

## New larval host plants for the Slate flash, Black rajah and Tiny grass blue butterflies (Insecta: Lycaenidae, Nymphalidae) from Bankura, West Bengal, India

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### Abstract

Received: 30 June 2021

Accepted: 19 December 2021

Published online: 31 December 2021

A survey was carried out studying the life cycle of butterflies in the Bankura district, West Bengal, India. Four new larval host plants of three different species of butterflies, together with their life cycles, were observed during this survey: *Calliandra heamotocephala* (Hassk) as new larval host plant of *Charaxes solon* (Fabricius) and *Rapala manea* (Hewitson). *Litchi chinensis* (Sonn) as new larval host plant of *Rapala manea* and *Hemigraphis hirta* (Vahl) (T. Anders) as new larval host plant of *Zizula hylax* (Fabricius).

**Key words:** Diversity, Kotulpur, life cycle, new food plants, new report, South Bengal

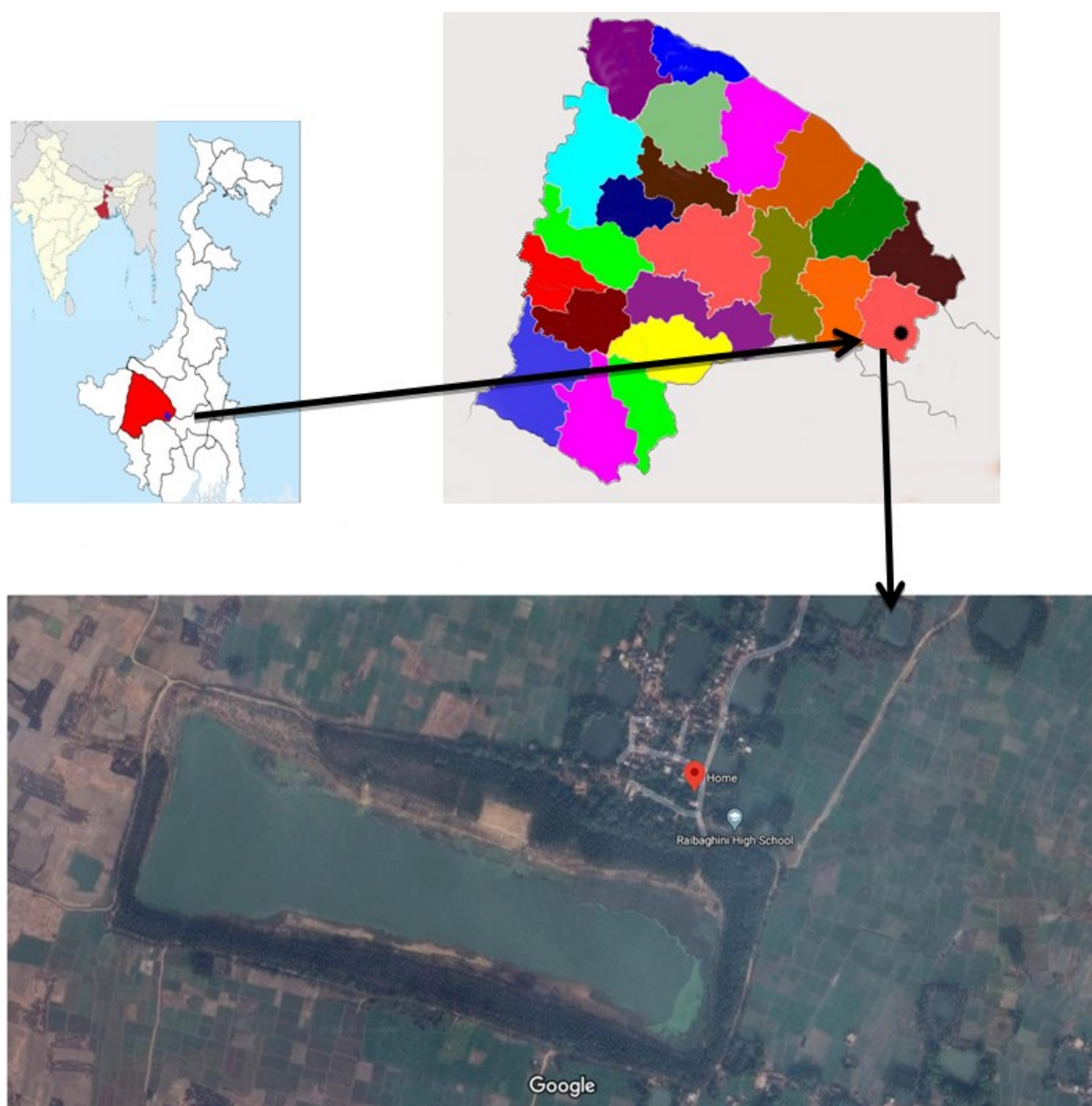
### Introduction

Pollinators play a crucial part in the world's food supply and have received a lot of attention in recent years since they have an important role in ecosystems (Losey and Vaughan, 2006; Lindström et al., 2018). Butterflies are among the most susceptible wildlife species, negatively responding to climate and habitat changes (Thomas, 2005). At many geographical scales, studies have discovered a close link between butterfly diversity and plant diversity (Hawkins and Porter, 2003a; 2003b; Menéndez et al., 2007; Kitahara et al., 2008). The documentation of butterfly larval host plants was initiated by T. R. Bell (1909–1927). The larval host plants of butterflies have been well documented from Western Ghat by Nitin et al. (2018). A total number of 834 plants has been reported as larval host plants of 320 species of butterflies (Nitin et al., 2018). The documentation of butterflies in the heterogeneous habitat of Bankura district was carried out by Mukherjee and Mondal (2020). They found 117 species of butterflies. This region is largely unexplored (Mirza and Mondal 2018; Mondal et al., 2020), but some interesting butterfly species distributions (Roy et al., 2021) and a new host plant of *Papilio crino* (Fabricius) has been reported by Mukherjee and Ghosh (2018). The objective of this present study is to understand the availability of the larval host plants in the Bankura district.

### Material and Methods

#### Study area

A small opportunistic survey was done in Raibaghini (23.029°N, 87.557°E) (Fig. 1). It is a small village in the Kotulpur block of the Bankura district. This study area is situated between Damodar and Darokeswar River. The average annual rainfall of Raibaghini is 1236 mm and the average temperature is 26.6 °C. The survey was carried out from March 2020 to June 2020. In this time-span, some life cycles were observed from the egg to the larval stage (caterpillars). The opportunistic method (Williams, 2015) was followed to complete the survey. The eggs and larvae were collected and the whole life cycle was observed in the author's home. The larvae were kept in plastic containers until they reached the adult stage. The flower and the leaf of the host plant were provided for the caterpillars. The containers were cleaned daily to avoid any fungal infections. The plants were identified as per regional publications of flora (Hooker, 1875–1887; Kanjilal et al., 1934–1940; Haridasan and Rao, 1985–1987). Information was collected about the early stages of larvae and host plants from the Butterflies of India website, <https://www.ifoundbutterflies.org>.



