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## A preliminary checklist of butterflies from Adukkam forest in Dindigul district, Tamil Nadu, India

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### Abstract

A preliminary study on the diversity of butterflies from Adukkam Forest, Dindigul district, Tamil Nadu (10°15'45.0"N 77°32'46.7"E), was conducted over a span of nine years. The study recorded 72 species of butterflies, encompassing 17 species of Hesperidae, 23 species of Lycaenidae, 19 species of Nymphalidae, six species of Papilionidae, six species of Pieridae and one species of Riodinidae. Four species of butterflies reported in this study were endemics to the Western Ghats, while five were protected under various schedules provided in the Wildlife (Protection) Act, 1972. The threats faced by this forest from road expansion projects has been discussed in this work, and a possible solution to a common way forward for humans and butterflies was also described.

**Keywords:** Dindigul, butterflies, Kodaikanal, Palni hills

### Introduction

The Western Ghats of Tamil Nadu, India constitutes 60% of all forest cover of the state <sup>[1]</sup>. Among these forested hills, the Palni hills are a well-studied bio diverse zone in the southern part of the state. The most comprehensive study from these hills was the old works of Evans 1910 and Ugarte & Rodricks 1960. Along with few recent records, the region is home to 310 species of butterflies <sup>[4]</sup>. Another study from these hills, from the drier parts of these hills, recorded 150 species of butterflies <sup>[5]</sup>. Though many studies have been conducted from the entire hills, few studies have been focused on a select location. Studies on the diversity of butterflies in the various habitats of the Palni hills and the relation between the floral diversity and butterfly species diversity have also been conducted from these hills <sup>[6]</sup>. One of the more restricted studies is a study from the Sirumalai range, which recorded 36 species of butterflies <sup>[7]</sup>. Another study from Sirumalai reported 39 species <sup>[8]</sup>. Recently, two surveys <sup>[9, 10]</sup> were conducted by The Nature and Butterfly Society (TNBS) in collaboration with the Tamil Nadu Forest Department (TNFD), which totally reported consolidated list 161 species. Another study by TNBS from the Devadhanapatti range of Palani hills recorded 131 species <sup>[11]</sup>.

The objective of this study was to investigate the distribution and diversity of butterflies from this forest and hope that this publication will be able to protect this reserve forest from encroachment and road expansion activities that threaten the forest currently, by placing it in the spotlight of the scientific community.

### Materials and Methods

#### Study Area

For the purpose of the study, a stream located on the Kodai-Kudumbanar Road, at Addukam, and is at a distances of 16.7 km from the Kodaikanal Lake (10°15'45.0"N 77°32'46.7"E), which has been shown in Figure 1. No special permission is required to be obtained to visit this sight as it is along the Kodai-Kudumbanar road, a public road. The average temperature recorded was 26°C. The wettest month was October, while the driest month was February, recording an average rainfall of 134 cm. The habitat present at this location was moist evergreen forest, which is known to occur along the South Western Ghats. No studies have been published from this forest to comment on its floral diversity. However from the author's observation, the area had thickly covered a thickly covered canopy and a dense forest floor. *Lantana camara* were recorded along the road and the stream had rocks, as seen in Figure 2, and small sand banks, to allow mudpuddling.

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110 species of birds, including the Brown-backed Needletail (*Hirundapus giganteus*), Dark-fronted Babbler (*Rhopocichla atriceps*), Rufous Babbler (*Turdoides subrufa*) and Banded Bay Cuckoo (*Cacomantis sonneratii*) have been reported from this location [12]. According to the officials at Tamil Nadu Forest Department (unpublished), Indian Leopards

(*Panthera pardus fusca*) have been seen in the forest. The author personally came across a Dhole (*Cuon alpinus*) attempting to hunt a Sambar Deer (*Rusa unicorn*). Apart from these, Indian Gaur (*Bos gaurus*), Malabar Giant Squirrel (*Ratufa indica*) and Dusky-striped Squirrel (*Funambulus sublineatus*) frequented the study area.



**Fig 1:** Map depicting the study area, located in the Palni Hills in Tamil Nadu



**Fig 2:** The Stream present in the study area where most butterfly observations were made. Species such Tree Flutter, Gaudy Baron and Restricted Demon were recorded from this rock patch.

