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DIVERSITY AND ABUNDANCE OF BEETLES (ORDER: COLEOPTERA) IN TEHSIL PINDI GHEB DISTRICT ATTOCK, PUNJAB, PAKISTAN

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ABSTRACT

This study examines beetle diversity and abundance (Order: Coleoptera) across various sites in District Attock, Punjab, from July 2024 to June 2025. Coleoptera, the most diverse insect order with around 400,000 known species, is found in nearly all ecosystems. While some beetles are pests, many are beneficial, aiding in pest control. Beetles were collected using hand-picking, net sweeping, jarring, and plastic bag traps. A total of 52 specimens were identified, representing 1 order, 10 families, 22 genera, and 22 species. The Scarabaeidae family was most abundant (7 species), followed by Tenebrionidae (5 species), and Tenebrionidae and Hydrophilidae (2 species each). Other families included Hydrophilidae. The dominance of Scarabaeidae likely reflects favorable conditions and ample organic matter. These results align with findings from neighboring areas and highlight beetles' ecological significance and their role as bioindicators.

Keywords: Beetles, Coleoptera, Scarabaeidae, Tenebrionidae, Hydrophilidae, fauna, diversity, family, region, Attock.

INTRODUCTION

Beetles (Order: Coleoptera) represent the most diverse group within the class Insecta, comprising nearly 400,000 described species globally and accounting for approximately 40% of all known insect species (Banerjee, 2014; Bernardes et al., 2020). The name Coleoptera, derived from the Greek words *keleos* (sheath) and *pteron* (wing), refers to their distinctive hardened forewings (elytra), which protect the delicate hind wings and play roles in camouflage and survival (Goczał & Beutel, 2023). These insects are found in nearly every habitat and perform essential ecological functions by interacting with plants, decaying organic matter, and other organisms. Their structural adaptations, such as lightweight yet durable exoskeletons, reflect a high level of evolutionary optimization (Chen et al., 2015). With a lineage extending over 300 million years, beetles have survived multiple mass extinction events, highlighting their resilience and adaptability (McKenna et al., 2016). While many beetle species are beneficial as predators of agricultural pests, others are known for causing significant damage to crops and stored products, impacting global food security (Adamski et al., 2019). The family Coccinellidae, for example, is widely studied for its role in biological control, particularly in reducing aphid populations. Beetles are also recognized as effective bioindicators due to their sensitivity to environmental changes, rapid response to habitat disturbances, and ease of sampling (Avgin & Luff, 2010). This makes them valuable in ecological monitoring programs, especially in studies assessing land use, pollution, and habitat fragmentation (Sklaski et al., 2011; Bednarska et al., 2013). Given their ecological importance and adaptability, studying beetle diversity and abundance can offer critical insights into ecosystem health and biodiversity conservation.

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MATERIALS AND METHODS

The present study on diversity of beetles. was conducted in Tehsil Pindi Gheb, District Attock, Pakistan, from July 2024 to June 2025. We selected 7 sites for data collection representing seven habitats: Gardens, Agricultural fields, Sandy areas, Wetlands, Grasslands, and Woodlands.

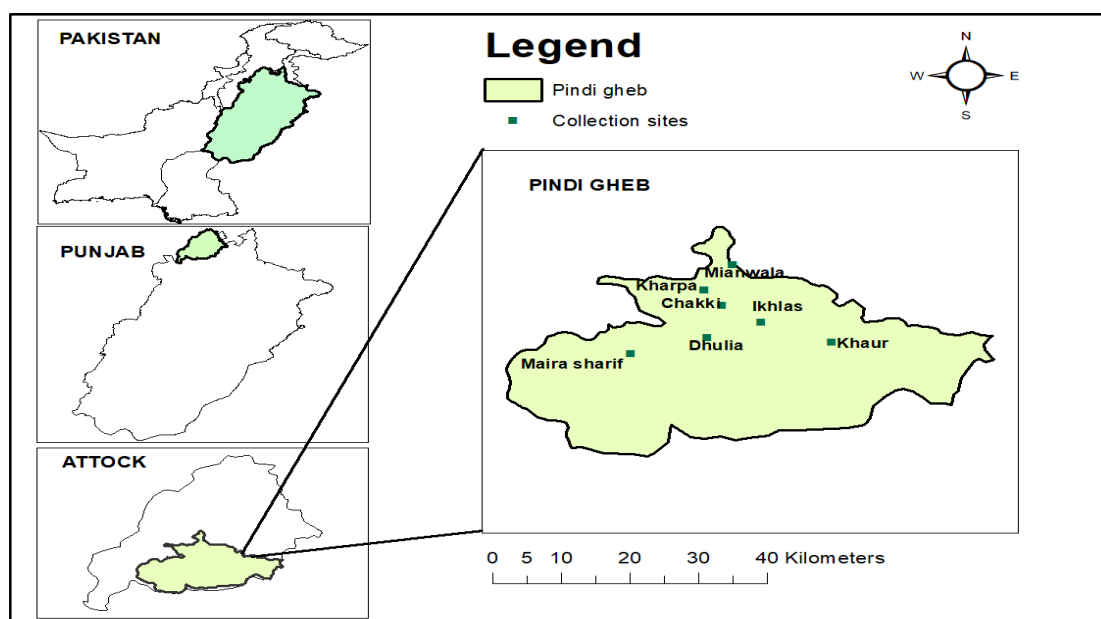


Figure 1. Map of study area, showing collection sites selected in Tehsil Pindi Gheb

The Attock district came into existence in 1908 with global positioning of 33.4620° N latitude and 72.2260° E longitude. District covers an area of 693 thousand hectares (Yunas et al., 2019). Punjab presents an extraordinary diversity of biological environments. Different cropping patterns and diverse soil types are found within its boundaries (Nasir et al., 2011). It is characterized by semi-arid climate and the maximum temperature exceeds 45°C in summer while falls below 20°C in winter (Jabeen 2013).

