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ECO-BIODIVERSITY AND POPULATION STATUS OF BUGS (HEMIPTERA) IN DISTRICT BUNER

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Abstract

Hemiptera are called "true" bugs. Hemi denotes half, or half-winged; ptera indicates wing.Heteroptera (True Bugs), the most varied suborder of non-endopterygote hemimetabolous insects, are found all over the world. In the current study, 2200 Hemiptera specimens belonging to the suborder Heteroptera were gathered from various locations in District Buner between October 2021 and September 2022. Data was gathered on a monthly basis. Heteroptera specimens were collected using a variety of techniques, including sweeping nets, hand trapping, light trapping, beating vegetation, and sorting techniques. Seventeen species and sixteen genera belonging to six families—Pentatomidae, Largidae, Scutelleridae, Reduviidae, Lygaeidae, and Alydidae—were identified. Of these, seventeen were identified for the first time from District Buner. The identified species are Erthesina fullo Thunberg, Eocanthecona furcellata Halys dentatus Fabricius, Halyomorpha halys, Perillus bioculatus Nezara viridula, Dendrocoris humeralis, Cosmopela lintneriana, Lelia Decempunctata, , Dieuches uniguttatus Thunberg, Chinavia hilaris, Physopelta gutta Burmeister, Spilostethus pandurus Scopoli ,Riptortus linearis Fabricius, Rhynocoris fuscipes Fabricius, Poecilocoris lewisi .

These species are all new to Buner District. The Pentatomidae family predominates throughout the

investigation. keys to the studied families and diagnostic traits, Reliable, consistent, and distinctive characters were used to form genera and subfamilies. During the investigation, new host plants were noted along with their corresponding species. For every species, photographic details of specimens have been illustrated.

INTRODUCTION

Hemiptera, or "true" bugs, are the most diverse suborder of non-endopterygote hemimetabolous insects, with a worldwide distribution. Ptera means wing, and hemi means half (half winged) [1]. They range in size from 1 mm (0.04 in) to roughly 15 cm (6 in) and have an osthognate head structure with both piercing and sucking mouthparts. They have two sets of bristle-like stylets, which are modified to mandibles and maxillae. [2]. The number of Hemiptera species ranges from 50,000 to 82,000, and they display a remarkable diversity of morphological traits and lifestyles.

[3].There are 133 families and between 184,000 to 1930,000 species of insects in the Hemiptera class worldwide.

[4]. The order Heteroptera has a large number of "bugs" that live either above or below the water line. Unlike terrestrial heteropterans, the vast majority of which are herbivorous, aquatic bugs are the predators of the aquatic environment.

[5]. The first known Heteroptera with non-functioning mouthparts in the first nymphal stage instar are the Aradidae.

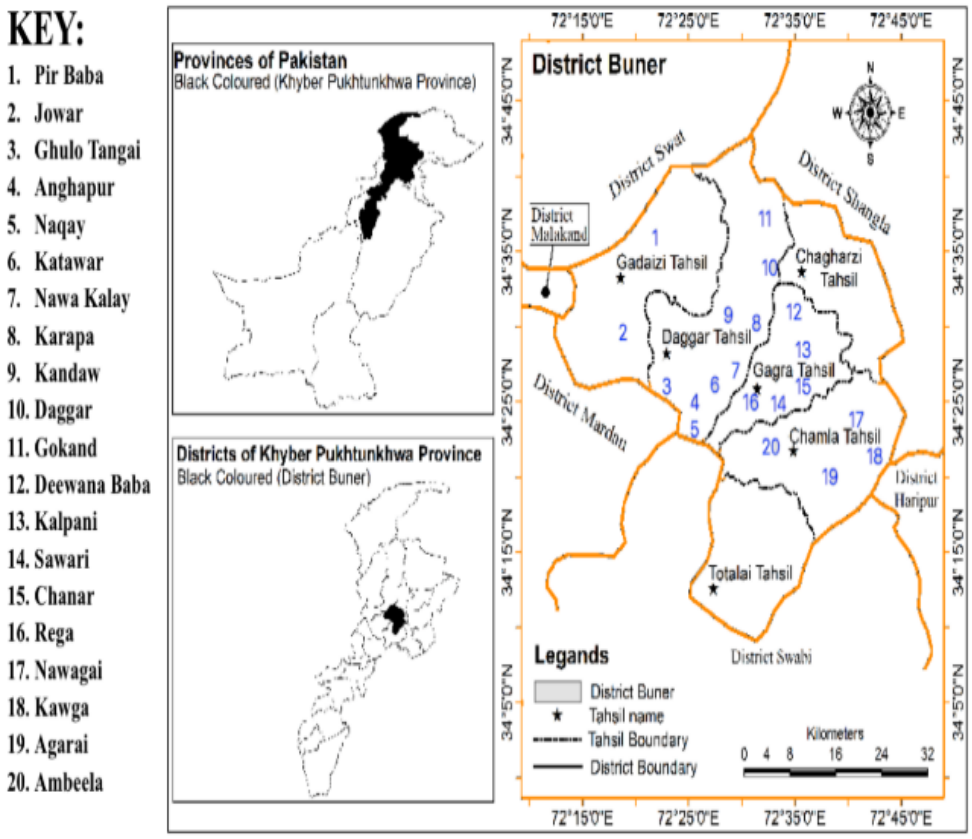
[6] Hemipteran insects are very important commercially because the majority of them are pests of many commercial crops. They are essential to both flower pollination and the maintenance and harmony of the natural world. They ate the plant, which served as food for other animals and parasites[7].

