Journal of Threatened Taxa | www.threatenedtaxa.org | January 2013 | 5(1): 3565–3570

ISSN
Online 0974-7907
Print 0974-7893

OPEN ACCESS

Moth diversity of Tawang District, Arunachal Pradesh, India

Kailash Chandra [1] & S. Sambath [2]

[1] 1. Zoological Survey of India, Prani Vigyan Bhavan, 535, 'M' Block, New Alipore, Kolkata, West Bengal 700053, India
[2] Zoological Survey of India, Central Zone Regional Centre, 168-169, Scheme No. 5, Vijay Nagar, Jabalpur, Madhya Pradesh 482002, India
[1] kailash611@rediffmail.com (corresponding author),
[2] sambath63@gmail.com

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). Extensive faunistic surveys, along with proper identification and documentation, at least to species and subspecies level, provide the most reliable data for conservation and management of different habitats.

Materials and Methods: Study area: The district of Tawang is located in Arunachal Pradesh, bordered by Tibet to the north, Bhutan to the southwest and the Sela ranges separate it from West Kameng District in the east. The district is situated at 27^{0}33'N and 41^{0}48'E between 2000–3000 m. A rapid faunistic survey or assessment was carried out in the study area which included the Lumla Forest Range including Bukhiyong, Thrillum, Thonglong, and a few localities of the Zemmethang Forest Ranges. The geographic coordinates of the collection localities are listed in Table 1.

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. A 160 watt mercury vapour lamp was used as a light source through the night. Moths started collecting on the sheet just after sunset between 1800–2300 hr, after that the abundance of moths slowly declined.

Identification: The moths collected from different localities were identified, and classified with the available literature (Hampson 1894–96; Bell & Scott 1937) and their current nomenclature is based on LEPINDEX (Beccaloni et al. 2003). The hierarchy of different families of moths is based on the modern classification of insects above family level by Varshney (2003) and Van Nieukerken et al. (2011).

Results: The study revealed that a total of 102 species belonging to 81 genera, 24 subfamilies, 12 families under seven superfamilies (Table 2).

Discussion and Conclusions: The moth fauna of the family Arctiidae of Arunachal Pradesh was studied by Arora & Chaudhury (1982). Kirti et al. (2005) inventoried 105 species of the family Arctiidae from northeastern India. But, the information on moth fauna of Tawang District has been very poorly studied and very few species are reported. In the present study, more than 250 morpho-species of moths were collected and 102 species, 81 genera under 12 diverse families were identified (Annexure 1). The family Geometridae dominated with 48% of the total species recorded, followed by the families Erebidae (26%), Drepanidae (8%), Crambidae (7%), Uraniidae (3%), Lasciocampidae

DOI: http://dx.doi.org/10.11609/JoTT.o2718.966 | **ZooBank:** urn:lsid:zoobank.org:pub:14139C6D-2D94-497D-9E44-8245FD5F468D

Editor: Peter Smetacek, Butterfly Research Centre, Bhimtal, India. **Date of publication:** 26 January 2013 (online & print)

Manuscript details: Ms # o2718 | Received 24 February 2012 | Final received 10 October 2012 | Finally accepted 12 November 2012

Citation: Chandra, K. & S. Sambath (2013). Moth diversity of Tawang District, Arunachal Pradesh, India. *Journal of Threatened Taxa* 5(1): 3565–3570. doi:10.11609/JoTT.o2718.966

Funding: None.

Competing Interest: None.

Acknowledgements: The authors are highly grateful to the Director, Zoological Survey of India, Kolkata for providing necessary field facilities. Sincere thanks are also due to D.F.O. Lumla and Zemmethang Range, State Forest Department, Tawang District, Arunachal Pradesh for providing helps during the course of study. Thanks are also due to Dr. G. Maheshwaran, Scientist C and Officer-in-Charge, Zoological Survey India, Arunachal Pradesh Field Station for constant cooperation during the period of field study.

