

Studies on a Collection of Family Scarabaeidae (Coleoptera: Insecta) from Nagaland, India

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Abstract Scarab beetles are a group of insects under the family Scarabaeidae belonging to superfamily Scarabaeoidea of Order Coleoptera. The family includes 33,504 species globally, out of which about 2,211 species are reported from India. The state Nagaland, situated in the Northeast biogeographic zone of India, has been less explored and less information is published for scarab beetles. The specimens for the study were collected using light trap and from dungs, waste matter, and carrion. The study revealed a total of 62 species belonging to 34 genera and 5 subfamilies of family Scarabaeidae from Nagaland state, India. Five species: *Catharsius molossus* (Linnaeus, 1758), *Paracopris punctulatus* (Wiedemann, 1823), *Liatongus mergacerus* (Hope, 1831), *Liatongus vertagus* (Fabricius, 1798) [Scarabaeinae], and *Anomala varicolor* (Gyllenthal, 1817) [Rutelinae] are reported for the first time from the state. Scarabaeinae (16 species) was the dominant subfamily followed by Melolonthinae, Rutelinae, Cetoniinae, and Dynastinae. *Maladera* is the dominant genus with 8 species. This study documented the present status and diversity of scarab beetles in Nagaland that will help in the proper conservation of scarab beetle diversity in future. The species from Intanki National Park were studied for the first time. The forests, vegetation, and wildlife of Nagaland state should be appropriately conserved otherwise, the diversity and abundance of faunal and floral diversity may be affected.

Keywords Chafers, Dung Beetles, New Distributional Record, Checklist

1. Introduction

Scarabaeidae under the superfamily Scarabaeoidea is one of the largest families of Coleoptera that can be easily identified by their characteristic lamellate antennae. The

family consists of 33,504 species, of which approximately 2,211 species are known from India [1-2]. The beetles in this family extend from less than 2 mm to more than 10 cm in length [3]. Some species, especially their males, have extravagant horns or mandibles [4]. The dung beetles in subfamily Scarabaeinae are very famous in Egyptian mythology as their behaviour of rolling balls of dung is known as a symbol for the sun moving across the sky in the prehistoric period [5]. The beetles consist of economically significant chafers that act as serious pests of agriculture, forest and fruit trees. In contrast, the dung beetles act as scavengers by feeding on dung and decaying vegetative and animal matters. Among the chafers, dynastines feed on stems or roots, cetoniines feed on sap, fruit and flowers, while the scarabs under subfamily Rutelinae feed on foliage, fruit and flowers, and Melolonthine scarabs feed on foliage [6]. Larvae of chafers feed on soil humus, live in decay woods and debris in hollow of trees [7]. The knowledge of Scarabaeidae from Northeast biogeographic zone of India is mainly known from the various workers [8-29]. In the case, Nagaland state, very less information is published so far for scarab beetles. Therefore, this paper aims to study the materials collected in the recent surveys and the specimens present in Coleoptera Section of Zoological Survey of India to provide an account of family Scarabaeidae from this state.

2. Materials and Methods

2.1. Study Area

Nagaland state between 26.1584°N latitudes, and 94.5624°E longitudes, biogeographically situated in North-eastern parts of India, bordering Assam to the west, Arunachal Pradesh and Assam to the north, Myanmar to the east, and Manipur to the south. Its capital is Kohima, while the largest city is Dimapur. It has an area of 16,579