### Survey and Identification

The butterfly observations were made for a period of nine years months from January 2010 to June 2019 at the study area. The site was visited from 7:30am to 12pm on all but four surveys, which were conducted from 2:30pm to 5pm. With the exception of the year 2016, when no trips were made, every year had a minimum of four visits. A single transect of 100m was used during this study, which started from the described stream, and continued along the road leading to Kodaikanal. A total of 50 surveys were done in this time period, over various seasons, to collect data on the various butterflies present in the study area. Photographic documentation was done using Canon 7D camera or a Canon 5D camera, using a 70-100mm macro lens. Identification and classification of butterfly species and scientific names was done using Field guides [13–15]. The recorded species were categorised on the basis of their abundance under different score classes such as: Abundant (80–100%), Common (60–80%), Occasional (40–60%), Rare (20–40%) and Very Rare (below 20%), similar to the method used in another study from this region [5].

### Results and Discussion

#### Species recorded in Study

A total of 72 species of butterflies were recorded from this

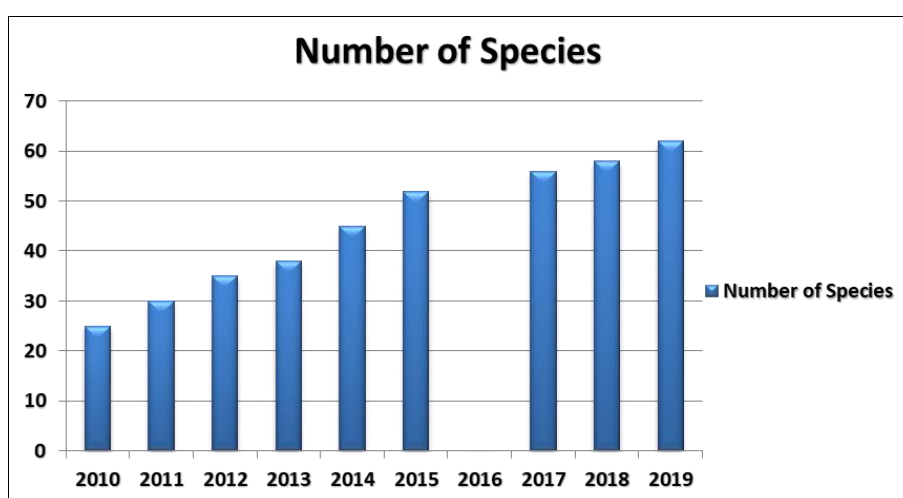
location during the defined time period, with 17 species of Hesperidae, 23 species of Lycaenidae, 19 species of Nymphalidae, six species of Papilionidae, six species of Pieridae and one species of Riodinidae. The complete list of species recorded has been listed in Table 1. This result is contrary to other studies, which have recorded many species of Nymphalidae [5]. The results confirm the study by [6], which recorded 92 species of butterflies from forested location in the Palni Hills. All the species recorded from the study have earlier been reported from the Palni Hills [4], with close to 23% of species reported from the hills, being seen along this transect. A select 20 species that were photographed from the described stream have been shown in Figure 3.

18 abundant species, 18 common species, six occasional species, 12 rare species and 18 very rare species were recorded from the study, which have been mentioned in Table 1. The year wise sighting of butterfly species has been shown in Figure 4. The break in 2016 is due to the lack of observations from that year, and doesn't signify the absence of butterflies from the region. Out of the species recorded, five are protected by the Wildlife Protection Act 1972. The Common Hedge Blue (*Acytolepis puspa*) is protected by Schedule I species, while the Peablu (*Lampides boeticus*), Dark-branded Bushbrown (*Mycalesis mineus*) and Common Gull (*Cepora nerissa*) by Schedule II and the Tamil Dartlet (*Oriens concinna*) by Schedule IV of the WPA. Four butterflies recorded in the study were endemic to the Western Ghats. White-disc Hedge Blue (*Celatoxia albidisca*), Red-disc Bushbrown (*Telinga oculus*), Palni Four-ring (*Ypthima ypthimoides*) and Malabar Raven (*Papilio dravidarum*). Species characteristic to hills [13] such as Orange-striped Awlet (*Burara jaina*), Dingy Scrub Hopper (*Aeromachus dubius*), Tamil Dartlet (*Oriens concinna*), White hedge Blue (*Udara akasa*), White-disc Hedge Blue (*Celatoxia albidisca*), Nilgiri Tiger (*Parantica nilgiriensis*), Club Beak (*Libthea myrrha*), Red-disc Bushbrown (*Telinga oculus*) and Palni Four-ring (*Ypthima ypthimoides*), Black Prince (*Rohana parisatis*), Indian Red Admiral (*Vanessa indica*) and Indian Blue Admiral (*Kaniska canace*) that are known to be recorded only from hills were also seen. Species such as the Common Cerulean (*Jamides celeno*), and the Peablu (*Lampides boeticus*), which are known to occur in hill and plain habitats [13] were also reported.