Table 1. Geographic coordinates of collection localities in Tawang District

Collection localities	Latitude (N)	Longitude (S)	Altitude (m)
Lumla Circuit House (Camp-I) (29.ix.2009–06.ix.2009)	27°31′45″	91°42′37″	2408
Thonglong (03.x.2009)	27°34′34″	91°47′33″	2357
Thrillum (03.x.2009)	27°32′45″	91°44′51″	2355
Zemmethang (tourist lodge) (Camp-II) (07.x.2009–15.x.2009)	27°42′38″	91°43′27′′	2190

(2%), Sphingidae (2%). The other moth families such as Pyralidae, Zygaenidae, Bombycidae, Saturniidae, and Notodontidae are represented each by 1%. The family Geometridae is one of the largest families of the order Lepidoptera and is represented by Geometrinae, Ennominae, Larentiinae and Sterrhinae. The increase in distribution of the members of moths under Larentiinae is related to latitude (Ghosh 2003), and in the tropics similar trends are observed with increase in altitude (Holloway 1993, 1997). However, in the present study, the subfamily Ennominae outnumbers the members of other subfamilies and families. Overall higher species richness and diversity was recorded in the forest regions of Zemmethang more than the other localities of the study areas. The results from this study can be used to make decisions on the conservation of natural resources management especially for insect biodiversity. Hence, intensive surveys with long term monitoring programmes will help to identify the status of the species with the help of IUCN categories for the conservation and management of biodiversity.

Table 2. The diversity of moths in Tawang District, Arunachal Pradesh, India as recorded in the present study

	Superfamily	Family	Number of		
			Subfamily	Genus/ Genera	Species
1.	Zygaenoidea	Zygaenidae	Chalcosiinae	1	1
2.	Pyraloidea	Pyralidae	Pyralinae	1	1
		Crambidae	Spilomelinae	7	7
3.	Drepanoidea	Drepanidae	Cyclidiinae	1	1
			Drepaninae	4	4
			Thyatirinae	3	3
			Oretinae	1	1
4.	Lasiocampoidea	Lasiocampidae	Lasiocampinae	2	2
5.	Bombycoidea	Bombycidae	-	1	1
		Saturniidae	Saturniinae	1	1
		Sphingidae	Sphinginae	1	1
			Macroglossinae	1	1
6.	Geometroidea	Uraniidae	Microniinae	1	1
			Epipleminae	2	2
		Geometridae	Geometrinae	8	9
			Ennominae	21	32
			Larentiinae	5	7
			Sterrhinae	1	1
7.	Noctuoidea	Notodontidae	-	1	1
		Erebidae	Arctiinae	6	8
			Lithosiinae	4	6
			Lymantriinae	4	6
			Amphipyrinae	1	1
			Erebinae	3	3
			Hadeninae	1	1
			Pantheinae	1	1
			Total	**81**	**102**

REFERENCES

Alfred, J.R.B., A.K. Das & A.K. Sanyal (1998). *Faunal Diversity in India*. ENVIS Centre *Zoological Survey of India,* Kolkata: 311–318.

Arora, G.S. & M. Chaudhury (1982). On the Lepidopterous Fauna of Arunachal Pradesh & Adjoining areas of Assam in North-East India (Family: Arctiidae), *Zoological Survey of India, Tech. Mono. No*. 6: 1-63pp.

Beccaloni, G.W., M.J., Scoble, G.S. Robinson, A.C. Downton & S.M. Lucas (2003). Lepindex - The Global Lepidoptera Names Index: An online website published by the Natural History Museum, London.

Bell, T.R.D. & F.B. Scott (1937). *The Fauna of British India including Ceylon and Burma*—Moths 5. Taylor and Francis, London, 537pp.

Chandra, K. & D.K. Nema (2007). *Fauna of Madhya Pradesh (including Chhattisgarh) part-I, State Fauna Series* 15: 347. Published by Director, *Zoological Survey of India*, Kolkata.

Ghosh, S.K. (2003). Insecta: Lepidoptera: Heterocera: Geometridae, *State Fauna Series* 9, *Fauna of Sikkim* (Part-4): 217–342.

Hampson, G.F. (1892). *The Fauna of British India including Ceylon and Burma*—Moths 1. Taylor and Francis, London, 527pp.

