

EXPLORING THE DIVERSITY AND DISTRIBUTION OF ODONATA FAUNA IN THE FOOTHILLS OF THE HINDU KUSH RANGE, LOWER DIR, PAKISTAN

I. Ullah^{1*}, A. Zia², D. Hayat³, S. Rashied⁴, I. Ilahi⁵, M. Inam⁶, S. Aslam⁷ and A. Hakeem⁸

¹Department of Zoology, Shaheed Benazir Bhutto University, Sheringal, Dir Upper, Pakistan

²National Insect Museum, National Agricultural Research Centre, Islamabad, Pakistan

³Department of Zoology, Sardar Bahadur Khan Women University, Quetta, Baluchistan

⁴Department of Zoology, University of Azad Jammu and Kashmir, Muzaffarabad, Pakistan

⁵Department of Zoology, University of Malakand, Chakdara, Dir Lower, Pakistan

⁶Department of Zoology, Abdul Wali Khan University, Mardan, Pakistan

⁷Honey Bee Research Institute, National Agricultural Research Centre, Islamabad

⁸Department of Plant Pathology, Lasbela University of Agriculture, Water and Marine Sciences, Lasbela, Balochistan, Pakistan

* Correspondence author's Email: ikramzoology@sbbu.edu.pk

ABSTRACT

The ecologically diverse foothills of the Hindu Kush range have remained largely unexplored in taxonomic surveys. The current research aimed to explore the diversity and distribution of the Odonata fauna in the foothills of the Hindu Kush Mountain range within the district of Lower Dir, Khyber Pakhtunkhwa, Pakistan. Field visits were carried out at 35 localities across the study area in 2024. Specimens were collected using aerial nets and identified under a stereoscope using standard taxonomic keys, following the descriptions provided by Fraser (1933, 1934, 1936); Chaudhry (2010); Zia (2010). The fieldwork yielded a sum of 321 Anisoptera specimens, representing 26 species and subspecies across 15 genera and 3 families. In addition, 72 Zygoptera specimens were recorded, representing 6 species and subspecies under 5 genera and 4 families. Detailed accounts are provided for every recorded species, including the valid name, sex ratio, locality with coordinates and elevation, collection date, previous records from Pakistan, global distribution, habitat description, and zoogeographic affiliation. The current study provided baseline knowledge regarding the Odonata fauna of the study area and revealed a substantial increase in recorded species richness from 11 to 32 species.

Keywords: Anisoptera, Hindu Kush range, Insect fauna, Odonata, Zygoptera

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0>)

<https://doi.org/10.36899/JAPS.2026.5.0125>

Published first online July, 24, 2026

INTRODUCTION

Insects constitute one of the most diverse taxonomic groups across the globe that perform an essential role in ecosystem functioning, yet the knowledge on their diversity, ecology, and population trends remains abysmally poor (Van Klink *et al.*, 2024). Of the nearly 2.17 million described species on Earth, one million are insects (IUCN, 2025). Among these, Odonata is an ancient order of Pterygota with a fossil record dating back to the Permian period (299-251) million years ago. Based on phenotypic features, the order Odonata is categorized into three suborders: Anisoptera, Zygoptera, and Anisozygoptera (Goswami *et al.*, 2025). They are amphibiotic, hemimetabolous insects with a three-stage life cycle i.e., egg, naiad, and adult (Din *et al.*, 2013; Goswami *et al.*, 2025).

Odonates consume mosquito larvae, fish fry, and tadpoles, and serve as a food source for birds, fish, spiders, and beetles, thereby forming part of the food web and food chain of various animals (Zia *et al.*, 2018). They prey on crop pests, mosquitoes, noxious flies, jassids, aphids, bollworms, and blackflies (Subramanian, 2005). Adults are utilized in soup (Boyd, 2005), and larvae serve as fishing bait (Rowe, 2003). They act as biocontrol agents against vectors of dengue, malaria, and filariasis (Mitra, 2006). Some species are used in the treatment of throat, eye infections and fever (Rehman *et al.*, 2020).

Odonates are cosmopolitan in distribution except Antarctica (Silsby, 2001). Currently, the Odonata fauna of the world is divided into 3 orders, 17 superfamilies, 55 families and 687 genera containing 6447 species (Carter *et al.*, 2026). In the neighboring countries with broadly similar ecology, China supports 818 species (Sandall *et al.*, 2022). India harbors 508 species (Goswami *et al.*, 2025), Iran houses 100 species (Schneider *et al.*, 2018), and Afghanistan is represented by 62 species (Asahina, 1966). However, the Odonata fauna of Pakistan was represented by 127 species,

including 73 Anisoptera and 54 Zygoptera (Kalkman *et al.*, 2020). With the addition of four newly recorded species: *Sympetrum hypomelas* from District Swabi (Nur-Ul-Islam *et al.*, 2021), *Aeshna mixta* from District Neelum (Zia *et al.*, 2024), *Anisogomphus caudalis* from District Buner (Inam *et al.*, 2025), and *Cephalaeschna klapperichi* from District Upper Dir (Ullah *et al.*, 2026), the Anisoptera species of Pakistan have increased to 77. With these records, the Odonata fauna of Pakistan now comprises 131 species, representing 77 Anisoptera and 54 Zygoptera.

Ecologically, the study area is featured with diverse habitats like rivers, streams, marshes, perennial springs, manmade earthen ponds, water channels, storage tanks, waterfalls, and bogs, which provide a favourable abode for Odonata species. The study area is characterized by four seasons, of which summer is prolonged, with July being the warmest month, in which temperatures range from 15°C–32°C, while January and February are the coldest months, with average temperatures ranging from -2°C–11°C. The area receives an average rainfall of 1468.8 mm in December and 253.7 mm in March (Ullah *et al.*, 2014; Rawan *et al.*, 2022). The study area is also facing challenges like deforestation, urbanization, and a gradual change in water quality, especially in forested streams and rivers, due to human activities, which affect the habitat of the Odonata (Dudgeon, 2010), and a reduction in the species mass is already noticed, due to overpopulation and pollution (Zia *et al.*, 2011). Considering the ecological importance of the study area and the ecological and medical services provided by Odonata, the current study was undertaken to explore the Odonata fauna of the region.

MATERIALS AND METHODS

Study Area: Lower Dir District is located in the Malakand Division of Khyber Pakhtunkhwa, Pakistan. The district lies in the foothills of the Hindu Kush Mountains range between 34°37' to 35°07' N latitude and 71°31' to 72°14' E longitude (Ullah *et al.*, 2020). The study area covers an area of approximately 1583 km², with an average elevation ranging between 700–2800 meters above sea level. It shares boundaries with Afghanistan and Bajaur in the west, Upper Dir in the north, Swat in the east, and Malakand District in the south (Ahmad *et al.*, 2020). A GIS-based map was designed to depict geographical boundaries, spatial extent, and sampling localities across the study area (Figure 1).

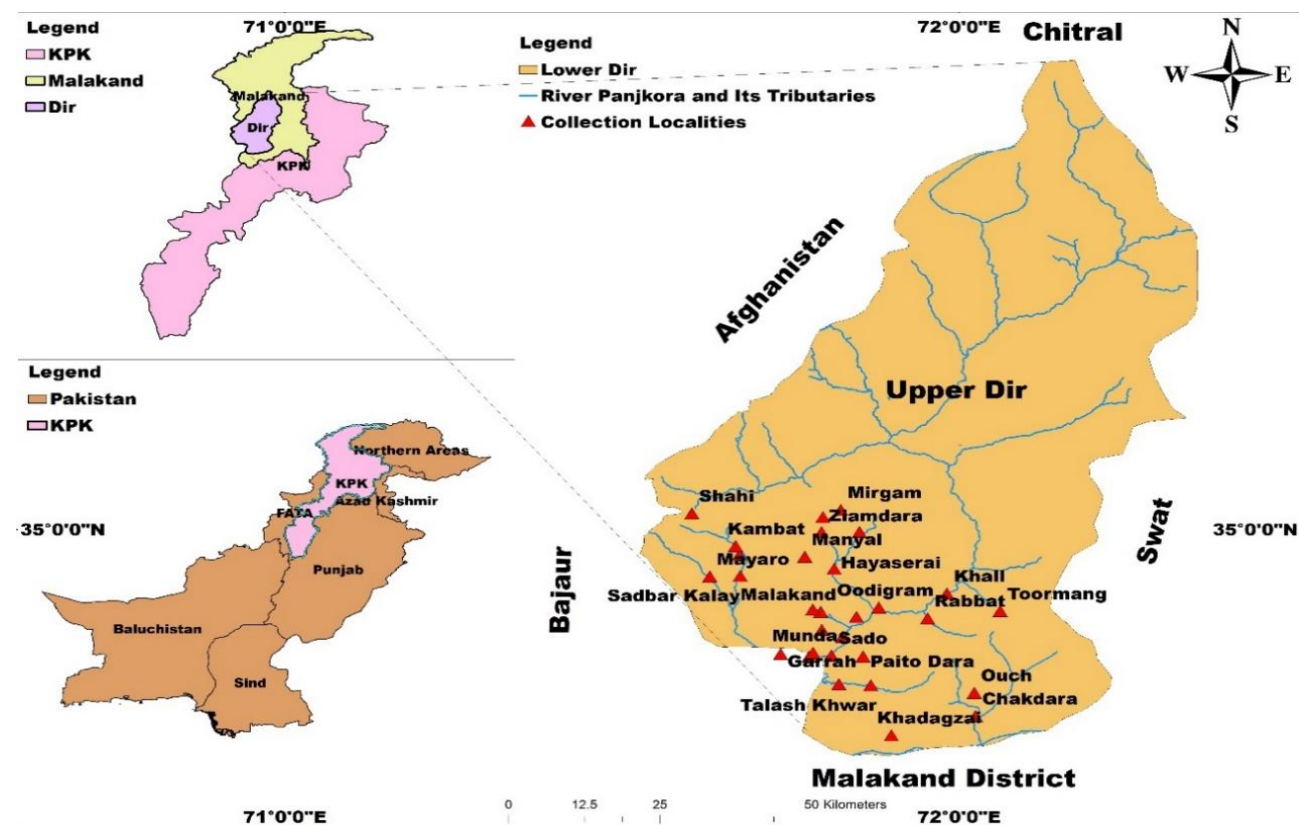


Fig 1: Location Map of the study area showing Pakistan, KPK, Malakand Division and sampling localities in the foothills of the Hindu Kush Mountain range, Lower Dir

