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## Survey of Odonata (Anisoptera) Fauna in Babuzai, Pakistan, Featuring New Distributional Records for Swat

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### ABSTRACT

An exploratory investigation was conducted on the dragonfly species in Babuzai, a tehsil located in the scenic Swat district of Pakistan, known for its tourism. The study was conducted from April 2021 to June 2022, during two time intervals: 8:00 AM to 12:00 PM and 2:00 PM to 5:00 PM. Specimens were collected from different parts of the region, including Odigram, Rahim Abad, Qambar, Gulkada, Islampur, Mingora, Banr, Kokarai, Manglawar, Tindodag, Bishbanh, Saidu Sharif, Dangram, a Marghuzar, Sangar, and Jambil. A total of 18 species belonging to two families were identified. The Libellulidae family was the most diverse, accounting for 94% of the species, while the Ashenidae family was represented by just one species, making up 6% of the total. 4 species—*Orthetrum iuzonicum*, *Sympetrum commixtum*, *Sympetrum fonscolombii*, and *Palpopleura sexmaculata*—were recorded for the first time in the district of Swat. This study increases the understanding of the Odonata species in the district and provides important insights for biodiversity conservation and ecosystem management efforts in the region.

**Keywords:** Faunistic, Dragonfly, Swat, Babuzai, Insects diversity, Anisoptera

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### Introduction

Odonata is a significant order of insects, known for their predatory nature, and serves as a key bioindicator for assessing the health of ecosystems. It is one of the most easily recognizable insect groups [1, 2]. This order is divided into 3 suborders: Anisoptera (dragonflies), Zygoptera (damselflies), and Anisozygoptera (primitive dragonflies) [3]. Globally, about 3,000 dragonfly species are distributed, with no presence in Antarctica [4]. The order encompasses 8 superfamilies, 29 families, and 58 subfamilies, with nearly 600 genera and 6,000 species described globally [5, 6]. As top predators, Odonates have an important ecological role, serving as bioindicators of environmental health and pollution [7]. Their larvae and adult forms help control various insect pests that impact human health, aiding in the management of diseases like malaria, dengue, and filariasis [2]. Due to their significant ecological and economic value, studying their fauna is essential for effective pest management and environmental conservation [8].

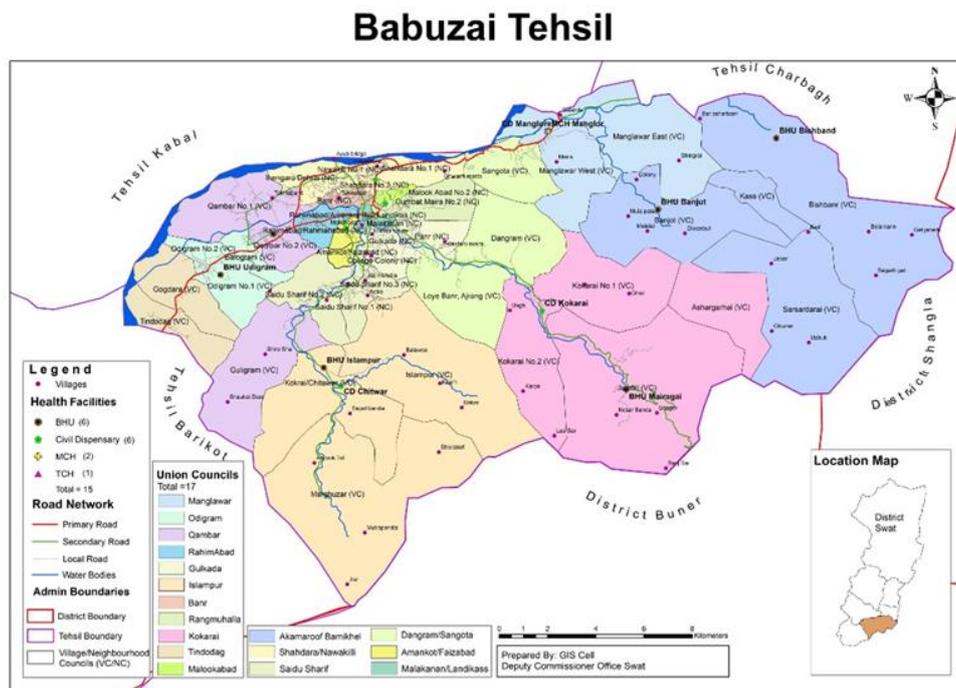
Mingora, the largest city in Swat District, Khyber Pakhtunkhwa, Pakistan, is situated along the Swat River. It is the heart of cultural, economic, and social activities in the Malakand Division, playing a central role in the northern region of Khyber Pakhtunkhwa. While research on the Odonata fauna of Pakistan has been undertaken by various researchers [2, 3, 9-16], there is limited information available regarding the dragonfly species in Tehsil Babuzai.

