

## TAXONOMY AND ECOLOGY OF *BASSARONA DURGA DURGA* (MOORE) FROM THE HIMALAYAN ECO-ZONE OF SIKKIM

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**ABSTRACT** ■ The ten species of the genus *Bassarona* distributed in India. Out of ten species, the six species are distributed in Eastern Himalaya. *Bassarona durga* Moore is one of the species of nymphalid butterfly of the Eastern Himalaya which has two subspecies.

Thus, this paper presented the distributional and phenomenal matrix of one of the subspecies *Bassarona durga durga* (Moore) of the Sikkim Himalaya.

**Key Words:** *Bassarona durga durga* (Moore), Luhung, Nymphalid, Sikkim Himalaya.

### INTRODUCTION

*Bassarona durga durga* (Moore), one of the endemic species of Sikkim, is distributed at the altitudinal gradient of 1500-2200m. This subspecies mostly basks at the top of the canopies of *Ficus auriculata* Loureiro [Moraceae], *Dendrocalamus hamiltonii* Nees [Poaceae], *Bambusa nutans* Wall [Poaceae], *Evodia fraxinifolia* (Hook) Benth [Rutaceae] and other fruiting trees at the farmland, and descends to the moist places near the stream too. Additionally, it also required suitable forest habitat for its population growth. Furthermore, the occurrence of adult butterfly of this species reported from April to November (Alfred, 2003).

The species under this genus *Bassarona* (Moore) [1897] is widely distributed from

India to Sundaland and Philippines. The ten species of this genus is known in India whereby the Sikkim represents six (Alfred, 2003; Moore, 1878). Out of ten species of India, one species, *Bassarona teuta teutoides* (Moore, 1877) is distributed up to Andaman Islands (Alfred, 2003; Das *et. al*; 2020). *Bassarona durga* Moore [1897] is differentiated from other by having outwardly black edged white discal band. It has two subspecies, *Bassarona durga durga* (Moore, [1858]) and *Bassarona durga splendens* Tytler, 1915 (Evans, 1932). The subspecies *B. durga splendens* differs from *B. durga durga* in having a complete series of blue lunule marking on the outer edge of discal band of upper hindwing (Evans, 1932; Tytler, 1915). Although, this butterfly taxonomically placed

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under the genus *Euthalia* and subgenus *Bassarona* (Yokochi, 2010). Even so, the most widely accepted name of this butterfly in the literatures is *Bassarona durga durga* (Moore), 1857 (Blue Duke). The entomologist, Yokochi described that the holotype of this species was not designated in the original description. Thus, the syntype of male of *Bassarona durga* (Moore) is in BMNH (Rh37227), labeled "Type / Adolias Durga B& Moore / Darjiling / Paris Exhib. / Darjiling. Paris Exhib. Ind. Mus 79-64. / Ind. Mus. 79.64. / B.M. TYPE No. Rh10187 Adolias durga, B& Moore. / B.M. (N.H.) Rhopalocera Slide No. 29862 / BMNH(E) #807816".

In the recent study of Western Arunachal Pradesh, *Bassarona durga durga* (Moore), 1858 (Blue Duke) recorded from Sochung and Riloh trails at Pakke-Kesang, Sessa and Sessni at Eaglenest in September and October, at altitudes gradients 900m to 1400m (Sonfhi & Kunti, 2016). Additionally, the presence of *Bassarona durga durga* (Moore), 1857 (Blue Duke) also reported in Tsirang, Punakha and Tashiyangtshu of Bhutan (Irungham, 2014; Sbordonni *et. al.*, 2015).

Thus, this paper presented the information of *Bassarona durga durga* (Moore) of the Sikkim Himalaya for the documentation of endemic species.

#### MATERIALS AND METHODS

Reconnaissance of data from the several qualitative sources performed and compared the information with the available data for understanding of *Bassarona durga durga* (Moore). The field visit and interaction among stakes performed for qualitative and quantitative analysis in the Sikkim.

