

Moths as Bioindicator Organisms; A Preliminary Study from Baramulla District of State Jammu and Kashmir India

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Abstract—The present paper confirms the species diversity of moths from Baramulla during March 2018 to November 2018. This study determines the diversity and abundance of moth species from this area. A total number of 40 moth species from 8 families were recorded by using the light trapping method. It was an initial step to discover the moth fauna of this region and very first attempt in this region of Kashmir to illuminate such kind of insect life. Both adult moths and their caterpillars are food for a wide variety of wildlife, insects and birds. Moths also benefit plants by pollinating flowers while feeding on their nectar and so help in seed production. This not only benefits wild plants but also many of our food crops, which depend on moths as well as other insects to ensure a good harvest. Moths play a vital role in regulating the health of our environment. Monitoring their numbers and ranges can give us vital clues to changes in our environment.

Introduction:

In recent decades a dramatic decrease of biological diversity in agricultural landscapes can be observed. The rapid decline in plant and animal species diversity in modern agricultural landscapes can be explained by two main causes. Firstly, most species disappear from agroecosystems due to habitat destruction by increased farming intensity, a deterministic cause of extinction (Tscharntke and Kruess 1999). Secondly, reductions in population size caused by habitat fragmentation lead to further stochastic species losses. Therefore, habitat management schemes in these areas have a particularly high potential to restore overall biodiversity and enable the survival of many species in modern cultivated landscapes. Invertebrates play an important role as major contributors to total biodiversity on farmland and as food for vertebrates, such as farmland birds (Baur and Erhardt 1995). In response to an increasing awareness of the rapid decline of biological diversity, several approaches are currently being introduced to reduce this process. Recent estimates report over 1,27, 000 species of moths from all over the world (Alfred et al. 1998). Of which, over 12,000 species are recorded from India (Chandra & Nema 2007). The present study aims to collect a baseline data on moth fauna of orchards of Baramulla district and disseminate information and values on the importance and

role played by moths in maintaining healthy ecosystems, through awareness campaigns to the schools, students, forest officials and local peoples in and around the study area.

Materials and Methods:

The district is located in state Jammu and Kashmir. The district is spread from Srinagar district and Ganderbal district in east to the line of control in the west and from Kupwara district in the north and Bandipora district in the northwest to Poonch district in the south and Budgam district in the southwest. The district is situated at 34° 10' N and 74° 30' E. The recorded Forest area in the district is 2292 Sq Km. The Devdar, Kail, Cheer trees etc are found in the forest. Survey was conducted throughout the natural habitats and undisturbed forest of district Baramulla. The climate of the area is typical with medium to high rainfall during July–August at lower altitudes. The study of moth specimens was done from four sampling sites Pattan, Baramulla town, Sopore and Tangmarg.

Collection method:

The sheet method was used, which allows collection of all the specimens individually without any damage. A white cloth sheet (10'X6') was hung between two vertical poles in such a way that it touched the surface and extended forward over the ground slightly away from direct source of light placed at such a point that the whole sheet from edge to edge brightly reflected the light. Light traps were set using a solar powered lantern or gas petromex in front of cloth sheet.

Identification: The moths collected from different localities were identified and classified with the available literature (Hampson 1894- 1896; Bell & Scott 1937).

Results and Discussion:

Table 1. List of moth species recorded during the study period.

Family	Subfamily	Genus	Species	
Noctuidae (Latreille, 1809)	Catocalinae	Achaea	<i>Achaea janata</i> (Linnaeus, 1758)	
	Acontiinae	Acontia	<i>Acontia lucida</i> (Hufnagel, 1766)	
	Noctuinae	Agrotis	<i>Agrotis ipsilon</i> (Hufnagel, 1776)	
	Noctuinae	Agrotis	<i>Agrotis clavis</i> (Hufnagel, 1766)	
	Amphipyridae	Amphipyra	<i>Amphipyra monolitha</i> (Guenee, 1852)	
	Catocalinae	Catocala	<i>Catocala ammonfreidbergi</i> (Kravchenko et al., 2007)	
	Catocalinae	Catocala	<i>Catocala grotiana</i> (Bailey, 1879)	
	Hadeninae	Cetola	<i>Cetola dentata</i> , (Walker, 1855)	
	Geometridae (Leach, 1815)	Geometrinae	Agathia	<i>Agathia lycaenaria</i> (Kollar, 1848).
		Larentiinae	Aplocera	<i>Aplocera plagiata</i> (Linnaeus, 1758)
Ennominae		Cleora	<i>Cleora repulsaria</i> (Walker, 1860)	
Ennominae		Hyposidra	<i>Hyposidra talaca</i> (Walker, 1860)	
Sterrhinae		Urapteryx	<i>Urapteryx ebuleata</i> (Guenee, 1878)	
Sterrhinae		Rhodometra	<i>Rhodometra sacraria</i> (Linnaeus, 1767)	
Crambidae (Latreille, 1810)		Spilomelinae	Agathodes	<i>Agathodes ostentalis</i> (Geyer, 1837)
	Spilomelinae	Antigastra	<i>Antigastra catalaunalis</i> (Duponchel, 1833)	
	Spilomelinae	Cirrhochrista	<i>Cirrhochrista brizoalis</i> (Walker, 1859)	
	Spilomelinae	Diaphania	<i>Diaphania indica</i> (Saunders, 1851)	
	Spilomelinae	Leucinodes	<i>Leucinodes orbonalis</i> (Guenee, 1854)	
	Sphingidae (Latreille, 1802)	Macroglossinae	Macroglossum	<i>Macroglossum insipidia</i> (Butler, 1875)
Macroglossinae		Hippotion	<i>Hippotion celerio</i> (Linnaeus, 1758)	
Macroglossinae		Heterolocho	<i>Heterolocho arizana</i> (Wileman, 1910)	
Sphinginae		Agrius	<i>Agrius convolvuli</i> (Linnaeus, 1758)	
Erebidae (Leach, 1815)		Arctiinae	Aloa	<i>Aloa lactinea</i> (Cramer, 1777)

