Pakistan Entomologist

Journal homepage: www.pakentomol.com

ANISOPTEROUS DRAGONFLIES OF DISTRICT NEELUM, AZAD JAMMU AND KASHMIR PAKISTAN

Hamad Ahsan[1], *Ahmed Zia[2], Sardar Muhammad Abdul Ghaffar[3], Shabir Ahmed[4], Abdul Rauf Bhatti[2], Sardar Azhar Mehmood[4], Rukshanda Saleem[5], Javed Iqbal[2]

[1]Agriculture Department (Muzaffarabad), AJ&K - Pakistan
[2]National Agriculture Research Centre (NARC) Islamabad - Pakistan
[3]The University of Poonch, Rawalakot (AJ&K) - Pakistan
[4]Hazara University, Mansehra (K.P.) - Pakistan
[5]University of Sialkot, Punjab - Pakistan

ARTICLE INFORMATION

Received: August 20, 2018
Received in revised form: June 05, 2019
Accepted: June 10, 2019

***Corresponding Author**:
Ahmed Zia
E-mail: saiyyedahmed@gmail.com

ABSTRACT

District Neelum of Azad Jammu & Kashmir, Pakistan represents an important geographical position being located at Line of Control (Separating Indian occupied Jammu Kashmir and Azad Kashmir of Pakistan). It shares its border with Indian held Kashmir and thus faced uncertain ground conditions since inception. It represents important topography and ecology that support a complex of Odonata. During present study district Neelum was thoroughly surveyed for the first time for exploring Anisoptera fauna. A total of 18 species under 11 genera of four families were recorded. Observations were also taken for dominance and richness of recorded species. Among recorded fauna, family Libellulidae appeared to be a dominant group. Being an ecologically rich area, seasonal surveys and temporal data collection can surely bring forward important information for migratory odonate species between India and Pakistan. A need to explore Zygoptera fauna along with more detailed surveys for Anisoptera is highly felt for the area.

Keywords: Dragonflies, Neelum, Azad Jammu and Kashmir, Pakistan.

INTRODUCTION

Dragonflies are an ancient group of insects that evolved long before dinosaurs live (Zia, 2009). They are popular bio-control agents that come under order Odonata of class Insecta. They are strong flyers that spend dual life style; aquatic as naiads and terrestrial as adults (Zia, 2010). Some species are tolerant to brackish and saline waters, while mostly live in fresh waters (Din *et al*., 2013). Yet many species have small ranges and are specific to certain habitats such as alpine mountain bogs or deserts and are thus frequently used as indicators of environment health. Their sensitivity to habitat quality makes them well-suited agents for environment monitoring (Dijkstra and Lewington, 2006). Their presence or absence is taken as signs and symbols to represent quality of aquatic microhabitats (Rutherford and Mallow, 1994; Kefford *et al*., 2003). They also possess medicinal properties and are used in treating sore throats and eye infections (Zia, 2010). Dragonflies are also valued fore being used as bio control agents in insect pest management programs (Rowe, 2003).

Anisoptera fauna of Pakistan firstly explored by Yousaf (1972) brought forward 46 species. However last known country wide surveys were carried out by Chaudhry (2010), who reported 68 Anisoptera species. Although lot of small scale faunistic studies were also conducted during course of time, yet number of known Odonata species in Pakistan remains far less as compared to neighbouring countries like India and China. In all previous works few pockets of the country remained unexplored due to uncertain ground conditions. Among these, Azad Jammu & Kashmir is an important area.

The State of Azad Jammu and Kashmir is part of Pakistan that lies between longitude of 73˚ to 75˚ & latitude of 33˚ to 35˚ and comprises an area of 5,134 square miles (Mushtaq, 2011). It is an area with least disturbed ecology and abundant natural niches for insect fauna. Administratively it includes ten districts that are Muzaffarabad, Neelum, Sudhnutti, Bhimber, Poonch, Mirpur, Bagh, Kotali, Haveli, and Hattian. Among these, district Neelum is spread over an area of 3,621sq. Km.

