



Butterflies (Insecta: Lepidoptera: Papilionoidea) Fauna of Papum Pare district of Arunachal Pradesh, India

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Abstract: The Papum Pare district of Arunachal Pradesh was surveyed from April 2019 to March, 2022 to record the butterfly diversity. Total 209 species referable to 127 genera under six families i.e., Nymphalidae, Pieridae, Papilionidae, Lycaenidae, Riodinidae and Hesperidae were recorded from Papum Pare district. The family Nymphalidae was with maximum number of species i.e., 85 species under 42 genera (40%), followed by Lycaenidae, 49 species under 38 genera (23%), Hesperidae, 36 species under 27 genera (17%), Pieridae, 20 species under 12 genera (10%), Papilionidae, 18 species under 7 genera (9%), and Riodinidae, 1 species under 1 genus (1%). The diversity revealed that of these 209 species, 60 species (29%), were common, 84 species (40%) uncommon and remaining 65 species (31%) less common. Out of 209 species, 37 species are in the Wildlife (Protection) Amendment Act, 2022.

Keywords: Butterfly, Diversity, Papum Pare, Wildlife (Protection) Amendment act, Arunachal Pradesh

Arunachal Pradesh is one of the 28 states of India, situated in the country's Northeast. The state is 83,743 square kilometers in size. The state is bordered by Assam and Nagaland in the south and shares international borders with Bhutan in the West, Myanmar in the East and the People's Republic of China in the North. Most of Arunachal Pradesh is mountainous and terrain consists of lofty, haphazardly aligned ridges that separate deep valleys and rise to the peaks of the Great Himalayas. Geographically speaking, Arunachal Pradesh is essentially a hilly region tucked away in the Himalayan foothills. Four major climate categories and five major forest types—plus a sixth category of secondary forests—can be used to categorize the vegetation of Arunachal Pradesh. These are tropical forests, sub tropical forests, pine forests, temperate forests and alpine forests. Arunachal Pradesh is the largest in area among North – Eastern states and is the second largest forest covered state next to Madhya Pradesh in the country.

Butterflies, the flying flowers, form a crucial component in the food web-chain and are at the primary trophic level and important pollinators (anthophilous). Their habitat requirement are very diverse in terms vegetation, water and moisture and also depend on sun and warmth, shadow, etc. (Warren 1985). Butterflies are a valuable tool for monitoring the health of the environment and can provide early warning signs of environmental stress or pollution. Abundance of butterflies usually indicates a healthier ecosystem. The 1.87% of all insects worldwide are butterflies, with 18768 species currently recognized (van Nieukerken et al., 2011). From the Indian Himalaya, a total of 1013 species from six families are known.

Doubleday (1845) was the first person to study butterflies of North –Eastern India from Lower Dibang Valley. Earlier British Lepidopterists had explored and published reports from Abor and Mishimi hills (Moore 1857, Evans 1912, South 1913). The other important contributions on the butterfly fauna of Arunachal Pradesh were made by Betts (1950), Varshney and Chandra (1971), Arora and Mondal (1981), Mondal (1985), Gupta and Shukla (1988), Radhakrishnan (1988), Athreya (2006), Borang et al. (2008), Gogoi (2012), Roy (2013), Sondhi and Roy (2013), Sondhi and Kunte (2014), Sondhi and Kunte (2016), Singh (2017), Gayen et al. (2019), Mazumder et al. (2019), Sharma and Prathana (2020, 2021, 2021a). The main objective of the study is to provide the inventory of butterflies from Papum Pare district of Arunachal Pradesh and this is the first study on the diversity of butterflies from Papum Pare district.

MATERIAL AND METHODS

The collections and observations were made at Papum Pare district of Arunachal Pradesh from April 2019 to March, 2022. Papum Pare District is situated in the Northeastern part of Arunachal Pradesh. It is extended between 26°55' and 28°40' North latitude and 92°40' and 94°21' East longitudes. The state of Assam borders the district on the South, Lower Subansiri district on the East, East Kameng district on the West, and Kra Daadi district on the North. The district's name is taken from the names of its two principal rivers, Papum and Pare. The district covers an area of 3462 sq. kms. approximately. The land is mostly mountainous with Himalayan ranges. The hill ranges approximately varies from 45 to 1200 mtrs. above sea level. The natural vegetation of

Papum Pare district comprises chiefly humid semi-evergreen and sub-tropical evergreen forests. The vegetation is largely made up of ferns and rhododendrons at higher elevations, and tall trees, shrubs, bamboo, wild bananas, cane, and various other types of creepers found at lower elevations.