This study aims to fill this research gap by documenting the dragonfly species present across different areas of Tehsil Babuzai. The goal is to offer an initial exploration of the Odonata communities within this region, contributing to a deeper understanding of the freshwater biodiversity and supporting future conservation initiatives.

## Materials and Methods

### Study area

Swat is a well-known tourist destination in Khyber Pakhtunkhwa (KPK), consisting of 7 administrative tehsils: Babuzai (Mingora), Barikot, Kabal, Matta, Khwazakheela, Charbagh, and Bahrain. Babuzai is the primary tehsil of District Swat, Khyber Pakhtunkhwa, Pakistan [17]. Key biodiversity areas within Tehsil Babuzai include Odigram, Rahim Abad, Qambar, Gulkada, Banr, Islampur, Mingora, Tindodag, Kokarai, Manglawar, Saidu Sharif, Bishbanh, Marghuzar, Jambil, Dangram, and Sangar (**Figure 1**).



**Figure 1.** Map showing the location of Tehsil Babuzai within the district of Swat

### Collection and preservation

The study was conducted over fifteen months, between April 2021 and June 2022, with specimen collection occurring from 8:00 a.m. to 12:00 p.m. and 2:00 p.m. to 5:00 p.m. Since dragonflies are attracted to bright, warm environments, the majority of samples were gathered in the afternoon and evening. The specimens were humanely killed by placing them in a jar containing cotton soaked with potassium cyanide (KCN). After euthanasia, the specimens were arranged on a stretching board for mounting. Once dried, the specimens were stored in insect boxes, each marked with a label containing the date, collection site, and the name of the collector. To prevent damage from pests, naphthalene balls were placed inside the boxes. Additionally, the research area was photographed twice a week using a Nikon D7200 camera paired with a NIKKOR 18-140 mm lens.

### Identification

The collected specimens were identified with the help of existing references [2, 3, 9-16], and further confirmation was sought from experts in Odonata taxonomy to ensure accurate identification. The validated specimens were then preserved and stored in the Zoology Museum at Govt Post Graduate Jahanzeb College, Swat.

## Results and Discussion

This research offers an in-depth exploration of dragonfly diversity in Babuzai, Swat, conducted between April 2021 and July 2022. A total of eighteen dragonfly species were identified from two primary families: Aeshnidae and Libellulidae. Libellulidae dominated the species composition, contributing 94% of the species, with 17 species, while Aeshnidae represented only 6% with a single species (**Table 1, Figures 2-4**). The species recorded from Libellulidae include *Orthetrum pruinosum*, *O. taeniolatum*, *O. triangulare*, *O. iuzonicum*, *O. Chrysis*, *O. sabina*, *Crocothemis erythraea*, *C. servilia*, *T. aurora*, *Trithemis festiva*, *Sympetrum fonscolombii*, *S. vulgatum*, *S. commixtum*, *Pantala flavescens*, *Acisoma panorpoides*, *Palpopleura sexmaculata*, and *Tramea virginia*. In contrast, the Aeshnidae family was represented by just one species, *Anax immaculifrons*. Notably, four species—*O. iuzonicum*, *S. fonscolombii*, *S. commixtum*, and *P. sexmaculata*—were first recorded in District Swat, significantly contributing to our knowledge of the region’s odonate fauna. These findings emphasize the ongoing need for biodiversity assessments in Swat to better document and protect its ecological heritage.

Several studies on dragonfly fauna in Pakistan have been conducted. In 2018, a study in Sindh identified 215 specimens, documenting 9 species across 5 genera and 2 families [12]. A similar study in the district of Sialkot in 2019 recorded 185 specimens, identifying 10 species from seven genera and two families, with overlapping species found in this research [11]. A survey in Swabi, Khyber Pakhtunkhwa, conducted between 2015 and 2016, identified 23 species across 15 genera and 3 families. The species identified in this study showed significant similarities to those found in Babuzai, reflecting broader regional patterns in odonate biodiversity [2]. Additionally, research conducted in Tehsil Tangai, district Charsadda, identified 11 species from 7 genera and 2 families, including Libellulidae and Gomphidae [13]. Our findings of 18 species align well with these studies, further demonstrating the richness of the local dragonfly fauna.