Hampson, G.F. (1894). *The Fauna of British India including Ceylon and Burma*—Moths 2. Taylor and Francis, London, 528pp.

Hampson, G.F. (1895). *The Fauna of British India including Ceylon and Burma*—Moths 3. Taylor and Francis, London, 546pp.

Hampson, G.F. (1896). *The Fauna of British India including Ceylon and Burma*—Moths 4. Taylor and Francis, London, 594pp.

Holloway, J.D. (1993). Moths of Borneo: The family Geometridae, subfamily Ennominae. *Malayan Nature Journal* 47: 1–309.

Holloway, J.D. (1997). The Moths of Borneo: Family Geometridae, subfamilies Sterrhinae and Larentiinae. *Malayan Nature Journal* 51: 1–242.

Kirti J.S., J.S. Sodhi & N.S. Gill (2005). Inventory of Arctiidae of North-Eastern India (Arctiidae: Lepidoptera). *Journal of Entomological Research* 29(3): 243–249.

Van Nieukerken, E.J. et al. (2011). Order Lepidoptera Linnaeus, 1758. In: Zhang, Z.-Q. (ed.) 2011: Animal biodiversity: an outline of higher-level classification and survey of taxonomic richness. *Zootaxa* 3148: 212–221.

Varshney, R.K. (2003). Modern classification of Insecta above family level. *Bionotes* 5(3&4) & 6(1,2&3): 61–62 & 85–87; 9–11; 43-44; 67–69.

Annexure 1. List of taxa

Order: Lepidoptera
Suborder: Glossata Fabricius, 1775
Infraorder: Heteroneura
Clade: Apoditrysia Minet, 1983
Superfamily: Zygaenoidea Latreille, 1809
Family: Zygaenidae Latreille, 1809
Subfamily: Chalcosiinae
1. *Herpa subhyalina* Moore, 1879 (Image 1)

Clade: Obtectomera Minet, 1986
Superfamily: Pyraloidea Latreille, 1809
Family: Pyralidae Latreille, 1809
Subfamily: Pyralinae
2. *Vitessa suradeva* Moore, 1860 (Image 2)

Family: Crambidae Latreille, 1810
Subfamily: Spilomelinae
3. *Botyodes principalis* Leech, 1889 (Image 3)
4. *Bradina diagonalis* (Guenee, 1854) (Image 4)
5. *Maruca testulalis* (Geyer, 1832) (Image 5)
6. *Palpita asiaticalis* Inoue, 1994
7. *Parotis vertumnalis* (Guenee, 1854)
8. *Spoladea recurvalis* (Fabricius, 1775) (Image 6)
9. *Syllepta verecunda* Warren, 1896

Clade: Macroheterocera Chapman, 1893'
Superfamily: Drepanoidea Boisduval, 1828
Family: Drepanidae Boisduval, 1828
Subfamily: Cyclidiinae
10. *Cyclidia rectificata* Walker, 1862 (Image 7)
Subfamily: Drepaninae
11. *Drepana pallida* Moore, 1879
12. *Macrauzata fenestraria* (Moore, 1867) (Image 8)
13. *Macrocilix mysticata* (Walker, 1863) (Image 9)
14. *Thymistada tripunctata* Walker, 1865
Subfamily: Thyatirinae
15. *Gaurena florens*, Walker, 1865
16. *Habrosyne derasa* (Linnaeus, 1767)

Subfamily: Oretinae
17. *Oreta sanguinea* (Moore, 1879)

Superfamily: Lasiocampoidea Harris, 1841
Family: Lasiocampidae Harris, 1841
Subfamily: Lasiocampinae
18. *Euthrix laeta* (Walker, 1855)
19. *Trabala vishnou* Lefebvre, 1827 (Image 10)

Superfamily: Bombycoidea Latreille, 1802
Family: Bombycidae Latreille, 1802
20. *Bombyx huttoni* Westwood, 1847

Family: Saturniidae Boisduval, 1837
Subfamily: Saturniinae
21. *Caligula simla* Westwood, 1847