The specimens were collected with the help of a specified butterfly net. Being soft, the species need a light pressure at thorax while killing. After killing, the specimens were transferred to the insect folder labelled with name of locality, date, latitude, longitude and altitude. Later in the laboratory, the specimens were relaxed in desiccator and stretched. After drying in the drying chamber for 3 days, the adults were shifted to fumigated insect storage boxes. All the well stretched specimens labelled with the information such as name of collector, place of collection, date of collection, latitude, longitude, and altitude. The identified specimens have been deposited in the National Zoological Collections (NZC) at, Arunachal Pradesh Regional Centre, Itanagar. The butterflies were determined as per the available literature (Evans, 1932, Talbot, 1939, 1947, Wynter-Blyth, 1957, Kehimkar, 2008, Sidhu and Kumar, 2016). The geographic

coordinates and altitude were obtained, by Orgon 550 Garmin GPS.

RESULTS AND DISCUSSION

Total 209 species referable to 127 genera under six families i.e., Papilionidae, Pieridae, Nymphalidae, Riodinidae, Lycaenidae, and Hesperidae were recorded from the Papum Pare district of Arunachal Pradesh. The family Nymphalidae was with maximum number of species i.e., 85 species under 42 genera (40%), followed by Lycaenidae, 49 species under 38 genera (23%), Hesperidae, 36 species under 27 genera (17%), Pieridae, 20 species under 12 genera (10%), Papilionidae, 18 species under 7 genera (9%), and Riodinidae, 1 species under 1 genus (1%) (Table 1, Fig. 1). Out of 209 species, 60 species (29%), were found to be common, 84 species (40%) uncommon and remaining 65 species (31%) less common (Table 1, Fig. 2).

In all the six butterfly families, Nymphalidae is the only family having the dry and wet-season forms in some genera. Seasonal morphological variations were noted in the fifteen

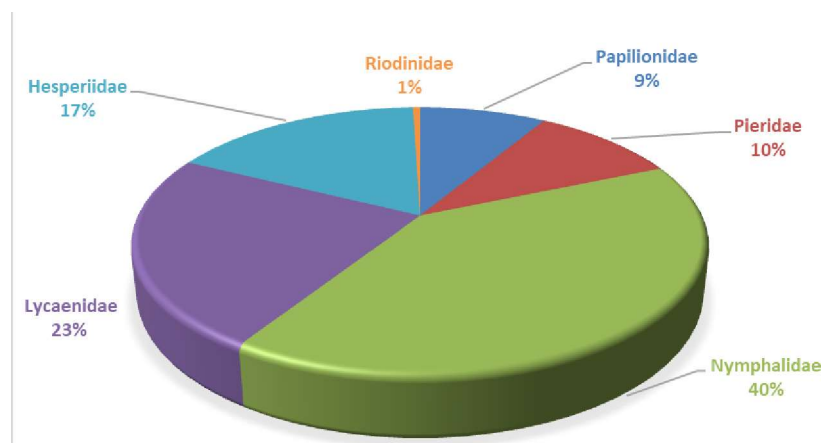


Fig. 1. Family-wise number of species of butterflies

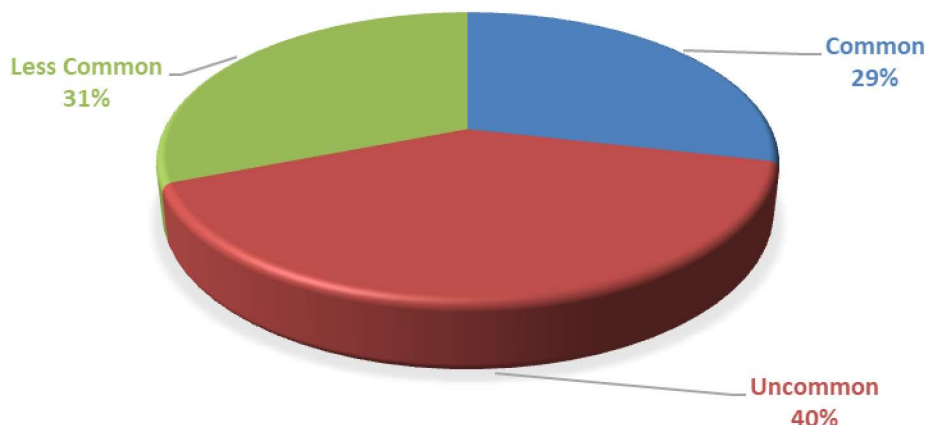


Fig. 2. Relative abundance of butterflies

Table 1. Inventory of Butterflies (Rhopalocera) recorded from Papum Pare District, Arunachal Pradesh

