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Reports of new larval host plants for the butterflies *Virachola isocrates* (Fabricius, 1793) and *Junonia orithya* (Linnaeus, 1758) from Bankura, West Bengal, India

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Abstract

This paper is reporting *Evolvulus nummularius* (L.) L. (Convolvulaceae) as a new larval host plant for *Junonia orithya* (Linnaeus) (Nymphalidae) and *Syzygium samarangense* (Blume) Merr. and L. M. Perry (Myrtaceae), as a new larval host plant for *Virachola isocrates* (Fabricius) (Lycaenidae) from Raibaghini, Bankura, West Bengal, India.

Key words: *Evolvulus nummularius*, Lepidoptera, Lycaenidae, new host plant, Nymphalidae

The main documentation of larval host plants of butterflies from India was done by T. R Bell (1909–1927). After this date, there is a significant amount of research on butterfly larval host plants. Very recently a total number of 834 plants have been reported as larval host plants from Western Ghat by Nittin et al. (2018). In addition to this host plant list, 143 new host plants have been reported from the Neura Valley National Park, West Bengal, and the North-eastern states of Himalayas by Karmakar et al. (2018). The western part of West Bengal is less explored (Mondal et al., 2018), and some work on butterfly diversity, and their host plants, has been done in Bankura and Purulia districts of West Bengal. The butterfly fauna of Baghmundi, Purulia district of West Bengal has been reported by Samanta et al. (2017). A new larval host plant of *Papilio crino* (Fabricius, 1793) has been reported from Bankura district by Mukherjee et al. (2018) and *Papilio helenus* (Linnaeus, 1758) has been reported for the first time from Bankura by Mukherjee (2018). In the immediate past new larval host plants of *Charaxes solon* (Fabricius, 1793), *Rapala manea* (Hewitson, 1863) and *Zizula hylax* (Fabricius, 1775) butterflies has been observed by Mukherjee (2021) from Bankura district. *Junonia orithya* Linnaeus, 1758 is commonly known as the Blue pansy, which is a very common butterfly of India (Wynter Blyth, 1957; Kehimkar, 2008) and this is a butterfly of the plains (Dasgupta, 2010). The species prefers sunny and hot places and is particularly fond of dry river beds, and flat stony uncultivated land (Bhakare and Ogale, 2018). Males and females of *J. orithya* visit flowers, damp patches and animal urine (Kehimkar, 2008). *Evolvulus nummularis* (L.) L is commonly found throughout India, grows in various habitats, like on footpaths or along the road sides, and in grassland (Das, 1962).

The status of *Virachola isocrates* Fabricius, 1793 is common in India (Kehimkar, 2008), and it is frequent in the Bankura district (Mukherjee and Mondal, 2020). It inhabits the whole of India, Myanmar, and Sri Lanka (Burma and Ceylon) except the desert tracts (Bell, 1920). *Virachola isocrates* is commonly found in guava and pomegranate gardens (Dasgupta, 2006). The larva of *V. isocrates* feeds on any handy species (Wynter-Blyth, 1957). The little egg-larva eats into the carpel or the fruit (Bell, 1920). *Syzygium samarangense* (Blume) Merr. and L. M. Perry is an evergreen tropical fruit of the Myrtaceae family, which is known as the Java apple or Jamrul in Bengali (Shabnam et al., 2014). When ripe, the fruits of *S. samarangense* have fragrant flesh, a sweet flavor, and become crunchy (Fig. 1a). The edible portion of the fruit is roughly 80%, and the water content is 90% (Nakasone and Paul, 1998).

Figure 1: *Syzygium samarangense* fruits (a), *Syzygium samarangense* plant at Raibaghini, Bankura, West Bengal (b).

The trees grow well in moist tropical lowland areas up to 1200 meters in elevation above sea level and also grow best in areas with a fairly long dry season (Nakasone and Paul, 1998). The plant is about 3 meters tall (Fig. 1b) and is found in Bankura, West Bengal, but is not common.

The current study intends to examine the variety of host plants for butterfly larvae in the Bankura district of West Bengal, India. The findings add to the knowledge needed about the ecological functions and management of butterfly species and their host plant conservation.

Raibaghini (latitude 23.029° N and longitude 87.557° E) is situated on the east side of Bankura district in the West Bengal State (Figs. 2–4). The area lies between the Chhotanagpur Plateau and the Gangetic Plains (Mukherjee and Mondal, 2020). The average annual rainfall in this area is 1236 mm, while the average annual temperature is 26.6 °C. Vindhya alluvial soil type defines the soil profile. Dry and deciduous forest covers the area (Mirza and Mondal, 2018).

