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Research Article

The first report of *Chiloloba acuta* (Wiedemann, 1823) from Sindh, Pakistan

Mehtab Ali Mahar[1] | Waheed Ali Panhwar*[2] | Abdul Manan Shaikh[3] | Shahnoor Suhriani[1] | Sami Ullah[4]

1. Department of Zoology, Shah Abdul Latif University, Khairpur Mir's, Sindh, Pakistan.
2. Department of Zoology, University of Sindh, Jamshoro, Sindh, Pakistan.
3. Department of Zoology, Government College University, Hyderabad, Sindh, Pakistan.
4. College of Life Science, Hubei University, Wuhan, Hubei, China.

*Corresponding Author Email: waheed.panhwar@salu.edu.pk

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Abstract:
The study was conducted between 2021 and 2022 to investigate the dung beetle species in the Sindh province of Pakistan. A total of 31 specimens of dung beetle specimens were collected from various locations across 15 districts within the province. The specimens analysed in this study belonged to the genus Chiloloba. The study yielded significant findings, as it reported the presence of a single species within the genus Chiloloba, namely Chiloloba acuta (Wiedemann, 1823), which had not been previously documented in Pakistan. This discovery marks the first record of Chiloloba acuta within the country. In addition to identifying the species, the study provided a comprehensive morphological description of Chiloloba acuta. This description included detailed information about the physical characteristics and features of the species, allowing for better understanding and classification. Furthermore, the study investigated the distribution of Chiloloba acuta within the Sindh province, providing insights into its geographic range and potential habitat preferences. Overall, this study contributes to the knowledge of dung beetles in Pakistan, specifically in the Sindh province. The identification and documentation of Chiloloba acuta expands the understanding of biodiversity in the region and highlights the importance of ongoing research in documenting and preserving unique species.

Keywords: Genus *Chiloloba*, Dung beetle, Dung beetle species, Dung beetle specimens, Morphological description, Classification of species, Biodiversity.

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1. Introduction

Beetles belong to the order Coleoptera, class Hexapoda of phylum Arthropoda. Order Coleoptera consists of 160 families. Family Scarabaeidae are commonly known as dung beetles. These beetles are taxonomically essential and are an important component of the ecosystem. They are prominent beetles in their habitats (Woodruff, 1973). Scarabaeidae is the most prominent family of the order Coleoptera, represented by 30,000 species of beetles worldwide (Erler & Ates, 2015). It is divided into 13 subfamilies widely distributed worldwide (Kumar *et al.*, 2017a; b). Dung beetles' dwell in every type of habitat, including grasslands, tropical grasslands, deserts, farmlands, and native and exotic forests, except Antarctica, because they do not like freezing weather. They are most diverse in Africa, where more than 2,000 species occur (Beiroz *et al.*, 2017). Some species are diurnal and found hovering on different vegetation and flowers (e.g. *Euphoria*, *Cotinis*). Moreover, some are nocturnal, they are attracted to the lights (e.g. *Polyphylla*, *Plusiotis*, and *Dynastes*) (Hanski & Cambefort, 1991).

Dung beetles are a type of beetle that subsists on faeces. Certain species of dung beetles possess the extraordinary ability to bury dung up to 250 times their own mass in a single night. The dung beetle community has distinct groups with specific behaviours (Hanski & Cambefort, 2014; deCastro-Arrazola *et al.*, 2023). Rollers, for instance, roll dung into spherical balls that serve as both a source of nourishment and breeding chambers. On the other hand, tunnelers bury dung wherever they come across it. The third group, known as dwellers, inhabit the dung without engaging in rolling or burrowing activities. Dwellers are often attracted to faeces collected by burrowing owls (Arellano *et al.*, 2023).

