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Research Article

EXPLORATION OF THE COLEOPTERA FAUNA IN THE CHOLISTAN DESERT, PUNJAB, PAKISTAN

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ABSTRACT

The Cholistan desert hosts a diverse range of flora and fauna, including a rich variety of insects. However, studies focusing on Coleoptera (Beetles) in this region remain limited. To assess their biodiversity, the present study employed random sampling using hand nets, pitfall traps, and hand picking. Coleopterans are ecologically vital as ecosystem engineers and environmental indicators, but global research, especially in arid regions, lacks taxonomic expertise and resources. Although a comprehensive checklist of beetle species is urgently needed for the Cholistan region of Punjab, such efforts are currently constrained by limited knowledge of beetle natural history and distribution. Understanding their habitat preferences is key to evaluating environmental responses and guiding conservation. The present study, therefore, aimed to support future research on beetles in the Cholistan desert by providing baseline data. A total of 1,449 specimens were collected and identified, representing 8 species, 8 genera, and 4 families. The documented species include *Blaps gigas* (Linnaeus, 1767), *Pimelia canariensis* (Fabricius, 1781), *Scarabaeus gangeticus* (Castelnau, 1840), *Phyllophaga crinita* (Burmeister, 1855), *Julodis euphratica* (Laporte and Gory, 1835), *Anthia sexguttata* (Fabricius, 1775), *Calosoma auropunctatum* (Herbst, 1784), and *Trachyderma hispida* (Forskål, 1775). Notably, *P. crinita*, *J. euphratica*, and *T. hispida* are likely new records for both the Cholistan desert and Pakistan. The study not only enhances the understanding of Coleoptera biodiversity in the Cholistan desert but also provides foundational data for future ecological research and conservation efforts in arid regions of Pakistan.

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INTRODUCTION

The Cholistan desert, an extension of the Great Indian desert, is located in the southern Punjab province of Pakistan, between 27°42' and 29°45' N latitude and 69°52' and 75°24' E longitude (Baig et al., 1980). Spanning approximately 2.6 million hectares (FAO, 1993), the desert stretches about 480 km in length and varies from 32 to 192 km in width (Chaudhry, 1992, Kumar et al., 2022).

Based on topography, parent material, soil type, and

vegetation, the Cholistan desert is divided into two geomorphic zones: Lesser Cholistan in the north and Greater Cholistan in the south. Lesser Cholistan, located near canal-irrigated areas, covers about 7,770 km^2 and is characterized by saline alluvial flats (locally called dahar*s*) alternating with low sandy ridges. The clayey flats here are typically uniform to depths of 30 to 90 cm, with soil pH ranging from 8.2 to 8.4 in some areas and 8.8 to 9.6 in others, classifying them as saline or saline-sodic soils. Greater Cholistan, covering an area of 18,130 km^2, is a wind-blown sand desert with river terraces, large sand dunes, ridges, and depressions (Baig et al., 1980).

Beetles, belonging to the order Coleoptera, represent the most diverse animal group on Earth. Despite sharing the planet with a vast array of fauna, beetles are distinguished by their remarkable species richness, accounting for nearly one-quarter of all known animal species. Evans and Bellamy (2000) termed this phenomenon the "Age of Beetles," reflecting the ancient lineage of the group. Modern beetles are the product of 250 million years of evolution, as evidenced by fossil records dating back to the Permian period (New, 2009).

Beetles are distinguished from other insects by their hardened forewings (elytra), which protect the delicate, folded hind wings used for flight. The name Coleoptera originates from Latin, meaning "folded wings" (Majagi, 2022). They possess chewing mouthparts, including left- and right-hinged mandibles and robust jaws, often resembling tools like scissors, pliers, or secateurs. In arid environments, beetles make up the majority of insect species, living in close association with plants for food, shelter, and development.

Beetles are considered valuable indicators of environmental change, as shifts in their diversity often reflect changes in habitat and host plant populations. As decomposers and recyclers of organic matter, scavenger and wood-boring beetles provide essential ecosystem services. Predatory beetles, such as lady beetles, contribute to biological control by feeding on aphids and scale insects. Some species are used as fish feed in aquaculture, while others serve as pollinators for various crops. Moreover, they play a role in decomposing manure from both domestic and wild animals, including cows, elephants, and horses (Weyer, et al., 2012; Satheesha, et al 2018; Trigos-Peral, et al., 2021 and Majagi 2022). Given their ecological roles in biological control, food webs, and environmental monitoring, the present study was initiated to explore the systematics and diversity of beetles in the Cholistan desert of Bahawalpur district, Punjab, Pakistan. Beetles are among the most ecologically and biologically diverse organisms. While most are terrestrial herbivores, many are predators with highly specialized host ranges or life cycles (Forest Science Project [FSP] Technical Report by Tom and Aippallil, 2016). The majority feed on plant materials such as leaves, seeds, fruits, and wood, while others are carnivorous, feeding on small animals, fungi, or manure. Often, beetle larvae feed on different substrates than adults (Cranshaw and Peairs, 2008).

Because beetle larvae and grubs serve as essential food sources for many insectivorous birds, beetles play a crucial role in terrestrial food chains (Cummings et al., 2012). Although a few studies are available on darkling beetles from Sindh (Soomro and Sultana, 2018; Soomro et al., 2019; Waseem et al., 2023, Soomro et al., 2024), there is currently no updated, or even basic, information available on the Coleoptera of the Cholistan Desert. Therefore, this study was designed to explore Coleoptera fauna in the Cholistan Desert Punjab. Therefore, this study was designed to explore the Coleoptera fauna of the Cholistan desert, Punjab.

