



Ground Beetles (Coleoptera: Carabidae) Collected from Different Ecological Zones of Sukkur Sindh-Pakistan with New Records

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ABSTRACT: Ground beetles very beautiful creatures occurring in the crops, vegetated fields in a particular area. They are regarded as biological indicators in most of temperate zones in addition to the bio-control agents. Family Carabidae comprises nearly 40,000 species, 1927 genera worldwide. These ground beetles reside in the land habitats all over the world. The present study was aimed to explore the biodiversity of ground beetles from different ecological zones of Sukkur. For the present study about 160 specimens were collected from different localities of district Sukkur during the March 2019 - December-2019. Five species were identified into 03 Subfamilies i-e: Carabinae, Licininae, Brachininae, 03 genera and 05 species viz: *Carabus cashmirensis*, *Chlaenius quadricolar*, *Chlaenius laticollis*, *Chlaenius hamifer* are first time recorded from Sindh and 01 species *Pheropsophus andrewesi*, first time recorded from Pakistan. Population of these species *Chlaenius quadricolar* and *Chlaenius laticollis* is more common while *Carabus cashmirensis* and *Pheropsophus andrewesi* was rare in number. Taluka Salehapat and Rohri were observed rich while new Sukkur contain less members.

Keywords: Ground beetles, Coleoptera, New record, Ecology

Abbreviations: SK, Sukkur; NSK, New Sukkur; RH, Rohri; SP, Saleh Pat; PA, Pano Aqil; T, Total

I. INTRODUCTION

Ground beetle is the member of family Carabidae, often recognize by big prognathous mandibles, sturdily margined pronotum and antennae elongated thread like. Entomologist fascinated because family has wide number of species [1]. Genitalia have been used to identify different species for more than hundred years, and the technique is constantly become upgrade. Main biogeographical regions of the world dwelled by more than 25000 species and very rich family Coleoptera order [2]. Since commencement of modern entomology distribution, ecology and classification of Carabid have been carefully investigated, and now great material about ground beetles [3].

Even though ground beetles are quite consistent morphologically but have little difference in basic body structure [4]. Previous studies tried to relate the morphological characters with locality but some of the adaptations were found such as cave inhabitant, fosorial and arboreal. The majorities of variation are related with habitats [5-7].

Ground beetles are one of the taxonomically varied beetle families, have worldwide distribution and usually employed to show the qualitative status of the environment. Many species of ground beetle are key stone species of ecosystem and thus are frequently studied [8]. Several species of ground beetles feed

weed seeds and are predators of pest such as insects and slugs [9].

At present, about 38600 authentic names occur globally and expected about 100 new other species every year [10]. 1927 genera of ground beetles, carabidae including tiger beetle present worldwide. Carabids dwell in the majority land habitats of almost all continents. Bio elements of Pakistan are largely Palaearctic (western Indus valley, Himalaya, Karakorum and more), secondly Oriental (Thar Desert, southern Punjab, eastern Indus valley and more); lastly some elements of Ethiopian region (southwest of Balochistan) [11-12]. The majority of the taxonomic groups that signify in western Palaearctic fauna are discussed in this study, which elaborates the frameworks of concepts in which other species having same morphologies can be simply studied and accommodated. Species having unrelated and contrast morphologies residing in particular habitats (e.g. arboricolous species, such as *Dromius*) are not under study. However, to keep prejudice away they were introduced and studied in the strong bias they would introduce in the comparative examination. The geographical conditions of the sukkur district comprises cultivated lands, agriculture crops throughout the year due to the presence of water so the environmental features are suitable for the life of ground beetles. It is therefore the proposed study was designed.

II. MATERIALS AND METHODS

A. Study Area

Study was conducted in the district Sukkur, Sindh Pakistan. District Sukkur is the main city of the Sindh province in Pakistan, Consists five administrative strata (tehsils), namely, Sukkur city, New Sukkur, Rohri, Saleh Pat and Pano Aqil. Among them Sukkur city and New sukkur are urban centre while Pano Aqil, Saleh Pat and Rohri are rural areas. Among them Rohri is the smallest tehsil of the Sukkur district. Having the 27° 40'N 69°30' E. Total area 5,165 km² (750/sq mi). With the pleasant weather and hilly areas with grasses and mango tree and date palms.