A total of 7 field surveys were conducted from July 2024 to June 2025. The specimens were collected by hand picking, jarring, net picking, plastic bags collection. We handled the specimen using gloves. Geographical coordination and habitat of the collection sites were recorded using GPS (Offline maps, travel guides and navigation). Collected beetles were preserved and stored in 10% formalin and 90% water. The collected specimens were identified with help of internet sources, recent works published and using identification keys (Nasir et al., 2016; Noureen et al., 2015a; Tissiani et al., 2017; Arrow, 1931)

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RESULTS

In the current result beetle fauna was collected from Tehsil Pindi Gheb, District Attock, Punjab, Pakistan. During the present study 52 specimens of beetles were collected, preserved and identified by keys. Seven sampling sites were selected for the present survey. The primary collection sites within Pindi Gheb include: Mianwala, Kharpa, Chakki, Ikhlas, Dhulia, Khaur, Maira Sharif. The Specimens collected and identified belong to 1 Order, 10 Families, 22 genera, 22 species respectively are:

Coccinella septumpunctata, *Pseudosyrichthus clathratus*, *Cyclocephala lurida*, *Hoplia philanthus*, *Pelidnota lugbaris*, *Trachyderma philistina*, *Otriorhynchus sulcatus*, *Limnohydrobius tumidus*, *Hydrophilus triangularis*, *Apatides fortis*, *Ligyris gibbosus*, *Melanotus castanipes*, *Gonocephalum rusticum*, *Melolontha papposa*, *Alphitobius diaperinus*, *Mylabris syriaca*, *Cratacanthus dubius*, *Opatrum sabulosum*, *Euetheola humilis*, *Coptodera subapicalis*, *Ammodonus fossor*, *Acmaeops proteus*

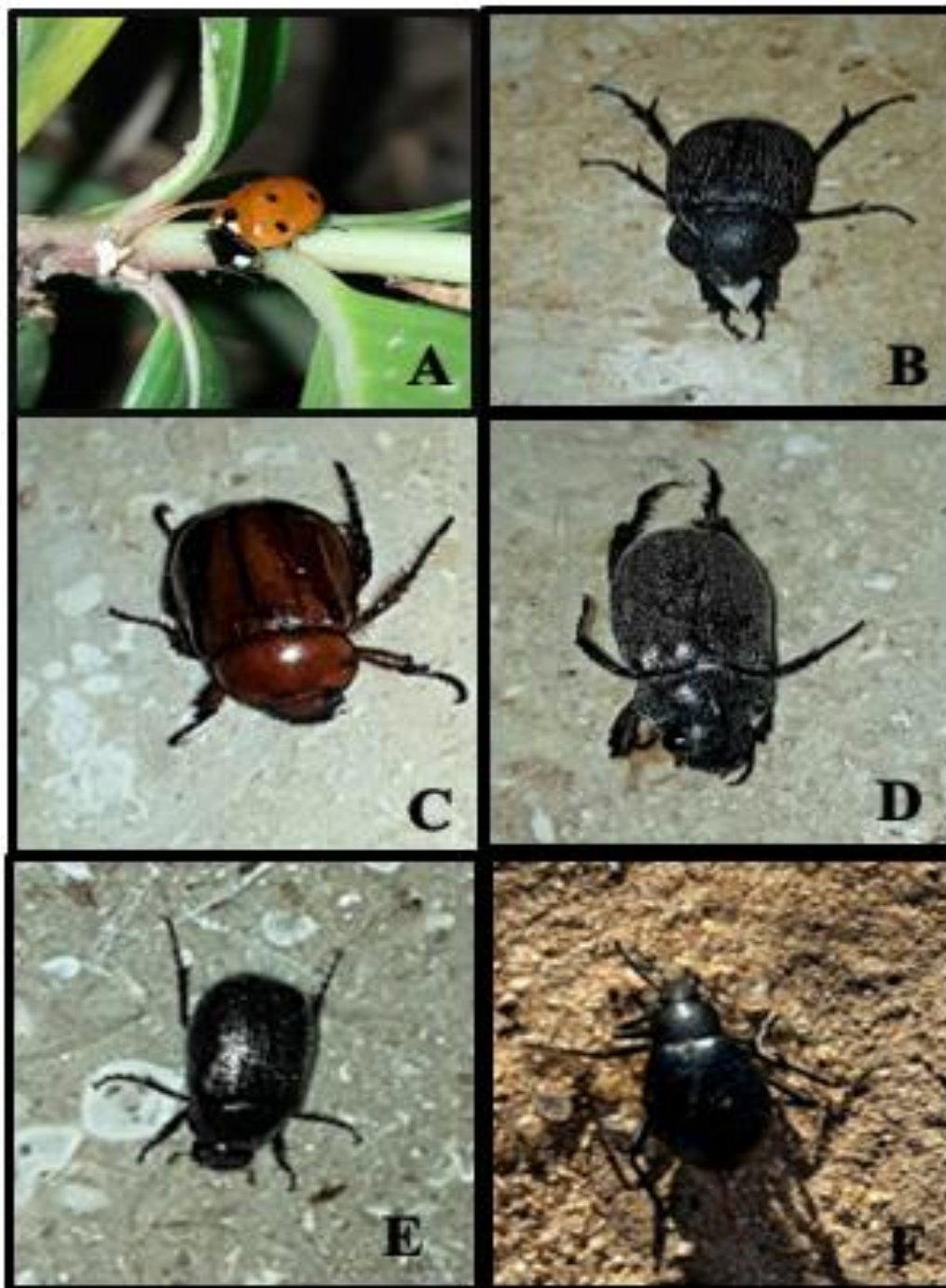
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A) *Coccinella septempunctata* (B) *Pseudosyrichthus clathratus* (C) *Cyclocephala lurida* (D) *Hoplia philanthus* (E) *Pelidnota lugbaris* (F) *Trachyderma philistina*