MATERIALS AND METHODS

Sampling

Random sampling was conducted using pitfall traps and hand-picking methods at selected sites in the Cholistan desert for the collection of beetles. The sampling locations included Basti Bara, Mari Sheikh Sujra, Chatriwala Dahar, Basti Kabul, Basti Jhabel, and the CUVAS area (Table 1, Figure 1). These areas are known for their diverse medicinal plants and shrubs, which serve as important shelters and breeding grounds for beetles. The habitats surveyed included trees, agricultural lands, open grounds, natural vegetation, herbs, shrubs, bushes, grasses, vegetable fields, storage areas, roadsides, and sandy patches. Collected specimens were placed in polythene bags or plastic bottles for transport.

Killing and preservation

Specimens were euthanized using absolute alcohol and preserved in insect storage boxes. Mounting was performed using insect pins of various sizes (No. 2, 3, and 4) on black enamel boards. Each specimen was labeled with comprehensive information, including the collection site, date of collection, name of the collector, specimen number, and depository details.

Table 1. Coordinates of the sampling sites in the Cholistan desert.

Location Name	Latitude	Longitude
Marri Sheikh Shujra	29.31223219728796	71.56922295684683
Basti Kabul	29.321631857003354	71.61271269121626
Basti Bara	29.312202281710853	71.61099607750097
Basti Jhabel	29.308771932450245	71.58723466894493
Chatri Wala Dahr	29.292804250988436	71.66344497070192

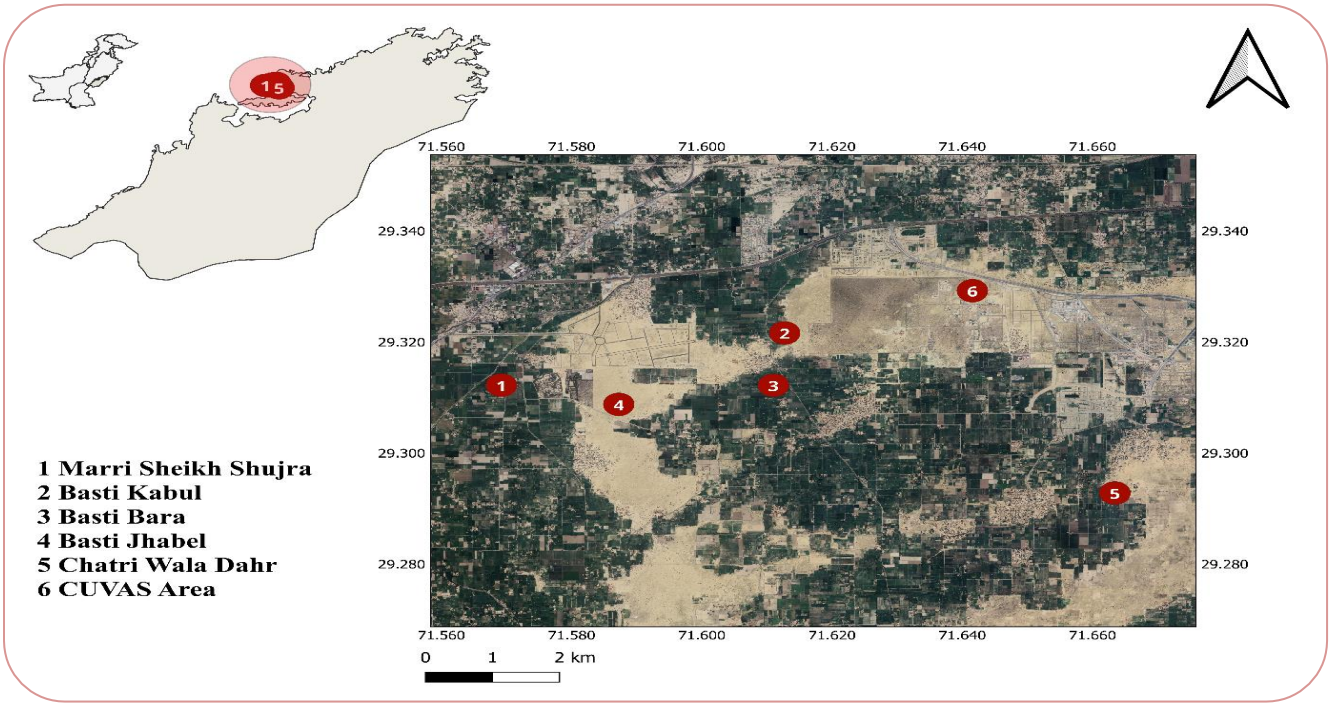

Figure 1. Map of the sample collection sites in the Cholistan Desert.

Identification and morphometry

Identification

Beetle species were identified by comparing their morphological characteristics with descriptions available in taxonomic literature and by consulting the identification keys and references provided by Soomro et al., (2024) to ensure accurate classification.

Key to the Coleoptera of the Cholistan desert

The identification key and descriptive accounts of eight species, representing eight genera across four families, are provided below:

1. Body length more than 45 mm (2)
   Body length less than 45 mm (5)
2. Body metallic green; elytra shiny with large punctations (*Julodis euphratica*)
   Body black or non-metallic, without metallic shine (3)
3. Elytra with four white dorsal spots; thorax with two white markings; body shiny black (*Anthia sexguttata*)
   Elytra without white markings (4)
4. Elytra with a mucro at the tip; body cylindrical, entirely black, smooth; length 43-45 mm (*Blaps gigas*)
   Elytra striated; anterior margin of elytra forming an obtuse angle; body robust; length 53-55 mm (*Scarabaeus gangeticus*)
5. Elytra with visible scutellum; body yellowish brown; small size (13-14 mm) (*Phyllophaga crinita*)
   Elytra without visible scutellum or body color not yellowish brown (6)
6. Elytra densely granulated; soft bristles present; body round and compact (*Trachyderma hispida*)
   Elytra not densely granulated or bristles sparse (7)
7. Elytra with two pits or punctures; medium-sized beetle (17-19 mm); pronotum smooth (*Pimelia canariensis*)
   Elytra with striae and pits; pronotum round and smooth; body 19-21 mm (*Calosoma auropunctatum*)

Morphometry

Measurements were recorded in millimeters (mm) using an ocular micrometer fitted in a dissecting microscope. For larger body parts, additional measurements were taken using a ruler and vernier caliper to ensure precision.

