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Original Article

Diversity of the Anisoptera & Zygoptera (Odonata: Insecta) of Swat, Pakistan

Diversidade de Anisoptera e Zygoptera (Odonata: Insecta) de Swat, Paquistão

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Abstract

Odonates are important biological control agents for the control of insect pests and insect disease vectors of medical and veterinary importance. The present study was conducted to evaluate the odonate fauna of Swat, Pakistan from March to October 2019. A total of 200 specimens of odonates were collected from diverse habitats. The collected specimens of the order Odonata belonged to 5 families, three families of suborder Anisoptera namely Libellulidae, Gomphidae and Aeshnidae while two families of suborder Zygoptera (Chlorocyphidae and Coenagrionidae). The specimens were categorized into 12 genera and 22 species. Libellulidae was the dominant family (n = 138) accounting for 69% of the odonate fauna. *Orthetrum* was the dominant genus (n = 73) of suborder Anisoptera accounting for 36.5% of the odonate fauna. The least dominant genera were *Anax*, *Paragomphus* and *Rhyothemis* (n = 5 each) accounting each for 2.5% of the odonate fauna. In Zygoptera, the dominant genus was *Ceriagrion* (12.5%) and the least dominant genus was *Ischnura* (6%). *Pantala flavescens* (Fabricius, 1798) was the most abundant odonate species in the study area recorded from all surveyed habitats. Shannon Diversity Index (H) was 2.988 and Simpson Diversity Index (D) was 0.95 for the collected odonate fauna. The highest abundance of Odonata was recorded in August, September and May while no odonate species were recorded in January, February, November and December. Lotic water bodies were the most suitable habitats with abundant odonate fauna. *Anax immaculifrons* (Rambur, 1842) was the largest sized odonate species having a wingspan of 53.2±1.63 mm and body length of 56.3 ± 0.4 mm. The present study shows the status of odonate fauna of Swat, Pakistan in diverse habitats and seasonsonal variation throughout the year. Further work is recommended to bridge the gaps in the existing literature.

Keywords: dragonflies, damselflies, Libellulidae, Gomphidae, Aeshnidae.

Resumo

Odonatos são importantes agentes de controle biológico para o controle de insetos-praga e vetores de doenças de insetos de importância médica e veterinária. O presente estudo foi conduzido para avaliar a fauna de odonatos de Swat, Paquistão, de março a outubro de 2019. Um total de 200 espécimes de odonatos foi coletado em diversos habitats. Os espécimes coletados da ordem Odonata pertenciam a cinco famílias, três famílias da subordem Anisoptera, a saber, Libellulidae, Gomphidae e Aeshnidae, enquanto duas famílias eram da subordem Zygoptera (Chlorocyphidae e Coenagrionidae). Os espécimes foram classificados em 12 gêneros e 22 espécies. Libellulidae foi a família dominante (n = 138), respondendo por 69% da fauna de odonatos. Orthetrum foi o gênero dominante (n = 73) da subordem Anisoptera, responsável por 36,5% da fauna de odonatos. Os gêneros menos dominantes foram Anax, Paragomphus e Rhyothemis (n = 5 cada), representando cada um 2,5% da fauna de odonatos. Em Zygoptera, o gênero dominante foi Ceriagrion (12,5%), e o gênero menos dominante foi Ischnura (6%). Pantala flavescens (Fabricius, 1798) foi a espécie de odonato mais abundante na área de estudo, registrada em todos os habitats pesquisados. O Índice de Diversidade de Shannon (H) foi de 2,988, e o Índice de Diversidade de Simpson (D) foi de 0,95 para a fauna de odonatos coletados. A maior abundância de Odonata foi registrada em agosto, setembro e maio, enquanto nenhuma espécie de Odonata foi registrada em janeiro, fevereiro, novembro e dezembro. Corpos d'água lóticos foram os habitats mais adequados, com abundante fauna de odonatos. Anax imaculifrons (Rambur, 1842) foi a espécie de odonato de maior tamanho, com envergadura de 53,2 ± 1,63 mm e comprimento do corpo de 56,3 ± 0,4 mm. O presente estudo mostrou o status da fauna de odonatos de Swat, Paquistão, em diversos habitats e variação sazonal ao longo do ano. Recomenda-se trabalho adicional para preencher as lacunas na literatura existente.

Palavras-chave: libélulas, libelinhas, Libellulidae, Gomphidae, Aeshnidae.

