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## DIVERSITY OF MOTHS IN SOME SELECTED AREAS OF DISTRICT BAGH, AZAD JAMMU & KASHMIR

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### ABSTRACT

The present study was designed to find the diversity and composition of moths existing at different tropical levels in food chain for sustainable ecological process of ecosystem in Bagh (Azad Jammu & Kashmir). The study was conducted from 10 December 2017 to 30 September 2018. A total of fifty-eight species belonging to thirteen families were collected from three sites (cultivated areas, wild areas and suburban) of study area by using light trap method. This study provides baseline data for checklist of moths in Bagh.

**Keywords:** Simpson index, Shannon index, Moth, Sustainable, ecological process.

### INTRODUCTION

Moths, like other insects, comprise a good group for studies on conservation and ecology. Most moth species are nocturnal and can be easily attracted to light traps, allowing for efficient estimates of relative abundance and geographical patterns of species richness (Choi, 2008). Moths are bio-indicators of habitat quality and respond to human disturbances and successional processes (Hilt et al., 2006). All groups of moths are not affected by certain environmental changes, so vulnerability differs among taxa (New, 2004). Therefore, the monitoring of moth communities that respond to changes in habitat quality constitutes an important tool for biological conservation (New, 2004). Changes in vegetation can alter the prevalence of the endemic moth species, promoting changes in the abundance of common species, which may be indicative of potential shifts in the abundance of rare species. For example, intensive agriculture and grazing accelerates changes in species composition and abundance of plant communities, and the resulting loss of endemic host plants leads to a corresponding loss of specialist moth fauna (White, 1991).

Several studies have been conducted on the biodiversity in AJK area regarding reptiles in Tolipir (Faiz et al., 2018), insects in Rawalakot (Faiz et al., 2018), mammals in Tolipir (Faiz et al., 2016), amphibians in Tolipir (Faiz et al., 2018), birds from Tolipir (Faiz et al., 2015a) and even Butterflies from Tolipir (Faiz et al., 2015b). The aim of the present work was to identify and study the diversity of moth species from study area which still was lacking fresh documentation of moth fauna.

### MATERIAL AND METHODS

#### *Study Area*

Azad Jammu and Kashmir is mostly a hilly and mountainous area with valleys and stretches of plains. People living in lower areas grow barley, mangoes, millet, corn and wheat. A small population in higher areas depends on forestry and livestock. The south has dry sub-tropical climate while the north is considerably moist.

Bagh is an urban area located 80 km from Muzaffarabad, the capital city of Azad Kashmir. It is 160 Km from Islamabad, the capital of Pakistan. It is present on the confluence of two mini

Nallahs, Mahlwani and Mhal, which flow all year round. The locally recognized Haji Peer Pas is about 32 km from Bagh City. Bagh is a mountainous area from northeast to south-west with an elevation of about 1500 and 2500 meters above sea level which lies in the lesser Himalayan zone of Pir-Panjal.

### Sample Collection

The sampling of specimens was done by using light traps and collected specimens (moths) were killed by ethyl acetate vapors and preserved. The specimens were relaxed, pinned and studied under a Leica EZ 4 HD stereo zoom microscope. The identification was carried out with the help of keys of Holloway (1987, 1998) and Kristensen (1999).

## RESULTS

**Table 1. The diversity and abundance of moths found from different areas of District Bagh**

Scientific Name	Location	Abundance
<b>Pterophoridae</b>		
<i>Hellinsia homodactyla</i>	non-woody habitat	+
<b>Sphingidae</b>		
<i>Clanis Deucalion</i>	wild area	+++
<i>Ceratomia undulosa</i>	recorded from all study area types	+
<i>Xylophanes tersa</i>	recorded from seasonal forest habitat	+
<i>Pachysphinx modesta</i>	was recorded from offshore island, many coastal localities and urbanized areas	+
<i>Agrius convolvuli</i>	recorded from gardens, orchards, woodland, suburban localities and the place where mellows grow	+
<i>Hyles lineata</i>	recorded from variety of habitat including deserts, gardens, and suburbs, also seen in mountains	+++
<b>Noctuidae</b>		
<i>Agrotis ipsilon</i>	was recorded from plants and also vegetables	+++
<i>Amphipyra sp.</i> ,	was recorded from forest areas, also found in agricultural areas	+
<i>Condica dolorosa</i>	recorded from woodlands. Variety of habitats including urban areas	+
<i>Xestia c-nigrum</i>	recorded from “cutting” off a seedling at ground, also in vegetated areas	+++
<i>Spodoptera litura</i>	was recorded from tropical and temperate regions, some were in forest	+
<i>Leucania phragmitidicola</i>	recorded from woody areas, forests, feed on plants and shrubs	+
<i>Helicoverpa armigera</i>	was recorded from moist soil, crops, and other places	+
<i>Amphipyra pyramidea</i>	was recorded from woodland, scrub, hedgerows, gardens and parks	+++
<i>Dysgonia algira</i>	was recorded from salt marshes, mangroves, sand dunes, low land forest, wetlands,	+