Dung beetles exhibit a wide range of colours and sizes; certain functional traits like body mass and leg length can exhibit significant variability. All dung beetle species are categorized under the superfamily Scarabaeoidea, with the majority belonging to the subfamilies Scarabaeinae and Aphodiinae within the family Scarabaeidae (also known as scarab beetles). Since most Scarabaeinae species feed solely on faeces, this subfamily is called "true" dung beetles. There are also dung-feeding beetles in other families, such as the Geotrupidae (earth-boring dung beetle). The Scarabaeinae subfamily alone encompasses over 5,000 species (Rivera *et al.*, 2023). Among the fascinating dung beetles, the nocturnal African dung beetle *Scarabaeus satyrus* stands out as one of the few known invertebrate animals capable of using the Milky Way for navigation and orientation.

Many dung beetles of the Scarabaiodae family are apparent due to their comparatively large size; Goliath beetle from Africa (*Goliathus goliaths* L.) is known to be one of the heaviest insects, up to 100 grams (Medvedev, 1960). It also includes the elephant beetle (*Megasoma elephas* L.) and the Hercules beetle (*Dynastes hercules* Fabricus), both from the American tropics, which are known for their large size (up to 160 mm for the Hercules beetle) and well-developed horns in the males. The group includes many species worldwide, intriguing life histories, and interesting adaptations.

During the year 1966, dung beetles were introduced from African regions to Australian regions to control the faeces of cattle because dung beetles already found there were unable to control faeces by feeding on them. Introduced beetles feed on the faeces of cattle and provide dung to the grasses, resulting in grass and plant growth in a better way. They also reduced breeding

spots for contagious (Ritcher, 1958; Hanski & Cambefort, 1991). The statistics on the taxonomy of their dispersal have been recorded in the first half of the present decade from Australia (Arrow, 1931).

They perform numerous ecological functions such as cycling of nutrients, dispersal of seeds, regulation of gastric parasites, and dung breeding pests of dipteran. They are also helpful as indicators in conservation and global warming studies. A few species are a pest of plants. They cause huge destruction by defoliation and root feeding (*Popillia japonica*) (Estrada & Coates-Estrada, 1991; Mittal, 1993; Larsen, 2004; Chandra & Gupta, 2013). The present study was investigated to explore the fauna of Genus *Chiloba* from Sindh, Pakistan.

2. Material and method

Specimens for this study were collected from various locations within the Sindh Province, which is situated in a subtropical region. The geographic coordinates of Sindh are approximately Latitude: 25.8943°N and Longitude: 68.5247°E. The province experiences warm and moist weather during the summer season. The collection of specimens was carried out using two methods: pitfall traps and handpicking. The sampling sites included diverse environments within the Sindh province, such as croplands, grasslands, and riverbanks. After collection, the specimens were transported safe and carefully to the entomology laboratory at the Department of Zoology, Shah Abdul Latif University Khairpur, Sindh, Pakistan from 2021 to 2022.

In the laboratory, the collected specimens were euthanized using potassium cyanide (KCN) in killing bottles, following standard techniques for preservation and advanced studies (Larsen & Forsyth, 2005). The specimens were then preserved in insect collection boxes. To facilitate their identification, the specimens were examined under a binocular microscope, and high-resolution digital images of each specimen were captured using a digital camera. The identification process of the dung beetles involved using dichotomous keys and relevant literature. Various resources were consulted for the accurate identification of the specimens, including works by Arrow (1931), Jessop (1986), Noureen *et al.* (2015a; b), and Mora-Aguilar *et al.* (2023). Once identified, the specimens were carefully labelled and placed in the entomology laboratory at the Department of Zoology, Shah Abdul Latif University Khairpur, for further study and preservation.

3. Results

A total of 31 dung beetle specimens were collected from 2021 to 2022. The sampling was collected from 15 districts of Sindh province. The specimens studied belong to the genus *Chiloloba.* This comprehensive data reported one new species, *Chiloloba acuta* (Wiedemann, 1823) of the genus *Chiloloba*, reported for the first time from Pakistan. The taxonomy consists of Family (Scarabaeidae), Subfamily (Cetoniinae), and Genus (*Chiloloba*) in this specie (Burmeister, 1842).