Nezara viridula, a common pest of many commercially important crops, is sometimes referred to as the southern green stink bug (Heteroptera: Pentatomidae). Because of its economic impact, there are many examples of N. viridula rearing methods and diets. [8]. Globally, people are concerned about climate change since it will negatively impact biodiversity. The possible impacts of current and future temperatures on aquatic (Heteroptera) species in relation to their ecological preferences and geographic distribution, especially in Pakistan, a region rich in biodiversity[9]. Air, humidity,soil Temperature, photoperiod, and soil moisture all have a significant impact on bug biodiversity.

[10]. To assess the genuine bug population and species variety in District Buner.to document how environmental conditions affect the distribution and variety of real bugs in District Buner.

Materials and methods

Buner is the eastern part of Khyber Pakhtunkhwa, Pakistan. Located in latitude 34 North and longitude 72 East, it has an average elevation of 728 meters. The Buner is bordered to the south by the Swat area and to the east by Mansehra, Shangla, and Torghar in Haripur. Malakand, Mardan, and the west. It became a part of Pakistan in 1969 and was given district status in 1991. Corn, rice, and wheat are the main crops farmed in the region. The region grows a wide range of vegetables, including potatoes, peas, tomatoes, and onions, as well as fruit trees, including apples, apricots, walnuts, pears, and peaches.



Map indicating study area of District Buner.

Table 1. Selected localities of district Buner with Longitude and latitude.

	Locality	Latitude	Longitude
1	Dagger	34.50734 N	72.5223 E
2	Pirbaa	34.593255 N	72.4176 E
3	Gokand	34.58765 N	72.4534 E
4	Chanar	34.4632 N	72.5743 E
5	Anghapur	34.5765 N	72.4352 E
6	Raga	34.4885 N	72.7875 E
7	Sawari	34.6542 N	72.6738 E
8	Kalpani	34.5675 N	72.5753 E
9	Deewana Baba	34.4833 N	72.4573 E
10	Nawagi	34.4349 N	72.3854 E
11	Agari	34.3901 N	72.4534 E
12	Kawga	34. 3295 N	72.3235 E
13	Ambela	34.4576 N	72.5176 E
14	Nawa Kaly	34.4390 N	72.5223 E
15	Ghulo Tangay	34.7653 N	72.6176 E
16	Naqay	34.5096 N	72.2223 E
17	Karapa	34.7876 N	72.6176 E
18	Kandaw	34.7654 N	72.3176 E
19	Katawer	34.6542 N	72.6534 E
20	Jowar	34.6542 N	72.4223 E

Specimen collection

Twenty distinct locations in District Buner provided 2200 specimens of the suborder Heteroptera for this study between October 2021 and September 2022. During lengthy visits, straight-line transect techniques have been employed to collect real bugs from their natural habitats.Sorting method

By manually sorting leaf litter, which is where they are usually found, small genuine bugs were recovered.

Beating

Most heteropterans are found on the leaves of herbaceous plants and trees. Therefore, a white sheet was placed underneath the leaves and tree branches after each bugs was picked up one at a time.

Sweep net methods
Some real insects were collected from herbaceous plants using sweeping nets.

Light trap methods
Light sources, usually mercury bulbs that provide some ultraviolet light, attract a variety of genuine bug species. Light traps were used to collect a large number of specimens. Killing jars with ethanol or ethyl acetate swabs were created in order to destroy the specimen.

Preservation of the specimen
The killed specimen was pinned using one of two methods:
The immense specimens were placed in wooden cases with naphthalene balls after being stretched and fixed. Each specimen was labeled with information about the host plant, the location, and the time it was gathered. A pin in the card was used to adhere the tiny bugs on the small triangular card paper.

Identification
Binocular litz stereomicroscopes and USB digital microscopes were used for the measuring and morphological study of different body components. The collected specimens were identified by comparing them to keys from Distant's Fauna of British India (1908, 1902, 1910, and 1918). Meher and Hamid (1973), Bergroth (91905), and Ahmad and Afzal (1979) were some of the easily accessible books utilized in the research.

