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NOTE

Cirsium wallichii DC. (Asteraceae): a key nectar source of butterflies

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In general, both larvae and adult butterflies depend on plant resources (Kitahara et al. 2008; Nimbalkar et al. 2011). Adult butterflies forage on a wide variety of plant species for floral nectar (Courtney 1986; Raju et al. 2004). Butterflies, however, do not collect nectar extensively from all the available flowers (Kunte 2000). Thus, the diversity of the butterfly community of a region is associated with the availability of host plants (Murphy & Wilcox 1986; Kitahara et al. 2008). Also, the diversity and abundance of pollinators such as butterflies are crucial for the reproductive success of flowering plants (Mukherjee et al. 2015). Several wild plants considered as weeds serve as important nectar sources for butterflies (Mukherjee et al. 2015; Kapkoti et al. 2016). One such wild weed, *Cirsium* Mill. (Thistle) of the family Asteraceae has been well recognized as a nectar source of butterflies (Robertson 1928; Tooker et al. 2002; Kapkoti et al. 2016). *Cirsium* is a speciose genus of Asteraceae, with about 200 species distributed in Europe, Asia, North & Central America, and northern Africa (Mabberley 2008; Sahli et al. 2017). Among the species of this genus known from India, *Cirsium wallichii* DC. has been extensively used as a traditional medicinal plant in the Himalaya (Uniyal et al. 2011). Interestingly, owing to a lack of information on *Cirsium wallichii* DC. as a nectar source of butterflies, the current communication aims to address the value of Wallichii's Thistle not only as a weed, but also as a nectar source of butterflies.

The present study was conducted from May to August, 2019 in Benog Wildlife Sanctuary (30.467°N & 78.027°E), Mussoorie, Uttarakhand, India. The sanctuary is characterized by Banj Oak *Quercus leucotrichophora* forests, Chirpine *Pinus roxburghii* forests and grasslands (Champion & Seth 1968) which harbour at least 335 species of vascular plants (Kumar et al. 2012). The survey was done between 08.00h and 11.00h to record the butterfly species visiting *Cirsium wallichii*. We photographed representatives of each butterfly species from the area. Based on the photographs, identification of the species was carried out using Evans (1932) and Kehimkar (2016).

Cirsium wallichii grows along open and modified stream habitats in the sanctuary as well as near human settlements and agricultural lands at the peripheral area (Image 1A). Leaves are stalkless and pinnately lobed with long spines at the margin. The plant blooms from May–July. Capitula are many-flowered, solitary or clustered and borne on leafless stalks. They are 2–3.4cm

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Table 1. List of butterfly species foraging on *Cirsium wallichii*

