

Diversity and abundance of beetles in different agricultural sites of Morigaon district, Assam

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Abstract

The present study was conducted to assess beetle diversity in three different sub urban sites of Morigaon district, Assam, India. Morigaon district is an agricultural based district, which attracts many insects and make the places rich in biodiversity. The study sites were agricultural sites, wet lands and sub town area. In the study 23 different species of beetles were collected and identified belonging to 10 families in the three study sites. The result of Shannon – Wiener diversity index shows a moderate diversity of beetles. On the other hand, the value of Simpson's index indicates a significant diversity of beetle in the study area. Simpson's dominance index shows minimum or no dominance of some of particular species of beetle. Whereas, Simpson's reciprocal index shows a moderate evenness and richness of beetles in the study site.

Keywords: Beetle diversity, agricultural sites, morigaon district

Introduction

Insects are the most species rich groups of organisms having numerous ecological significance (Hazarika and Kalita 2018) [1]. Coleopterans are insects having largest numbers of species found in both terrestrial and aquatic environments (Chapman, 2009). They are commonly called as beetles. The most important feature of the beetle is their "elytra" the hard exoskeletal covering over their wings. According to a study, 1,50,000 reported beetles are found in India among 3,50,000 identified beetle species worldwide.

It was reported that about 25% of beetle feeds on plants. Beetle feed on plants, breaks down plants, therefore they can be categorising as pest (Gilliot,1995). On the otherhand, some beetles are beneficial as they are able to control population of pest, as like lady bird beetle can control aphids, scale insects, mealy bugs etc. Some ground beetles are predators for many caterpillars and wire worms (Kromp, 1999) [4]. The dung beetle helps in reducing the population of pestilent flies and parasitic worms (Kakkar and Gupta 2019) [5].

Assam is home to a vast array of flora and fauna (Upadhyay and Upadhyay, 2025) [6] and district Morigaon is an urban town full of rice cultivation as well as vegetable farming. The town is surrounded by many waterbodies like, beel, small rivers, natural ponds and wetlands (Mahanta *et al.*, 2024) [7]. It makes the town biodiversity rich specially for coleopterans. Therefore, the current study attempts to investigate the diversity pattern of beetles in this region. The biological and ecological characteristics of beetles are incredibly diverse. Certain types of beetles have shown to be useful, while others are incredibly dangerous (Arjun *et al.*, 2022) [8]. In complicated biological system, if the beetle population is healthy, hence it determines that the habitat is healthy as well (Ghannem *et al.*, 2017, SergeyViktorovicy *et al.*, 2019) [9, 10].

Materials and Methods

Study Area

The study of beetle diversity was conducted in the Dalbari area of Mayong block, district Morigaon, Assam. Morigaon

District is a centrally located district in Assam, it is located between latitude and longitude of 26°15'08"N and 92°20'32"E respectively. The district covers an area of 10,83,165 Bighas (1450.02 sq. Kms). The district is bounded by the mighty Brahmaputra on the North, Karbi Anglong district on the South, Nagaon District on the East and Kamrup District on the West. Annual rainfall Ranges between 1500 mm to 2600 mm. Average humidity: 75 %, Max. temp.37–39 °C, Min. temp.6–7°C.

Dalbari Area

This area is located between 26.2529°N and 26.3660° N latitudes and between 92.3369° E and 92.4530°E longitudes, which is a rural area located about 3 km away from the Morigaon Town. Dalbari area includes Dalbari, Sunarigaon and Barigaon village as sampling site. This study was conducted during October,2025 –February,2026.

Table1: Table showing 3 study sites

Sl No	Site name	Description of site
1	Dalbari Village	Agriculture based land.
2	Barigaon Village	Wet-land area with some agricultural lands
3	Sunarigaon Village	Sub-town area with scanty agricultural practice

Survey Time

The current investigation was carried out in 2024-25 between October-February. The beetle collection was done in the morning between 6 and 8 a.m. and at night between 6 and 8p.m.but in case of all the Sundays the survey has done for the whole day. During the survey, a variety of supplies were brought, including test tubes, a camera, a copy, a pencil, and a plastic container that contained chloroform. In test tubes, the beetles were primarily gathered by handpicking. Flying beetles were captured using butterfly nets. A white light source was used to aid collect certain

insects at night. The captured beetles were stored in a jar with chloroform.