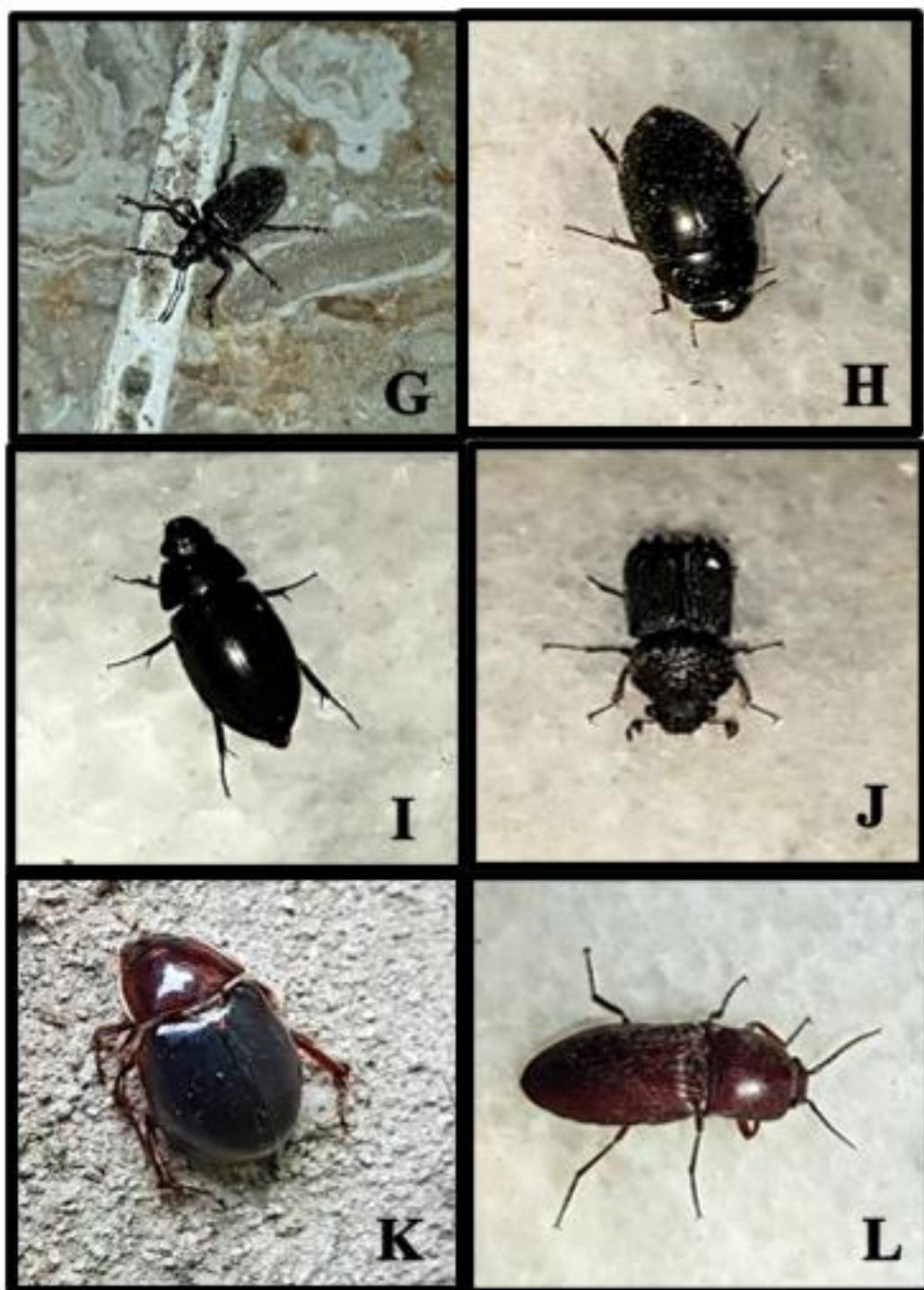
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G) *Otriorhynchus sulcatus* (H) *Limnohydrobius tumidus* (I) *Hydrophilus triangularis*
J) *Apatides fortis* (K) *Ligyris gibbosus* (L) *Melanotus castanipes*