Cite this article as: Ahsan, H., A. Zia, S.M.A. Ghaffar, S. Ahmed, A.R. Bhatti, S.A. Mehmood, R. Saleem, J. Iqbal, 2019. Anisopterous dragonflies of district neelum, Azad Jammu and Kashmir – Pakistan. Pak. Entomol., 41(1):7-12.

Topography of district Neelum is mainly hilly and mountainous and it is located at northern end of AJ&K with an average annual precipitation of 1511mm. Main crops and fruits grown here include maize, rice, potato, pulses, apple, walnut, pear, plum, apricot and variety of vegetables (Ahsan, 20115). Dragonflies are known to feed on pests of these crops as a major predator (Rafi *et al*., 2010; Zia *et al*., 2009). Besides, climate and ecology of district Neelum also support a broad spectrum of odonate species. The ground conditions in district Neelum however remained less favourable for research surveys being located at the border of disputed territory i.e. Indian held Kashmir, thereby facing tension between the two countries (India and Pakistan) most of the time. Keeping in view the unexplored status, ecology and aquatic reservoirs like springs, streams, rivers, snow fall, precipitation, lakes and dams in district Neelum that naturally favours Odonata biology and population, it was decided to explore it thoroughly for dragonflies' species complex by involving local researchers.

MATERIALS AND METHODS

Adult dragonflies were collected during successive summer seasons of the years 2014-2015 from ten localities of district Neelum (Fig.1). Specimens were collected during their active period using aerial nets and killed by placing in jars having ethyl acetate soaked butter paper. Specimens after killing were kept in paper pockets and brought to laboratory where they were softened and rehydrated by keeping in humid chamber. Once the specimens became soft enough, they were set over appropriate setting boards and mounted properly with tags and labels attached. The specimens were transferred to storage boxes as became dried. Naphthalene balls were mounted and anti-ant powder was sprinkled in boxes to prevent from attack of ants and other insectivorous pests. Specimens were identified up to lowest specific taxa through Fraser (1934-1936), Chaudhry (2010) and Raza (2015), using Olympus (SZ2-ILST) stereoscope. Help in confirmation of specimens was also taken from reference collection of National Insect Museum (NARC), Islamabad. All identified specimens were deposited at Department of Entomology, The University of Poonch, Rawalakot and their representatives were kept at National Insect Museum NARC for future reference and record.

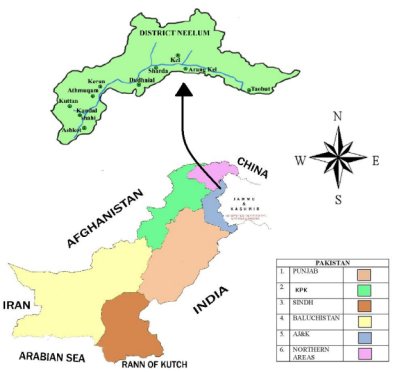

Fig.1
Map showing surveyed localities in district Neelum, AJ&K-Pakistan.

RESULTS AND DISCUSSION

A total of 18 species under 11 genera of four families were collected and identified during this study (Table 1). Distribution of species was studied (Fig. 2) and *Crocothemis servilia* (Drury, 1770), *Orthetrum triangulare triangulare* (Selys, 1878) and *Pantala flavescens* (Fabricius, 1798) were found to be most widely distributed species of the area being recorded from seven out of ten surveyed localities. These were followed by *Cordulegaster brevistigma* (Selys, 1854), *Crocothemis erythraea* (Brulle, 1832), and *Trithemis festiva* (Rambur, 1842) that were found at five localities. Certain taxa were observed to be rare and were seen only at single locality. These include, *Anax nigrofasciatus* Fraser, 1935, *Onychogomphus bistrigatus* Selys, 1854, *Orthetrum pruinosum neglectum* (Rambur, 1842), *Sympetrum commixtum* (Selys, 1884) and *Tramea virginia* (Rambur, 1842) followed by *Brachythemis contaminata* (Fabricius, 1793), *Orthetrum chrysostigma luzonicum* (Brauer, 1868), *Orthetrum sabina* (Drury, 1770), *Palpopleura sexmaculata sexmaculata* (Fabricius, 1787) and *Sympetrum decoloratum* (Selys, 1884) which were found less common than earlier and recorded from two localities.