Scientific name	Common name	Status	Wild Life (Protection) Amendment Act, 2022
Family: PAPILIONIDAE			
Subfamily PAPILIONINAE			
<i>Pachliopta aristolochiae</i> (Fabricius 1775)	Common Rose	Uncommon	
<i>Troides aeacus</i> (C. & R. Felder 1860)	Golden Birdwing	Common	Schedule II, part H
<i>Troides helenus</i> (Linnaeus 1758)	Common Birdwing	Uncommon	Schedule IV, Appendix II
<i>Byasa dasarada</i> (Moore 1858)	Great Windmill	Uncommon	
<i>Papilio bianor</i> Cramer [1777]	Common peacock	Uncommon	
<i>Papilio clytia</i> Linnaeus 1758	Common Mime	Uncommon	Schedule II, Part H
<i>Papilio demoleus</i> Linnaeus 1758	Lime Butterfly	Common	
<i>Papilio helenus</i> Linnaeus 1758	Red Helen	Common	
<i>Papilio memnon</i> Linnaeus 1758	Great Mormon	Common	
<i>Papilio polytes</i> Linnaeus 1758	Common cormon	Common	
<i>Papilio paris</i> Linnaeus 1758	Paris Peacock	Less Common	
<i>Papilio alcmenor</i> C. & R. Felder [1864]	Redbreast	Uncommon	
<i>Papilio protenor</i> Cramer [1775]	Spangle	Uncommon	
<i>Graphium agamemnon</i> (Linnaeus 1758)	Tailed Jay	Less Common	
<i>Graphium sarpedon</i> (Linnaeus 1758)	Common Bluebottle	Common	Schedule II, Part H
<i>Graphium xenocles</i> (Doubleday 1842)	Great Zebra	Uncommon	
<i>Lamproptera curius</i> (Fabricius 1787)	White Dragontail	Less Common	
<i>Meandrusa payeni</i> (Boisduval 1836)	Yellow Gorgon	Uncommon	
Family HESPERIIDAE			
Subfamily COELIADINAE			
<i>Hasora chromus</i> (Cramer [1780])	Common Banded Awl	Less Common	
Subfamily PYRGINAE			
<i>Tagiades japedus</i> (Stoll [1781])	Suffused Snow Flat	Less Common	
<i>Tagiades litigiosa</i> Moeschler 1878	Water Snow Flat	Less Common	
<i>Celaenorrhinus leucocera</i> (Kollar [1844])	Common Spotted Flat	Uncommon	
<i>Pseudocoladenia dan</i> (Fabricius 1787)	Fulvous Pied Flat	Common	
<i>Spialia galba</i> (Fabricius 1793)	Indian Skipper	Less Common	
Subfamily HESPERIINAE			
<i>Ochus subvittatus</i> (Moore 1878)	Tiger Hopper	Uncommon	
<i>Ampittia dioscorides</i> (Fabricius 1793)	Bush Hopper	Uncommon	
<i>Aeromachus jhora</i> (de Niceville 1885)	Grey Scrub Hopper	Uncommon	
<i>Halpe zola</i> Evans 1937	Long-banded Ace	Uncommon	
<i>Pithauria stramineipennis</i> Wood-Mason & de Niceville [1887]	Light Straw Ace	Uncommon	
<i>Astictopterus jama</i> C. & R. Felder 1860	Forest Hopper	Uncommon	
<i>Iambrix salsala</i> (Moore [1866])	Chestnut Bob	Common	
<i>Koruthaialos butleri</i> (de Niceville [1884])	Dark Velvet Bob	Uncommon	
<i>Ancistroides nigrita</i> (Latreille [1824])	Chocolate Demon	Uncommon	
<i>Notocrypta curvifascia</i> (C. & R. Felder 1862)	Restricted Demon	Common	
<i>Notocrypta paralysos</i> (Wood-Mason & de Niceville 1881)	Common Banded Demon	Uncommon	
<i>Gangara thyrsis</i> (Fabricius 1775)	Giant Redeye	Uncommon	
<i>Udaspes folus</i> (Cramer [1775])	Grass Demon	Common	

