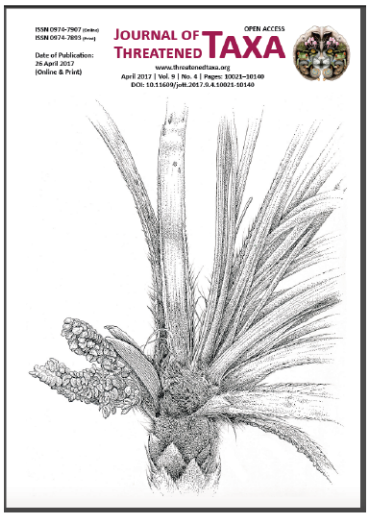

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Short Communication

Butterfly diversity (Lepidoptera: Rhophalocera) associated with nectar feeding on *Ziziphus mauritiana* Lamarck (Rosales: Rhamnaceae) flowers in Chuadanga, Bangladesh

Tahsinur Rahman Shihan

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Abstract: A study was conducted during the flowering season of *Ziziphus mauritiana* from September 2015 to October 2015 in Belgachi Railgate Para, Chuadanga, Bangladesh. The study recorded 265 individuals of 39 butterfly species belonging to five families and 32 genera nectar feeding on *Z. mauritiana* flowers. Amongst the families, Lycaenidae was dominant with 33.33% (n=13). Amongst the species *Parnara bada* (Moore, 1878) (Hesperiidae) was the most dominant species followed by *Ypthima baldus* (Fabricius, 1775) (Nymphalidae). *Virachola isocrates* (Fabricius, 1793) (Lycaenidae) spent the maximum time (60–120 sec) nectar feeding on *Z. mauritiana* amongst the 39 species sampled.

Keywords: Chuadanga, Lycaenidae, *Parnara bada*, *Virachola isocrates*, *Ziziphus mauritiana*.

Nectar is an important factor influencing the level and persistence of butterfly populations, but particular sources of nectar may not be optimal for all species. In a homestead vegetation context, it is not always clear whether nectar sources used by butterflies are good quality species. They may be used opportunistically in the absence of true preferences, therefore possibly limiting maximal reproduction (Gillespie & Wratten 2013). The nectar of flowers is the main source of adult nutrition and butterflies exhibit distinct differences for flower preference (Jennersten 1984; Ômura & Honda 2005). They choose plants as nectar sources depending on various factors including colors and odors of flowers (Jolivet 1986; Weiss 1997; DeVries et al. 1999; Dosa 1999; Sourakov et al. 2012). Odor sometimes acts as a synergist with color as the important cue for foraging (Ômura & Honda 2005). The usefulness of butterfly foraging depends on corolla depth and proboscis length, which limits the range of flowers from which nectar can be extracted (Porter et al. 1992; Corbet 2000).

The floral syndrome of *Ziziphus mauritiana* Lamarck (Family Rhamnaceae) reflects its adaptation to insects as well as butterflies. Flower emergence and development lasts for one month from late September to late October in Bangladesh. Morphology: Inflorescence axillary cymes, 01–02 cm long, with 07–20 flowers; peduncles 02–03 mm long; flowers are small 02–03 mm across and inconspicuous, greenish-yellow, faintly fragrant; pedicels 03–08 mm long; calyx with five deltoid lobes, hairy outside, glabrous within; five petals, subspathulate, concave, reflexed (Orwa et al. 2009). *Z. mauritiana* is a fruit tree well known for its nutritional and medicinal benefits. It is a spiny, evergreen shrub or small tree up to 15m high, with trunk 40cm or more in diameter; spreading crown; stipular spines and many drooping

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branches. The plant is native to Afghanistan, Algeria, Australia, Bangladesh, China, Egypt, India, Indonesia, Iran, Kenya, Libyan Arab Jamahiriya, Malaysia, Nepal, Pakistan, Thailand, Tunisia, Uganda, Vietnam in southern Asia and eastern Africa (Mishra et al. 2004; Sellers 2014; Ashraf et al. 2015).