	Arctiinae	Amerila	<i>Amerila astreus</i> (Drury, 1773)
	Arctiinae	Callimorpha	<i>Callimorpha principalis</i> (Kollar, 1844)
	Arctiinae	Cretonotus	<i>Cretonotus gangis</i> (Linnaeus, 1763)
	Pangraptinae	Episparis	<i>Episparis liturata</i> (Fabricius, 1787)
	Calpinae	Eudocima	<i>Eudocima maternal</i> (Linnaeus, 1767)
	Erebinae	Mocis	<i>Mocis undata</i> (Fabricius, 1775)
	Arctiinae	Olepa	<i>Olepa ricini</i> (Fabricius, 1775)
	Erebinae	Spirama	<i>Spirama indenta</i> (Hampson, 1891)
	Erebinae	Spirama	<i>Spirama retorta</i> (Clerck, 1759)
Notodontidae (Stephens, 1829)	Notodontinae	Clostera	<i>Clostera albosigma</i> (Fitch, 1856)
	Notodontinae	Furcula	<i>Furcula scolopendrina</i> (Boisduval, 1869)
Saturniidae (Boisduval, 1837)	Saturniinae	Actias	<i>Actias selene</i> (Hubner, 1807)
	Saturniinae	Antheraea	<i>Antheraea mylitta</i> (Drury, 1773)
Drepanidae (Boisduval, 1828)	Thyatirinae	Cilix	<i>Cilix glaucata</i> (Scopoli, 1763)
	Thyatirinae	Habrosyne	<i>Habrosyne derasa</i> (Linnaeus, 1767)
	Thyatirinae	Thyatira	<i>Thyatira batis</i> (Linnaeus, 1758)

A total of 40 species were successfully recorded throughout the study period from 8 families: *Crambidae*, *Drepanidae*, *Erebidae*, *Geometridae*, *Noctuidae*, *Notodontidae*, *Saturniidae*, and *Sphingidae*. The family *Erebidae*, represented by 10 species was the most dominant family followed by *Noctuidae* (8 species), *Geometridae* (6 species), *Crambidae* (5 species), *Sphingidae* (4 species), *Drepanidae* (3 species), *Notodontidae* (2), and *Saturniidae* (2 species). Despite small differences in geographical features the landscape was able to support high Lepidopteran diversity. Currently Van Niekerken *et al.*, (2011) defined *Erebidae* family as the largest family of the *Lepidoptera* comprising 1,760 genera and 24,569 species. As there exists no previous record of species of *erebidae* family for the Kashmir. In the present study 10 species of *erebidae* family were recorded. Dar and Kirti (2015) studied the taxonomy of two species of genus *Calyptra ochsenheimer* of *Noctuidae* family from Kashmir region. Kriti *et al.*, (2014)

reported six species of Noctuidae family as agricultural pest from Kashmir region. But in the present investigation 8 species of Noctuidae family were recorded and this family was dominant at second position and all these moths were recorded only from the single Baramulla district of Kashmir. Geometridae family was third dominant family with a record of 6 species. Similarly Kirti *et al.*, (2009) reported seven species of Geometridae species from North East India and five geometrid species from Himachal Pradesh. Sphingidae family was represented by four species from Baramulla area. These moths are commonly known as Hawkmoths with large stout bodies. Similar to the study of Smetacek and Kitching (2012) who have added three species of hawkmoths from Ladakh, Jammu and Kashmir. Literature review reveals no record from Drepanidae family of moths from entire Kashmir area. Whereas in present study three species of moths are recorded from Drepanidae family. Considering the present study there were a high number of species new to State and also several species which have the potential to meet the IUCN Red List criteria for threatened species, indicating that the site has a high conservation value, as there is little published data available on the distribution and assemblage of moths in this study area.

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