

Diversity of Butterflies in Renuka Lake and its Vicinity of Himachal Pradesh

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Abstract: *Butterflies diversity in Himachal Pradesh is very rich and diversified, primarily due to varied climatic conditions ranging from tropical in the foothills to arctic environment in the Trans-Himalayan region. Renuka Lake situated at 30°36'36" North latitude and 77°27'30" East longitude and at an altitude of 672 (2205 ft) m, in district Sirmaur of Himachal Pradesh with a circumference of about 3214 m (10,545 ft). A lion safari and a zoo are there at Renuka Ji. This area fall under the Renuka Ji Wild Life Sanctuary. The sanctuary falls in the biogeographical zone IV and biogeographical province IV as per the classification done by the Wildlife Institute of India (WII) various natural ecosystems/habitats like agriculture fields, forests, grasslands, streams, human habitations etc., were selected to explore the presence of Butterflies in studied area. Butterflies studies carried out in Renuka Lake and its vicinity, during different seasons of the years revealed the presence of 49 species of insects belonging to 37 genera and 9 families. During the course of present studies it was observed that Nymphalidae represented by 12 species (25%), spread over 8 genera was the largest family followed by Pieridae (11 species (23%)), Papilionidae and Satyridae (8 species (16%) each), Danaidae (4 species (8%)), Lycaenidae and Hesperidae (2 species (4%) each). Moreover, it was interesting to note that two families of butterflies viz., Erycinidae and Acraeidae were represented by one species (2%) each.*

Keywords: Butterflies, Renuka Ji lake, Himachal Pradesh, Wildlife Sanctuary, Trans-Himalayan.

1. Introduction

Insects are the most dominant creatures on this earth. It is commonly believed that 75 to 80% of the total animal species on this planet are insects. The world contains at least 10 to 30 million species of arthropods most of them being the insects (May, 1988). The Insects are believed to have appeared on this planet in the Devonian period, some 200 million years ago and since then survived the glacial periods and evolved into myriad forms. Lepidoptera, one of the highly specialized insect orders, includes scale winged insects of the holometabolous-endopterygote series. This order includes butterflies and moths that show total metamorphosis and pass through egg, larva, pupa and adult stages. Butterflies have always been a subject of fascination to mankind and they are considered as one of the best-known species of insects. The term 'butterfly' is derived from the butter-yellow colour of the male of 'Common Brimstone' of the Family Pieridae. These are most easily recognizable of all the other insects and second in number in their universal popularity after birds. Because of their charming colour patterns and most interesting phenomenon of mimicry and migration, these evoke curiosity and fondness among all the people on the earth, particularly among children, naturalists and scientists. They are good pollinators of many agricultural and horticultural crops. The adults visit flowers for nectar, while some of the male species congregate on damp or moist places near streams. Some of the species are attracted in large number over ripe fruits, animal dung and bird-droppings, etc., while majority of butterflies are found in sheltered and shaded areas; several others occur in open ground, among bushes and over tree tops.

1. Previous Study

The diversity and bioecological study on insects in India were initiated with the arrival of the European traders, missionaries

and rulers largely from middle of the 18th century. Insects became one of the subjects of interest with the establishment of Royal Asiatic Society of Bengal. Studies of Beeson (1941) "An epitome to the National History of Insects" and "Ecology and control of forest insects in India and the neighboring countries" are excellent work from the South Asian region. Moreover, until the publication of first account of Indian butterflies in 1857 in their 'Catalogue of the Lepidoptera in the Museum of East India Company,' little attention was paid to Indian butterflies, though these butterflies have attracted the attention of some researchers (Talbot, 1939).

The earliest comprehensive work on butterfly diversity of Indian subcontinent was Moore's 'Lepidoptera of Ceylon,' the first volume of which appeared in 1881. In 1882, Lionel de Niceville and Major GFL Marshall published the first volume of 'The butterflies of India, Burma and Ceylon,' followed by the second in 1890. Many investigators have studied the diversity, distribution, relative abundance, taxonomy and ecology of butterflies from different parts of the country (Wynter-Blyth, 1982; Alfred *et al.*, 1998; Alfred, 2005; Thakur *et al.*, 2006 a), but only a few studies have been conducted on biosystematics and ecology of butterflies from the Himalayan region (Mani, 1986; Mehta *et al.*, 2002; Mehta *et al.*, 2003; Arora *et al.*, 1995, 2005). However, a little has been done to survey the insect fauna from Himachal Pradesh (Uniyal and Mathur, 1998; Mehta *et al.*, 2002, 2006 b; Singh, 2007; Kumar, 2009). Keeping in view the above account, present studies were undertaken in order to update the account of maximum number of species in a short span of time.