**Fig 3:** 1. Indian Awlking (*Chaospes benjaminii*) 2. Fulvous Pied Flat (*Pseudocoladenia dan*) 3. Common Spotted Flat (*Celaenorrhinus leucocera*) 4. Restricted Demon (*Notocrypta curvifascia*) 5. Tree Flitter (*Hyarotis adrastus*) 6. Dart spp (*Poanthus sp*) 7. Indian Dartlet (*Oriens goloides*) 8. Large Four-Lineblue (*Nacaduba pactolus*) 9. Transparent Six-Lineblue (*Nacaduba kurava*) 10. Indian Cupid (*Everes lacturnus*) 11. Common Hedge Blue (*Acytolepis puspa*) 12. Plain Hedge Blue (*Celastrina lavendularis*) 13. Nilgiri Tiger (*Parantica nilgiriensis*) 14. Dark-branded Bushbrown (*Mycalis mineus*) 15. Red-disc Bushbrown (*Telinga oculus*) 16. Rustic (*Cupha erymanthis*) 17. Gaudy Baron (*Euthalia lubentina*) 18. Blue Admiral (*Kaniska canace*) 19. Southern Bluebottle (*Graphium teredon*) 20. Three-spot Grass Yellow (*Eurema blanda*)



**Fig 4:** Number of butterflies sighted over different years of the study.

Most of the butterflies seen during the study were either seen mudpuddling or nectaring on *Lantana camara*. Around 22% of the recorded butterflies in the study were seen nectaring on *Lantana camara*. *Lantana camara* is a known invasive species to the Indian subcontinent [16]. Though it has been recorded as a nectar plant in this study, as is the case with other studies [17], it is known to have a negative impact on bird assemblages [18]. Thus the growing of *Lantana camara* should not be a conclusion drawn from this study, based on the nectaring of butterflies. Another find from the study was that 53% of species sighted were recorded mudpuddling from the sand banks or rocks of the stream. This percentage, though lower compared to a study in Mumbai that recorded 90% of sighted butterflies mudpuddling [19], is still strongly indicative

that mudpuddling sites are excellent spots to locate butterflies. Butterfly mudpuddling was normally observed from 08.00 hrs to 14.30hrs and was seen to peak at 11:00 hrs. Most of the species that were seen to mudpuddle, belonged to the Lycaenidae. Mass mixed congregations of species such as Common Emigrant, Three-spot Grass Yellow and Common Grass Yellow were recorded in the study. Thus conclusions from the study from Mumbai were also observed in this study. Additionally the mudpuddling of the Orange-striped Awlet (*Burara jaina*), which were not reported to mudpuddle in that study. Species such as Tiny Grass Blue (*Zizula hylax*) and *Ypthima* species were normally seen flying along the fringes of the pathway frequently.

