

Data Descriptor

# Scarabaeoidea (Coleoptera) Fauna of the Republic of Mordovia (Russia)

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**Abstract:** (1) Background: Beetles in the superfamily Scarabaeoidea are one of the most important groups of Coleoptera. They are found in various ecosystems all over the world and belong to coprophagous, necrophagous, saproxylophagous, phyllophagous and rhizophagous types. The aim of the study is to describe the fauna and distribution of Scarabaeoidea in the Republic of Mordovia (central part of European Russia); (2) Methods: The study was conducted from 2003 to 2023. Collection material (specimens from 1972 and 1986) was also used. Specimens were collected using traditional Coleoptera collecting methods (manual collecting, light trap, collection of rotten remains and pitfall traps). For each observation, the coordinates, number of specimens and dates were recorded; (3) Results: The dataset contains 3198 occurrences. We examined 11,011 specimens of Scarabaeoidea. The dataset contains information on 88 species of Scarabaeoidea. Of these, five species (*Aphodius pedellus*, *Nobius serotinus*, *Phaephodius rectus*, *Planolinus fasciatus* and *Onthophagus medius*) are listed for the region for the first time. Another seven species are additionally known from others taken from the literature (but were not found during the present field survey); (4) Conclusions: Species diversity of Scarabaeoidea of Mordovia accounts for 95 species from 4 families (Geotrupidae, Trogidae, Lucanidae and Scarabaeidae). Ten species (*Protaetia marmorata*, *Anoplotrupes stercorosus*, *Cetonia aurata*, *Protaetia cuprea volhyniensis*, *Oxythyrea funesta*, *Platycerus caraboides*, *Serica brunnea*, *Melolontha hippocastani*, *Trichius fasciatus* and *Protaetia fieberi*) constitute the main population of Scarabaeoidea fauna given in the dataset. The species diversity of Scarabaeoidea of the Republic of Mordovia is roughly similar in number of species to that of neighboring or more northern regions.

**Keywords:** dataset; occurrences; data paper; Coleoptera; Scarabaeoidea; Republic of Mordovia



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## 1. Summary

Fauna lists are currently an important feature of faunal studies, given their important role in biological inventories at local and regional levels. These parameters contribute to the knowledge of the structure and composition of communities in a specific systematic group [1–6]. A recognized problem for biodiversity is the fragmentation of and reduction in ecosystems as a result of human activity [7–9]. The main factors contributing to the decline in the number of insect species are considered to be: habitat loss and the transition to intensive agriculture and urbanization; pollution, mainly with synthetic pesticides and fertilizers; biological factors, including pathogens and introduced species; and climate change [10,11]. Various studies have shown that Scarabaeoidea species are sensitive to

structural changes in the habitat caused by various anthropogenic disturbances. In disturbed habitats, they exhibit dramatic changes in their distribution and development, and they must adapt to new conditions as they arise [12].

Beetles from the superfamily Scarabaeoidea are one of the most important insect groups, and they are a prominent component of the Coleoptera fauna in almost all ecosystems [13]. The superfamily Scarabaeoidea has more than 35,000 species worldwide [14]. The Scarabaeidae family alone consists of more than 30,000 beetle species worldwide. In Europe, Scarabaeoidea is represented by 8 families, 208 genera and about 1250 species [15]. The dominant trophic group among the Scarabaeoidea are dung beetles. Dung beetles are found all over the world, but they are especially diverse in tropical forests and savannas [16,17]. Among the Scarabaeoidea, there are also saproxylophages, necrophages, phyllophages and rhizophages. There are forest and pasture species, as well as mountain and lowland species; some are attracted by flowers or fermenting fruits, while others are attracted to artificial lighting [18–20]. Their action as saproxylophages and necrophages ensures the transformation of decaying wood, plant and animal residues and the integration of organic matter into the nutrient cycle [21,22].

Taxonomic and faunal works allow us to understand the biology, rhythms and behavior of Scarabaeoidea. Such works describe new taxa and classify organisms, as well as showing their distribution, diversity and habitat requirements. Therefore, knowledge of the species composition, richness and regional diversity of Scarabaeoidea, as well as their relationship with geospatial factors deserves our attention.

The purpose of this work is to describe the fauna and occurrence of Scarabaeoidea (Coleoptera) in the Republic of Mordovia, based on our recently published dataset in GBIF as Darwin Core Archive [23]. This is the first complete description of the Scarabaeoidea fauna of the Republic of Mordovia, located in the center of the European part of Russia.