**Figure 1:** The location of the study area: Raibaghini, Bankura, West Bengal, India.

## Results and Discussion

### 1. Slate flash (*Rapala manea*) -

**a.** *Rapala manea* is common in India and seen throughout the year (Kehimker, 2008). The species is frequently found in Bankura district of West Bengal (Mukherjee and Mondal, 2020). The larvae feed on the flower and buds during all of their life (Bhakare and Ogale, 2018). On 10<sup>th</sup> March 2020, a Slate flash female was laying an egg on the buds of *Litchi chinensis* (Sonn) (Sapindaceae), which was full with flowers at the time (23.029°N, 87.557°E). The plant was approximately 9.5 m tall. The egg was fresh green in color, and it blackened gradually. A small hairy larva hatched from the egg after 4 days. The first molt occurred after 5 days from the hatching date. It spent 12 days as a larva. On the 13<sup>th</sup> day (22<sup>nd</sup>

March 2020) from the date of oviposition, the larva pupated. After spending 7 days as a pupa the adult Slate flash emerged on 30<sup>th</sup> of March 2020. The larva took 20 days to complete its lifecycle on *Litchi chinensis* plant (Fig. 2), and it feeds on the flowers of *Litchi chinensis*. This plant has also been reported as the larval host plant of *Rathinda amor* (Fabricius, 1775), *Anthene emolus* (Godart, 1824), and *Deudorix epijarbas* (Moore, 1858) (<https://www.ifoundbutterflies.org/flora/1426/Litchi-chinensis>) but has never previously been reported as a host plant of *Rapala manea*. Previously reported larval host plants are given in Table 1.

**b.** Another host plant of *Rapala manea* was recorded from Raibaghini, Bankura (23.029°N, 87.557°E). On the 16<sup>th</sup> of May 2020, a Slate flash female was seen laying eggs on the buds of *Calliandra haematocephala* (Hassk). *Calliandra haematocephala* is a small

flowering, deciduous plant of the Fabaceae family, and the height was about 14 ft. On the same day, another 3 larvae of the 3rd instar were also found (Fig. 3). These caterpillars were left on the plant for observation under natural conditions. One egg was collected and reared. The egg hatched after 3 days (on 19<sup>th</sup> May 2020). The size of the final instar caterpillar was 4 cm and it became a pupa on 1<sup>st</sup> June 2020, which hatched on 7<sup>th</sup> June 2020. The life cycle took a total of 22 days from egg to adult (Fig. 4). *Calliandra heamotocephala* is recorded as the larval host plant of *Eurema hecabe* (Linnaeus, 1758) (<https://www.ifoundbutterflies.org/flora/747/Calliandra-haematocephala>) and *Eurema blanda* (Boisduval, 1836; Nitin et al. 2018), but has never been reported as a larval host plant of *Rapala manea*.