In District Swat, multiple studies have contributed to the understanding of its odonate biodiversity. A study in Manglawar, Swat, recorded 11 species from the Libellulidae family [3]. Our current study, by contrast, identified 17 species from this family, with the first 8 species closely resembling those documented in Manglawar. Furthermore, another study conducted from March to October in Swat collected 200 specimens from 5 families, with Libellulidae emerging as the most prevalent family, which is consistent with our findings [15].

In Upper Swat, Khyber Pakhtunkhwa, a study identified fifteen species from eleven taxa [18]. However, several species—such as *Hydrobasileus croceus*, *O. anceps*, *Potamarcha obscura*, *S. meridionale*, *Tholymis tillarga*, *Zygonyx torridus*, and *S. orientale*—were not reported in their research, highlighting the distinctiveness of our results and the broader diversity of odonates in the region.



**Figure 2.** Families, genera, and species of Anisoptera recorded in Babuzai, Swat.

**Table 1** presents a species checklist from the research area.

**Table 1.** Species list from the research area.

Order	Family	Species
Odonata	Libellulidae	<i>O. sabinac</i>
		<i>O. ctriangulare</i>
		<i>O. taeniolatunc</i>

	<i>O. pruinose</i>
	<i>O. chrysis</i>
	<i>O. iuzonicum</i>
	<i>C. erythraea</i>
	<i>C. servilia</i>
	<i>T. festiva</i>
	<i>T. aurora</i>
	<i>S. fonscolombii</i>
	<i>S. commixtum</i>
	<i>S. vulgatum</i>
	<i>P. flavescens</i>
	<i>P. sexmaculata</i>
	<i>A. panorpoides</i>
	<i>T. virginia</i>
Aeshnidae	<i>A. immaculifrons</i>

## Order Odonata

## Family Libellulidae

1. *O. sabina* (Drury, 1773)

Common name: Slender Skimmer

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Mingora; 10-vii-2021, Police line Mingora; 27-ix-2021, Coll.Sanan | Gugdara; 10-x-2021, Coll.Bakhtawar | Saidu Sharif; 5-viii-2021, Coll.Malala.

2. *O. triangulare* (Selys, 1878)

Common name: Blue-tailed Forest Hawk

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Mingora; 15-iv-2021, Coll.Sanan | Police line Mingora; 03-x-2021, Coll.Malala | Marghuzar; 17-vii-2021, Coll.Bakhtawar.

3. *O. taeniolatum* (Schneider, 1845)

Common name: Small Skimmer

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Mingora; 19-v-2021, 07-vii-2021, Coll.Malala | Police line; 11-vi-2021, Amankot; 22-iv-2021, Coll.Sanan | Manglawar; 22-ix-2021, Coll.Bakhtawar.

4. *O. pruinose* (Burmeister, 1839)

Common name: Crimson-Tailed Marsh Hawk

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Saidu Sharif; 15-v-2021, Coll.A.Rehman | Odigram; 24-viii-2021, Coll.Bakhtawar | Kokari; 14-vi-2022, Coll.Waqas.

5. *O. chrysis* (Selys, 1891)

Common name: Spine-tufted Skimmer

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Police line Mingora; 19-iv-2021, Sangar; 27-vii-2021, Coll.Sanan | Odigram; 25-vi-2021, Gugdara; 11-x-2021, Coll.Bakhtawar.

6. *O. iuzonicum* (Brauer, 1868)

Common name: Tricolored Marsh Hawk

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Mingora; 17-vi-2021, Police line Mingora; 29-vii-2021, Coll.Sanan | Saidu Sharif; 21-v-2021, Coll.Malala.

7. *C. erythraea* (Brulle, 1832)

Common name: Broad Scarlet

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Mingora; 07-iv-2021, Police line Mingora; 17-v-2021, Coll.Sanan | Saidu Sharif; 29-vi-2021, Coll.Bakhtawar | Manglawar; 12-viii-2021, Coll.Malala

8. *C. servilia* (Drury, 1770)

Common name: Scarlet Skimmer

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Mingora; 17-v2021, Police line Mingora; 5-vii-2021, Coll.Sanan | Marghuzar; 11-vi-2021, Amankot; 13-viii-2021, Coll.Malala | Odigram; 09-ix-2021, Coll.Bakhtawar.

