Research Article

Richness and Distribution of Odonata in Kurram District, Khyber Pakhtunkhwa

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Abstract | District Kurram represents an important geographical position. It shares its border with Afghanistan and possesses unlimited water resources. Due to prolonged uncertain ground conditions, this area remains unexplored for insect fauna. Present study was carried out in to record richness, abundance and species complex of Odonata. It revealed four families, fifteen genera and twenty-six species. Among recorded fauna, family Libellulidae appeared to be a dominant group representing 19 species, followed by family Coenagrionidae with 5 species and family Calopterygoidae and Aeshnidae representing single species each. Being a flying insect group, seasonal surveys and temporal data collection for odonates in this ecologically rich area can surely bring forward important information for the migratory species between Afghanistan and Pakistan.

Received | December 17, 2018; **Accepted** | April 10, 2019; **Published** | October 24, 2019
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Citation | 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 Journal of Agricultural Research,* 32(4): 589-594.
DOI | http://dx.doi.org/10.17582/journal.pjar/2019/32.4.589.594
Keywords | Odonata, Abundance, Richness, District Kurram, Khyber Pakhtunkhwa, Pakistan

Introduction

Odonates are strong flying insects that are predatory in both larval and adult stages. They enjoy dual life style, their naiads are purely aquatic however adults live a terrestrial life, yet prefer to stay near aquatic bodies (Zia, 2010). Many of the species are generalist, thus found in almost all kind of water bodies but few are specific in their requirements (Zia et al., 2011). They play an important role in studying environmental disorders and in doing crop pest management (Zia, 2010). Across the globe there are more than 6500 known species of Odonates (Mehmood, 2016), while known Pakistan's Odonata fauna is far less, even if compared to neighbouring countries (Choudhry, 2010; Zia, 2010; Mehmood, 2016). To date, only 124 species including 55 Zygoptera and 69 Anisoptera species (Zia et al., 2009; Zia, 2010; Zia et al., 2011; Dow et al., 2014; Zia, 2015; Din, 2012; Chaudhry, 2010; Mehmood, 2016; Raza, 2015) have been documented from Pakistan.

Pakistan represents an important geographic position. It shares its border with Afghanistan, Iran, China, India and therefore acts as a home to lot of migratory species. Yet, since inception of Pakistan (in 1947) due to uncertain ground conditions in few pockets some areas remained unexplored and neglected for biological surveys. District Kurram (earlier known as Kurram agency) is one of these areas. It comes under tribal areas of Pakistan and located at latitude of 34°20' 24" North of the Equator and longitude (72.2 degrees) 73° 12' 0" East. It is bordered in the west and north by Afghanistan. It is blessed with unlimited

water resources in the form perennial springs, snow glaciers, streams and rivers. Average temperature during summer goes to 41°C (Hussain, 2016). All these conditions favour a complex of Odonata but to date no record for inhabiting odonates has come forward. Keeping in view the importance of Odonata, geographic location as well as ecological and geo-political background of the area present study was planned as an effort to record Odonata fauna of district Kurram for the first time since birth of Pakistan.

Materials and Methods

Surveys were conducted during three successive summer seasons of the years 2014-2016 to collect adults of Odonata. With slight modifications, methods of sampling were based on Zia (2010) and Mehmood (2016). Specimens were collected during their active period from different ecologies of surveyed area (Figure 1). Collected specimens were kept in triangle envelopes and field data was noted in field book. On completion of field work specimens were brought to National Insect Museum for taxonomic identification. Being hard and stiff due to long period of preservation specimens were first softened by keeping in humid chamber and their body parts were relaxed for proper pinning and mounting. Followed by mounting and initial labelling specimens were identified up to lowest possible taxa through Fraser (1933-1936), Zia (2010) and Chaudhry (2010). Identified specimens were thereafter labelled with important field and taxonomic information and shifted to preservation boxes and cabinets of Odonata section at NIM. Naphthalene balls were fixed in boxes to save specimens from fungus and ants and anti-ant powder was sprinkled all around them.