## 2. Tiny grass blue (*Zizula hylax*) –

This is the second smallest butterfly in India and its status is considered common (Kehimkar, 2008). It is frequently found in Bankura (Mukherjee and Mondal, 2020). The larvae feed on the immature pods and flowers of the host plant *Hemigraphis hirta* (Vahl) T. Anders. (Acanthaceae) (Bhakare and Ogale, 2018) and this butterfly has been recorded in all possible localities where surveys are conducted (Das, 2014). On 11<sup>th</sup> April a 3<sup>rd</sup> instar caterpillar of the tiny grass blue was seen on the flower of *Hemigraphis hirta* at Raibaghini, Bankura (23.029°N, 87.557°E). *Hemigraphis hirta* grows on the ground with a beautiful bluish flower, which is large in respect to this small plant. The larva completed its lifecycle on this plant feeding on the fresh flower-bud and flower. The larva pupated on 19<sup>th</sup> April 2020, and the pupa hatched on 24<sup>th</sup> April 2020. Previously *Hemigraphis hirta* was reported as the larval host plant of *Junonia almana* (Linnaeus, 1758) and *Junonia lemonis* (Linnaeus, 1758) (Shihan, 2018), but has never

previously been reported for *Zizula hylax*. Earlier recorded larval host plants of this species are given in Table 2. The life cycle image is given in Fig. 5.

## 3. Black rajah (*Charaxes solon*) –

The Black rajah is a butterfly of the Nymphalidae family, which is not common in India (Kehimker, 2008). The species has a scattered distribution in West Bengal (Das, 2014) and is rare in Bankura (Mukherjee and Mondal, 2020). A female Black rajah was seen laying eggs on the upper side of a leaf of *Calliandra heamotocephala* on 12<sup>th</sup> March 2020 in Raibaghini, Bankura (23.029°N, 87.557°E). One egg was collected and reared at home. The egg hatched after 3 days (15<sup>th</sup> March 2020) and it spent a total 32 days as a larva from the date of hatching. On the 33<sup>rd</sup> day (17<sup>th</sup> April 2020) the larva pupated. Pupation was 6 days and on the 7<sup>th</sup> day (24<sup>th</sup> April 2020) the pupa hatched as the adult *Charaxes solon*. It took a total of 43 days to go from egg to adult. The life cycle images are given in the Fig. 6. Previously, *Calliandra heamotocephala* has not been reported as the host plant of *Charaxes solon*. An existing host plant list is given in Table 3.

## Conclusion

This study shows that *Rapala manea*, *Zizula hylax*, and *Charaxes solon* accept new host plants, which are not previously reported. More fieldwork and surveys are needed to reveal more possibilities, in order to know more about the diversity of butterflies in relation to their host plants in this geographic region. Host plants and butterflies have co-evolved in the same context so their biotopes are crucial for maintaining butterfly variety. It is very important to determine relationships between butterfly taxa and host plants to conserve them in their native habitat.

**Table 1:** Previously reported host plants of the Slate flash.

Sl. No.	Host plant name	Family name	References
1	<i>Lantana camara</i>	Verbenaceae	Nitin et al. (2018)
2	<i>Camellia sinensis</i>	Theaceae	Wynter-Blyth (1957); Kunte (2000)
3	<i>Clerodendrum infortunatum</i>	Lamiaceae	Saji et al. (2018)
4	<i>Mangifera indica</i>	Anacardiaceae	Robinson et al. (2010)
5	<i>Combretum indicum</i>	Combretaceae	Wynter-Blyth (1957); Kunte (2000)
6	<i>Acacia pennata</i>	Fabaceae	Wynter-Blyth (1957); Kunte (2000)
7	<i>Mimosa invisa</i>	Fabaceae	Nitin et al. (2018)
8	<i>Urena lobata</i>	Malvaceae	Saji et al. (2018)
9	<i>Ziziphus</i> sp.	Rhamnaceae	Wynter-Blyth (1957); Kunte (2000)
10	<i>Sorbaria sorbifolia</i>	Rosaceae	Wynter-Blyth (1957); Kunte (2000)
11	<i>Lepisanthes tetraphylla</i>	Sapindaceae	Saji et al. (2018)
12	<i>Antidesma ghaesembilla</i>	Phyllanthaceae	Wynter-Blyth (1957); Kunte (2000)
13	<i>Antidesma acidum</i>	Phyllanthaceae	Wynter-Blyth (1957); Kunte (2000)
14	<i>Acacia megaladena</i>	Fabaceae	Wynter-Blyth (1957); Kunte (2000)