Fig. 1. Map of Study area.

B. Sampling, Killing, Fixation and Identification of Samples

The beetles were captured from several localities of Sukkur district by insect net, specimens were killed into killing bottles having KCN. The samples were set by pinned on the elytra. Taxonomic characters were noted down and dust of samples were removed with the help of ethanol. Beetles were identified by the help of taxonomic keys available in books, literature [13-15]. About 160 specimens which were collected during the March 2019 - December-2019.

C. Morphology and Photography

The beetles morphology were observed and measurement of body parts such as head, thorax, wings were done with help of divider and scale having mm (millimeter) unit. Male and Female genitalia dissected out and the samples first were kept for 24 hours into desicator having alcohol nearly 70-90% containing water. The beetles were dissected on next day and male and female genitalia character [16-20]. The images were taken with the help of camera.

III. RESULTS AND DISCUSSION

A. Ground beetles

A total of 160 carabid beetles representing 05 species i.e; *Carabus cashmirensis*, *Chlaenius quadricolar*, *Chlaenius laticollis*, *Chlaenius hamifer* and *Pheropsophus andrewesi* were caught in 26 traps in 2019 from 05 talukas (Sukkur, New Sukkur, Rohri, Saleh pat and Pano Aqil) of District Sukkur, Sindh, Pakistan (Table 1).

Table 1: Showing the List of studied species.

S. No.	Species	Status
1.	Sub-family Carabinae <i>Carabus cashmirensis</i> Redtenbacher, 1844	New record from Sindh
2.	Sub-family Licininae <i>Chlaenius quadricolar</i> Oliver, 1790	New record from Sindh
3.	<i>Chlaenius laticollis</i> Say, 1823	New record from Sindh
4.	<i>Chlaenius hamifer</i> Chaudoir, 1856	New record from Sindh
5.	Sub-family Brachininae <i>Pheropsophus andrewesi</i> Jedlicka, 1964	New record from Pakistan

B. *Carabus cashmirensis* Redtenbacher, 1844(Fig. 2A)

Diagnosis. Colour black rather dull, head narrow and smooth in front, surface finally wrinkled, eyes prominent, tooth of the mentum triangular. Pro- thorax slightly transverse, convex and wider than the head, elytra elongate and oval in shape extending up to the tip of abdomen. Elytra with irregular pits apex not finely granulate, pro tarsi undiluted; average body length 35mm.

C. *Chlaenius quadricolar* Oliver, 1790(Fig. 2B)

Diagnosis. Antennae 3-3.5 mm long, mouth parts hypognathous, tooth of the mentum triangular, eyes prominent. Thorax large and wider than head, femur robust as compared to tibia and tarsi. Elytra reaching to the tip of abdomen with regular intervals; body colour black, body length ranging up to 14 mm.

D. *Chlaenius laticollis* Say, 1823(Fig. 2C)

Diagnosis. Tooth of the mentum triangular, antennae 5.5 mm long. Thorax wider than head and with out median line, colour of legs yellow, hind pair of leg larger than pro leg in size. Elytra reaching up to the tip of abdomen with regular intervals; body flat, size ranging from 9-9.5 mm.

E. *Chlaenius hamifer* Chaudoir, 1856(Fig. 2D)

Diagnosis. Colour black rather dull, head narrow and smooth in front, surface finally wrinkled, eyes prominent, tooth of the mentum triangular. Pro-thorax slightly transverse, convex and wider than the head, elytra elongate and oval in shape extending up to the tip of abdomen. Elytra with irregular pits apex not finely granulate, pro-tarsi undiluted; average body length 35mm.