Figure 1: *Map of Kurram district showing surveyed localities.*

Results and Discussion

Extensive field surveys carried out to collect Odonata fauna in Kurram district revealed a collection that spread to four families, 15 genera and 26 species. The district is administratively divided into three units i.e. Upper Kurram, Lower Kurram and Central Kurram. Among these lower Kurram is plain; however Central and Upper Kurram are mountainous. There are more water resources in Upper and Lower Kurram than in Central Kurram. Also, temperature of Central Kurram remains less favourable for inhabiting Odonata as compared to Upper and Lower Kurram as it receives more snow fall than other two units. In this context if we see dispersal of recorded species it is evident that maximum numbers of species were recorded from Upper Kurram followed by Lower Kurram and Central Kurram respectively (Figure 2). Dispersal of each species in each unit is provided in Table 1. It is evident that within the recorded fauna, family Libellulidae appeared to be a dominant group (Figure 3) representing 19 species followed by Coenagrionidae (5 species) and families Calopterygidae and Aeshnidae (single species each). According to Silsby (2001), family Libellulidae is the largest family of order Odonata and suborder Anisoptera and it includes over 1000 species worldwide. In Pakistan as well, it is the most common and dominant group among all known odonate families. In many previous works, like of Fazlullah (2015), Zada (2015) and Din et al. (2013) conducted in various ecologies of the country, family Libellulidae was observed as the most common and abundant group. Results of the present study further endorse family Libellulidae as a dominant group among Odonata of Pakistan.

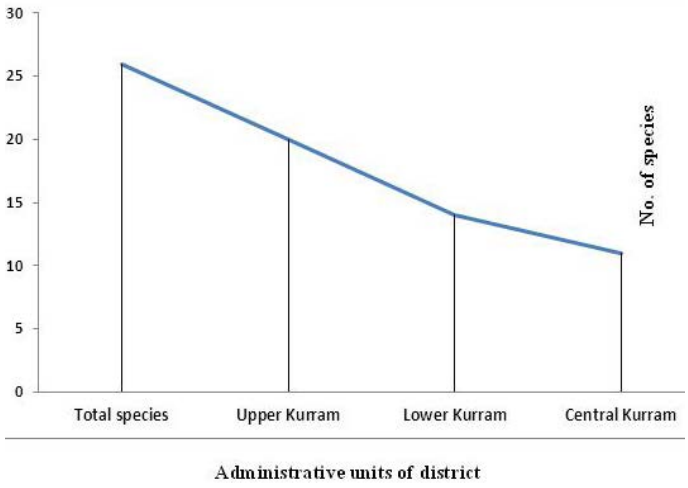

Figure 2: *Richness of Odonata in three administrative units of district Kurram.*

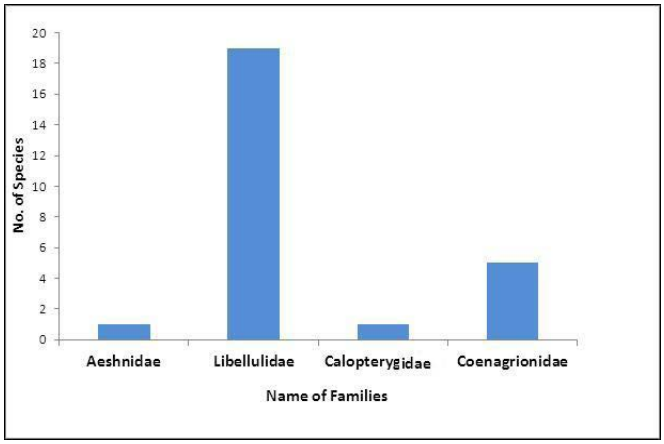

Figure 3: *Family wise richness of recorded Odonata species.*

Richness of species in each genus was also studied during present study. It is visible from Figure 4 that genus *Orthetrum* with its eight species is significantly dominant over all other recorded taxa. *Orthetrum* is a big genus of subfamily Libellulinae including 80 worldwide known species. It is a common observation that members of this genus are more readily adjustable in different type of climates and ecologies than any other genus of many an isopterous family. Similar observations are documented by various workers like Din (2012), Raza, (2015), Ahsan (2015) and Mehmood (2016). In all these studied genera *Orthetrum* dominated among all recorded taxa.