Earlier Mishra et al. (2004) studied the diversity of flower-visiting insects in relation to plant density of *Z. mauritiana* in Awadhesh Pratap Singh University campus (24°33'59.88"N & 81°19'49.21"E), Rewa, Madhya Pradesh in India and reported 18 species of butterflies as visitors to this flower. On the other hand, in Bangladesh, studies have been carried out on the morphology and taxonomy of different butterfly species but data on the nectar feeding behavior of adult butterflies are scanty (Begum et al. 2014). Therefore, the objective of the present investigation was to study the butterfly diversity association with *Z. mauritiana* flowers and nectar feeding behavior of butterfly species.

Study Area: Belgachi Railgate Para (23°37'53.90"N & 88°51'0.53"E) was the study site which is 1.79km away from the main town named Chuadanga. It is situated in the southwestern part of Bangladesh (Fig. 1). This area is covered with cultivated land, wetland and homestead vegetation include trees, herbs, shrubs, grasses and climbers which support butterflies species for their larval food, nectar feeding and resting (Shihan 2016).

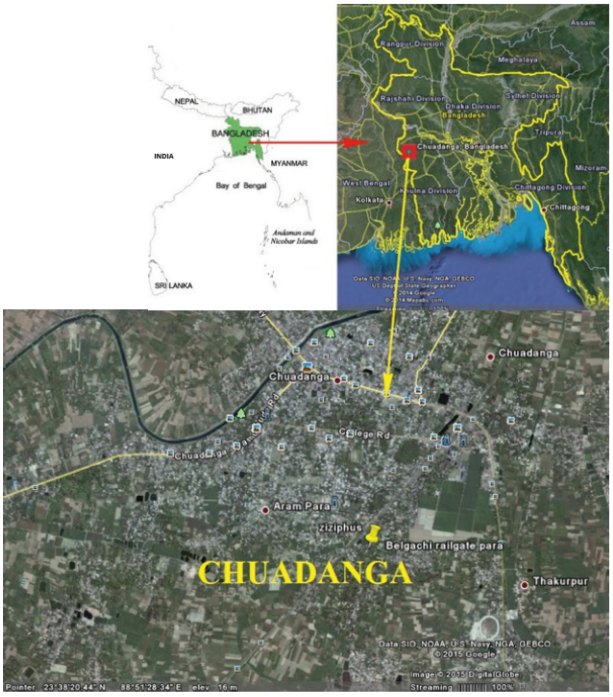


Figure 1. Location of the study site in Chuadanga District, Bangladesh

Methods

The author monitored three *Z. mauritiana* flowering trees daily, in the morning from 08:00–11:00 hr and in the afternoon 15:30–17:00 hr from September 2015 to October 2015. Digital photographs of adult butterflies that were nectar feeding on flowers were taken with a zoom lens. Species were identified with help of literature (Kunte 2000; Kehimkar 2008) and classifications follow by literature Varshney & Smetacek (2015).

Result and Discussion

Two-hundred-and-sixty-five individuals of 39 butterfly species belonging to five families and 32 genera were recorded. Among the families, Lycaenidae was dominant with 33.33% (n=13) representation followed by the Nymphalidae 28.20% (n=11), Hesperiidae 23.07% (n=09) and both Pieridae and Papilionidae at 7.69% (n=03) (Fig. 2). The details of the number of individuals visiting flowers and range of feeding time of each species are given in Table 1.

Lycaenidae: *Anthene emolus* was the most abundant (n=17) visitor followed by *Rathinda amor* (n=13), respectively. *Virachola isocrates* (60-120 sec) and *Tajuria cippus* (45–60) spent the maximum time on nectar feeding.

Nymphalidae: *Ypthima baldus* (n=22) and *Junonia almana* (n=19) were the dominant species. Again *Y. baldus* (40–45 sec) spent the highest time on nectar feeding.

Pieridae: *Catopsilia pomona* (n=05) was the dominant species and spent the highest time (30–35 sec) on nectar feeding.

Papilionidae: *Graphium agamemnon* (n=06) was the dominant visitors of this family and spent the highest time (10–20 sec) on nectar feeding.