From May 2021 to July 2021, a survey was conducted following the opportunistic method (Williams, 2015) at Raibaghini, and the two species under study were reported as discussed below. The caterpillars and plants were photographed with a Canon EOS 77D DSLR camera and Tamron 90 mm non-vc Lens. The caterpillars were kept and maintained in a plastic box at room temperature. Fresh fruit was given to *Virachola isocrates* and fresh leaves to *Junonia orithya* larvae. To ensure hygiene, the boxes were cleaned daily. Immature stages were recorded at home and in the outdoor environment during the survey. To measure the size of the larvae a vernier caliper scale was used (Labworld).

1. *Junonia orithya* - On 18th June 2021, a female *Junonia orithya* was seen depositing an egg on *Evolvulus nummularius* (Fig. 5) at Raibaghini. The egg was collected by the author to observe the lifecycle and many larvae were seen feeding on the plant. The spherical egg was pale green. The egg hatched on 21st June 2021. The caterpillar gradually changed its size, and in the final instar, it was 3.9 cm. The mature larva pupated on 7th July 2021. The pupa size of *J. orithya* was approximately 1.8 cm. Finally, on 12th July 2021, the pupa eclosed and a male emerged. The life cycle observation photos are given in Figure 6. Previously, Deepika et al. (2014) reported *Evolvulus alsinoides* as the larval host plant of *J. orithya*. *Evolvulus nummularius* resembles *E. alsinoides* in being a perennial, creeping herb, but in *E. nummularius*, the leaves have truncated, lobed bases and rounded or emarginate apices whereas in *E. alsinoides* the bases are obtuse-angled and the apices mucronate. The stems and leaves of both species of *Evolvulus* are pubescent but those of *E. nummularius* are less dense and its trichomes are not spreading. The two species also differ in the shape and color of their floral features. *Evolvulus nummularius* has shorter, more sparsely hairy pedicels and glabrous sepals, apart from their ciliate margins, whereas the sepals of *E. alsinoides* are hairy over the whole outer surface. In addition, the corollas of *E. nummularius* are white and deeply lobed and sometimes six-lobed whereas in *E. alsinoides* the corollas are blue and always five-lobed. (Iqbal et al., 2020).