Photography
The specimen was photographed with a DSLR camera.

Results
From October 2021 to September 2022, 2200 specimens were collected from 20 localities in the current study on the eco-biodiversity and population status of true bugs of the Order Hemiptera and sub-order Heteroptera in District Buner. A total of 17 species, belonging to 16 genera and 6 families, were recorded; 17 of these species were recorded for the first time in the district.
These are *Eocanthecona Halys dentatus Fabricius, furcellata, Erthesina fullo Thunberg, Halyomorpha halys, Perillus bioculatus, Nezara viridula, Cosmopela lintneriana, Lelia Decempunctata, Dendrocoris humeralis Chinavia hilaris, , Spilostethus pandurus Scopoli, Dieuches uniguttatus Thunberg, Physopelta gutta Burmeister, Riptortus linearis Fabricius, Neophysopelta schlonbuschi Fabr, Rhynocoris fuscipes Fabricius ,Poecilocoris lewisi, Rhynocoris fuscipes Fabricius.* District Buner is where these species are first documented. The Pentatomidae family, which has ten species, is the most prevalent family found in the study. There are two species in the Lygaeidae family and two species in the Largidae family. Each of the families Alydidae, Scutelleridae, and Reduviidae contained one species.
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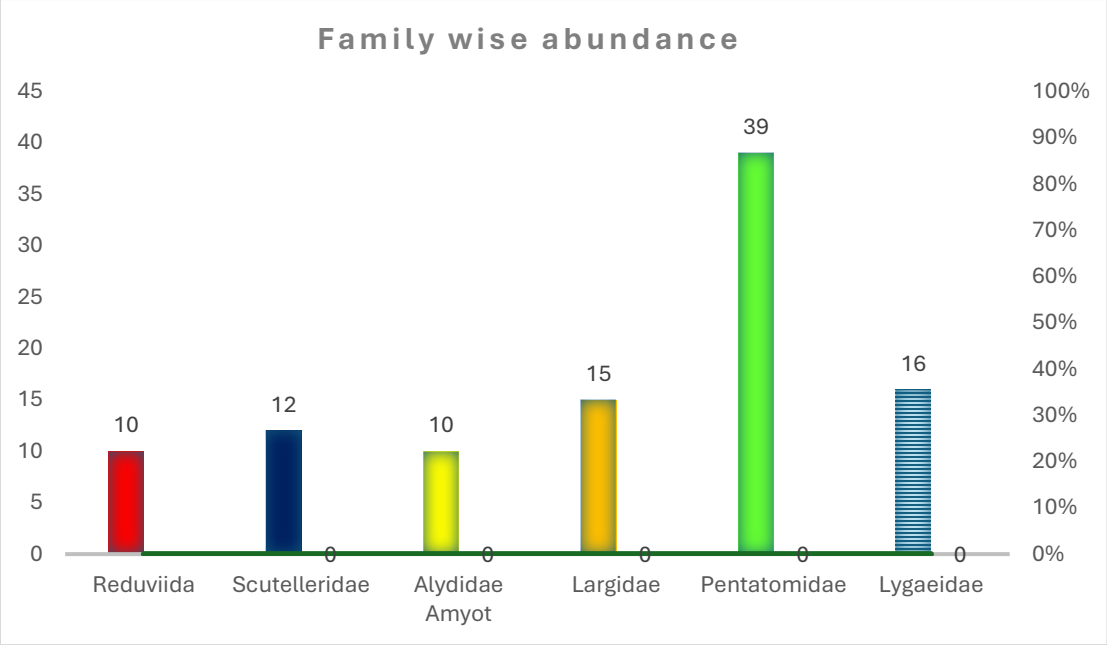


Figure 1. Family-wise abundance of Heteroptera in District Buner.

