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Cover Photo by Roshan Upadhaya of *Yamamotozephyrus kwangtungensis*.

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BUTTERFLY VISITORS TO TWO INVASIVE PLANTS IN THE INDIAN AND BHUTANESE HIMALAYA

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Reviewer: M. Ackram Awan

Introduction

During the last century, several invasive plants colonized parts of the Indian sub-continent. These include *Parthenium hysterophorous* L., *Ageratum conyzoides* L. and *Lantana camara* L. (Aigbedion Atalor *et al*., 2019; Evans, 1997; Kohli *et al*., 2006; Negi *et al*., 2019). These plants spread rapidly and have colonized parts of the Himalaya.

In the present study, we have documented lepidopteran visitors to the flowers of *Choromlaena odorata* L. and *Ageratina adenophora* Spreng. at two locations, one in Uttarakhand, India and the second in Bhutan. Although information is available on germination, seeds, toxicity and other aspects of these plants (Zheng *et al*., 2015), no information appears to have been published about the variety of insects that visit them. Since they belong to Asteraceae and Verbanaceae, which are insect pollinated, it appears that a part of their success in colonizing can be attributed to the fact that they are popular nectaring plants for insects.

Methodology

Butterflies visiting the flowers were photographed between March, 2014 and April, 2020 at the Butterfly Research Centre (1500 m), Bhimtal, Uttarakhand, India and between October, 2017 and November, 2019 at Mendrelgeng (2100 m), Tsirang block, Bhutan. The study site in Bhimtal has been colonized by *A. adenophora* while the study site in Bhutan has been colonized by *C. odorata*. Butterflies were photographed at the flowers in India by DSS, AA, PS and in Bhutan by Gyeltshen. Since several insects merely perch on flowers or leaves, only those species have been included in the following list where it was possible to obtain photographs of individuals with the proboscis inserted in the flowers.

Remarks

There is no doubt that these flowers are very popular among insects. Many individuals of the species were observed at the flowers over the years. Few native plants are known to attract such a variety of species from all the different families. True, the flowers are not popular with Papilionidae and Pieridae, for several species belonging to these families that are on the wing during the flowering season are conspicuous by their absence, although they visit other flowers in the vicinity. The butterflies that have not been recorded visiting *A. adenophora* despite being present in the area include *Graphium sarpedon* (Linnaeus, 1758), *G. cloanthus* (Westwood, 1841), *P. polytes* Linnaeus, 1758, *P. bianor* Cramer, [1777], *P. protenor* Cramer, [1775], *Catopsilia pomona* (Fabricius, 1775), *C. pyranthe* (Linnaeus, 1758), *Gonepteryx*

nepalensis Doubleday, 1847, etc. The present list does not purport to be a list of pollinators of these plants but a list of butterflies that visit these flowers, insert their proboscis and presumably suck their nectar.

Acknowledgement

We are grateful to the Butterfly Research Centre, Bhimtal, India, for facilities.

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Table 1

S.N	Scientific names	Remarks
	PAPILIONIDAE	
1.	*Pachliopta aristolochiae* (Fabricius, 1775)	Rarely visited and then only briefly. The main flowering of the plant does not coincide with the emergence of the main brood of this species, so the individuals that emerged late get to feed on the early flowers of the plant.
2.	*Papilio agestor* Gray, 1831	This species also visits the flowers occasionally, for the same reason as outlined above.
	HESPERIIDAE	
3	*Tagiades menaka* (Moore, [1866])	A regular and frequent visitor to the flowers.
4	*Pseudocoladenia dan* (Fabricius, 1787)	As for *T. menaka*.
	PIERIDAE	
5	*Pieris brassicae* (Linnaeus, 1758)	A regular visitor to the flowers.
6	*Pieris canidia* (Linnaeus, 1768)	This is a commoner species than *P. brassicae* in the Indian study area and is a frequent visitor to the flowers.
7	*Ixias pyrene* (Linnaeus, 1764)	This has been recorded at *C. odorata* in Bhutan. The species is an occasional straggler in the Uttarakhand study area.
8	*Delias descombesi* (Boisduval, 1836)	Recorded at *C. odorata* flowers. The species does not occur in the western Himalaya.