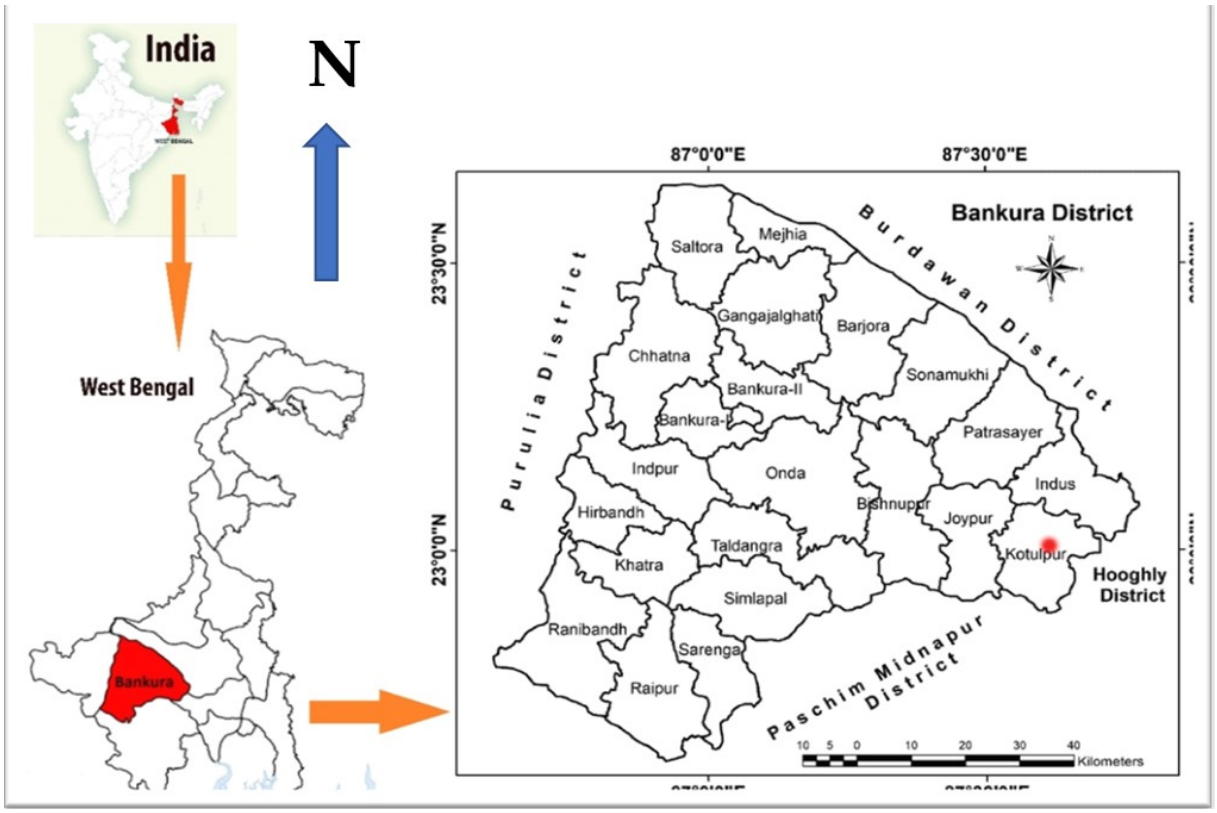

Figure 2: Location of the study site Raibaghini, situated in the Kotulpur block of the Bankura district in West Bengal, India. (Map Source – Google image).

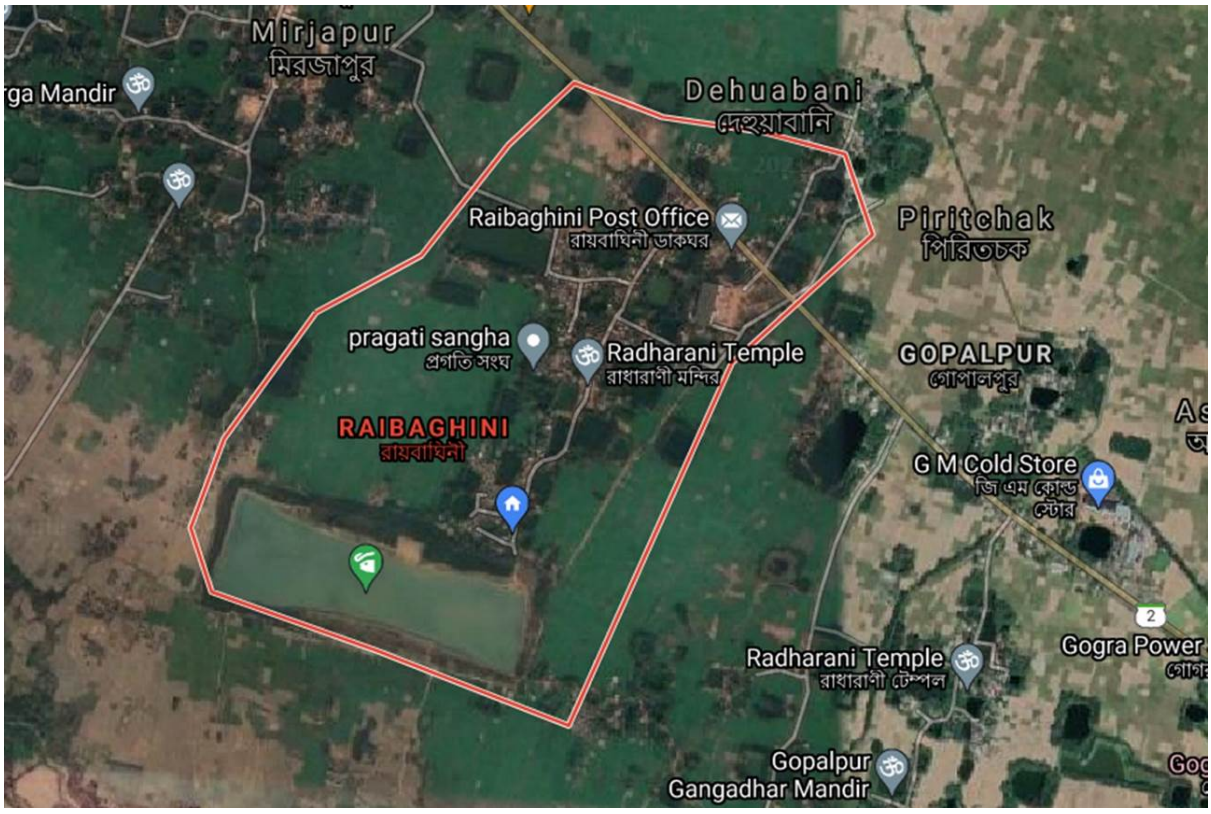

Figure 3: Map of Raibaghini, Bankura, West Bengal, India (Source- Google Map).

