

A STUDY ON BIODIVERSITY OF DUNG BEETLES (SCARABAEIDAE: COLEOPTERA: INSECTA) IN PIPALDA TEHSEEL, KOTA DISTRICT, RAJASTHAN

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ABSTRACT: Hadoti region is rich in biodiversity and natural resources. Present research study was carried out on biodiversity of dung beetles in Pipalda Tehseel, Kota District Rajasthan. The study sites blessed by rich vegetation and wetlands. The diversity of class Insecta is astounding at this region. Insects are described as the toughest and most successful animals on the Earth. In present study 13 species were explored under 8 genera of Family Scarabaeidae (Coleoptera: Insecta) were found. The collection is under study and many more species of this and other families will be identified. The field survey was conducted from March, 2018 to October, 2018. Surveys and collection was done in morning (7 AM-10 AM) and evening (4 PM-6 PM) at one month interval. Scarab beetles were collected with the help hand picking method and light trap method.

KEYWORDS:- Scarabaeidae, Coleoptera, pitfall, Pipalda, Insecta, beetles etc.

INTRODUCTION:-

The largest family of order Coleoptera is Scarabaeidae about 30000 species are included worldwide. Dung beetles belong to the family Scarabidae they are very effective on parasitic worms and pestilent flies for population control. They are a very important trophic level of terrestrial ecosystem taxonomically as well as functionally. The family defined over 30,000 species throughout the world. These are stout bodied beetles. These show bright metallic colors. The body length is between 1.5-160 mm long. Their antennae are clubbed and composed of many plates called lamellae. The first pair of legs of many members is adapted for digging. In males of some groups a horn is present on head or pronotum to fight. Their larva is typical 'C' shaped known as grub. Larva is white or pale yellow. Grubs live under debris or underground. Maximum beetles are scavengers feed on decaying plant materials and dung. Most of the members are nocturnal. In Ancient Egypt

dung beetles known as *Scarabaeussacer*. These play an important role in Tropical and Temperate environment. Dung beetles are a globally distributed insect group, with their high diversity in tropical forests and savannas (Hanski and Cambefort, 1991) and are member of family Scarabaeidae of insect's largest order Coleoptera. The beetles mostly feed on the micro-organism rich liquid component of mammalian dung and use the more fibrous material to brood their larvae (Halffter and Edmonds, 1982; Halffter and Matthews, 1966). Preserved beetles were identified by the help of taxonomy key of Chandra and Gupta (2013), Vol. 8, No. 1, ZSI.

MATERIALS AND METHODS:-

The abundance of variety of different species was recorded. Majority of dung beetles were collected from cow dung, dead plant materials, soil and under the stones.

Following methods were adopted for collection of insects as per requirement of the place, type of insect and season.

- (1) **Hand Picking Method** - It is the most common type for collection the subterranean coleopterans. This method is useful for large dung beetles. These were well visible to collect. Most medium to large sized were easy to pick. Since some of the dung beetles have strong jaws so they are able to bite. For avoid the risk gloves were also used in some situations. This method needs many tools like – hatchet, knife, small garden shovel, forceps, brush, gloves, hand-lens, pocket knife etc.
- (2) **Light Trap Method** – This method was used in collection of nocturnal beetles. For this a very simple light trap was made from a funnel, light source and a collecting jar. As light source a yellow colored bulb and light emitting diodes were used. As background a white sheet was used. A wide mouth funnel was placed the beneath the light source over

a killing jar/bottle so that insects can easily drop inside the funnel. The bottle was filled with 70% alcohol adding with some preservative like ethyl acetate.

Collected beetles specimens were narcotized using the killing bottles containing ethyl acetate specifically. Carbon tetrachloride and chloroform was also used for killing. After killing the insects they were preserved in 70% alcohol, for some hard bodied beetles formalin was used. Photographs were captured through a Nikon 500 digital camera.

RESULTS:

In all mentioned investigations and observations it is concluded that the study was carried out in context of the diversity and abundance of dung beetles from selected sites of Pipalda Tehseel, Kota, Rajasthan. The investigation was done by field surveys. The observations were based on scientific standard methods. Different types of methods were used in collection, observation, preservation and identification of coleopterans. In present study total 08 genus and 13 species of Scarabaeids were reported. The most abundant recorded species was *Onthophagushindu* (abundance was 19) while less abundance species was *Orphanusparvus* (abundance was 2). The names of Genera, species and abundance are listed in Table 1.

Table 1: Diversity of family Scarabaeidae (Dung beetles) from Pipalda Tehseel Kota District, Rajasthan

S. No.	Genus	Species
1	<i>Aphodius</i>	<i>moestus</i>
2	<i>Caccobius</i>	<i>unicornis</i>
3	<i>Catharsius</i>	<i>molossus</i>
4	<i>Catharsius</i>	<i>pithecius</i>
5	<i>Copris</i>	<i>carinicius</i>
6	<i>Gymnopleurus</i>	<i>cyaneus</i>
7	<i>Gymnopleurus</i>	<i>gammatus</i>
8	<i>Heliocopris</i>	<i>bucephalus</i>
9	<i>Onthophagus</i>	<i>armatus</i>
10	<i>Onthophagus</i>	<i>bonosus</i>
11	<i>Onthophagus</i>	<i>Hindu</i>
12	<i>Onthophagus</i>	<i>sagittarius</i>
13	<i>Orphanus</i>	<i>Parvus</i>

DISCUSSION:-

Some pioneer studies carried out on dung beetles these classified under subfamily Scarabaeinae and members of the suborder Lamellicornia were included by Linnaeus (1758) under a single genus *Scarabaeus* (Fourcroy 1785) separated the dung beetles from the Linnean *Scarabaeus* and constituted a new genus *Copris*. (Fabricius 1798) separated genus *Onitis* from genus *Copris*. (Creutzer 1799) proposed the name *Actinophorus* for the ball rolling beetles now included in the genera *Scarabaeus* and *Gymnopleurus*.