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Scientific name	Common name	Status	Wild Life (Protection) Amendment Act, 2022
<i>Scobura isota</i> Swinhoe 1893	Swinhoe's Forest Bob	Uncommon	
<i>Erionota torus</i> Evans 1941	Banana Skipper	Less Common	
<i>Parnara guttatus</i> (Bremer & Grey [1852])	Straight Swift	Uncommon	
<i>Borbo cinnara</i> (Wallace 1866)	Rice Swift	Less Common	
<i>Pelopidas assamensis</i> (de Niceville 1882)	Great Swift	Uncommon	
<i>Pelopidas mathias</i> (Fabricius 1798)	Variable Swift	Uncommon	
<i>Pelopidas conjuncta</i> (Herrich-Schaeffer 1869)	Conjoined Swift	Uncommon	
<i>Pelopidas sinensis</i> (Mabille 1877)	Large Branded Swift	Uncommon	
<i>Polytremis eltola</i> (Hewitson 1869)	Yellow Spot Swift	Uncommon	
<i>Polytremis lubricans</i> (Herrich-Schaeffer 1869)	Contiguous Swift	Less Common	
<i>Baoris farri</i> (Moore 1878)	Paintbrush Swift	Common	
<i>Baoris pagana</i> (de Niceville 1887)	Figure of Eight Swift	Uncommon	
<i>Caltoris philippina</i> (Herrich-Schaeffer 1869)	Philippine Swift	Uncommon	
<i>Caltoris tulsii</i> (de Niceville [1884])	Purple Swift	Uncommon	
<i>Potanthus pallidus</i> (Evans 1932)	Pale Dart	Less Common	
<i>Potanthus mara</i> (Evans 1932)	Sikkim Dart	Less Common	
<i>Telicota bambusae</i> (Moore 1878)	Dark Palm Dart	Uncommon	
Family PIERIDAE			
Subfamily COLIADINAE			
<i>Catopsilia pomona</i> (Fabricius 1775)	Common Emigrant	Common	
<i>Catopsilia pyranthe</i> (Linnaeus 1758)	Mottled Emigrant	Common	
<i>Gandaca harina</i> (Horsfield [1829])	Tree Yellow	Less Common	
<i>Eurema blanda</i> (Boisduval 1836)	Three-spot Grass Yellow	Less Common	
<i>Eurema hecabe</i> (Linnaeus 1758)	Common Grass Yellow	Common	
Subfamily PIERINAE			
<i>Leptosia nina</i> (Fabricius 1793)	Psyche	Common	
<i>Pieris brassicae</i> (Linnaeus 1758)	Large Cabbage White	Common	
<i>Pieris canidia</i> (Linnaeus 1768)	Indian Cabbage White	Common	
<i>Ixias pyrene</i> (Linnaeus 1764)	Yellow Orange Tip	Less Common	
<i>Appias indra</i> (Moore 1857)	Plain Puffin	Uncommon	Schedule II, Part H
<i>Appias libythea</i> (Fabricius 1775)	Striped Albatross	Common	
<i>Appias lycinda</i> (Cramer [1777])	Chocolate Albatross	Common	Schedule II, Part H
<i>Cepora nadina</i> (Lucas 1852)	Lesser Gull	Uncommon	Schedule II, Part H
<i>Appias galba</i> (Wallace 1867)	Indian Orange Albatross	Uncommon	
<i>Cepora nerissa</i> (Fabricius 1775)	Common Gull	Less Common	
<i>Delias acalis</i> (Godart 1819)	Redbreast Jezebel	Uncommon	
<i>Delias descombesi</i> (Boisduval 1836)	Red-spot Jezebel	Common	
<i>Delias pasithoe</i> (Linnaeus 1767)	Red-base Jezebel	Uncommon	
<i>Pareronia avatar</i> (Moore [1858])	Pale Wanderer	Less Common	Schedule II, Part H
<i>Hebomoia glaucippe</i> (Linnaeus 1758)	Great Orange-tip	Common	
Family RIODINIDAE			
Subfamily RIODININAE			
<i>Zemeros flegyas</i> (Cramer [1780])	Punchinello	Common	
Family LYCAENIDAE			
Subfamily PORITINAE			
<i>Poritia hewitsoni</i> Moore [1866]	Common Gem	Uncommon	Schedule II, Part H