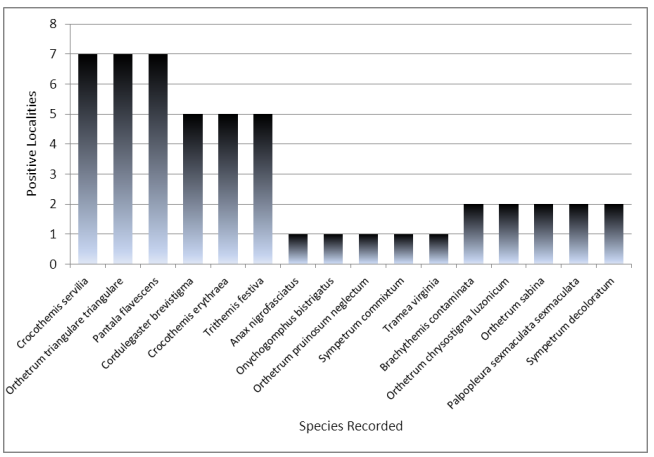

Fig. 2
Distribution of species observed in district Neelum, AJ&K-Pakistan.

Dominance of species was studied and family Libellulidae with its fifteen out of total eighteen species appeared as a dominant group among all recorded families (Fig. 3). On country level as well as worldwide basis it is the most common and dominant group among all known odonate families as studied and documented by Silsby (2001), Din *et al*. (2013) Fazlullah *et al*. (2016), Zada *et al*. (2016), and Zia *et al*. (2019). Results of present study further validate these findings declaring family Libellulidae as a dominant group among Odonata of district Neelum as well. Genera wise richness of species was also studied and genus *Orthetrum* of family Libellulidae was observed to be most rich genus among all recorded genera by representing six out of fifteen recorded Libellulid species (Fig. 4). These findings are also in accordance to the observations made by various early workers like Din (2012), Raza (2015), Hussain (2016), Mehmood (2016) and Zia *et al*. (2019). In all these studies, genus *Orthetrum* dominated among all recorded taxa.

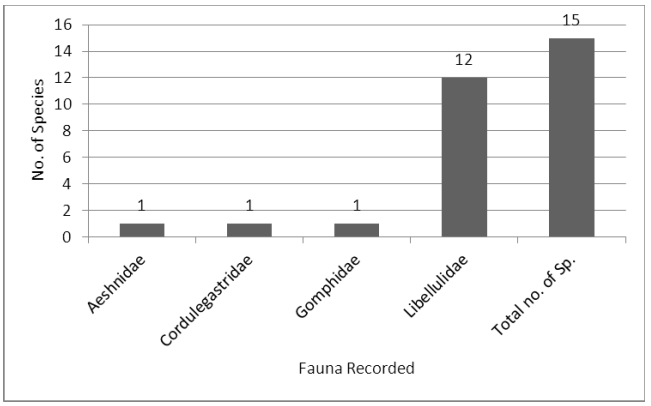

Fig. 3
Dominance observed in Anisoptera families

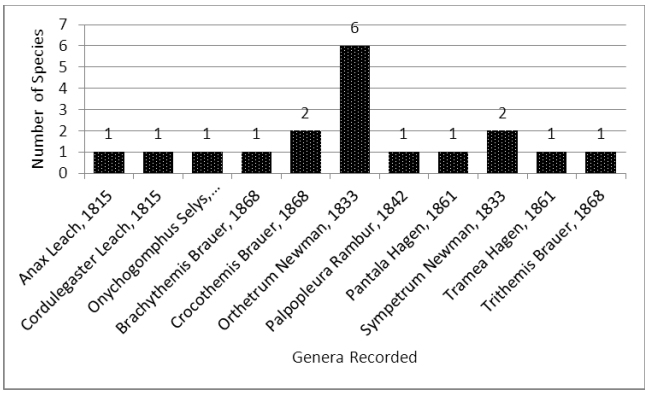

Fig. 4
Genera wise richness of species.