Depository

All collected specimens were deposited in the Entomological Museum, Department of Zoology, CUVAS, Bahawalpur. Each specimen was tagged with a detailed label to facilitate future reference and study.

RESULTS

Species account

The description of the beetle species (Figure 2) is provided below based on the identification key.

1. *Blaps gigas* (Linnaeus, 1767)

Description

The body was black, smooth in texture, shiny, and both cylindrical and elliptical in shape, measuring approximately 43-45 mm in length. The maximum width of the elytra was 10-12 mm.

Head

The anterior margin of the frontoclypeus was bisinuate and straight at the center. The lateral angles of the frontoclypeus were right-angled. The head was widest at eye level, with a width 1.46 times greater than the interocular gap. The outer edge of the genae was rounded only near the eyes. Between the frontoclypeus and genae, the outer head margin displayed a distinct obtuse emargination. The frontoclypeal suture was faint and barely distinguishable.

Thorax

The thorax measured 8-9 mm in length. The pronotum was transverse, being 1.3 times wider than long, and 1.73 times wider than the head. It was slightly longer than the head, with weakly rounded lateral edges. The pronotum was concave anteriorly and convex posteriorly. The disc was weakly convex, and the external margins were narrowly beaded, interrupted only at the middle of the anterior margin.

Foreleg

The total length of the foreleg, including the tarsus, was 13-15 mm. The femur was wider and more cylindrical than the tibia. The tibia was slightly shorter than the femur, narrowing at the base and widening slightly towards the apex. From mid to base, the tibia had a grainy texture. When combined with the tarsus, its length equaled that of the femur. The tarsus comprised five tarsomeres and ended in two claws. All tarsomeres had bifurcated setal brushes. The forelegs were bent forward.

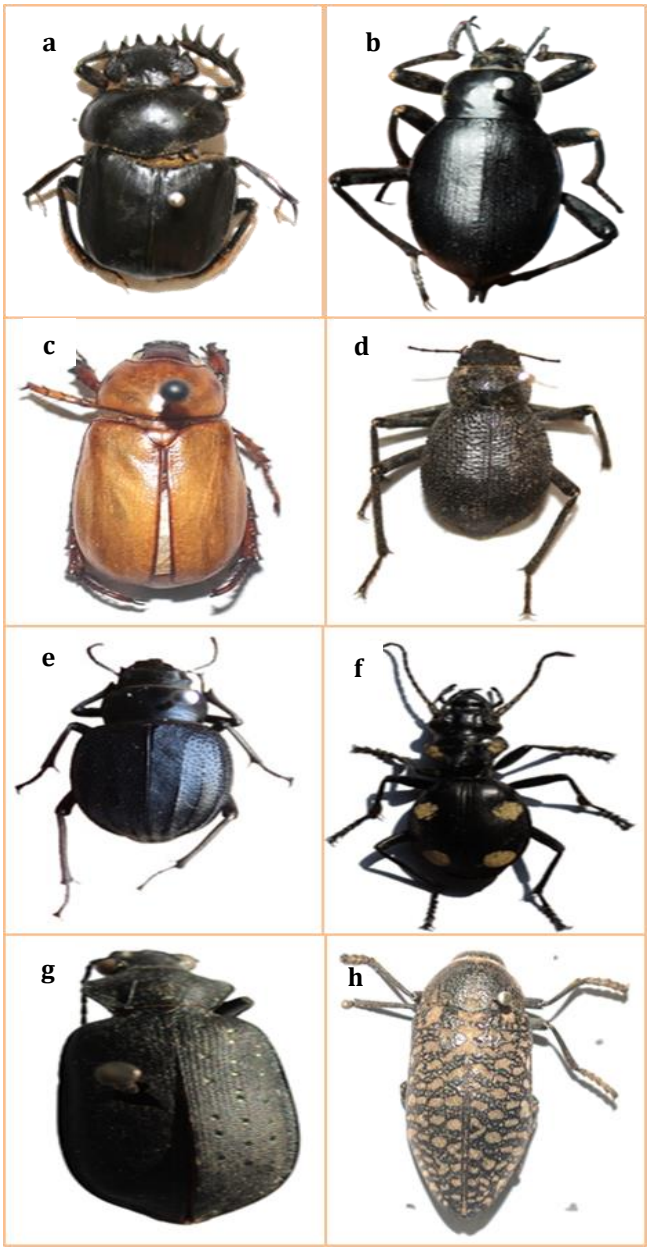

Figure 2. (a) *Scarabaeus gangeticus* (b) *Blaps gigas* (c) *Phyllophaga crinita* (d) *Trachyderma hispida* (e) *Pimelia canariensis* (f) *Anthia sexguttata* (g) *Calosoma auropunctatum* (h) *Julodis euphratica*.

Mid leg

The mid leg, including femur, tibia, and tarsus, measured 16-18 mm. The femur was more cylindrical and broader than the tibia, tapering at both ends. The tibia was narrow at the base and widened slightly toward the

apex, with a grainy texture from the middle to the base. Combined with the tarsus, the tibia was longer than the femur. The tarsus had five tarsomeres and terminated in two claws. The tarsomeres were broader at the base and narrowed at the tip.

Hind leg

The hind leg, including all segments, measured 18-20 mm in length. As with the fore and mid legs, the hind femur was broadest in the middle and narrow at the apex and base. The tibia, along with the tarsus, was longer than the femur. Compared to the fore and mid legs, the hind femur was narrower at the base. The tibia displayed a grainy texture from the middle to the base. The tarsus consisted of four tarsomeres and two claws.