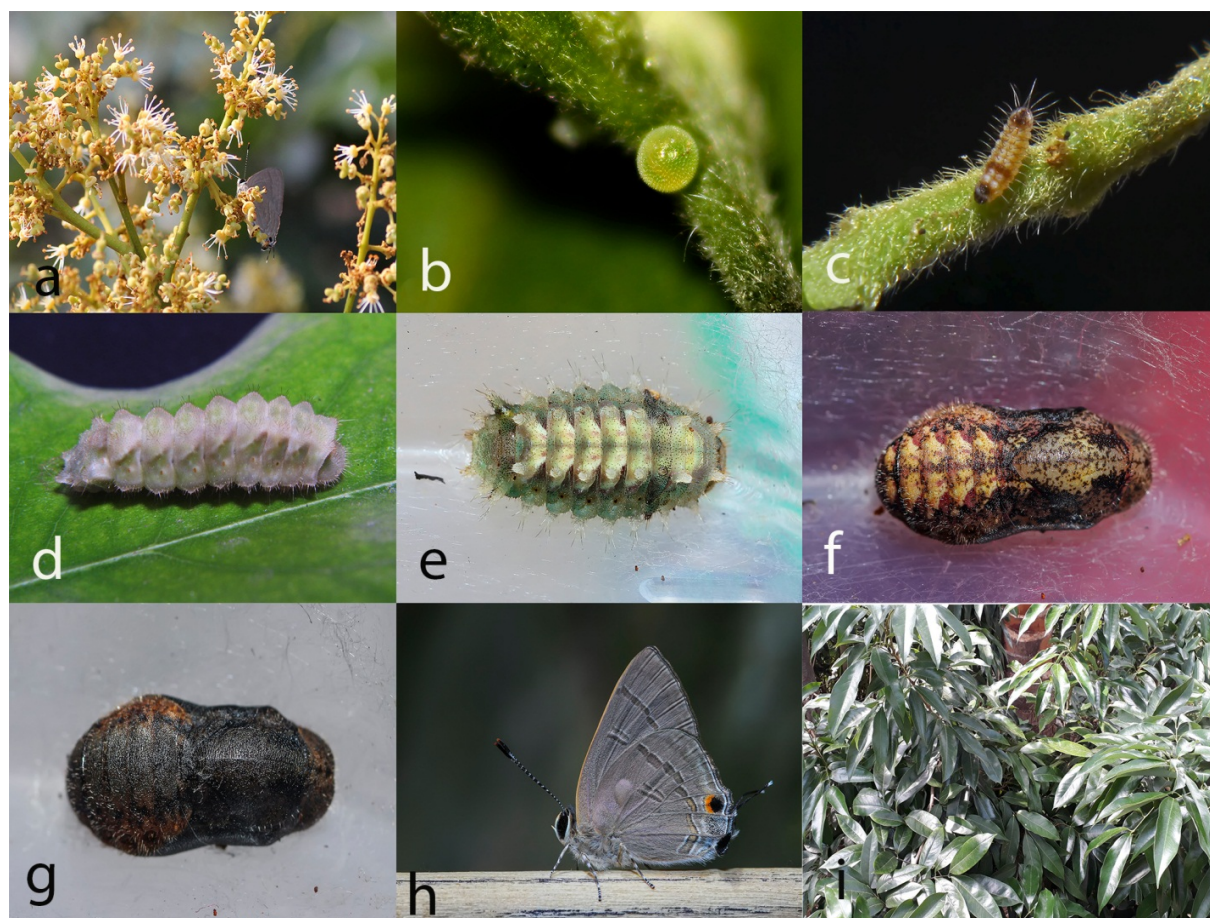


**Table 2:** Previously reported host plants of the Tiny grass blue.

Sl. No.	Host plant name	Family name	References
1	<i>Lantana</i> sp.	Verbenaceae	Wynter-Blyth (1957); Robinson et al. (2010); Kunte (2000)
2	<i>Hygrophila auriculata</i>	Acanthaceae	Robinson et al. (2010); Das (2014); Nitin et al. (2018)
3	<i>Nelsonia canescens</i>	Acanthaceae	Wynter-Blyth (1957); Robinson et al. (2010); Kunte (2000) Wynter-Blyth (1957); Robinson et al. (2010); Kunte (2000)
4	<i>Phaulopsis dorsiflora</i>	Acanthaceae	Kunte (2000)
5	<i>Hygrophila ringens</i>	Acanthaceae	Nitin et al. (2018)
6	<i>Dipteracanthus prostratus</i>	Acanthaceae	Nitin et al. (2018)
7	<i>Ruellia tuberosa</i>	Acanthaceae	Nitin et al. (2018)
8	<i>Ruellia tweediana</i>	Acanthaceae	Nitin et al. (2018)
9	<i>Visia</i> sp.	Fabaceae	Wynter-Blyth (1957); Kunte (2000)
10	<i>Tribulus terrestris</i>	Zygophyllaceae	Nitin et al. (2018)

