Journal of Biodiversity and Environmental Sciences (JBES)
ISSN: 2220-6663 (Print) 2222-3045 (Online)
Vol. 7, No. 3, p. 20-26, 2015
http://www.innspub.net

INNSPUB
RESEARCH PAPER
OPEN ACCESS

Taxonomic account of dung beetles from Gujrat, Punjab (Pakistan)

Nadia Noureen[1], Mubashar Hussain[2*], Muhammad Faheem Malik[3]

[1]*Research Scholar, Department of Zoology, University of Gujrat, Pakistan*

[2, 3]*Department of Zoology, Faculty of Science, University of Gujrat, Pakistan*

Article published on September 17, 2015

Key words: Dung beetles, Diversity & Abundance, Gujrat, Pakistan.

Abstract

The study was aimed to explore the diversity, distribution and description of dung beetle fauna in Gujrat, Pakistan in 2014 - 2015. Samples were collected from natural forests, grazing pastures and agricultural areas of district Gujrat during the study period by using appropriate sampling techniques.Total of 349 specimens were collected and identified by using standard keys. The recorded specimens were identified into 4 tribes, 7 genera and 16 species including *Gymnopleurus bicallosus, Heliocopris bucephalus, Catharsius pithecius, Catharsius molessus, Catharsius sagax, Catharsius platypus, Catharsius granulatus, Onthophagus gazelle, Onitis philemon, Onitis subopacus, Onitis singhalensis, Onitis castaneous, Onitis excavatus, Tiniocellus spinipes* and *Oniticellus cinctus* of subfamily Scarabaeidae and *Aphodius crenatus* of subfamily Aphodiinae. It was concluded that Gujrat is a diverse area for dung beetle fauna but there is a need to study the population dynamics of Scarabaeidae at a comprehensive level to evaluate its ecological role.

***Corresponding Author:** Mubashar Hussain ✉ dr.mubashar@uog.edu.pk

Introduction

Insects are the most devastating and abundant species on the face of earth and has invaded every possible niche. There are about 100 million species of insects on earth (Grimaldi and Engel, 2005) which act as predators, parasites, parasitoids, and as a food source for other species. They provide some useful products such as honey, wax and silk etc. and are efficient decomposers (Miller, 1993). Agro ecosystem accounts for one third of total land on earth (FAO, 2001) and serve as a major terrestrial habitat for insects.

Dung beetles are efficient decomposers and play a vital role in nutrient recycling, soil turnover and seed dispersal (Halffter and Matthews, 1966; Andresen, 1999; Horgan, 2001; Andresen 2002a, 2002b; Andresen and Levey, 2004; Nichols *et al.*, 2008). These are the most important components of the ecosystems for its regulation and maintenance and represent a well-established community within an ecosystem (Halffter and Matthews, 1966; Hanski and Cambefort, 1991).

Dung beetles have variable sizes ranging from 2mm to 15mm and demonstrate a variety of color from dull to metallic black, red, brown, yellow, blue and green. Most of the dung beetle species are good fliers and search food while flying close to the ground (Halffter and Matthews, 1966). Antennae and maxillary palps function as chemoreceptors from longer and shorter distance, respectively (Halffter and Matthews, 1966). On the basis of food proximity and nesting behavior dung beetles may act as Telocoprids (rollers), Endocoprids (dwellers) or Paracoprids (Tunnelers) (Halffter and Edmonds, 1982).

More than 7000 species of Scarabaeinae family have been reported worldwide (Vaz-de-Mello, 2000). Very scanty work is available on diversity and distribution of Scarabaeidae in Pakistan. A comprehensive distributional note of dung beetle fauna in Pakistan has been reported by Siddiqui *et al.*, (2014) which comprised of 50 species mainly from Azad Kashmir and Sindh province. But still there is a need to explore the diversity and species richness of dung beetles in Pakistan at a broader scale.

This study was intended to reveal the fauna of dung beetles in Gujrat and to provide taxonomic keys for identification and description of dung beetles in Pakistan.

Materials and methods

The study was carried out in Gujrat in 2014-2015. Gujrat is situated between the rivers The Chenab and The Jehlum, at the northern boundary of Punjab province, between latitude 32.5738°N and longitude 74.0789°E, 224 meters above the sea level (734ft) with an area of 3192 km². The average temperature in summer is 45 °C and 2 °C in winter and average rainfall is recorded as 67cm per annum.