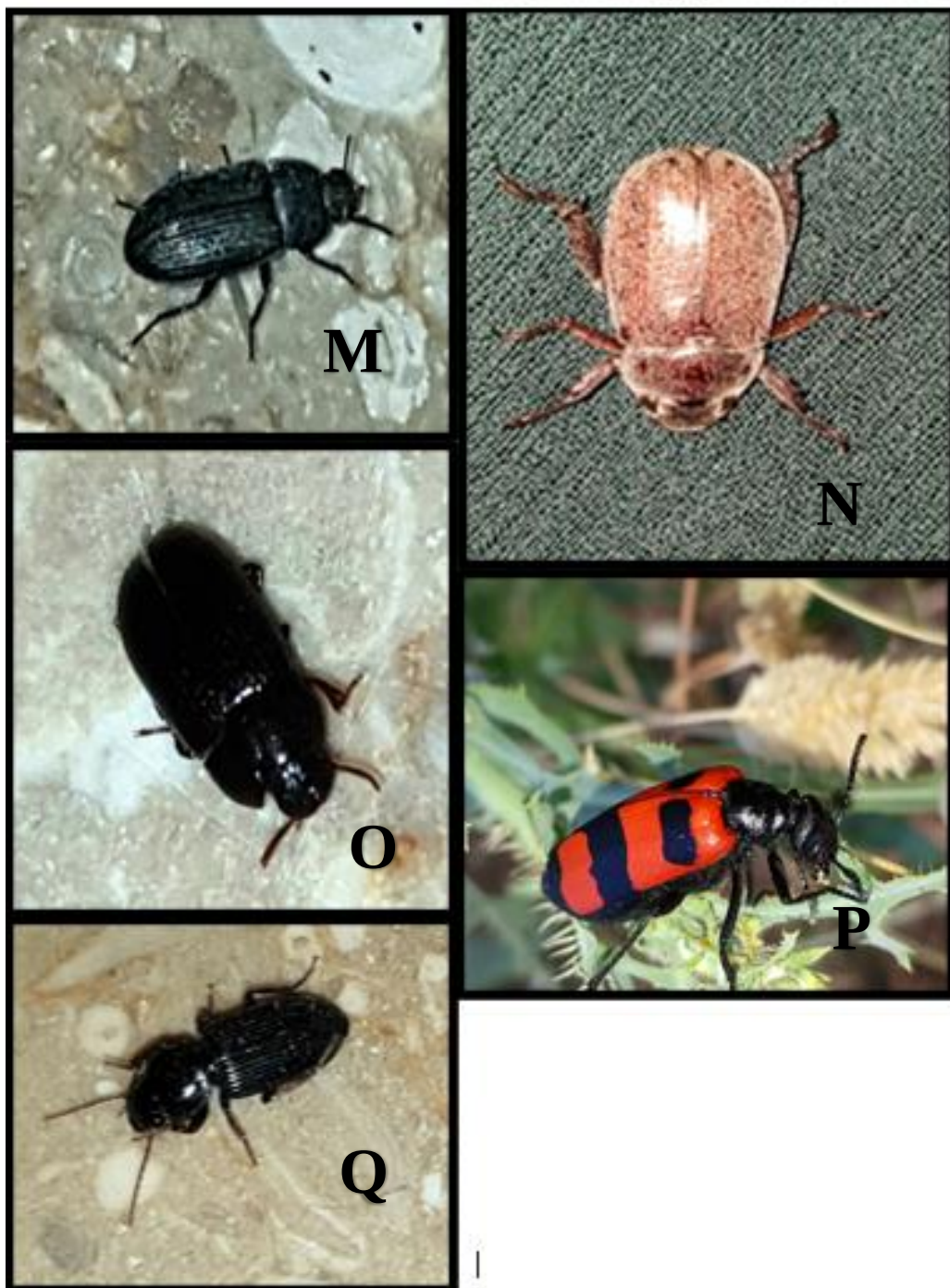
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M) *Gonocephalum rusticum* (N) *Melolontha papposa* (O) *Alphitobius diaperinus*
P) *Mylabris syriaca* (Q) *Cratacanthus dubius*

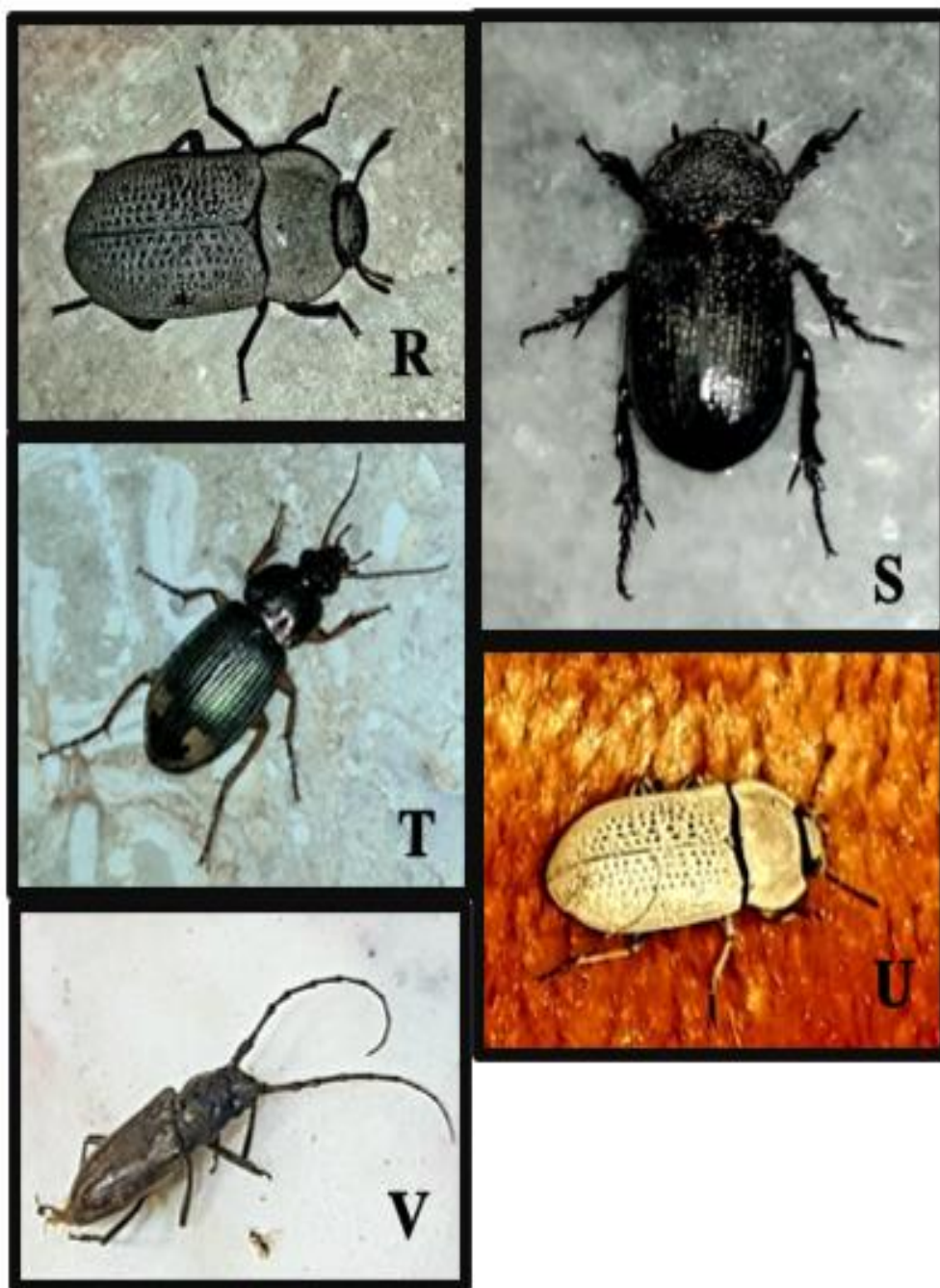
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R) *Opatrum sabulosum* (S) *Euetheola humilis* (T) *Coptodera subapicalis*
U) *Ammodonus fossor* (V) *Acmaeops proteus*