Elytra

The elytra were elliptical, rounded, and measured 27-30 mm in length, covering most of the abdomen ventrally. A caudal extension, or mucro, was present, divided by a median cut. The elytra were smooth, slightly shiny, and featured distinct texture rows. The widest point measured 10-12 mm.

Abdomen

The abdomen was largely concealed by the elytra and visible only from the ventral side. Abdominal ventrite 1 featured an acute or occasionally rounded tubercle, with a tuft of hair between ventrites 1 and 2. Ventrites 1 and 2 were covered with recumbent reddish hairs. Ventrites 1-3 were wrinkled, displaying rasp-like punctation and sparse recumbent setae, whereas ventrites 4 and 5 had simple, fine punctation.

Material examined

Punjab: Bahawalpur, Cholistan University of Veterinary and Animal Sciences, 2.II. 2021, 22♂♂ 25♀♀ (Zain, M. and Kumar, S.); Bahawalpur, Khairpur, 17.III.2021, 29♂♂ 27♀♀ (Zain, M. and Kumar, S.); Bahawalpur, Yazman, 24.IV.2021, 35♂♂ 50♀♀ (Zain, M. and Kumar, S.); Bahawalpur, Chak 44 DB, 11 VI 2021, 30♂♂ 55♀♀ (Zain, M. and Kumar, S.); Bahawalpur, Chak 44 DB, 15 VIII 2021, 28♂♂ 14♀♀ (Zain, M. and Kumar, S.); and Bahawalpur, Derawar, 12 XII (Zain, M. and Kumar, S.).

Comments

This species was recorded near the university campus on a hot, sunny day. The habitat was dominated by xerophytic plant species, adapted to extreme conditions of salinity, high temperatures, moisture fluctuations, and a range of endemic stress factors. It was observed that vegetation cover in the Greater Cholistan region was relatively denser compared to the hyper-arid southern zone.

2. *Pimelia canariensis* (Fabricius, 1781)

Description

A mid-sized beetle with a total body length of approximately 17-19 mm. The elytra, at their widest point, measured around 5-6 mm.

Head

The head length was recorded at 3-4 mm. The eyes were located laterally near the thorax, with antennae positioned adjacent to them. The head is convex at the apex and narrows slightly toward the tip, with anteriorly placed mouthparts. Mandibles were either reduced or absent. The front clypeus was not completely rounded; it bended downward toward the head, forming a narrow margin, and was broader and more rounded toward the pronotum. The clypeus was convex toward the pronotum and concave toward the head.

Thorax

Thorax length was measured at 2-3 mm. The pronotum was nearly twice as wide as it was long, rounded, shiny, and smooth, lacking any granulated texture. It was concave anteriorly and convex posteriorly, with thickened margins. The disc of the pronotum was convex.

Foreleg

The total length of the foreleg was recorded at 7-8 mm. The femur was shorter than the tibia, cylindrical, smooth, and without spots or textures. The tibia was longer than the femur and covered in numerous bristles, giving it a hairy appearance. Two downward-facing tibial spurs were present at the end of the femur. The tarsus had five bristled tarsomeres, contributing to its hairy look, and terminated in two claws.

Mid leg

The total length of the mid leg measured approximately 11-12 mm. The femur was shorter, wider, and more cylindrical than the tibia. The tibia was covered with many bristles, giving it a hairy appearance. Two downward-pointing tibial spurs or spines were present. The tarsus consisted of five bristled tarsomeres and ended in two claws.

Hind leg

The hind legs measured 19-20 mm in total length. The femur was shorter, wider, and more cylindrical than the tibia, with a smooth surface free of texture or spots. The tibia was approximately twice the length of the femur and bore many bristles. Two tibial spurs were located at the end of the tibia, near the tarsus. The tarsus comprised four tarsomeres, with the final segment bearing two claws.

Elytra

The elytra were oval-shaped and measured 11-12 mm in length. They exhibited a granular texture with visible striae. Granulation was present across the entire surface of the elytra and along the striae. No mucro was present at the apex of the elytra.

Abdomen

The abdomen was entirely covered by the elytra and was visible only from the ventral side. It was narrow at the anterior end and fully rounded posteriorly. Abdominal length was measured at 9-10 mm.

Material examined

Punjab: Bahawalpur: Cholistan University of Veterinary and Animal Sciences, 2.II.2021, 25♂♂, 22♀♀ (Zain, M. and Kumar, S.); Khairpur, 17.III.2021, 28♂♂, 29♀♀ (Zain, M. and Kumar, S.); Yazman, 24 IV 2021, 35♂♂, 49♀♀ (Zain, M. and Kumar, S.); Chak 44 DB, 11 VI 2021, 1245 specimens (Zain, M. and Kumar, S.); Chak 44 DB, 15 VIII 2021, 9♂♂, 11♀♀ (Zain, M. and Kumar, S.); and Derawar, 12 XII 2021 (Zain, M. and Kumar, S.).

Comments

This species was also found in the Cholistan Desert, where it prefered habitats with dry vegetation. The soil in the Cholistan region was typically saline, alkaline, and gypsiferous. The landscape was characterized by shifting sand dunes, which favored the proliferation of this species.

3. *Scarabaeus gangeticus* (Castelnau, 1840)

Description

The total body length was measured at approximately 53-55 mm, with a maximum width at the elytra of around 14-15 mm.

Head

The head length was recorded at about 7-9 mm. The anterior region was densely and coarsely punctured, while the posterior part was tuberculate. Tubercles or plate-like structures were present on the front. The clypeus bore four teeth (or horns), separated by a rounded notch. The eyes were slightly lateral but visible from the dorsal view. Numerous bristles were present on the head, giving it a hairy appearance.