Weber (1801) introduced the name *Ateuchus* for *Scarabaeussacer* and its congeners. Latreille (1802) introduced the largest dung beetle genus, *Onthophagus*. The genus *Gymnopleurus* was established by Illiger (1803). Latreille (1807) introduced the genus *Sisyphus*.

Hope (1837) introduced two new genera, *Catharsius* and *Heliocopris* comprising large dung beetles. Thomson (1863) established the genus *Caccobius*. The genus *Liatongus* of dung beetle was introduced by Reitter (1892).

Balthasar (1963a, b) ranked the dung beetles as a family comprising two behaviorally distinct subfamilies: Coprinae and Scarabaeinae. Subfamily Coprinae included the tribes *Coprini*, *Dichotomini*, *Phanaeini*, *Oniticellini*, *Onitini*, and *Onthophagini* and the subfamily Scarabaeinae included the tribes *Eucraniini*, *Eurystemnini*, *Canthonini*, *Gymnopleurini*, *Scarabaeini* and *Sisyphini*. He gave an addition to the knowledge on Indian dung beetles was given only after three decades by in his monograph on Scarabaeidae and Aphodiidae in the Palearctic and Oriental region. Beetles belong to the insect order Coleoptera, which is characterized by a pair of sheath wings known as elytra. He paid his subsequent efforts on taxonomic studies of dung beetles that were limited to the occasional catalogues and regional check lists published by Zoological Survey of India from different regions.

Cambefort (1991) noted the mythological use of Scarab beetles these used as symbol prominently over approximately 3000 years, from the First Dynasty (5000 years ago) to the conquest of Egypt by the Roman Empire. He gave a detailed review of all facets of the use of scarab beetles by ancient Egyptians. He reported that the carvings and symbols of Buprestidae and Elateridae also held meaning to the ancient Egyptians. He hypothesized that buprestids symbolized the Egyptian myth of rebirth, perhaps due to the emergence of adult beetles from the trunks of living trees. Scarab beetles Perhaps the best-known use of beetles in mythology and

religion is the sacred scarab of the ancient Egyptians. Ancient Egyptians likened the rolling of dung balls by dung beetles to the sun rolling across the sky each day. Because the sun was thought to be reborn each day, scarab beetles became powerful symbols of resurrection and eternal life, which were prominent aspects of ancient Egyptian mythology.

Hutton and Giller (2003) analysed the effect of intensification of agriculture on dung beetles in temperate region.

Davis *et al.* (2004) studied usefulness of dung beetles as indicators of effects related to local transformation from natural habitat to farm land. In his review of Scarabaeidae dung beetles as indicators of biodiversity, habitat transformation and pest control chemicals in agro-ecosystems use of dung beetles as biodiversity, ecological and environmental indicators at regional, local and pasture scales were outlined and recommendations were made on the conservation of dung beetles in agro-ecosystems.

Vinod and Sabu (2007) compared the species composition and community structure of dung beetles associated with the dung of gaur and elephant from the same locality. Succession of dung beetles in the dung pats of gaur, from the moist deciduous forests of South Western Ghats was also studied (Sabu *et al.* 2007).

Thakare *et al.* (2011) conducted a survey of scarab beetle faunal diversity, abundance and composition in Kolkas region of Melghat Tiger Reserve, Amravati, Maharashtra, during May to October 2009. Scarab beetles were collected by dung baited pitfall traps and handpicking in five transects with different vegetation type and microhabitat. Total 26 species of scarab beetles belonging to 14 genera and 8 subfamilies were reported. Scarabaeinae was the dominant subfamily with respect to species diversity (15 species) and abundance. *Onthophagus* (Latreille, 1802) is the dominant genus observed in the study area.

Chandra and Gupta (2012) documented diversity and composition of dung beetles (Scarabaeidae: Scarabaeinae and Aphodiinae) assemblages in Singhori Wildlife Sanctuary (SWLS), Madhya Pradesh. Collection of specimens yielded a total of 669 beetles representing 26 species belonging to 12 genera and two subfamilies. The subfamily Scarabaeinae with 24 species is dominating (71.59% of total individuals) over Aphodiinae (27.40%) with two species. Twenty species were collected in mixed forests (n=398) and nineteen species in agricultural lands (n=271), wherein thirteen

species were present in both the habitats. Though the species richness is almost similar in SWLS, but there is significant difference in guild structure and composition. Tunnellers were the most species (22 species) and abundant (55.3%) followed by dwellers which constitute three species with 42.8% abundance in the assemblage.

Chandra and Gupta (2013) studied scarab beetles (Coleoptera: Scarabaeoidea) of Barnawapara Wildlife Sanctuary, Chhattisgarh, India reported 43 species of Super family Scarabaeoidea, belong to 25 genera, 16 tribes and eight subfamilies in two families, Hybosoridae and Scarabaeidae. All the species are recorded for the first time from the Sanctuary, while 31 species are new to the scarab fauna of Chhattisgarh, India.

CONCLUSION:-

The data revealed will be addition to our knowledge of diversity of dung beetles found in some of the study sites of Pipalda Tehseel, Rajasthan. It also provides baseline data for further research.

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