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Table 1. Species of Beetles recorded from tehsil Pindi Gheb, District Attock, Pakistan.

S#	Scientific Name	Common Name	Encounter Rate
Family Coccinellidae			
1	<i>Coccinella septumpunctata</i>	Seven spotted ladybird	Common
Family Scarabaeidae			
2	<i>Pseudosyrichthus clathratus</i>	Horned dung beetle	Common
3	<i>Cyclocephala lurida</i>	Southern masked chafer	Common
4	<i>Hoplia philanthus</i>	Welsh chafer	Common
5	<i>Pelidnota lugbaris</i>	Shining leaf chafer	Uncommon
6	<i>Ligyrus gibbosus</i>	Western carrot beetle	Common
7	<i>Melolontha papposa</i>	Cockshafer	Common
8	<i>Euetheola humilis</i>	Sugarcane beetle	Common
Family Tenebrionidae			
9	<i>Trachyderma philistina</i>	Darkling beetle	Common
10	<i>Gonocephalum rusticum</i>	Dark mealworm beetle	Uncommon
11	<i>Alphitobius diaperinus</i>	Lesser mealworm beetle	Uncommon
12	<i>Opatrum sabulosum</i>	Sand loving darkling beetle	Common
Family Curculionidae			
13	<i>Otiorhynchus sulcatus</i>	Black vine weevil	Uncommon
Family Hydrophilidae			

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S#	Scientific Name	Common Name	Encounter Rate
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14	<i>Limnohydrobius tumidus</i>	Swampy water scavenger	Common
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15	<i>Hydrophilus triangularis</i>	Giant water scavenger beetle	Common
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Family Bostrichidae

16	<i>Apatides fortis</i>	Horned powderpost beetle	Uncommon
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Family Elateridae

17	<i>Melanotus castanipes</i>	Chestnut-footed click beetle	Common
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Family Meloidae

18	<i>Mylabris syriaca</i>	Northern blister beetle	Common
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Family Carabidae

19	<i>Cratachanthus dubius</i>	Harp ground beetle	Uncommon
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20	<i>Coptodera subapicalis</i>	Asian bombardier beetle	Uncommon
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Family Cerambycidae

21	<i>Acmaeops proteus</i>	Long horned beetle	Uncommon
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Family Elateridae

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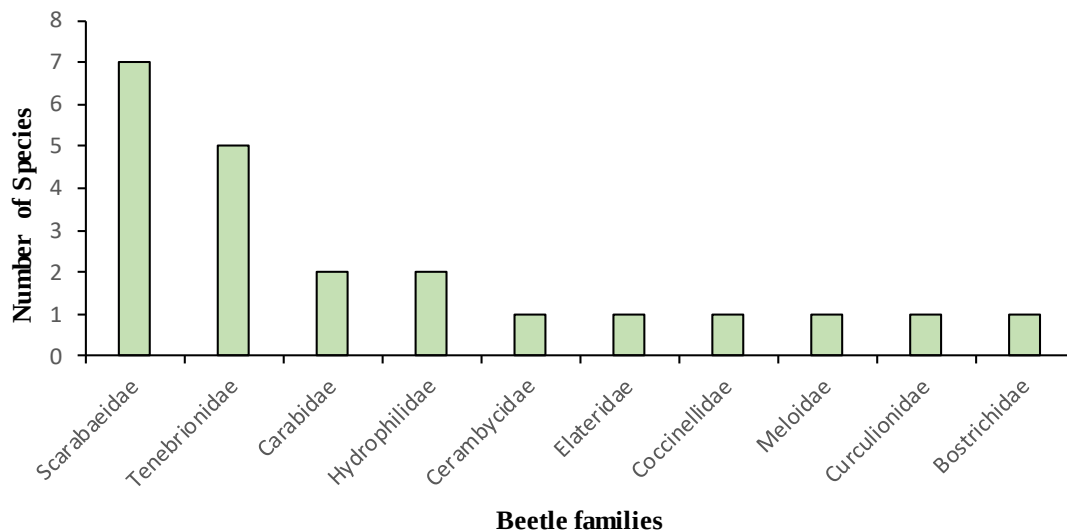
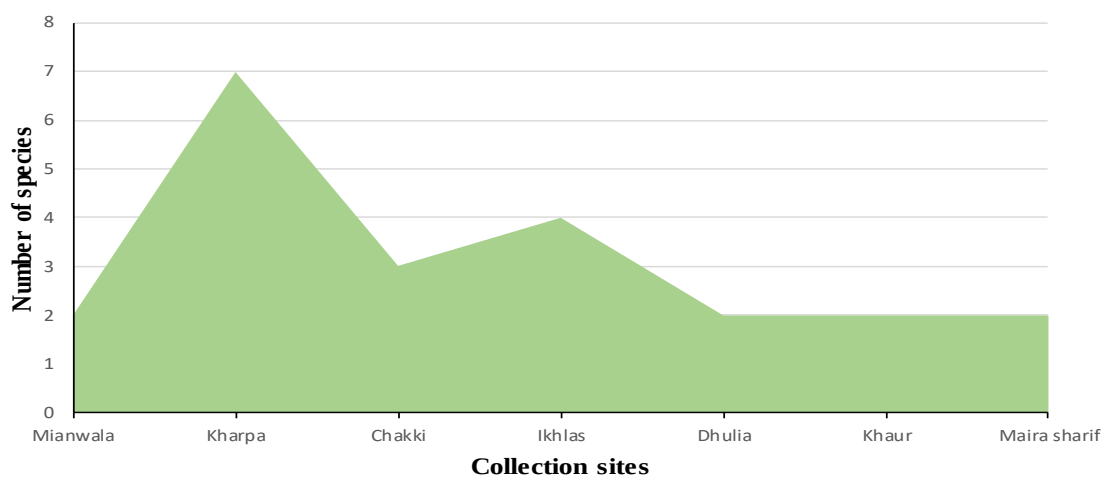
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S#	Scientific Name	Common Name	Encounter Rate
22	<i>Ammodonus fossor</i>	Sand beetle	Uncommon