3.1. Diagnosis

These beetles' upper and lower surfaces are frequently glossy and covered in tiny hairs. The keel of the clypeus is in the middle. Adult beetles often seem green but can sometimes be red

or blue. Hairs cover their bodies in a patchwork pattern on top and more densely on the sides and bottom. Where the elytra converge at the back of the body, they are elevated into a ridge. The clypeus, or pointy skullcap, is connected to the forehead by a thin ridge.

3.2. Ecology

The young consume dead organisms and aid in the circulation of soil nutrients. After the northeast monsoon, the adults of this species can be found grazing on grasses throughout southern India. Sometimes, the adults may eat the blossoms and grain from farmed cereal and millet crops like sorghum and maize. Extreme annoyance is unusual.

3.3. Diagnostic characteristics of *Chiloloba acuta* (Wiedemann, 1823)

C. acuta is a flower chafer beetle. It is about 11 mm in length and 4.5 mm in width, having shiny metallic green**.** These beetles are often shiny with short, hairy surfaces both above and below. The clypeus has a median keel. They are clothed in hairs irregularly on the upper side but more densely on the sides and underside. A fine ridge extends from the forehead to the tip of the clypeus. The pronotum is short and oval-shaped. The elytra are raised into a ridge along the edge where they meet towards the hind end of the body (Figure 1 & Table-1).

Figure 1. *Chiloloba acuta* (Wiedemann, 1823)

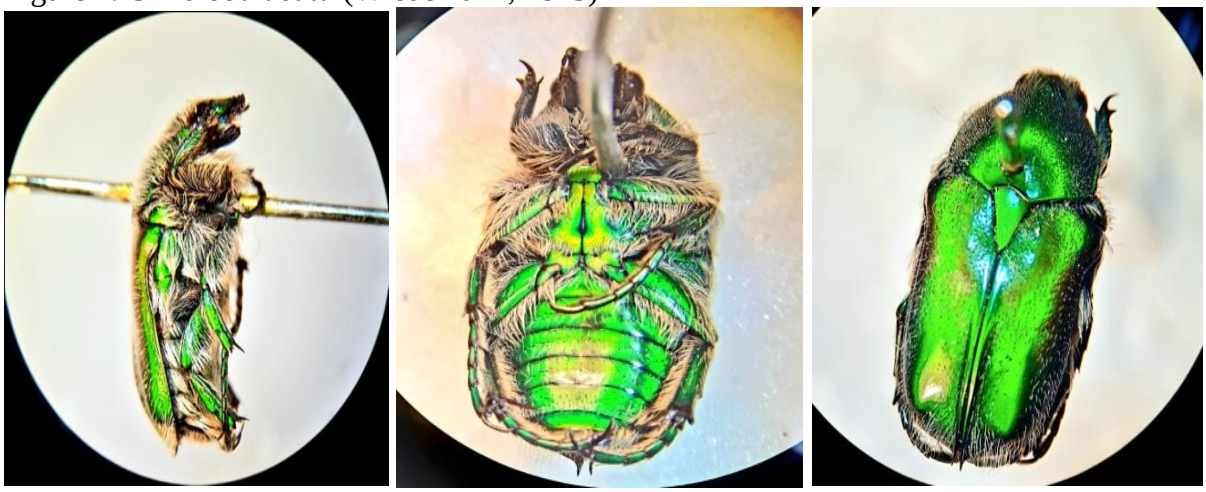

Table 1: Morphometric measurement of *Chiloloba acuta*

Body Parameters	Length (mm)				Width (mm)			
	Male (n = 10)		Female (n = 10)		Male (n = 10)		Female (n = 10)	
	Mean ± SD	Min - Max	Mean ± SD	Min-Max	Mean ± SD	Min-Max	Mean ± SD	Min - Max
Head	2 ± 0.5	1.5 – 2.5	4.33 ± 1.25	3 – 5.5	3.5 ± 0.5	3 – 4	4.83 ± 0.76	4 – 5.5
Thorax	5.5 ± 0.5	5 – 6	6 ± 1	5 – 7	7.5 ± 0.5	7 – 8	7.5 ± 0.5	7 – 8
Abdomen	13 ± 1	12 – 14	14.83 ± 0.76	14 – 15.5	10 ± 1	9 – 11	12 ± 1	11 – 13
Total length	19 ± 1	18 – 20	21 ± 1	20 – 22	----------	--------	---------	----------