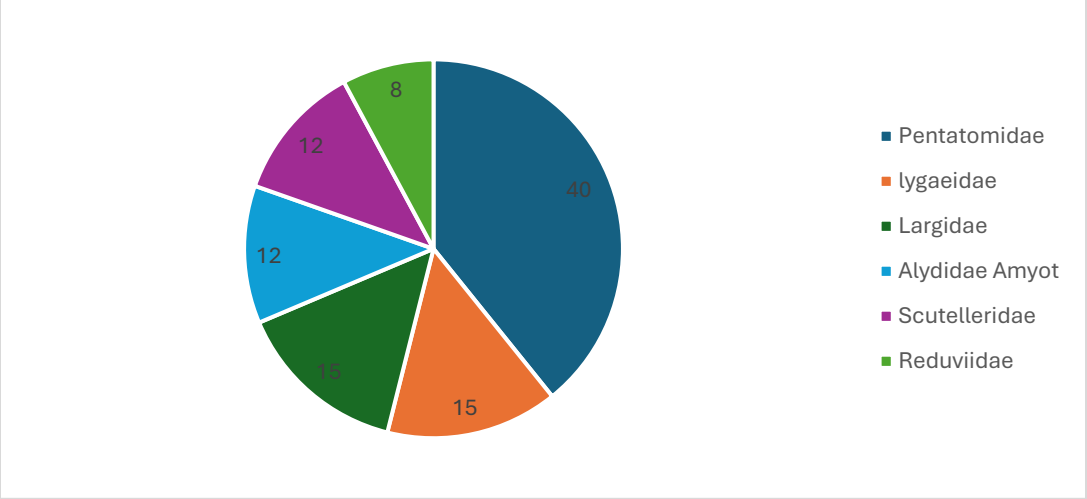


Figure 2 Heteroptera abundance by family in District Buner, represented graphically.

Table 2. Abundance of reletively true bugs Heteroptera of District Buner.

S.No	Scientific names	Populations	Relative abundance	%age
1	*Eocanthecona furcellata Wolf*	100	*100/2200*100*	4.5
2	*Erthesina fullo Thunberg*	250	*250/2200*100*	11.3
3	*Halys dentatus Fabricius*	129	*129/2200*100*	5.86
4	*Perillus bioculatus*	244	*244/2200*100*	11.0
5	*Rhynocorisfuscipes Fabricius*	160	*160/2200*100*	7.27
6	*Neophysopelta schlonbuschi Fabr*	70	*70/2200*100*	3.81

7	*Dieuches uniguttatus Thunberg*	170	*170/2200*100*	7.7
8	*Physopelta gutta Burmeister*	90	90/2200*100	4.0
9	*Riptortus linearis Fabricius*	95	*95/2200*100*	4.31
10	*Halyomorpha halys*	243	243/2200*100	11.0
11	*Spilostethus pandurus scopoli*	120	*120/2200*100*	5.45
12	*Cosmopela lintneriana*	60	*60/2200*100*	2.7
13	*Nezara Viridula*	150	*150/2200*100*	6.8
14	*Lelia Decempunctata*	65	*65/2200*100*	2.9
15	*Dendrocoris humeralis*	105	*105/2200*100*	4.7
16	*Poecilocoris lewisi*	50	*50/2200*100*	4.5
17	*Chinavia lewisi*	99	*99/2200*100*	2.2