**Table 1:** Checklist of butterflies recorded during the study period.

Scientific Name	Common Name	Behaviour observed	Status	Frequency of sightings (in %)
<b>Hesperiidae</b>				
<i>Badamia exclamationis</i>	1. Brown awl	Roosting	Very Rare	2
<i>Burara jaina</i>	2. Orange-striped Awlet	Mudpuddling	Very Rare	2
<i>Hasora chromus</i>	3. Common-banded Awl	Nectaring on <i>Lantana camara</i>	Common	76
<i>Hasora taminatus</i>	4. White-banded Awl	Nectaring on <i>Lantana camara</i>	Rare	40
<i>Choaspes benjaminii</i>	5. Indian Awlking	Mudpuddling from bird faecal matter	Occasional	54
<i>Pseudocoladenia dan</i>	6. Fulvous Pied Flat	Nectaring on <i>Lantana camara</i>	Common	68
<i>Caprona ransonnetii</i>	7. Golden angle	Nectaring on <i>Lantana camara</i>	Very Rare	4
<i>Celaenorrhinus leucocera</i>	8. Common Spotted Flat	Nectaring on <i>Lantana camara</i>	Very Rare	10
<i>Aeromachus dubius</i>	9. Dingy Scrub Hopper	Found along grass patches adjacent to the road	Common	76
<i>Notocrypta curvifascia</i>	10. Restricted Demon	Nectaring on <i>Lantana camara</i>	Occasional	44
<i>Hyarotis adrastus</i>	11. Tree Flitter	Basking	Very Rare	2
<i>Matapa aria</i>	12. Common redevye	Nectaring on <i>Lantana camara</i>	Very Rare	2
<i>Pelopidas agna</i>	13. Little-branded Swift	Basking	Common	86
<i>Pothanthus sp</i>	14. Dart spp	Basking, Nectaring on <i>Lantana camara</i>	Abundant	90
<i>Oriens concinna</i>	15. Tamil Dartlet	Basking	Very Rare	2
<i>Oriens goloides</i>	16. Indian Dartlet	Nectaring on <i>Lantana camara</i>	Abundant	94
<i>Telicota bambusae</i>	17. Dark-Palm Dart	Nectaring on <i>Lantana camara</i>	Rare	40
<b>Lycaenidae</b>				
<i>Spalgis epius</i>	18. Apefly	Once attempted to lay eggs. Normally seen flying around broad leaved trees.	Rare	36
<i>Nacaduba pactolus</i>	19. Large Four-Lineblue	Mudpuddling	Occasional	58
<i>Nacaduba hermus</i>	20. Pale Four-Lineblue	Mudpuddling	Very Rare	2
<i>Nacaduba kurava</i>	21. Transparent Six-Lineblue	Mudpuddling	Common	86
<i>Nacaduba beroe</i>	22. Opaque Six-Lineblue	Mudpuddling	Rare	32
<i>Prosotas nora</i>	23. Common Lineblue	Mudpuddling	Rare	32
<i>Prosotas dubiosa</i>	24. Tailless Lineblue	Mudpuddling	Rare	30
<i>Caleta decidia</i>	25. Angled Pierrot	Mudpuddling	Abundant	98
<i>Discolampa ethion</i>	26. Banded Blue Pierrot	Mudpuddling	Abundant	84
<i>Jamides bochus</i>	27. Dark Cerulean	Mudpuddling	Common	38
<i>Jamides celeno</i>	28. Common Cerulean	Mudpuddling	Rare	24
<i>Lampides boeticus</i>	29. Peablu	Nectaring on <i>Lantana camara</i>	Common	62
<i>Zizula hylax</i>	30. Tiny Grass Blue	Along the pathway	Abundant	88
<i>Everes lacturnus</i>	31. Indian Cupid	Mudpuddling	Very Rare	2
<i>Talicada nyseus</i>	32. Red Pierrot	Along the pathway, basking or perched.	Very Rare	2
<i>Acytolepis pusp</i>	33. Common Hedge Blue	Mudpuddling	Common	72
<i>Celastrina lavendularis</i>	34. Plain Hedge Blue	Mudpuddling	Rare	34
<i>Udara akasa</i>	35. White Hedge Blue	Mudpuddling	Common	78
<i>Celatoxia albidisca</i>	36. White-disc Hedge Blue	Mudpuddling	Occasional	46
<i>Freyeria putli</i>	37. Small Grass Jewel	Along the pathway, basking or perched.	Very Rare	2
<i>Surendra quercetorum</i>	38. Common Acacia Blue	Along the pathway, basking or perched.	Very Rare	2
<i>Amblypodia anita</i>	39. Leaf Blue	Mudpuddling	Very Rare	2
<i>Rathinda amor</i>	40. Monkey Puzzle	Flying around broadleaved trees	Occasional	62
<b>Nymphalidae</b>				
<i>Libythea myrrha</i>	41. Club Beak	Mudpuddling	Abundant	100
<i>Parantica aglea</i>	42. Glassy Tiger	Nectaring on <i>Lantana camara</i>	Common	82
<i>Parantica nilgiriensis</i>	43. Nilgiri Tiger	Mudpuddling	Common	72
<i>Mycalesis mineus</i>	44. Dark-branded Bushbrown	Along the pathway, basking or perched.	Common	78
<i>Mycalesis junonia</i>	45. Gladeye Bushbrown	Along the pathway, basking or perched.	Rare	22
<i>Telinga oculus</i>	46. Red-disc Bushbrown	Along the pathway, basking or perched.	Abundant	100
<i>Ypthima baldus</i>	47. Common Five-ring	Along the pathway, basking or perched.	Abundant	100
<i>Ypthima huebneri</i>	48. Common Four-ring	Along the pathway, basking or perched.	Abundant	100
<i>Ypthima ypthimoides</i>	49. Palni Four-ring	Near the stream, moving to higher elevation	Very Rare	2
<i>Cirrochroa thais</i>	50. Tamil Yeoman	Mudpuddling	Rare	20
<i>Cupha erymanthis</i>	51. Rustic	Mudpuddling	Abundant	100
<i>Neptis hylas</i>	52. Common Sailer	Nectaring on <i>Lantana camara</i>	Abundant	100
<i>Pantoporia hordonia</i>	53. Common Lascar	Nectaring on <i>Lantana camara</i>	Common	80
<i>Euthalia lubentina</i>	54. Gaudy Baron	Mudpuddling	Very Rare	2
<i>Cyrestis thyodamas</i>	55. Common Map	Mudpuddling	Common	72
<i>Rohana parisatis</i>	56. Black Prince	Mudpuddling	Occasional	64
<i>Vanessa indica</i>	57. Indian Red Admiral	Mudpuddling	Abundant	100
<i>Kaniska canace</i>	58. Blue Admiral	Mudpuddling	Rare	20
<i>Junonia iphita</i>	59. Chocolate Pansy	Mudpuddling	Abundant	100
<b>Papilionidae</b>				
<i>Graphium teredon</i>	60. Sothern Bluebottle	Mudpuddling	Abundant	100
<i>Papilio helenus</i>	61. Red Helen	Mudpuddling	Abundant	100
<i>Papilio dravidarum</i>	62. Malabar Raven	Mudpuddling	Very Rare	2
<i>Papilio polymnestor</i>	63. Blue Mormon	Mudpuddling	Abundant	100

