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Damselflies (Odonata: Zygoptera) fauna of District Buner, Khyber Pakhtunkhwa, Pakistan

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Abstract
Damselfly fauna of district Buner (Khyber Pakhtunkhwa, Pakistan) was surveyed during 2013 and 2014. A total of 230 adult damselflies were collected from fifteen localities of the district during two successive summer seasons. Twelve species of damselflies under 08 genera of 05 families were found, harboring in district Buner, including family Calopterygidae (represented by one species, *Neurobasis chinensis chinensis* Linnaeus); family Chlorocyphidae (having two genera represented by two species, *Libellago lineata lineata* Burmeister, *Rhinocypha quadrimaculata* Selys); family Coenagrionidae (including seven species *Ceriagrion coromandelianum* Fabricius, *Pseudagrion ceylanicum* Kirby, *P. rubriceps* Selys, *Ischnura aurora rubilio* Selys, *I. elegans* Vander Linden, *I. forcipata* Morton, *I. fountainei* Morton in three genera); family Protoneuridae (having a single species, *Elattoneura campioni* Fraser); and family Chlorolestidae (represented by a single species, *Megalestes major* Selys).

Keywords: Damselflies, Zygoptera, Adults, Taxonomy, Distribution, Buner.

1. Introduction
Damselflies belong to suborder Zygoptera of order Odonata and differs from dragonflies (Sub-order Anisoptera) in wing pattern and eyes position. They are amongst most ancient flying insects and have medium to large sized body [1]. They play significant role in protection of environment and management of crops [2]. Odonates have incomplete metamorphosis with three life stages as egg, naiad and adult. Eggs are generally laid in tissues of underwater or partially submerged plants. Naiads are aquatic and can be seen in flowing as well as in stagnant water bodies [3]. Their immature are eaten by freshwater fish and songbirds, their adults are terrestrial with diversified habitat and food preferences [4]. Odonata are provided with a lot of features that makes them prominent in class Insceta [5]. Normally, adults feed on gnats midges and mosquitoes [6]. Odonates feeding on many crop pests of rice, cotton and sugarcane including aphids, jassids, white flies, thrips, stem borers, leaf folders and larvae of American bollworms [4]. The female Odonata eat much greater number of insect pests as compared with males [7]. The naiads are rapacious feeders and have big protractible labium for attracting the prey [5]. These are natural enemies of mosquito larvae assisting in the control of some fatal diseases like dengue, malaria and filariasis [8]. Immature Odonata are also good environmental indicators of synthetic chemical free status [9]. They are also important indicators of habitat disturbances [10]. The naiads of damselflies are also used as baits to catch fish by fishermen [2]. Some countries of the World use naiads as food also [11]. Odonata have medicinal properties for example *Sympetrum* species are utilized for curing fever [9].
In Pakistan, [12] & [13] reported 52 species of damselflies and 68 species of dragonflies respectively. Among the neighboring countries of Pakistan, 470 species of Odonata are reported from India [14] 54 species from Sri Lanka [15] and 75 species from Nepal [16]. No taxonomic studies have ever been conducted on damselflies of district Buner, a valley of Malakand division of Pakistan, lying between 72°-13′ to 72°-45′ East longitudes and 34°-11′ to 34°- 43′ North latitudes which borders Swat and Shangla towards its North, Malakand division and Mardan district towards its West, Swabi district on its South and to river Indus, and Hazara towards East. Buner separates from Swat at the mountain range called Karakar. The elevation of this sub-tropical area varies from 1200 m in Totalai (on South) to 3000 m of Dosara Peak towards North. During summer, the temperature rises up to 44 °C and drops to -2 °C during winter [17]. The climate of district Buner is favorable for a lot of damselflies species. This highlights the possibility of exploring new records of damselflies from the valley. The present studies were conducted to explore the species of damselflies in district Buner.

2. Materials and Methods

The adult damselflies were collected through aerial netting during two successive summer seasons (2013 and 2014) from fifteen localities of district Buner (Fig. 1). The names of localities were Karapa L1, Daggar L2, Gokand L3, Pir Baba L4, Batara L5, Totalai L6, Jowar L7, Budal L8, Chagharzai L9, Nawagai L10, Amazai L11, Shalbandi L12, Gagra L13, Dokada L14 and Koga L15. All the localities were visited on weekly basis to collected damselflies adults during summer seasons between 10.00 AM to 5.00 PM. Data relating habitat, locality, date of collection and collector's name were written in the field book. Specimens were properly set with the help of setting board and after drying they were labeled and transferred to wooden boxes. Naphthalene balls were pinned to protect them from ants attack. Specimens were identified up to lowest specific taxa through taxonomic keys [12, 18] using stereoscope (Lambomed CZM6). The overall distribution of damselflies over localities was determined (Fig. 2). The photographs of damselflies (Fig. 3) were captured with the help of digital camera (12 MP).