Thorax

The thorax was significantly larger than the head, measuring approximately 21-23 mm in length. The pronotum was uneven and densely punctured. The lateral margins were strongly rounded and closely denticulate. No visible scutellum was present. Bristles were scattered throughout the thoracic region, also giving it a hairy appearance. A row of ridges was present along both lateral sides.

Forelegs

The forelegs were large and robust, with a total length of 20-22 mm. The femur was shorter than the tibia and bore bristles that become denser toward the tibial region. The tibia was strong and bore four prominent external teeth and two internal teeth. A single, prominent tibial spur was present. The tarsus was small, situated some distance from the tibia, and ended in two small claws.

Mid legs

The midlegs measured approximately 29-30 mm in total length. The femur was shorter and wider than the tibia, with sparse bristles. The tibia was longer, lacked teeth, but bore a strong and prominent tibial spur. The tarsus comprised small tarsomeres, located at a distance from the claws.

Hind legs

The hind legs measured about 37-39 mm in total length. The femur was shorter but wider, elliptical in shape, and densely bristled, giving it a hairy appearance. The tibia was longer, lacked teeth, and bore numerous bristles along its length. It was slightly bent toward the abdomen. The tarsus was small, with five tarsomeres, and ended in a claw. The tibia narrowed toward the apex and gradually widened near the tarsus.

Elytra

The elytra were 27-29 mm in length and exhibited distinct striae. The margins were thickened, forming a visible outline. Anteriorly, the elytra form an obtuse angle with the lateral sides.

Abdomen

The abdomen was robust and significantly wider than in many other beetles. It was larger than the elytra, measuring approximately 29-30 mm in length.

Material examined

Punjab: Bahawalpur: Cholistan University of Veterinary and Animal Sciences, 02.II.2021, 15♂♂, 10♀♀ (Zain, M. and Kumar, S.); Khairpur, 17.III.2021, 20♂♂, 13♀♀ (Zain, M. and Kumar, S.); Yazman, 24.IV.2021, 30♂♂, 27♀♀ (Zain, M. and Kumar, S.); Chak 44 DB, 11.VI.2021, 35♂♂, 35♀♀ (Zain, M. and Kumar, S.); Chak 44 DB, 15.VIII.2021, 10♂♂, 12♀♀ (Zain, M. and Kumar, S.); and Derawar, 12.XII.2021 (Zain, M. and Kumar, S.).

Comments

This species is best known for feeding on decomposing matter such as dung, fungi, or carrion. This ecological role makes them important as natural decomposers,

essentially the cleanup crew or "garbage haulers" of the animal kingdom.

4. *Phyllophaga crinita* (Burmeister, 1855)

Description

A small beetle, yellowish-brown in color, with a body length of approximately 13-14 mm. The maximum width at the elytra was about 3-5 mm.

Head

The head was small, measuring 3-5 mm in length. The clypeus was bent downward, and the eyes were positioned laterally and slightly enlarged. Small mandibles were present on the labrum. The antennae consisted of five segments. The area around the eyes was slightly narrower, while the anterior part of the head broadens. The frons had darker-colored margins and curveed upward, connecting with the pronotum of the thorax.

Thorax

The thorax was larger than the head, rounded, and slightly elevated above both the head and elytra. The pronotum featured two dark spots on the dorso-lateral sides and was lined with small bristles along its lateral margins. While the pronotum lacked a distinct anterior or posterior curvature, the lateral sides displayed a convex shape when viewed dorsally.

Forelegs

The forelegs were 6-7 mm in total length. The femur was wide and cylindrical. The tibia was longer and broader than the tibiae of the mid and hind legs and bore a few bristles. At the distal end of the tibia, tibial spurs and prominent teeth or horns were visible. The tarsus had small tarsomeres, except for the last one, which was larger and ended in two claws.

Mid legs

The mid legs were also 6-7 mm long. The femur was short, wide, and cylindrical, and not visible from the dorsal view. The tibia was thinner than that of the forelegs and lacked teeth or horns but ended with tibial spurs. It was densely covered with bristles, giving it a hairy appearance. The tarsus consisted of five tarsomeres, with the last one being distinctly larger and terminating in two claws.

Hind legs

The hind legs measured 7-8 mm in length. The femur resembled that of the mid legs, short, wide, and cylindrical. The tibia was thin and densely covered with bristles. Tibial spurs or horns were present at the distal end. The tarsus consisted of five tarsomeres, with the last one being considerably larger and ending in two claws. The tarsomeres were narrower at the tip and wider toward the base, and the entire leg was covered with fine bristles.

Elytra

The elytra were elliptical and measured 6-7 mm in length. A triangular scutellum was visible just behind the pronotum. The elytra displayed distinct, textured lines that were darker in color. These lines began narrowly and widened toward the posterior end. The division between the two elytra was distinct, and the beetle was capable of flight.

Abdomen

The abdomen was larger than the elytra, measuring 7-8 mm in length, and was visible from the lateral sides. The posterior end of the abdomen was prominently rounded, giving it a bumpy appearance.

Material examined

Punjab: Bahawalpur; Cholistan University of Veterinary and Animal Sciences, 2.II.2021, 9♂♂ 9♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Khairpur, 17.III.2021, 12♂♂ 12♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Yazman, 24.IV.2021, 20♂♂ 30♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Chak 44 DB, 11.VI.2021, 20♂♂ 35♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Chak 44 DB, 15.VIII.2021, 8♂♂ 6♀♀ (Zain, M. and Kumar, S.); and Bahawalpur; Derawar, 12.XII.2021 (Zain, M. and Kumar, S.).

Comments

Phyllophaga crinita is found mainly in temperate grasslands and agricultural landscapes. The larvae are called white grubs and develop in damp soils under grasses, including Bermuda grass, St. Augustine grass and tall fescue. They also dine on the roots of crops such as corn and sorghum. Adults are nocturnal and will occasionally be drawn to lights at night.