sq. km. The species reported from Nagaland are taken from different literature are provided in the table. The samples examined were collected from the following sites: Zunheboto, Mokukchung, Intanki National Park, Wokha, Kohima, and Medziphema. The species that are listed from literature are: *Serica nagana* Brenske, 1899, *Maladera satrapa* (Brenske, 1898), *M. garoana* Ahrens & Fabrizi, 2016, *M. jaintiaensis* Ahrens & Fabrizi, 2016, *M. murzini* Ahrens, 2004, *M. profana* Ahrens & Fabrizi, 2016, *M. pseudohongkongica* Ahrens & Fabrizi, 2016, *M. siniaevi* Ahrens, 2004, *M. subspinoso* (Brenske, 1898), *Neoserica speciosa* Brenske, 1898, *Cheirotonus gestroi gestroi* Pouillaude, 1913, *C. parryi* Gray, 1848, *Cyphochilus candidus* (Olivier, 1789), *Lepidiota stigma* (Fabricius, 1798), *Anomala indistincta* Arrow, 1917, *A. merula* Arrow, 1917, *Popillia amabilis* Arrow, 1913, *P. patricia* Arrow, 1917, *P. subquadrata* Kraatz, 1892, *Parastasia rufopicta* Westwood, 1842, *Eophileurus (Eophileurus) planatus* (Wiedemann, 1823), *Xylotrupes gideon* (Linnaeus, 1767), *Cetonia (Indocetonia) laeviventris* Arrow, 1910, *Protaetia (Protaetia) caudata* Arrow, 1910, *Coenochilus gracilipes* Mos, 1910, *Rhomborrhina resplendens ssp. heros* (Gory & Percheron, 1833), *Torynorrhina distincta* (Hope, 1841), *T. hyacinthina* (Hope, 1841), *Trigonophorus (Trigonophorus) nepalensis* Hope, 1831, *Philistina (Cephalocosmus) microphylla* (Wood-Mason, 1881), *Thaumastopeus nigrinus* (Fröhlich, 1792), *Euselates perraudieri* (Fairmaire, 1893), *E. quadrilineatus* (Hope, 1831), *Taeniodera flavofasciata* (Moser, 1901), and *T. nigricolis* (Janson, 1881).

2.2. Collection and Preservation

3. Results

Table 1. Checklist of family Scarabaeidae known from Nagaland state, India

S. N.	Taxa	Distribution in Nagaland/Specimens records	Distribution in other Indian states and abroad
	Family Scarabaeidae Subfamily Scarabaeinae Tribe Coprini		
1	<i>Catharsius molossus</i> (Linnaeus, 1758)*	Sumi: Zunheboto; Naga Hills, 05.ix.1915 (2♂), 15.vii.1991 (2♂, 3♀).	AN, AP, AR, BR, CG, GJ, HR, HP, KA, KL, MP, MH, ML, OD, RJ, SK, TR, UP, UK, WB; AF, BD, KH, CN, LA, MY, NP, LK, TH, TL, VN.
2	<i>Catharsius birmanensis</i> Lansberge, 1874	Zunheboto, Kokesha, 15.vii.1991 (1♂, 1♀).	HR, HP, PB, RJ, SK, TR, UP, WB; MM, LA, TH.
3	<i>Copris (Copris) corpulentus</i> Gillet, 1910	Dimapur: Jharnapani; Peren, Intanki National Park, Munglumukh, 27.iii.2017 (1♀).	AS, AR, GJ, MN, ML, RJ, UP, WB; MM, VN.
4	<i>Copris (Copris) magicus</i> Harold, 1881	Mokokchung; Kohima: Naga Hills; Peren, Intanki National Park, Munglumukh, 25.iii.2017 (1♂, 1♀).	AP, AR, AS, MN, ML, MZ, NL, SK, WB; CN, LA, MM, NP, TH, VN.
5	<i>Paracopris punctulatus</i> (Wiedemann, 1823)*	Peren, Intanki National Park, Munglumukh, 27.iii.2017 (2♀).	AS, ML; KH, ID, LA, MY, MM, TH, VN.
6	<i>Synapsis tridens</i> Sharp, 1881	Wokha: Koio village, 24.i.1990 (1♂).	AS, MN, ML, MZ, OD, SK, WB; LA, MM, TH, VN.
	Tribe Gymnopleurini		
7	<i>Paragymnopleurus sinuatus assamensis</i> (Waterhouse, 1890)	Dimapur, 27.iii.2017 (2♀).	AP, AS, CG, HR, HP, KA, KL, MP, MH, ML, PB, SK, TN, UK, WB; ID, LA, MM, NP, TW, TH.