Methodology: Comprehensive field surveys were conducted randomly during the year 2024 in localities such as Talash, Bandagai, Ouch, Chakdara, Khazana, Garrah, Makhai, Munda, Mayaro, Sadbar Kaly, Samarbagh, Kambat, Shahi Top, Timergara, Paito Dara, Sado, Balambat, Malakand Dara, Shatai, Koto, Hajiabad, Hayaseri, Manial, Kumbar, Ziamdara, Mirgam, Beshgram, Odigram, Khal, Toormang, and Rabat (Figure 1). Adult specimens were collected by three collectors at each locality. At each site, standardized sampling was carried out for 2–3 hours per visit using aerial nets during peak flight hours: 9:00 am–5:00 pm, which were determined based on repeated field observations. This sampling period may have poorly represented species exhibiting early morning and crepuscular activity. However, such species are relatively uncommon in comparison with the predominantly diurnal Odonata fauna. Specimens were killed in bottles containing ethyl-acetate wet swabs and then placed in triangular paper envelopes, and labelled with locality, date and collector, while other information was noted in the field diary. The material was transferred to the laboratory, where hard and dried specimens were softened in a humid chamber at room temperature for 12 hours at a relative humidity of 80–90% to relax tissues and restore flexibility for subsequent proper stretching and pinning. Specimens were mounted in insect boxes with Naphthalene balls fixed in the corners, and Coopex powder, with ingredient permethrin, was sprayed to protect them from the attack of pests, mites, and crawling insects (Zia *et al.*, 2011; Hafeez *et al.*, 2021). Specimens were identified in the biosystematics laboratory at the National Insect Museum, under a stereoscope (Model: Olympus SZX7, Japan) by comparing with taxonomic keys and following the descriptions of Fraser (1933–1936); Zia (2010); Chaudhry (2010). All the identified specimens were properly labelled, mounted in insect boxes, and deposited in the National Insect Museum (NIM) at the National Agricultural Research Centre (NARC), Islamabad, as reference material for future studies.

RESULTS

The present study documented a total of 321 Anisoptera specimens, identified as 26 species and subspecies, categorized into 15 genera, and 3 families. By comparison, 72 Zygoptera specimens, recognized as 06 species and subspecies, were classified into 05 genera and 4 families (Table 1). For each species, a detailed description is provided, including the valid name, sex ratio, locality with altitude and coordinates, date of collection, previous records from Pakistan, global distribution, habitat description and zoogeographical affiliation. The current study recorded a sum of 32 species and subspecies from the study area.

Table 1: Odonata species recorded during the current study and their presence or absence across the provinces of Pakistan as well as in bordering countries

[illegible]

	<i>Crocothemis servilia</i>	O, P, IA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<i>Urothemis signata signata</i>	O, P	✓	✓	–	✓	–	–	–	✓	–	–
	<i>Palpopleura sexmaculata</i>	P, O, IA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<i>Pantala flavescens</i>	O, P, A, N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<i>Acisoma panorpoides</i>	O, P	✓	✓	–	✓	✓	✓	✓	✓	✓	✓
	<i>Libellula quadrimaculata</i>	O, P	✓	–	–	–	–	✓	✓	✓	✓	✓
	<i>Brachythemis contaminata</i>	O, P	✓	✓	✓	✓	✓	–	✓	✓	✓	✓
	<i>Zygonyx torridus isis</i>	O	✓	✓	–	–	✓	–	✓	–	–	–
	<i>Ictinogomphus angulosus</i>	O	✓	✓	–	–	✓	–	✓	–	–	–
	<i>Gomphidia t-nigrum</i>	O	✓	✓	–	–	–	–	✓	–	–	–
	<i>Paragomphus lineatus</i>	O, P	✓	✓	–	–	✓	–	✓	–	✓	–
	<i>Anax indicus</i>	O	✓	✓	–	–	–	–	✓	–	–	–
Zygoptera	<i>Ceriagrion coromandelianum</i>	O	✓	✓	✓	✓	✓	✓	✓	–	–	–
	<i>Pseudagrion rubriceps rubriceps</i>	O, P	✓	✓	–	–	✓	–	✓	✓	–	–
	<i>Neurobasis chinensis</i>	O	✓	✓	–	–	✓	–	✓	✓	–	–
	<i>Aristocypha quadrimaculata</i>	O	✓	✓	–	–	✓	–	✓	–	–	–
	<i>Bayadera indica</i>	O	✓	✓	–	–	✓	–	✓	–	–	–
	<i>Bayadera longicauda</i>	O	✓	✓	–	–	✓	–	✓	–	–	–

Note: ✓ indicates the presence of species, – indicates the absence of species
 Zoogeographic regions: Australian (A), Afrotropical (AF), Nearctic (N), Palearctic (P), Oriental (O), Indo-Australian (IA).

Order Odonata Fabricius, 1793
Family Libellulidae Leach, 1815
Genus *Orthetrum* Newman, 1833
***Orthetrum triangulare triangulare* (Selys, 1878)**

Material examined: 3♂ 1♀, Hayaserai, 34°55'48" N, 71°48'36" E, 971 m, 19.vii.2024; 3♂, Mirgam, 35°1'48" N, 71°49'12" E, 1702 m, 18.vii.2024; 2♂ 1♀, Khazana, 34°47'24" N, 71°46'12" E, 688m, 29.vii.2024; 3♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 3♂, Talash, 34°44'24" N, 71°51'36" E, 833 m, 16.vii.2024; 1♂ 1♀, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024; 1♂, Beshgram, 34°59'24" N, 71°51'0" E, 1370 m, 18.vii.2024.

Earlier records from Pakistan: Khyber Pakhtunkhwa, Punjab, Azad Jammu and Kashmir (AJK), and Gilgit Baltistan (Rafi *et al.*, 2009; Chaudhry *et al.*, 2016; Khan *et al.*, 2016; Zia *et al.*, 2019; Rehman *et al.*, 2020; Attaullah *et al.*, 2021; Mehmood *et al.*, 2021; Islam *et al.*, 2024; Rashied *et al.*, 2024).

Global distribution: India, Bhutan, Nepal, Sri Lanka, and Bangladesh (Kalkman *et al.*, 2020), Iran, Armenian and Asia Minor Highlands (Ketenchiev *et al.*, 2021). China (Wilson and Reels, 2001), Hong Kong, Thailand, Lao, Myanmar, and Vietnam (Chaudhry, 2010).

Habitat: Specimens of this species were collected from rocks and vegetation along small moving streams, rivers, springs, stagnant waters, and marshes. Specimens were recorded previously from puddles, tanks, and slow-moving water with vegetation (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, and Palearctic.

***Orthetrum pruinosum neglectum* (Rambur, 1842)**

Material examined: 2♂, Hayaserai, 34°55'48" N, 71°48'36" E, 971 m, 19.vii.2024; 2♂, Khazana, 34°47'24" N, 71°46'12" E, 688 m, 29.vii.2024; 3♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 1♂, Talash, 34°44'24" N, 71°51'36" E, 833 m, 16.vii.2024; 1♂, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024.

Earlier records from Pakistan: Punjab, Sindh, AJK and, Khyber Pakhtunkhwa (Rafi *et al.*, 2009; Iqbal *et al.*, 2013; Chaudhry *et al.*, 2016; Khan *et al.*, 2016; Zia *et al.*, 2019; Bhatti *et al.*, 2020; Rehman *et al.*, 2020; Hafeez *et al.*, 2021; Mehmood *et al.*, 2021; Rashied *et al.*, 2024).

Global distribution: Indonesia, Japan, Malaysia, and Thailand (Chaudhry, 2010). India, Nepal, Bangladesh, Bhutan, and Sri Lanka (Kalkman *et al.*, 2020), China (Wilson and Reels, 2001), and Armenian, Iranian and Asian Minor Highlands (Ketenchiev *et al.*, 2021).

Habitat: Specimens were collected along slow-running streams, stationary waters, near springs, marshes, and water channels. Specimens were recorded earlier from standing waters, and slow-running streams in mountainous and sub-mountainous areas (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, and Palearctic.

***Orthetrum luzonicum* (Brauer, 1868)**

Material examined: 3♂ 1♀, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024; 5♂, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024; 4♂, Khazana, 34°47'24" N, 71°46'12" E, 688 m, 29.vii.2024; 2♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 3♂, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024.

Earlier records from Pakistan: Punjab, Baluchistan, AJK and Northern Areas (Chaudhry *et al.*, 2016; Attaullah *et al.*, 2021; Mehmood *et al.*, 2021; Islam *et al.*, 2024; Rashied *et al.*, 2024).

Global distribution: Taiwan, Indonesia, Singapore, Myanmar, Japan, Malaysia, Thailand, Philippines, and Vietnam (Chaudhry, 2010), India, Sri Lanka, Bhutan, Nepal, and Bangladesh (Kalkman *et al.*, 2020), China (Wilson and Reels, 2001), and Iran (Schneider *et al.*, 2018).

Habitat: This species was recorded from swampy places along slow-running streams, rivers, and near lentic waters. Specimens were collected earlier from stones in open stationary shallow water in mountainous areas (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, and Palearctic.

***Orthetrum glaucum* (Brauer, 1865)**

Material examined: 3♂ 1♀, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024.

Earlier records from Pakistan: Azad Jammu and Kashmir, Punjab, and Khyber Pakhtunkhwa (Rafi *et al.*, 2009; Zia *et al.*, 2009; Chaudhry *et al.*, 2016; Zia *et al.*, 2019; Attaullah *et al.*, 2021; Mehmood *et al.*, 2021; Rashied *et al.*, 2024).

