

Research Article

ON SOME AGRICULTURALLY IMPORTANT PHYTOPHAGOUS SCARABAEIDAE (INSECTA: COLEOPTERA) FROM LOWER GANGETIC PLAINS OF WEST BENGAL, INDIA

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ABSTRACT

This study provides an inventory of scarab beetles (Scarabaeidae) in the Lower Gangetic Plains of West Bengal, India, based on field surveys and collections housed at the Zoological Survey of India, Kolkata, India. A total of 32 species, distributed across 19 genera, 9 tribes, and 5 subfamilies, were identified. Notably, *Popillia birmanica* Arrow and *Xylotrupes mnischei mnischei* Thomson are newly recorded scarab beetles from the West Bengal state. Our findings contribute to a better understanding of scarab beetle diversity in this region and underscore the importance of effective pest management strategies to mitigate potential negative impacts.

Keywords: Taxonomy, Scarabaeidae, Diversity, New Records. *Popillia birmanica*.

INTRODUCTION

The Scarabaeidae family, a prominent member of the Scarabaeoidea superfamily, is one of the largest within the Coleoptera order. Globally, it encompasses a staggering diversity of approximately 36,313 species, distributed across 24 subfamilies and 106 tribes. India, in particular, is home to around 2,250 species (Schoolmasters, 2024; Gupta *et al.*, 2018). Scarab beetles are characterized by their distinctive lamellate antennae, typically composed of 8 to 11 segments. The final three antennomeres form plate-like structures that can either expand or contract into a compact club. Despite their varied sizes, scarab beetles play significant roles in ecosystems. While some, such as dung-dwelling species (Scarabaeinae and Aphodiinae), are beneficial to humans due to their contributions to nutrient cycling, others, particularly phytophagous chafers (Sericinae, Rutelinae, Dynastinae, Melolonthinae, and Cetoniinae), can be detrimental. The larvae of many phytophagous scarab beetles are soil-dwelling and feed on plant roots, posing a threat to agricultural crops. However, some larvae, especially those of Cetoniinae and Dynastinae, contribute positively to soil health by decomposing organic

matter. Among the harmful species, *Popillia cupricollis* Hope is a particularly significant pest (Nutan *et al.*, 2022).

Previous studies in West Bengal have explored various aspects of scarab beetle diversity, including those by Chatterjee and Biswas, 1995; Ghosh and Bhunia, 2016; Sarkar *et al.*, 2017, 2018, 2019; Das *et al.*, 2020; Bhunia *et al.*, 2023. To further enhance our understanding of scarab beetle diversity in the region, we conducted comprehensive field surveys in the Lower Gangetic Plains of West Bengal between 2021 to 2024. This paper aims to investigate phytophagous scarab beetles collected during these surveys.

MATERIAL AND METHODS

Study Area

The Lower Gangetic Plains of West Bengal are renowned for their fertile alluvial soil and diverse ecosystems, making them a critical region for agricultural and ecological research (Singh, 2012). The Lower Gangetic Plains of West Bengal are renowned for their fertile alluvial soil and

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diverse ecosystems, making them a critical region for agricultural and ecological research. This region encompasses several districts: Darjeeling, Jalpaiguri, Cooch Behar, Alipurduar, Malda, Uttar Dinajpur, Dakshin Dinajpur, Bankura, Birbhum, Jhargram, Murshidabad, Nadia, Purba Bardhaman, Paschim Bardhaman, West Midnapore, East Midnapore, Hooghly, Howrah, and Kolkata. The plains are intersected by numerous rivers and tributaries, including the Hooghly, Teesta, and Damodar. These waterways contribute to the region's rich wetland ecosystems and the deposition of fertile alluvial soil, making it one of India's most agriculturally productive areas. The average elevation of the Lower Gangetic Plains is relatively low, generally below 100 meters above sea level.

Collection and Preservation

Specimens for this study were collected using light traps and sweeping nets. They were euthanized using benzene vapors and subsequently preserved as dry pinned specimens. Species identification was achieved through a combination of literature review and comparison with reference collections housed at the Zoological Survey of

India, Kolkata. All specimens have been deposited at the Zoological Survey of India for future reference. Furthermore, species newly recorded for the state of West Bengal are documented in this study, significantly expanding our understanding of the region's biodiversity. The detailed list of survey localities is given in Table 1.