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Scientific name	Common name	Status	Wild Life (Protection) Amendment Act, 2022
Subfamily MILETINAE			
<i>Taraka hamada</i> (Druce 1875)	Forest Pierrot	Uncommon	
<i>Spalgis epius</i> (Westwood [1851])	Common Apefly	Less Common	
Subfamily LYCAENINAE			
<i>Heliophorus epicles</i> (Godart [1824])	Purple Sapphire	Common	
<i>Heliophorus tamu</i> (Kollar [1844])	Powdery Green Sapphire	Less Common	
Subfamily APHNAEINAE			
<i>Spindasis lohita</i> (Horsfield [1829])	Long-banded Silverline	Uncommon	Schedule II, Part H
Subfamily THECLINAE			
<i>Arhopala centaurus</i> (Fabricius 1775)	Centaur Oakblue	Less Common	
<i>Surendra quercetorum</i> (Moore [1858])	Common Acacia Blue	Less Common	
<i>Loxura atymnus</i> (Stoll 1780)	Yamfly	Less Common	
<i>Yasoda tripunctata</i> (Hewitson 1863))	Branded Yamfly	Less Common	Schedule II, Part H
<i>Horaga onyx</i> (Moore 1858)	Common Onyx	Uncommon	
<i>Cheritra freja</i> (Fabricius 1793)	Common Imperial	Common	
<i>Suasa lisides</i> (Hewitson [1863])	Red Imperial	Uncommon	Schedule II, Part H
<i>Hypolycaena erylus</i> (Godart [1824])	Common Tit	Common	
<i>Zeltus amasa</i> (Hewitson [1865])	Fluffy Tit	Less Common	
<i>Deudorix epijarbas</i> (Moore 1857)	Cornelian	Uncommon	
<i>Rapala nissa</i> (Kollar [1844])	Common Flash	Uncommon	
<i>Rapala pheretima</i> (Hewitson 1863)	Copper Flash	Less Common	
Subfamily POLYOMMATINAE			
<i>Anthe emolus</i> (Godart [1824])	Common Ciliate Blue	Common	
<i>Una usta</i> (Distant 1886)	Singleton	Uncommon	Schedule II, Part H
<i>Petrelaea dana</i> (de Nicéville [1884])	Dingy Lineblue	Uncommon	
<i>Nacaduba beroe</i> (C. & R. Felder [1865])	Opaque Six-Lineblue	Common	
<i>Nacaduba kurava</i> (Moore [1858])	Transparent Six-Lineblue	Uncommon	
<i>Prosotas aluta</i> (Druce 1873)	Banded Lineblue	Uncommon	Schedule II, Part H
<i>Prosotas bhutea</i> (de Nicéville [1884])	Bhutia Lineblue	Less Common	Schedule II, Part H
<i>Prosotas nora</i> (C. Felder 1860)	Common Lineblue	Less Common	
<i>Prosotas dubiosa</i> (Semper [1879])	Tailless Lineblue	Less Common	Schedule II, Part H
<i>Ionolyce helicon</i> (C. Felder 1860)	Pointed Lineblue	Uncommon	Schedule II, Part H
<i>Caleta elna</i> (Hewitson 1876)	Elbowed Pierrot	Uncommon	
<i>Jamides alecto</i> (C. Felder 1860)	Metallic Cerulean	Common	Schedule II, Part H
<i>Jamides bochus</i> (Stoll [1782])	Dark Cerulean	Less Common	
<i>Jamides elpis</i> (Godart [1824])	Glistening Cerulean	Less Common	
<i>Catochrysops panormus</i> (C. Felder 1860)	Silver Forget-me-not	Uncommon	
<i>Catochrysops strabo</i> (Fabricius 1793)	Forget-me-not	Less Common	
<i>Lampides boeticus</i> (Linnaeus 1767)	Pea Blue	Common	
<i>Leptotes plinius</i> (Fabricius 1793)	Zebra Blue	Less Common	
<i>Castalius rosimon</i> (Fabricius 1775)	Common Pierrot	Common	
<i>Tarucus ananda</i> (de Nicéville [1884])	Dark Pierrot	Uncommon	