Global distribution: Malaysia, Thailand, Hong Kong, Philippines, Japan, Myanmar, Peninsular Malaysia, Singapore, Vietnam, and Taiwan (Chaudhry, 2010), India, Bangladesh, Nepal, Sri Lanka, and Bhutan (Kalkman *et al.*, 2020), China (Wilson, 2008; Zhang, 2011), and Indonesia (Hastomo *et al.*, 2022).

Habitat: This species was documented from marshy places with dense grasses near springs and streams. Specimens were collected in a prior study from small gullies, marshes, streams, and ponds in hilly areas (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, Palearctic, and Indo-Australian.

***Orthetrum coerulescens anceps* (Schneider, 1845)**

Material examined: 2♂, Khazana, 34°47'24" N, 71°46'12" E, 688 m, 29.vii.2024; 1♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 2♂, Talash, 34°44'24" N, 71°51'36" E, 833 m, 16.vii.2024; 1♂ 1♀, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024; 2♂, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024; 2♂, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024.

Earlier records from Pakistan: Northern Areas, AJK, Khyber Pakhtunkhwa, and Punjab (Chaudhry *et al.*, 2016; Khan *et al.*, 2016; Zia *et al.*, 2019; Rehman *et al.*, 2020; Rashied *et al.*, 2024).

Global distribution: Europe, Kazakhstan, Caucasus, and Turkey (Chaudhry, 2010), India (Kalkman *et al.*, 2020), Iran (Sadeghi and Mohammadalizadeh, 2009; Schneider *et al.*, 2018), Armenian, Iranian and Asian Minor Highlands (Ketenchiev *et al.*, 2021), Russia (Malikova and Kosterin, 2019), and Italy (La Porta *et al.*, 2023).

Habitat: Specimens were recorded from marshy places with spring water, stationary waters along the river, and water channels. This species was recorded earlier near running and stagnant water with dense vegetation (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, and Palearctic.

***Orthetrum cancellatum* (Linnaeus, 1758)**

Material examined: 4♂ 1♀, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024.

Earlier records from Pakistan: Gilgit Baltistan, Sindh, Khyber Pakhtunkhwa, and Punjab (Chaudhry *et al.*, 2016; Zia *et al.*, 2019; Bhatti *et al.*, 2020; Attaullah *et al.*, 2021; Mehmood *et al.*, 2021; Sidra *et al.*, 2022).

Global distribution: Africa, Europe, Kazakhstan, Mongolia, and Turkey (Chaudhry, 2010). India (Kalkman *et al.*, 2020), Uzbekistan (Sh *et al.*, 2021), Turkish (Hacet, 2017), Siberia (Borisov, 2021), Italy (Assandri, 2019), Ireland (Nelson *et al.*, 2011), Iran (Sadeghi and Mohammadalizadeh, 2009; Schneider *et al.*, 2018), Armenian, Iranian and Asian Minor Highlands (Ketenchiev *et al.*, 2021), Germany (Henningsen *et al.*, 2020), Russian Federation (Shapoval and Shapoval, 2017; Malikova and Kosterin, 2019).

Habitat: Specimens were collected from vegetation near spring water along a slow-moving stream. Earlier collected from riverbanks, standing, and slow-running water (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, Palearctic, and Afrotropical.

Orthetrum sabina sabina (Drury, 1770)

Material examined: 2♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 1♂ 1♀, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024; 2♂, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024; 3♂ 1♀, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024.

Earlier records from Pakistan: Azad Jammu and Kashmir, Khyber Pakhtunkhwa, Gilgit Baltistan, Sindh, Punjab, and Baluchistan (Rafi *et al.*, 2009; Iqbal *et al.*, 2013; Chaudhry *et al.*, 2016; Khan *et al.*, 2016; Shaikh *et al.*, 2019; Zia *et al.*, 2019; Bhatti *et al.*, 2020; Hafeez *et al.*, 2021; Rehman *et al.*, 2020; Attaullah *et al.*, 2021; Naeem *et al.*, 2022; Sidra *et al.*, 2022; Ahmed *et al.*, 2023; Islam *et al.*, 2024; Rashied *et al.*, 2024).

Global distribution: Bangladesh, Bhutan, Sri Lanka, Nepal, and India (Kalkman *et al.*, 2020), Oman (Schneider and Ikemeyer, 2016), Uzbekistan (Sh *et al.*, 2021), United Arab Emirate (Giles, 1998), Saudi Arabia (Monnerat and AlDhafa, 2016), Indonesia (Hastomo *et al.*, 2022), China (Wilson and Reel, 2001), Iran (Sadeghi and Mohammadalizadeh, 2009; Schneider *et al.*, 2018), Iranian, Armenian and Asian Minor Highlands (Ketenchiev *et al.*, 2021), and Russian Federation (Malikova and Kosterin, 2019).

Habitat: This species was recorded from small running streams, rivers, and stationary waters with grasses. Recorded earlier from stagnant waters along rivers and streams (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, Palearctic, Afrotropical, and Indo-Australian.

Genus Sympetrum Newman, 1833

Sympetrum vulgatum decoloratum Selys, 1884

Material examined: 6♂ 2♀, Shahi Top, 35°11'24" N, 71°36'00" E, 2286 m, 8.vii.2024.

Earlier records from Pakistan: Punjab, Khyber Pakhtunkhwa, and Gilgit Baltistan (Chaudhry *et al.*, 2016; Zia *et al.*, 2019; Rehman *et al.*, 2020; Nur-ul-Islam *et al.*, 2021; Mehmood *et al.*, 2021; Sidra *et al.*, 2022).

Global Distribution: Turkey (Chaudhry, 2010), Uzbekistan (Sh *et al.*, 2021), Iranian, Armenian and Asia Minor Highlands (Ketenchiev *et al.*, 2021), Russian Federation (Malikova and Kosterin, 2019), and Iran (Schneider *et al.*, 2018).

Habitat: Specimens were collected from vegetation near spring water. In a former study documented from stationary and slow running water with dense vegetation (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, and Palearctic.

Sympetrum meridionale (Selys, 1841)

Material examined: 1♂, Khazana, 34°47'24" N, 71°46'12" E, 688 m, 29.vii.2024; 1♂, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024.

Earlier records from Pakistan: Azad Jammu and Kashmir (Rafi *et al.*, 2009; Chaudhry *et al.*, 2016).

Global distribution: Mongolia, Africa, Caucasus, European Russia, Kazakhstan, and West Siberia (Chaudhry, 2010). India (Kalkman *et al.*, 2020), Uzbekistan (Sh *et al.*, 2021), Turkey (Hacet, 2017), Italy (Assandri, 2019), Armenian, Iranian and Asian Minor Highlands (Ketenchiev *et al.*, 2021), Russian Federation (Shapoval and Shapoval, 2017; Malikova and Kosterin, 2019), and Iran (Schneider *et al.*, 2018).

Habitat: Specimens were documented from spring water with dense vegetation along the river and streams. Collected previously from shallow waters and swamps (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, Palearctic, and Afrotropical.

***Sympetrum striolatum commixtum* (Selys, 1884)**

Material examined: 5♂, Shahi Top, 35°11'24" N, 71°36'00" E, 2286 m, 8.vii.2024.

Earlier records from Pakistan: Azad Jammu and Kashmir, Khyber Pakhtunkhwa, Baluchistan, and Punjab (Chaudhry *et al.*, 2016; Zia *et al.*, 2019; Rehman *et al.*, 2020; Nur-ul-Islam *et al.*, 2021; Mehmood *et al.*, 2021; Islam *et al.*, 2024; Rashied *et al.*, 2024).

Global distribution: India, Bhutan, and Nepal (Kalkman *et al.*, 2020).

Habitat: Collected from dense vegetation near stagnant and slow-running springs. Chaudhry (2010) recorded from vegetation near slow-running water.

Zoogeographical affiliation: Oriental.

Genus *Trithemis* Brauer, 1868

***Trithemis festiva* (Rambur, 1842)**

Material examined: 2♂, Khazana, 34°47'24" N, 71°46'12" E, 688 m, 29.vii.2024; 1♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 2♂, Talash, 34°44'24" N, 71°51'36" E, 833 m, 16.vii.2024; 2♂, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024.

Earlier records from Pakistan: Khyber Pakhtunkhwa, Azad Jammu and Kashmir, Punjab, and Northern Areas (Rafi *et al.*, 2009; Chaudhry *et al.*, 2016; Khan *et al.*, 2016; Zia *et al.*, 2019; Rehman *et al.*, 2020; Attaullah *et al.*, 2021; Naeem *et al.*, 2022; Islam *et al.*, 2024).

Global distribution: Bangladesh, Nepal, Bhutan, India, and Sri Lanka (Kalkman *et al.*, 2020), China (Wilson, 2008), Iran (Sadeghi and Mohammadalizadeh, 2009), Iranian, Armenian and Asian Minor Highlands (Ketenchiev *et al.*, 2021), Burma, Hong Kong, Vietnam, Malaysia, Philippines, Thailand, Singapore, Indonesia, Myanmar, Taiwan, and Turkey (Chaudhry, 2010).

Habitat: Specimens were collected from rocks in streams, shallow stationary waters, springs, and water channels. Recorded earlier from ponds, marshy places, slow-moving streams, and vegetation near water in hilly and plain areas (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, and Palearctic.

***Trithemis aurora* (Burmeister, 1839)**

Material examined: 2♂, Khazana, 34°47'24" N, 71°46'12" E, 688 m, 29.vii.2024; 3♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 3♂, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024; 3♂, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024.

Earlier records from Pakistan: Khyber Pakhtunkhwa, AJK, Gilgit Baltistan, Baluchistan, and Punjab (Chaudhry *et al.*, 2016; Attaullah *et al.*, 2021; Rehman *et al.*, 2020; Khan *et al.*, 2016; Rafi *et al.*, 2009; Rashied *et al.*, 2024; Islam *et al.*, 2024; Sidra *et al.*, 2022; Ahmed *et al.*, 2023).

Global distribution: India, Nepal, Sri Lanka, Bhutan, and Bangladesh (Kalkman *et al.*, 2020), China (Wilson and Reel, 2001), and Iran (Schneider *et al.*, 2018).