Figure 4: Dry and deciduous forest of the present study area at Raibaghini, Bankura, West Bengal, India.

Figure 5: *Evolvulus nummularius* plants with flowers from Raibaghini, Bankura, West Bengal, India (latitudes 23.029° N and longitudes 87.557° E).

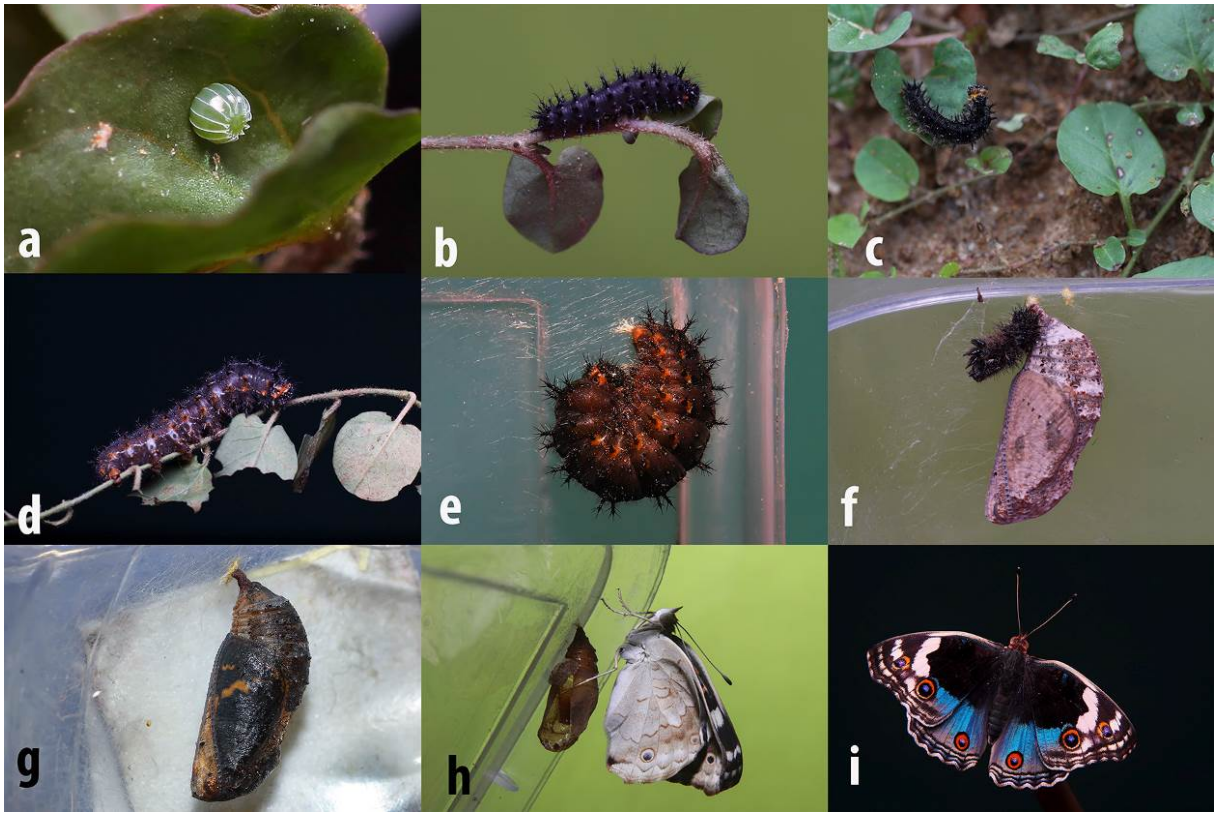

Figure 6: Different stages of the life cycle of *Junonia orithya*: a. Egg of *Junonia orithya*, b. 2nd instar larva, c. 3rd instar larva, d. 4th instar larva, e. pre-pupation, f. pupa, g. mature pupa, h. newly eclosed adult, i. upper view of the adult.