	grasslands and mountain	
<i>Proxenus Miranda</i>	was recorded from moist, open forests and grassland habitat.	+
<i>Condica videns</i>	was recorded from open areas especially in parks, forests, meadows.	+++
<b>Euteliidae</b>		
<i>Eutelia pulcherrima</i>	was recorded from woodlands. It occurred in a variety of habitats including urban areas.	+
<b>Arctiidae</b>		
<i>Aloa lactinea</i>	was recorded from lowlands to mountain regions	+++
<b>Lymantriinae</b>		
<i>Euproctis lutea</i>	was recorded from woodlands, especially dry areas	+
<b>Geometridae</b>		
<i>Cleora sublunaria</i>	was recorded from crops	+++
<i>Zamarada eogenaria</i>	was recorded from lowland forests	+
<i>Hemithea aestivaria</i>	was recorded from forest edges, oak-rich, dry slopes	+++
<i>Hyposidra talaca</i>	was recorded from forested localities, particularly alluvial forest, found in cultivated areas	+
<i>Rhodometra sacraria</i>	was recorded from meadows, forest clearing paths, gardens and urban environments	+
<i>Cleora cinctaria</i>	was recorded from various vegetated habitats	+++
<i>Corymica pryeri</i>	was recorded from mountain areas, forests	+
<i>Costaconvexa centrostrigaria</i>	was recorded from wet open areas and waste places where food plants grow	+
<i>Cyclophora packardi</i>	was recorded from vegetated habitat	+
<i>Campaea margaritata</i>	was recorded from broad leaved woodland and most other places with trees and shrubs such as parks and gardens	+++
<i>Idaea filicata</i>	was recorded from xerothermic habitats from sea level up to 1000m above sea level, rarely higher	+
<i>Problepsis cinerea</i>	was recorded from various vegetated habitat	+
<b>Saturniidae</b>		
<i>Actias selene</i>	was recorded from forested areas prefers deciduous woodland with trees such as hickory, walnut, sumacs, and persimmon	+
<i>Automeris io</i>	was recorded from deciduous woodlands, forest, meadows, thorn scrub, agricultural orchards, suburban parks and back yards	+
<i>Eacles imperialis</i>	was recorded from coniferous and deciduous forest, present in trees and shrubs	+
<b>Nolidae</b>		
<i>Nycteola revayana</i>	was recorded from deciduous woods and shrub lands	+++
<b>Erebidae</b>		

<i>Tribe arctiini</i>	woods, shrubby areas, open spaces and gardens	+++
<i>Plecoptera.sp</i>	fresh water habitat	+
<i>Tribe nygmii</i>	shrub-based habitats, including gardens, parks, open woodland, fens, hedgerows, heaths and moors	+
<i>Drasteria divergens</i>	oak and chaparral	+
<i>Cretonotos gangis</i>	wild type habitat, from grasslands to forest	+++
<i>Lymantria todara</i>	open forests, also found in urban and suburban areas	+
<i>Catocala serena</i>	deciduous, also found in trees and shrubs, on flowers	+
<i>Spilosoma luteum</i>	recorded from open meadows. Prefers woody habitat occurs on nettle in wet forests along the trails, also found in nature gardens and avoid dry habitat	+++
<i>Mocis mayeri</i>	recorded from grassland, woodland, river banks and in sandy soils	+
<i>Estigmene quadriramosa</i>	recorded from open wooded areas, meadows, farm fields, weedy waste places, grasslands	+++
<i>Aloa lactinea</i>	recorded from primary and secondary habitat, lowlands to mountain regions; tropical forests; close to the seaside	+++
<i>Barsine orientalis</i>	lowland forest, also found in dry heat forest	+
<i>Areas galactina</i>	recorded from mountainous areas, mangrove, freshwater and peat swamps	+
<b>Crambidae</b>		
<i>Herpetogramma sphingalis</i>	was recorded from terrestrial or aquatic vegetation; one group lives only in nests of arboreal ants	+
<i>Palpita annulifer</i>	recorded from terrestrial or aquatic vegetation, hedgerows, rough meadows, scrub and marshes	+
<i>Sameodes cancellalis</i>	was recorded from terrestrial or aquatic vegetation; one group lives only in nests of arboreal ants	+
<b>Limacodidae</b>		
<i>Nephelimorpha argentilinea</i>	recorded from tropical areas; distributed worldwide. Also present in temperate forests	+
<b>Pyralidae</b>		
<i>Sacada sp.</i>	from gardens, open country sides and lightly wooded areas.	+
<i>Tosale oviplagalis</i>	recorded from forest area, trees shrubs	+

(+); Present, (++) Common, (+++) Abundance, (-); Absence

All moths were attracted to light at night and were found to be herbivorous.