## 2. Data Description

### 2.1. Data Set Name

Each observation includes the following information: location (latitude/longitude), date of observation, observer name and identifier name. The coordinates were determined in situ using a GPS device or after surveys using Google Maps (Table 1). The dataset contains 3198 occurrences. A total of 11,011 specimens were studied.

**Table 1.** Description of the data in the dataset.

Column Label	Column Description
eventID	An identifier for the set of information associated with an Event (occurs in one place in one time).
occurrenceID	An identifier for the Occurrence (as opposed to a particular digital record of the occurrence).
basisOfRecord	The specific nature of the data record: HumanObservation
scientificName	The full scientific name including the genus name and the lowest level of taxonomic rank with the authority
kingdom	The full scientific name of the kingdom in which the taxon is classified
taxonRank	The taxonomic rank of the most specific name in the scientificName.
decimalLatitude	The geographic latitude of location in decimal degree
decimalLongitude	The geographic longitude of location in decimal degrees
geodeticDatum	The ellipsoid, geodetic datum, or spatial reference system (SRS) upon which the geographic coordinates given in decimalLatitude and decimalLongitude as based.
country	The name of the country in which the Location occurs
countryCode	The standard code for the country in which the Location occurs.
individualCount	The number of individuals represented present at the time of the Occurrence.
eventDate	The date when material from the trap was collected or the range of dates during which the trap collected material
year	The integer day of the month on which the Event occurred.
month	The ordinal month in which the Event occurred.
day	The integer day of the month on which the Event occurred
samplingProtocol	The names of, references to, or descriptions of the methods or protocols used during an Event.
recordedBy	A person, group, or organization responsible for recording the original Occurrence.
identifiedBy	A list of names of people, who assigned the Taxon to the subject

## 2.2. Figures, Tables and Schemes

The dataset contains data on 88 species of Scarabaeoidea from 4 families and 12 subfamilies studied during our research (Table 2). Of these, five species (*Aphodius pedellus*, *Nobius serotinus*, *Phaeaphodius rectus*, *Planolinus fasciatus* and *Onthophagus medius*) are listed for the region for the first time. In addition, 7 more species of Scarabaeoidea (*Lucanus cervus* (Linnaeus, 1758), *Rhysothorax rufus* (Fabricius, 1792), *Acrossus bimaculatus* (Laxmann, 1770), *Melinopterus punctatosulcatus hirtipes* (Fischer von Waldheim, 1844), *Rhodaphodius foetens* (Fabricius, 1787), *Onthophagus coenobita* (Herbst, 1783) and *Anisoplia brenskei* (Reitter, 1889)), which were not found in our study but may potentially inhabit the region and have been cited in publications, are included in Table 2 [24–27]. We exclude 5 species (*Aphodius fimetarius* (Linnaeus, 1758), *Onthophagus vacca* (Linnaeus, 1767), *Amphimallon volgense* (Fischer von Waldheim, 1823), *Tropinota hirta* (Poda von Neuhaus, 1761) and *Hoplia zaitzevi* (Jakobson, 1914)) from the fauna that were previously reported for Mordovia [26–28], but have raised doubts as to their occurrence in the region. *Amphimallon volgense* and *Tropinota hirta* have not been found in our long-term studies, and they are still not found in neighboring regions. The indications of *Aphodius fimetarius* and *Onthophagus vacca* refer to closely related species, *Aphodius pedellus* and *Onthophagus medius*, respectively. Two species of the *Aphodius fimetarius* complex are considered by us in accordance with the opinion of Wilson [29]. The same interpretation is accepted in the Catalogue of Palaearctic Coleoptera [15]. *Aphodius pedellus* lives in the Republic of Mordovia. After reading the publication by Rössner et al. [30], we revised the material on *Onthophagus vacca*. It has been established that only *Onthophagus medius* lives in the Republic of Mordovia. The taxonomic status of *Hoplia zaitzevi* requires clarification. Therefore, we exclude them from the fauna of the Republic of Mordovia. Thus, the Scarabaeoidea fauna of Mordovia currently includes 95 species.