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1. Introduction

Anisoptera (dragonflies) and Zygoptera (damselflies) (Odonata: Insecta) represent a diverse group of insects having 5740 described species worldwide (Johari and Jain, 2021). Odonates are beneficial insects and play an important role in pest management both as nymphs and adults (Trueman and Rowe, 2009; Ilahi et al., 2019). They are easily recognized by a long slender abdomen, large eyes, short antennae, and long membranous wings with beautifully colored bodies (Nair, 2011). The male odonates are usually brightly colored than females. Odonates tend to inhabit both lotic and lentic water bodies. They are mostly found around the fresh water, and act as biological indicators. They are good ecological indicators of the ecosystem (Johnson and Triplehorn, 2005). The presence of Odonata on water shows its pollution-free status.

Odonates are predators both in the larval stage as well as adult stage; their larvae are voracious feeders and possess large retractable labium for capturing prey. They are known to feed on mosquito larvae, protozoans and small crustaceans (Irshad, 2008) tadpoles, fish fry and even larvae of other odonates (Boyd, 2005). Adults normally feed on small flying insects like gnats, moths and noxious flies (Fraser, 1933) and act as important biocontrol agents. Odonates act as predators of mosquito larvae and play an important role in regulation of mosquito population (Knight and Larsen, 2004). Due to predatory potential against mosquito larvae, they are used in the ecofriendly control of mosquito larvae (Mitra, 2002). The nymphs of Odonata play important role in the regulation of mosquito population (Din et al., 2013) and are very sensitive to environmental pollutants (Clark and Samways, 1996). The adults mostly feed on the harmful insects, which infest orchard and forest, and maintain forest and agricultural fields (Mitra, 2002).

Inventories of target taxa provide good data. Odonates are diverse in habitats, but some species are specific to habitats which make them useful as biological indicators (Clark and Samways, 1996; Samways and Steytler, 1996). Many species of Odonata are specialists which are sensitive to changes in habitats and become extinct than generalist species (Suhonen et al., 2014). Anisoptera which includes the dragonflies are larger in size and are more resistant to disturbance, do not require riparian vegetation and found mostly in open areas to absorb the sunlight (DeMarco Junior and Resende, 2002). Urbanization is one of the major causes for the loss of odonate diversity (Willigalla and Fartmann, 2012).

The odonates fauna of Pakistan has been less investigated than their neighbor countries. Studies on Odonate fauna from some parts of Pakistan include Rafi et al. (2009), Zia et al. (2009, 2011, 2019), Din et al. (2013), Perveen et al. (2014), Chaudhry et al. (2016) and Fazlullah et al. (2016). The present study was aimed to evaluate the diversity of the suborders Anisoptera and Zygoptera of the order Odonata in Swat, Pakistan across diverse habitats and in different seasons of the year.

2. Materials and Methods

2.1. Study area

The present study was conducted at District Swat, Pakistan. Swat is located at 35.2227^0 N and 72.4258^0 E with a total area of 5337 Km^2. Diverse habitats including running and stagnant freshwater bodies, rice fields, marshes, low and high-altitude mountainous areas were surveyed for the collection of odonate fauna. The habitats surveyed for the collection of odonate fauna are given (see Figure 1).

2.2. Sample collection

Collection of dragonflies and damselflies was made from March to October 2019 through aerial nets; the sites were sampled in sunny days between 10:00 am and 02:00 pm. Odonate abundance was less in the streams having pollutants and industrial chemical discharges compared with less polluted and unpolluted freshwater bodies.

2.3. Killing and preservation

The collected specimens were placed in killing bottles having Potassium Cyanide. After killing and rigor mortis, the specimens were properly pinned in the setting boards, labelled, and mounted in the entomological boxes. Naphthalene balls were placed in the boxes to prevent them from pests. All these activities were carried out in the Agriculture Research Institute, Takhta Band, Swat.

2.4. Identification

Identification of the specimens was done in the Entomology Laboratory, Department of Zoology, University of Malakand, Pakistan with the help of taxonomic keys and previous literature by Nair (2011), Fraser (1933) and through internet surfing. Morphological characters of the adult odonate specimens were studied with the help of Lx 400 binocular microscope.

2.5. Morphometric measurements

Wingspan and body length of the collected specimens were calculated in millimeters (mm) with the help of a ruler. Mean values of the wingspan and body length of all specimens in each species were calculated and tabulated (as shown in Table 1).