The specimens for the present study were collected using light trap and from cattle dung, soil, mud, waste matter, and carrion with the help of forceps, wherever required, the ground was dug out for 1-3 feet to find the large tunnellers. The specimens were killed in jars containing benzene vapours and later preserved dry pinned. The dung beetles were cleaned with detergent to remove debris and soil from the body surface to expose all the morphological characters for identification. The species were identified using different literature and matched with reference collection, present at Zoological Survey of India, Kolkata. The specimens are deposited in the Zoological Survey of India, Kolkata. The species which are new records to the state are marked with an asterisk (*).

Abbreviations: AP: Andhra Pradesh, AR: Arunachal Pradesh, AS: Assam, BR: Bihar, CG: Chhattisgarh, GJ: Gujarat, HR: Haryana, HP: Himachal Pradesh, JK: Jammu and Kashmir, KA: Karnataka, KL: Kerala, MP: Madhya Pradesh, MH: Maharashtra, MN: Manipur, ML: Meghalaya, MZ: Mizoram, NL: Nagaland, OD: Odisha, PB: Punjab, RJ: Rajasthan, SK: Sikkim, TN: Tamil Nadu, TR: Tripura, UK: Uttarakhand, UP: Uttar Pradesh, WB: West Bengal, AN: Andaman and Nicobar Islands; AF: Afghanistan, AU: Australia, BD: Bangladesh, KH: Cambodia, CN: China, HK: Hong Kong, ID: Indonesia, JP: Japan, LA: Laos, MM: Myanmar, MY: Malaysia, NP: Nepal, PH: Philippines, PK: Pakistan, LK: Sri Lanka, SG: Singapore, TH: Thailand, TL: Timor-Leste, TW: Taiwan, VN: Vietnam.