## DISCUSSION

From the Family **Pterophoridae** only one species was recorded. The Plume

moth (*Hellinsia homodactyla*) is reported as pest of vegetable crops from India (Rai et al., 2014)

From the Family Sphingidae, six species were recorded. The geographic distribution of the three-lined velvet hawk moth (*Clanis deucalion*) was also confirmed by Rafi et al. (2014). The waved sphinx moth (*Ceratomia undulosa*) adult is strictly nocturnal, hiding away as dawn approaches (Fullard et al., 2001). The diet of this species includes plants. Sphinx moth or hawk moth (*Xylophanes tersa*) was found to be present year-round in southern states in US and migrates north in warmer months as reported by Hodges et al. (1971). This species prefers flower nectar; the larvae feed on Madder Family plants, smooth button plant star clusters, Borreria and Manettia (Covell et al., 1984). The Poplar hawk moth (*Pachysphinx modesta*) is widespread in North America, most of East and Southern areas. The habitat of this species includes moist forested areas, mixed hardwood and conifers and rocky mountainous regions (Covell et al., 1984). The larvae of this species feed on cotton wood and willows (Hodges et al., 1971). The Hawk moth (*Agrius convolvuli*) is distributed all over the world (*Agrius convolvuli*, n.d.). The Larvae of this species strip entire fields of all leaves, before they en masse to new fields. They are considered as pests of crops especially the sweet potato (*Agrius convolvuli*, n.d.). The white-lined sphinx (*Hyles lineata*) are prevalent in most of the United States and Canada (Mahr, 2010). This species lives in a variety of habitat including deserts, gardens and suburbs (Miller et al., 1981). The caterpillars of this species feed on willow weed, apple, elm, grape and tomato. Adults feed on clovers, lilac, moon vine and petunia. The caterpillars of this species are pest of crop plants that damage grapes, tomatoes and garden crops (Mahr, 2010).

The Black cut worm (*Agrotis ipsilon*) has been reported as almost cosmopolitan in its geographic distribution

(Hill, 1983). This species prefers to feed on seedlings of most crops for example cotton and legumes (Rings et al., 1975). The geographic distribution of owl moth or army moth (*Amphipyra sp.*) has been reported to be worldwide (Poole, 1989). Condica moth (*Condica dolorosa*) has been reported in indo-Australian tropics. Host plant of this species is conyza and Elephantopus (Sevastopulo, 1941). The habitat of this species is generally distributed in woodlands and urban habitat (Hampson, 1908).

The Cotton bollworm (*Helicoverpa armigera*) has been confirmed in several Asian countries including Pakistan. This species is considered as invasive and a major pest of crops (*Helicoverpa armigera*, n.d.). The passenger moth (*Dysgonia algira*) has not been reported in Pakistan but geographic distribution confirmed in Austria, Great Britain, Hungary, Germany, Denmark, Greece, Spain, Italy etc. (Karsholt and Razowski, 1996). The habitat of this species is found in salt marshes, mangroves, sand dunes, low land forest, wetlands, grasslands and mountain. (Linnaeus, 1767).

Beautiful Eutelia (*Eutelia pulcherrima*) was found to be less in number. The habitat of this species includes woodlands and urban areas (Hodges et al., 1983). The geographic distribution of this species is not conformed in the state. The salt marsh tiger (*Estigmene quadriramosa*) was reported in the Himalayan region (Markku, 1988). This species is found in open wooded areas, meadows, farm fields, weedy waste places, grasslands (Rothschild, 1910). The red costate tiger moth (*Aloa lactinea*) was confirmed in India, Japan, Indonesia and Sri Lanka reported by (Hampson, 1894). The habitat of this species is lowlands to montane regions, also tropical forest; close to the seaside reported by (Karel, 2011).

The milky tiger, foamy Bells (*Areas galactina*) was confirmed in most southeast asian countries like China, India,

Bangladesh, Malaysia and Philippines and is usually found in mountainous habitat, inhabit in mangrove, freshwater and peat swamps (Dubatolov, Haynes, Kishida, 2009). The crambid snout moth (*Herpetogramma sphingalis*) was confirmed in southern and eastern United States (Dowell, 1911). This species is present in terrestrial or aquatic vegetation; one group lives only in nests of arboreal ants (Scholtens and Solis, 2015).

The snout moth (*Palpita annulifer*) was confirmed in Thailand, Taiwan, India and Java reported by (Hampson, 1908). This species is found in terrestrial or aquatic vegetation, hedgerows, rough meadows, scrub and marshes (Scholtens and Solis, 2015). The banded pearl (*Sameodes cancellalis*) was confirmed in India, Australia, Sri Lanka, Japan, China, Burma and Malaysia (Herbison-Evans and Crossley, 2010). The dimorphic Tosale moth (*Tosale oviplagalis*) was found in forest area, in trees and shrubs (Covell, 1984).

## CONCLUSION

The present study was designed to find the diversity and species composition of moths existing at different trophic level in food chain for sustainable ecological process of forested and cultivated ecosystem of District Bagh (AJK). A total of fifty-six species belonging to thirteen families were collected from the study area. The species were attracted to light at night; mostly moth species were present under light. All moth species were herbivorous. Moths were present in different habitats and fed on different plants. All moths were attracted to light at night. The moths were found to be very sensitive to changes.

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