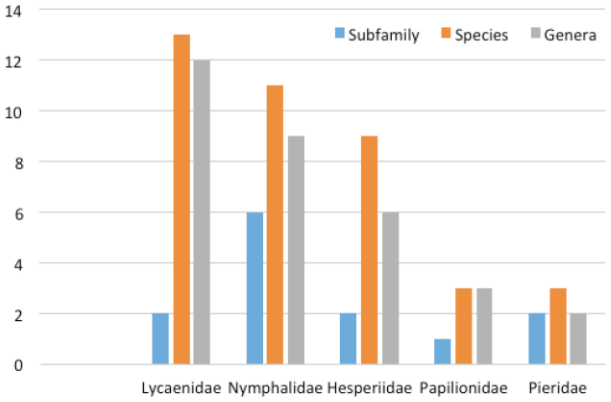


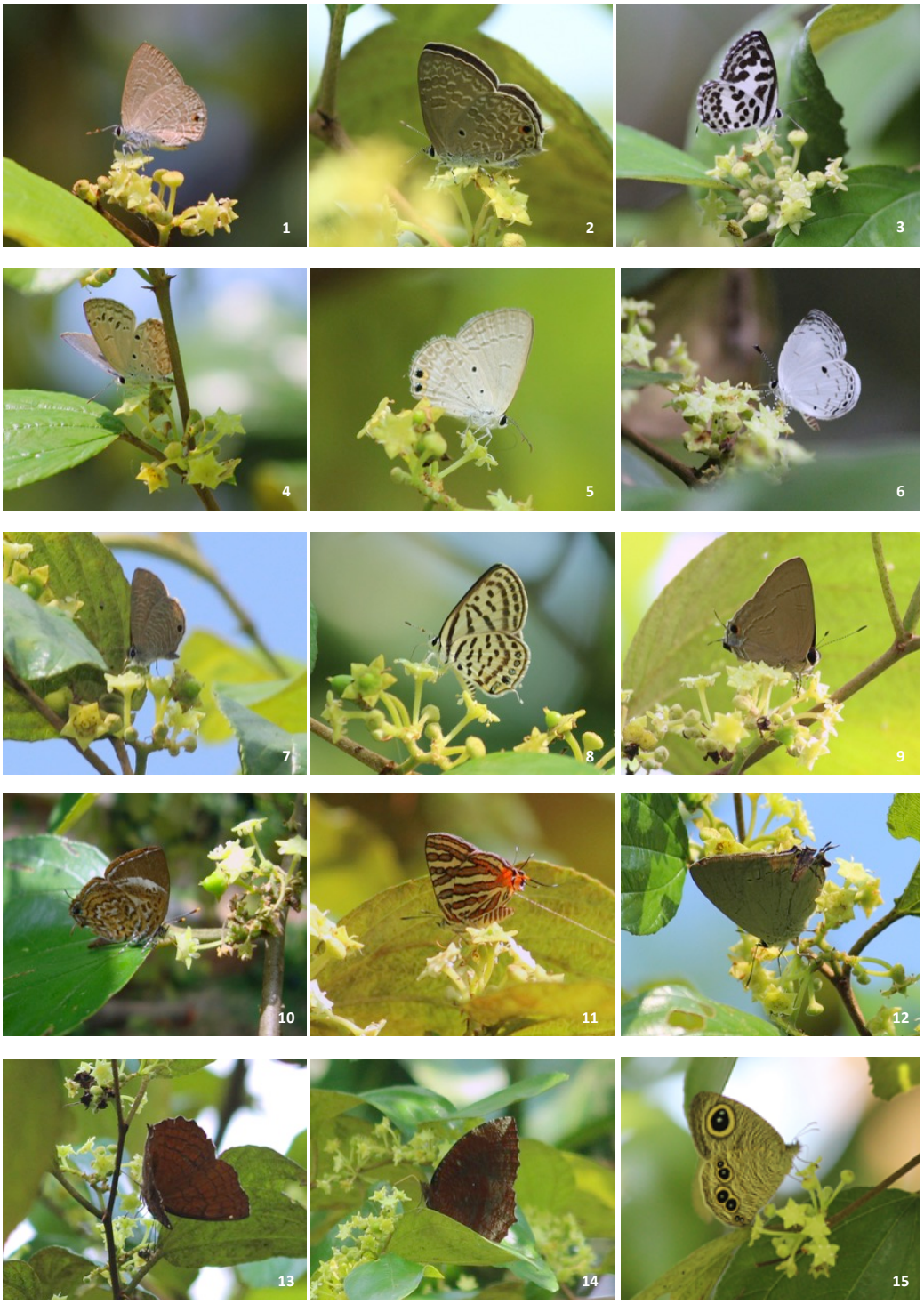
Figure 2. Butterfly families compared among subfamily, species and genera.