Collecting Methods

In order to adequately sample the various habitats and collect different kinds of beetles, a wide variety of collecting & trapping methods were used (Skvatla *et al.*, 2017). It includes Hand Picking method for catching the large insects' beetles. When collecting beetles from dung or other unpleasant places, forceps were used (Basu *et al.*, 2022) [12]. Butterfly nets and arial nets were used to catch flying beetles. Umbrella method is used where umbrella is

used as a collecting tool. Bed sheets were also used to collect slow moving and small beetles, which have been jarred from plants. Light traps were used to attracts lots of nocturnal beetles. Head torch used during night survey was also responsible to attract the beetles for collection (Singh 1981) [13]. Pitfall traps were used for catching the ground dwelling beetles. This trap was made by soup cans where small drainage holes were made in the bottom. The top of the can should be level with the ground surface so an insect will fall right into it and we can collect it easily. (Chaudhary *et.al*, 2025) [14]. Jakoi was used for collecting aquatic beetles.



Fig1: Photographs of trapping methods and materials used during beetle collection

Identification

The Beetles were photographed with the help of camera and then identified various species and families by analysing the morphological characters under microscope. The identification was conducted by the help of Assam Agricultural University, Jorhat.

Data Analysis

Diversity of beetles were analysed using Shannon–Wiener index, Simpson's index, Simpson's diversity index and Simpson's reciprocal index.

Results

398 beetles were collected from various sites of Dalbari area, which includes --Dalbari village (site 1), Barigaon (site 2), and Sunarigaon (site 3). A total of 23 species beetle belonging to 10 families were capture during the survey. The families were--- Scarabaeidae (17.84), Carabidae (27.63), Chrysomelidae (25.64), Coccinellidae (6.28), Hydrophilidae (1.25), Trachypachidae (7.53), Tenebrionidae (4.53), Curculionidae (3.01), Cantharidae (4.03), Cerambycidae (2.26).

The following tables includes the beetles spotted, collected and identified from all the 3 sites of the Dalbari area and also various graphical representation on the basis of their number of abundance and diversity are also plotted below --

Table 2: List of different types of beetles found in the study area and their morphology and habitat

Sl No.	Name of Species	Common Name	Morphology	Host Plant or Habitat
1	<i>Xylotrupes gideon</i>	Rhinoceros beetle	They are shiny, dark brown or black in colour. They are large scarab beetle reaching up to 7 cm in length.	Coconut, Bamboo, Oil palm And Sugarcane etc.
2	<i>Adoretus ictericus</i>	Yellow rose beetle or Scarab beetle	They are elongated and oval in shape, 10-12 mm long. Brown in colour with a covering of white or cream setae.	Cacao, coffee, rose and various vegetable.
3	<i>Heteronychus arator</i>	African black beetle	They are 12-15 mm long, shiny black oval shaped beetle. Antennae 10 segmented.	Crop plants, garden flowers, trees and shrubs.
4	<i>Copris Spp.</i>	Dung beetle	Body is oval and highly convex. 9-30 mm long in size. They are shiny black in colour Head is semicircular.	Do not feed on plant, they primarily consume dung and lived on land.