Abbreviations used in Manuscript

Indian states: Andhra Pradesh: AP, Arunachal Pradesh: AR, Assam: AS, Bihar: BR, Chhattisgarh: CG, Delhi: DL, Jharkhand: JH, Karnataka: KA, Kerala: KL, Madhya Pradesh: MP, Maharashtra: MH, Manipur: MN, Meghalaya: ML, Mizoram: MZ, Odisha : OR, Punjab: PB, Sikkim: SK, Tamil Nadu: TN, Tripura: TR, Uttarakhand: UK, Uttar Pradesh: UP, West Bengal: WB, Tamil Nadu: TN, Tripura: TR, Andaman and Nicobar Islands: AN, Himachal Pradesh: HP, Jammu & Kashmir: JK. Countries: Afghanistan: AF, Australia: AU, Bangladesh: BD, Bhutan: BT, Cambodia: KH, China: CN, India: IN, Indonesia: ID, Japan: JP, Laos: LA, Madagascar: MG, Mauritius: MU, Myanmar: MM, Malaysia: MY, Nepal: NP, Philippines: PH, Pakistan: PK, Sri Lanka: LK, Singapore: SG, Thailand: TH, Taiwan: TW, South Korea: SK, Vietnam: VN.

Table 1. List of survey localities in the Lower Gangetic Plains of West Bengal during the study period.

Sl. No.	District	Protected Area	Locality	Latitude (N)	Longitude (E)
1.	Darjeeling	Mahananda Wildlife Sanctuary	Gulma Beat Office	26.80472	88.40528
2.	Alipurduar	Buxa Tiger Reserve	Rajabhatkhawa	26.61692	89.52806
3.	Birbhum	Ballavpur Wildlife Sanctuary	-	23.58429	87.11695
4.	Darjeeling	Mahananda Wildlife Sanctuary	Watch Tower Murti,	26.82222	88.52083
5.	Jalpaiguri	Gorumara National Park	Churachandrapur Watch Tower	26.756348	88.797415
6.	Burdwan	Ramnabagan Wildlife Sanctuary	-	23.15199	87.51038
7.	North Dinajpur	Kulik Wildlife Sanctuary	Forest Rest House Campus West Range,	25.63487	88.11861
8.	Alipurduar	Buxa Tiger Reserve	Damanpur, West Gram	25.38101	88.0709 ¹
9.	Bankura	Bankura	Gangajalghati	23.42330	87.11409
10.	Kolkata	Kolkata	Saltlake	22.57971	88.41430
11.	Bankura	Bankura	Birsinghapur	23.13343	87.09007
12.	Jalpaiguri	Gorumara National Park	-	26.75641	88.79755
13.	Jalpaiguri	Sonali tea estate	-	26.54045	88.71939
14.	Bankura	Saltora	-	23.22080	87.10114
15.	North 24 Parganas	Bibhutibhushan Wildlife Sanctuary	-	23.32508	88.23303
16.	North 24 Parganas	Bibhutibhushan Wildlife Sanctuary	Parmadan Forest Rest House	23.186044	88.762371
17.	Birbhum	Ballavpur Wildlife Sanctuary	-	23.58061	87.12612
18.	Bankura	Sonabera	-	23.233774	87.087250
19.	Birbhum	Ballavpur Wildlife Sanctuary	Jheel Tower	22.31432	88.17614

RESULTS AND DISCUSSION

This study documents a total of 32 scarab beetle species belonging to 19 genera, 9 tribes, and 5 subfamilies (Melolonthinae, Sericinae, Rutelinae, Cetoniinae, and Dynastinae) within the Lower Gangetic Plains of West Bengal. Among these, *Popillia birmanica* Arrow and *Xylotrupes mniszechi mniszechi* Thomson are new records for the state. The Rutelinae subfamily is the most dominant, with 11 species, followed by Sericinae (10 species), Dynastinae (5 species), Cetoniinae (4 species), and Melolonthinae (2 species). The genus *Anomala* is the most represented, with 6 species, followed by *Maladera* (5