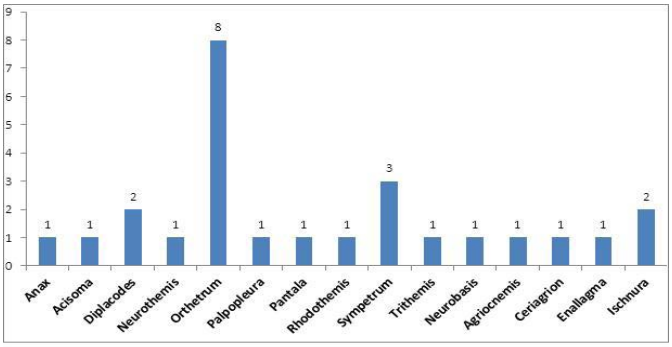

Figure 4: *Genus wise rrichness of recorded Odonata species.*

Present manuscript is based over a study that was under taken to record dragonflies and damselflies in district Kurram for the first time. Kurram district comes under administrative boundaries of Khyber Pakhtunkhwa (KP) province. It is bestowed upon with variable ecologies and unlimited water sources in various forms as discussed under introduction section. The area represents an undisturbed ecology as well as important geographical position owning variable climates in the form of snow receiving mountain tops in winter and summer with maximum temperature of 41°C. Current work reports 26 species of odonates which are far less in comparison to ideal climatic and other conditions for Odonata breeding and survival. Being a pioneer study, it thirsts for more extensive field work to reveal additional taxa from this area. Due to topographic diversity and important geographic location of the area it can provide a good picture for the migratory species of Afghanistan as well. Therefore, further surveys are highly suggested that can unhide and bring forward important records adding valuable information to world's Odonata species index. Within 26 recorded taxa, five species i.e. *Diplacodes lefbevrei, Neurothemis fluctuans, Orthetrum glaucum, Orthetrum japonicum internum* and *Sympetrum fonscolombei* are first time recorded from KP province.

Among new records, *Diplacodes lefebvrei* was observed to be a common species of the area and it was recorded from many localities and in quite high numbers. It has been earlier recorded in Pakistan from the provinces of Baluchistan (Arshad, 1994; Chaudhry, 2010), Punjab (Yousuf, 1972; Chaudhry, 2010), Sindh (Ullah, 1994; Chaudhry, 2010), Gilgit Baltistan/ Northern areas (Jahangir, 1997; Zia et al., 2009; Chaudhry, 2010). It prefers marshy places for breeding, yet some time seen well away from water bodies as well. Outside Pakistan it is reported from India, Africa and Turkey (Chaudhry, 2010). Keeping above information in view it's probably presence in Afghanistan can be easily expected.

Neurothemis fluctuans has been recorded from a single mountainous location of district Kurram with only a few specimens collected. It thus seems to be a rare species of this area. Also, it is reported to be a less common species in Pakistan and is recently documented from the foothills of Himalaya (Raza, 2015) and Azad Jammu and Kashmir (Chaudhry, 2010) only. Around the globe it is documented from Lao, India, China, Myanmar, Singapore, Indonesia and Thailand (Chaudhry, 2010).

Orthetrum glaucum was recorded from two localities and only three specimens were recorded for this species. It is also a mountainous species and reported from hill tracts of Punjab (Chaudhry, 2010), Azad Jammu and Kashmir (Rafi et al., 2009), Northern areas (Zia et al., 2009) and Sub-Himalaya (Raza, 2015). It is comparatively seems to be a peace lover species that try to restrict itself to silent waters of ponds, marshes and slow moving springs. Outside Pakistan it is known from Guadong, India, Myanmar, Sri Lanka,