2. Study Area and Methodology

Diversity and ecological studies of butterflies in Renuka Ji Lake and its vicinity, District Sirmaur of Himachal Pradesh were conducted in different season and various habitat.

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Important biological aspects of butterflies studied were: diversity distribution, habits and habitat, and taxonomy. These investigations were mainly intended to know the current status of butterflies in Renuka Ji Lake and its vicinity which has in recent past seen industrial growth and increasing anthropogenic pressure. Renuka Lake situated at 30°36'36" North latitude and 77°27'30" East longitude and at an altitude of 672 (2205 ft) m, in district Sirmaur of Himachal Pradesh with a circumference of about 3214 m (10,545 ft) (Figure 1). A lion safari and a zoo are there at Renuka Ji. This area fall under the Renuka Ji Wild Life sanctuary. The total area of

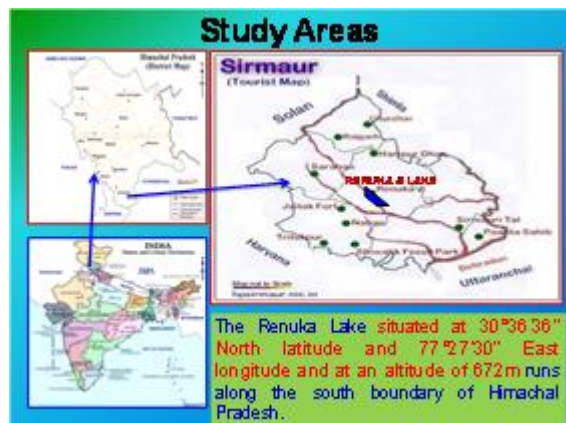


Figure 1: Map Showing the Location of Renuka Ji Lake and Its Vicinity of Himachal Pradesh