5 *Julodis euphratica* (Laporte and Gory, 1835)

Description

The body was elongated and oval, measuring between 53-60 mm in length. The maximum width at the elytra was approximately 13-14 mm. The beetle displayed a metallic green coloration.

Head

The head was about 6-8 mm long. It was equipped with fine, short carinae and was directed downward, appearing smaller than the thorax. The antennae were short, serrate, and composed of 11 segments. The head was hypognathous and somewhat recessed into the prothorax. It narrowed towards the tip and broadened at the base.

No punctation was observed on the head. The eyes were ventro-lateral in position and oriented downward.

Thorax

The thorax was significantly larger and broader, measuring approximately 24-26 mm in length. The pronotum formed a central triangular tip where it connected with the elytra. Concave curves extended from both sides of this tip. The pronotum lacked carinae and punctation. It narrowed at the anterior end and broadened at the base, with a distinct depression in the middle region near the elytra.

Forelegs

The forelegs were about 20-21 mm long. The femur was cylindrical and wider than the tibia, bearing numerous punctures. The tibia was longer but narrower than the femur and had forward-oriented bristles directed toward the tarsus. The tarsus was wider than the tibia, consisted of five tarsomeres, and ended in two small claws.

Mid legs

The mid legs measureed 22-3 mm, primarily due to the elongated tibia. The femur was slightly smaller than that of the forelegs. The tibia was long and slender, slightly widening toward the apex, and covered with bristles at the distal end. Both the femur and tibia exhibited punctation. A small tibial spur was present, though it might be inconspicuous.

Hind legs

The hind legs were shorter than both the fore and midlegs, measuring about 18-20 mm in total length. The femur was small and narrow, while the tibia was thinner and shorter than those of the other legs. Punctation and bristles were present. The tarsus was composed of smaller tarsomeres, with the final one ending in two small claws.

Elytra

The elytra were long and oval-shaped, measuring 29- mm in length. They had a shiny surface with punctation and irregular, dark, larger spots. The texture was not smooth. The elytra were slightly separated at the posterior end, allowing partial visibility of the abdomen.

Abdomen

The abdomen wa rounded and oval-shaped, approximately 27-8 mm long. It tapered slightly at the apex and was densely covered with bristles, giving it a hairy appearance.

Material examined

Punjab: Bahawalpur; Cholistan University of Veterinary and Animal Sciences, 2.II.2021, 11♂♂, 5♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Khairpur, 17.III.2021, 12♂♂, 7♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Yazman, 24.IV.2021, 25♂♂, 14♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Chak 44 DB, 11.VI.2021, 29♂♂, 10♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Chak 44 DB, 15.VIII.2021, 8♂♂, 3♀♀ (Zain, M. and Kumar, S.); and Bahawalpur; Derawar, 12.XII.2021 (Zain, M. and Kumar, S.).

Comments

A considerable number of specimens of this species have been recorded from Bahawalpur, particularly in the vicinity of Derawar. Derawar Fort is a large square fortress located in Ahmadpur East Tehsil, Punjab, Pakistan, approximately 130 km south of Bahawalpur city. Its forty bastions are prominently visible from miles away in the Cholistan desert.

6. *Anthia sexguttata* (Fabricius, 1775)

Description

The total body length ranged from approximately 50 to 53 mm. The body was black with six prominent white dorsal markings, four on the elytra and two on the thorax. The surface was covered with yellow or white setae and pubescence, contributing to its distinctive appearance.

Head

The head measured 11-12 mm in length. It is smooth, shiny, and more lustrous than the rest of the body. The clypeus had a central depression, and the head was embossed near its junction with the pronotum. The mandibles and prothorax exhibited sexual dimorphism: males possessed elongated mandibles, while females had shorter ones. The dorsolateral eyes were widely spaced. The antennae were located anterior to the eyes and consisted of 11 segments.

Thorax

The thorax was approximately 8- mm long. The pronotum was cordiform (heart-shaped), concavely curved, and distinctly expanded laterally, forming large lateral flanges. It was narrower at the base than at the anterior. Two identification spots were present dorsolaterally and on the anterior portion of the pronotum. In males, the pronotum had two posterior flanges at the base with noticeable tumescent structures, which were absent or unpronounced in females. The base of the pronotum was bifurcate, with this feature more prominent in larger specimens.

Forelegs

The forelegs measured 21-23 mm in total length. The femur was cylindrical, narrow at the base, and sparsely bristled. The tibia gradually widened toward the tarsus

and was densely bristled, particularly toward the apex. It ended in tibial spurs or horns. The tarsus consisted of five tarsomeres, with the first being the longest. The tarsus terminated in two small claws.

Mid legs

Slightly longer than the forelegs, the mid legs measured 23-24 mm in length. The femur resembled that of the forelegs, while the tibia was thinner and ended in a bumpy structure near the tarsus, which also bore tibial spurs or horns. The tarsus had five tarsomeres, the first being the longest, and ended in two claws. Bristles were present along the leg.

Hind legs

The hind legs were the largest, measuring 24-28 mm in length. The femur was slightly wider and bore a few bristles. The tibia was longer than in the other legs, narrow at the base, and widened toward the apex, but lacked the bumpy structure seen in the mid tibia. The tarsus had five tarsomeres, with the first claw noticeably larger than those of the other legs. Tibial spurs or horns were present, and the entire leg was covered in bristles.

Elytra

The elytra were approximately 19-21 mm long and oval to elliptical in shape. They were smooth and slightly shiny. A faint suture separated the elytra along the midline. A distinguishing feature of *Anthia sexguttata* was the presence of four white spots, two anterior and two posterior, equally spaced across the elytra.

Abdomen

The abdomen was oval-shaped and slightly smaller than the elytra, measuring 19-21 mm in length. It was not prominently visible from the dorsal side.