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Scientific name	Common name	Status	Wild Life (Protection) Amendment Act, 2022
<i>Zizeeria karsandra</i> (Moore 1865)	Dark Grass Blue	Common	
<i>Pseudozizeeria maha</i> (Kollar [1844])	Pale Grass Blue	Common	
<i>Zizina otis</i> (Fabricius 1787)	Lesser Grass Blue	Common	
<i>Zizula hylax</i> (Fabricius 1775)	Tiny Grass Blue	Less Common	
<i>Talicauda nyseus</i> (Guérin-Ménéville 1843)	Red Pierrot	Uncommon	
<i>Megisba malaya</i> (Horsfield [1828])	Malayan	Uncommon	Schedule II, Part H
<i>Celastrina lavendularis</i> (Moore 1877)	Plain Hedge Blue	Uncommon	
<i>Celastrina hueglini</i> (Moore 1882)	Large Hedge Blue	Uncommon	
<i>Celastrina argiolus</i> (Linnaeus 1758)	Hill Hedge Blue	Uncommon	
<i>Acytolepis puspa</i> (Horsfield [1828])	Common Hedge Blue	Uncommon	
<i>Chilades lajus</i> (Stoll [1780])	Lime Blue	Less Common	
Family NYMPHALIDAE			
Subfamily DANAINAE			
<i>Danaus chrysippus</i> (Linnaeus 1758)	Plain Tiger	Common	
<i>Danaus genutia</i> (Cramer [1779])	Common Tiger	Common	
<i>Danaus melanippus</i> (Cramer [1777])	White Tiger	Uncommon	
<i>Parantica aglea</i> (Stoll [1782])	Glassy Tiger	Common	
<i>Tirumala septentrionis</i> (Butler 1874)	Dark Blue Tiger	Less Common	
<i>Euploea mulciber</i> (Cramer [1777])	Striped Blue Crow	Common	
<i>Euploea midamus</i> (Linnaeus 1758)	Spotted Blue Crow	Less Common	Schedule II, Part H
Subfamily CHARAXINAE			
<i>Polyura bharata</i> (C & R Felder [1867])	Common Nawab	Less Common	
<i>Charaxes bernardus</i> (Fabricius 1793)	Tawny Rajah	Less Common	Schedule II, Part H
<i>Charaxes marmax</i> Westwood 1847	Yellow Rajah	Less Common	Schedule II, Part H
Subfamily MORPHINAE			
<i>Discophora sondaica</i> Boisduval 1836	Common Duffer	Less Common	Schedule I, Part I
<i>Discophora timora</i> Westwood [1850]	Great Duffer	Uncommon	
Subfamily SATYRINAE			
<i>Elymnias hypermnestra</i> (Linnaeus 1763)	Common Palmfly	Common	
<i>Elymnias malelas</i> (Hewitson 1863)	Spotted Palmfly	Uncommon	Schedule II, Part H
<i>Elymnias nesaea</i> (Linnaeus 1764)	Tiger Palmfly	Uncommon	
<i>Penthema lisarda</i> (Doubleday 1845)	Yellow Kaiser	Uncommon	Schedule II, Part H
<i>Ethope himachala</i> (Moore 1857)	Dusky Diadem	Less Common	
<i>Melanitis leda</i> (Linnaeus 1758)	Common Evening Brown	Common	
<i>Melanitis zitenius</i> (Herbst 1796)	Great Evening Brown	Uncommon	Schedule II, Part H
<i>Lethe chandica</i> (Moore [1858])	Angled Red Forester	Common	
<i>Lethe confusa</i> Aurivillius [1898]	Banded Treebrown	Less Common	
<i>Lethe distans</i> Butler 1870	Scarce Red Forester	Uncommon	Schedule I, Part I
<i>Lethe europa</i> (Fabricius 1775)	Bamboo Treebrown	Uncommon	Schedule I, Part I
<i>Lethe kansa</i> (Moore [1858])	Bamboo Forester	Uncommon	
<i>Lethe mekara</i> (Moore [1858])	Common Red Forester	Uncommon	
<i>Mycalesis anaxias</i> Hewitson 1862	White-bar Bushbrown	Uncommon	Schedule II, Part H
<i>Mycalesis francisca</i> (Stoll [1780])	Lilacine Bushbrown	Uncommon	
<i>Mycalesis gotama</i> Moore 1857	Chinese Bushbrown	Uncommon	Schedule II, Part H