F. *Pheropsophus andrewesi* Jedlicka, 1964(Fig. 2E)

Diagnosis. Colour black rather dull, head narrow and smooth in front, surface finally wrinkled, eyes prominent, tooth of the mentum triangular. Pro-thorax slightly transverse, convex and wider than the head, elytra elongate and oval in shape extending up to the tip of abdomen. Elytra with irregular pits apex not finely granulate, pro tarsi undiluted; average body length 3mm.

Distribution. The taluka wise distribution of species is presented in Table 2 & Fig. 3.

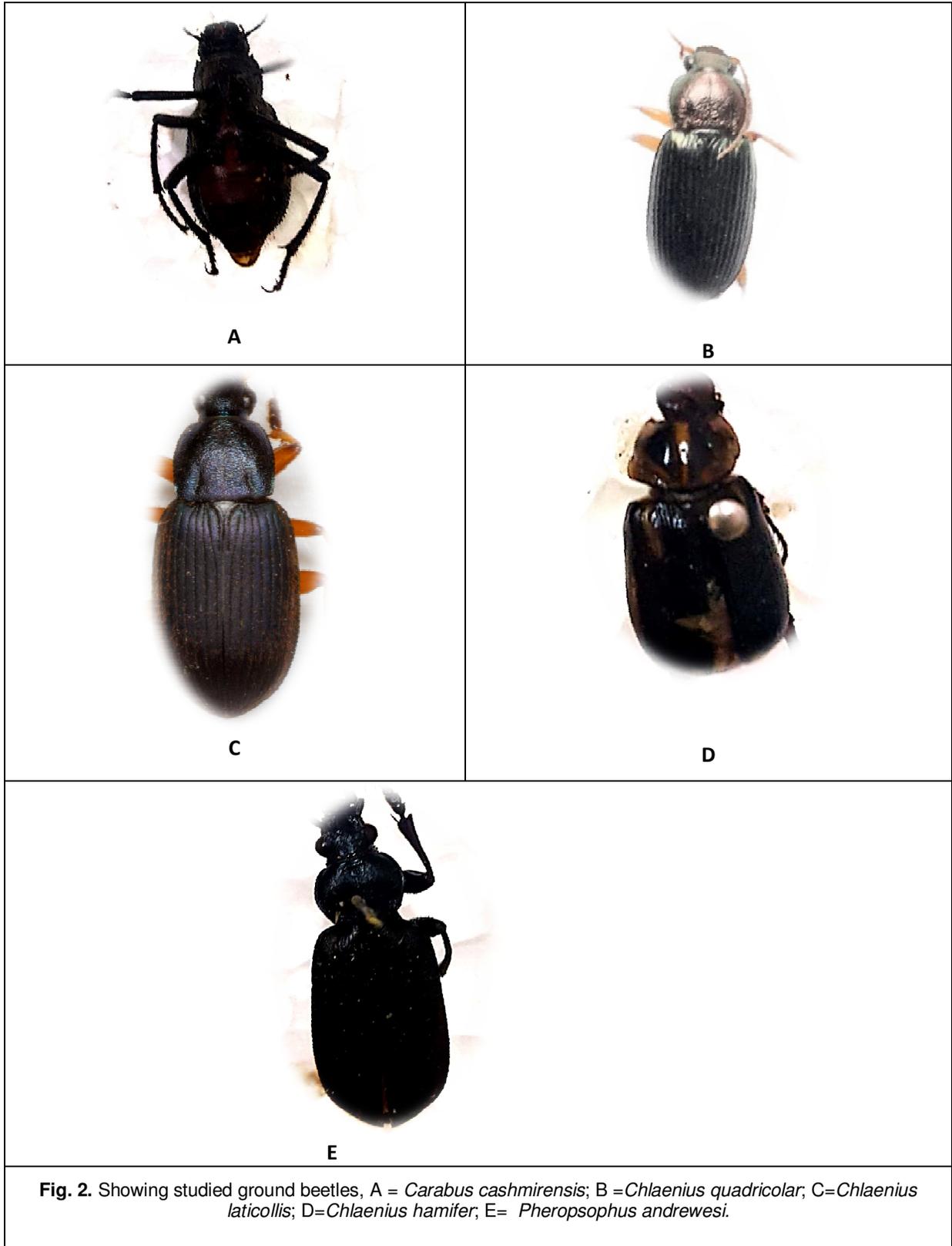


Table 2: Showing Taluka wise distribution of species.