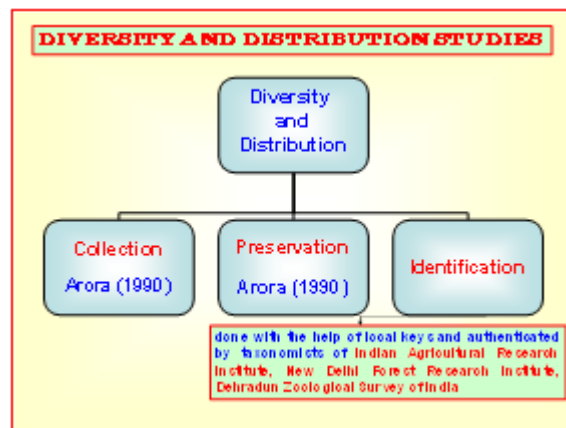


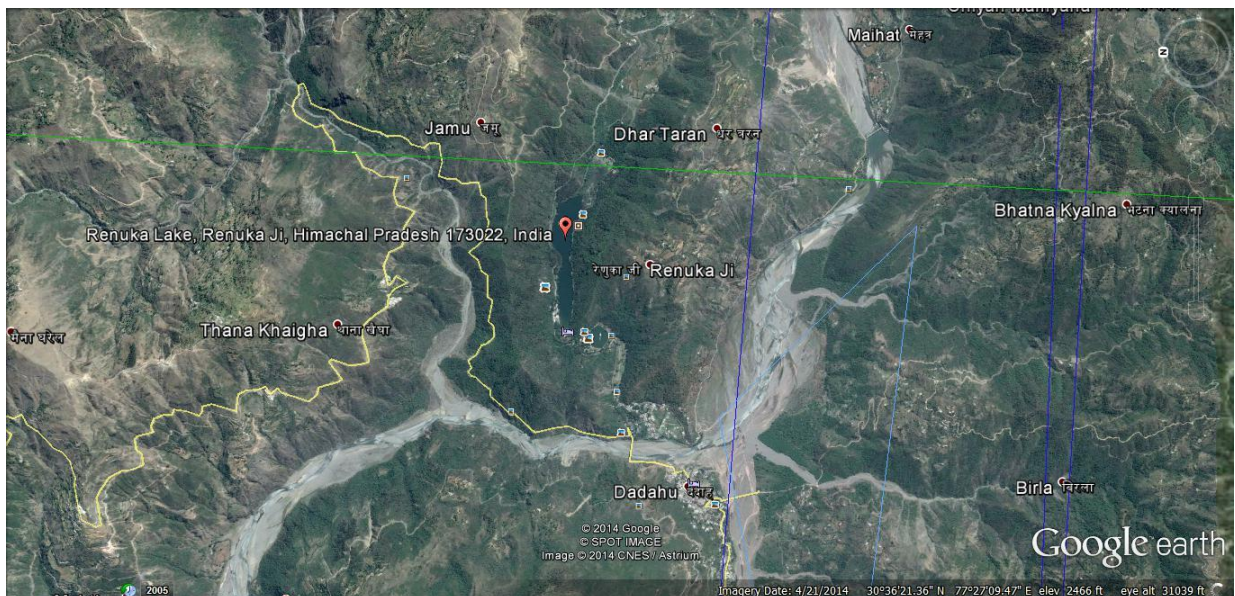
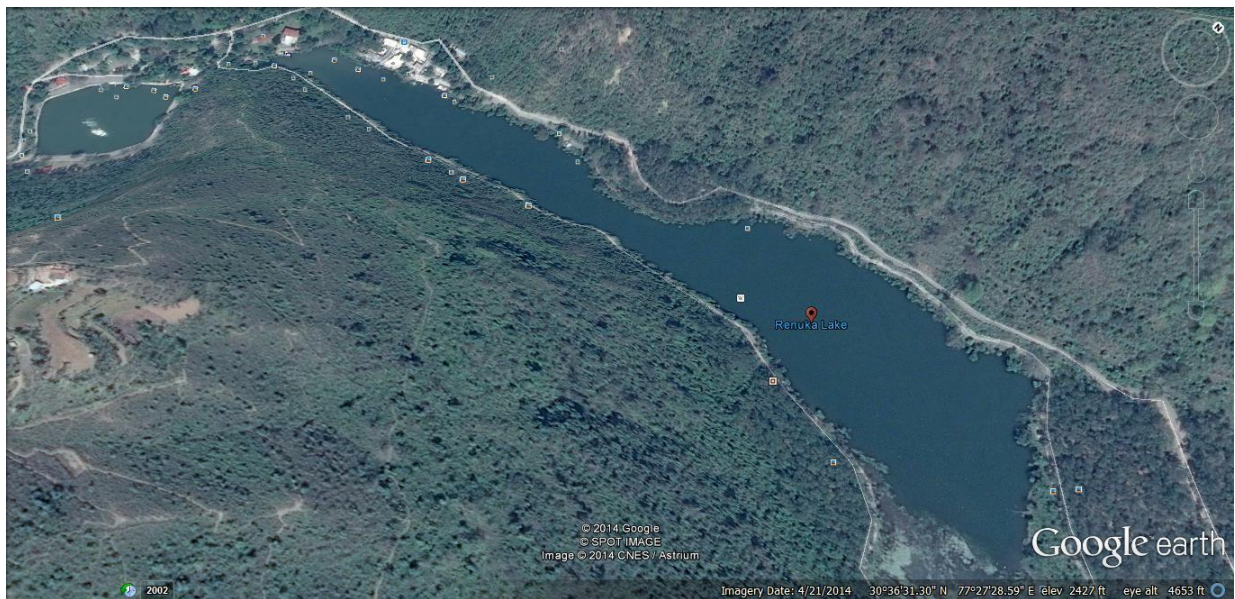
Figure 2: The Methodology for Present Diversity Study of Renuka Ji Lake and Its Vicinity of Himachal Pradesh

sanctuary is about 4.028 km². The entire sanctuary consists of Renuka Reserve Forest. An area of roughly about 3 km² that lies outside the sanctuary has been declared as a buffer belt. The sanctuary falls in the biogeographical zone IV and biogeographical province IV as per the classification done by the Wildlife Institute of India (WII). According to forest type's classification, the area falls under group 5B/C2, i.e., dry mixed deciduous forest and group 5/051, i.e., dry sal forest. Various natural ecosystems/habitats like agriculture fields, forests, grasslands, streams, human habitations etc., were selected to explore the presence of Butterflies in studied area. The comprehensive bio-ecological studies were conducted on various aspects of butterfly fauna in Renuka Lake and its vicinity, District Sirmaur of Himachal Pradesh.