Fig 1: Map showing district Buner, where damselflies were recorded

3. Results and Discussion

In the present study, a total of 230 specimens of adult damselflies were recorded comprising of five families, in eight genera and twelve species. Among these family Coenagrionidae appeared to be up it rich family including three genera and seven species, followed by family Chlorocyphidae including (two genera and two species).

***Neurobasis chinensis chinensis* Linnaeus, 1758**

Material Examined: Karapa, 5♂ 4♀, 25-vi-2013, leg. (N. Zada), Daggar, 3♂ 2♀, 26-vi-2013, leg. (N. Zada), Shalbandi, 4♂ 3♀, 29-vi-2013, leg. (A. Zia), Gokand, 3♂ 2♀, 01-vi-2013, leg (A. Farid), ex. NIM (National Insect Museum, NARC, Islamabad).

Earlier Records from Pakistan: Azad Jammu and Kashmir [19, 20], K.P.K. [12, 21].

World Distribution: India, Nepal, Bangladesh, Sri Lanka, Hong Kong, China, Singapore [9].

Habitat: flying specimens were collected from fast running water with stream, also captured sitting on grasses, swamp places an bushes.

***Libellago lineata lineata* Burmeister, 1839**

Material Examined: Batara, 8♂, 13-vi-2013, leg. (N. Zada), Daggar, 7♂, 12-vi-2013, leg. (N. Zada), ex. (NIM).

Earlier Records from Pakistan: Punjab [12].

World Distribution: India, China, Vietnam [9].

Habitat: Specimens were recorded on wing with bushes, scrubs and grass and grass also capture from sitting on long grasses with tall vegetation.

***Rhinocypha quadrimaculata* Selys, 1853**

Material Examined: Budal, 4♂ 3♀, 13-vii-2013, leg. (A. Zia), Jowar, 4♂ 2♀, 12-vii-2013, leg. (N. Zada), Nawagai, 3♂ 2♀, 15-vii-2013, ex. (NIM).

Earlier Records from Pakistan: Punjab [12, 22], Azad Jammu and Kashmir [19, 20].

World Distribution**:** India [9].

Habitat: Specimens were collected from water streams with grasses.

***Ceriagrion coromandelianum* Fabricius, 1798**

Material Examined: Pir Baba, 8♂**,** 04-viii-2014, leg. (Fazaullah), Totali, 14♂**,** 06-viii-2014, leg. (T. Badshah),

Nawagai 12♂, 08-viii-2014, leg. (N. Zada), ex. (NIM).
Earlier Records from Pakistan: Azad Jammu and Kashmir [12, 19], Punjab [12, 22, 23, 24], K.P.K. [12, 21, 22], Sindh [12, 22], Baluchistan [12], Gilgit and Baltistan [9].
World Distribution: India, Malaysia, Indonesia, Singapore, Malaysia, China and Sri Lanka [9].
Habitat: Specimens were collected from stagnant water with grasses, water streams and lakes.

***Pseudagrion ceylanicum* Kirby, 1891**
Material Examined: Gagra, 13♂, 13-vii-2014, leg. (N. Zada), Koga, 11♂.15-vii-2014, leg. (Fazlullah), ex. (NIM).
Earlier Records from Pakistan: Azad Jammu and Kashmir [12, 19].
World Distribution: Sri Lanka [9].
Habitat: Specimens were collected from stagnant water of ponds.

***Pseudagrion rubriceps* Selys, 1876**
Material Examined: Karapa, 7♂, 05-vii-2014, leg. (N. Zada), Amazai, 8♂, 06-vii-2014, leg. (Fazullah), Shalbandi, 6♂, 09-vii-2014, leg. (T. Badshah), ex. (NIM).
Earlier Records from Pakistan: Azad Jammu and Kashmir [12, 19, 25, 26], Punjab [12, 22], K.P.K [12, 22].
World Distribution: India, Malaysia, Singapore, Indonesia, China, Nepal, Bangladesh, Hong Kong, Sri Lanka [9].
Habitat: Specimens were collected from stagnant water with grassy vegetation.