Table 1 Continued

	Tribe Oniticellini		
8	<i>Liatongus gagatinus</i> (Hope, 1831)	Zunheboto: Shoixe; Naga Hills 16.iii.1991 (5♂, 1♀), 15.viii.1991 (10♂, 5♀).	AR, AS, JK, ML, NL, SK, UK, WB; LA, MM, TW.
9	<i>Liatongus mergacerus</i> (Hope, 1831)*	Dimapur: Piphima, 16.iii.1993 (2 ♀).	AR, JK, ML, SK, UP, UK, WB; BT, NP.
10	<i>Liatongus vertagus</i> (Fabricius, 1798)*	Peren: Intanki National park; Dimapur: Munglumukh, 21.iii. 2017 (14♂, 20♀), 24.iii.2017 (2♂, 1♀), 27.iii.2017 (3♂, 10♀).	AR, AS, MN, ML, SK, UK, WB; BT, LA, MM, NP, TW.
11	<i>Oniticellus cinctus</i> (Fabricius, 1775)	Dimapur: Piphima; Peren, Intanki National Park, Munglumukh 26.iii.2017 (2♂), 27.iii.2017 (2♂), 16.iii.1993 (2♀).	AP, AR, AS, CG, GJ, HR, HP, KL, MP, MH, ML, PB, RJ, UK, TN, TR, WB; BD, MY, MM, CN, TH, VN.
	Tribe Onthophagini		
12	<i>Onthophagus (Furconthophagus) amicus</i> (Gillet, 1925)	Dimapur, 26.iii.2017 (1♂, 1 ♀).	AS, KA, ML, NL, SK, UP, UK; NP.
13	<i>Onthophagus (Gibbonthophagus) rectecornutus</i> Lansberge, 1883	Naga Hills; Peren, Intanki National Park, 21.iii.2017 (2♂, 3♀), 27.iii.2017 (2♂, 1 ♀).	AR, AS, BR, GJ, HR, KA, KL, ML, TN, TR, WB; BD, BT, CN, MM, LK.
14	<i>Onthophagus (Parascatonomus) rudis</i> Sharp, 1875	Intanki National Park, 26.iii.2017 (1 ex.).	AR, BR, KA, MP; CN, ID, LA, MY, MM, PH, TH, VN.
15	<i>Onthophagus (Serrophorus) sagittarius</i> (Fabricius, 1775)	Intanki National Park 21.iii.2017 (2♂).	AR, AS, CG, MP, ML, OD, RJ, TR; BD, CN, ID, MM, TW, TL, TH.
	Tribe Sisyphini		
16	<i>Sisyphus indicus</i> Hope, 1831	Naga Hills; Dimapur, 26.iii.2017 (1♂).	AR, AS, JK, HP, ML, NL, OD, PB, SK, WB; CN, MM, NP, LK.
	Subfamily Melolonthinae Tribe Sericini		
17	<i>Serica nagana</i> Brenske, 1899	Naga Hills.	Endemic.
18	<i>Maladera satrapa</i> (Brenske, 1898)	Naga Hills.	AS, ML; MM.
19	<i>Maladera garoana</i> Ahrens & Fabrizi, 2016	Medziphema.	ML, MZ.
20	<i>Maladera jaintiaensis</i> Ahrens & Fabrizi, 2016	Medziphema.	ML; CN.
21	<i>Maladera murzini</i> Ahrens, 2004	Medziphema.	AS, ML.
22	<i>Maladera profana</i> Ahrens & Fabrizi, 2016	Medziphema.	ML, MZ.
23	<i>Maladera pseudohongkongica</i> Ahrens & Fabrizi, 2016	Medziphema.	AS, ML; BD.
24	<i>Maladera siniaevi</i> Ahrens, 2004	Medziphema.	AS, ML, SK, WB; BT, MM.
25	<i>Maladera subspinosa</i> (Brenske, 1898)	Medziphema.	ML.
26	<i>Neoserica speciosa</i> Brenske, 1898	Medziphema.	ML, MZ.
	Tribe Euchirini		
27	<i>Cheirotonus gestroi gestroi</i> Pouillaude, 1913	Kohima, Naga hills.	MN; CN, MM, LA, TH, VN.
28	<i>Cheirotonus parryi</i> Gray, 1848	Naga Hills.	HP, ML, UP, WB; BD, LA, TH.
	Tribe Leucopholini		
29	<i>Cyphochilus candidus</i> (Olivier, 1789)	Naga Hills.	AS, KL, ML, SK, WB.
30	<i>Lepidiota stigma</i> (Fabricius, 1798)	Nagaland.	HP.
	Subfamily Rutelinae Tribe Anomalini		
31	<i>Anomala indistincta</i> Arrow, 1917	Naga Hills.	AS; BD, MM, VN, LA.
32	<i>Anomala merula</i> Arrow, 1917	Naga Hills.	AS.
33	<i>Anomala varicolor</i> (Gyllenthal, 1817)*	Dimapur: Piphima, 16.iii.1993 (1♂); Peren, Intanki National Park, Munglumukh 23.iii.2017 (1♂, 2 ♀).	AS, ML; BD, BT, CN, NP, LK, TW.
34	<i>Mimela heterochropus heterochropus</i> Blanchard, 1851	Naga Hills; Peren, 23.iii.2017 (1♂).	AN, AR, MN, SK, WB; BT, CN, MM, NP
35	<i>Mimela laevigata</i> Arrow, 1908	Naga Hills, 13.vi.1907 (1♂).	AS, SK, WB; BT.
36	<i>Mimela pyriformis</i> Arrow, 1908	Naga Hills; Peren, 25.iii.2017 (1♂, 1♀).	AS, ML; NP.
37	<i>Mimela schneideri</i> Ohaus, 1905	Dimapur: Piphima, 16.iii.1993 (1♀); Peren, Intanki National Park, Munglumukh, 25.iii.2017, 2♀), 27.iii.2017 (1♀).	MN, ML, MZ, SK, WB; MM.