#### TAXONOMY

*Bassarona durga* subsp *durga* (Moore) 1857  
*Bassarona* Moore, Lep. Indica, 3 (7) : 49. 59.

*Adolias durga* Moore. Horsefield and Moore, Cat. up. Mus. East India Coy., 1 : 196. no. 197.

1992. *Euthalia durga durga* (Moore) : Haribal. Butterflies of Sikkim Himalaya, : 183.

1994. *Bassarona durga durga* (Moore) : Varshney. Oriental Insects, 28 : 184.

**Specimens:** Sikkim, 4 exs, -. - 1868 (T.C. Jerdon coll); Sikkim, lex, no date, (De Niceville purchased); Sikkim, 2 exs, no date, Sikkim, Luhung.

***Bassarona durga* subsp *splendens* Tytler, 1913.**  
*Euthalia durga* subsp *splendens* Tytler, in National History Museum London (NHMUK), BMNH (E) 229255, Locality Suroifui, Manipur. 1913.

**Habitat:** Basking high upto the tree canopy level to moist patches near streams.

**Host plants:** *Pilea melastomoides* (Poir.) Wedd. [Urticaceae], *Ficus auriculata* Loureiro [Moraceae], *Dendrocalamus hamlintonii* Nees [Poaceae], *Bambusa nutans* Wall [Poaceae], *Artemisia vulgaris* L [Asteraceae], *Evodia fraxinifolia* (Hook) Benth [Rutaceae] and others.

#### Key to species<sup>1</sup>

1. Upper-side of fore wing with a submarginal row of white spots, cell of fore wing not fully closed ..... *franciae* (Gray)  
 - Upper-side of fore wing without any row of submarginal white spots, cell of fore wing closed ..... 2
2. Upper-side of fore wing with white discal band vertical and reaching inner margin beyond middle, veins R, and Sc anastomosed in fore wing. Cell open in hind wing ..... 3
3. Upper side of hind wing with discal band outwardly black edged .....  
*durga* (Moore)

#### RESULTS AND DISCUSSION

*Bassarona durga durga* (Moore) is one of the attractive butterfly species of Sikkim Himalaya having two subspecies in existence, namely *Bassarona durga durga* (Moore) and *Bassarona durga splendens* Tytler. The latter species is BMNH (E) 229255 collected from the type locality Suroifui, Manipur in 1913. However, the collection of *Bassarona durga durga* (Moore) reported from the locality Luhung of North Sikkim, by T.C. Jerdon in 1868.

In Sikkim, *Bassarona durga durga* (Moore), the butterfly, found active from April till November. The adult butterfly lays its eggs in October and November, followed by larval development till February, which will be further developed to pupae. These pupae develop into the butterflies (Table 1). After the hatching, the caterpillar is the main feeding stage of butterfly and feeds the specific host plants. Some of the host plants of this butterfly are *Pilea melastomoides* (Poir.) Wedd. [Urticaceae], *Ficus auriculata* Loureiro [Moraceae], *Artemisia vulgaris* L

[Asteraceae], *Evodia fraxinifolia* (Hook) Benth [Rutaceae] etc.

One of the interesting finding of this work is that this butterfly is the indicator of the good forest and environment. In the degraded forest areas, the population of this butterfly decreases. For instance, this butterfly sighting is observed mostly near the pristine forest fringed villages having their suitable host plants such as Linko and Timbong in Dzongu, Lingi, South Sikkim etc (Table1). The feeding habit indicates that it consumes flavonoids, phenolic compounds, nitrogenous acidic food and fermented alcoholic content. Eventually, it helps to accelerate the decaying process due to consumption of fermented alcohol. This species also generally seen around the fallen trees base, exposed soil, latex of trees, fruiting trees (*Citrus sinensis* (L) Osbeck [Rutaceae], *Psidium guajava* L [Myrtaceae]) etc. The study suggested that the fallen wood and overripe fruits contain nutrients along with ethanol within the pulp