species), *Adoretus*, *Gynaecoserica*, *Popillia*, and *Gametis* (2 species each), and *Holotrichia*, *Lasioserica*, *Pachyserica*, *Melolontha*, *Adorrhinyptia*, *Xylotrupes*, *Oryctes*, *Alisontum*, *Heteronychus*, *Phyllognathus*, *Glycosia*, *Protaetia* (1 species each) (Table 2). Several of these species are known agricultural pests. For example, *Holotrichia serrata* is a serious pest of sugarcane and French beans (Ramanujam, 2020; Sreedevi *et al.*, 2021). *Xylotrupes* spp. are polyphagous and have been reported to damage *Acacia mearnsii*, *Hevea brasiliensis* and *Toona australis*. *Oryctes rhinoceros* is known to damage banana fruits, date palms, and coconuts (Sivakumar, 2013; Yadav, 1987).

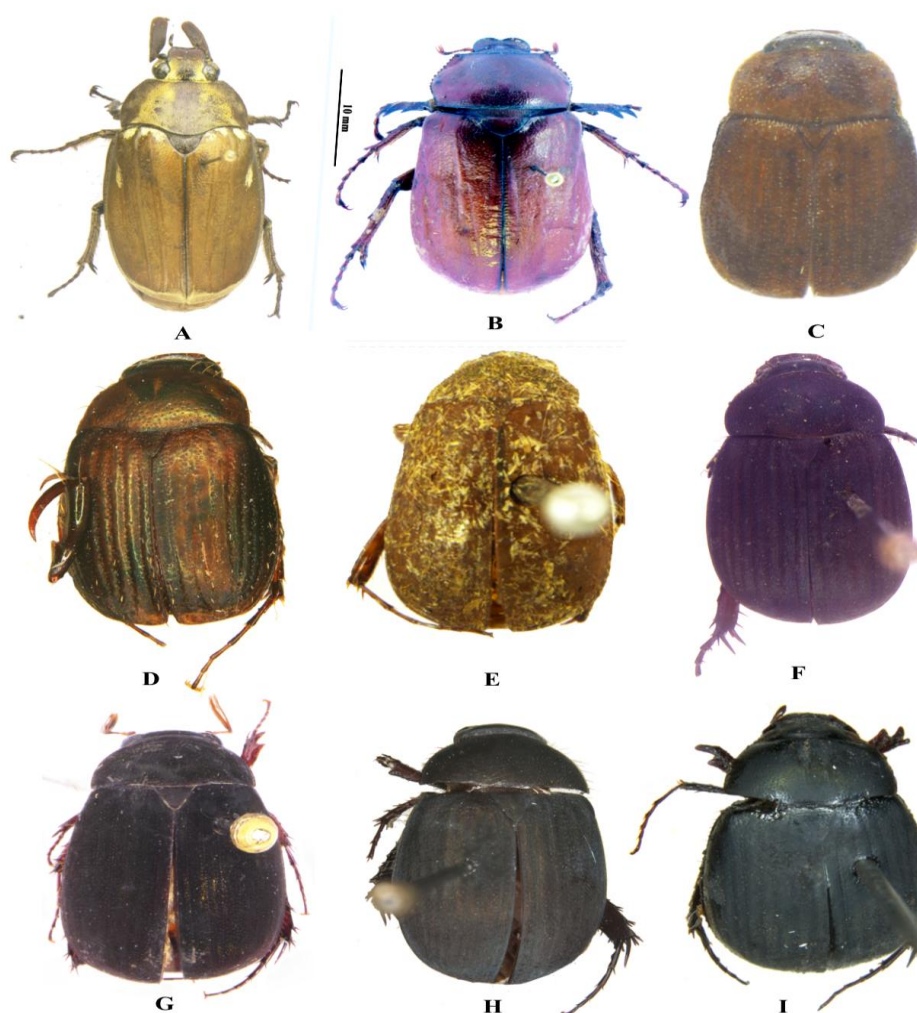


Figure 1. A. *Melolontha guttigera* Sharp, 1876; B. *Holotrichia serrata* (Fabricius, 1787); C. *Gynaecoserica cymosa* (Brenske, 1896); D. *Gynaecoserica perdita* Ahrens, 2004; E. *Lasioserica thoracica* Brenske, 1898; F. *Maladera paraquindens* Ahrens, 2004; G. *Maladera festina* (Brenske, 1899); H. *Maladera proxima* (Burmeister, 1855); I. *Maladera kolkataensis* Bhunia, Gupta, Sarkar and Ahrens 2023.