<i>Papilio paris</i>	64. Paris Peacock	Flying by the stream	Very Rare	2
<i>Troides minos</i>	65. Southern Birdwing	Nectaring on <i>Lantana camara</i>	Common	78
<b>Pieridae</b>				
<i>Eurema blanda</i>	66. Three-spot Grass Yellow	Mudpuddling	Abundant	100
<i>Eurema hecabe</i>	67. Common Grass Yellow	Mudpuddling	Common	70
<i>Catopsilia pomona</i>	68. Common Emigrant	Mudpuddling	Abundant	100
<i>Hebomoia glaucippe</i>	69. Great Orange-tip	Mudpuddling	Common	70
<i>Pieris canidia</i>	70. Indian Cabbage White	Mudpuddling	Common	76
<i>Cepora nerissa</i>	71. Common Gull	Mudpuddling	Rare	38
<b>Riodinidae</b>				
<i>Abisara bifasciata</i>	72. Plum Judy	Basking	Very Rare	2

### 3.2 Threats faced by the habitat

During this study period, the landscape changed significantly. What was once a very narrow and battered road, was initially re-laid and in 2014. In the year 2017, road construction work from the Perumalmai section of the road had commenced. By July 2017, major chunks of the road leading to the study area were redone once again, along with significant road expansion. Water needed for the laying of these roads was sometimes taken from this stream and in the process, many parts of the study area were disturbed and a section tarred. Though these were cleaned up in weeks, the damage done to the habitat was significant, as butterflies avoided these disturbed places. This activity continued well into 2019, at which point, the stream started to run drier than usual. The drying of the stream, though probably a result of upstream activity can also be attributed to the removal of water by various tankers from the study area. A notable change was the absence of the Indian Awlwing (*Choaspes benjaminii*) from the forest, after the start of these construction activities. Clubbeaks and the Lineblues (*Prosotas* and *Nacaduba* species) were also seen frequenting areas less disturbed by road expansions. Road expansion projects in general are known to adversely affect the native flora and fauna of a habitat [20]. Hence, in the larger view of the butterfly community, it can be argued that the expansion of roads could cause a dent to butterfly diversity at the location. Another factor to consider along the entirety of the Palni hills, where road expansion projects pass through butterfly hotspots, is the persistence of road-killed butterflies. Butterflies have been well documented to be casualties of road kills [21]. Hence, care must be taken, to avoid increasing traffic in areas that are known for mass mudpuddling and nectaring in these hills. It is suggested that such locations alone can be left as such, with minimal efforts of road restoration taken up, for the safety of users, and to also thereby ensure slower traffic on these roads. Road safety signs can also be provided at locations of better motor ability that are known as butterfly congregation and puddling sites, to alert drivers to drive slower in these regions. Such regions can be identified and these actions coordinated by the TNFD and the transportation ministry, taking inputs from local butterfly organisations such as TNBS.

### 4. Conclusion

The Adukkam forest is a bio-rich location along the Palni Hills. This study reports 72 species of butterflies, based on data that was collected for a period of nine years. The forest is cut through by the Kodai-Kudumbanar Road, and thus is at risk from road expansion projects and other encroachment activities. It is suggested that road expansions are not taken up in areas that are adjacent to the reserve forest, but are only expanded near towns and other settlements for now. Other expansions can be taken, with recommendations from butterfly experts of the region. The extraction of water from

the stream must also be regulated by the local government, in order to avoid the exploitation of this water resource, which could disturb the ecosystem of this forest. Further studies are required on the influence of human disturbances, at this location, as well at other parts of the Palni Hills.

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