2.6. Data analysis

Data was calculated using MS Excel 2016. Shannon diversity index (H) and Simpson diversity index (D) were calculated for the odonate fauna using the formulae given in the results section. Morphometrics of the identified species were calculated and their mean values with standard deviations are tabulated in the results section.

3. Results

The collected specimens (n = 200) of Odonata were categorized into 22 species, belonging to 5 families. Suborder Anisoptera was represented by families *Gomphidae, Libellulidae* and *Aeshnidae*. Family Gomphidae

Figure 1. Habitats surveyed for collection of Odonata at Swat, Pakistan.

(clubtails) was represented by the common hooktails *Paragomphus lineatus* (Selys 1850) in which the males were medium-sized (32-37 mm long with a wingspan of 24-27 mm, yellow and black dragonflies identified by the lateral expansions of 8th and 9th abdominal segments and diagnostic hook-shaped superior anal appendages. The females were somewhat similar in size but duller in color lacking lateral expansions to abdomen. Family *Libellulidae* (Skimmers or perches) was the dominant family recorded from diverse habitats in the present study. The males are often brightly colored. The habitat choice varies hugely and encompasses almost all forms of wetlands including garden ponds, marshes, lakes, rivers and even seasonal rainwater puddles. Libellulidae was represented by *Acisoma panorpoides* (Rambur, 1842), *Orthetrum cancellatum* (Linnaeus, 1758), *O. pruinosum* (Bermeister, 1839), *O. testaceum* (Bermeister, 1839), *O. sabina* (Drury, 1770), *O. triangulare* (Selys, 1878), *Rhyothemis variegate* (Linnaeus, 1763), *Pantala flavescens* (Fabricius, 1798), *Rhodothemis rufa* (Rambur, 1842), *Palpopleura sexmaculata* (Fabricius, 1787), *Trithemis aurora* (Bermeister, 1839), *Trithemis festiva* (Rambur, 1842) and *O. luzonicum* (Brauer, 1868).

Table 1. Classification and morphometrics of the odonate fauna of Swat, Pakistan.

S.No.	Species	Family	Suborder	n	WS (mm) Mean ± SD	BL (mm) Mean±SD
1.	*Paragomphus lineatus*	Gomophidae	Anisoptera	05	27.3±0.75	34.76±0.45
2.	*Acisoma panorpoides*	Libellulidae		10	18.5±1.52	17.3±0.9
3.	*Orthetrum triangulare*	Libellulidae		10	40±1.18	32±1.5
4.	*O. pruinosum*	Libellulidae		15	54.8±1.64	30±1.12
5.	*O. testaceum*	Libellulidae		10	34±1.56	33±2.04
6.	*O. glaucum*	Libellulidae		04	40±1.18	34.76±0.45
7.	*O. luzonicum*	Libellulidae		10	31±1.13	30±0.9
8.	*O. cancellatum*	Libellulidae		09	34±1.56	33.7±1.67
9.	*O. sabina*	Libellulidae		10	34.7±1.56	33±2.04
10.	*Rhyothemis variegate*	Libellulidae		05	32±1.16	24±1.54
11.	*Pantala flavescens*	Libellulidae		20	36.47±3.34	30.76±2.18
12.	*Palpopleura sexmaculata*	Libellulidae		10	17±0.86	15.5±1.04
13.	*Trithemis aurora*	Libellulidae		05	32.2±1.8	24±0.89
14.	*Crocothemis servilia*	Libellulidae		10	30.7±0.78	26.5±1.11
15.	*O. taeniolatum*	Libellulidae		05	40.2±0.5	39±0.73
16.	*Trithemis festiva*	Libellulidae		05	32±1.16	26.5±1.11
17.	*Anax immaculifrons*	Aeshnidae		05	53.2±1.63	56.3±0.4
18.	*Rhinocypha quadrimaculata*	Chlorocyphidae	Zygoptera	10	27.3±0.75	23±1.73
19.	*R. bisignata*	Chlorocyphidae		05	18±1.26	24±1.53
20.	*Ischnura aurora*	Coenagrionidae		12	17±1.09	32±1.16
21.	*Ceriagrion coromandelianum*	Coenagrionidae		15	24±0.89	34.7±2.1
22.	*C. olivaceum*	Coenagrionidae		10	14.8±1.49	20±1.29

Legend: n: number of specimens; WS: Wingspan; BL: Body Length; mm: milli meter.