Habitat: This species was recorded from spring water with dense grasses and stagnant waters, riverbanks and irrigation channels. Chaudhry (2010) collected from marshy places, slow-running water in hilly and plain areas.

Zoogeographical affiliation: Oriental, and Palearctic.

***Trithemis kirbyi* Selys, 1891**

Material examined: 3♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 2♂, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024.

Earlier records from Pakistan: Punjab, Baluchistan, Azad Jammu and Kashmir, and Khyber Pakhtunkhwa (Chaudhry *et al.*, 2016; Rehman *et al.*, 2020; Naeem *et al.*, 2022; Ahmed *et al.*, 2023).

Global distribution: Sri Lanka (Chaudhry, 2010), India (Kalkman *et al.*, 2020), Oman (Schneider and Ikemeyer, 2016), UAE (Giles, 1998), Saudi Arabia (Monnerat and Al Dhafre, 2016), Iran (Sadeghi and Mohammadalizadeh, 2009; Schneider *et al.*, 2018), and Germany (Henningsen *et al.*, 2020).

Habitat: This species was observed near spring and stagnant water with vegetation along the river. Recorded earlier from rocks and grasses near streams in hilly areas (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, Palearctic, and Afrotropical.

Genus *Crocothemis* Brauer, 1868

***Crocothemis erythraea* (Brulle, 1832)**

Material examined: 3♂, Khazana, 34°47'24" N, 71°46'12" E, 688 m, 29.vii.2024; 4♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 4♂, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024; 4♂, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024; 4♂, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024.

Earlier records from Pakistan: Khyber Pakhtunkhwa, Azad Jammu and Kashmir, Punjab, Baluchistan, and Sindh (Rafi *et al.*, 2009; Iqbal *et al.*, 2013; Din *et al.*, 2013; Chaudhry *et al.*, 2016; Rehman *et al.*, 2020; Hafeez *et al.*, 2021; Rashied *et al.*, 2024; Naeem *et al.*, 2022; Sidra *et al.*, 2022; Islam *et al.*, 2024).

Global distribution: Turkey, Caucasus, Africa, Europe, and Kazakhstan (Chaudhry, 2010), Bhutan, Nepal and India (Kalkman *et al.*, 2020), Oman (Schneider and Ikemeyer, 2016), Uzbekistan (Sh *et al.*, 2021), UAE (Giles, 1998), Turkey (Hacet, 2017), Saudi Arabia (Monnerat and Al Dhafre, 2016), Italy (Assandri, 2019), Iran (Sadeghi and Mohammadalizadeh, 2009; Schneider *et al.*, 2018). Russian Federation (Shapoval and Shapoval, 2017; Malikova and Kosterin, 2019), and western Nepal (Sharma *et al.*, 2018).

Habitat: Specimens were collected from irrigation channels, grasses near springs and stationary waters along the river and streams. Chaudhry (2010) collected from grasses near stagnant waters and temporary water pits in hilly and plain areas.

Zoogeographical affiliation: Oriental, Palearctic, and Afrotropical.

***Crocothemis servilia* (Drury, 1770)**

Material examined: 2♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 3♂, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024; 4♂ 2♀, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024; 4♂ 1♀, Khazana, 34°47'24" N, 71°46'12" E, 688 m, 29.vii.2024; 2♂, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024.

Earlier records from Pakistan: Gilgit Baltistan, Khyber Pakhtunkhwa, AJK, Sindh, Baluchistan, and Punjab (Rafi *et al.*, 2009; Iqbal *et al.*, 2013; Rehman *et al.*, 2015; Chaudhry *et al.*, 2016; Rehman *et al.*, 2020; Hafeez *et al.*, 2021; Attaullah *et al.*, 2021; Mehmood *et al.*, 2021; Naeem *et al.*, 2022; Sidra *et al.*, 2022; Ahmed *et al.*, 2023; Rashied *et al.*, 2024).

Global distribution: Japan, Australia, Lao, Myanmar, Malaysia, Philippines, Thailand, Indonesia, Turkey, Burma, Hong Kong, Taiwan, and Peninsular Malaysia (Chaudhry, 2010). Bangladesh, Nepal, Bhutan, Sri Lanka, and India (Kalkman *et al.*, 2020), Uzbekistan (Sh *et al.*, 2021), Caribbean, Puerto Rico (Ramírez, 2020), China (Wilson and Reels, 2001), North America (Paulson and Dunkle, 1999), Iran (Sadeghi and Mohammadalizadeh, 2009), and western Nepal (Sharma *et al.*, 2018).

Habitat: This species was recorded near slow-running streams, channels, and stagnant waters with vegetation along the river. Chaudhry (2010) collected from ponds, marshes, and ditches.

Zoogeographical affiliation: Oriental, Palearctic, Afrotropical, Indo-Australian.

Genus *Urothemis* Brauer, 1868

***Urothemis signata signata* (Rambur, 1842)**

Material examined: 2♂, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024; 1♂, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024.

Earlier records from Pakistan: Khyber Pakhtunkhwa, Punjab and Sindh (Chaudhry *et al.*, 2016).

Global distribution: India, Cambodia, Sri Lanka, Myanmar, Thailand, Vietnam, Bangladesh, and Hong Kong (Chaudhry, 2010), Nepal (Kalkman *et al.*, 2020), and China (Wilson, 2008; Wilson and Reel, 2001).

Habitat: Specimens were collected from perennial lentic waters with grasses along the rivers. Chaudhry (2010) recorded near river, standing water and water channels with dense vegetation.

Zoogeographical affiliation: Oriental, and Palearctic.

Genus *Palpopleura* Rambur, 1842

***Palpopleura sexmaculata* (Fabricius, 1787)**

Material examined: 1♂ 1♀, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 1♂, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024; 3♂ 1♀, Khazana, 34°47'24" N, 71°46'12" E, 688 m, 29.vii.2024.

Earlier records from Pakistan: Sindh, Khyber Pakhtunkhwa, Azad Jammu and Kashmir, Gilgit Baltistan, Baluchistan, and Punjab (Chaudhry *et al.*, 2016; Khan *et al.*, 2016; Zia *et al.*, 2019; Rehman *et al.*, 2020; Attaullah *et al.*, 2021; Mehmood *et al.*, 2021; Rafi *et al.*, 2009; Sidra *et al.*, 2022; Rashied *et al.*, 2024).

Global distribution: India, Bangladesh, Nepal, and Bhutan (Kalkman *et al.*, 2020). China (Wilson and Reels, 2001), Iranian, Armenian and Asian Minor Highlands (Ketenchiev *et al.*, 2021), Lao, Myanmar, Malaysia, Thailand, Vietnam, and Hong Kong (Chaudhry, 2010).

Habitat: This species was recorded from standing water near river and irrigation channels. Reported earlier from, marshy places and paddies in hilly and plain areas (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, Palearctic, Indo-Australian, and Ethiopian.

Genus *Pantala* Hagen, 1861

***Pantala flavescens* (Fabricius, 1798)**

Material examined: 3♂ 2♀, Mirgam, 35°1'48" N, 71°49'12" E, 1702 m, 18.vii.2024; 2♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 1♂ 1♀, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024.

Earlier records from Pakistan: Azad Jammu and Kashmir, Gilgit Baltistan, Khyber Pakhtunkhwa, Baluchistan, Punjab, and Sindh (Rafi *et al.*, 2009; Din *et al.*, 2013; Iqbal *et al.*, 2013; Rehman *et al.*, 2015; Chaudhry *et al.*, 2016; Khan *et al.*, 2016; Zia *et al.*, 2019; Attaullah *et al.*, 2021; Hafeez *et al.*, 2021; Naeem *et al.*, 2022; Islam *et al.*, 2024; Rashied *et al.*, 2024).

Global distribution: Taiwan, Mexico, Myanmar, Singapore, Malaysia, Thailand, Vietnam, Chile, Cuba, Guyana, Japan, Venezuela, Indonesia, Colombia (Chaudhry, 2010). India, Bangladesh, Nepal, Sri Lanka and Bhutan (Kalkman *et al.*, 2020), Franc (Meurgey and Poirion, 2012), Russia Federation (Shapoval and Shapoval, 2017), Australia (Endersby, 2010), South America (Von Ellenrieder *et al.*, 2017), Italy (La Porta *et al.*, 2023), Argentina (Lozano *et al.*, 2020), Iran (Schneider *et al.*, 2018), Brazil (Koroiva *et al.*, 2017), and China (Wilson, 2008).

Habitat: Specimens were collected from paddies, irrigation channels and near stationary water. Chaudhry (2010) collected from swarms in crop fields, ponds and playgrounds near water.

Zoogeographical affiliation: Oriental, Palearctic, Australian, Neotropical, and Nearctic.

Genus *Acisoma* Rambur, 1842

***Acisoma panorpoides* Rambur, 1842**

Material examined: 4♂ 1♀, Khazana, 34°47'24" N, 71°46'12" E, 688 m, 29.vii.2024; 2♂ 1♀, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 1♂, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024; 1♂, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024; 1♂, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024.

Earlier records from Pakistan: Khyber Pakhtunkhwa, Azad Jammu and Kashmir, Gilgit Baltistan, Punjab, and Sindh (Rafi *et al.*, 2009; Chaudhry *et al.*, 2016; Zia *et al.*, 2019; Bhatti *et al.*, 2020; Rehman *et al.*, 2020; Attaullah *et al.*, 2021; Mehmood *et al.*, 2021; Hafeez *et al.*, 2022; Naeem *et al.*, 2022; Sidra *et al.*, 2022; Islam *et al.*, 2024; Rashied *et al.*, 2024).

Global distribution: Myanmar, Hong Kong, Malaysia, Indonesia, Singapore, Japan, Thailand, Philippines, and Taiwan (Chaudhry, 2010). India, Bangladesh, Sri Lanka, Nepal and Bhutan (Kalkman *et al.*, 2020), Oman (Schneider and Ikemeyer, 2016), Armenian, Iranian and Asian Minor Highlands (Ketenchiev *et al.*, 2021), and China (Wilson, 2008).