	Scientific name	Common name
A.	**Family: Papilionidae**	
1.	*Graphium sarpedon* (Linnaeus, 1758)	Common Bluebottle
2.	*Graphium cloanthus* (Westwood, 1841)	Glassy Bluebottle
3.	*Graphium agamemnon* (Linnaeus, 1758)	Tailed Jay
4.	*Papilio protenor* Cramer, [1775]	Spangle
5.	*Papilio bianor* Cramer, [1777]	Common Peacock
6.	*Papilio polytes* Linnaeus, 1758	Common Mormon
B.	**Family: Pieridae**	
7.	*Aporia agathon caphusa* (Moore, 1872)	Garhwal Great Blackvein
8.	*Aporia agathon agathon* (Gray, 1831)	Nepalese Great Blackvein
9.	*Aporia leucodice* (Eversmann, 1843)	Himalayan Blackvein
10.	*Colias erate* (Esper, 1805)	Pale Clouded Yellow
11.	*Colias fieldii* Ménétriés, 1855	Dark Clouded Yellow
12.	*Pieris brassicae* (Linnaeus, 1758)	Large Cabbage White
13.	*Pieris canidia* (Linnaeus, 1768)	Indian Cabbage White
14.	*Gonepteryx rhamni* Linnaeus, 1758	Common Brimstone
15.	*Pontia daplidice* (Linnaeus, 1758)	Bath White
16.	*Belenois aurota* (Fabricius, 1793)	Pioneer
C.	**Family: Lycaenidae**	
17.	*Heliophorus sena* (Kollar, [1844])	Sorrel Sapphire
18.	*Spindasis nipalicus* (Moore, 1884)	Silver-grey Silverline
19.	*Rapala selira* (Moore, 1874)	Himalayan Red Flash
20.	*Rapala varuna* (Horsfield, [1829])	Indigo Flash
21.	*Rapala manea* (Hewitson, 1863)	Slate Flash
22.	*Aricia agestis* (Denis & Schiffermüller, 1775)	Orange-bordered Argus
23.	*Lycaena phlaeas* (Linnaeus, 1761)	Common Copper
24.	*Lampides boeticus* (Linnaeus, 1767)	Pea Blue
25.	*Chilades pandava* (Horsfield, [1829])	Plains Cupid
26.	*Celastrina huegelii* (Moore, 1882)	Large Hedge Blue
27.	*Deudorix epijarbas* (Moore, [1858])	Cornelian
D.	**Family: Nymphalidae**	
28.	*Vanessa indica* Herbst, 1794	Red Admiral
29.	*Vanessa cardui* Linnaeus, 1758	Painted Lady
30.	*Kaniska canace* Linnaeus, 1763	Blue Admiral
31.	*Aglais caschmirensis* Kollar, 1844	Indian Tortoiseshell
32.	*Callerebia annada caeca* Moore, 1857	Ringed Argus
33.	*Callerebia hybrida* Butler, 1880	Hybrid Argus
34.	*Callerebia nirmala* Moore, 1865	Common Argus
35.	*Argynnis hyperbius* (Linnaeus, 1763)	Indian Fritillary
36.	*Ypthima nareda* Kollar, 1844	Large Three-Ring
37.	*Ypthima nikaea* Moore, 1874	Moore's Five-Ring
38.	*Parantica aglea* (Stoll, [1782])	Glassy Tiger
39.	*Tirumala limniace* (Cramer, [1775])	Blue Tiger
40.	*Tirumala septentrionis* (Butler, 1874)	Dark Blue Tiger
41.	*Danaus genutia* (Cramer, [1779])	Striped Tiger
42.	*Danaus chrysippus* (Linnaeus, 1758)	Plain Tiger
43.	*Euploea mulciber* (Cramer, [1777])	Striped Blue Crow
44.	*Argynnis childreni* Gray, 1831	Large Silver stripe
45.	*Libythea lepita* Moore, [1858]	Common Beak
46.	*Lasiommata schakra* Kollar, 1844	Common Wall
47.	*Acraea issoria* (Hübner, [1819])	Yellow Coster
48.	*Cyrestis thyodamas* Doyère, [1840]	Common Map
49.	*Junonia iphita* Cramer, 1779	Chocolate Pansy
E.	**Family: Hesperiidae**	
50.	*Seseria dohertyi* Watson, 1893	Himalayan White Flat
51.	*Potanthus dara* (Kollar, [1844])	Himalayan Dart
52.	*Celaenorrhinus leucocera* (Kollar, [1844])	Common Spotted Flat
53.	*Lobocla liliana* Atkinson, 1871	Marbled Flat
54.	*Celaenorrhinus dhanada* (Moore, [1866])	Himalayan Yellow-banded Flat
55.	*Pseudocoladenia dan* (Fabricius, 1787)	Fulvous Pied Flat
56.	*Tagiades menaka* Moore, 1865	Spotted Snow Flat
57.	*Celaenorrhinus munda* Moore, 1884	Himalayan Spotted Flat
58.	*Aeromachus stigmata* Moore, 1878	Veined Scrub Hopper
59.	*Notocrypta feisthamelii* Boisduval, 1832	Spotted Demon
60.	*Pedesta masuriensis* Moore, 1878	Mussoorie Bush Bob
61.	*Polytremis discreta* (Elwes & Edwards, 1897)	Himalayan Swift
62.	*Parnara* sp.	Swift sp.



Image 1. *Cirsium wallichii*: A—habit | B—inflorescence | C—flower. © Bitupan Boruah.

across, homogamous, bisexual, discoid, and clustered in corymbose racemes (Image 1B). Florets are about 2cm long, pale-white, corolla tube long, limb five-toothed and pappus hair pale-white. Outer involucre bracts are lanceolate with spreading erect or recurved spines; inner bracts dilated, lanceolate-ovate and incurved near the apex (Image 1C).