5	<i>Onthophagus unifasciatus</i>	Dung beetle	Body is short, compact and shining. Average length is about 6-9 mm. Dorsum coppery green or dark blue in colour. Elytra bright yellow, and decorated with a broad irregular black median band.	Do not feed on plant, they primarily consume dung and lived on land.
6	<i>Chlaenius bimaculatus</i>	Ground beetle	Golden cyan body, a large reddish-yellow spot on the posterior portion of the forewing.	They lived on land and are found in various habitats, including sweet potato and rice fields.
7	<i>Scarites subterraneus</i>	Big-headed ground beetle	These beetles are generally between 15-30 mm. They have large mandibles, which have two teeth, for hunting and consuming their prey.	They lived on ground and feeds on other insects, snails, slugs, grubs, ants, and soil-dwelling caterpillars.
8	<i>Harpalus affinis</i>	Ground beetle	The species is 8.5–12 mm long and is black coloured with colourful metallic reflections on its shin. Their surface is metallic bronze, green or blue coloured.	This ground beetle is commonly found in dry places, running over the soil surface and hiding under stones.
9	<i>Chlaenius bengalensis</i>	Ground beetle	Body length 15-20 mm. Head and pronotum shiny green, elytra unicoloured dark green, palpi, antennae, and legs reddish brown. Body is wide and convex.	They lived on dry places, and feed exclusively on amphibian's larvae.
10	<i>Pheropsophus Spp.</i>	Bombardier beetle	They are characterized by their reddish or yellow to reddish body, often with two or four large black spots on their elytra. 13-20 mm in length.	They are found in riverbanks, sandbars, and soils near freshwater, with some species also inhabiting woodlands or grasslands
11	<i>Aulacophora indica</i>	Cucurbit beetle or Pumpkin beetle	It is a yellow-brown beetle with blackish meso- and metathorax and abdomen, and a pale head.	They feed on plants in the family Cucurbitaceae, including cucumbers, pumpkins, melons, and gourds.
12	<i>Aplosomyx Spp.</i>	Leaf beetle	It is yellow in colour. 2-3 cm in length.	Not known
13	<i>Asphaera lustrans</i>	Shiny flea beetle	They are small beetle around 7mm in length with a shiny, metallic appearance, often with a red or orange head and red hind femora.	They lived and feed on variety of plants.
14	<i>Cycloneda sanguinea</i>	Spotless lady beetle	They are 4-6.5 mm long, colour ranges from orange to deep red. They are with red unspotted elytra.	They are often found on plants infested with aphids, particularly milkweeds, but also on other plants.
15	<i>Delphastus pusillus</i>	Whitefly predatory beetle	They are small ladybird beetle, adult is 1/16 in length, body is shiny black in colour.	cucumbers, peppers, and other glasshouse vegetable crops.
16	<i>Harmonia axyridis</i>	Asian lady beetle	They are oval and convex, with 3 main colour morphs: Red or Orange with zero to many black spots, or Black with either four or two orange spots, typically measures 5.5 - 8.5 mm in length and 4 - 6.5 mm in width.	They are found on plants infested with preys including trees like maple, walnut, willow, and rose, as well as herbaceous plants like nettle, thistles, and cow parsley.
17	<i>Hydrophilus piceus</i>	Silver Water Beetle.	Adults can reach up to 5–5.15 cm in length and 2.05 cm in width. The body of adults is black with a greenish or olive sheen. It has protruding eyes and reddish-black antennae.	It is an aquatic beetle found in marshy, shallow, and heavily weeded aquatic environments, including ditches, marshy areas, and coastal grazing marshes.
18	<i>Trachypachus inermis</i>	Unarmed false ground beetle	They are small, typically around 3.8-7 mm in length, with a body shape resembling small ground beetles, but distinguished by their large coxae (the base of the legs).	Typically found in forested areas, particularly in leaf litter, and is thought to be a diurnal predator or scavenger.
19	<i>Opatrum sabulosum</i>	Sand darkling beetle	They are around 8.5 mm in length, long Y- shaped horn and body is black in colour.	They lived in open area, sunny area, sparsely vegetated area, sandy soil.
20	<i>Charagmus Spp.</i>	Lupin Root Weevils	Adults can range from 4.5 to 8.5 mm in length. Eyes are rounded; Legs are dark but densely scaled. Elytra are broad, flat scales are present on the wing-cases, Bristles are short, flat to recurved and Tibiae are covered with flat oval scales.	They are primarily found in areas where their host plants, leguminous plants (Fabaceae and some Mimosaceae).
21	<i>Odoiporus longicollis</i>	Banana stem weevil or Banana pseudo-stem borer	The body length of about 23-39 mm. Adult is black, but some reddish also.	The primary host plant is the banana plant, specifically the pseudostem and bunch stalks.
22	<i>Centaharis pellucida</i>	Solider beetle	They are 9-12 mm long and are characterized by its orange/red pronotum, black shields, and black legs, with a narrow black band at the tip of the hind femora.	Found in open, flowery habitats such as hedgerows, meadows, scrub, woodland margins, and grassy areas, especially during the spring and early summer

