathered. Thus, after 7 days of pupation, on the 32nd day, both eggs were encased. Every egg and larval stage were seen on the herb's blossoming individuals. When the larva reaches adulthood and stops feeding, it seeks out areas to pupate by moving to the edges of neighboring rocks or larger plants. Additionally, it was discovered that the raised larvae pupated on the plastic container's wall and moved away from the host shoot. Pupa is always created near the ground and hangs free from the cremaster.

Behaviour. In order to hide, the larvae's first instars have been observed to drop from the tiny plant into the thick grasses when startled. It has been observed that some millipedes and pangolins have an intriguing protective mechanism that involves rolling into a tight spiral (Dettner, 2010). In semiaquatic sandy grasslands (Singh, 1997) and wastelands on wet laterite soil (Rao & Kumari, 2002), the host plant, a delicate small common medicinal parasitic herb that is only 15 cm tall (Mahendru *et al*., 2022), is typically miscible among the grasses. It is known to flower from August to October (Paria & Chattopadhyay, 2005), and it offers the eggs and larvae the perfect safety cover.

Distribution. The distribution of *Junonia orithya* includes Africa (van Son, 1979) [19], the Middle East (west Asia), the Oriental region (south and south-east Asia), and Australia (Butler, 1875) [8]. It is widely dispersed across India, with the exception of high altitudinal regions like Sikkim and Ladakh (Kunte *et al*., 2022). It is rather prevalent in Tamilnadu's western regions, especially in the Eastern Ghats.

Family Hesperiidae Latreille, 1809
Genus Coladenia Moore, 1881 *Coladenia Uposathra* (Moore, 1865)
Common name: Tricolor Pied Flat (Fig. 2) (Table 3)

Biology: Eventually, groups of ten to fifteen larvae were observed in seven Schleichera oleosa (Ceylon Oak) trees, which ranged in height from three to roughly twenty meters, in different places around the Pachamalai Hills. On July 16, 2024, one of the larvae that had been gathered from Ceylon oak trees of various heights entered the pre-pupation stage. On July 25, 2024, an adult butterfly emerged from the pupa, which had formed on July 17 (Fig. 2H). This species, in contrast to other butterfly larvae, only consumes mature green leaves (Fig. 2A shows that young leaves are usually red).

Care was made to limit disturbance of the leaf cell (where the larva and pupa nest) during the pupal stage, as it was noted that it frequently enters an indefinite period of pupation upon being disturbed or intimidated (S. Kalesh pers. comm.). The host plant is a typical medium-sized deciduous tree found in South-East Asian plains and low hill forests. In the Eastern Ghats' Pachamalai Hills, it is known to bloom from February to March and bear fruit from April to August. According to Chandra (1997) [10], it is widely available in the Konaadu, Aruvikkarai, and Topsenkattuppatty areas. All of the larval observations were made when the plant was in its post-fruiting stage, meaning that no flowers or fruits were visible. A person was initially observed in the village of Top Senkattuppatty (S3) on July 28, 2024, and then again on September 24, 2024. The second author first noticed and collected larvae from an amature Schleichera oleosa tree in his hamlet on June 12, 2024, at 18:00. It was discovered that some unknown fungi had invaded the pupa. actions. The majority of skippers, including Coladenia uposathra, have larvae that reside in cells made from curled-over leaves (Wynter-Blyth, 1957). The larva's early instar removes a circular section from the center of an adult leaf and flips it over onto the leaf's top, creating a concave compartment with a broad base that it uses for rest and only emerges to feed. It continues to feed on the leaves during the first two instars while hiding inside the leaf (Fig. 2F). During the feeding cycle, larvae go into intermittent dormancy. The safe refuge of that cell is where the pre-pupation and pupal stages of development occur.