Table 1. List of butterflies recorded nectar feeding on *Ziziphus mauritiana* flowers in Chuadanga, Bangladesh (September–October 2015).

	Common name	Scientific name	No. of individuals recorded	Time spent on nectar feeding (seconds)
Family: Lycaenidae, Subfamily: Polyommatinae				
1	Ciliate Blue	*Anthene emolus* (Godart, 1824)	17	05–12
2	Pointed Ciliate Blue	*Anthene lycaenina* (Felder, 1868)	01	05
3	Common Pierrot	*Castalius rosimon* (Fabricius, 1775)	05	20–25
4	Lime Blue	*Chilades lajus* (Stoll, [1780])	02	05–07
5	Gram Blue	*Euchrysops cnejus* (Fabricius, 1798)	01	25–30
6	Quaker	*Neopithecops zalmora* (Butler, [1870])	01	20–25
7	Tailless Lineblue	*Prosotas dubiosa* (Semper, [1879])	01	10
8	Pierrot spp	*Tarucus spp.*	03	10–14
Family: Lycaenidae, Subfamily: Theclinae				
9	Slate Flash	*Rapala manea* (Hewitson, 1863)	07	20–40
10	Monkey Puzzle	*Rathinda amor* (Fabricius, 1775)	13	18–30
11	Common Silverline	*Spindasis vulcanus* (Fabricius, 1775)	05	10–13
12	Peacock Royal	*Tajuria cippus* (Fabricius, 1798)	07	45–60
13	Common Guava Blue	*Virachola isocrates* (Fabricius, 1793)	05	60–120
Family: Nymphalidae, Subfamily: Biblidinae				
14	Angled Castor	*Ariadne ariadne* (Linnaeus, 1763)	04	03–05
Family: Nymphalidae, Subfamily: Satyrinae				
15	Common Pamfly	*Elymnias hypermnestra* (Linnaeus, 1763)	03	20–21
16	Common Fivering	*Ypthima baldus* (Fabricius, 1775)	22	40–45
17	Common Fourring	*Ypthima huebneri* Kirby, 1871	04	30–31
Family: Nymphalidae, Subfamily: Danainae				
18	Common Crow	*Euploea core* (Cramer, [1780])	01	05–08
Family: Nymphalidae, Subfamily: Limenitidinae				
19	Common Baron	*Euthalia aconthea* (Cramer, [1777])	10	35–45
20	Commander	*Moduza procris* (Cramer, [1777])	03	07–09
Family: Nymphalidae, Subfamily: Nymphalinae				
21	Great Eggfly	*Hypolimnas bolina* (Linnaeus, 1758)	04	07–12
22	Peacock Pansy	*Junonia almana* (Linnaeus, 1758)	19	30–34
23	Grey Pansy	*Junonia atlites* (Linnaeus, 1763)	07	28–32
Family: Nymphalidae, Subfamily: Heliconiinae				
24	Common Leopard	*Phalanta phalantha* (Drury, [1773])	06	05–07
Family: Pieridae, Subfamily: Coliadinae				
25	Common Emigrant	*Catopsilia pomona* (Fabricius, 1775)	05	30–35
26	Mottled Emigrant	*Catopsilia pyranthe* (Linnaeus 1758)	04	27–30
Family: Pieridae, Subfamily: Pierinae				
27	Common Jezebel	*Delias eucharis* (Drury, 1773)	07	40–45
Family: Papilionidae, Subfamily: Papilioninae				
28	Tailed Jay	*Graphium agamemnon* (Linnaeus, 1758)	06	10–20
29	Common Rose	*Pachliopta aristolochiae* (Fabricius, 1775)	04	10–12
30	Common Mormon	*Papilio polytes* Linnaeus, 1758	02	05–07
Family: Hesperiidae, Subfamily: Hesperiinae				
31	Chestnut Bob	*Iambrix salsala* (Moore, [1866])	15	07–30
32	Obscure Branded Swift	*Pelopidas agna* (Moore, [1866])	18	20–22
33	Ceylon Swift	*Parnara bada* (Moore, 1878)	32	20–30
34	Evans' Swift	*Parnara ganga* Evans, 1937	01	15
35	Large Branded Swift	*Pelopidas subochracea* (Moore, 1878)	03	45–110
36	Indian Palm Bob	*Suastus gremius* (Fabricius, 1798)	02	30–32
37	Dark Palm Dart	*Telicota bambusae* (Moore, 1878)	05	18–19
38	Common Palm Dart	*Telicota colon* (Fabricius 1775)	08	22–34
Family: Hesperiidae, Subfamily: Pyrginae				
39	Common Snow Flat	*Tagiades japetus* (Stoll, [1781])	02	26–40