***Ischnura aurora rubilio* Selys, 1876**
Material Examined: Budal, 7♂, 15-vii-2013, leg. (N. Zada), Chagharzai, 9♂, 18-vii-2013, leg. (A. Zia), Batara, 11♂, 19-vii-2013, leg. (A. Farid), ex. (NIM).
Earlier Records from Pakistan: Azad Jammu and Kashmir [12, 19, 25], Punjab [12, 22, 23], K.P.K. [12, 21, 22], Sindh and Baluchistan [12], Gilgit and Baltistan [9].
World Distribution: Turkey [27].
Habitat: *I. aurora rubilio* were collected from stagnant water ponds with grasses.

***Ischnura elegans* Vander Linden, 1820**
Material Examined: Gagra, 6 ♂, 22-vi-2013, leg. (A. Zia), Dokada, 5♂, 26-vi-2013, leg. (A. Farid), ex. (NIM).
Earlier Records from Pakistan: Azad Jammu and Kashmir [12, 19, 20], K.P.K. [12, 21, 22], Baluchistan [12, 22], Gilgit [12], Gilgit and Baltistan [9].
World Distribution: Turkey, India, Spain, Russia, Iran, throughout Europe [9].
Habitat: *I. elegans* were collected from slow moving water with thin grassy vegetation.

***Ischnura forcipata* Morton, 1907**
Material Examined: Daggar, 5♂, 24-vii-2013, leg. (M. Saeed), Gokand, 8♂ 1♀, 25-vii-2013, leg. (A. Zia), ex. (NIM).
Earlier Records from Pakistan: Azad Jammu and Kashmir [12, 19, 25, 28], Punjab [12, 22], K.P.K. [12, 21, 22], Gilgit and Baltistan [9].
World Distribution: India, Bhutan, Iran [9].
Habitat: Specimens were collected from stagnant water with thin grasses and thick grassy vegetation.

***Ischnura fountainei* Morton, 1905**
Material Examined: Jowar 12♂, 04-vii-2014, leg. (N. Zada), Budal, 8♂, 05-vii-2014, leg. (Fazlullah), ex. (NIM).
Earlier Records from Pakistan: Baluchistan [12, 22].
World Distribution: Egypt, Turkey [9].
Habitat: Specimens were collected from moving water stream, margins of a water lake.

***Elattoneura campioni* Fraser, 1922**
Material Examined: Gokand, 5♂, 17-vii-2014, leg. (N. Zada), Karapa, 3♂, 15-vii-2014, leg. (T. Badshah), ex. (NIM).
Earlier Records from Pakistan: Azad Jammu and Kashmir [12].
World Distribution: India [9].
Habitat: Specimens were collected from slow running water with grasses.

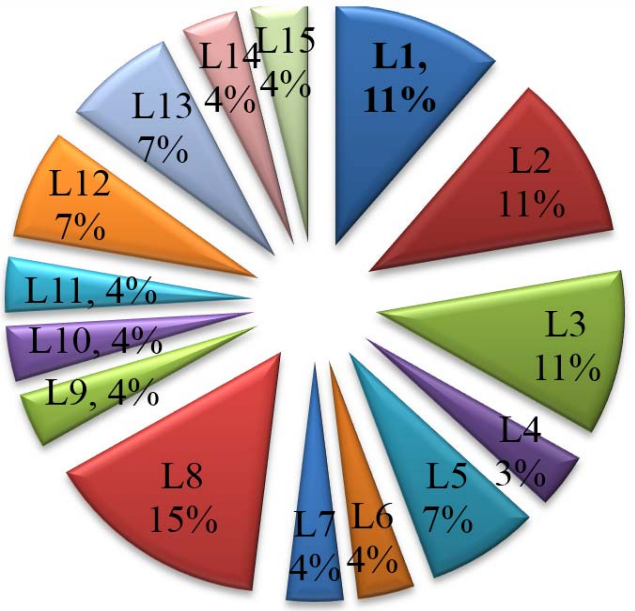

Fig 2: Richness of recorded Zygoptera from district Buner (L refers to location)

Majority of species were recorded from L8 (Budal) followed by L1 (Karapa) L2 (Daggar) and L3 (Gokand) as compared to other localities. This may be due to the suitable environment for their growth and reproduction.