Table 1: *Dispersal of Odonata species in Kurrum district.*

Family	Species	Upper Kurram	Lower Kurram	Central Kurram
Aeshnidae	*Anax parthenope* Selys	+	+	-
Libellulidae	*Acisoma panorpoides panorpoides* Rambur	+	-	+
	Diplacodes lefbevrei Rambur	+	+	-
	Diplacodes trivialis Rambur	+	-	-
	Neurothemis fluctuans Fabricious	+	-	+
	Orthetrum anceps Schneider	+	-	-
	Orthetrum cancellatum cancellatum Linnaeus	-	+	+
	Orthetrum chrysostigma luzonicum Brauer	+	-	-
	Orthetrum glaucum Brauer	+	-	-
	Orthetrum japonicum internum MacLachlan	-	+	-
	Orthetrum pruinosum neglectum Rambur	+	-	+
	Orthetrum sabina Drury	+	+	-
	Orthetrum triangulare triangulare Selys	+	+	-
	Palpopleura sexmaculata sexmaculata Fabricius	+	+	-
	Pantala flavescens Fabricius	+	-	-
	Rhodothemis rufa Rambar	+	+	-
	Sympetrum commixtum Selys,	-	+	+
	Sympetrum decoloratum Selys	+	-	-
	Sympetrum fonscolombei Selys	-	+	+
	Trithemis festiva Rambur	+	-	+
Calopterygidae	*Neurobasis chinensis* Linnaeus	+	-	-
Coenagrionidae	*Agriocnemis pygmaea* Rambur	-	+	+
	Ceriagrion coromandelianum Fabricius	+	-	-
	Enallagma parvum Selys	-	+	+
	Ischnura aurora aurora Brauer	+	+	+
	Ischnura forcipata Morton	+	+	+

+ indicates Presence; - Indicates Absence.

Japan, Hong Kong, Philippines, Thailand, Singapore, China and Malaysia (Chaudhry, 2010).

Orthetrum japonicum internum is another new to province record of this study. It was recorded within high hills and in reasonably high numbers as compared to all other new records making it a common species of hilly areas. Earlier it was documented from mountains of Azad Jammu and Kashmir (Chaudhry, 2010; Ahsan, 2015) and Sub-Himalaya (Raza, 2015).

It is always seen restricted to dense vegetation and rock stones near water bodies. Across the globe, it is known from Guandong, India, Japan, Taiwan, Thailand, Viet Nam, Myanmar and China (Chaudhry, 2010).

Another new record is *Sympetrum fonscolombei* recorded from a single locality with only few specimens. It seems to be a rare species of the area. Its presence in this area is really interesting as earlier it was documented from Pakistan from far away area. It was reported by Arshad (1994) and Chaudhry (2010) from Baluchistan. However, its larvae were recorded from Potohar plateau in Punjab (Din, 2012; Din et al., 2013) and Sub-Himalayan hill tracts (Naeem, 2016) in near past. Finding this species in Kurram district raises question over its dispersal. The work of Din (2012), Din et al. (2013) and Naeem (2016) are based on larval studies and thus confirms its presence and breeding in Punjab within a period of last decade. However, the works of Arshad (1994), Chaudhry (2010) and current study is based over adult's collection i.e. flying state. The species either travels long in search of ideal conditions for habitat and ecology or is getting affected through climate change impacts, but it needs more extensive data to conclude. It is however a known phenomenon that Odonata adults sometime travel hundreds of miles away from their breeding places in search

of ideal conditions (Silsby, 2001). There is a gap of more than two decades between previous works and current study, so more surveys and data collection for this species can bring better information for its current position and dispersal in Pakistan. Across the globe this species is known from Kazakhstan, India, Caucasus, Sri Lanka, Russia, Africa, Mangolia and Turkey (Chaudhry, 2010).

Author's Contribution

Ahmed Zia: Taxonomic identification of all the specimens recorded.
Iqtidar Hussain: Data collection in field (specimens collection).
Sardar Azhar Mehmood: Assisted in data collection and GIS mapping.
Shabir Ahmad: Financially contributed and assisted in field surveys.
Muzaffar Shah: Data analysis and preparation of graphs.
Abdul Rauf Bhatti: Write up of manuscript.

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