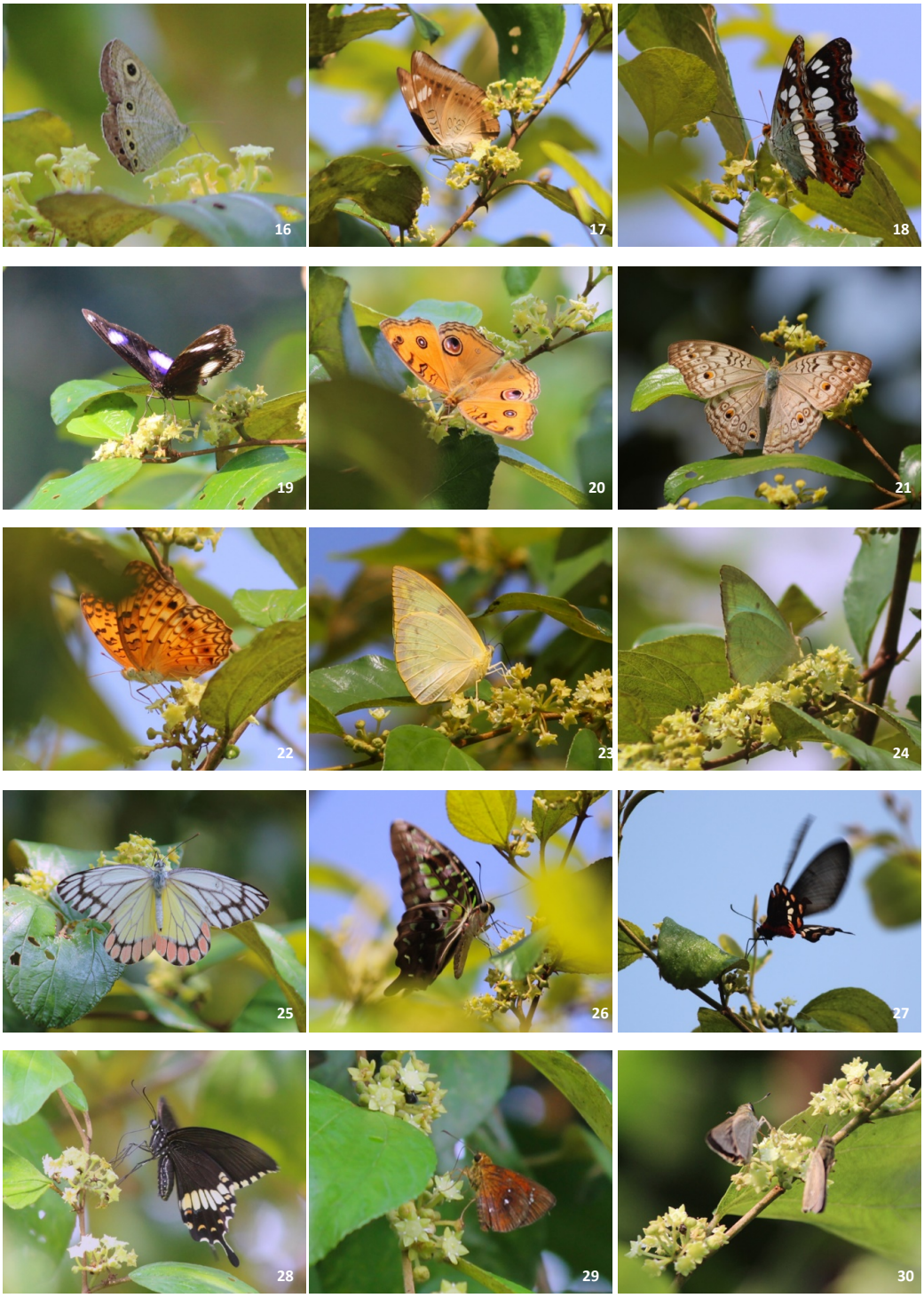
Hesperiidae: *Parnara bada* was the most dominant (n=32) species and *Pelopidas subochracea* spent the highest time (45–110 sec) on nectar feeding.