**Table 3:** Previously reported host plants of the Black rajah.

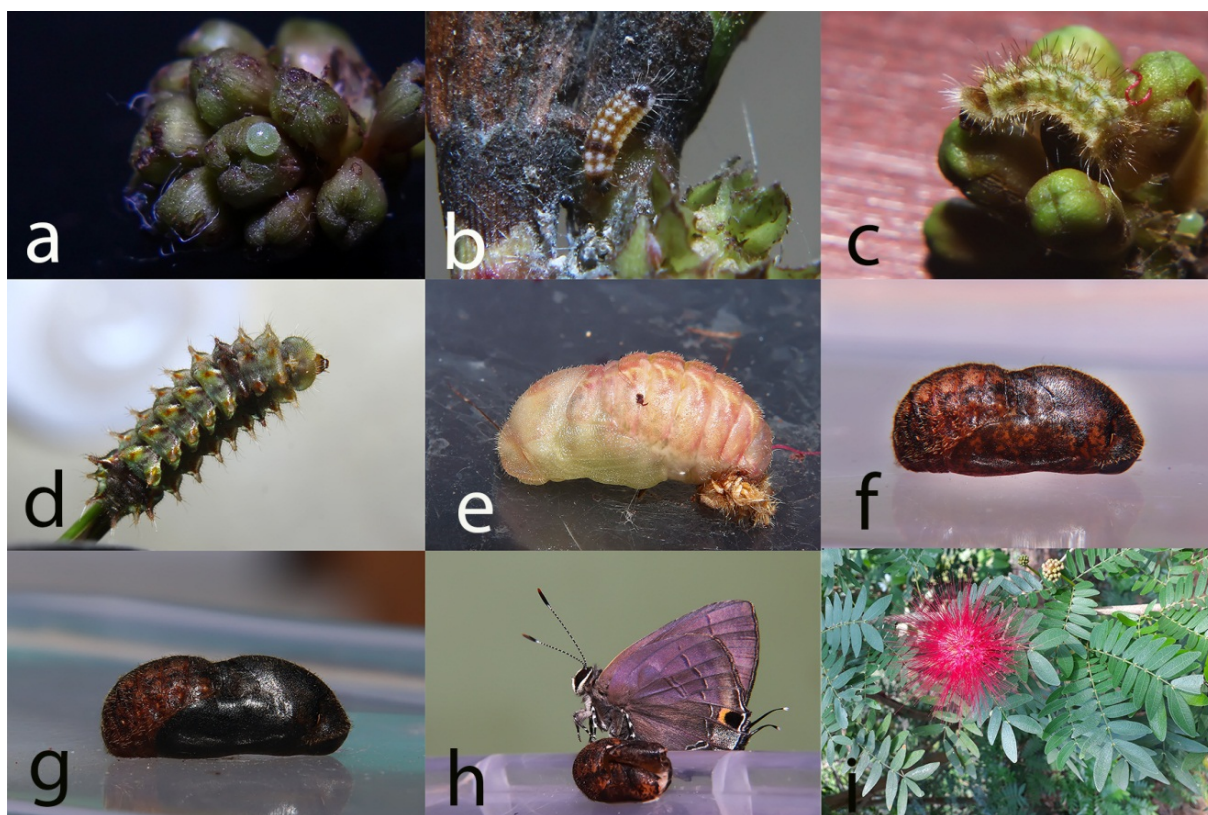
Sl. No.	Host plant name	Family name	References
1	<i>Dalbergia sissoo</i>	Fabaceae	Robinson et al. (2010)
2	<i>Pithecellobium dulce</i>	Fabaceae	Robinson et al. (2010)
3	<i>Tamarindus indica</i>	Fabaceae	Bell (1909–1927); Kehimker (2008); Robinson et al. (2010)
4	<i>Xylia xylocarpa</i>	Fabaceae	Robinson et al. (2010)
5	<i>Moullava spicata</i>	Fabaceae	Kehimker (2008); Robinson et al. (2010)
6	<i>Bauhinia racemosa</i>	Fabaceae	Kehimker (2008)

**Figure 2:** Life cycle of the Slate flash on *Litchi chinensis* plant. Egg laying female (a), freshly laid egg (b), two days old larva (c), last instar larva (d), pre-pupation (e), pupa (f), mature pupa (g), adult Slate flash (h), and *Litchi chinensis* plant (i).