2. *Virachola isocrates*- The author spotted two *Virachola isocrates* larvae, which were in the 2nd instar inside a *Syzygium samarangense* fruit at Raibaghini on 5th June 2021. The approximate size of the caterpillars was 0.8 cm. After close observation an egg of *V. isocrates* was found on a leaf of *S. samarangense.* The author also observed that many Java apples with holes in them were on the ground just beneath the plant. The larvae were eating the fruit pulp and seeds together. The larvae reached the 3rd instar on 9th June 2021 and the size was 1.6 cm. Gradually, it transformed into the 4th instar on 14th June 2021. The size was 2.1 cm. The larva made its pupa on the outside of the fruit on 19th June 2021. The pupa was light pink and it gradually turned to dark brown. After 9 days of pupation, the adult came out on 28th June 2021. According to the previous observations of Bhakare and Ogale (2018), the larvae emerged from the fruit and weaved silk threads all over the stem and surface of the fruit, as well as the adjacent branch, but no silk threads were observed here. Many fruits were found beneath the Java apple plant, which were half-eaten and larvae were present inside them. The life cycle observation photos are given in Figure 7.

From this opportunistic study it is observed that *Junonia orithya* feeds on *Evolvulus nummularis*, which had not been reported earlier as a larval host plant. Similarly, it can be said that *Syzygium samarangense* is a new larval host plant of *Virachola isocrates.* It is also noted that the caterpillars of this species are not making silk threads to attach to the branch, so this is an interesting observation. Further research is needed to reveal the actual reason for this thread-spinning behavior of *Virachola isocrates* caterpillars. Previously reported host plants for both butterflies are given in Tables 1 and 2. Butterfly diversity at local or regional scales is closely related to their host plant density (Gutierrez and Mendez, 1995; Cowley et al., 2001) and further research is needed to continue the butterfly conservation work in the Chotanagpur Plateau.

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Table 1: Previously reported host plants of *Junonia orithya.*

Sl. No.	Host plant name	Family name	References
1	*Ipomoea batatas*	Convolvulaceae	Robinson et al., 2010
2	*Evolvulus alsinoides*	Convolvulaceae	Deepika et al., 2014
3	*Justicia*	Acanthaceae	Robinson et al., 2010
4	*Justicia micrantha*	Acanthaceae	Robinson et al., 2010
5	*Lepidagathis prostrata*	Acanthaceae	Robinson et al., 2010
6	*Justicia neesii*	Acanthaceae	Wynter-Blyth,1957
7	*Justicia procumbens*	Acanthaceae	Wynter-Blyth, 1957; Kunte, 2000
8	*Barleria mysorensis*	Acanthaceae	Haneesh and Prashanth, 2018
9	*Hygrophila auriculata*	Acanthaceae	Wynter-Blyth, 1957; Kunte, 2000
10	*Nelsonia campestris*	Acanthaceae	Kehimkar, 2008
11	*Mimosa pudica*	Fabaceae	Wynter-Blyth, 1957; Kunte, 2000
12	*Plectranthus scandens*	Lamaiaceae	Robinson et al., 2010
13	*Misopates orontium*	Plantaginaceae	Wynter-Blyth, 1957; Kunte, 2000
14	*Sida rhombifolia*	Malvaceae	Kehimkar, 2008
15	*Mimosa pudica*	Mimosaceae	Wynter-Blyth, 1957; Kunte, 2000

Table 2: Previously reported host plants of *Virachola isocrates.*

Sl. No.	Host plant name	Family	References
1	*Citrus aurantium*	Rutaceae	Robinson et al., 2010
2	*Citrus sinensis*	Rutaceae	Robinson et al., 2010
3	*Limonia acidissima*	Rutaceae	Robinson et al., 2010
4	*Limonia elephantum*	Rutaceae	Robinson et al., 2010
5	*Naringi crenulata*	Rutaceae	Wynter-Blyth, 1957
6	*Tamarindus indica*	Fabaceae	Bell, 1920; Kehimkar, 2008
7	*Strychnos nux-vomica*	Loganiaceae	Bell, 1920; Kehimkar, 2008
8	*Psidium guajava*	Myrtaceae	Bell, 1920; Kehimkar, 2008
9	*Punica granatum*	Punicaceae	Wynter-Blyth, 1957; Kehimkar, 2008
10	*Eriobotrya japonica*	Rosaceae	Bell, 1920; Wynter-Blyth, 1957; Robinson et al., 2010
11	*Prunus dulcis*	Rosaceae	Robinson et al., 2010
12	*Prunus persica*	Rosaceae	Robinson et al., 2010
13	*Pyrus communis*	Rosaceae	Robinson et al., 2010
14	*Malus pumila*	Rosaceae	Robinson et al., 2010
15	*Catunaregam nutans*	Rubiaceae	Wynter-Blyth, 1957
16	*Tamilnadia uliginosa*	Rubiaceae	Wynter-Blyth 1957, Robinson et al., 2010
17	*Gardenia latifolia*	Rubiaceae	Bell, 1920; Kehimkar, 2008
18	*Catunaregam spinarum*	Rubiaceae	Bell, 1920; Wynter-Blyth, 1957; Kehimkar, 2008
19	*Sapindus laurifolius*	Sapindaceae	Variya, 2020