Number of Beetle Species per Family**Figure 2.** Number of different beetle species found in different families**Abundance of species in Different areas****Figure 3.** Recorded beetle species across different collection sites in Punjab, Pakistan, showing site-specific diversity and species richness

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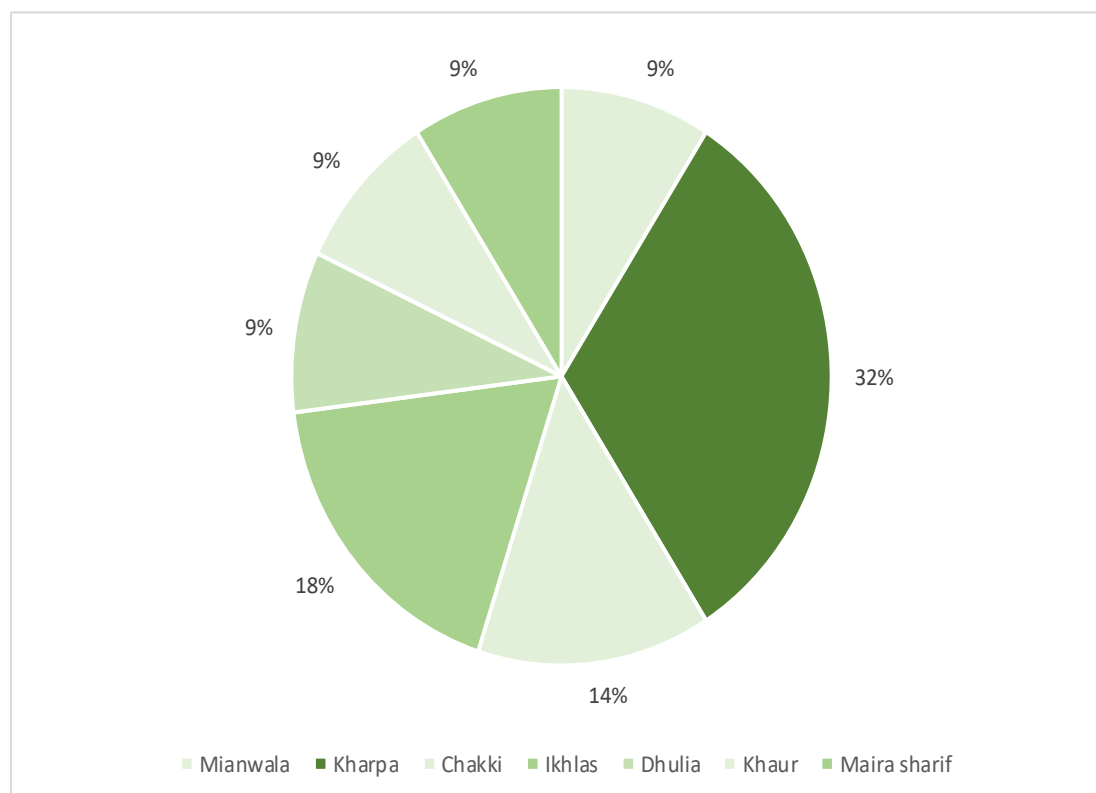
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Figure 4. Comparison of population (%) of recorded species in different collection sites

DISCUSSION

The research was conducted in District Attock, Punjab, Pakistan. During the study, 22 beetle species were identified and systematically classified into 1 Order, 10 Families, and 22 Genera (Table 1). Species identification was based on morphological examination using standard taxonomic keys (Choate, 1999). Among the identified families, Scarabaeidae and Tenebrionidae were the most dominant. The beetle diversity observed corresponds with the region's ecological variety and microclimatic conditions. Notably, some beetles were found in human residences, indicating their adaptability to man-made environments.

A comparison with earlier studies highlights key differences. S. Nasir (2008) reported 26 species of Staphylinids from various Punjab regions, using methods like sifting leaf litter, sweeping, pitfall and light traps. In contrast, our study identified 22 beetle species from 10 families in Attock, with Scarabaeidae and Tenebrionidae most abundant. These differences likely stem from climatic and habitat variations influencing beetle distribution.

Another study by M. Ghazanfar in District Jhelum recorded 15 Scarabaeidae species, with most in subfamily Scarabaeinae. Our findings also revealed Scarabaeidae as the most abundant family in grasslands, forests, and agricultural fields of Attock. This supports the view that Scarabaeidae, especially dung beetles, thrive in agroecosystems due to the availability of organic matter and dung, vital for feeding and reproduction.