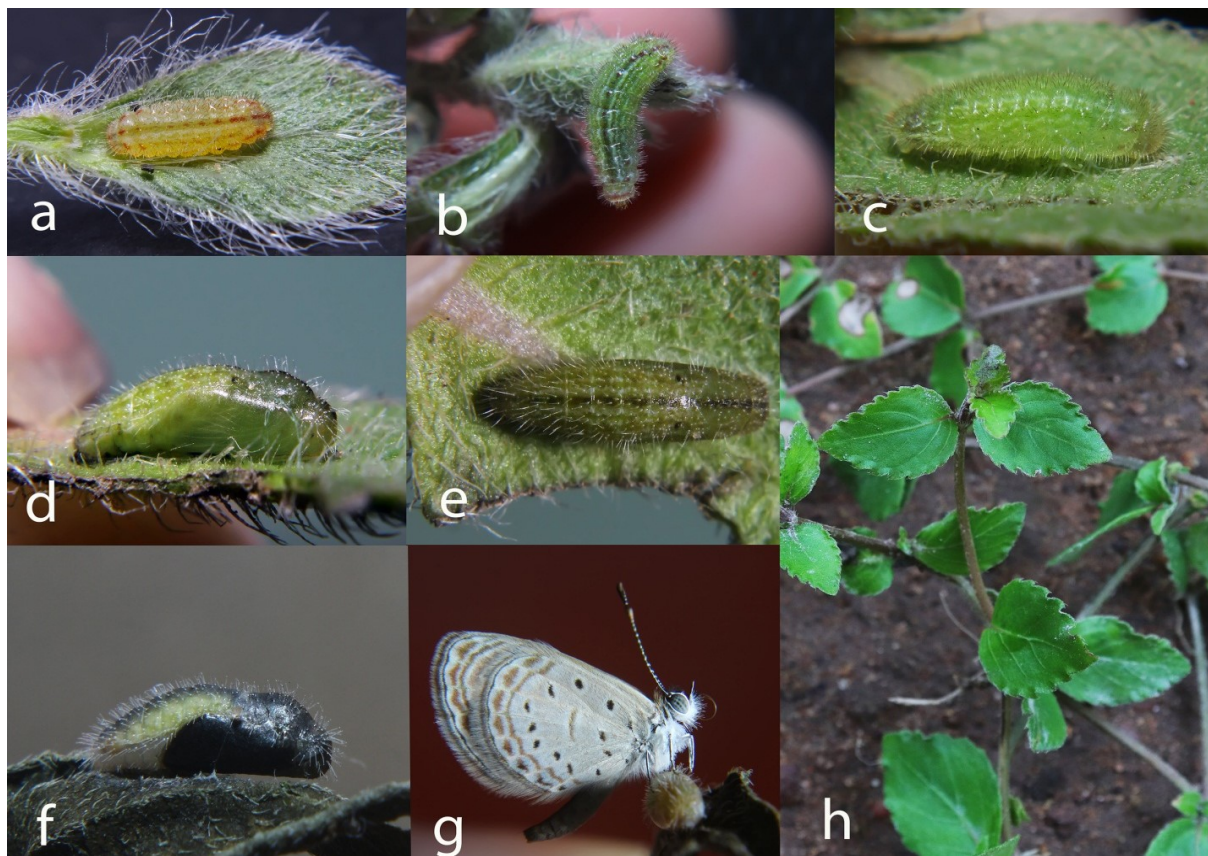


**Figure 3:** 3<sup>rd</sup> Instar larvae of the Slate flash.

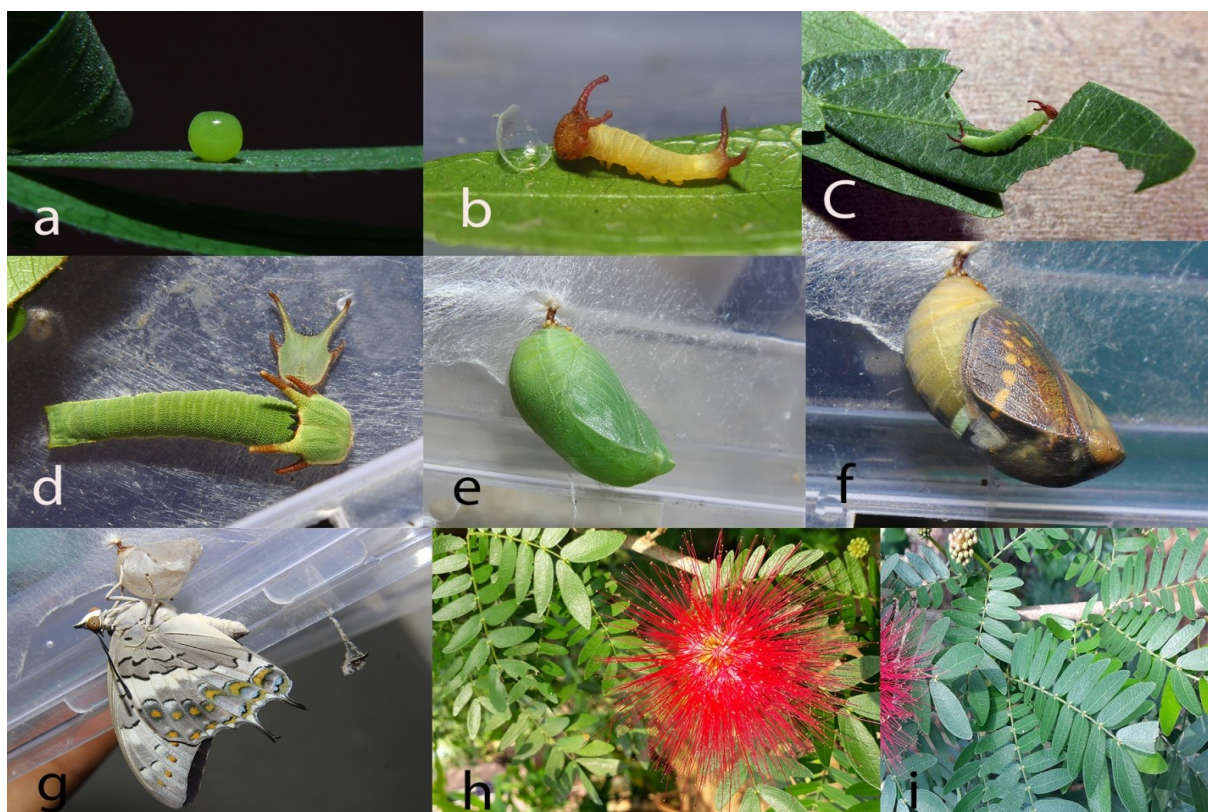


**Figure 4:** Lifecycle of the Slate flash on *Calliandra heamotocephala* plant. Freshly laid egg (a), 4 days old larva (b), 2<sup>nd</sup> instar larva (c), last instar Slate flash larva (d), pre-pupa of Slate flash (e), 3 days old pupa (f), Mature pupa (g), adult Slate flash butterfly (h), and *Calliandra heamotocephala* flower (i).





**Figure 5:** Lifecycle of the Tiny grass blue on *Hemigraphis hirta*. 3<sup>rd</sup> instar larva (a), 4<sup>th</sup> instar larva of tiny grass blue (b), pre-pupa (c), freshly formed pupa (d), pupa dorsal view (e), mature pupa (f), adult Tiny grass blue (g), and *Hemigraphis hirta* plant (h).



**Figure 6:** Life cycle of the Black rajah on *Calliandra heamotocephala*. Freshly laid egg (a), larva just after hatching (b), the larva is eating *Calliandra heamotocephala* leaf (c), final instar larva (d), freshly formed pupa (e), mature pupa (f), adult Black rajah (g), *Calliandra heamotocephala* flower (h), and *Calliandra heamotocephala* leaf (i).



## Acknowledgements

The author acknowledges the entire team of Green Plateau (NGO) for their kind and continuous help during the study period. The author is very thankful to Keya Mukherjee and Prabir Das for their support during the field work. The author is grateful to Ayan Mondal and Amar Kumar Nayak for helping to prepare the manuscript and to Paresh Churi, Haneesh KM, and Dipanjan Ghosh for their encouragement. Finally, I would like to gratefully acknowledge the anonymous reviewers who dedicated their time to improving my manuscript with their valued suggestions and comments.

## Conflict of interest

The author declares that there are no conflicting issues related to this research article.