				months.
23	<i>Monochamus Spp.</i>	Sawyer beetles	They are large beetle, body length ranges from 1.5-3 cm, with males having antennae that are twice the body length, while females have antennae about one body length.	Their larvae bore into dead or dying trees, especially conifers such as pines.

Table 3: Relative abundance and number of beetles with their scientific name in different sites of the study area

SI No.	Scientific Name	Site 1	Site 2	Site 3	Total	Relative abundance
1	<i>Xylotrupes gideon</i>	2	2	0	4	Very Rare
2	<i>Adoretus ictericus</i>	5	5	2	12	Common
3	<i>Heteronychus arator</i>	5	4	2	11	Common
4	<i>Copris Spp.</i>	10	13	4	27	Very common
5	<i>Onthophagus unifasciatus</i>	5	4	8	17	Common
6	<i>Chlaenius bimaculatus</i>	15	4	3	22	Very Common
7	<i>Scarites subterraneus</i>	7	16	1	24	Very Common
8	<i>Harpalus affinis</i>	11	6	3	20	Common
9	<i>Chlaenius bengalensis</i>	6	5	4	15	Common
10	<i>Pheropsophus Spp.</i>	11	13	5	29	Very Common
11	<i>Aulacophora indica</i>	18	14	16	48	Abundant
12	<i>Aplosonyx Spp.</i>	6	15	2	23	Very Common
13	<i>Asphaera lustrans</i>	15	10	6	31	Abundant
14	<i>Cycloneda sanguinea</i>	10	2	0	12	Common
15	<i>Delphastus pusillus</i>	4	1	2	7	Rare
16	<i>Harmonia axyridis</i>	2	1	3	6	Rare
17	<i>Hydrophilus piceus</i>	0	5	0	5	Very Rare
18	<i>Trachypachus inermis</i>	20	6	4	30	Abundant
19	<i>Opatrum sabulosum</i>	13	5	0	18	Common
20	<i>Charagmus Spp.</i>	6	2	0	8	Rare
21	<i>Odoiporus longicollis</i>	4	0	0	4	Very Rare
22	<i>Centaharis pellucida</i>	8	5	3	16	Common
23	<i>Monochamus Spp.</i>	5	3	1	9	Rare

On the basis of number of Individuals

(a)Below 5 – Very Rare, (b)Below 10–Rare, (c)Below 20–Common, (d)Below 30 – Very Common, (e)30 and above-- Abundant