Table 2. Species List of Phytophagous Scarabaeidae from Lower Gangetic Plains of West Bengal, India.

Sl. No.	Species	Specimen records	Distribution	
	Subfamily Melolonthinae		India	Outside
1.	<i>Melolontha guttigera</i> Sharp, 1876 (Figure: 1A)	Darjeeling, 1 ex., 28.iii.2018, leg. A.R. Kumar; Alipurduar, Buxa Tiger Reserve, Rajabhatkhawa, 1 ex., 17. x. 2018, leg. S. Chand.	SK, WB	NP
2.	<i>Holotrichia serrata</i> (Fabricius, 1787) (Figure: 1B)	Ballavpur Wildlife Sanctuary, 06.xii.2021, 2 exs., leg. Jasmin P.	AP, AS, HR, HP, MH, MZ, SK, UP, WB	LK
	Subfamily Sericinae			
3.	<i>Gynaecoserica cymosa</i> (Brenske, 1896) (Figure: 1C)	Darjeeling, Mahananda Wildlife Sanctuary, 7 exs, 28.iv.1971, leg. A. R Bhowmik.	ML, SK, WB	-
4.	<i>Gynaecoserica perdita</i> Ahrens, 2004 (Figure: 1D)	Darjeeling, Mahananda Wildlife Sanctuary, Laltong Watch Tower, 2 exs., 7.xi.2017, leg. S. Chand.	WB	-
5.	<i>Lasioserica thoracica</i> Brenske, 1898 (Figure: 1E)	Darjeeling, Mahananda Wildlife Sanctuary, Laltong Watch Tower, 2 exs. 7.xi.2017, leg. S. Chand.	SK, and WB	NP
6.	<i>Maladera paraquinquidens</i> Ahrens, 2004 (Figure: 1F)	Darjeeling, Mahananda Wildlife Sanctuary, Laltong Watch Tower, 2 exs., 7.xi.2017, leg. S. Chand.	SK, WB	BT
7.	<i>Maladera festina</i> (Brenske, 1899) (Figure: 1G)	Darjeeling, Mahananda Wildlife Sanctuary, Laltong Watch Tower, 2 exs., 7.xi.2017, leg. S. Chand.	SK, WB	NP
8.	<i>Maladera proxima</i> (Burmeister, 1855) (Figure: 1H)	Darjeeling, Mahananda Wildlife Sanctuary, Gulma Beat Office, 2 exs., 7.xi.2017, leg. S. Chand.	TN, KL, WB	
9.	<i>Maladera kolkataensis</i> Bhunia, Gupta, Sarkar and Ahrens 2023 (Figure: 1I)	Kolkata, Saltlake, 1 ex., 24.ix.2024, leg. Debika Bhunia.	WB	
10.	<i>Maladera affinis</i> (Blanchard, 1850) (Figure: 2A)	North 24 Parganas, Bibhutibhushan Wildlife Sanctuary, Parmadan Forest rest House, 10.x.2023, 2 exs., leg. P. Jasmin.	AS, BR, TR, UK, UP, WB	BD, MM NP, PK, MG
11.	<i>Maladera himalayica himalayica</i> (Brenske, 1896)	Darjeeling, Mahananda Wildlife Sanctuary, Laltong Watch Tower, 7.xi.2017, 2 exs., leg. S. Chand.	RJ, SK, TN, and WB	-
12.	<i>Pachyserica stabilis</i> Ahrens, 2004 (Figure: 2B)	Darjeeling, Mahananda Wildlife Sanctuary, Gulma	SK, WB	-