9. *T. festiva* (Rambur, 1842)

Common name: Black Stream Glider

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Mingora; 19-vi2021, Marghuzar; 25-viii-2021, Coll.Sanan | Saidu Sharif; 11-iv-2021, Coll.Malala | Odigram; 12-ix-2021, Coll.Bakhtawar.

10. *T. aurora* (Burmeister, 1839)

Common name: Crimson Marsh Glider

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Police line Mingora; 11-iv-2021, Sangar; 18-vi-2021, Coll.Sanan | Saidu Sharif; 13-v-2021, Coll.Malala | Odigram; 25-vii-2021, Coll.Waqas.

11. *S. fonscolombii* (Selys, 1840)

Common name: Red-veined Darter

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Police line Mingora; 27-vi-2021, Manglawar; 11-iii-2022, Coll.Sanan | Amankot; 10-v-2022, Coll.Bakhtawar | Kokarai; 15-vi-2022, Coll.Waqas.



a)



b)



c)



d)



e)



f)



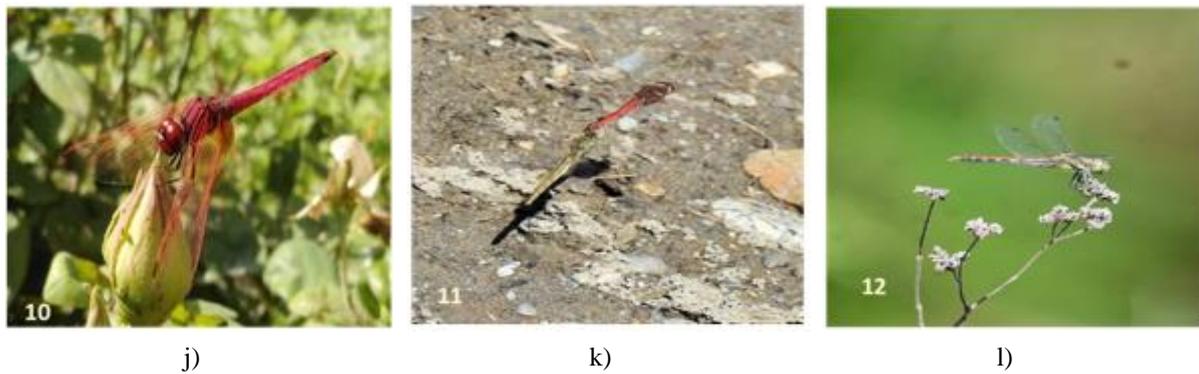
g)



h)



i)



**Figure 3.** a) *O. sabinac*, b) *O. triangulare*, c) *O. taeniolatumc*, d) *O. pruinosumc*, e) *O. chrysis*, f) *O. iuzonicumc*, g) *C. erythraea*, h) *C. servilia*, i) *T. festiva*, j) *T. aurora*, k) *S. fonscolombii*, and l) *S. commixtum*

12. *S. commixtum* (Selys, 1884)