Site Views of Renuka Ji Lake and Its Vicinity



Some Satellite Views of Renuka Ji Lake and Its Vicinity of Himachal Pradesh



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The butterfly specimens collected by various methods like hand picking, beating, sweeping, trapping, night trap and aerial netting were then killed in a killing bottle. After killing, specimens were removed from bottle within half an hour to avoid any damage to colouration and then pinned, identified, preserved and labeled (Arora, 1990) (Figure 2). The identified

collections were stored in insect cabinets having good quality drawers. The naphthalene powder was also put in the grooves of the drawers. The cotton balls soaked in the mixture of camphor and carbolic acid, in the ratio of 1:3 were put in each corner of the drawers.

Table 1: Diversity of butterflies species in Renuka Lake and its vicinity of Himachal Pradesh

S.No.	Taxon	S.No.	Taxon
	Family: Papilionidae	30	<i>Aulocera saraswati</i> (Kollar)
1	<i>Polydorus philoxenus philoxenus</i> (Gray)	31	<i>Ypthima sakra nikaea</i> Moore
2	<i>Polydorus dasarada ravana</i> (Moore)	27	<i>Lethe insane insane</i> (Kollar)
3	<i>Papilio protenor protenor</i> Cramer	28	<i>Rhaphicera moorei moorei</i> Butler
4	<i>Papilio polyctor polyctor</i> Boisduval	29	<i>Aulocera swaha swaha</i> (Kollar)
5	<i>Papilio demoleus demoleus</i> Linnaeus	30	<i>Aulocera saraswati</i> (Kollar)
6	<i>Pathysa nomius nomius</i> (Esper.)	31	<i>Ypthima sakra nikaea</i> Moore
7	<i>Graphium cloanthus cloanthus</i> (Westwood)		Family: Nymphalidae
8	<i>Parnassius hardwickei hardwickei</i> Gray	32	<i>Neptis mahendra</i> Moore
	Family: Pieridae	33	<i>Neptis hylas astola</i> Moore
9	<i>Metaporia leucodice soracta</i> (Moore)	34	<i>Hypolimnys bolina</i> (Linn.)
10	<i>Metaporia agathoni phryxe</i> (Boisduval)	35	<i>Hypolimnys misippus</i> (Linn.)
11	<i>Delias belladonna horsfieldi</i> (Gray)	36	<i>Precis hiarta</i> (Fabr.)
12	<i>Delias eucharis</i> (Drury)	37	<i>Precis orithya</i> (Linn.)
13	<i>Anaphaeis aurota aurota</i> (Fabr.)	38	<i>Precis almana</i> (Linn.)
14	<i>Pieris canidia indica</i> Evans	39	<i>Cynthia cardui</i> (Linn.)
15	<i>Ixias marianne</i> (Cramer)	40	<i>Vanessa cashmirensis</i> Kollar
16	<i>Catopsilia crocale</i> (Cramer)	41	<i>Argynnis lathonia</i> (Linn.)
17	<i>Gonepteryx rhamni nepalensis</i> Doubleday	42	<i>Phalanta phalantha</i> (Drury)
18	<i>Eurema laeta laeta</i> (Boisduval)	43	<i>Auzakia danava</i> (Moore)
19	<i>Colias erate erate</i> (Esper)		Family: Erycinidae
	Family: Danaidae	44	<i>Libythea myrrha</i> Godart
20	<i>Danaus chrysippus chrysippus</i> (Linn.)		Family: Acraeidae
21	<i>Tirumala hamata septentrionis</i> (Butler)	45	<i>Acraea issoria anomala</i> Kollar
22	<i>Parantica sita sita</i> (Kollar)		Family: Lycaenidae
23	<i>Euploea core core</i> (Cramer)	46	<i>Pseudozizeeria maha</i> (Kollar)
	Family: Satyridae	47	<i>Spindasis vulcanus</i> (Fabr.)
24	<i>Mycalesis perseus blasius</i> (Fabr.)		Family: Hesperidae
25	<i>Mycalesis mineus mineus</i> (Linn.)	48	<i>Suastus gremius</i> (Fabr.)
26	<i>Lethe rohria rohria</i> (Fabr.)	49	<i>Spialia galba</i> (Fabr.)
27	<i>Lethe insane insane</i> (Kollar)		
28	<i>Rhaphicera moorei moorei</i> Butler		
29	<i>Aulocera swaha swaha</i> (Kollar)		