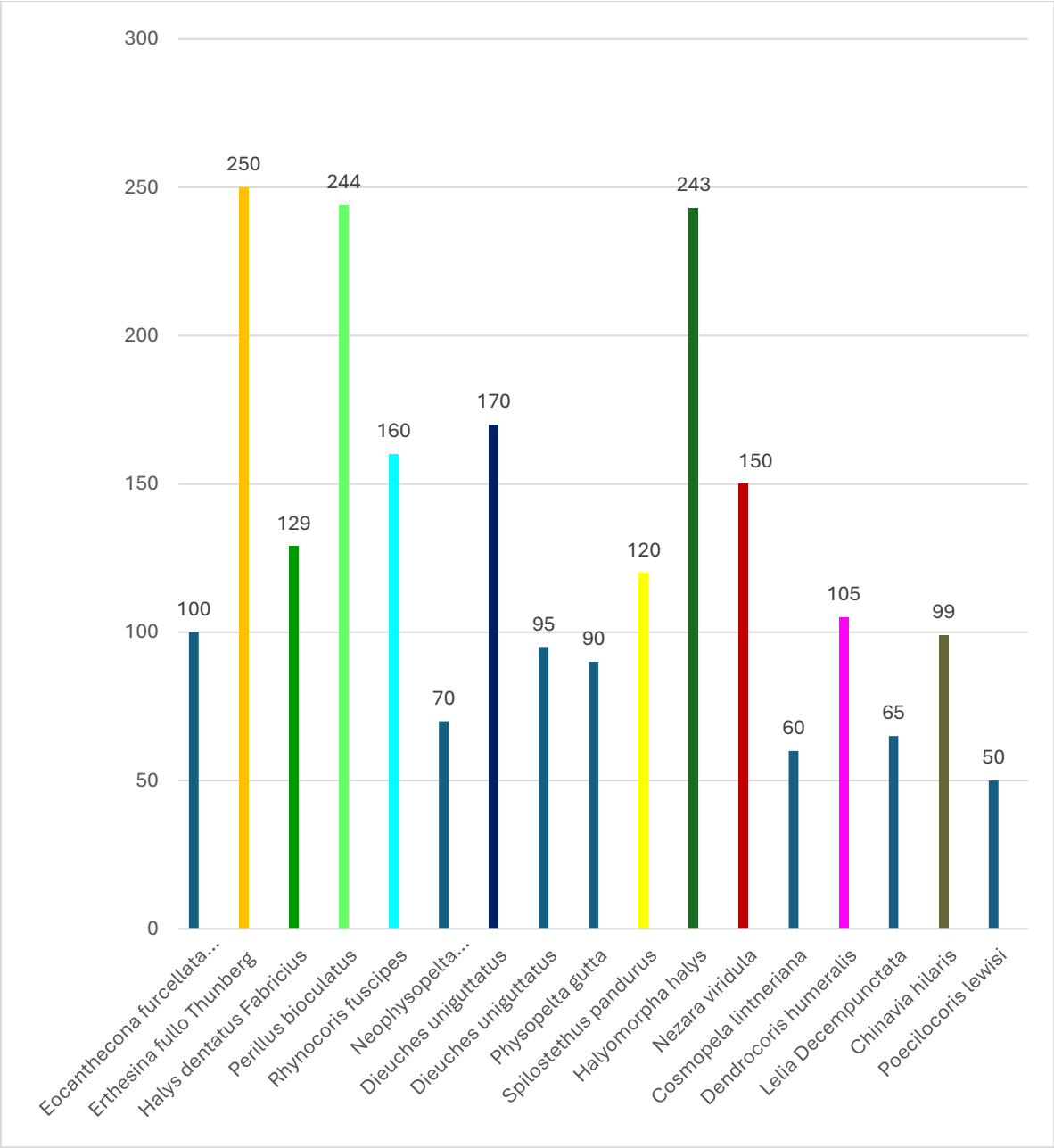


Figure 3. Specimen-wise abundance of Heteroptera in the study area.