Habitat: This species was documented near standing and spring waters with grasses along the riverbanks. Chaudhry (2010) recorded from stationary shallow waters with dense vegetation.

Zoogeographical affiliation: Oriental, Palearctic, and Indo-Australian.

Genus *Libellula* Linnaeus, 1758

***Libellula quadrimaculata* Linnaeus, 1758**

Material examined: 1♂ 1♀, Khazana, 34°47'24" N, 71°46'12" E, 688 m, 29.vii.2024; 3♂ 1♀, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 2♂ 1♀, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024; 4♂ 2♀, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024.

Earlier records from Pakistan: Gilgit Baltistan (Zia *et al.*, 2009; Chaudhry *et al.*, 2016).

Global distribution: Turkey, Europe, Kazakhstan, and Mongolia (Chaudhry, 2010). Nepal and India (Kalkman *et al.*, 2020), Iran (Schneider *et al.*, 2018), Russian Federation (Shapoval and Shapoval, 2017; Malikova and Kosterin, 2019), North America ((Paulson and Dunkle, 1999), Iran, Armenian and Asia Highlands (Ketenchiev *et al.*, 2021), Ireland (Nelson *et al.*, 2011), Italy (Assandri, 2019), and Siberia (Borisov, 2021).

Habitat: Specimens of this species were collected from still water along the river, and in irrigation channels. However, previously reported from standing and slow-moving waters (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, and Palearctic.

Genus *Brachythemis* Brauer, 1868

***Brachythemis contaminata* (Fabricius, 1793)**

Material examined: 3♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024.

Earlier records from Pakistan: Punjab, Baluchistan, Sindh, Khyber Pakhtunkhwa, and Azad Jammu and Kashmir (Iqbal *et al.*, 2013; Chaudhry *et al.*, 2016; Rehman *et al.*, 2020; Sidra *et al.*, 2022; Islam *et al.*, 2024).

Global distribution: Thailand, Taiwan, Vietnam, Myanmar, Cambodia, Malaysia, Singapore, Burma, Hong Kong, Peninsular Malaysia, Japan, and Philippines (Chaudhry, 2010). India, Nepal, Bhutan, Sri Lanka and Bangladesh (Kalkman *et al.*, 2020), Indonesia (Hastomo *et al.*, 2022), China (Wilson and Reels, 2001), and Iran (Schneider *et al.*, 2018).

Habitat: This species was recorded from irrigation channels in the crops. Earlier collected from lentic water with grasses and shady spots near small, running water (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, and Palearctic.

Genus *Zygonyx* Hagen, 1867

***Zygonyx torridus isis* Fraser, 1924**

Material examined: 3♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024.

Earlier records from Pakistan: Azad Jammu and Kashmir, Punjab, and Khyber Pakhtunkhwa (Chaudhry *et al.*, 2016; Rehman *et al.*, 2020).

Global distribution: Known from India (Kalkman *et al.*, 2020).

Habitat: This species was documented from irrigation channels and stationary water in crops. Specimens were collected earlier from slow-running water (Chaudhry, 2010).

Zoogeographical affiliation: Oriental.

Family Gomphidae Rambur, 184

Genus *Ictinogomphus* Cowley, 1934

***Ictinogomphus angulosus* (Selys, 1854)**

Material examined: 5♂ 1♀, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024; 6♂ 2♀, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024.

Earlier records from Pakistan: Azad Jammu and Kashmir, Khyber Pakhtunkhwa, and Punjab (Chaudhry *et al.*, 2016; Rehman *et al.*, 2020; Sidra *et al.*, 2022).

Global distribution: Nepal, and India (Kalkman *et al.*, 2020).

Habitat: Specimens were collected from perennial stagnant waters with vegetation along the river. Chaudhry (2010) documented from lentic waters and water channels in mountains. **Zoogeographical affiliation:** Oriental.

Genus *Gomphidia* Selys, 1854

***Gomphidia t-nigrum* Selys, 1854**

Material examined: 2♂ 1♀, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024.

Earlier records from Pakistan: Punjab (Chaudhry *et al.*, 2016; Naeem *et al.*, 2022).

Global distribution: India, and Nepal (Chaudhry, 2010; Kalkman *et al.*, 2020).

Habitat: Specimens were recorded from perennial stagnant water with grasses along river. Specimens were collected previously from the edge of small dam, and ponds (Chaudhry, 2010).

Zoogeographical affiliation: Oriental.

Genus *Paragomphus* Cowley, 1934

***Paragomphus lineatus* (Selys, 1850)**

Material examined: 1♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 2♂, Talash, 34°44'24" N, 71°51'36" E, 833 m, 16.vii.2024; 3♂, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024.

Earlier records from Pakistan: Azad Jammu and Kashmir, Punjab, and Khyber Pakhtunkhwa (Rafi *et al.*, 2009; Chaudhry, 2010).

Global distribution: Bangladesh, Bhutan, Nepal, and India (Kalkman *et al.*, 2020), Iran (Schneider *et al.*, 2018), Armenian and Asia Minor Highlands (Ketenchiev *et al.*, 2021).

Habitat: This species was recorded from streams, and standing waters along the river. Earlier recorded from elevated flora, sandy edges near lentic and lotic water (Chaudhry, 2010).

Zoogeographical affiliation: Oriental, and Palearctic.

Family Aeshnidae Leach, 1815

Genus *Anax* Leach, 1815

***Anax indicus* Lieftinck, 1942**

Material examined: 2♂, Beshgram, 34°59'24" N, 71°51'0" E, 1370 m, 18.vii.2024.

Earlier records from Pakistan: Punjab (Chaudhry *et al.*, 2016).

Global distribution: India, Bangladesh, Nepal, Bhutan, and Sri Lanka (Kalkman *et al.*, 2020).

Habitat: Specimens were collected near the river and spring with vegetation. Specimens were collected in a prior study from standing water (Chaudhry, 2010).

Zoogeographical affiliation: Oriental.

Suborder Zygoptera Selys, 1854

Family Coenagrionidae Kirby, 1890

Genus *Ceriagrion* Selys, 1876

***Ceriagrion coromandelianum* (Fabricius, 1798)**

Material examined: 3♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024; 3♂ 1♀, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024; 2♂ 1♀, Garraha Kotkai, 34°47'24" N, 71°43'48" E, 706 m, 21.vii.2024; 1♂, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024.

Earlier records from Pakistan: Khyber Pakhtunkhwa, Sindh, Baluchistan, Punjab, Azad Jammu and Kashmir, and Gilgit Baltistan (Khaliq and Maula, 1999; Zia, 2010).

Global distribution: India, Bangladesh, Bhutan, Nepal, and Sri Lanka (Kalkman *et al.*, 2020).

Habitat: Specimens were documented from irrigation channels, paddies, and near standing water. Zia *et al.* (2011) collected from paddies, grasses, and weeds near lentic and lotic water.

Zoogeographical affiliation: Oriental.

Genus *Pseudagrion* Selys, 1876

Pseudagrion rubriceps rubriceps Selys, 1876

Material examined: 2♂, Balambat, 34°49'12" N, 71°49'12" E, 800 m, 24.vii.2024.

Earlier records from Pakistan: Punjab, Khyber Pakhtunkhwa, and Azad Jammu and Kashmir (Kanth, 1985; Rafi *et al.*, 2009; Zia, 2010, 2016).

Global distribution: India, Bangladesh, Nepal, and Bhutan (Kalkman *et al.*, 2020), and China (Wilson and Reels, 2001; Zhang, 2011).

Habitat: Specimens were observed in rice fields. Documented previously from rice fields, stagnant, running waters and grasses near water bodies (Zia *et al.*, 2011).

Zoogeographical affiliation: Oriental, and Palearctic.

Family Calopterygidae Selys, 1850

Genus *Neurobasis* Selys, 1853

Neurobasis chinensis (Linnaeus, 1758)

Material examined: 8♂ 2♀, Munda, 34°48'36" N, 71°49'12" E, 730 m, 25.vii.2024.

Earlier records from Pakistan: Khyber Pakhtunkhwa, Punjab, and Azad Jammu and Kashmir (Khaliq, 1990; Khaliq and Maula, 1999; Rafi *et al.*, 2009; Zia, 2010, 2016; Zia *et al.*, 2019; Mehmood *et al.*, 2021; Naeem *et al.*, 2022; Islam *et al.*, 2024).

Global distribution: India, Bhutan, Nepal, Sri Lanka, and Bangladesh (Kalkman *et al.*, 2020) and, China (Wilson and Reels, 2001; Zhang, 2011).

Habitat: This species was recorded from running spring water with grasses. Earlier observed near fast moving streams, submerged grasses, paddies and swamps (Zia *et al.*, 2011).

Zoogeographical affiliation: Oriental.

Family Chlorocyphidae Cowley, 1937

Genus *Aristocypha* Laidlaw, 1950

Aristocypha quadrimaculata Selys, 1853

Material examined: 2♂, Talash Bandagai, 34°44'24" N, 71°49'12" E, 759 m, 16.vii.2024.

Earlier records from Pakistan: Punjab, Azad Jammu and Kashmir, and Khyber Pakhtunkhwa (Kanth, 1985; Khaliq, 1990; Khan *et al.*, 2008; Rafi *et al.*, 2009; Zia, 2010, 2016 Attaullah *et al.*, 2021; Mehmood *et al.*, 2021; Naeem *et al.*, 2022).

Global distribution: India, Bangladesh, Bhutan, and Nepal (Kalkman *et al.*, 2020).

Habitat: This species was documented from spring water with small grasses. Previously, it was recorded along seasonal water stream, rocks adjacent to lotic water, rivers, and partially submerged grasses and hide in gaps between the edges of stones (Zia *et al.*, 2011).

Zoogeographical affiliation: Oriental.

Family Euphaeidae Yakobson & Bainchi 1905

Genus *Bayadera* Selys, 1853

***Bayadera indica* (Selys, 1853)**

Material examined: 3♂ 1♀, Mirgam, 35°1'48" N, 71°49'12" E, 1702 m, 18.vii.2024.