3. Result and Discussion

Diversity and ecological studies were conducted on butterfly fauna in order to study their diversity, distribution and taxonomy in different agro climatic zones of Renuka Lake and its vicinity, Himachal Pradesh. An attempt was also made to examine the taxonomically significant morphological features including vein venation for characterising different species/subspecies of butterflies. Investigations were also made on habits and habitat of different butterfly species and their interrelationship with flora. Estimates within Lepidoptera from the Indian sub-continent reveal that the group comprises over 15,000 species and many more subspecies distributed over 84 families and 18 superfamilies (Alfred et al., 1998). There are about 1500 species of butterflies in India (Alfred et al., 1998). Presence of butterfly species at a particular habitat depends on a wide range of factors, of which the availability of food and climatic conditions are the most important. Butterflies show distinct pattern of habitat utilization. The nature of vegetation is an important factor, which determines the dependence and survival of a species on a particular habitat. Being highly sensitive to environmental changes, they are now being used as indicators of environmental quality and also reflect the health of an ecosystem. Present diversity and ecological studies on butterflies carried out in Renuka lake and its vicinity, during different seasons of the years revealed the presence of 49 species of insects belonging to 37 genera and 9 families (Table 1). During the course of present studies it was observed that Nymphalidae represented by 12 species, spread over 8 genera was the largest family followed by Pieridae 11 species, Papilionidae and Satyridae 8 species each, Danaidae 4 species, Lycaenidae and Hesperidae 2 species each. Moreover, it was interesting to note

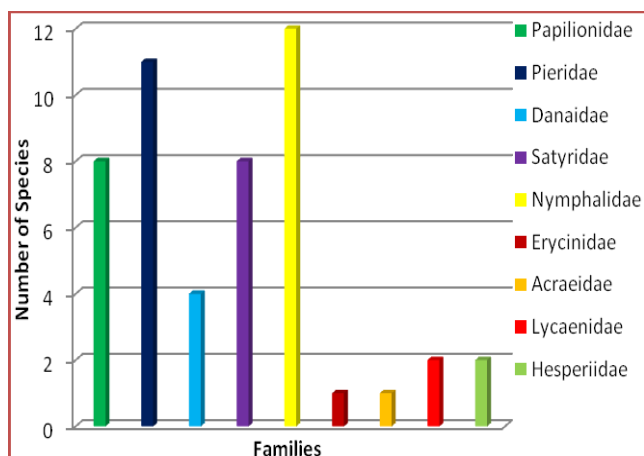


Figure 3: Diversity of Butterfly Fauna in Renuka Ji Lake and its Vicinity of Himachal Pradesh

that two families of butterflies viz., Erycinidae and Acraeidae were represented by one species each (Table 1; Figure 3). Similar studies pertaining to bio-systematics, biology,

ecology and diversity of butterflies in different parts of India in the recent past have been conducted by a number of workers. For example Nandi (1987) studied the Lepidoptera fauna of Orissa; Gupta and Thakur (1990) explored the butterflies of Gujarat; Similarly,

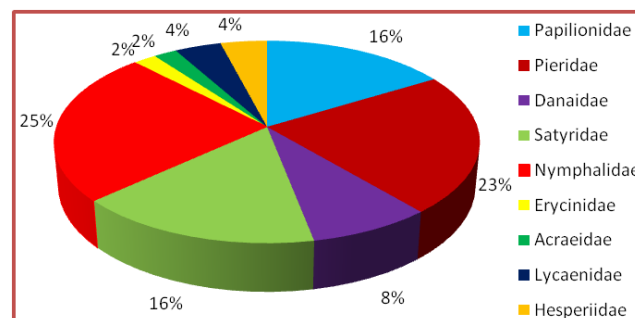


Figure 4: Percent Composition of Butterfly Families in Renuka Ji Lake and its Vicinity of Himachal Pradesh

Bhattacharya (1997). Moreover, Mandal *et al.* (2000) from Tripura; Palolet *et al.* (2001) in Arlam Wild Life sanctuary, Kerala; Radhakrishnan *et al.* (2002) from Eravikulam National Park, Kerala; and Singh (2007) studied 87 species of butterflies belonging to 64 genera and 10 families from Shiwalik hills. He further found that maximum number of species belonged to family Lycaenidae (18) followed by Nymphalidae, Pieridae and Hesperidae (16 species each), Satyridae (9), Danaidae (5), Papilionidae (4) and Acraeidae, Erycinidae and Riodinidae (1 each). Kumar (2009) recorded the presence of 102 species of butterflies belonging to 66 genera and 9 families. Of 102 species studied, the maximum number of species belonged to family Nymphalidae (26 species), followed by Pieridae and Satyridae (19 each), Papilionidae (14), Danaidae (8), Lycaenidae (7), Hesperidae (5), Erycinidae (3) and Acraeidae (1).