Table 1 Continued

38	<i>Mimela subsericea</i> Arrow, 1908	Nagaland	ML; MM.
39	<i>Popillia amabilis</i> Arrow, 1913	Naga Hills.	MN, ML, WB; CN, VN, MM.
40	<i>Popillia cyanea</i> Hope, 1831	Naga Hills; Peren, 26.iii.2017 (1♂, 1♀).	AR, AS, HP, JK, ML, SK, UK, WB; CN, NP.
41	<i>Popillia macclellandi</i> Hope, 1845	Naga Hills; Peren, 26.iii.2017 (1♂, 1♀).	AR, HP, ML, WB; CN.
42	<i>Popillia patricia</i> Arrow, 1917	Naga Hills.	ML; CN.
43	<i>Popillia subquadrata</i> Kraatz, 1892	Naga Hills.	CN, KH.
	Tribe Rutelini		
44	<i>Parastasia rufopicta</i> Westwood, 1842	Naga Hills.	AS, MN, SK, WB; BT, NP, VN.
	Subfamily Dynastinae Tribe Phileurini		
45	<i>Eophileurus (Eophileurus) planatus</i> (Wiedemann, 1823)	Naga Hills.	AR, AN, UK, MN, SK, WB; BD, MM.
	Tribe Dynastini		
46	<i>Xylotrupes gideon</i> (Linnaeus, 1767)	Nagaland.	AN, AS, CG, HP, KL, MP, MH, MN, ML, MZ, SK, TN, TR, WB; AU, ID, LK, ID.
	Tribe Oryctini		
47	<i>Oryctes (Rykanes) rhinoceros</i> Linnaeus, 1758	Peren, 26.iii.2017 (1♂, 1♀).	AP, AR, AN, MH, MP, OD, TN, WB; HK, ID, JP, PH, SG, LK, TH.
	Tribe Pentodontini		
48	<i>Alissonotum simile</i> Arrow, 1910	Naga Hills; Peren, 26.iii.2017 (1♂).	BR, HP, CG, MP, WB; NP, PK.
	Subfamily Cetoniinae Tribe Cetoniini		
49	<i>Cetonia (Indocetonia) laeviventris</i> Arrow, 1910	Naga Hills.	MN.
50	<i>Protaetia (Protaetiola) caudata</i> Arrow, 1910	Naga Hills.	SK, WB; BT, LA, MM.
	Tribe Cremastocheilini		
51	<i>Coenochilus gracilipes</i> Mos, 1910	Naga Hills.	ML.
	Tribe Goliathini		
52	<i>Rhomborrhina resplendens</i> ssp. <i>heros</i> (Gory & Percheron, 1833)	Kohima.	AS, SK, WB; BT, NP, VN.
53	<i>Torynorrhina distincta</i> (Hope, 1841)	Kohima, Naga Hills	AS, MN, ML, SK, WB; CN, MM, NP.
54	<i>Torynorrhina hyacinthina</i> (Hope, 1841)	Naga Hills.	AS, HP, ML, SK, WB; MM, NP, BD, BT, TH.
55	<i>Trigonophorus (Trigonophorus) nepalensis</i> Hope, 1831	Naga Hills.	AR, AS, HP, MN, ML, SK, WB; BD, BT, MM, NP.
	Tribe Phaedimini		
56	<i>Philistina (Cephalocosmus) microphylla</i> (Wood-Mason, 1881)	Naga Hills.	SK, WB; BT, MM.
	Tribe Schizorhini		
57	<i>Thaumastopeus nigritus</i> (Fröhlich, 1792)	Naga Hills.	AN, BR, HP, PB, SK, WB; BT, ID, LK, MY, MM.
58	<i>Euselates perraudieri</i> (Fairmaire, 1893)	Naga Hills.	AS, MN; MM, LA.
59	<i>Euselates quadrilineatus</i> (Hope, 1831)	Naga Hills.	AR, SK, WB; BT, NP, MM.
60	<i>Taeniodera flavofasciata</i> (Moser, 1901)	Naga Hills.	AS; BT, CN, MM, NP.
61	<i>Taeniodera nigricollis</i> (Janson, 1881)	Naga Hills.	AS, ML; CN, VN.
62	<i>Jumnos ruckeri ruckeri</i> Saunders, 1839	Naga Hills, 14.iv.1927 (3♂, 2♀).	AS, HP, MN, SK, UK, WB; BT, CN, MM, TH.