Morphometric parameters of all collected specimens were carried out and the values (Mean ± Standard Deviation) were tabulated (as shown in Table 1).

Suborder Zygoptera was represented by families Chlorocyphidae and Coenagrionidae. Chlorocyphidae (stream jewels) are characterized by large prominent eyes and are medium sized having projecting nose. Their wings are longer than their abdomens. Sexual dimorphism between male and female is common, males have colorful metallic patches on their wings while females have transparent wings. They mostly inhabit flowing streams. Species belonging to family Chlorocyphidae in the present study were *Rhinocypha quadrimaculata* and *Rhinocypha bisignata* (as shown in Table 1). *Rhinocypha quadrimaculata* (Selys, 1853) is commonly known as black emperor because of the black coloration with pinkish triangular mid thoracic patches. They are medium sized with males 25 mm long with wing length of 27 mm while females are 25 mm long with a wingspan of 31 mm. *Rhinocypha bisignata* (Selys, 1853) is commonly known as stream ruby. Family Coenagrionidae (marsh darts) was represented by three species, *Ceriagrion coromandelianum*, *Ceriagrion olivaceum* and *Ischnura aurora. Ceriagrion coromandelianum* (Fabricius, 1798) is a medium-sized damselfly having yellowish-green eyes. Thorax is green above and yellowish green on the sides with yellow abdomen. Females are more robust having dull coloration. Males are 20 mm with a wingspan of 24-26 mm. Females are 16 mm long with wingspan of 22 mm. *Ceriagrion olivaceum* (Laidlaw, 1914) is a medium sized damselfly having brown capped greenish eyes, thorax green in color and paler on the sides. *Ischnura aurora* (Brauer 1865) is also known as aurora bluetail. A small

Table 2. Seasonal variation of the odonate fauna of Swat, Pakistan.

S.No.	Species	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
1	*P. lineatus*	--	--	--	--	--	--	--	2	1	--	--	--	05
2	*A. panorpoides*	--	--	--	--	--	--	--	5	5	--	--	--	10
3	*O. triangulare*	--	--	--	--	5	5	--	--	--	--	--	--	10
4	*O. pruinosum*	--	--	--	--	5	2	--	3	5	--	--	--	15
5	*O. testaceum*	--	--	--	4	3	--	2	1	--	--	--	--	10
6	*O. luzonicum*	--	--	--	--	5	--	--	2	3	--	--	--	10
7	*O. cancellatum*	--	--	--	--	3	2	2	2	--	--	--	--	09
8	*O. sabina*	--	--	--	--	2	2	1	3	2	--	--	--	10
9	*P. flavescens*	--	--	--	--	--	--	5	9	6	--	--	--	20
10	*T. aurora*	--	--	--	--	1	2	--	1	1	--	--	--	05
11	*P. sexmaculata*	--	--	--	--	--	--	--	3	7	--	--	--	10
12	*R. variegate*	--	--	--	--	2	--	--	1	2	--	--	--	05
13	*T. festiva*	--	--	--	--	--	--	--	2	1	2	--	--	05
14	*O. taeniolatum*	--	--	--	1	2	1	--	--	1	--	--	--	05
15	*O. glaucum*	--	--	--	--	1	1	--	1	1	--	--	--	04
16	*C. servilia*	--	--	--	--	3	4	--	2	1	--	--	--	10
17	*A. immaculifrons*	--	--	2	1	2	--	--	--	--	--	--	--	05
18	*R.quadrimaculata*	--	--	--	--	1	2	--	3	4	--	--	--	10
19	*R. bisignata*	--	--	--	--	2	1	--	1	1	--	--	--	05
20	*I. aurora*	--	--	--	--	--	5	4	2	1	--	--	--	12
21	*C.coromandelianum*	--	--	--	--	5	3	2	2	3	--	--	--	15
22	*C. olivaceum*	--	--	--	--	--	3	2	4	1	--	--	--	10
Total		--	--	2	6	42	33	18	49	46	04	--	--	200

apple green damselfly having black stripes on its thorax and blue tipped yellow tail. Males are brightly colored while the females have dull coloration. The highest abundance of the odonates was recorded in August, September and May while no odonate species were detected in January, February, November and December (as shown in Table 2). Reasons for the low diversity in the specific months are the unfavorable climatic conditions which restricts the increase in populations of insect fauna. Lotic water bodies were dominated by odonates followed by lentic water bodies while the least number of odonate species was recorded in hilly areas with scarce water bodies (as shown in Table 3).