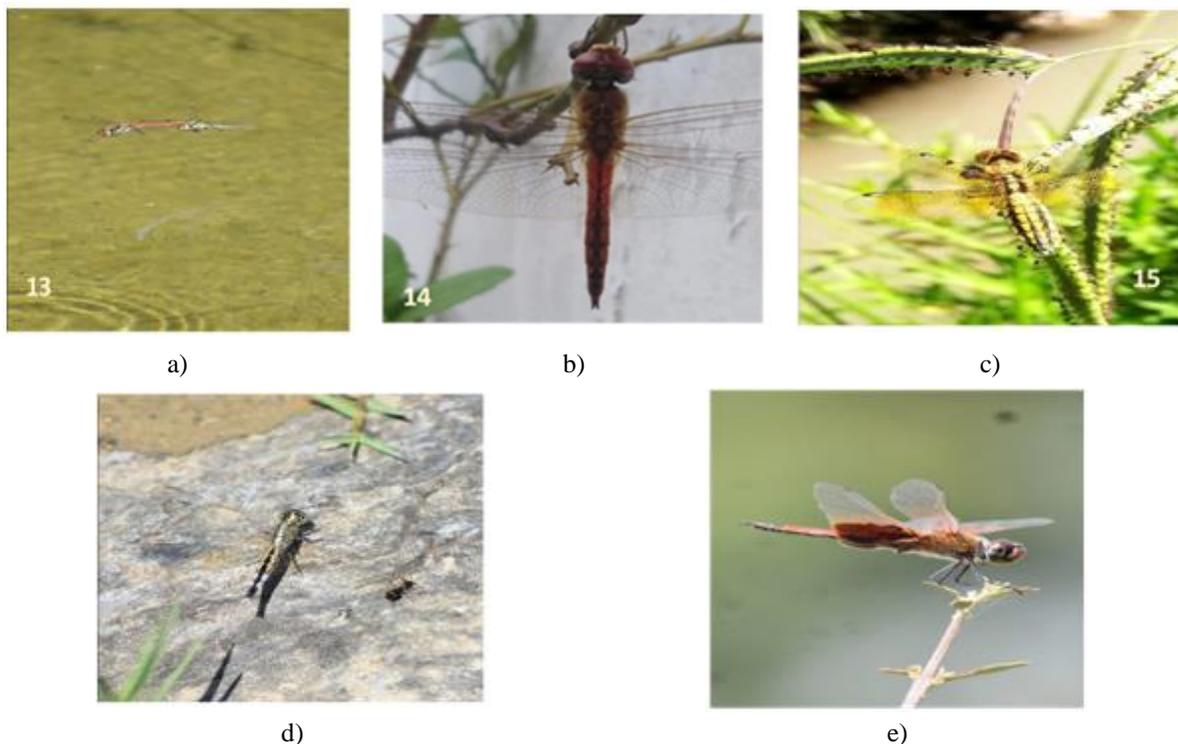
Common name: Mountain Meadow Hawk

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Marghuzar; 11-vi-2022, Coll.Sanan | Mingora; 15-vi-2021 | Saidu sharif; 11-iii-2022, Coll.Waqas.

13. *S. vulgatum* (Linnaeus, 1758)

Common name: Vagrant Darter

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Marghuzar; 22iv-2021, Sangar; 18-vi-2021, Coll.Sanan | Saidu sharif; 09-ix-2021, Coll.Nazir.



**Figure 4.** a) *S. vulgatum*, b) *P. flavescens*, c) *Palpopleura sexmaculata*, d) *A. panorpoides*, and e) *T. Virginia*

14. *P. flavescens* (Fabricius, 1798)

Common name: Wandering Glider

Material examined: Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Marghuzar; 02-v-2021, Amankot; 13-vii-2021, Coll.Sanan | Manglawar; 29-ix-2021, Coll.A.Rehman.

15. *Palpopleura sexmaculata* (Fabricius, 1787)

Common name: Blue-tailed Yellow Skimmer

*Material examined:* Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Police line Mingora; 19-iv-2022, Marghuzar; 11-vi-2021, Mingora; 17-ix-2021, Coll.Sanan | Saidu sharif; 15-vii-2021, Coll.Malala.

16. *A. panorpoides* (Rambur, 1842)

Common name: Grizzled Pintail

*Material examined:* Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Police line Mingora; 15-iv-2022, Manglawar; 07-viii-2021, Coll.Sanan.

17. *T. virginia* (Rambur, 1842)

Common name: Saddlebag Glider

*Material examined:* Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Odigram; 19iv-2021, Sangar; 09-ix-2021, Coll.Sanan | Marghuzar; 15-vii-2021, Coll.Malala.

Family Ashenidae

18. *A. immaculifrons*: (Rambur, 1842)

Common name: Blue Darner

*Material examined:* Pakistan; Khyber Pakhtunkhwa; Swat; Babuzai; Amankot; 19v-2021, Coll.Bakhtawar | Police line Mingora; 10-viii-2021, Manglawar; 29-iii-2022, Coll.Sanan.

## Conclusion

This study provides valuable insights into the Odonata species in Tehsil Babuzai, showcasing the importance of freshwater ecosystems in the region. The recorded species diversity emphasizes the need for preserving these habitats. By documenting species presence and habitat preferences, this research paves the way for future exploration. Conservation strategies should focus on safeguarding critical areas. Effective ecosystem management will require cooperation between conservationists, researchers, and local communities. The findings highlight the crucial need to protect Odonata populations in Tehsil Babuzai and similar regions.

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**Conflict of Interest:** None

**Financial Support:** None

**Ethics Statement:** The study was carried out following ethical standards.

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