Dragonflies are insects that prefers undisturbed and pollution free ecologies. According to Zia *et al.* (2011), their population is decreasing due to rapid increase in air and water pollution in recent decade. In Pakistan, Azad Jammu & Kashmir generally and the area under district Neelum, specifically presents a clean ecology that can bring forward high richness of Odonata species, if explored thoroughly and extensively. The area is blessed with unlimited water resources in the form of seasonal streams, perennial rivers and natural springs with lots of small lakes and ponds. Whole valley become snow covered in winters that feed hundreds of streams and rivers in summers ultimately supporting Odonata biology and population. In all previous studies i.e. Kanth (1985), Khaliq (1990), Khaliq *et al*. (1994), Khaliq and Siddique (1995), Luqman (1995), Rafi *et al*. (2009), Chaudhry (2010), Mushtaq (2011), Chaudhry *et al*. (2015) and Ahsan (2015) recording Anisoptera complex of AJ&K, a record of 45 species has been brought forward. This makes more than 50% (Fig. 5) of the country's known Anisoptera fauna (71 species) documented by various workers like Chaudhry (2010), Din (2011) and Raza (2015).

Also in a recent study, Dow *et al.,* (2014) documented a new to science record of Odonata from Nausery valley (district Muzaffarabad) of AJ&K that highlights potential of a rich odonate fauna in valleys of AJ&K

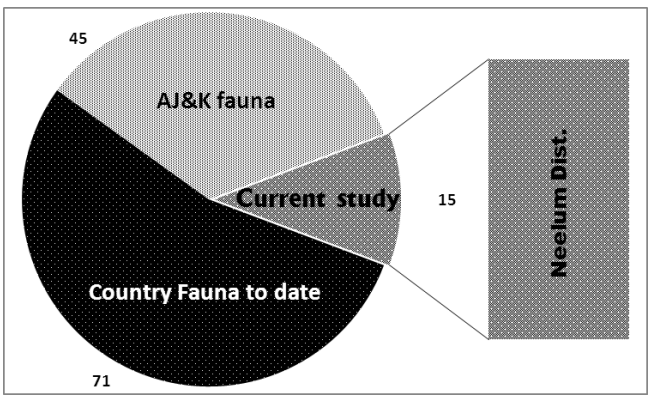

Fig. 5
Comparison of current study with previous known Odonata fauna

Present manuscript is based over a study that was under taken to record dragonflies of district Neelum for the first time since 1947. Neelum district lies at the border of Indian held Kashmir which is declared as Line of Control between India and Pakistan. Both the countries possess an important geographic position by reflecting Oriental, Palearctic as well as Ethiopian fauna. The area of Kashmir holds a transitional position between India and Pakistan. China also lies further next, and north to it. It is a known fact that odonates travels long in search of their food and ideal climatic conditions (Zia *et. al*., 2019). Now Kashmir; either "Azad Jammu Kashmir of Pakistan" or "Indian held, Jammu & Kashmir", both serves as house to lot of migratory Odonata species of China, Pakistan and India. So both the territories should be thoroughly surveyed for exploring new and important records of migratory Odonata. Present manuscript by reporting 15 species of dragonflies from district Neelum in its initial and baseline survey presents a good picture for inhabiting Anisoptera by reporting 1/3rd of the total AJ&K fauna (Fig. 6). Yet further search, deep in the valleys and high up the mountains is required to explore more important records of dragonflies from the area. A need to explore Zygoptera fauna in this ecologically rich area is also not to be denied.

Table 1.

Record of Anisoptera species studied in district Neelum, AJ&K.