Dung beetles were collected by hand picking within the dung pat and by digging under and near the dung pats in natural pastures, semi forests or natural rangeland and agricultural area of Gujrat district during 2014 - 2015.

The collected specimens were killed by using killing jars of KCN and then softened by using hot water treatment for 15 minutes. Specimens were then identified to species level by using a binocular microscope (CZM6) with the help of identification keys (Arrow, 1931; Jessop, 1986). Identified specimens were then dry pinned and preserved in wooden boxes.

Results and discussion

A total of 349 species were collected from various parts of district Gujrat comprising of almost all types of microhabitats. The collected specimens represented 16 species from 2 families, 4 tribes and 7 genera. The study showed a higher number of species belonging to Scarabaeidae including *Gymnopleurus bicallosus, Heliocopris bucephalus, Catharsius pithecius, Catharsius molessus, Catharsius sagax, Catharsius platypus, Catharsius granulatus,*

Onthophagus gazelle, Onitis philemon, Onitis subopacus, Onitis singhalensis, Onitis castaneous, Onitis excavatus, Tiniocellus spinipes, Oniticellus cinctus and only one species *Aphodius crenatus* representing Aphidiinae. The study of guild structure characterized the dominance of tunnelers in the area.

Plate I. (A) *Heliocoprisbucephalus,* (B) *Catharsiuspithecius,* (C) *Catharsiussagax*, (D) *Catharsiusmollesus,* (E) *Catharsius granulates,* (F) *Catharsius platypus*, (G) *Onitiscastaneous*, (H) *Onitissubopacus* (I) *Onitis excavates* (J) *Onitisphilemon* (K) *Onitissinghalensis* (L) *Oniticelluscinctus,* (M) *Tiniocellusspinipes,,* (N) *Aphodiuscrenatus,* (O) *Onthophagus gazelle,* (P) *Gymnopleurusbicallosus*.

Key to Subfamilies, Tribes and Genera of Dung Beetles collected from Gujrat

1. Club shape antennae with 3 to 7 lamellated segments, flattened fore tibia, and head not covered by pronotum. Abdomen with six sclerites and tarsi five segmented, mid coxae extended, trochanter not closed instead broadly separated.....2

-No such features present..... Not a Dung Beetle

2. Pygidium not exposed, completely covered by elytra, two spurs at hind tibia, mid coxae jointed, scutellum evident.....Aphodiinae.....3

- Elytra not covering pygidium, one spur at hind tibia and midcoxaeseparated, scutellum not obvious.....Scarabaeinae Latreille.....4

3. Aphodiinae: Hindtibiabearingtwoslopingcarinae. Hind femor somewhat thick and not so long, Pronotum simple.....*Aphodius* Illiger

4. Scarabaeinae: Midcoxae jointed and a single spur on middle tibia..... 5

- Mid coxae separated and middle tibia bearing two spurs..... 7

5. Elytra removed from shoulders, having front tarsi.....Gymnopleurini Lacordaire 6

6. Abdominal sides without carination at base.....*Gymnopleurus* Illiger

7. Hind legs with normal length and tarsi smooth and narrowing.....8

8. First segment of labial pulp larger than second and third very discrete..... .....Coprini Leach.....9

-First segment smaller than second while third not present.....11

9. Coprni; Elytra bearing carination on sides.....10

10. Antennal club without hair rather shiny.....*Heliocopris* Hope

- Antennal club completely hairy.....*Catharsius* Hope

11. Pronotum with two distinct basal depressions at the center.....*Onitis* Fabricius

- Basal depressions absent at pronotum.....12

12. Indistinguishable scutellum. Antennae having nine segments.....Onthophagini.....13

- Scutellum can be seen and antenna having 8 segments.....Onticellini.....14

13. Onthophagini; Fore tibia having inclined margins. Anterior margins of pronotum solid underneath .....*Onthophagus* Latereille

14. Onticellini; Setae absent rather shiny, pygidium without margination.....Oniticellina

1. Aphodius crenatus, Harold, 1862

Brown in colour, body very convex and elongate, scutellum distinguished with median line. A short horn at clypeus and paraocular lobes are angular.