Family: Sphingidae Latreille, 1802
Subfamily: Sphinginae
Tribe: Acherontiini
22. *Acherontia lachesis* (Fabricius, 1798) (Image 11)
Subfamily: Macroglossinae
Tribe: Macroglossini
23. *Cechenena lineosa* (Walker, 1856)

Superfamily: Geometroidea Leach, 1815
Family: Uraniidae Leach, 1815
Subfamily: Microniinae
24. *Acropteris iphiata* Guen'ee, 1857 (Image 12)
Subfamily: Epipleminae
25. *Dysaethria fulvilinea* Hampson, 1895
26. *Europlema himala* (Butler, 1880) (Image 13)

Family: Geometridae Leach, 1815
Subfamily: Geometrinae
27. *Agathia hilarata* (Guenee, 1858)
28. *Chlorissa gelida* (Butler, 1889)
29. *Chlorochaeta pictipennis* (Butler, 1880)
30. *Comostola subtiliaria* Bremer, 1864
31. *Gelasma thetydaria* (Guenee, 1857)
32. *Hemithea graminea* Hampson 1891.
33. *Mixochlora parsinus* (Butler, 1879)
34. *Tanaorhinus dimissa* (Walker, 1861)
35. *Tanaorhinus luteoviridata* (Walker, 1861) (Image 14)
Subfamily: Ennominae
36. *Abraxas (Abraxas) conferta* Swinhoe, 1893
37. *Abraxas (Calospilos) pusilla* (Butler, 1880)
38. *Abraxas (Calospilos) martaria* (Guenee, 1857)
39. *Abraxas (Calospilos) neomartaria* Inoue, 1970
40. *Alcis arisema* Prout, 1934 (Image 15)
41. *Aplochlora vivilaca* (Walker, 1861)
42. *Arichanna lapsariata* (Walker, 1862)
43. *Arichanna maculata* (Moore, 1869)
44. *Ascotis selenaria* Schiffermuller, 1775
45. *Campaea haliaria* (Walker, 1861)
46. *Chorodna vulpinaria* Moore, 1867
47. *Cleora acaciaria* (Boisduval, 1833)
48. *Dalima schistacearia* Moore, 1867
49. *Elphos hymenaria* Guenee, 1857
50. *Godonela emersaria* Walker, 1861
51. *Godonela nora* (Walker, 1861)
52. *Heterocallia temeraria* Swinhoe, 1891
53. *Hypochrosis quadraria* Warren
54. *Hypochrosis rufescens* (Butler, 1880)
55. *Loxaspilates* sp. Warren, 1893
56. *Medasina contaminata* (Moore, 1887)
57. *Medasina creataria* (Guenee, 1857)
58. *Nothomiza dentisignata* (Moore, 1867)
59. *Odontopera obliquaria* (Moore, 1867)
60. *Odontopera similaria* (Moore, 1888)
61. *Ourapteryx ebuleata* Guenee, 1858
62. *Ourapteryx picticaudata* Walker, 1860
63. *Ourapteryx primularis* Butler, 1886
64. *Ourapteryx sciticaudaria* Walker, 1862
65. *Opisthograptis molleri* Warren, 1893
66. *Plutodes costatus* (Butler, 1886)
67. *Sirinopteryx rufivinctata* (Walker, 1862)

Subfamily: Larentiinae
68. *Amnesicoma albiseriata* (Warren, 1893)
69. *Hydrelia ornata* (Moore, 1867)
70. *Pericallia viridescens* (Warren, 1894)
71. *Psyra angulifera* Walker, 1867
72. *Psyra spurcataria* (Walker, 1862)
73. *Xandrames albofasciata* Moore, 1867 (Image 16)
74. *Xandrames latiferaria* Walker, 1860
Subfamily: Sterrhinae
75. *Calothysanis responsaria* Moore, 1888

Superfamily: Noctuoidea Latreille, 1809
Family: Notodontidae Stephens, 1829
76. *Allata argentifera* (Walker, 1862)