A diverse fauna of Odonata was recorded in the present study as indicated by the values of Shannon Diversity Index (H = 2.988) and Simpson Diversity Index (D = 0.95) (as shown in Table 4). A total of 12 genera of odonates were recorded in the present study with *Orthetrum* as the highest prevalent genus having a relative abundance of 36.6% and the genera *Paragompus* and *Rhyothemis* were the least abundant species having relative abundance of 2.5% each (as shown in Table 5). Overall, 22 species of odonates were recorded in the present study from diverse habitats with *Pantala flavescens* (Libellulidae: Anisoptera) as the most abundant species (as shown in Table 1). Morphometrics of the collected specimens showed that *Anax immaculifrons* was large sized odonate species having a wingspan (53.2±1.63 mm) and body length (56.3 ± 0.4 mm) (as shown in Table 1).

Shannon diversity index (H) is given by the formula 1:

$$H = -\Sigma(Pi) \times \ln(Pi) \quad (1)$$

Where P*i* is the proportion of individuals of a given species and ln stands for natural log. In the present study, H= - (-2.988) = 2.988

Simpson diversity index (D) is calculated by the given formula 2:

$$D = 1 - \left[\frac{\Sigma n(n-1)}{N(N-1)}\right] \quad (2)$$

Where "n" is the total no of organisms of a given species while "N" is the total number of organisms of all species. In the present study, D = 1- [1966/200(200-1)] = 1- 0.049 = 0.95

4. Discussion

The present study was conducted to evaluate the diversity of the suborders Anisoptera and Zygoptera of

Table 3. Habitat distribution of the odonate fauna of Swat, Pakistan.

S.No.	Species	Lotic waters	Lentic waters	Marshes	Swamps	Vegetation	Rice fields	Hilly areas	Total
1	*P. lineatus*	03	02	--	--	--	--	--	05
2	*A. panorpoides*	--	05	03	--	02	--	--	10
3	*O. triangulare*	06	--	--	--	--	--	04	10
4	*O. pruinosum*	07	05	--	--	03	--	--	15
5	*O. testaceum*	05	02	03	--	--	--	--	10
6	*O. luzonicum*	--	--	05	03	--	02		10
7	*O. cancellatum*	06	03	--	--	--	--	--	09
8	*O. sabina*	03	04	--	--	02	--	01	10
9	*P. flavescens*	05	03	02	04	03	01	02	20
10	*T. aurora*	02	01		01	01	--	--	05
11	*P. sexmaculata*	--	--	05	03	--	02	--	10
12	*R. variegate*	--	03	--	--	01	01	--	05
13	*T. festiva*	03	--	--	02	--	--	--	05
14	*O. taeniolatum*	02	02	--	--	01	--	--	05
15	*O. glaucum*	01	01	01	--	01	--	--	04
16	*C. servilia*	04	05	--	--	--	01	--	10
17	*A. immaculifrons*	02	01	--	--	01		01	05
18	*R.quadrimaculata*	--	--	--	--	04	03	03	10
19	*R. bisignata*	02	--	--	--	02	--	01	05
20	*I. aurora*	04	03	--	03	01	--	01	12
21	*C.cormandelianum*	--	06	--	--	07	02	--	15
22	*C. olivaceum*	04	--	--	--	03	03	--	10
	Total	59	46	19	16	32	15	13	200

the order Odonata (Insecta) of Swat, Pakistan. A total of 22 species were identified belonging to 12 genera and 5 families and 2 suborders of the Order Odonata. Suborder Anisoptera comprised 74% (n=148) while suborder Zygoptera comprised 26% (n=52) of the odonate species with family Libellulidae the largest family. This pattern conforms to the overall abundance and diversity of odonate fauna worldwide as is evident from a recent report on the odonate fauna of Brazil (Garcia Junior et al., 2021). Some of the successful traits that make family Libellulidae the dominant family in diverse habitats worldwide include their ability to efficiently control their body temperature (Corbet & May 2008), adaptation to open vegetation environments (Rodrigues & Roque 2017), survival in human dominated habitats (Damaceno et al. 2014) and a great dispersion potential (Oliveira-Júnior et al. 2017). The families Gomphidae and Aeshnidae of the suborder Anisoptera were the least abundant families of the Order Odonata. Some of the reasons for the low number of these families include their crepuscular nature and their fast-flying potential at higher altitudes (Bedê et al. 2000) which makes them difficult to be captured uniformly with the conventional collection methods.