9	*Delias pasithoe* (Linnaeus, 1767)	As for *D. descombesi.*
	LYCAENIDAE	
10	*Remelana jangala* (Horsfield, [1829])	As for *D. descombesi.*
11	*Chliaria kina* (Hewitson, 1865)	A single individual was photographed on the flowers on 4. iv. 2014. It was observed again on the flowers in 2018. The individuals observed spent over ten minutes skipping from flower to flower.
12	*Deudorix epijarbas* (Moore, 1857)	Several individuals visit the flowers each year, spending over 5 minutes among the flowers.
13	*Rapala maena* (Hewitson, 1863)	An uncommon visitor to the flowers, since it is not usually on the wing so early in the year. Individuals that do visit spend many minutes on the flowers.
14	*Rapala pheretima* (Hewiston, 1863)	Frequent visitor to the flowers of *C. odorata* in Bhutan; not recorded at *A. adenophora* flowers in Uttarakhand.
15	*Rapala nissa* (Kollar, [1844])	A regular visitor to the flowers every year, since it is common in the Indian study area and on the wing when this plant is in flower. Individuals spend up to 15 minutes on the flowers.
16	*Rapala varuna (Horsfield, [1829])*	Individuals occasionally recorded in Bhimtal
17	*Celastrina gigas* (Hemming, 1928)	Individuals spend three to five minutes on the flowers. A regular visitor in the Indian study area.
18	*Celastrina huegelii* (Moore, 1882)	As for the previous species. This species occurs in larger numbers than *C. gigas*.
19	*Megisba malaya* (Horsfield, [1828])	Not a common visitor to the flowers, since there are few individuals on the wing so early in the year. Those that do visit the flowers spend more than three minutes there.
20	*Udara dilecta* (Moore, 1879)	As for *C. gigas*.
	NYMPHALIDAE	
21	*Danaus chrysippus* (Linnaeus, 1758)	Occurs singly in both the study areas. Individuals visiting the flowers spend a minute or two and fly away. They do not stay long in an area.
22	*Danaus genutia* (Cramer, [1779])	As for *D. chrysippus*.
23	*Parantica aglea* (Stoll, [1782])	Males are territorial, and visit the flowers in their territory throughout the day, in brief visits. The remaining time is spent patrolling the territory.
24	*Tirumala septentrionis* (Butler, 1874)	Not a common butterfly in the study areas, usually one individual at a time flying by. Individuals attracted to the flowers spend five to ten minutes fluttering from flower to flower. A regular visitor year after year.
25	*Euploea core* (Cramer, [1780])	In some years, a male will take up a beat in the study area and visit the flowers repeatedly through the day, spending three to five minutes at each session.
26	*Euploea mulciber (Cramer,*[1777])	An occasional visitor to the flowers.