Family	Genus	Species	Localities									
			Ashkot	Kundal Shahi	Kuttan	Athmuqam	Keran	Dudhnial	Sharda	Kel	Arang Kel	Taobut
Aeshnidae	*Anax* Leach, 1815	*Anax nigrofasciatus* Fraser, 1935	-	-	-	-	-	-	+	-	-	-
Cordulegastridae	*Cordulegaster* Leach, 1815	*Cordulegaster brevistigma* (Selys,1854)	-	-	-	-	-	+	+	+	+	+
Gomphidae	*Onychogomphus* Selys, 1854	*Onychogomphus bistrigatus* Selys, 1854	-	-	-	-	-	-	+	-	-	-
Libellulidae	*Brachythemis* Brauer, 1868	*Brachythemis contaminata* (Fabricius, 1793)	-	-	-	-	+	+	-	-	-	-
	Crocothemis Brauer, 1868	*Crocothemis erythraea* (Brulle,1832)	+	+	-	+	+	+	-	-	-	-
		Crocothemis servilia (Drury,1770)	+	+	+	+	+	+	-	-	+	-
	Orthetrum Newman, 1833	*Orthetrum anceps* (Schneider,1845)	-	-	-	+	+	+	-	-	+	-
		Orthetrum chrysostigma luzonicum (Brauer, 1868)	-	-	-	+	+	-	-	-	-	-
		Orthetrum japonicum internum (MacLachlan, 1894)	-	-	-	-	+	+	-	-	+	-
		Orthetrum pruinosum neglectum (Rambur, 1842)	-	-	-	-	-	+	-	-	-	-
		Orthetrum sabina (Drury, 1770)	-	-	-	-	-	+	-	+	-	-
		Orthetrum triangulare triangulare (Selys, 1878)	+	+	+	+	+	+	-	-	+	-
	Palpopleura Rambur, 1842	*Palpopleura sexmaculata sexmaculata* (Fabricius, 1787)	-	-	-	+	+	-	-	-	-	-
	Pantala Hagen, 1861	*Pantala flavescens*(Fabricius,1798)	+	+	+	+	+	+	+	-	-	-
	Sympetrum Newman, 1833	*Sympetrum commixtum* (Selys,1884)	-	-	-	-	-	-	-	+	-	-
		Sympetrum decoloratum (Selys,1884)	-	+	-	-	+	-	-	-	-	-
	Tramea Hagen, 1861	*Tramea virginia* (Rambur, 1842)	-	-	-	-	-	+	-	-	-	-
	Trithemis Brauer, 1868	*Trithemis festiva* (Rambur, 1842)	-	-	+	+	+	-	+	-	+	-

-indicates absence + indicates presence

REFERENCES

Ahsan, H., 2015. Species composition of dragonflies (Anisoptera: Odonata) from district Neelum of Azad Jammu and Kashmir. M. Sc. (Hons.) Thesis. Department of Entomology, The University of The Poonch Rawalakot, Azad Jammu and Kashmir. Pakistan. 68pp.

Chaudhry, M.T., 2010. Systematics of Dragonflies (Anisoptera: Odonata) of Pakistan. Ph.D. Thesis. Department of Entomology, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi. Pakistan. 190pp.

Chaudhry, M.T., A.U. Mohsin, R.A. Javed, A. Zia and I. Bodlah, 2015. New records of *Rhodothemisrufa* (Rambur, 1842) and *Lamelligomphus biforceps* (Selys 1878) (Odonata: Anisoptera) from Pakistan with re-description of *L. biforceps* (Selys 1878). Iranian J. Sci. Technol., 39(3): 305-309.

Dijkstra K.D.B. and R. Lewington, 2006. Field guide to the dragonflies of Britain and Europe. British Wildlife Publishing, 3(6): 22-29.

Din, A., 2012. Spatial and temporal distribution of Odonata larvae in lentic and lotic ecosystems of Potohar plateau, Punjab. M.Phil. Thesis. Department of Plant and Environmental Protection, Khyber Pakhtunkhwa Agriculture University, Peshawar. Pakistan. 77pp.

Din, A., A. Zia, A.R. Bhatti, and M. N. Khan, 2013. Odonata naiads of Potohar plateau, Punjab, Pakistan. Pakistan J. Zool., 45(3): 695-700.

Dow, R. A., A. Zia, M. Naeem and M.A. Rafi, 2014. *Calicemia fortis* sp. Nov. from Pakistan (Odonata: Zygoptera: Platycnemidae). Zootaxa, 3869(3): 338-342.

Fazlullah, M. Saeed, A. Zia, A. Farid, M. S. Khan, T. Badshah, and N. Zada, 2016. Libellulidae (Anisoptera) of upper Swat, Khyber Pakhtunkhwa, Pakistan. J. Entomol. Zool. Stud., 4(1): 227-228.

Fraser, F.C., 1934-36. The Fauna of British India Including Ceylon and Burma. Vols. 2-3, Today and Tomorrow's Printers and Publishers. New Dehli-5. 859pp.