Earlier records from Pakistan: Azad Jammu and Kashmir, Punjab, and Khyber Pakhtunkhwa (Kanth, 1985; Khaliq, 1990; Khaliq and Siddique, 1995; Khaliq and Maula, 1999; Zia, 2010, 2016; Rashied *et al.*, 2024).

Global distribution: Bhutan, Nepal, and India (Kalkman *et al.*, 2020).

Habitat: Specimens were recorded from a small stream with big rocks near fields during flight between rocks. Reported earlier from grasses, vegetation and rocks in streams (Zia *et al.*, 2011).

Zoogeographical affiliation: Oriental.

***Bayadera longicauda* Fraser, 1928**

Material examined: 6♂ 2♀, Mirgam, 35°1'48" N, 71°49'12" E, 1702 m, 18.vii.2024.

Earlier records from Pakistan: Punjab, and Azad Jammu and Kashmir (Yousuf *et al.*, 2000; Zia, 2010; Rashied *et al.*, 2024).

Global distribution: Bhutan, Nepal and India (Kalkman *et al.*, 2020).

Habitat: Documented from a small stream with large stones. In prior surveys, specimens were recorded from tall vegetation within and around small streams (Zia *et al.*, 2011).

Zoogeographical affiliation: Oriental.

DISCUSSION

Based on physiography, Pakistan possesses four major mountainous ranges: Himalaya, Karakorum, Hindu Kush, and Suleiman (Zia, 2016). The country harbors fauna from three zoogeographical regions: Palearctic, Oriental, and Ethiopian or Afrotropical (Waseem *et al.*, 2025). The Hindu Kush Mountain range is part of the Palearctic realm (Zia *et al.*, 2011) that connects Afghanistan with Pakistan through the Chitral region, and extends northeastward to Gilgit-Baltistan (Baig *et al.*, 2022).

District Lower Dir is located at the foothills of the Hindu Kush Mountain range, is relatively underexplored for Odonata diversity. In previous countrywide surveys, Zia *et al.* (2011) reported 53 species of Zygoptera representing 21 genera and 9 families, of which 3 species; *Ceriagrion coromandelianum*, *Ischnura rubilio* and *Ischnura forcipata* were recorded from the study area. Similarly, Chaudhry (2010) recorded 68 Anisoptera species belonging to 39 genera and 5 families from Pakistan, with no records from the study area. Recently, from the study area a preliminary limited survey documented 11 species of Anisoptera, representing seven (7) genera and three (3) families (Perveen *et al.*, 2014). However, these studies ignored 98% of the study area. Geographically district Lower Dir connected to Upper Dir District in the north, from where in a small-scale survey, Islam *et al.* (2024) documented 17 species belonging to 11 genera and 4 families. Recently a comprehensive study was conducted on the Odonata fauna of Upper Dir, which reported 27 species of Anisoptera representing 12 genera and 3 families including *Cephalaeschna klapperichi* as a new record for Pakistan and 6 species of Zygoptera belonging to 5 genera and 4 families (Ullah *et al.*, 2026). Another study carried out on the habitat-based diversity of Odonata complex across districts of Dir (Upper & Lower), which reported that riparian and agricultural habitat, each supporting 36 species, followed by springs, forest, and subalpine habitats, harboring 27, 15, and 5 species, respectively. However, alpine pastures yielded no record due to harsh weather conditions (Ullah *et al.*, 2026). On the southern side, River Swat separates the study area from Malakand District, where the Odonata fauna is completely unexplored to date, and both areas are likely to be harboring similar species due to the absence of physical barriers, and similarity in topography, ecological characteristics, and climate. To the east, the study area is bounded by the Swat District, where a study on the diversity of Odonata revealed 22 species representing 12 genera and 5 families (Attaullah *et al.*, 2021). From the same area, Akbar *et al.* (2017) reported *Anax imperator* and *Anax parthenope*. The study area shares its western boundaries with Bajaur District and Afghanistan, where the Odonata fauna is poorly explored and still seems to have less chances of exploration for many decades due to war on terror situations within and

across the border, as these areas were designated as restricted zones and research activities were not permitted. To date, 62 species are reported from Afghanistan (Asahina, 1966), whereas no species have been recorded from Bajaur District. The species recorded from the localities adjacent to the border, such as Samarbagh, Miskini, Shahi, show expected presence in the territory of Afghanistan, and the odonates of these areas may have dispersed from Afghanistan because the regions on both sides of the line of control share similar water resources, vegetation, topography, climatic factors, and other ecological characteristics. Odonates have lived for several generations in favourable habitats, and when their native habitats are disturbed, they can migrate to other suitable habitats (Corbet, 2004). Similarly, odonates are efficient fliers and can fly thousands of miles from their feeding and breeding ground for survival and ideal conditions, and in many instances, adult individuals have been observed away from their naiads (Din *et al.*, 2013). Previous studies reported 11 species of Anisoptera and 03 species of Zygoptera from the area; however, the current study increased this richness to 26 and 6 species, respectively, indicating a significant increase in species diversity. Moreover, it extends the known geographical range of the Odonata fauna of Pakistan.

Conclusion: The present study provides the first comprehensive assessment of the composition and distribution of Odonata fauna in the foothills of the Hindu Kush range Lower Dir, Pakistan. The results indicate that the study area support a rich diversity of Odonata fauna distributed across a wide range of habitats and altitudinal zones. The present work has substantially expanded the existing knowledge of Odonata fauna by documenting distributional information and updating regional species records. Moreover, it shows the expected occurrence of the same species in Bajaur, Malakand and adjacent regions of Afghanistan. The current study indicates that the study area harbors a rich and largely unexplored insect fauna, highlighting the need for further systematic exploration and biodiversity assessment.

Authors Contributions: All authors contributed to this study. Ikram Ullah contributed to fieldwork, manuscript preparation and identified the specimens. Ahmed Zia helped in the identification of specimens, proofread the manuscript and provided funds for the study through ALP Project (CS-404). Ikram Ilahi provided assistance and guidance in preparation of the materials; Muhammad Inam, Durkhatoon Hayat, Shahida Rashied, Sumera Aslam and Abdul Hakeem contributed in preparation of manuscript.

Conflict of Interest: The authors declare no conflict of interest.

Funding: Pakistan Agricultural Research Council supported this work under grant “ALP (CS-404)”, funded project running at National Insect Museum, NARC, Islamabad-Pakistan.

REFERENCES

- Ahmed, B., M. Amin, A. Zia, M. Qasim, M. Khan, Z. Ullah and M. Khan (2023). Dragonflies fauna (Odonata: Anisoptera) of Kech Balochistan, Pakistan. *Jammu Kashmir J. Agric.* 3(3): 215-220. [org/10.56810/jkjagri.003.03.0095](https://doi.org/10.56810/jkjagri.003.03.0095)
- Ahmad, L., F. Ullah. A.J. Semotiuk, W. Rashid, I. Khan, H. A. Jan and W. Rainer (2020). Traditional knowledge and economic significance of *Berberis lycium* Royle in the District Dir Lower. *Ethnobot. Res. Appl.* 20(30): 1-12. [12.org/10.32859/era.20.30](https://doi.org/10.32859/era.20.30).
- Akbar, A., S.A. Mehmood, W.A. Panhwar, S. Ahmed, S. Tabassum, S. Rajput and M. Ali (2017). Collection and identification of genus *Anax* (Odonata, Aeshnidae) from district Swat. *J. Entomol. Zool. Stud.* 5(2): 1440-1442.
- Aksenova, O.V., G.S. Potapov, Y.V. Bepalaya, Y.S. Kolosova, I.V. Vikhrev, A.V. Kondakov and I.N. Bolotov (2020). Dragonflies from hot springs in Russia with a country-level checklist of species known to occur in geothermal environments. *Ecol. Montenegrina*, 10(34): 49-63. [org/10.37828/em.2020.34.6](https://doi.org/10.37828/em.2020.34.6)
- Assandri, G. (2019). A critical review of the odonate fauna of Trentino: annotated checklist and new relevant data for Italy (Insecta: Odonata). *Fragm. Entomol.* 51(1): 75-88. [org/ 10.13133/2284-4880/339](https://doi.org/10.13133/2284-4880/339).
- Asahina, S. (1966). The Afghan Odonata. Results of the Kyoto University Scientific Expedition to the Karakoram and Hindukush. *Insect fauna Afghan. Hindukush.* 8: 155–158.
- Attaullah, M., I. Ullah, M. Ali, F. Maula, I. Ilahi, B. Ahmad and S.M.M. Raheel (2021). Diversity of the Anisoptera & Zygoptera (Odonata: Insecta) of Swat, Pakistan. *Braz. J. Biol.* 83: e251958. [org/10.1590/1519-6984.251958](https://doi.org/10.1590/1519-6984.251958).
- Baig, T., S. Ali and A. Shah (2022). Mountain studies: Understanding and managing mountains for people and nature. 1st Ed. Karakoram International University; Gilgit (Pakistan). 206 pp.
- Bhatti, H., W.A. Panhwar and S.A. Zia (2020). Study on the dragonfly (Anisoptera: Odonata) fauna of district Larkana Sindh, Pakistan. *J. Entomol. Zool. Stud.* 8(2): 619-623.
- Borisov S.N. (2021). Updates to the fauna of dragonflies (Odonata) of the Altaiskii Krai with new records of species for Siberia. *Eur. J. Entomol.* 20(3):136-141. [org/10.15298/euroasentj.20.3.03](https://doi.org/10.15298/euroasentj.20.3.03)
- Boyd, S. (2005). Damselflies and dragonflies. Scientific illustration major; University of Georgia, Athens (United States). 1-45 pp
- Carter, P., A. Goodman, J. Abbott, C. Bota Sierra, S. M. Bybee, R. Dow and V. Kalkman (2026). The classification and diversity of extant dragonflies and damselflies (Odonata). *Int. J. Odonatol.* 29: 95-124. [org/10.48156/1388.2026.1917385](https://doi.org/10.48156/1388.2026.1917385)
- Cannings, R.A. (2014). The dragonflies and damselflies (Odonata) of Canadian grasslands. 1st Ed. Biological Survey of Canada; Ottawa (Canada), 231-269 pp.