4. Discussion

The present study records 62 species belonging to 34 genera, 19 tribes, 5 subfamilies, i.e. Scarabaeinae, Melolonthinae, Rutelinae, Cetoniinae and Dynastinae, under family Scarabaeidae from Nagaland state. Out of these 62 species, *Catharsius molossus* (Linnaeus, 1758), *Paracopris punctulatus* Wiedemann, 1823, *Liatongus mergacerus* (Hope, 1831), *Liatongus vertagus* (Fabricius, 1798), and *Anomala varicolor* (Gyllenthal, 1817) are new records to the state of Nagaland. Of the family Scarabaeidae, the dominant subfamily is Scarabaeinae (16 species), followed by Melolonthinae, Rutelinae, and Cetoniinae (14 species each), and Dynastinae (4 species) (Table 1). *Maladera* is the dominant genus (8 species), followed by *Popillia* and *Mimela* (5 species each), *Onthophagus* (4 species), *Anomala* and *Liatongus* (3 species each), *Copris*, *Catharsius*, *Cheirotonus*, *Torynorrhina*, *Euselates*, *Taeniodera* (2 species each), *Paracopris*, *Synopsis*, *Paragymnopleurus*, *Oniticellus*, *Sisyphus*, *Cyphochilus*, *Serica*, *Neoserica*, *Lepidiota*, *Parastasia*, *Eophileurus*, *Xylotrupes*, *Oryctes*, *Alissonotum*, *Cetonia*, *Protaetia*, *Coenochilus*, *Jumnos*, *Rhomborrhina*, *Trigonophorus*, *Philistina*, *Thaumastopeus* (1 species each).

Fifteen species are dung feeders or coprophagus (subfamily Scarabaeinae), while the rest 47 species are chafers or phytophagous. The species of the tribes; Sisyphini, Gymnopleurini are dung ball rollers that include 2 species under 2 genera, i.e. *Sisyphus* and *Paragymnopleurus*. The species of the tribes Coprini, and Onthophagini are dung tunnellers that include the genera; *Catharsius*, *Paracopris*, *Copris*, *Onthophagus* and

Synopsis. The members of the tribe Oniticellini are dung dwellers that brood their young ones inside the dung pats that include the genera: *Oniticellus* and *Liatongus*. Among the chafers, *Oryctes rhinoceros* is reported to damage the banana fruit, date palm, and coconut in Nagaland [30-31]. *Popillia cyanea* is reported to damage rajma [31]. *Xylotrupes* sp. is polyphagous and is reported to damage *Acacia mearnsii*, *Hevea brasiliensis* and *Toona australis* [32-33].

5. Conclusions

The present study gives an idea of scarab beetles in this study area that revealed the diversity of 62 species belonging to 34 genera under 5 subfamilies were studied. This study provides basic information and inventory on the present status, composition and diversity of scarab beetles in Nagaland. There is also a need to be protected and conserve the species for the future. The present work resulted in the database of scarabs which will help in future work for its conservation, preservation and addition of the local biodiversity of scarab beetles.

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Appendix



Figure 1. (A-I): A. *Catharsius molossus*, B. *C. birmanensis*, C. *Copris (C.) corpulentus*, D. *C. (C.) magicus*, E. *Paracopris punctulatus*, F. *Paragymnopleurus sinuatus assamensis*, G. *Liatongus gagatinus*, H. *L. mergacerus*, I. *Oniticellus cinctus*.



Figure 2. (A-I): A. *Onthophagus* (F.) *amicus*, B. *O.* (G.) *rectecornutus*, C. *O.* (P.) *rudis*, D. *Sisyphus indicus*, E. *Anomala varicolor*, F. *Mimela heterochropus heterochropus*, G. *M. laevigata*, H. *M. pyriformis*, I. *M. schneideri*.