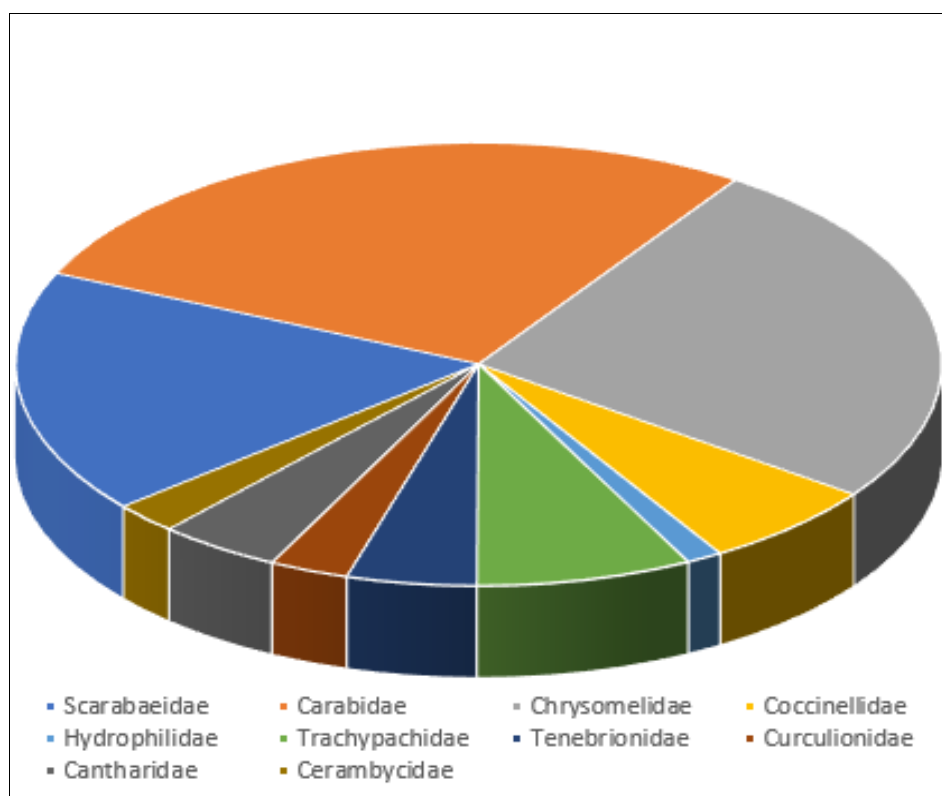


Fig 2: Distribution of beetles according to their family

Table 4: Result of Shannon – Wiener diversity index for beetle diversity

SI no.	Species	No. of Sps. (n)	Pi	ln pi	pi × ln pi	H'
1	<i>Xylotrupes gideon</i>	4	0.010050251	-4.600157644	-0.04623274	2.95036
2	<i>Adoretus ictericus</i>	12	0.030150754	-3.501545355	-0.105574232	
3	<i>Heteronychus arator</i>	11	0.027638191	-3.588556732	-0.099181216	
4	<i>Copris Spp.</i>	27	0.067839196	-2.690615139	-0.182529168	
5	<i>Onthophagus unifasciatus</i>	17	0.042713568	-3.153238661	-0.134686073	
6	<i>Chlaenius bimaculatus</i>	22	0.055276382	-2.895409552	-0.160047764	
7	<i>Scarites subterraneus</i>	24	0.060301508	-2.808398175	-0.169350644	
8	<i>Harpalus affinis</i>	20	0.050251256	-2.990719732	-0.150287424	
9	<i>Chlaenius bengalensis</i>	15	0.037688442	-3.278401804	-0.123557857	
10	<i>Pheropsophus Spp.</i>	29	0.072864322	-2.619156175	-0.190843038	
11	<i>Aulacophora indica</i>	48	0.120603015	-2.115250994	-0.255105648	
12	<i>Aplosonyx Spp</i>	23	0.057788945	-2.850957789	-0.164753842	
13	<i>Asphaera lustrans</i>	31	0.077889447	-2.552464801	-0.198810072	
14	<i>Cycloneda sanguinea</i>	12	0.030150754	-3.501545355	-0.105574232	
15	<i>Delphastus pusillus</i>	7	0.01758794	-4.040541856	-0.071064807	
16	<i>Harmonia axyridis</i>	6	0.015075377	-4.194692536	-0.063236571	
17	<i>Hydrophilus piceus</i>	5	0.012562814	-4.377014093	-0.054987614	
18	<i>Trachypachus inermis</i>	30	0.075376884	-2.585254624	-0.194868439	
19	<i>Opatrum sabulosum</i>	18	0.045226131	-3.096080247	-0.14002373	
20	<i>Charagmus Spp.</i>	8	0.020100503	-3.907010464	-0.078532874	
21	<i>Odoiporus longicollis</i>	4	0.010050251	-4.600157644	-0.04623274	
22	<i>Centaharis pellucida</i>	16	0.040201005	-3.213863283	-0.129200534	
23	<i>Monochamus Spp</i>	9	0.022613065	-3.789227428	-0.085686047	
	TOTAL---	N= 398			-2.950367305	