**Table 1:** Tabular representation of the biological attributes of different phases of the life cycle of *Bassarona durga durga* (Moore)

Phases of Blue Duke	Months	Biological attributes
Butterfly	April – November	Active phase of Blue Duke
Reproductive period	October –November	Blue Duke lays eggs
Larva	December-January	Egg hatching and larval development
Pupae	February –March	Pupae Development in the host plants

**Table 2:** Distribution matrix of *Bassarona durga durga* (Moore) recorded in Sikkim

Pakyong District	Pakyong	27° 22' 82" N, 88° 58' 79" E
Gyalshing District	Rinchenpong-Yangsum	27° 24' 33" N, 88° 27' 09" E
North District	Hee Gyathang to Tingvong	27° 50' 98" N, 88° 43' 75" E
South District	Lingi	27° 37' 26" N, 88° 44' 22" E
Gangtok District	Tadong, Gangtok	27° 31' 06" N, 88° 59' 76" E
Gangtok District	Ranka	27° 34' 38" N, 88° 58' 74" E
North District	Linko-Tingvong	27° 32' 50" N, 88° 29' 25" E

at concentrations averaging 0.9% and 4.5% (Beaulieu *et. al.*, 2017). Such nutrients with ethanol consumption in the form of liquids or extract through their proboscis, a flexible tube, is beneficial, which helps to clean the environment as well expedite the decomposition process. Thus, the ecological services of this butterfly are significant in both agriculture and forestry.

Looking in these significances, the occurrence of *Bassarona durga durga* (Moore) recorded (Table 2) that generally prefers moist and cold places, near to steam and riverine belts.

#### **Cultural, ecological and Conservation significances**

There are two species of *Bassarona durga* (Moore, [1858]) – Blue Duke namely, *Bassarona durga splendens* and *Bassarona durga durga*. The subspecies *splendens* is legally protected in India under Schedule I of the Wildlife (Protection) Act, 1972 whereas the subspecies *durga* is legally protected in India under Schedule II of the Wildlife (Protection) Act, 1972.

As this paper deals with *Bassarona durga durga* (Moore), the ecological and cultural significances are discussed hereunder:

1. This species is an ecological indicator of quality forest habitat, clean air and fruit orchard habitat as the population of this subspecies found declined with the increase of the deforestation. Moreover, this subspecies prefers to feed on the fruits from the fruit orchard which helps to reduce the foul smell from the fruit orchard.
2. It helps to expedite the process of decomposition in nature consuming the nutrients like flavonoids, phenolic acid, ethanolic content etc from the substrate.
3. This is a beneficial subspecies which feeds on the weeds as well as the

fallen dead woods. It does not harm on the economically important plants.

4. The indigenous people of Sikkim believed that the presence of this species as the indicator of good farm produces.

#### **Charismatic features and Attractive Aspect**

This butterfly has the vibrant colour for the attraction, which is large in size too. It can be seen around the fruit trees and its host plants. The upper side of fore wing with white vertical discal band makes this species attractive.

#### **Easy to identify, observe and remember**

It's easy to identify by the presence of white discal band. The upper side of fore wing with white vertical discal band and the upper side of hind wing with discal band outwardly black edged are the characteristics of this species.

#### **Forms of butterfly**

Taxonomically, it's identify is distinct and unique. This subspecies *Bassarona durga durga* (Moore) has no reports of its variation.

It is a unique species of Sikkim and was recollected from the locality Luhung, Sikkim Himalaya by T.C. Jerdon in 1868 whereas the other subspecies *Bassarona durga splendens* was collected from type locality, Suroifui, Manipur (Yokochi, 2010).

#### **Beneficial Aspects**

Other beneficial aspect of this species is that it is not harmful to the crops and is not the invasive species of the region. As it is not a pest, it helps to decompose the matter into the simpler form by removing the ethanolic contents from the substrate.