The family Coenagrionidae of the suborder Zygoptera was the abundant family (n = 37) with three identified species followed by Chlorocyphidae (n = 15) with two identified species. Zygopterans are mostly habitat specific representing peculiar habitats and are not dominant in diverse habitats like Anisoptera. This property makes them less diverse and resultantly leads to less catch during various sampling techniques. The less abundance of the species of Zygoptera can be attributed to their small sizes and the resultant restrictions to habitats with less temperature fluctuations and less exposure to sunlight (Brasil et al. 2019).

Abundant species of Anisoptera were *Pantala flavescens* and *Orthetrum pruinosum* while in Zygoptera, *Ceriagrion coromandelianum* was the most dominant species in District Swat, Pakistan representing maximum number of specimens found in diverse habitats ranging from lotic to lentic water bodies, hilly areas, marshes, running streams, grasslands, rice lands and swampy areas. The species *P. flavescens* was collected almost from all surveyed habitats.

The variations among different reports are because of the different ecological, climatic and topographic conditions of the study areas along with differences in the sampling techniques. Overall, odonate fauna is diverse in habitats

Table 4. Shannon and Simpson diversity indices of the odonate fauna of Swat, Pakistan.

S.No.	Species	Number (n)	P*i*	ln (P*i*)	P*i* × ln (P*i*)	n(n-1)
1	*P. lineatus*	05	0.025	3.688	-0.092	20
2	*A. panorpoides*	10	0.05	2.996	-0.149	90
3	*O. triangulare*	10	0.05	2.996	-0.149	90
4	*O. pruinosum*	15	0.075	2.590	-0.194	210
5	*O. testaceum*	10	0.05	2.996	-0.149	90
6	*O. luzonicum*	10	0.05	2.996	-0.149	90
7	*O. cancellatum*	9	0.045	3.101	-0.139	72
8	*O. sabina*	10	0.05	2.996	-0.149	90
9	*P. flavescens*	20	0.1	2.302	-0.230	380
10	*T. aurora*	05	0.025	-3.688	-0.092	20
11	*P. sexmaculata*	10	0.05	2.996	-0.149	90
12	*R. variegate*	05	0.025	3.688	-0.092	20
13	*T. festiva*	05	0.025	3.688	-0.092	20
14	*O. taeniolatum*	05	0.025	3.688	-0.092	20
15	*O. glaucum*	04	0.02	3.912	-0.078	12
16	*C. servilia*	10	0.05	2.996	-0.149	90
17	*A. immaculifrons*	05	0.025	3.688	-0.092	20
18	*R. quadrimaculata*	10	0.05	2.996	-0.149	90
19	*R. bisignata*	05	0.025	3.688	-0.092	20
20	*I. aurora*	12	0.06	-2.813	-0.168	132
21	*C.coromandelianum*	15	0.075	2.590	-0.194	210
22	*C. olivaceum*	10	0.05	2.996	-0.149	90
	Total	N = 200	Σ(P*i*) = 1	--	H = 2.988	Σn(n-1) = 1966 D = 0.95

Table 5. Relative abundance of the recorded genera of odonate fauna of Swat, Pakistan.

S No	Genera	No. of specimens (n)	Relative abundance (%)
1	*Paragomphus*	05	2.5
2	*Acisoma*	10	5
3	*Orthetrum*	73	36.5
4	*Pantala*	20	10
5	*Trithemis*	10	5
6	*Palpoplura*	10	5
7	*Rhyothemis*	05	2.5
8	*Crocothemis*	10	5
9	*Anax*	05	2.5
10	*Rhinocypha*	15	7.5
11	*Ischnura*	12	6
12	*Ceriagrion*	25	12.5
Total		200	100%

with fresh and unpolluted water bodies encompassing rich vegetation.

The present study shows the status of odonate fauna of Swat, Pakistan with 22 species belonging to 5 families and 12 genera of the two suborders of Odonata, Anisoptera and Zygoptera. Decline in the odonate fauna compared with some of the previous reports like Chaudhry et al. (2016) and Zia et al. (2009) is indicative of the habitat degradation due to enhanced anthropogenic activities. Conservation measures are required to protect the diversity of these important biological control agents in diverse ecosystems. Further work is recommended on odonate adults as well as naiads and allied insect fauna of the study area to bridge the gaps found in the existing literature for future planning and conservation measures.

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