27	*Lethe confusa* Aurivillius, 1890	An unusual visitor to any flower, two individuals of this species were recorded day after day spending over five minutes at a time at the flowers on 7.iv.2014 and the following four days at the Indian study site.
28	*Mycalesis mineus* (Linnaeus, 1758)	Again, a very unusual record at flowers. An individual visited the flowers for three days starting 4.iv.2014 at the Indian study site.
29	*Callerebia annada* (Moore, [1858])	A frequent visitor to the flowers. Individuals spend three to ten minutes on each visit.
30	*Ypthima baldus* (Fabricius, 1775)	A regular visitor to the flowers, but individuals do not spend long at each visit, usually a minute or two before moving on.
31	*Neptis clinia* Moore, 1872	All members of the genus in the area are frequent visitors to the flowers and each individual spends two to twenty minutes investigating the flowers.
32	*Neptis nata* Moore, [1858]	See under *N. clinia*.
33	*Neptis sappho* (Pallas, 1771)	See under *N. clinia*.
34	*Neptis soma* Moore, 1858	See under *N. clinia*.
35	*Athyma cama* Moore, [1858]	An occasional visitor to the flowers that stays for around three to five minutes, during which time it keeps moving from flower to flower.
36	*Athyma opalina* (Kollar, [1844])	As for *A. cama*.
37	*Athyma selenophora* (Kollar, [1844])	As for *A. cama*.
38	*Argynnis hyperbius* (Linnaeus, 1763*)*	Not recorded in Uttarakhand at flowers of *A. adenophora*, but visits *C. odorata* in Bhutan.
39	*Vagrans egista* (Cramer, [1780])	An occasional visitor, but a few visit the flowers every year. They are habitually very nervous and do not sit for long anywhere. Flower visits are usually less than 30 seconds per flower, while an individual might settle on and probe ten or more flowers during a single visit.
40	*Cirrochroa aoris* Doubleday, [1847]	A female was recorded at *C. odorata* flowers in Bhutan. Males are also frequent visitors.
41	*Hestinalis nama* (Doubleday, 1844)	A regular visitor to the flowers. Individuals visit singly, and spend five minutes or more visiting flowers.
42	*Cyrestis thyodamas* Boisduval, 1846	A regular visitor to the flowers, where several individuals may spend hours among the flowers on a sunny day.
43	*Symbrenthia lilaea* (Hewitson, 1864)	Several individuals can spend half an hour or more each on the flowers, taking up to three minutes on each flower before moving on.
44	*Aglais caschmirensis* (Kollar, [1844])	Not all individuals of this species in an area visit the flowers. Those that do, spend up to four minutes at the flowers per visit.

45	*Vanessa cardui* (Linnaeus, 1758)	A regular visitor to the flowers, where each individual can spend up to ten or more minutes. Each flower is thoroughly explored before moving on to the next.
46	*Vanessa indica* (Herbst, 1794)	As for *Vanessa cardui*.
47	*Junonia lemonias* (Linnaeus, 1758)	Not all individuals in the area visit the flowers and those that do do not spend much time there, around half a minute per flower head. They do not flit from flower head to nearby flower head, but dash about after taking wing before returning to a distant flower of the same species.
48	*Junonia iphita* (Cramer, [1779])	Several individuals at a time can spend more than half an hour each at a time investigating the flowers.
49	*Cethosia cyane (Drury,*[1773]	Regular visitor to *C. odorata* flowers in Bhutan.
50	*Libythea myrrha* Godart, 1819	A regular visitor. Both sexes visit the flowers and spend up to half an hour at a time, visiting different flowers. They are not wary and seem to have implicit faith in the effectiveness of their underside camouflage, which resembles a dead leaf.

Fig.1: *Tagiades menaka*

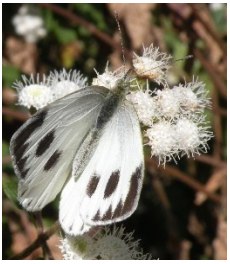

Fig.2: *Pieris canidia*

Fig.3: *Delias pasithoe*

Fig.4: *Chliaria kina*

Fig.5: *Rapala nissa*

Fig.6: *Rapala pheretima*

Fig.7: *Deudorix epijarbas*

Fig.8: *Megisba malaya*

Fig.9: *Hypolycaena erylus*

Fig.10: *Remelana jangala*

Fig.11: *Hestinalis nama*

Fig.12: *Cirrochroa aoris*

Fig.13: *Tirumala septentrionis*

Fig.14: *Lethe confusa*

Fig.15: *Mycalesis mineus*

Fig.16: *Neptis nata*

Fig.17: *Neptis sappho*

Fig.18: *Neptis soma*

Fig.19: *Athyma cama*

Fig.20: *Athyma selenophora*

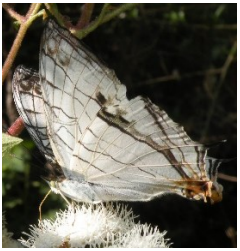

Fig.21: *Cyrestis thyodamas*

Fig.22: *Argynnis hyperbus*

Fig.23: *Junonia iphita*

Fig.24: *Callerebia annada*

Fig.25: *Libythea myrrha*

Fig.26: *Vagrans egista*