Table-2: Showing District wise distribution of *Chiloloba acuta*

S. No	District	No. of specimen
01	Ghotki	2
02	Hyderabad	3
03	Jacobabad	3
04	Jamshoro	2
05	Karachi Central	0
06	Karachi East	0
07	Karachi South	3
08	Karachi West	4
09	Kashmore	2
10	Khairpur	4
11	Larkana	0
12	Naushehro Feroze	3
13	Qambar Shahdadkot	2
14	Shikarpur	2
15	Sukkur	1
	Total	31

4. Discussion

The green chafer beetle, or *Chiloloba acuta* (Wiedemann, 1823), is a common species that may be found all over the Indian subcontinent. It is the lone member of its genus and a member of the Pleurosticti Scarabaeidae family's phytophagous scarab clade. It differs from other genera of Cetoniinae in part due to the presence of a keeled clypeus with sharp angles. The adult beetles are covered in yellow hairs that are long and decumbent along the sternum and sides of the abdomen and short and upright on the remainder of their bodies. The mature beetles are shiny metallic green and are covered in yellow hairs (Arrow, 1910). Because the adult individuals of these beetles feed on pollen and harm grains, they are sometimes pests of cereals and millets. This is how they got the name "pollen beetles." It is interesting to note that these beetles unintentionally aid in crop pollination while munching on pollen. Crops like okra, cucumber, radish, and litchi have positively affected pollination (Thapa, 2006). Additionally, adults of *Chiloloba acuta* have been observed in Uttar Pradesh eating upland rice (Garg, 1986). On the other hand, this species' larvae are typically regarded as non-pestiferous because they mostly consume decaying organic waste. During the present study, a total of 31 dung beetle specimens were collected from 2021 to 2022. The sampling was collected from 15 districts of Sindh province. The specimens studied belong to the genus *Chiloloba.* This comprehensive data reported one new species, *Chiloloba acuta* (Wiedemann, 1823) of the genus *Chiloloba* reported for the first time from Pakistan.

Sreedevi and Tyagi (2013) studied the morphological analysis of the juvenile stages of *Chiloloba acuta*, which substantially contributes to our knowledge of this pest species. At the Indian Agricultural Research Institute's Insect Systematics Laboratory, careful analysis of eggs, larvae, and pupae produced helpful taxonomic keys for species identification. This information contributes to the more extensive study of entomology and insect systematics and is crucial for developing successful pest management plans. Based on further investigation, it may be

possible to improve pest management strategies and gain a better comprehension of the ecology and behaviour of the flower chafer beetle. The present study gives detailed morphology along with digital images of *Chiloloba acuta* from this region. Hopefully, this study will form a baseline for future researchers dealing with *Chiloloba* fauna.

5. Conclusion

In conclusion, the present study conducted between 2021 and 2022 in the Sindh province of Pakistan focused on investigating dung beetle species. A total of 31 specimens were collected from various locations across 15 districts within the province. The specimens belonged to the genus *Chiloloba*. The study made a significant discovery by reporting the presence of a previously undocumented species within the genus Chiloloba in Pakistan, namely *Chiloloba acuta* (Wiedemann, 1823). This finding marks the first record of *Chiloloba acuta* in the country. In addition to identifying the species, the study provided a comprehensive morphological description of *Chiloloba acuta*, offering detailed information about its physical characteristics and features. This description enhances our understanding and aids in the classification of the species. Furthermore, the study examined the distribution of *Chiloloba acuta* within the Sindh province, shedding light on its geographic range and potential habitat preferences. Overall, this study contributes to the knowledge of dung beetles in Pakistan, particularly in the Sindh province. The identification and documentation of *Chiloloba acuta* expand our understanding of biodiversity in the region and underscore the importance of continued research in documenting and conserving unique species.

Declaration of conflict of interest

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