		Beat Office, 1 ex., 28.iii.2018, leg. A. Kumar.		
	Subfamily Rutelinae			
13.	<i>Adorrhinyptia dorsalis</i> (Burmeister, 1855) (Figure: 2C)	Purba Bardhaman, 1 exs, 01.iii.2022, leg. D. Bhunia (NZSI).	BR, HR, MH, PB, and WB	BD, MM, NP, and PK
14.	<i>Adoretus costopilosus</i> Ohaus, 1914 (Figure: 2D)	Burdwan, Stn 11, Ramnabagan WLS, 1 exs, 15.ix.2023, leg. D. Bhunia (NZSI).	AN, HP, UK, UP, SK, ML, PB and WB	BD, MM, and NP
15.	<i>Adoretus versutus</i> Harold, 1869 (Figure: 2E)	North Dinajpur, Kulik WLS, FRH Campus, 1 exs, 15.ix. 2023, leg. S.Dey (NZSI); Alipurduar, Buxa Tiger Reserve, W. Range, Damanpur, West gram, 3exs, 03. xi. 2018, leg. M. E. Hassan (NZSI).	AN, AP, BR, HR, KL, MP, UP, WB, JK, UK	ID, MG, MU
16.	<i>Anomala bengalensis</i> Blanchard, 1851 (Figure: 2F)	Bankura, Gangajalghati, 3exs, 17.v.2023, leg. P.Ghosh (NZSI).	AP, BR, CG, HR, HP, JH, DL, KA, MP, MH, ML, RJ, TN, UP, UK, WB	BD and MM
17.	<i>Anomala biharensis</i> Arrow, 1917 (Figure: 2G)	Bankura, Birsinghapur, 1 exs, 14.v.2023, leg. P. Ghosh (NZSI).	BR, CG, HR, MP, UP, MH, TN, UK, WB	NP
18.	<i>Anomala perplexa</i> (Hope, 1839) (Figure: 2H)	Jalpaiguri, Sonali tea estate, 07. xi. 2014 02 exs, leg. B.Mitra and Party(NZSI).	AS, AR, ML, UP, SK, WB	BT, CN, MM
19.	<i>Anomala rufiventris</i> Kollar and Redtenbacher, 1848	Jalpaiguri, Gorumara National Park, Murti, Churachandrapur watch tower, 150ft, 22. ix. 2019 01 exs, leg. S. K. Das.	AS, HR, MN, ML, MZ, Up, WB, HP, JK, SK, UK	NP, VT, BT, CN
20.	<i>Anomala varicolor</i> (Gyllenhal, 1817) (Figure: 2I)	Bankura, Saltora, 1 exs, 12.v.2023, leg. P. Ghosh (NZSI).	AN, AS, BR, CG, HR, HP, MP, MH, MN, OR, PB, SK, TN, TR, UK, UP, UK, WB	BD, BT, CN NP, LK, TW
21.	<i>Anomala xanthoptera</i> Blanchard, 1851 (Figure: 3A)	Darjeeling, Mahananda WLS, Laltong Watch Tower, 2 exs, 07.xi.2017, leg. S. Chand and Party (NZSI).	HP, UK, SK, WB	NP and PK
22.	<i>Popillia birmanica</i> Arrow, 1913* (Figure: 3B)	North Dinajpur, Kulik WLS, FRH Campus, 2 exs, 07.xi.2017, leg. S. Chand and Party (NZSI).	AS, TR, WB	MM, NP.
23.	<i>Popillia cupricollis</i> Hope, 1831 (Figure: 3C)	Darjeeling, Mahananda WLS, Gulma Beat Office, 1exs, 28.iii.2018, leg. A. Ramesh Kumar. (NZSI).	AS, AR, HR, HP, JK, PB, ML, SK, UK, UP, WB	NP
	Subfamily: Dynastinae			
24.	<i>Oryctes</i> <i>rhinoceros</i> (Linnaeus, 1758)	24 P.G. (N) Dist., Bibhutibhushan WLS	KA, KL, MP, MH, OR, TN, WB	PK, BD, LK, MM, TH, MY, ID, KH,