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Scientific name	Common name	Status	Wild Life (Protection) Amendment Act, 2022
<i>Mycalesis intermedia</i> (Moore [1892])	Intermediate Bushbrown	Uncommon	
<i>Mycalesis mineus</i> (Linnaeus 1758)	Dark-branded Bushbrown	Common	
<i>Mycalesis perseus</i> (Fabricius 1775)	Common Bushbrown	Common	
<i>Mycalesis visala</i> Moore [1858]	Long-branded Bushbrown	Less Common	
<i>Orsotriaena medus</i> (Fabricius 1775)	Nigger	Common	
<i>Ypthima baldus</i> (Fabricius 1775)	Common Five-ring	Common	
<i>Ypthima huebneri</i> Kirby 1871	Common Four-ring	Common	
<i>Ypthima nareda</i> (Kollar [1844])	Large Threering	Less Common	
Subfamily LIMENITIDINAE			
<i>Neptis cartica</i> Moore 1872	Plain Sailer	Less Common	
<i>Neptis clinia</i> Moore 1872	Sullied Sailer	Less Common	Schedule II, Part H
<i>Neptis hylas</i> (Linnaeus 1758)	Common Sailer	Common	
<i>Neptis magadha</i> C. & R. Felder [1867]	Spotted Sailer	Less Common	
<i>Neptis miah</i> Moore [1858]	Small Yellow Sailer	Uncommon	
<i>Neptis sappho</i> (Pallas 1771)	Rusty Sailer	Less Common	
<i>Neptis soma</i> Moore 1858	Creamy Sailer	Less Common	Schedule II, Part H
<i>Pantoporia hordonia</i> (Stoll [1790])	Common Lascar	Less Common	
<i>Pantoporia sandaka</i> (Butler 1892)	Extra Lascar	Uncommon	
<i>Athyma asura</i> Moore [1858]	Studded Sergeant	Uncommon	
<i>Athyma nefte</i> (Cramer [1780])	Colour Sergeant	Common	
<i>Athyma perius</i> (Linnaeus 1758)	Common Sergeant	Less Common	
<i>Athyma ranga</i> Moore [1858]	Blackvein Sergeant	Uncommon	Schedule II, Part H
<i>Athyma selenophora</i> (Kollar [1844])	Staff Sergeant	Less Common	
<i>Athyma zeroa</i> Moore 1872	Small Staff Sergeant	Less Common	
<i>Moduza procris</i> (Cramer [1777])	Commander	Common	
<i>Sumalia daraxa</i> (Doubleday [1848])	Green Commodore	Uncommon	
<i>Tanaecia lepidea</i> (Butler 1868)	Grey Count	Common	
<i>Tanaecia jahnu</i> (Moore [1858])	Plain Earl	Less Common	
<i>Euthalia aconthea</i> (Cramer [1777])	Common Baron	Less Common	Schedule II, Part H
Subfamily HELICONIINAE			
<i>Argynnis hyperbius</i> (Linnaeus 1763)	Tropical Fritillary	Less Common	
<i>Phalanta phalantha</i> (Drury [1773])	Common Leopard	Less Common	
<i>Vagrans egista</i> (Cramer [1780])	Vagrant	Less Common	
<i>Vindula erota</i> (Fabricius 1793)	Cruiser	Less Common	
<i>Cirrochroa aoris</i> Doubleday [1847]	Large Yeoman	Common	
<i>Cirrochroa tyche</i> C. & R. Felder 1861	Common Yeoman	Less Common	
Subfamily BIBLIDINAE			
<i>Ariadne merione</i> (Cramer [1777])	Common Castor	Common	
Subfamily APATURINAE			
<i>Mimathyma ambica</i> (Kollar [1844])	Indian Purple Emperor	Uncommon	
<i>Hestialis nama</i> (Doubleday 1844)	Circe	Uncommon	
Subfamily CYRESTINAE			
<i>Cyrestis thyodamas</i> Boisduval 1846	Common Map	Uncommon	

Cont...

Table 1. Inventory of Butterflies (Rhopalocera) recorded from Papum Pare District, Arunachal Pradesh

Scientific name	Common name	Status	Wild Life (Protection) Amendment Act, 2022
<i>Pseudergolis wedah</i> (Kollar [1844])	Tabby	Uncommon	
Subfamily NYMPHALINAE			
<i>Symbrenthia hypselis</i> (Godart [1824])	Spotted Jester	Less Common	
<i>Symbrenthia lilaea</i> (Hewitson 1864)	Northern Common Jester	Common	
<i>Aglaia caschmirensis</i> (Kollar [1844])	Indian Tortoiseshell	Uncommon	
<i>Junonia almana</i> (Linnaeus 1758)	Peacock Pansy	Common	
<i>Junonia atlites</i> (Linnaeus 1763)	Grey Pansy	Common	
<i>Junonia iphita</i> (Cramer [1779])	Chocolate Pansy	Common	
<i>Junonia lemonias</i> (Linnaeus 1758)	Lemon Pansy	Common	
<i>Junonia hierta</i> (Fabricius 1798)	Yellow Pansy	Less Common	
<i>Junonia orithya</i> (Linnaeus 1758)	Blue Pansy	Less Common	
<i>Hypolimnas bolina</i> (Linnaeus 1758)	Great Eggfly	Common	
<i>Hypolimnas misippus</i> (Linnaeus 1764)	Danaid Eggfly	Uncommon	Schedule II, Part H
<i>Kallima inachus</i> (Boisduval 1846)	Orange Oakleaf	Less Common	
<i>Doleschallia bisaltide</i> (Cramer [1777])	Autumn Leaf	Uncommon	
<i>Rhinopalpa polynice</i> (Cramer [1779])	Wizard	Uncommon	
Subfamily ACRAEINAE			
<i>Acraea issoria</i> (Huebner [1819])	Yellow Coster	Common	
<i>Cethosia biblis</i> (Drury [1773])	Red Lacewing	Less Common	Schedule II, Part H
<i>Cethosia cyane</i> (Drury [1773])	Leopard Lacewing	Common	
Subfamily LIBYTHEINAE			
<i>Libythea lepita</i> Moore [1858]	Common Beak	Uncommon	Schedule II, Part H