Species	Talukas					T	%
	SK	NSK	RH	SP	PA		
<i>Carabus cashmirensis</i>	02	02	03	03	03	15	9.4%
<i>Chlaenius quadricolar</i>	09	05	16	13	08	51	32%
<i>Chlaenius laticollis</i>	07	06	11	20	10	54	34.4%
<i>Chlaenius hamifer</i>	06	03	04	09	07	29	18.0%
<i>Pheropsophus andrewesi</i>	02	00	04	03	02	11	7.0%

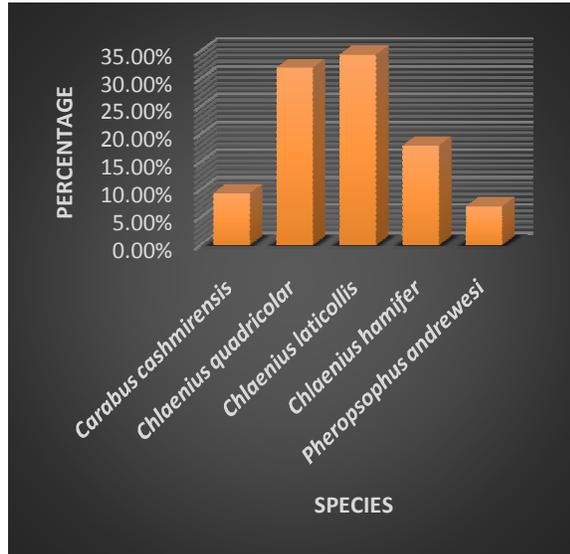


Fig. 3. Showing distribution percentage of species collected.

G. Carabid Beetle Food

From the feeding point of view Carabid beetles are usually considered as polyphagous predators. But in the family Carabidae massive species prosperity and diversity in biotopes they inhabit and in body shapes, entire population range of trophic specializations occurs. It is astonishing that many of the basic questions on carabid feeding remain still unanswered, mainly species of European, North American, and Japanese species, fundamental information regarding food preferences, interests or requirements is often absent, even for many familiar species [22-23].

H. Beetles as Bioindicators

Bio-indicators are useful tool for monitoring environmental changes. To detect carbon monoxide in mines canaries were used before, then increased use of indicators has been observed from the local disruption to global environmental and climatic change. Bio-indicator can be defined as a species that shows the vital environmental conditions and denotes the impact of change of environment on a habitat, community, ecosystems which indicates the diversity of other species. There are few reasons to use the bio-indicators most important one is their cost-effectiveness. With the use of bio indicators, we can examine the influence of human activities on the organism, instead of assessing the available entire biota. Bioindicators also helps to monitor the toxins effects on the life organisms. It might be very hard to check toxicity level directly. In surveys,

the use of bioindicators to evaluate the species richness of the community. This is very useful in the tropics, where it is not possible to conduct survey all available species because of high number of reported species. However, there are many problems associated with the use of bio-indicators [23-27].

IV. CONCLUSION

The present study concluded the finding of 05 species of ground beetles i-e: *Carabus cashmirensis*, *Chlaenius quadricolar*, *Chlaenius laticollis*, *Chlaenius hamifer* and *Pheropsophus andrewesi* new record from Sindh Province while species *Pheropsophus andrewesi* new record from throughout Pakistan. Taluka Salehapat and Rohri were observed rich while New sukkur contain less numbers of ground beetles population. If more surveys carried out that may result in finding of other diversity of ground beetles' species from this region.

V. FUTURE SCOPE

Morphological characteristics are still the principal tools for identification, but molecular detection could be practiced for accurate systematic positioning of ground beetle fauna. Local farmers should be educated through seminars about Pest status of ground beetles. Ground beetles of Sindh should be further explored.

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Conflict of Interest: The authors declare no conflict of interest.

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