		(Parmadan), FRH, 10.xii.2023, 2 exs, leg. S. Dey (NZSI).		SKR, TW, VN.
25.	<i>Xylotrupes mnischechi mnischechi</i> Thomson, 1859* (Fig: 3D)	24 P.G (N) Dist., Bibhutibhushan WLS, 13.xii.2023, 2ex, leg. P. Jasmin (NZSI).	KL, MP, UK, SK, WB	LK
26.	<i>Alissonotum crassum</i> Arrow, 1908	Birbhum, Ballavpur, Amar kutir, 1exe, 21. ix. 2024, leg. Debika Bhunia (NZSI).	AS, BR, MN, ML, WB, SK	PK, TW, MM, BD
27.	<i>Heteronychus lioderes</i> Redtenbacher, 1868 (Figure: 3E)	24 P.G (N) Dist., Bibhutibhushan WLS, 15m, 14.xii.2021, 1 ex., leg. K. Rajmohana and Party; Nalban, Salt Lake City, 10. x.2022. 1 ex., leg. Debika Bhunia (NZSI).	AN, CG, HR, HP, KA, ML, MZ, MP, MH, MN, ML, MZ, OR, SK, TR, UP, UK, WB	PK, ID, MY, MM, TH, NP.
28.	<i>Phyllognathus dionysius</i> (Fabricius, 1792)	24 P.G (N) Dist., Bibhutibhushan WLS, 15m, 14.xii.2021, 1 ex., leg. K. Rajmohana and Party (NZSI).	AP, BR, CG, HR, HP, KA, MP, OR, SK, UP, UK, WB	MM, NP, LK, TW
Subfamily: Cetoniinae Leach, 1815				
29.	<i>Clinteria spilota</i> (Hope, 1831) (Figure: 3F)	Jalpaiguri, Mahananda, Sukna, 28.x.2022, 1 ♂, leg. Debika Bhunia Party (NZSI).	HP, JK, SK, UP, WB	NP
30.	<i>Gametis jucunda</i> (Faldermann, 1835) (Figure: 3G)	North Dinajpur, Kulik WLS, FRH Campus, 13.xii.2021, 2ex, leg. K. Rajmohana and Party (NZSI); Chhindwara: Totladoh 17.ix.2001, 1 exs, leg. S.K. Mishra (NZSI).	HR, HP, MN, ML, SK, WB, MH, ML, and UK	BD, CN, JP, MM, NP, and SK
31.	<i>Gametis versicolor</i> (Fabricius, 1775) (Figure: 3H)	Bankura, Sonabera; 13. vii. 2011, 1 exs, leg. B.Mitra Party (NZSI); Birbhum, Ballavpur WLS, Jheel tower, 2exs, 19.ix. 2022, leg. R. Chakraborty (NZSI).	AP, CG, DL, HR, HP, MP, MH, PB, KA, MP, TN, UP, UK, WB	AF, PK, BD, BT, MU, MG, LK
32.	<i>Protaetia aurichalcea</i> (Fabricius, 1775) (Figure: 3I)	Birbhum, Ballavpur, Amar kutir; Kolkata, New Alipore, 1ex, 21. ix. 2024, leg. Debika Bhunia.	BR, MP, TN, WB	MU, LK.