- Chaudhry, M.T. (2010). Systematics of dragonflies (Anisoptera: Odonata) of Pakistan. Ph.D. Thesis. Deptt. of Entomol., P.M.A.S. Arid Agric. Univ., Rawalpindi.
- Chaudhry, M.T., A. Mohsin, F.A. Shaheen, M. Arshad and A. Zia (2016). Dragonflies (Odonata: Anisoptera) of Pakistan. Pak. J. Zool. 48(6): 1957-1962.
- Corbet, P.S. (2004). Dragonflies: Behavior and Ecology of Odonata. Harley Books; Colchester (United Kingdom).
- Din, A.U., A. Zia, A.R. Bhatti and M.N. Khan (2013). Odonata Naiads of Potohar Plateau, Punjab, Pakistan. Pak. J. Zool. 45(3): 695-700.
- Dudgeon, D. (2010). Prospects for sustaining freshwater biodiversity in the 21st century: linking ecosystem structure and function. Curr. Opin. Environ. Sustain. 2(5-6): 422-430. [org/10.1016/j.cosust.2010.09.001](https://doi.org/10.1016/j.cosust.2010.09.001)
- Endersby, I.D. (2010). A revised, annotated checklist of Victorian dragonflies (Insecta: Odonata). Proc. R. Soc. Vict. 122(1): 9-27. [org/10.1071/RS10002](https://doi.org/10.1071/RS10002)
- Fraser, F.C. (1933). The fauna of British India including Ceylon and Burma. Vol. I. Taylor and Francis; London, UK. 423 pp.
- Fraser, F.C. (1934). The fauna of British India including Ceylon and Burma. Vol. II. Taylor and Francis; London, UK. 398 pp.
- Fraser, F.C. (1936). The fauna of British India including Ceylon and Burma. Vol. III. Taylor and Francis; London, UK. 461 pp.
- Giles, G.B. (1998). An illustrated checklist of the damselflies and dragonflies of the UAE. Tribulus, 8(2): 9-15.
- Goswami, R., D. Rawat and C. S. Negi (2025). Indian Odonata: Diversity, Ecology, and Conservation Challenges. Indian J. Ecol. 52(5): 1023-1030. [org/10.55362/IJE/2025/4610](https://doi.org/10.55362/IJE/2025/4610)
- Hacet, N. (2017). Updated checklist of Odonata fauna in the Turkish Thrace Region, with additional records of new, rare, and threatened taxa. Turk. J. Zool. 41(1): 33-42. [org/10.3906/zoo-1601-65](https://doi.org/10.3906/zoo-1601-65)
- Hafeez, B., M.F. Malik, W. Asghar, R. Shabbir, I. Latif, A. Jabeen and F. Ghafoor (2021). Diversity and distribution of Dragonfly in District Sialkot, Punjab, Pakistan. Pure Appl. Biol. 10(4): 988-994. [org/10.19045/bspab.2021.100103](https://doi.org/10.19045/bspab.2021.100103)
- Hastomo, S.O.E., Z. Muttaqin and K.D. Cita (2022). Inventory and diversity of dragonflies (Odonata) at Kuningan Resort of Mount Ciremai National Park, West Java Province. Earth Environ. Sci. 959(1): 012019. [org/10.1088/1755-1315/959/1/012019](https://doi.org/10.1088/1755-1315/959/1/012019)
- Henningsen, M., G. Peitzner, P. Peitzner and M. Husemann (2020). An updated checklist of type material of dragonflies and damselflies (Odonata) housed in the Zoological Museum Hamburg (ZMH), Germany. Evol. Syst. 4:53-60. [org/10.3897/evolsyst.4.48407](https://doi.org/10.3897/evolsyst.4.48407)
- Inam, M., K. Shahjeer, A. Zia, G. Rehman and T. Iqbal (2025). First record of *Anisogomphus caudalis* (Fraser 1926), a data deficient species of Odonata (Anisoptera: Gomphidae) from Pakistan with special reference to species distribution modelling. Orient. Insects. 59(4): 671-691. [org/10.1080/00305316.2025.2531837](https://doi.org/10.1080/00305316.2025.2531837)
- Iqbal, M.A., S.A. Rizvi, Z. Ahmed and M.A. Akhter (2013). A list of Dragonflies (Anisoptera: Odonata) with new records from Pakistan. Int. J. Biol. Biotech. 10(1): 83-90.
- Islam, I., R. Ullah, A. Zia, A.R. Bhatti, M. Ilyas, S. Hayat and K. Hayat (2024). Species complexity of order Odonata in district Dir Upper, Khyber Pakhtunkhwa, Pakistan. Pak. J. Agri. Res. 37(1): 56-61. [org/10.17582/pjar/2024/37.1.56.61](https://doi.org/10.17582/pjar/2024/37.1.56.61)
- IUCN (2025). IUCN Red List Summary Statistics. Version 2025-2, Table 1a. Available online at: <https://www.iucnredlist.org/resources/summary-statistics>. Accessed on June 28, 2026.
- Kalkman, V.J., R. Babu, M. Bedjanić, K. Conniff, T. Gyltshen, M.K. Khan, K.A. Subramanian, A. Zia and A.G. Orr (2020). Checklist of the dragonflies and damselflies (Insecta: Odonata) of Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka. Zootaxa, 4849(1): 1-84. [org/10.11646/zootaxa.4849.1.1](https://doi.org/10.11646/zootaxa.4849.1.1)
- Kanth, Z. I. (1985). Odonata of Azad Jammu and Kashmir. M.Sc. thesis (Unpublished), Deptt. of Entomol., Univ. Agric., Faisalabad.
- Ketenchiev, K.A., S.G. Kozminov, A.Y. Paritov, R.K. Sabanova and E.A. Krapivina (2021). Comparative study on the fauna composition of dragonflies (Insecta: Odonata) in the Armenian, Iranian and Asia Minor Highlands as part of the Asiatic Mediterranean (Mediterranean faunal subregion, Paleosubtropical region, Boreal kingdom; 7-11 Orenburg, Russian Federation.
- Khaliq, A. and F. Maula (1999). Records of dragonflies from Swat Valley, Pakistan. Fraseria, 6(12): 1-2.
- Khaliq, A. (1990). Taxonomic studies on Zygoptera (Odonata) of Pakistan. PhD thesis, Deptt. of Entomol., Univ. Agric., Faisalabad.
- Khaliq, A. and M. Siddique (1995). Some rice-field Odonata in the districts of Poonch and Bagh, Azad Kashmir, Pakistan. Not. Odonatol. 4(6): 106-106.
- Khan, M. R., M. Irshad and M. A. Rafi (2008). Insect fauna of Azad Jammu and Kashmir. University of Azad Jammu and Kashmir: Muzaffarabad (Pakistan). pp. 1-143.
- Khan, J., Saifullah and A. Zia (2016). Biodiversity of Dragonflies and their Life Threatening Factors in Tehsil Chamla and Daggar of District Buner, Khyber Pakhtunkhwa, Pakistan. Pak. J. Zool. 48(4): 1077-1082.
- Koroiva, R., M.E. Rodrigues, F. Valente-Neto and F.D.O. Roque (2017). Odonates from Bodoquena Plateau: checklist and information about endangered species. Biota Neotrop. 17(3): e20160310. [org/10.1590/1676-0611-BN-2016-0310](https://doi.org/10.1590/1676-0611-BN-2016-0310)
- La Porta, G., F. Landi, F. Leandri and G. Assandri (2023). The new checklist of the Italian fauna: Odonata. Biogeogr. 38(1): 1-14. [org/10.21426/B638158781](https://doi.org/10.21426/B638158781)
- Lozano, F., A. Del Palacio, L. Ramos and J. Muzon (2020). The Odonata of Argentina: state of knowledge and updated checklist. Int. J. Odonatol. 23(2): 113-153. [org/10.1080/13887890.2020.1737585](https://doi.org/10.1080/13887890.2020.1737585)
- Malikova, E.I. and O.E. Kosterin (2019). Check-list of Odonata of the Russian Federation. Odonatol. 48(1-2): 49-78. [org/10.5281/zenodo.2677689](https://doi.org/10.5281/zenodo.2677689)
- Mehmood, S.A., A. Zia, S. Ahmad, M. Shah and W. Ali (2021). Distribution and abundance of odonates fauna of Tanawal region District Mansehra, Pakistan. J. Anim. Plant Sci. 31(6): 1848-1854. [org/10.36899/JAPS.2021.6.0389](https://doi.org/10.36899/JAPS.2021.6.0389)