Further, the percent composition studies of butterfly fauna show that Nymphalidae represented by 25% species, was the largest family followed by Pieridae 23 % species, Papilionidae and Satyridae 16% species each, Danaidae 8% species, Lycaenidae and Hesperidae 4% species each and two families of butterflies viz., Erycinidae and Acraeidae were represented by 2% species each (Table 1; Figure 4).

Similarly, Shields (1989) has reported 6440 species of Nymphalidae from the world, which reduced to 3562, on excluding subfamilies Danainae, Satyrinae and Colinae from the family. Moreover, Nymphalidae is the largest family represented with nearly one-third of the known butterfly species of the world. From the Indian region, Varshney (1986) has shown 232 species of this family. Rose and Sidhu (2001) have listed 21 species of this family in the Punjab. Similarly, Arora *et al.* (2005) has enlisted this family as the largest family with 56 species in Himachal Pradesh. Kumar (2009) recorded the Thus, it is evident that by laying

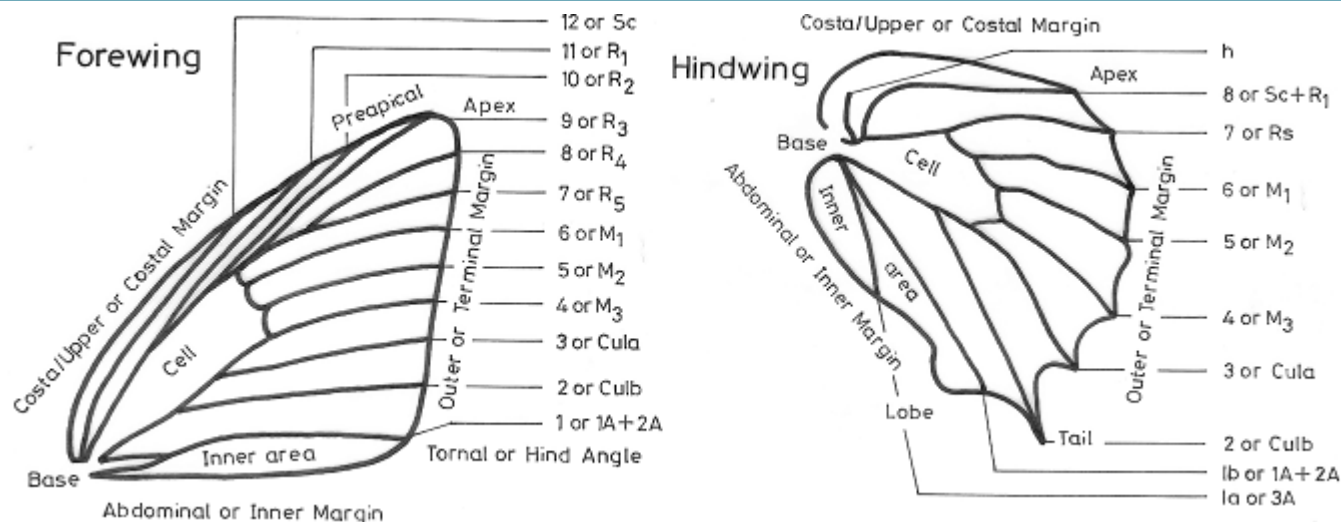


Figure 5, 6: General Wing Venation Of Forewing And Hindwing Butterfly

particular emphasis on the biosystematics and ecology and their profitable use for identification of genera and species has justified the scope of present study. In spite of important contribution, it is desired that more intensive and repeated surveys in the poorly surveyed and virgin areas should be conducted to have new information. It is hoped that present contribution will provide a model for further studies in this field.

Present study of diversity contributes to the requirements of conservation and monitoring for climate change. It gives basic identification, makes information available, assembles information from a comparative perspective and thus allows synthesis, generates and stimulates idea and hypothesis applicable to other fields. Thus, these studies are quite closely related because understanding the biodiversity is the basis of systematic. As butterflies are very good bio-indicators of any disturbance in the ecosystem. So, studies on their diversity status, etc. shall be of great use in monitoring changes in an ecosystem especially due to habitat degradation, deforestation and organic and inorganic pollution.

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