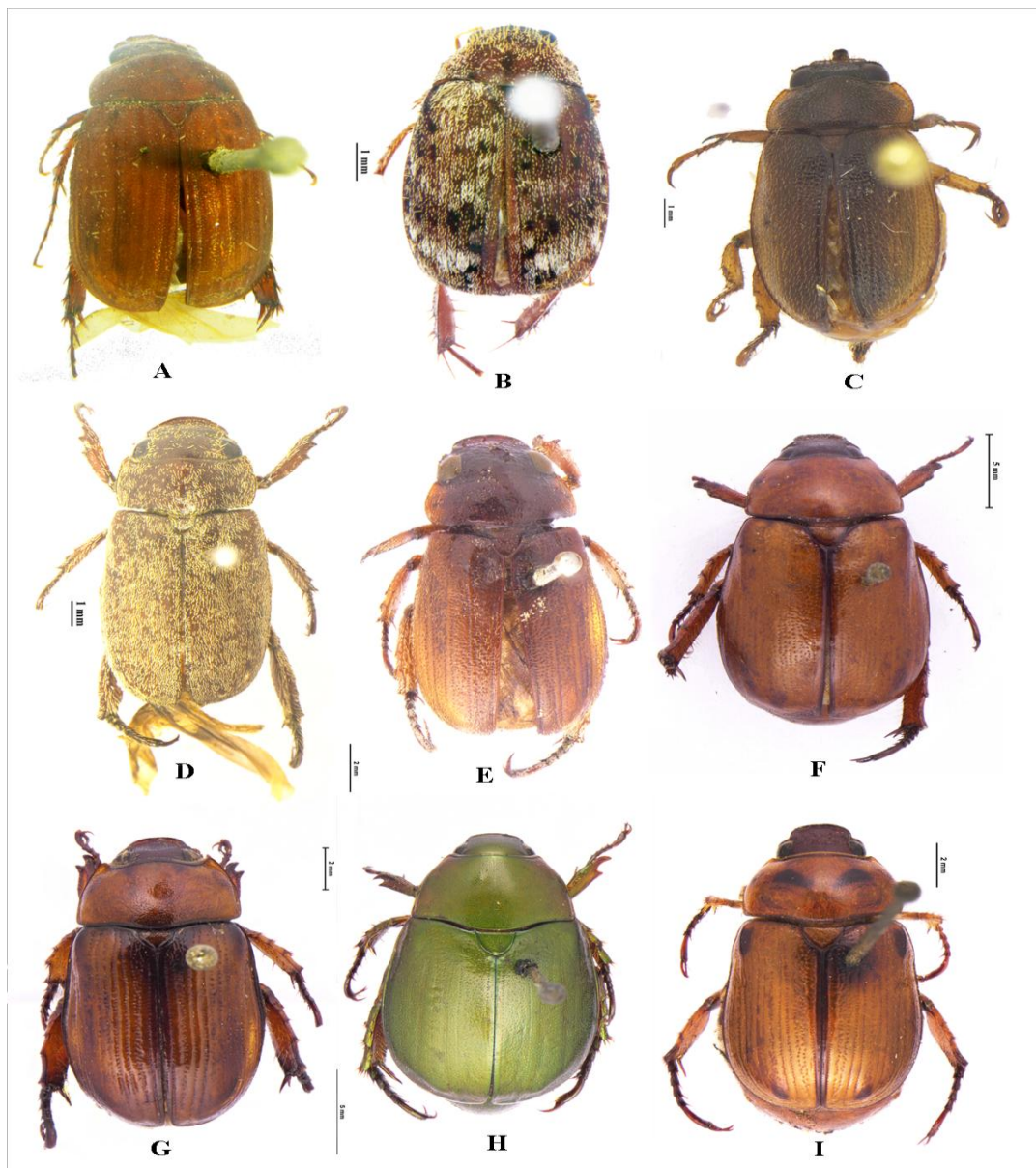


Figure 2. A. *Maladera affinis* (Blanchard, 1850); B. *Pachyserica stabilis* Ahrens, 2004; C. *Adorrhinyptia dorsalis* (Burmeister, 1855); D. *Adoretus costopilosus* Ohaus, 1914; E. *Adoretus versutus* Harold, 1869; F. *Anomala bengalensis* Blanchard, 1851; G. *Anomala biharensis* Arrow, 1917; H. *Anomala perplexa* (Hope, 1839); I. *Anomala varicolor* (Gyllenhal, 1817).



Figure 3. A. *Anomala xanthoptera* Blanchard, 1851; B. *Popillia birmanica* Arrow, 1913; C. *Popillia cupricollis* Hope, 1831; D. *Xylotrupes mnischechi mnischechi* Thomson, 1859; E. *Heteronychus lioderes* Redtenbacher, 1868; F. *Clinteria spilota* (Hope, 1831); G. *Gametis jucunda* (Faldermann, 1835); H. *Gametis versicolor* (Fabricius, 1775); I. *Protaetia aurichalcea* (Fabricius, 1775)

CONCLUSION

The present study enriches the existing knowledge of scarab beetle diversity in the Lower Gangetic Plains of West Bengal by documenting 32 species across 19 genera, 9 tribes, and 5 subfamilies. The identification of *Popillia birmanica* and *Xylotrupes mniszechi mniszechi* as new records for the state highlights the dynamic and still partially unexplored nature of the region's beetle fauna. These findings not only enhance our understanding of local biodiversity but also emphasize the need for continuous monitoring and effective pest management strategies to address the potential agricultural and ecological impacts of scarab beetles. Future research should focus on long-term ecological studies and integrated pest management approaches to sustainably conserve biodiversity while protecting local livelihoods.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

AI TOOL DECLARATION

The authors declares that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

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