Members of the Lycaenidae family were dominant in the study area because most of the species were small in size with short proboscis length and easily fed on nectar from the small flower. Orwa et al. (2009) mentioned that *Z. mauritiana* flowers were protandrous. Hence, the fruit set depends on crosspollination by insects attracted by the fragrance and nectar. The pollen of the flower is described as 'heavy and thick'. In India, different species of honeybees, *Apis* spp. and house flies *Musca*



Images 1–15. 1 - *Anthene emolus*; 2 - *Anthene lycaenina*; 3 - *Castalius rosimon*; 4 - *Chilades lajus*; 5 - *Euchrysops cnejus*; 6 - *Neopithecops zalmora*; 7 - *Prosotas dubiosa*; 8 - *Tarucus* spp; 9 - *Rapala manea*; 10 - *Rathinda amor*; 11 - *Spindasis vulcanus*; 12 - *Tajuria cippus*; 13 - *Ariadne ariadne*; 14 - *Elymnias hypermnestra*; 15 - *Ypthima baldus*. © Tahsinur Rahman Shihan

domestica are reported to be important pollinators; the wasps *Polistes hebraceus* and *Physiphora* spp. have also been observed on flowers. Cross-incompatibility occurs, and cultivars have to be matched for good fruit set; some cultivars produce good crops parthenocarpically (Orwa et al. 2009). Mishra et al. (2004) recorded butterfly visiting flowers namely *Zizula hylax*, *Tarucus theophrastus indica*, *Eurema hecabe*, *Junonia almana*,



Images 16–30. 16 - *Ypthima huebneri*; 17 - *Euthalia aconthea*; 18 - *Moduza procris*; 19 - *Hypolimnas bolina*; 20 - *Junonia almana*; 21 - *Junonia atlites*; 22 - *Phalanta phalantha*; 23 - *Catopsilia pomona*; 24- *Catopsilia pyranthe*; 25 - *Delias eucharis*, 26 - *Graphium agamemnon*; 27 - *Pachliopta aristolochiae*; 28 - *Papilio polytes*; 29 - *Iambrix salsala*; 30 - *Pelopidas agna*. © Tahsinur Rahman Shihan

Pieris brassiceae, *Spindasis* spp., *Euploea core* and *Phalanta phalanta*.

In the late monsoon (September–October), the numbers of plants producing nectar are few, so butterflies choose *Z. mauritiana* flowers as a source of nectar in the study area. In the flowering season, a large numbers of flowers bloom together in a single tree and provide nectar for butterflies.

Images 31–36. 31 - *Parnara bada*; 32 - *Suastus gremius*; 33 - *Telicota bambusae*; 34 - *Telicota colon*; 35 - *Tagiades japetus*; 36 - *Virachola isocrates*. © Tahsinur Rahman Shihan

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