Hussain, I., 2016. Biosystematics of Odonata of Kurram Agency. M. Phil. Thesis. Department of Zoology, Hazara University Mansehra Khyber Pakhtukhwa. Pakistan. 74pp.

Kanth, Z.I., 1985. Odonata of Azad Jammu and Kashmir. M. Sc. Thesis. Department of Entomology, University of Agriculture Faisalabad. Pakistan. 102pp.

Kefford, B.J., P.J. Papas and D. Nugegoda, 2003. Relative salinity tolerance of macro invertebrates from the Barwon River, Victoria, Australia. Mar. Freshwater Res., 54: 755-765

Khaliq, A. and M. Siddique, 1995. Some rice field Odonata in the districts of Poonch and Bagh, Azad Kashmir, Pakistan. Notulae Odonatol., 4 (6): 106.

Khaliq, A., 1990. Taxonomic studies on Zygoptera (Odonata) of Pakistan. Ph.D. Thesis. Department of Entomology, University of Agriculture Faisalabad. Paksitan. 125pp.

Khaliq, A., M. Ayub, M.A. Nafees and F. Maula, 1994. A collection of Odonata from Gilgit and Baltistan, Kashmir, with three new species for Pakistan. Notulae Odonatol., 4(4): 68-69.

Luqman, M., 1995. Taxonomic studies of Odonata of district Muzaffarabad (Azad Kashmir). M.Sc. thesis. Department of Entomology, University of Agriculture. Faisalabad. Pakistan. 99pp.

Mehmood, S.A., 2016. Analysis of species diversity of Odonata in Hazara region of Pakistan through conventional and molecular approaches. Ph.D. Thesis. Department of Zoology, Hazara University Mansehra. Pakistan. 343pp.

Mushtaq, I., 2011. Biodiversity of Odonata from Poonch Division of Azad Jammu & Kashmir. M. Sc. Thesis. Department of Entomology and Pathology, The University of Azad Jammu & Kashmir, Muzaffarabad. Pakistan. 90pp.

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. Haltares, 1(1): 28-35.

Raza, K.N., 2016. Altitudinal distribution of dragonflies of sub-Himalayan hill tracts of Pakistan. M. Phil. Thesis. Department of Plant and Environmental Protection, PIASA Institute - Quaid-e-Azam University, Islamabad. Pakistan. 143pp.

Rowe, R., 2003. Dragonflies: Behaviour and Ecology of Odonata. Australian J. Entomol., 42(2): 210-211.

Rutherford, J.E. and R.J. Mellow, 1994. The effects

of an abandoned roast yard on the fish and macro-invertebrate communities of surrounding beaver ponds. Hydrobiol., 294(3): 219-228.

Silsby, J., 2001. Dragonflies of the world. Washington, DC: Smithsonian Institute Press. 215pp.

Yousaf, M., 1972. Taxonomic studies on Anisoptera (Odonata) of Pakistan. Ph.D. Thesis, Department of Entomology, West Pakistan Agriculture University Lyallpur. Pakistan. 150pp.

Zada, N., A. Farid, A. Zia, M. Saeed, S. M. Khan, A. Khan, I. A. Khan, Fazlullah, T. Badshah, 2016. Damselflies (Odonata: Zygoptera) fauna of district Buner, Khyber Pakhtunkhwa. Pakistan J. Entomol. Zool. Stud., 4(1): 491-495.

Zia, A., 2009. Dragonflies: Beneficial or Harmful. Farming Outlook, 28-31 pp.

Zia, A., 2010. Biosystematics of damselflies (Zygoptera: Odonata) of Pakistan. Ph.D. Thesis, Department of Entomology, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi. Pakistan. 254pp.

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. Agric. Res., 33: 102-111.

Zia, A., M.A. Rafi, Z. Hussain and M. Naeem, 2009. Occurrence of Odonata in Northern areas of Pakistan with seven new records. Haltares, 1(1): 48-56.

Zia, A., Z.J. Awan and Z.H. Astori, 2011. Boreal Odonata of Pakistan. Lambert Academic Press, Germany. 69pp.