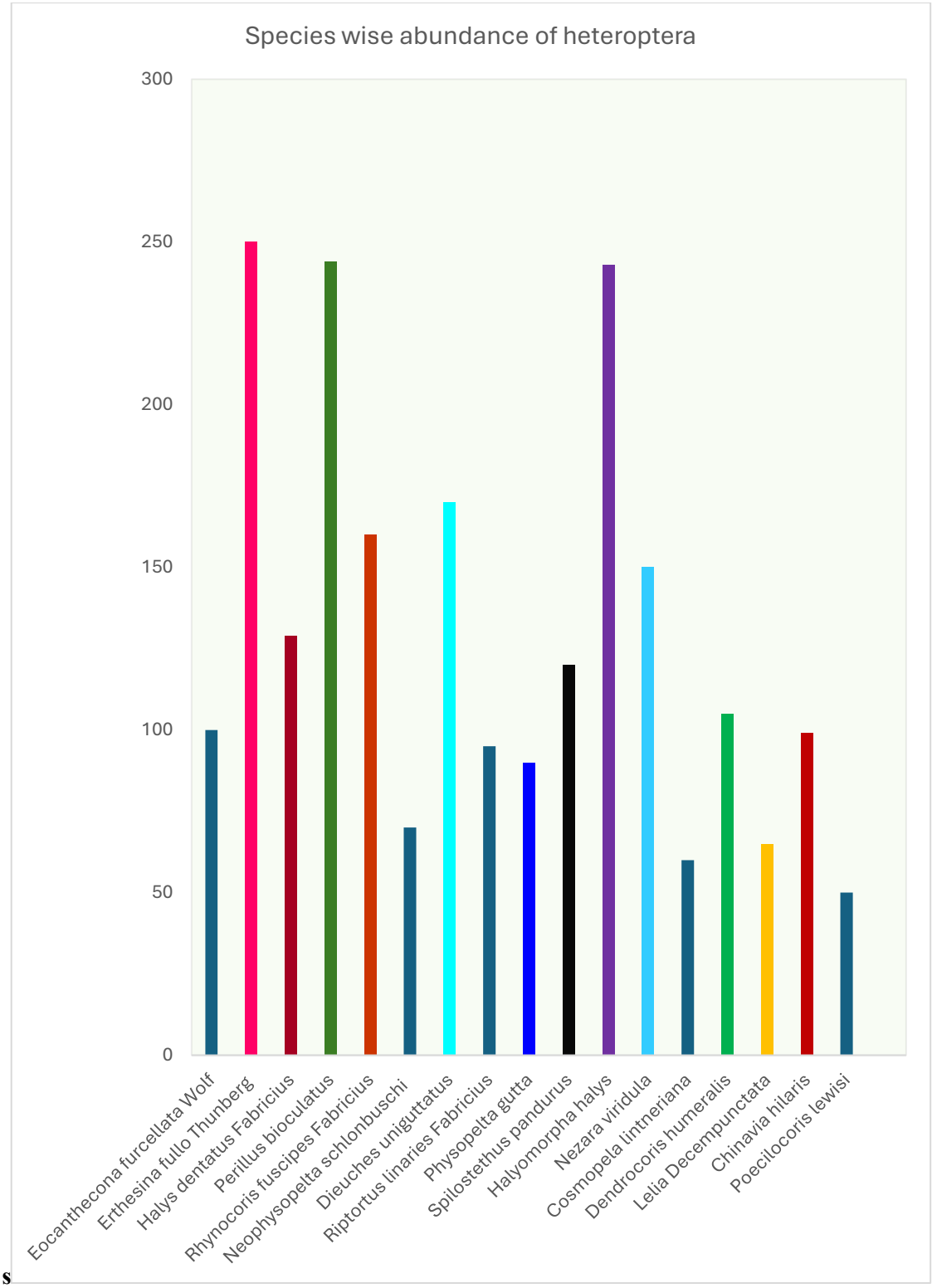


Figure 4. Heteroptera species abundance in District Buner.

DISCUSSION

The Heteroptera fauna of the Buner district was examined in this study. The range of species, host plants, morphometric measurements, and a brief description of each species are provided. There have been reports of 17 species from various places in the region, representing 16 genera and 6 families. For District Buner, 17 species were new records. With 10 species, the Pentatomidae family was the most prevalent, followed by the Lygaeidae, Largidae, Alydidae Amyot, Scutelleridae, and Reduviidae families.

Pentatomidae members were found all across the area under study. Ten of the Pentatomidae family's ten species were identified for the first time in the region. Several authors have documented family members from various parts of Pakistan, including Ahmad and Afzal (1984), Rana (1985), Ahmad (1986), and Memon (2002). Native to North America is Perilus bioculatus. In order to biologically control potato bugs, the species has been brought to numerous nations. Additional research on the dispersion of

In Pakistan, *Perillus bioculatus* will assist in using it for biological pest control. The majority of the pentatominae subfamily's members are severe pests of various tree crops. Several trees were found to have Erthesina fullo. Two species from the Lygaeidae family were identified for the first time in the region.

[11] Ten of the 25 taxa described in the study of the Pakistani family Lygainae were new records. They also provided information about the species' geographic range and host plants.

[12] Three species of the Lygaeidae family were reported for the first time in Pakistan while studying the Parachinar Heteroptera Fauna. In a same vein, there were five species of Coridae, two of which were new records for District Swat. [13] During his doctoral studies, he described six genera with 49 species from the Indian subcontinent and examined the group Homoeocerni. She went over the metathoracic scent glands, male and female genitalia, and species keys and line diagrams. [14] 42 Pakistani species of the Coreidae family were listed and discussed, 20 of which were new records.

.[15] They have supplied a checklist and keys for the genetic identification of Pakistan's Coreoidea fauna. They also included information about the host plants and distribution of certain species.

[16] d examined 28 genus and 39 species of assassin bugs from different parts of Pakistan and AJK. Four Reduviidae species were gathered from cannabis and tomatoes for their investigation.

[17] conducted a phylogenetic analysis of fifteen Pakistani species from the Scutelleridae family. Host plants were listed with their corresponding taxonomy for the majority of the species in the current study.

[18] conducted a comprehensive analysis of actual bugs. He mostly depended on his personnel collecting in New Delhi. He groups all the species into four subfamilies: Phyllocephalinae, Podopinae, Pentatominae, and Atropinae. North India was home to 21 species from 15 genera out of a total of 60 genera and 93 species.

[19] After analyzing 344 Heteroptera species from the Canadian National Collections of Insects, it was shown that DNA barcoding is useful for identifying these species.

In Pakistan, real insects have been used for taxonomic research. The most significant and thoughtful taxonomic efforts are discussed in the section that follows. Ahmad (1965) further separated the family Alydidae into the three subfamilies Alydinae while studying Leptocorisinae worldwide. Leptocorinae, and Micrelytrinae

[20] There have been reports of 40 species and 34 genera from Pakistan, including the superfamilies Pentatomidea and Coreoidea.

[21] Twenty-five taxa from the Pakistani family Lygaeinae were identified, ten of which were new records.

[21] examined in-depth the structure of the cephalothorax in species belonging to the superfamily Coreoidea's families Rhopalidae, stenocephalidae, Coreidae, and Alydidae. They also examined these species' characteristics that are indigenous to Pakistan. Pakistan is home to the Coreiodea superfamilies and Pentatomoidea, which comprise 465 species across 196 genera (Ahmad, 1977). He also provided information on the hosts and spread of various species.

[17] has out taxonomy research using cluster analysis to ascertain the links between 29 features from 15 species in the Scutelleridae family in Pakistan.