Distribution: The majority of South and Southeast Asia, including India, Nepal, Bhutan, Myanmar, Thailand, Laos, Vietnam, and South China, is home to Coladenia uposathra

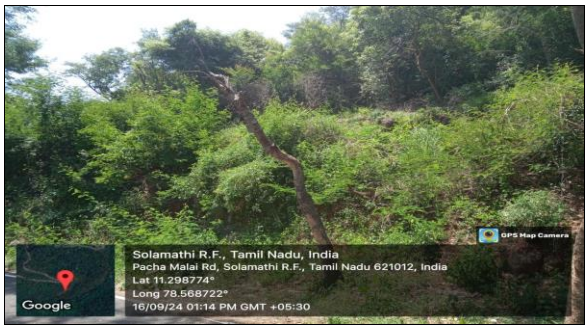
(van Gasse, 2021). It is a common species in South Tamilnadu, which is at the foothills of the Western Ghats.It is sporadically found in Tamil Nadu, Odisha, Chhattisgarh, Madhya Pradesh, Maharashtra (eastern region), and West Bengal (western region) of peninsular India. The Western Ghats are another area where it is commonly seen (Kunte *et al*., 2022). It is prevalent in the northern Dooars region of West Bengal, which includes the districts of Alipurduar, Jalpaiguri, Kalimpong, and Darjeeling. However, it is sometimes seen in the western districts of Paschim Medinipur, Purulia, Jhargram, and Bankura. In the Gangetic plains, it is extremely uncommon (Kunte *et al*., 2022).

Table 1: The host plants of *Junonia orithya*

Host plant	Name of the family	Reference
Desmos viridiflorus	Annonaceae	Balakrishnan et al.
Miliusa nilagirica	Annonaceae	Vansen et a.,
Orophea uniflora	Annonaceae	Wynter blyth et al.,
Polyalthia rufescens	Annonaceae	Chandra s. Sapindaceae et al.,
Peucedanum anamallayense	Apiaceae	Fayth et al.,
Nothopegia aureo-fulva	Anacardiaceae	Dasguptha et al.,
Ceropegia decaisneana	Asclepiadaceae	Hooker jd et al.,
Elaeocarpus blascoi	Elaeocarpaceae	Butler jd et al.,
Crotalaria kodaiensis	Fabaceae	Kalia et al
Dicranopteris linearis	Dicranopteridaceae	Wynter blyth et al.,
Crotalaria clavata	Fabaceae	Dasguptha et al.,
Crotalaria digitata	Fabaceae	Balakrishnan et al.
Actinodaphne bourneae	Fabaceae	Dasguptha et al.,

Table 2: The host plants of *Coladenia Uposathra* (Moore, 1865)

Host plant	Name of the family	Reference
Didymocarpus missionis	Gesneriaceae	Debudal banerjee, et al.,
Acrocephalus palniensis	Lamiaceae	Wynter blyth et al.,
Kendrickia walkeri	Melastomataceae	Dasguptha et al.,
Antistrophe serratifolia	Myrsinaceae	Balakrishnan et al.
Syzygium courtallense	Myrtaceae	Dasguptha et al.,



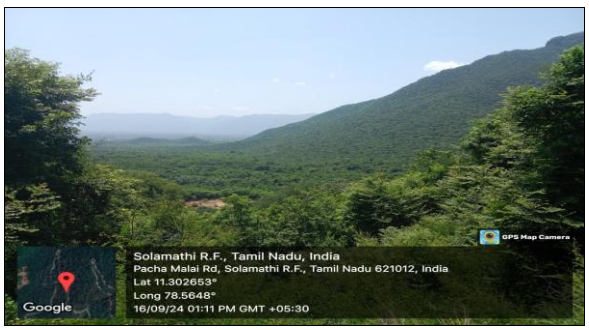


Fig 1: Sampling site, Pachamalai Hills of Eastern Ghats

Identification of Endemic Butterfly - Host Plant Species in the Pachamalai Hills of Eastern Ghats

According to the following study, *Schleichera oleosa* is the host plant for Coladenia uposathra, and *Centranthera tranquebarica* is the host plant for *Junonia orithya*. In that area, both plant species are Endemic in Nature. The preservation of the species will open the door for the conservation of the same butterfly species through *In Situ* conservation.

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