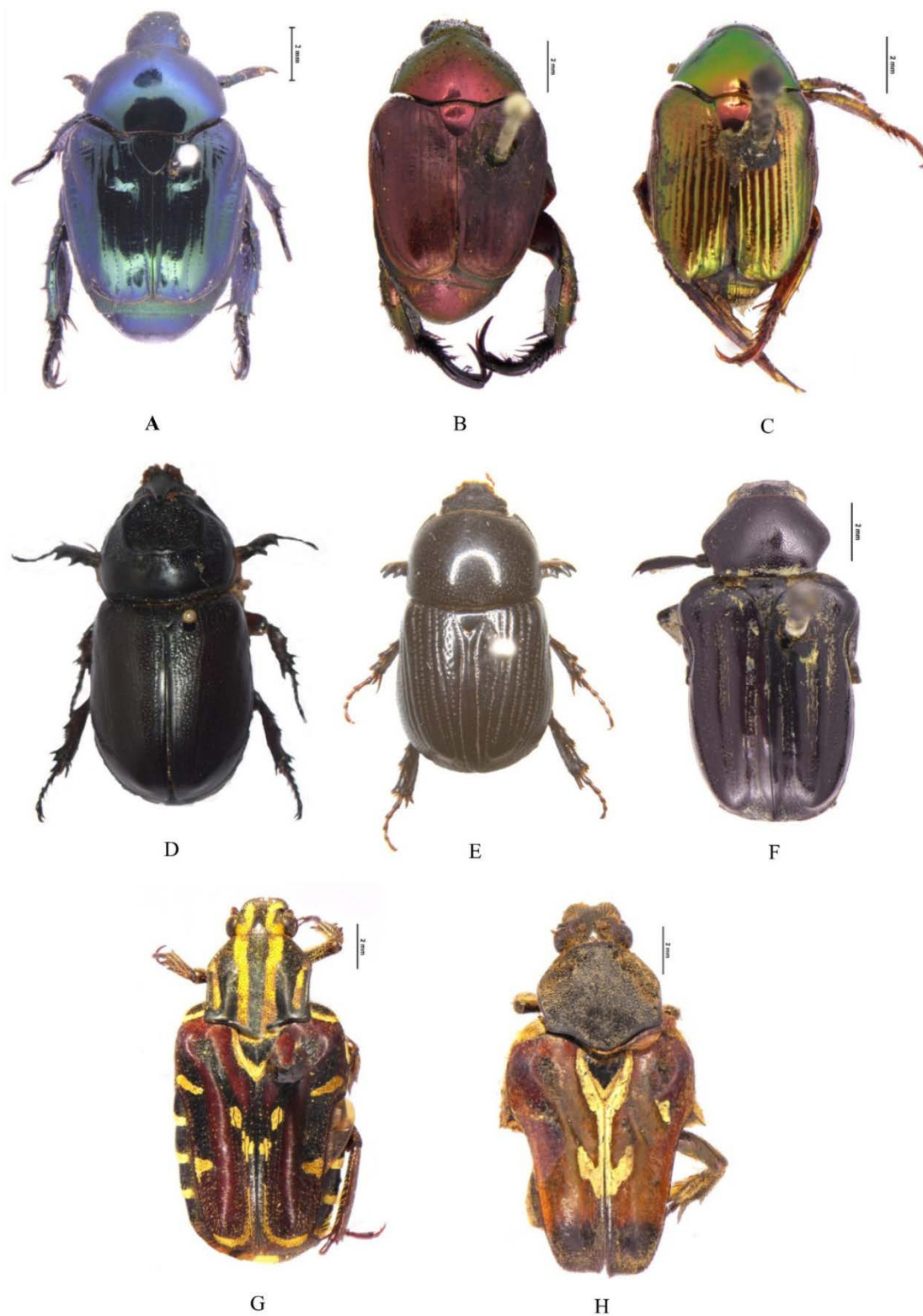


Figure 3. (A-I) A. *Popillia cyanea*, B. *P. macclellandi*, C. *P. patricia*, D. *Oryctes (R.) rhinoceros*, E. *Alissonotum simile*, F. *Coenochilus gracilipes*, G. *Euselates quadrilineatus*, H. *Taeniodera nigricollis*.

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