- Meurgey, F. and C. Poiron (2012). An updated checklist of Lesser Antillean Odonata. *Int. J. Odonatol.* 15(4): 305-316. [org/10.1080/13887890.2012.738401](https://doi.org/10.1080/13887890.2012.738401)
- Mitra, A. (2006). Current status of the Odonata of Bhutan: A checklist with four new records. *Bhu. J. RNR.* 2(1): 136-143.
- Monnerat, C. and H.M. Al Dhafer (2016). Odonata records from southwestern Saudi Arabia. *Not. Odonatol.* 8(7): 203-245.
- Naeem, M., S. Sattar, A. Zia, A. Rehman, T. Iqbal, S.A. Mehmood and K. Shahjeer (2022). Odonata (dragonflies and damselflies) naiads in sub Himalayan foothills of Pakistan. *J. Anim. Plant Sci.* 32(6): 1616-1627. [org/10.36899/JAPS.2022.6.0571](https://doi.org/10.36899/JAPS.2022.6.0571).
- Nelson, B., C. Ronayne and R.S. Thompson (2011). Ireland Red List No.6: Damselflies & Dragonflies (Odonata). National Parks and Wildlife Services, Department of the Environment, Heritage and Local Government; Dublin (Ireland). 1-26 pp.
- Nur-ul-Islam, H., A. Zia, K. Khan, H. Ali and A. Aziz (2021). *Sympetrum hypomelas* (Selys, 1884), an addition to Anisoptera fauna of Pakistan. *Pakistan J. Agri. Res.* 34(3): 538-544. [org/10.17582/pjar/2021/34.3.538.544](https://doi.org/10.17582/pjar/2021/34.3.538.544).
- Paulson, D.R. and S.W. Dunkle (1999). A Checklist of North American Odonata. Washington: Slater Museum of Natural History.
- Perveen, F., A. Khan and S.A. Rauf (2014). Check list of first recorded dragonfly (Odonata: Anisoptera) fauna of district Lower Dir, Khyber Pakhtunkhwa, Pakistan. *Arthropods*, 3(2): 120-126.
- Rafi, M.A., M.R. Khan, A. Zia and A. Shehzad (2009). Diversity of Odonata in district Poonch and Sudhnoti of Kashmir Valley-Pakistan, with a new record for the country. *Halteres*, 1(1): 28-35.
- Ramírez, A., N. Maldonado-Benítez, A. Mariani-Ríos and J. Figueroa-Santiago (2020). Dragonflies and damselflies (Odonata) from Puerto Rico: a checklist with notes on distribution and habitat. *Peer J.* 8:e9711.
- Rashied, S., A. Zia, R.A. Minhas, S. Aslam, A.R. Bhatti and G. Ali (2024). Diversity of the Anisoptera and Zygoptera (Odonata: Insecta) of State Biosphere Reserve Neelum of Azad Jammu and Kashmir, Pakistan. *Pak. J. Zool.* 56(5): 2293-2299. [org/10.17582/pjz/20231115114502](https://doi.org/10.17582/pjz/20231115114502)
- Rawan, B., W. Ullah, R. Ullah, T. A. Akbar, Z. Ayaz, M. F. Javed and O. Khan (2022). Assessments of roof-harvested rainwater in district Dir Lower, Khyber Pakhtunkhwa Pakistan. *Water*, 14(20): 3270. [org/10.3390/w14203270](https://doi.org/10.3390/w14203270)
- Rehman, A., S. Ahmad, A. Zia, A. Ali, K. Shahjeer, A. Latif and T. Khan (2020). Dragonflies (Anisoptera: Odonata) fauna of district Swabi Khyber Pakhtunkhwa, Pakistan. *Sarhad J. Agric.* 36(2): 675-684. [org/10.17582/journal.sja/2020/36.2.675.684](https://doi.org/10.17582/journal.sja/2020/36.2.675.684)
- Rehman, S.U., I. Khatri, M.A. Rustamani, A. Bukero, B.A. Pirzado and A.R. Rajpar (2015). Taxonomic studies of dragonflies from Hyderabad, Sindh. *Int. J. Biol. Biotech.* 12(1): 75-79.
- Rowe, R. (2003). Dragonflies: Behavior and Ecology of Odonata. *Austral. J. Entomol.* 42 (2): 210-211. [org/10.1046/j.1440-6055.2003.00341.x](https://doi.org/10.1046/j.1440-6055.2003.00341.x)
- Sadeghi, S. and J. Mohammadzadeh (2009). Additions to the Odonata fauna of Iran. *Iran. J. Sci. Technol. Trans.* 33(4): 355-359.
- Sandall, E.L., S. Pinkert and W. Jetz (2022). Country-level checklists and occurrences for the world's Odonata (dragonflies and damselflies). *J. Biogeogr.* 49(8): 1586-1598. [org/10.1111/jbi.14457](https://doi.org/10.1111/jbi.14457)
- Schneider, T. and D. Ikemeyer (2016). Dragonflies of Oman—a revised illustrated checklist (Odonata). *Entomol. Z.* 126(3): 137-147.
- Schneider, T., D. Ikemeyer, O. Müller and H.J. Dumont (2018). Checklist of the dragonflies (Odonata) of Iran with new records and notes on distribution and taxonomy. *Zootaxa* 4394(1): 1-40. [org/10.11646/zootaxa.4394.1.1](https://doi.org/10.11646/zootaxa.4394.1.1)
- Sh, A.M., M.J. Medetov and I.I. Abdullayev (2021). Fauna of Dragonflies (Odonata: Anisoptera, Zygoptera) In Khorezm Oasis, Uzbekistan. *Nat. Vol. Essent. Oil* 8(6): 1792-1798.
- Shaikh, J., N. Baloch, B.A. Bughio, A. Ashfaq, S.T.M. Ahmed, A.S. Kalhor and S. Ali (2019). Distribution of dragonflies and damselflies (Arthropoda: Odonata) from district Jamshoro Sindh. *J. Entomol. Zool. Stud.* 7(3): 394-396.
- Shapoval, N.A. and A.P. Shapoval (2017). Annotated checklist of the dragonflies (Insecta: Odonata) of the Kaliningrad region, northwestern Russia. *Ukr. J. Ecol.* 7(4): 157-168. [10.15421/2017_100](https://doi.org/10.15421/2017_100)
- Sharma, M., B.R. Oli, S. Awasthi, N. Subedi and P.R. Pokhrel (2018). Dragonflies and damselflies (Insecta: Odonata) of western Nepal: A checklist. *Int. J. Fauna Biol.* 5(6): 140-146.
- Sidra, S., A. Mahmood, M. Moavia and H.B. Saadaat (2022). Anisopteran diversity in two riverine habitats of Southern Punjab, Pakistan. *Inland Water Biol.* 15(4): 361-367. [org/10.1134/S1995082922040411](https://doi.org/10.1134/S1995082922040411)
- Silby, J. (2001). *Dragonflies of the World*. Smithsonian Institution Press; Washington. 211 pp.
- Subramanian, K.A. (2005). *Dragonflies and damselflies of Peninsular India-A field guide*. Indian Academy of Sciences; Bangalore (India).pp. 1-35.
- Ullah, I., I. Ilahi and A. Zia (2026). Exploring the Odonata fauna of Hindu Kush range in Upper Dir with the first record of *Cephalaeschna klapperichi* (Schmidt, 1961) from Pakistan. *Orient. Insects*, 60(1): 164-193. [org/10.1080/00305316.2025.2574455](https://doi.org/10.1080/00305316.2025.2574455)
- Ullah, I., I. Ilahi and A. Zia (2026). Effect of ecological factors and habitat changes on the diversity and distribution of Odonata complex across different ecological zones in Hindu Kush Range Dir, Pakistan. *Int. J. Agric. Biol.* 35(1):350101. [org/10.17957/IJAB/15.2416](https://doi.org/10.17957/IJAB/15.2416)
- Ullah, S., M. Akmal, F. Aziz, S. Ullah and K. J. Khan (2014). Hand pumps' water quality analysis for drinking and irrigation purposes at district Dir Lower, Khyber Pakhtunkhwa Pakistan. *Eur. Acad. Res.* 2(1): 1560-1572.
- Ullah, S., Z. Hasan, Z. Li, A. Zuberi, M. J. Zorriehzakra and G. Nabi (2020). Diversity and community composition of ichthyofauna at Konhaye Stream, district Dir Lower, Pakistan. *Iran. J. Fish. Sci.* 19(5): 2322-2339.
- Van Klink, R., J.K. Sheard, T.T. Høye, T. Roslin, L. A. Do Nascimento and S. Bauer (2024). Towards a toolkit for global insect biodiversity monitoring. *Philos. Trans. R. Soc. B: Biol. Sci.* 379(1904): 20230101. [org/10.1098/rstb.2023.0101](https://doi.org/10.1098/rstb.2023.0101)
- Von Ellenrieder, N., B. Willink and E.I. Svensson (2017). Checklist of the dragonflies and damselflies from Guyana (Insecta: Odonata), with new records from the country. *Check List*, 13(2): 1-22. [org/10.15560/13.2.2104](https://doi.org/10.15560/13.2.2104)

- Waseem, M., R.Arshad, N. Bano, S. Khwaja, T.Murtaza, S.Iqbal and M. Abdullah (2025). The insect fauna of Pakistan: diversity, ecological significance, and conservation challenges. J. Basic Appl. Zool. 86(1): 93. [org/10.1186/s41936-025-00510-0](https://doi.org/10.1186/s41936-025-00510-0)
- Wilson, K.D.P. (2008). Revised checklist of Hainan Odonata, China. Echo, 5: 6-14.
- Wilson, K.D.P. and G.T. Reels (2001). Odonata of Hainan, China. Odonatol. 30(2): 145-208.
- Yousuf, M., L. M. Abbasi and A. Khaliq (2000). Description of a new allotype of *Bayadera longicauda* Fraser (Euphaeidae: Odonata) from Azad Kashmir. Pakistan Entomol. 22(1-2): 45-46.
- Zia, A. (2010). Biosystematics of damselflies (Zygoptera: Odonata) of Pakistan. Ph.D. Thesis. Deptt. of Entomol., P.M.A.S.-Arid Agri. Univ., Rawalpindi.
- Zia, A., A. Din, I. Azam, A. Munir and S. Afsheen (2018). Effect of salinity gradients on species composition of Odonata naiads. *Arthropods*, 7(1), 11-25.
- Zia, A., B. Shabnem, S.A. Mehmood, M.I. Mastoi, A. Shehzad and S. Ahmed (2024). *Aeshna mixta* (Latreille, 1805), a new record for the Odonata (Anisoptera: Aeshnidae) fauna of Pakistan. *Arthropods*, 13(2): 87-93.
- Zia, A., I. Hussain, S.A. Mehmood, S. Ahmad, M. Shah and A.R. Bhatti (2019). Richness and distribution of Odonata in Kurram district, Khyber Pakhtunkhwa. Pakistan J. Agri. Res. 32(4): 589-594. [org/10.17582/journal.pjar/2019/32.4.589.594](https://doi.org/10.17582/journal.pjar/2019/32.4.589.594)
- Zia, A., M. Naeem, M.A. Rafi, F. Naz, S. Afsheen and M. Ilyas (2011). Damselflies (Zygoptera: Odonata) of Pakistan: Part 1. J. Insect Sci. 11(1): 1-27.
- Zia, A. (2016). Zygoptera in Himalayan Foot Hills of Pakistan. IDF. 1-60.
- Zhang, H. (2011). Karst Forest Odonata from Southern Guizhou, China. PhD thesis, South China Agric. Univ., Guangzhou.