***Megalestes major* Selys, 1962**
Material Examined: Budal, 4♂, 05-viii-2014, leg. (N. Zada), Jowar, 3♂, 07-viii-2014, (N. Zada), ex. (NIM).
Earlier Records from Pakistan: Azad Jammu and Kashmir [12, 19], K.P.K. [12, 21, 22], Punjab and Baluchistan [12], Gilgit and Baltistan [12].
World Distribution: India, Nepal, Bhutan [9].
Habitat: *M. major* were collected from grassy vegetation with beside water.

Fig. 3: Some damselflies images during the study; A. *Neurobasis chinensis chinensis* Linnaeus; B. *Libellago lineata lineata* Burmeister; C. *Rhinocypha quadrimaculata* Selys; D. *Ceriagrion coromandelianum* Fabricius; E. *Pseudagrion rubriceps* Selys; F. *Ischnura aurora rubilio* Selys; G. *Ischnura elegans* Vander Linden; H. *Ischnura forcipata* Morton; I. *Megalestes major* Selys

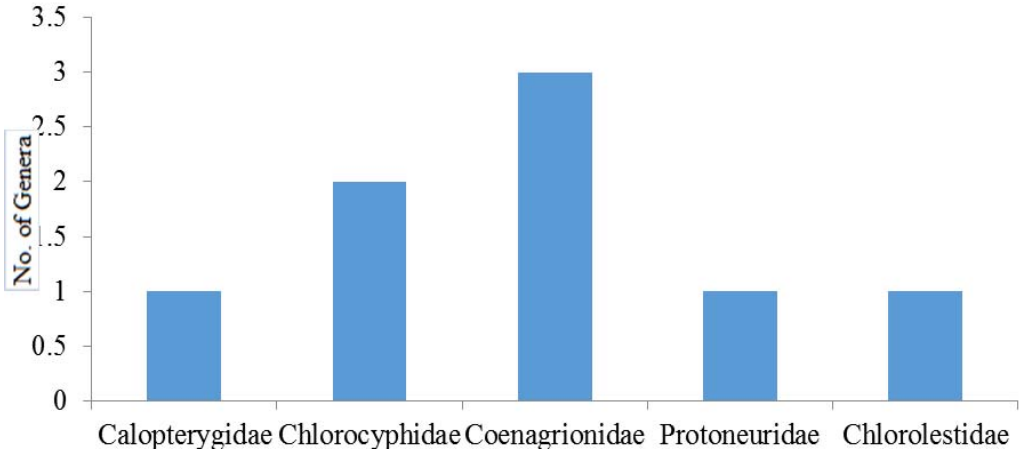

Fig 4: Zygoptera families wise genera reported from district Buner

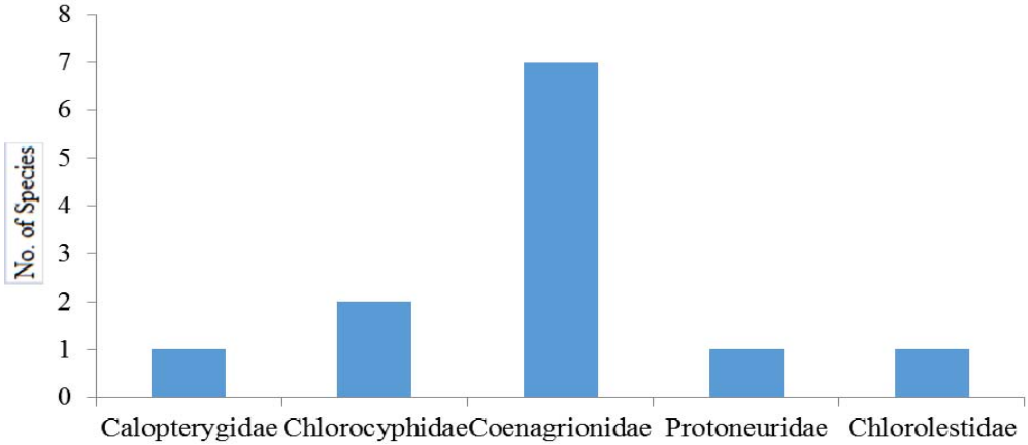

Fig 5: Zygoptera species wise reported from district Buner

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