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Hydrophilidae found in aquatic habitats in Attock align with Bjedov et al. (2025), who noted their value as indicators of clean aquatic systems. Carabidae beetles like *Cratachanthus dubius* were collected from agricultural fields and water bodies, reinforcing the role of beetles as ecological indicators (Rainio et al., 2003; Moreno-Fonseca et al., 2025).

Similar patterns were observed in Colombia, where Pardo-Locarno (2005) studied Scarabaeidae larvae and documented their role in crop damage and soil ecology. Our study supports this, as Scarabaeidae were common in agricultural fields and forests, highlighting their role in nutrient recycling and decomposition.

Beetle diversity also varies by habitat type, as seen in studies from Malaysia and Brazil. In Sabah, Malaysia, different forest types hosted varied beetle families, while Bernardes et al. (2020) found that Scarabaeidae thrived in both preserved and disturbed Brazilian ecosystems. Similarly, in District Attock, Scarabaeidae were dominant in multiple habitat types, showing their adaptability and ecological importance.

Tenebrionidae were particularly prevalent in dry and desert areas, supporting their known adaptation to arid environments. Their role as detritivores also contributes to ecosystem functioning in such habitats.

Despite the valuable findings, the study faced limitations. Manual collection methods like hand-picking may have overlooked nocturnal or cryptic species. Future studies should incorporate more effective sampling tools like light, baited, and pitfall traps (Lawrence et al., 2010). Moreover, morphological identification has limits in distinguishing closely related species. The use of molecular tools such as DNA barcoding is recommended for more precise identification and to discover potentially new species (Beutel & Leschen, 2005).

CONCLUSION

From the literature review, it can be concluded that there were no previous records on beetle fauna in the specific region of Pindi gheb, District Attock and the entire district itself. In conclusion, the current study indicates that the majority of beetle fauna was recorded in areas with fewer human activities and transportation. Without necessary conservation measures, the beetle fauna population in Tehsil Pindi Gheb, District Attock, Punjab, Pakistan, may face endangerment.

REFERENCES

- Adamski, Zbigniew, Sabino A Bufo, Szymon Chowański, Patrizia Falabella, Jan Lubawy, Paweł Marciniak, Joanna Pacholska-Bogalska, Rosanna Salvia, Laura Scrano, and Małgorzata %J *Frontiers in physiology* Słocińska. 2019. "Beetles as model organisms in physiological, biomedical and environmental studies—a review." 10:319.
- Banerjee, Moitreyee %J *Psyche: A Journal of Entomology*. 2014. "Diversity and composition of beetles (order: Coleoptera) of Durgapur, West Bengal, India." 2014 (1):792746.
- Bernardes, Alana Cristina Cunha, Osmani Cid Conde Oliveira, Raimunda Alves Silva, Patrícia Maia Correia Albuquerque, José Manuel Macário Rebêlo, Jéssica Herzog Viana, and Glécio Machado %J *Revista Brasileira de Ciência do Solo*

Online ISSN

3007-3197

Print ISSN

3007-3189

<http://amresearchreview.com/index.php/Journal/about>

- Siqueira. 2020. "Abundance and diversity of beetles (Insecta: Coleoptera) in land use and management systems." 44:e0190183.
- Chen, Jinxiang, Juan Xie, Zhishen Wu, Elsafi Mohamed Adam Elbashiry, Yun %J Materials Science Lu, and Engineering: C. 2015. "Review of beetle forewing structures and their biomimetic applications in China:(I) On the structural colors and the vertical and horizontal cross-sectional structures." 55:605-619.
- Goczał, Jakub, and Rolf G %J Biology Letters Beutel. 2023. "Beetle elytra: evolution, modifications and biological functions." 19 (3):20220559.
- Jabeen, Shazia. 2013. "Environmental geochemistry of Attock and Haripur basins, Pakistan." University of Peshawar Peshawar, Pakistan.
- Nasir, Shabab, Waseem Akram, Farooq Ahmed, and Shahbaz Talib %J Pak. J. Agri. Sci Sahi. 2011. "Biodiversity of staphylinids in cropped area of the Punjab (Pakistan)." 48 (2):125-128.
- Yunas, Muhammad, Shahzada Munawar Mehdi, Sarfraz Ahmed, Sher Afzal, and Bashir Ahmad. 2019. "Soil characteristics in Attock district."
- Choate, PM %J Dichotomous keys to some families of Florida Coleoptera. 1999. "Introduction to the identification of beetles (Coleoptera)."23-33.
- Goczał, J., & Beutel, R. G. (2023). Elytra as an evolutionary key innovation in Coleoptera: Structure, function, and transformation. *Arthropod Structure & Development*, 72, 101208. <https://doi.org/10.1016/j.asd.2023.101208>
- Gullan, P. J., & Cranston, P. S. (2014). *The Insects: An Outline of Entomology* (5th ed.). Wiley-Blackwell.
- Lawrence, J. F., Ślipiński, A., Seago, A. E., Thayer, M. K., Newton, A. F., & Marvaldi, A. E. (2010). Phylogeny of the Coleoptera based on morphological characters of adults and larvae. *Annales Zoologici*, 60(1), 1–217. <https://doi.org/10.3161/000345410X499826>
- Leschen, R. A. B., & Beutel, R. G. (2014). *Handbook of Zoology. Coleoptera, Beetles. Volume 3: Morphology and Systematics (Phytophaga)*. Walter de Gruyter.
- Sun, J., & Bhushan, B. (2012). Hierarchical structure and mechanical properties of beetle wings: A review. *RSC Advances*, 2, 12606–12623. <https://doi.org/10.1039/C2RA21563B>
- Beutel, R. G., & Leschen, R. A. B. (2005). *Coleoptera, Beetles. Volume 1: Morphology and Systematics*. In N. P. Kristensen (Ed.), *Handbook of Zoology (Vol. IV: Arthropoda: Insecta)*. Walter de Gruyter.
- Chapman, A. D. (2013). *Insects: Structure and Function* (5th ed.). Cambridge University Press.
- Crowson, R. A. (1981). *The Biology of the Coleoptera*. Academic Press.
- Goczał, J., & Beutel, R. G. (2023). Elytra as an evolutionary key innovation in Coleoptera: Structure, function, and transformation. *Arthropod Structure & Development*, 72, 101208. <https://doi.org/10.1016/j.asd.2023.101208>
- Gullan, P. J., & Cranston, P. S. (2014). *The Insects: An Outline of Entomology* (5th ed.). Wiley-Blackwell.
- Lawrence, J. F., Ślipiński, A., Seago, A. E., Thayer, M. K., Newton, A. F., & Marvaldi, A. E. (2010). Phylogeny of the Coleoptera based on morphological characters of adults and larvae. *Annales Zoologici*, 60(1), 1–217.