Table 5: Result of Simpson's index, Simpson diversity index and Simpson's reciprocal index for beetle diversity

SI No.	Species	No. of Species(n)	Simpson Index index(D)	Simpson's diversity index (1 - D)	Simpson's reciprocal index (1/D)
1	<i>Xylotrupes gideon</i>	4	7.59465E-05	0.942305988	17.33282141
2	<i>Adoretus ictericus</i>	12	0.000835411		
3	<i>Heteronychus arator</i>	11	0.000696176		
4	<i>Copris Spp.</i>	27	0.004442869		
5	<i>Onthophagus unifasciatus</i>	17	0.001721454		
6	<i>Chlaenius bimaculatus</i>	22	0.00292394		
7	<i>Scarites subterraneus</i>	24	0.003493538		
8	<i>Harpalus affinis</i>	20	0.002404972		
9	<i>Chlaenius bengalensis</i>	15	0.001329063		
10	<i>Pheropsophus Spp.</i>	29	0.005139045		
11	<i>Aulacophora indica</i>	48	0.014277939		
12	<i>Aplosonyx Spp</i>	23	0.00320241		
13	<i>Asphaera lustrans</i>	31	0.005885852		
14	<i>Cycloneda sanguinea</i>	12	0.000835411		
15	<i>Delphastus pusillus</i>	7	0.000265813		
16	<i>Harmonia axyridis</i>	6	0.000189866		
17	<i>Hydrophilus piceus</i>	5	0.000126577		
18	<i>Trachypachus inermis</i>	30	0.00550612		
19	<i>Opatrum sabulosum</i>	18	0.001936635		
20	<i>Charagmus Spp.</i>	8	0.000354417		
21	<i>Odoiporus longicollis</i>	4	7.59465E-05		
22	<i>Centaharis pellucida</i>	16	0.00151893		
23	<i>Monochamus Spp.</i>	9	0.000455679		
	TOTAL ---	N = 398	D = 0.057694012		

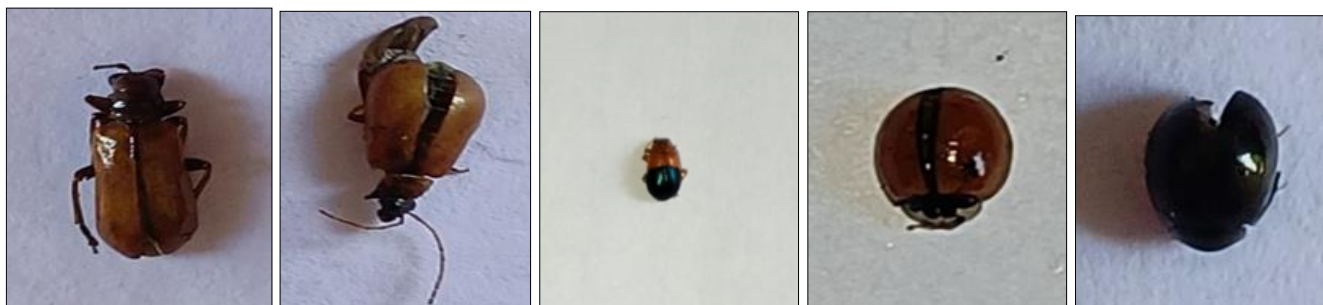
1: *Xylotrupes gideon* 2: *Adoretus ictericus* 3: *Heteron arator* 4: *Corpis Spp* 5: *Onthophagus unifasciatus*