Family: Erebidae Leach, 1815
Subfamily: Arctiinae
77. *Agylla ramelana* (Moore, 1865) (Image 17)
78. *Creatonotus transiens* (Walker, 1855) (Image 18)
79. *Mangina argus* (Kollar, 1844)

80. *Nyctemera adversata* (Schaller, 1788) (Image 19)
81. *Nyctemera arctata* (Walker, 1764) (Image 20)
82. *Spilarctia obliqua* Walker, 1855
83. *Spilosoma comma* (Walker, 1856)
84. *Spilosoma dalbergiae* (Moore, 1888) (Image 21)

Subfamily: Lithosiinae
85. *Barsine cuneonotata* (Walker, 1855)
86. *Barsine inflexa* (Moore, 1878)
87. *Chrysorabdia bivitta* (Walker, 1856) (Image 23)
88. *Cyana divakara* (Moore, 1865)
89. *Cyana signa* (Walker, 1854) (Image 22)
90. *Eilema colon* Moeschler, 1872

Subfamily: Lymantriinae
91. *Arctornis divisa* (Walker, 1855)
92. '*Euproctis' inconcisa* (Walker, 1865)
93. '*Euproctis' quadrangularis* (Moore, 1879)
94. '*Euproctis' similis* (Moore, 1879)
95. *Lymantria ascetria* Hubner, 1821
96. *Numenes patrana* Moore, 1859

Subfamily: Amphipyrinae
97. *Amphipyra cupreipennis* Moore, 1882

Subfamily: Erebinae
98. *Arcte polygrapha* Kollar, 1844 (Image 24)
99. *Catocala patala* Felder, 1874
100. *Hypopyra unistrigata* (Guenee, 1952)
Subfamily: Hadeninae
101. *Actinotia intermediata* (Bremer, 1861) (Image 25)

Subfamily: Pantheinae
102. *Trichosea diffusa* (Warren, 1913)

Image 1. *Herpa subhyalina* Moore (Zygaenidae)

Image 2. *Vitessa suradeva* Moore (Pyralidae)

Image 3. *Botyodes principalis* Leech (Crambidae)

Image 4. *Bradina diagonalis* (Guenee) (Crambidae)

Image 5. *Maruca testulalis* (Geyer) (Crambidae)

Image 6. *Spoladea recurvalis* (Fabricius) (Crambidae)

Image 7. *Cyclidia rectificata* Walker (Drepanidae)

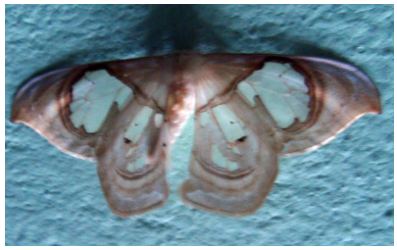

Image 8. *Macrauzata fenestraria* (Moore) (Drepanidae)

Image 9. *Macrocilix mysticata* (Walker) (Drepanidae)

Image 10. *Trabala vishnou* Lefebvre (Lasiocampidae)

Image 11. *Acherontia lachesis* (Fabricius) (Sphingidae)

Image 12. *Agathia hilarata* (Guenee) (Geometridae)

Image 13. *Europlema himala* (Butler) (Uraniidae)

Image 14. *Tanaorrhinus luteoviridata* (Walker) (Geometridae)

Image 15. *Alcis arisema* Prout (Geometridae)

Image 16. *Xandrames albofasciata* Moore (Geometridae)

Image 17. *Agylla remelana* (Moore) (Erebidae)

Image 18. *Creatonotus transiens* (Walker) (Erebidae) (Image 18)

Image 19. *Nyctemera adversata* (Schaller) (Erebidae)

Image 20. *Nyctemera arctata* (Walker) (Erebidae)

Image 21. *Spilosoma dalbergiae* (Moore) (Erebidae)

Image 22. *Cyana signa* (Walker) (Erebidae)

Image 23. *Chrysorabdia bivitta* (Walker) (Erebidae)

Image 24. *Arcte polygrapha* Kollar (Erebidae)

Image 25. *Actinotia intermediata* (Bremer) (Erebidae)