During recent field explorations in the Benog Wildlife Sanctuary, a total of 62 species and sub-species of butterflies belonging to 45 genera and five families foraging on *Cirsium wallichii* for nectar were documented (Table 1 and Images 2–5). The species assemblage includes Nymphalidae (35.5%), Hesperiidae (22.6%), Lycaenidae (17.7%), Pieridae (16.1%) and Papilionidae (9.7%). Among the recorded butterflies, five species such as *Aporia agathon*, *Gonepteryx rhamni*, *Celaenorrhinus munda*, *Vanessa cardui*, and *Vanessa indica* frequently visited the flowers for nectar while *Pontia daplidice* and *Callerebia nirmala* were recorded only once visiting the flowers. We also observed *Vanessa cardui* (Nymphalidae) utilizing *C. wallichii* as a larval host plant. During the study period, *C. wallichii* was the only species that attracted diverse butterfly species.

Cirsium has been studied in terms of nectar source by several workers such as Robertson (1928) who reported 14 species of Lepidoptera foraging on *C. vulgare*, eight species on *C. altissimum* and nine species each on *C. discolor* and *C. pumilum*. Thirty-three pollinators including 15 species of butterflies visiting *C. verutum* have been reported from the western Himalaya (Kapkoti et al. 2016). Although, it is used as a medicinal plant by the tribal people of the Himalaya (Uniyal et al. 2011), *C. wallichii* has never been reported as an important forage. The present communication highlights the importance of *C. wallichii* as a key nectar source for a large number of butterfly species though the plant is considered as a weed. The visits of several species of butterflies to *C. wallichii* could be attributed to the



Image 2. Butterfly species visiting *Cirsium wallichii*: A—*Celaenorrhinus dhanada* | B—*Seseria dohertyi* | C—*Lobocla liliana* | D—*Celaenorrhinus munda* | E—*Aeromachus stigmata* | F—*Pedesta masuriensis* | G—*Potanthus dara* | H—*Notocrypta feisthamelii* | I—*Polytremis discrete* | J—*Parnara* sp. | K—*Celastrina huegelii* | L—*Chilades pandava*. © Bitupan Boruah.



Image 3. Butterfly species visiting *Cirsium wallichii*. A—*Rapala manea* | B—*Lycaena phlaeas* | C—*Heliophorus sena* | D—*Spindasis nipalicus* | E—*Deudorix epijarbas* | F—*Lampides boeticus* | G—*Belenois aurota* | H—*Pontia daplidice* | I—*Gonepteryx rhamni* | J—*Pieris brassicae* | K—*Aporia leucodice* | L—*Colias fieldii*. © Bitupan Boruah.



Image 4. Butterfly species visiting *Cirsium wallichii*: A—*Colias erate* | B—*Aporia agathon caphusa* | C—*Aporia agathon agathon* | D—*Papilio bianor* | E—*Graphium agamemnon* | F—*Graphium sarpedon* | G—*Graphium cloanthus* | H—*Papilio protenor* | I—*Danaus genutia* | J—*Parantica aglea* | K—*Argynnis childreni* | L—*Lasiommata schakra*. © Bitupan Boruah.



Image 5. Butterfly species visiting *Cirsium wallichii*: A & B—*Vanessa cardui* | C—*Ypthima nareda* | D & E—*Argynnis hyperbius* | F—*Aglais caschmirensis* | G & H—*Vanessa indica* | I—*Callerebia annada caeca* | J—*Callerebia nirmala* | K & L—*Euploea mulciber*. © Bitupan Boruah.

hexose-rich sugar and strong amino acid content in the florets. This characteristic of the plants belonging to the family Asteraceae has been reported by Baker & Baker (1983). As observed on *Wendlandia tinctoria* (Raju et al. 2011), clustered flowering of *C. wallichii* also have benefited the butterflies thus, reducing searching time. Thistle in the Himalaya such as *C. verutum* has been found as an important forage (Kapkoti et al. 2016) and it proves to be an important resource for butterflies in the Benog Wildlife Sanctuary, Mussoorie. This study indicates that there is a need for further studies to understand the role of *C. wallichii* in sustaining butterfly diversity at landscape level during summer season.

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