6: *Chlaenius Spp.* 7: *Scarites subterraneus* 8: *Harpalaus affinis* 9: *Chlaenius bengalensis* 10: *Pheropsophus spp.*



11: *Aulacophora indica* 12: *Aplosonyx Spp.* 13: *Asphaera lustrans* 14: *Cycloneda sanguinea* 15: *Delphastus pusillus*



16: *Harmonia axyridis* 17: *Hydrophilus piceus* 18: *Trachypachus inermis* 19: *Opatrum sabulosum* 20: *Charagmus Spp.*



21: *Odoiporus longicornis* 22: *Centaharis pellucida* 23: *Monochamus Spp.*

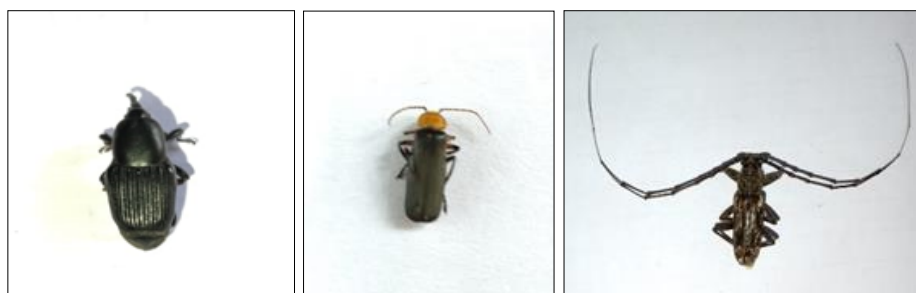


Fig 3: Pictures of Beetles collected from all the three study sites of Dalbari area

Discussion and Conclusion

There is a variety of 23 species of beetles were collected and identified which belongs 10 families in the three study sites. The result shows that Carabidae and Scarabaeidae are the most dominant families of beetle found in Dalbari area. Among those families, some families like Scarabaeidae, Carabidae, Chrysomelidae and Coccinellidae which possess great ecological significance. The Scarabaeidae beetles are also known as Scarab beetle or dung beetle, abundantly found in Northeast Indian biogeographic region (Bhattacharyya *et al.*, 2016, Haridas *et al.*, 2022)^[15, 16]. In the present study altogether 5 species of the scarab beetles

belonging to 5 different genera were found, out of which *Xylotrupes gideon* is the largest one also known as Rhinoceros beetle. This beetle is very essential for nutrient cycling and productivity because they feed on dungs and faces (Maddonado *et al.*, 2019, Hajji *et al.*, 2024). Among the Carabidae beetles or ground beetles there are 5 species belonging to 5 different genera were spotted and collected. They are considered as very important for agricultural crops because they feed on various crop destroying pests (Slipinski *et al.*, 2011)^[19]. Leaf beetles or Chrysomelidae are sometimes considered as pest for some crops but they serve as a direct indicator of biodiversity (Kalaichelvan,

2000). Coccinellids or ladybirds, are members of family Coccinellidae, and are amongst the most familiar beetles known variously as lady birds. In present study, there are about 3 species belonging to 3 different genera have collected and identified.

In this study, variety of biodiversity indicating measures were calculated for beetle's diversity like Shannon–Wiener index, Simpson's index, Simpson's diversity index and Simpson's reciprocal index.

The result of Shannon – Wiener diversity index is 2.9, which shows a moderate diversity of beetles. On the other hand, the value of Simpson's index or Simpson's dominance index is 0.0577, which shows minimum or no dominance of some of particular species of beetle. 0.0942 is the value of Simpson's diversity index, which indicates a significant diversity of beetle in the study area. Simpson's reciprocal index is 17.3 which shows a moderate evenness and richness in the study site.

Hence, it can be said that the diversity, number of abundances, Species richness and Species evenness of beetle diversity of the study area is still good and significant, rather the area is a sub-town area, basically the Dalbari village and Barigaon village still have significant plant diversity and also some of people are still associated with agricultures and these are the reasons of having a good ecosystem and biodiversity.

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