[22] developed a novel technique for enlarging the male genitalia of Hemiptera.

[23] examined 19 genera and 64 species from the Pentatomidae subfamily, including one new genus and 21 species from the tribes of Carpocrini and Aeliini.
[13] She studied the Homoecerini tribe of the Coreoidea family during her doctoral studies, describing six genera and 49 species from the Indian Subcontinent.
. [24] identified 30 genera from various regions of Pakistan that contain 38 species of the tribe Halyine, which is a member of the Pentatominae subfamily. It also included two Swat genera, Neohalys and Sarju.
[25] produced a cladogram using a parsimony-based design after doing a cladistics analysis on the subcontinental genus Cletomorpha Mayr of the Coreoidea family.
Rab and Ahmad (2008) performed a cladistics analysis of the genera Plinachtus Stal and Brunsellius Distant of the Family Coreoidea from the Indo-Pakistan area based on their out-group.
[26] concentrate on the genitalia and metathoracic gland apparatus of the examined species of glycerin squash bugs that are economically significant.
[27] examined sixty morphological traits, including those of the genitalia and the metathoracic scent gland, which were assessed in the morphological traits of thirty-one taxa that are members of the Haylini tribe in central and south Asia.
[28] contrasted the genitalia and smell gland ostiole of the recently found Pakistani species Halys spinosus with those of the closely related Halys serrigern.
[29] identified eight stink bug species from the Asopinae and Pentatominae subfamilies.
[30] 24 species from the Haripur District were found in 24 genera and nine families, with 12 of those species being members of the Pentatominae family, which is the dominant family.

Conclusion

The goal of the current study was to ascertain the district Buner's bug (Hemiptera) population status and ecobiodiversity. It was the first groundbreaking study that came to the following conclusion.

- From October 2021 to September 2022, 2200 specimens from 20 distinct locations were gathered for this investigation. Six families—Pentatomidae, Lygaeidae, Largidae, Alydidae Amyot, Scutelleridae, and Reduviidae—with 17 species from 16 genera and 7 subfamilies were identified. For the first time, 17 distinct species were identified in District Buner.
- Alydidae, Amyot, Scutelleridae, and Reduviidae each had one species, but Pentatomidae was the most prevalent family with 1380 specimens.

REFERENCE

[1] J. L. Capinera, *Encyclopedia of entomology*. Springer Science & Business Media, 2008.
[2] L. Bhai, "Hemiptera: Morphology and Phylogeny," *Department of Insects, University of Carbondale, Carbondale, USA,* vol. Entomol,Ornithol & Herpetol, Vol.11, 04-Apr-2022 2022.
[3] J. A. Kalisch, "Introduction to entomology," *University of Nebraska–Lincoln fact sheet EC1588,* 2014.
[4] D. Forero, "The systematics of the Hemiptera," *Revista Colombiana de Entomologia,* vol. 34, pp. 1-21, 01/01 2008.
[5] G. Kriska, "Water Bugs: Heteroptera," in *Freshwater Invertebrates in Central Europe: A Field Guide*: Springer, 2023, pp. 307-338.
[6] R. Rakitov, "Aphagy and vestigial stylets in first-instar nymphs of Aradidae (Hemiptera, Heteroptera)," *Arthropod Structure & Development,* vol. 72, p. 101226, 2023.
[7] T. Ohbayashi *et al.*, "Intercontinental diversity of Caballeronia gut symbionts in the conifer pest bug Leptoglossus occidentalis," *Microbes and environments,* vol. 37, no. 3, p. ME22042, 2022.
[8] M. G. Rojas and J. A. Morales-Ramos, "Effects of Taurine as Dietary Supplement on the Biological and Demographic Parameters of Nezara viridula (Heteroptera: Pentatomidae)," *Journal of Insect Science,* vol. 23, no. 1, 2023.