species of the Nymphalidae family during the course of the current studies. These species shows dry-season forms (DSF) and wet-season forms (WSF) i.e., *Junonia orithya* (Linnaeus), *J. hierta* (Fabricius), *J. almana* Linnaeus, *Ypthima baldus* Fabricius, *Y. huebneri* Kirby *Melanitis leda* Linn., *M. zitenus* (Herbst), *Mycalesis anaxias* Hewitson, *M. perseus* (Fabricius), *M. francisca* (Stoll), *M. mineus* (Linn.), *M. gotama* Moore, *M. visala* Moore, *M. intermedia* (Moore), and *Orsotriaena medus* (Fabricius). The seasonal variations in butterfly forms are entirely caused by environmental factors, specifically temperature and humidity, which have an impact on the internal chemical physiology of the immature butterflies. These differences are not genetic in nature. We refer to these non-genetic differences as polyphenism. As a result, DSF butterflies have reduced marginal ocelli, more angulate wings, and cryptic patterns on their undersides than WSF butterflies in monsoon regions.

Flight duration also noted during study period, although most butterflies prefer to fly during sun-hours but members of subfamily Satyrinae (Family Nymphalidae) i.e., *Mycalesis anaxias* Hewitson, *M. perseus* (Fabricius), *M. francisca* (Stoll), *M. mineus* (Linn.), *M. gotama* Moore, *M. visala* Moore, *M. intermedia*, *Lethe confusa* Aurivillius, *Lethe chandica*

Moore, *Lethe distans* Butler, *Lethe kansa* (Moore), *Melanitis leda* Linn., *Melantis zitenus* (Herbst), *Ypthima huebneri* Kirby and *Ypthima baldus* (Fabricius) were also active during dusk and dawn hours or cloudy days. The species *Kallima inachus* (Boisduval), and *Doleschallia bisaltide* (Cramer) shows camouflage mimicry and resemble to dry oak-leaf. The species, *Discophora sondaica* Boisduval and *Discophora timora* Westwood were observed sitting near the light source.

Out of 209 species, 37 species are included in the Wildlife (Protection) Amendment Act, 2022. Three butterfly species are included in Schedule I, Part I, 33 species, are included in the Schedule II, Part H and one species is included in the Schedule IV, Appendix II of the Act (Table 1). During the course of present studies, four species i.e., *Troides aeacus* (C. & R. Felder), *Graphium sarpedon* (Linnaeus), *Appias lycinda* (Cramer) and *Jamides alecto* (C. Felder) were found common and should be removed from the Act.

The four species i.e., *Ypthima narenda* (Kollar), *Talica naryseus* (Guérin-Méneville), *Pantoporia sandaka* (Butler) and *Caltoris philippina* (Herrich-Schaeffer) were recorded only from Papum Pare district of Arunachal Pradesh. The species *Suasa lisides* (Hewitson) is a very rare species and recording

of this species from Papum Pare district (Ganga Lake, Itanagar) is the second sighting in Arunachal Pradesh.

CONCLUSION

Out of these 209 species, 60 species (29%) were common, 84 species (40%) were uncommon, and the remaining 65 species (31%) were less common. 37 species out of 209 are covered by the Wildlife (Protection) Amendment Act of 2022. Four species—*Caltores philippina* (Herrich-Schaeffer), *Pantoporia sandaka* (Butler), *Talica naryseus* (Guérin-Méneville), and *Ypthima narede* (Kollar)—were first documented from Arunachal Pradesh and were only found in the Papum Pare district. The second sighting of the extremely rare species *Suasa lisides* (Hewitson) in Arunachal Pradesh was recorded from the Papum Pare district (Ganga Lake, Itanagar).

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