Material examined

Punjab: Bahawalpur; Cholistan University of Veterinary and Animal Sciences, 2.II.2021, 11♂♂, 9♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Khairpur, 17.III.2021, 12♂♂, 11♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Yazman, 24.IV.2021, 25♂♂, 26♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Chak 44 DB, 11.VI.2021, 29♂♂, 20♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Chak 44 DB, 15.VIII.2021, 8♂♂, 1♀♀ (Zain, M. and Kumar, S.); and Bahawalpur; Derawar, 12.XII.2021 (Zain, M. and Kumar, S.).

Comments

Commonly known as the six-spot ground beetle, this striking species is recognized by its distinct pattern of white spots on a black body. Often referred to as the "domino beetle," it belongs to a group of large tiger beetles found in India. It typically inhabits dry field areas, particularly favoring scrub vegetation.

7. *Calosoma auropunctatum* (Herbst, 1784)

Description

The total body length was measured at approximately 19-21 mm, with the maximum elytral width ranging from 5-7 mm.

Head

The head measured about 4-5 mm in length. The eyes were dorsolateral and centrally positioned on the head. The antennae, located near the eyes, consisted of seven segments. The head surface was smooth, lacking punctures, spots, or any distinct markings. It was slightly elongated and narrowed toward the tip.

Thorax

The thorax was 5-6 mm in length. The pronotum was disc-shaped, overall rounded, and slightly flattened at both the anterior and posterior ends. No punctures or spots were present. Ventrally, the pronotum was narrower and met the dorsal side to form a thin marginal line.

Forelegs

The forelegs measured about 7-8 mm in length. The femur was shorter than the tibia. The tibia was cylindrical, narrow at both ends, and slightly wider at the base. It bore a few bristles and terminated in tibial spurs. The tarsus consistsed of five small tarsomeres; the first tarsomere was longer than the others. The final tarsomere ended with two small claws.

Mid legs

The mid legs were 10-11 mm in length. The femur was shorter than the tibia and cylindrical, but slightly narrower than that of the fore legs. The tibia was slender, slightly curved toward the abdomen, and did not widen at the distal end. Tibial spurs or horns were present. Bristles were distributed along the leg. The tarsus comprised five tarsomeres, with the first being the longest.

Hind legs

The hind legs were the longest, measuring approximately 15-17 mm. The tibia was notably longer than those of the fore and mid legs and was covered with bristles. Tibial spurs were present. The tarsus had five tarsomeres; the first was the longest, and the final tarsomere ended in two claws.

Elytra

The elytra were oval in shape and not entirely smooth. They bore striae with evenly spaced pits. Elytral length ranged from 12-14 mm. The elytra were slightly narrower

at the base and became broader toward the apex.

Abdomen

The abdomen was rounded and oval, with a slight dorsal curvature at the center. Its length was measured at 11-12 mm.

Material examined

Punjab: Bahawalpur; Cholistan University of Veterinary and Animal Sciences, 2.II.2021, 6♂♂ 8♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Khairpur, 17.III.2021, 7♂♂ 9♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Yazman, 24.IV.2021, 23♂♂ 23♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Chak 44 DB, 11.VI.2021, 15♂♂ 20♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Chak 44 DB, 15.VIII.2021, 0♂♂ 6♀♀ (Zain, M. and Kumar, S.); and Bahawalpur; Derawar, 12.XII.2021 (Zain, M. and Kumar, S.).

Comments

Commonly known as the Black Ground Beetle, this species is surrounded by various cultural beliefs and symbolic interpretations around the world. In some traditions, a beetle flying through a window is considered a good omen. In Maryland, however, the presence of a black beetle indoors is seen as a sign of impending illness or even death. In England, killing a beetle is regarded as unlucky. The ancient Egyptians revered the scarab beetle as a sacred symbol representing the sun, light, and regeneration. In contrast, in Pakistan, children often play with this beetle and find joy in its presence, reflecting a more lighthearted and playful association.

8. *Trachyderma hispida* (Forskål, 1775)

Description

The body length measured approximately 21-3 mm, with a maximum elytral width of about 10-12 mm.

Head

The head ranged from 3-5 mm in size. It was relatively small, featuring small mandibles and dorsolaterally positioned eyes. The antennae, composed of six segments, were located near the eyes. The head was concave at the base and slightly tapered at the tip. It lacked punctures or spots but was covered with fine bristles, giving it a slightly hairy appearance.

Thorax

The thorax was about 3-4 mm long. The pronotum was convex anteriorly and slightly concave posteriorly, with rounded lateral margins. Its surface had fine granulation and soft bristles, giving it a velvety texture to the touch. The pronotum also featured thickened margins.

Forelegs

The forelegs were relatively short, measuring 8-10 mm in length. The femur was broader and cylindrical, while the tibia was thinner and longer, ending in tibial spurs. The tarsus comprised small tarsomeres, with the final one bearing two claws.

Mid legs

The mid legs measured 13-14 mm in length. Structurally similar to the forelegs, they were larger overall, with proportionally longer femur, tibia, and tarsus.

Hind legs

The hind legs were 14-5 mm in total length. The tibia was wider at the apex, forming a slight bump at the tip. Tibial spurs were present. The tarsus included five tarsomeres, with the final one ending in two claws.

Elytra

The elytra were round to oval and measured 14-15 mm in length. They displayed dense granulation and were covered with soft bristles, giving them a velvety texture. The elytra tapered to a pointed end.

Abdomen

The abdomen was slightly shorter than the elytra, measuring 13-14 mm in length. It was round to oval in shape.