## References

- Bell, T. R. (1909–1927). The common butterflies of the plains of India (including those met with the hill stations of the Bombay Presidency). *Journal of the Bombay Natural History Society*, 19: 658–660.
- Bhakare, M. and H. Ogale (2018). A guide to butterflies of Western Ghats (India) includes butterflies of Kerala, Tamil Nadu, Karnataka, Goa, Maharashtra and Gujarat State. Milind Bhakare (privately published). 116 pp.
- Churi, P. (2021). Plants — *Calliandra haematocephala*, In: Kunte, K., Sondhi, S. and Roy, P. (Eds.), *Butterflies of India, Volume 3.15*. Indian Foundation for Butterflies. [http://www.ifoundbutterflies.org/flora/1426/Litchi chinensis](http://www.ifoundbutterflies.org/flora/1426/Litchi_chinensis) (Accessed on 14th June, 2021).
- Churi, P. (2021). Plants — *Litchi chinensis*, In: Kunte, K., Sondhi, S. and Roy, P. (Eds.), *Butterflies of India, v. 3.15*. Indian Foundation for Butterflies. [http://www.ifoundbutterflies.org/flora/1426/Litchi chinensis](http://www.ifoundbutterflies.org/flora/1426/Litchi_chinensis) (Accessed on 14th June, 2021).
- Das, R. P. (2014). Diversity, distribution and bioecology of butterfly communities of West Bengal. Ph.D. Thesis. Department of Zoology, Chapter 5, University of Calcutta.
- Haridasan, K. and Rao, R. R. (1985–1987). *Forest flora of Meghalaya*. Volumes 1–2. Bishen Singh Mahendrapal Singh. DehraDun.
- Hawkins, B. A. and Porter, E. E. (2003a). Does herbivore diversity depend on plant diversity? The case of California butterflies. *American Naturalist*, 161 (1): 40–49. <https://doi.org/10.1086/345479>
- Hawkins, B. A. and Porter, E. E. (2003b). Water-energy balance and the geographic pattern of species richness of western Palearctic butterflies. *Ecological Entomology*, 28 (6): 678–686.
- Hooker, J. D. (1875–1897). *Flora of British India*. Volumes 1–7. L. Reeve and Co. LTD. Bank Street, Ashford, Kent, Landon.
- Kanjilal, U. N., Kanjilal, P. C., Das, A., Purkaysthya, C. and De, R. N. (1934–1940). *Flora of Assam*. Volumes 1–5. Published under the authority of the Government of Assam.
- Kehimkar, I. (2008). *The Book of Indian Butterflies*. Bombay Natural History Society and Oxford University Press, Mumbai. pp. 238–314.
- Kitahara, M., Yumoto, M. and Kobayashi, T. (2008). Relationship of butterfly diversity with nectar plant species richness in and around the Aokigahara primary woodland of Mount Fuji, central Japan. *Biodiversity and Conservation*, 17: 2713–2734. <https://doi.org/10.1007/s10531-007-9265-4>
- Kunte, K. (2000). *Butterflies of Peninsular India*. Universities Press, Hyderabad and Indian Academy of Sciences, Bangalore, India. 254 pp.
- Lindström, S. A. M., Klatt, B. K., Smith, H. G. and Bommarco, R. (2018). Crop management affects pollinator attractiveness and visitation in oil seed rape. *Basic and Applied Ecology*, 26: 82–88. <https://doi.org/10.1016/j.baae.2017.09.005>
- Losey, J. E. and Vaughan, M. (2006). The economic value of ecological services provided by insects. *Bioscience*, 56 (4): 311–323. [https://doi.org/10.1641/0006-3568\(2006\)56\[311:TEVOES\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2006)56[311:TEVOES]2.0.CO;2)
- Menéndez, R., González-Megías, A., Collingham, Y., Fox, R., Roy, D. B., Ohlemüller, R. and Thomas, C. D. (2007). Direct and indirect effects of climate and habitat factors on butterfly diversity. *Ecology*, 88 (3): 605–611. <https://doi.org/10.1890/06-0539>
- Mirza, Z. A. and Mondal, A. (2018). A new genus *Gravellyia* with two species of the family Nemesiidae (Araneae: Mygalomorphae) from India. *Acta Arachnologica*, 67 (1): 43–48. <https://doi.org/10.2476/asjaa.67.43>
- Mondal, A., Chanda, D., Patra, S. and Barman, M. (2020). *Phrynus whitei* (Gervais, 1842) from the type locality Burdwan is actually *Charinus bengalensis* (Gravelly, 1911). *Bugs R All# 187. Zoo's Print*, 35 (7): 1–3.
- Mukherjee, K. and Ghosh, D. (2018). Common Banded Peacock: record of new larval host plant of *Papilio crino* from Bankura, West Bengal. *Bugs R All #168. Zoo's Print*, 33 (12): 11–14.
- Mukherjee, K. and Mondal, A. (2020). Butterfly diversity in heterogeneous habitat of Bankura, West Bengal, India. *Journal of Threatened Taxa*, 12 (8): 15804–15816. <https://doi.org/10.11609/jott.5136.12.8.15804-15816>
- Nitin, R., Balakrishnan, V. C., Churi, P. V., Kalesh, S., Prakash, S. and Kunte, K. (2018). Larval host plants of the butterflies of the Western Ghats, India. *Journal of Threatened Taxa*, 10 (4): 11495–11550. <https://doi.org/10.11609/jott.3104.10.4.11495-11550>

- Robinson, G. S., Ackery, P. R., Kitching, I. J., Beccaloni, G. W. and Hernández, L. M. (2010). HOSTS - A Database of the World's Lepidopteran Hostplants. Natural History Museum, London. <http://www.nhm.ac.uk/hosts> (Accessed on 16 June 2021).
- Roy, S., Singhamahapatra, A. and Dutta, S. (2021). On the distribution of *Vagrans egista* (Cramer, 1780) in West Bengal, India. *Revista Chilena de Entomología*, 47 (3): 513–519. <https://doi.org/10.35249/rche.47.3.21.09>
- Saji, K., Jose, J., Ogale, H., Soman, A. and Sengupta, A. (2018). *Rapala manea* (Hewitson, 1863) – Slate Flash, In: Kunte, K., Sondhi, S. and Roy, P. (Eds.), *Butterflies of India*, v. 2.85. Indian Foundation for Butterflies <http://www.ifoundbutterflies.org/sp/634/Rapala-manea> (Accessed on 14th June, 2021).
- Shihan, T. R. (2018). Records of new larval host plants of some common butterflies of Bangladesh. *Journal of Threatened Taxa*, 10 (2): 11303–11311. <https://doi.org/10.11609/jott.3217.10.2.11303-11311>
- Thomas, J. A. (2005). Monitoring change in the abundance and distribution of insects using <https://doi.org/10.1098/rstb.2004.1585>
- Williams, M. C. (2015). *Practical guide to the study of Lepidoptera in Africa*, Chapter 8: Rearing and breeding techniques. Lepidopterist's Society of Africa. 27 pp.
- Wynter-Blyth, M. A. (1957). *Butterflies of the Indian region*. Oxford- Bombay Natural History Society, Bombay. 523 pp.