Next is that the species is the indicator of the fruiting habitat and quality forest so it is not apparently seen in degraded forest. Thus, it is one of the endemic species of Sikkim. Besides *Bassarona durga durga* (Moore), there

are other species which are endemic to the Eastern Himalaya such as *Rhinopalpa polynice birmana* Fruhstorfer, 1897 (Wizard), *Papilio paradoxa telearchus* Hewitson, 1852 (Great Blue Mime), *Athyma pravara acutipennis* Fruhstorfer, 1906 (Unbroken Sergeant), *Athyma kanwa phorkys* Fruhstorfer, 1912 (Dot-dash Sergeant), *Dercas verhuelli doubledayi*, Moore 1905, *Chonala masoni* Elwes, 1882 (Chumbi Wall) etc (Sing, 2017; Naro and Sondhi, 2014).

#### Ecological parameters for *Bassarona durga durga* (Moore)

The occurrence of *Bassarona durga durga* (Moore) is observed in the fruit orchard having fruiting trees namely, *Citrus sinensis* (L) Osbeck [Rutaceae], *Psidium guajava* L [Myrtaceae], *Citrus grandis* (L.) Osbeck [Rutaceae], *Citrus limetta* Risso [Rutaceae], *Citrus aurantifolia* Swingle [Rutaceae] etc. Other host plants of this butterfly are *Pilea melastomoides* (Poir.) Wedd. [Urticaceae], *Ficus auriculata* Loureiro [Moraceae], *Artemisia vulgaris* L [Asteraceae], *Evodia fraxinifolia* (Hook) Benth [Rutaceae], *Rubus ellipticus* Sm. [Rosaceae] etc.

Moreover, this subspecies prefers moist and cold places, near to steam and riverine belts.

**Note:** Based on the unique ecological species and the richness of butterflies in India, several State Governments of India designated the State Butterfly such as *Troides minos* Cramer, 1779, the Southern Birdwing in Karnataka, *Papilio polymnestor* Cramer, 1775, Blue Mormon in Maharashtra, *Papilio bianor* Cramer, 1777, Common Peacock in Uttarakhand etc.

#### CONCLUSION

*Bassarona durga durga* (Moore) is one of the endemic species of Sikkim which is legally protected in India under Schedule II of the Wildlife (Protection) Act, 1972. It is a rare

species and is not widely distributed. The ecological services of *Bassarona durga durga* (Moore) are significant for the fruit trees as well as biological development of forest and farmland of Sikkim. Thus, the conservation policy must be developed for conserving this species.

Eventually, *Bassarona durga durga* (Moore) warrants more researches for understanding its life, development, ecological services and impacts.

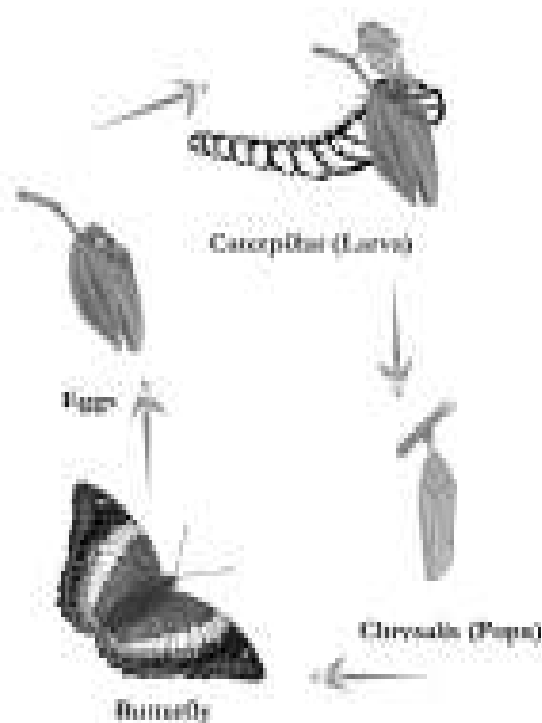


Fig. 1. Life Cycle of *Bassarona durga durga* (Moore)

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