Specimens Recorded; 1♂

2. Gymnopleurus bicallosus Felsche, 1909

Body covered by yellow setae beneath. Black and shiny, elongate in shape but thin legs. Three teeth on front tibia and two carinae at front femur. Clypeus divided into two lobes and elytra very finely punctured.

Specimens Recorded; 2♂

3. Heliocopris bucephalus Fabricius, 1775

Body broad and head bearing slightly erect horn in male while replaced by a carina in females.Pronotumirregulalryrugose,verticalinfrontwithasharpstraightcarina,feeblytoothedateachendandanteriorangles verysmoothandrathersharplyproducedinmalewhileinfemale,anteriorcarinasharpandgentlycurvedwithitsfrontanglesblunt.

Specimen Recorded; 1♂

Key to the species of genus *Catharsius*

1. Elytra not very dense and male bearing a horn and two very prominent tubercles on pronotum.....*Catharsius pithecius*(Fabricius)

- Male without tubercles and elytra completely opaque.....2

2. Head bearing a sharp conical horn at middle and little forwarded and aneven area adjacent to both eyes.....*Catharsius molossus* (Linnaeus)

-Head with no even area, having straight horn situated farther from head. Prominence absent on pronotum.....*Catharsius* (*Catharsius*) *sagax* (Quenstedt)

-Prontumwith lateral prominence.....*Catharsius granulates* (Sharp)

-Pronotum with distinct hind angles.....*Catharsius platypus*

4. Catharsius pithecius Fabricius, 1775
Black in color, shiny, slightly oval and very convex. Head hemispherical, clypeus feebly cut out in middle having almost straight slender horn just in front of eyes in male but in female only a transverse elevation. Pronotum bears sharp and tapering protuberance on each side of middle furrow in male.
Specimen Recorded; 1♂

5. Catharsius molossus Linnaeus, 1758
Body oval, shiny black in color and smooth. Eyes bear a smooth shining area adjacently with head large. Pronotum with sharp declivity forming a crest centrally and curves at margins. Male having a conical median horn with broad and flattened base and short pointed tip while female bears a short pointed process.
Specimens Recorded; 2♂

6. Catharsius (*Catharsius*) *sagax* Quenstedt, 1806
Black in color, body broad and convex, enlarged head and clypeus bearing granules without smooth shiny area. Pronotum having granules and elytra distinctly striated. Upper margin of declivity at pronotum straight and male bearing more or less erect horn further than head.
Specimens Recorded; 1♂

7. Catharsius granulates Sharp, 1886
Very similar with *Catharsius molessus* but no even area near eyes. Pronotum densely granular and elytra finely striated. A horn is present in male.
Specimens Recorded; 1♂

8. Catharsius platypus Sharp, 1875
Black in color having red hair all over the lower surface. Body massive and broad. Head granulated and semicircular. Male carrying carina on head instead of horn.
Specimens Recorded; 1♂, 1♀

9. Onthophagus (*Digitonthophagus*) *gazelle* Fabricius, 1787
Body yellow colored, broad and oval with shine. Pronotum bearing fine punctures and granules. Lower surface especially legs having oval light colored patches. Elytra distinctly striated but no striation at intervals.
Specimens Recorded; 7♂, 4♀

Key to the species of genus *Onitis*
1. Copper colored with four teeth at front tibia, pronotum wanting median even line.....*Onitis philemon* Fabricius

-Pronotum having smooth median line.....*Onitis singhalensis*

2. Black and meta sternum flat, clypofrontal carina extensively interrupted..... *Onitis subopacus*

-Tubercles placed on the clypeofrontal carina.....*Onitis castaneous*

.Metasternum transversally excavated in the middle..... *Onitis excavates*

10. Onitis philemon Fabricius,1801
Copper in color without smooth median line, clypeus parabolic and separated from forehead by an

interrupted curved carina and with a short transverse carina just before it and a conical tubercle just behind it. Pronotum punctured.
Specimens Recorded; 13♂, 19♀

11. Onitis singhalensis
Dark coppery in color, body oval and long. Head granulated and clypeus bilobed and a straight carina separate it from head with a conical tubercle behind it. Male poses strong front legs.
Specimens Recorded; 58♂, 77♀

*12. Onitis subopacus*Arrow, 1931
Black, oval and narrow in shape. Head and pronotum shiny, finely punctured and incomplete line at center of pronotum. Pygidium smooth and opaque.Male bearing single or double tooth at the base of front tibia.
Specimens Recorded; 1♂