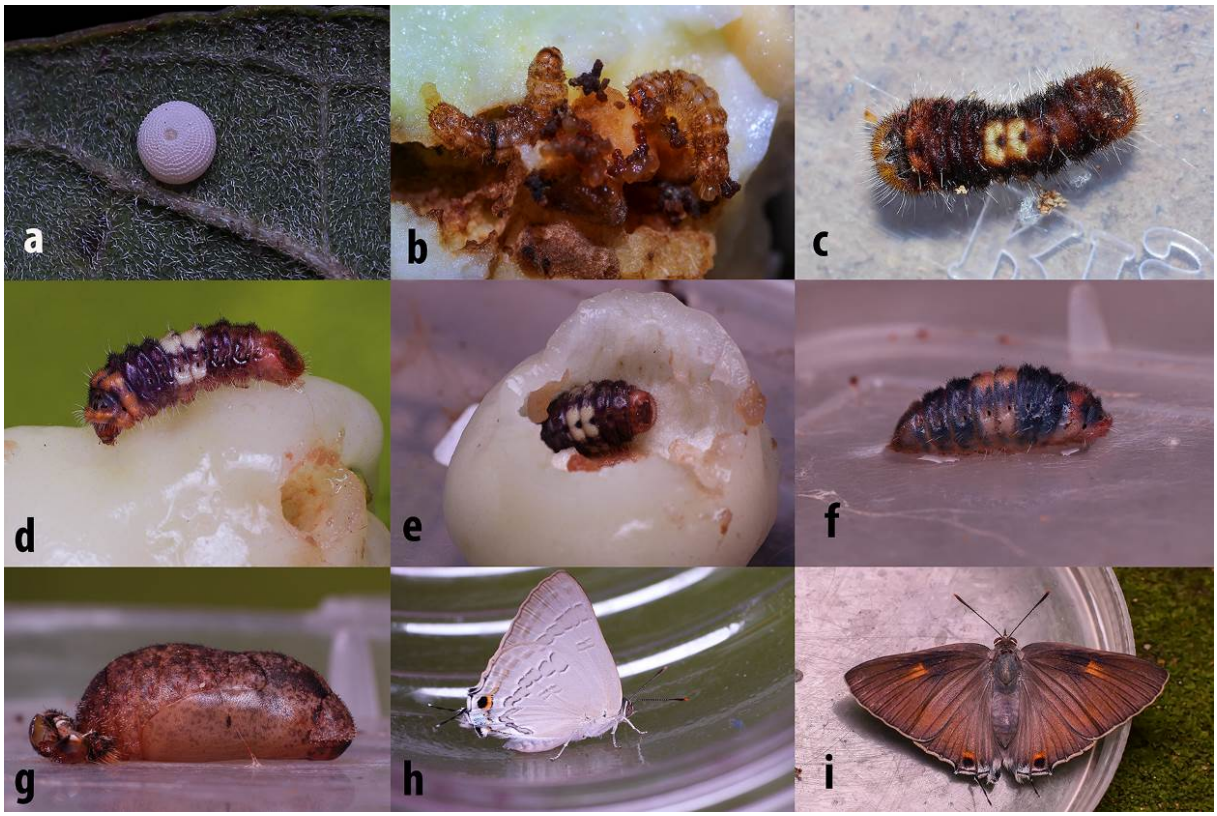

Figure 7: Different stages of the life cycle of *Virachola isoctares*. a. Egg of *V. isoctares*, b. 2nd instar larva, c. 3rd instar larva, d. 4th instar larva, e. feeding of 4th instar larva, f. pre-pupation, g. pupa, h. freshly eclosed *V. isoctares*, i. upper view of *V. isoctares*.

Conflict of interest

The author declares that there are no conflicting issues related to this short communication.

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