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3007-3197

Print ISSN

3007-3189

<http://amresearchreview.com/index.php/Journal/about>

<https://doi.org/10.3161/000345410X499826>

- Leschen, R. A. B., & Beutel, R. G. (2014). Handbook of Zoology. Coleoptera, Beetles. Volume 3: Morphology and Systematics (Phytophaga). Walter de Gruyter.
- Ortis, G., González, M., & Pons, X. (2025). Diversity and functional roles of carabid beetles across natural and cultivated habitats. *Journal of Insect Ecology*, **61**(2), 101–115. <https://doi.org/10.1016/j.jins.2025.03.007>
- Scholtz, C. H., Chown, S. L., & Kukalová-Peck, J. (2009). Evolutionary Biology and Ecology of Dung Beetles. Pensoft Publishers.
- Beutel, R. G., & Leschen, R. A. B. (2005). Coleoptera, Beetles. Volume 1: Morphology and Systematics. In N. P. Kristensen (Ed.), Handbook of Zoology (Vol. IV: Arthropoda: Insecta). Walter de Gruyter.
- Chapman, A. D. (2013). Insects: Structure and Function (5th ed.). Cambridge University Press.
- Crowson, R. A. (1981). The Biology of the Coleoptera. Academic Press.
- Eberhard, W. G. (1996). Female Control: Sexual Selection by Cryptic Female Choice. Princeton University Press.
- Emlen, D. J. (2008). The evolution of animal weapons. *Annual Review of Ecology, Evolution, and Systematics*, **39**, 387–413. <https://doi.org/10.1146/annurev.ecolsys.39.110707.173502>
- Gullan, P. J., & Cranston, P. S. (2014). The Insects: An Outline of Entomology (5th ed.). Wiley-Blackwell.
- Lawrence, J. F., Ślipiński, A., Seago, A. E., Thayer, M. K., Newton, A. F., & Marvaldi, A. E. (2010). Phylogeny of the Coleoptera based on morphological characters of adults and larvae. *Annales Zoologici*, **60**(1), 1–217. <https://doi.org/10.3161/000345410X499826>
- Scholtz, C. H., Chown, S. L., & Kukalová-Peck, J. (2009). Evolutionary Biology and Ecology of Dung Beetles. Pensoft Publishers.
- Scott, J. J. (1998). The ecology and behavior of burying beetles. *Annual Review of Ecology and Systematics*, **29**, 301–322.
- Beutel, R. G., & Leschen, R. A. B. (2005). Coleoptera, Beetles. Volume 1: Morphology and Systematics. In N. P. Kristensen (Ed.), Handbook of Zoology (Vol. IV: Arthropoda: Insecta). Walter de Gruyter.
- Bjedov, I., Vesović, N., Glišović, A., Stojković Piperac, M., & Karaman, M. (2025). Predatory aquatic beetles as indicators of heavy metal pollution. *Environmental Monitoring Reports*, **31**(1), 41–53.
- de Paula Malheiros, M., da Silva, R. L., & Costa, C. (2025). The diversity of beetles and their use as bioindicators. *Journal of Insect Biodiversity and Ecology*, **12**(1), 1–15.
- Ghannem, S., Nasri-Ammar, K., & Boumaiza, M. (2018). Ground beetles (Coleoptera: Carabidae) as bioindicators of ecological disturbance in Tunisian forests. *Zoology and Ecology*, **28**(3), 204–213.
- Haneda, N. F., & Rahmadhani, D. (2024). Longhorn beetles as bioindicators of forest disturbance. *Journal of Forest Biodiversity*, **8**(1), 112–121.
- Langraf, A., Müller, J., & Weiß, I. (2019). Tree felling and microclimatic shifts affect carabid beetle communities. *Forest Ecology and Management*, **432**, 712–722.

Online ISSN

3007-3197

Print ISSN

3007-3189

<http://amresearchreview.com/index.php/Journal/about>

- Moreno-Fonseca, L. P., Montes, D. M., & Trujillo, S. H. (2025). Functional traits of dung beetles as indicators of fire disturbance. *Insect Conservation and Diversity*, **18**(2), 101–119.
- Pinto, A. C. R., da Silva, J. R., & Fernandes, R. B. (2025). Scarabaeinae dung beetles as functional indicators of forest recovery. *Ecological Indicators*, **157**, 112489.
- Rainio, J., & Niemelä, J. (2003). Ground beetles (Coleoptera: Carabidae) as bioindicators. *Biodiversity and Conservation*, **12**(3), 487–506.
- Šteffek, J., Schlaghamerský, J., & Frouz, J. (2008). Carabid beetle response to clear-cutting and reforestation. *Forest Ecology and Management*, **254**(1), 50–60.