Material examined

Punjab: Bahawalpur; Cholistan University of Veterinary and Animal Sciences, 2.II.2021, 12♂♂, 11♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Khairpur, 17.III.2021, 11♂♂, 10♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Yazman, 24.IV.2021, 19♂♂, 20♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Chak 44 DB, 11.VI.2021, 20♂♂, 23♀♀ (Zain, M. and Kumar, S.); Bahawalpur; Chak 44 DB, 15.VIII.2021, 2♂♂, 9♀♀ (Zain, M. and Kumar, S.); and Bahawalpur; Derawar, 12.XII.2021 (Zain, M. and Kumar, S.).

Comments

This species is a sand-desert tenebrionid beetle and is considered a promising biological model for space chronobiology. Moreover, it is widely used in research due to its high viability, strong tolerance to housing and handling conditions, small size, and overall safety in laboratory use.

CONCLUSION

The present study was conducted to investigate the diversity and distribution of beetles in the Cholistan desert of Pakistan. A total of 1,449 beetles, representing eight species, were collected from various habitats and locations across the desert. *Blaps gigas* was the most abundant species, accounting for 21.7% of the total specimens, followed by *Pimelia canariensis* (18.3%) and

Scarabaeus gangeticus (14.3%). The least abundant species was *Julodis euphratica*, comprising only 6.6% of the total collection. The beetle fauna of the Cholistan desert was dominated by darkling beetles (Tenebrionidae), which represented 47.6% of the total specimens and included four of the eight recorded species. Other families present included scarab beetles (Scarabaeidae) at 25.4%, ground beetles (Carabidae) at 18.6%, and jewel beetles (Buprestidae) at 8.4%. Beetle diversity and abundance varied significantly across different habitats, influenced by the availability of food, water, and shelter. The highest diversity and abundance were recorded in areas with dense vegetation, such as irrigated plantations and riverine forests. In contrast, the lowest diversity and abundance were observed in habitats with sparse vegetation, including sand dunes and salt flats. This study provides valuable understandings about the beetle fauna of the Cholistan desert and highlights the importance of habitat features in shaping insect diversity. The findings can serve as a foundation for future conservation efforts and biodiversity management strategies in arid and semi-arid regions.

AUTHORS' CONTRIBUTIONS

MW conducted field surveys, wrote the manuscript; SK and RS designed the study and edited the manuscript; IB and ZM analyzed the data. All authors proofread and approved the final manuscript.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUSTAINABLE DEVELOPMENT GOALS TARGETED

SDG 13: Climate Action

SDG 15: Life on Land

REFERENCES

Baig, M.S., Akram, M., Hassan, M.A., 1980. Possibilities for range development in Cholistan desert as reflected by its physiography and soils. Pakistan Journal of Forestry 30, 61-71.

Chaudhry, S.A., 1992. The Cholistan desert. A token consultancy report, Cholistan Institute of Desert Studies, Islamia University, Bahawalpur, Pakistan.

Cranshaw, W.S., Peairs, F.B., 2008. Insect Pests of Home-Stored Foods. Insect Series, 5.

Cummings, J.A., Parker, I.M., Gilbert, G.S., 2012. Forest restoration, biodiversity and ecosystem functioning. Plant Ecology 213(12), 29-1989.

Evans, A.V., Bellamy, C.L., 2000. An inordinate fondness for beetles. University of California Press.

FAO, 1993. Pakistan Cholistan Area Development Project. Report No. 59/53 ADB-PAK 58 (Final Version). Food and Agriculture Organization of the United Nations, Rome.

Kumar, S., Sultana, R., Husemann, M., 2022. Extended list of *Orthoptera fauna* of Cholistan desert (Punjab, Pakistan). Pakistan Journal of Zoology 54(4), 1947-1949.

Majagi, S., 2022. Biodiversity Challenges and Measures. Daya Publishing House, Astral International Pvt. Ltd., New Delhi. pp. 1-159.

New, T.R., 2009. Insect species conservation. Cambridge University Press, Cambridge.

Satheesha, D.N.A., Vrushali, M.M., Jayaraj, F.C., Sreenivasa, G., 2018. Preliminary study on composition and diversity of beetles (Order-Coleoptera) in and around Davangere University Campus, Davangere, Karnataka. Journal of Entomology and Zoology Studies 6(4), 1751-1758.

Soomro, F.D., Sultana, R., 2018. Incidence of darkling beetles (Coleoptera: Tenebrionidae) from lower Sindh, Tando Jam Hyderabad. Journal of Entomology and Zoology Studies 6(2), 2560-2562.

Soomro, F.D., Sultana, R., Memon, F., 2019. The first two records of darkling beetles (Tenebrionidae: Coleoptera) from lower Sindh, Pakistan. Sindh University Research Journal (Science Series) 51(04), 601-606.

Soomro, F.D., Sultana, R., Soomro, S., Fatimah, S., Soomro, N.S., Larik, S.A., Afghan, A.A., 2024. Taxonomy of subfamily Tenebrioninae (Latreille, 1802) and Pimeliinae (Latreille, 1802) (Coleoptera: Tenebrionidae) with new record from Sindh, Pakistan. Agricultural Science Digest 44(2), 311-318.

Tom, H., Kaippallil, J.D., 2016. A preliminary study on the diversity of coleopterans in a rural area in Changanacherry, Kerala. Journal of Entomology

and Zoology Studies 4(5), 297-300.

Trigos-Peral, G., Juhász, O., Kiss, P.J., Módra, G., Tenyér, A., Maák, I., 2021. Wood ants as biological control of the forest pest beetles *Ips* spp. Scientific Reports 11(1), 1-0.

Waseem, M., Kumar, Sultana., R, S., 2023. A new species of the sub-genus *Afromorgus* (Trogidae: Scarabaeoidea) from Cholistan desert, Pakistan. Pakistan Journal of Zoology 57(1), 299-305.

Weyer, J., Weinberger, J., Hochkirch, A., 2012. Mobility and microhabitat utilization in a flightless wetland grasshopper, *Chorthippus montanus* (Charpentier, 1825). Journal of Insect Conservation 16(3), 379-390.