13. Onitis castaneous Redt, 1848
Deep chest-nut red with the lower surface, pygidium and legs having yellow hair. Short, compressed and convex, shiny and elytra sub opaque. The head have strong elevated tapering carina at front. The male poses a strong tilted spine at the middle of front femur at its outer region. Front tibia is long, slender and strongly curved, armed with four teeth externally.
Specimens Recorded; 104♂, 38♀

14. Onitis excavatus
Black, shiny having red hair all over the lower body. Clypeus granulated and the frontal carina interrupted and another transverse carination in front of it and a small tubercle behind it. Pronotum is not regularly punctured.
Specimens Recorded; 9♂, 5♀

15. Oniticellus (*Oniticellus*) *cinctus* Fabricius, 1775
Oblong-oval, not very convex. Smooth and shining black. Head shining and smooth and without any carina. Pronotum very smooth with a rather deeply impressed median longitudinal line up on its posterior half. Elytra deeply striated and each elytron with a pale yellow external border extending from behind shoulder to sutural angle.
Specimens Recorded; 1♂

16. Tiniocellus (Tiniocellus) spinipes Roth, 1851
Dark brown in color and pronotum metallic, clypeus slightly excised, head without ridges. Pronotum having incomplete median line and front tibia with four strong teeth.
Specimens Recorded; 2♂

References

Andresen E, Levey D. 2004. Effects of dung and seed onsecondary dispersal, seed predation, and seedling establishment of rain forest trees. Oecologica **139,** 45–54.

Andresen E. 1999. Seed dispersal by monkeys and the fateof dispersed seeds in a Peruvian rain forest. Biotrop **31,** 145–158.

Andresen E. 2002a. Primary seed dispersal by red howler monkeys and the effect of defecation patterns on the fate of dispersedseeds. Biotrop **34,** 261–272.

Andresen E. 2002b. Dung beetles in a Central Amazonian rain forest and their ecological role as secondary seed dispersers. Ecol. Entomol. **27,** 257–270.

Arrow GJ. 1931. The Fauna of British India including Ceylon and Burma, Col. Lamella III (Coprinae). Taylor and Francis, London, 428 p.

FAO. 2001. Crop production statistics. (Online) http://www.fao.org

Grimaldi D, Engel MS. 2005. Evolution of the insects. Cambridge University Press. New York, 755 p.

Halffter G, Edmonds WD. 1982. The nesting behavior of dung beetles (Scarabaeinae)- an ecological and evolutive approach, Instituto de Ecologia. Mexico DF, 1–176 p.

Halffter G, Matthews EG. 1966. The natural historyof dung beetles of the subfamily Scarabaeinae (Coleoptera: Scarabaeidae). Fol. Entomol. Mexi., **12(14),** 1–312.

Hanski I, Cambefort Y. 1991. Dung Beetle Ecology. (eds. I. Hanski & Y. Cambefort). Princeton UniversityPress, New Jersey, 305–329 p.

Horgan FG. 2001. Burial of bovine dung by coprophagous beetles (Coleoptera: Scarabaeidae) from horse and cow grazingsites in El Salvador. E J Soil Biol. **37,** 103–111.

Jessop L. 1986. Dung Beetles and Chafers, *Coleoptera: Scarabaeoidae*. **5,** *Part II*. Hand books for the identification of British insects. Royal Entomological Society of London, 53 p.

Miller JC. 1993. Insect natural history, multi-species interactions and biodiversity in ecosystems. Biodiv. Conserv **2,** 233–241.

Nichols E, Spector S, Louzada JNC, Larsen T, AmezquitaS, Favila ME. 2008. Ecological functions and ecosystemservices provided by Scarabaeinae dung beetles. Biol. Conserv., **141**:1461–1474.

Siddiqui H, Ahmed Z, Khatri I. 2014. Distributional Notes and New Records for the Dung Beetles (Coleoptera: Scarabaeidae: Scarabaeinae) of Pakistan. Pak J Zool., **46 (2)**: 295–307.

Vaz-De-Mello FZ. 2000. *Haciaun Proyecto CYTED parael inventario y estimaci´on de la diversid ad Entomol´ogicaenI beroam´erica: PrIBES-2000* (eds. F. Martin-Piera, J.J.