[9] S. Sundar, D. P. Silva, F. de Oliveira Roque, J. Simião-Ferreira, and J. Heino, "Predicting climate effects on aquatic true bugs in a tropical biodiversity hotspot," *Journal of Insect Conservation,* vol. 25, pp. 229-241, 2021.
[10] M. Islamoglu, "Effect of Some Abiotic Factors on Migration of Sunn Pest (Eurygaster integriceps Put.)(Hemiptera: Scutelleridae) from Aestivation Sites to Overwinteing Sites," *Pakistan Journal of Zoology,* vol. 55, no. 1, 2023.
[11] H. ABDUL and K. MEHER, "THE LYGAEINAE OF WEST PAKISTAN. I. SPILOSTETHUS STAL (HETEROPTERA: LYGAEIDAE) IN WEST PAKISTAN," 1973.
[12] R. Hussain, "Diversity and Ecology of Bugs (Hemiptera: Heteroptera) of Parachinar, Khyber Pakhtunkhwa Pakistan," University of Karachi, Karachi, 2013.
[13] P. Rokhsana, "TAXONOMIC STUDY OF TRIBE HOMOEOCERINI AMYOT AND SERVILE (HETEROPTERA COREIDAE) FROM INDO-PAKISTAN SUBCONTINENT," University of Karachi, 1991.
[14] M. U. Shadab, H. Lang, and J. P. Chapin, "A new genus of pseudophloeine bugs from the Democratic Republic of the Congo (Heteroptera, Coreoidea). American Museum novitates; no. 2493," 1972.
[15] I. Ahmad and F. A. J. T. o. t. S. E. S. Mohammad, "A new tribe, a new genus and two new species of the subfamily Pentatominae Amyot et Serville (Hemiptera: Pentatomidae) from Pakistan and their relationships," vol. 15, no. 1-2, pp. 11-25, 1980.
[16] H. Afzal, "Biodiversity, bioecology and use in biological control of assassin bugs (Heteroptera: Reduviidae)," University of Karachi, 2005.
[17] M. Afzal, S. S. Shaukat, and I. J. O. I. Ahmad, "Taxometric study of the family Scutelle-Ridae leach (Hemiptera: Pentatomoidea) from Pakistan," vol. 16, no. 3, pp. 373-383, 1982.
[18] M. N. J. H. Azim, "Taxonomic survey of stink bugs (Heteroptera: Pentatomidae) of India," vol. 3, pp. 1-10, 2011.
[19] D.-S. Park, R. Foottit, E. Maw, and P. D. J. P. o. Hebert, "Barcoding bugs: DNA-based identification of the true bugs (Insecta: Hemiptera: Heteroptera)," vol. 6, no. 4, p. e18749, 2011.
[20] G.-U. Chaudhry, "Survey of insect fauna of forests of Pakistan; final technical report," 1966.
[21] A. Hamid, K. J. P. j. o. s. Meher, and i. research, "genera of Lygaeinae (Heteroptera: Lygaeidae) in West Pakistan," 1973.
[22] I. J. P. J. o. E. Ahmad, "A fool-proof technique for inflation of male genitalia in Hemiptera (Insecta)," vol. 1, no. 2, pp. 111-112, 1986.
[23] R. H. Zaidi, "ASPECTS OF MORPHOLOGY AND TAXONOMY OF AELIINI STAL AND CARPOCORINI STAL (PENTATOMIDAE: PENTATOMINAE) OF INDO-PAKISTAN SUBCONTINENT WITH THEIR CALADISTIC ANALYSIS," UNIVERSITY OF KARACHI, KARACHI, 1987.
[24] N. MEMON, "A REVISION OF THE BERRY BUGS (HETEROPTERA: PANTATOMOIDEA: HALYINI) OF INDO PAKISTAN SUBCONTINENT WITH SPECIAL REFERENCE TO CLADISTIC ANALYSIS OF HALYINE GENERA," University of Karachi, 2002.
[25] I. Ahmad, N. J. I. J. o. B. Rab, and Biotechnology, "A cladistic analysis of the species of the gonocerine squash bug genus Cletomorpha Mayr (Hemiptera: Coreidae) from Indo-Pakistan subcontinent," vol. 4, no. 1, pp. 9-13, 2007.
[26] I. Ahmad, N. J. I. J. o. B. Rab, and Biotechnology, "Redescription of economically important gonocerine squash bug Cletus rubidiventris (Westwood)(Hemiptera: Heteroptera) from Murree, Punjab, Pakistan, with its phylogenetic relationship," vol. 7, no. 4, pp. 371-374, 2010.
[27] N. Memon, F. Gilbert, and I. J. A. o. t. E. S. o. A. Ahmad, "Phylogeny of the South Asian halyine stink bugs (Hemiptera: Pentatomidae: Halyini) based on morphological characters," vol. 104, no. 6, pp. 1149-1169, 2011.
[28] A. Shaikh, N. Memon, and M. J. S. U. R. J.-S. Shah, "A New Halyine Species Of Halys Fabricius (Hemiptera, Pentatomidae, Pentatominae) From Miani Forest, Sindh, Pakistan," vol. 43, no. 2, 2015.
[29] R. Kandhro, I. Khatri, M. A. Rustamani, Z. Ahmed, and N. J. S. I. Abro, "Some stink bugs (Heteroptera: Pentatomidae) from Tando Jam Sindh," vol. 28, no. 1, pp. 187-189, 2016.

[30] N. Ahmed and G. A. J. P. E. Bajwa, "Hemiptera Fauna of Haripur District, Pakistan," vol. 38, no. 1, pp. 43-45, 2016.