**Table 2.** Species diversity of Scarabaeoidea of Republic of Mordovia.

Taxa	Approximate Estimate of the Number
<b>GEOTRUPIDAE Latreille, 1802</b>	
<b>Bolboceratinae Mulsant, 1842</b>	
<i>Odonteus armiger</i> (Scopoli, 1772)	single individual
<b>Geotrupinae Latreille, 1802</b>	
<i>Anoplotrupes stercorosus</i> (Hartmann in Scriba, 1791)	numerous specimens
<i>Geotrupes baicalicus</i> Reitter, 1892	common specimens
<i>Trypocorpius vernalis vernalis</i> (Linnaeus, 1758)	single individual
<b>TROGIDAE W.S. MacLeay, 1819</b>	
<b>Troginae W.S. MacLeay, 1819</b>	
<i>Trox cadaverinus</i> Illiger, 1802	single individual
<i>Trox sabulosus</i> (Linnaeus, 1758)	common specimens
<i>Trox scaber</i> (Linnaeus, 1767)	single individual
<b>LUCANIDAE Latreille, 1804</b>	
<b>Syndesinae W.S. MacLeay, 1819</b>	
<i>Ceruchus chrysomelinus</i> (Hochenwarth, 1785)	single individual
<i>Sinodendron cylindricum</i> (Linnaeus, 1758)	rare specimens
<b>Lucaninae Latreille, 1804</b>	
<i>Dorcus parallelipedus</i> (Linnaeus, 1758)	rare specimens
<i>Lucanus cervus cervus</i> (Linnaeus, 1758)	single individual
<i>Platycerus caprea</i> (De Geer, 1774)	rare specimens
<i>Platycerus caraboides</i> (Linnaeus, 1758)	common specimens
<b>SCARABAEIDAE Latreille, 1802</b>	
<b>Aegialiinae Laporte, 1840</b>	
<i>Psammoporus sabuleti</i> (Panzer, 1797)	single individual
<i>Rhysothorax rufus</i> (Fabricius, 1792)	single individual
<b>Aphodiinae Leach, 1815</b>	
<i>Acanthobodilus immundus</i> (Creutzer, 1799)	single individual
<i>Acrossus bimaculatus</i> (Laxmann, 1770)	single individual
<i>Acrossus depressus</i> (Kugelann, 1792)	common specimens
<i>Acrossus luridus</i> (Fabricius, 1775)	rare specimens
<i>Acrossus rufipes</i> (Linnaeus, 1758)	common specimens

Table 2. Cont.

Taxa	Approximate Estimate of the Number
<i>Agoliinus isajevi</i> (Kabakov, 1994)	single individual
<i>Agoliinus nemoralis</i> (Erichson, 1848)	rare specimens
<i>Agrilinus ater</i> (De Geer, 1774)	rare specimens
<i>Ammoecius brevis</i> (Erichson, 1848)	single individual
* <i>Aphodius pedellus</i> (De Geer, 1774)	common specimens
<i>Biralus satellitius</i> (Herbst, 1789)	single individual
<i>Bodiloides ictericus</i> (Laicharting, 1781)	single individual
<i>Bodilopsis rufa</i> (Moll, 1782)	common specimens
<i>Bodilopsis sordida</i> (Fabricius, 1775)	single individual
<i>Bodilus lugens</i> (Creutzer, 1799)	rare specimens
<i>Calamosternus granarius</i> (Linnaeus, 1767)	rare specimens
<i>Chilothorax distinctus</i> (O.F. Müller, 1776)	common specimens
<i>Chilothorax melanosticus</i> (W.L.E. Schmidt, 1840)	rare specimens
<i>Colobopterus erraticus</i> (Linnaeus, 1758)	common specimens
<i>Esymus pusillus</i> (Herbst, 1789)	rare specimens
<i>Euheptaulacus sus</i> (Herbst, 1783)	single individual
<i>Eupleurus subterraneus</i> (Linnaeus, 1758)	common specimens
<i>Liothorax niger</i> (Illiger, 1798)	single individual
<i>Liothorax plagiatus</i> (Linnaeus, 1767)	single individual
<i>Melinopterus prodromus</i> (Brahm, 1790)	common specimens
<i>Melinopterus punctatosulcatus hirtipes</i> (Fischer von Waldheim, 1844)	single individual
<i>Mendidaphodius linearis</i> (Reiche & Saulcy, 1856)	rare specimens
<i>Nialus varians</i> (Duftschmid, 1805)	single individual
* <i>Nobius serotinus</i> (Panzer, 1799)	rare specimens
<i>Otophorus haemorrhoidalis</i> (Linnaeus, 1758)	single individual
<i>Oxyomus sylvestris</i> (Scopoli, 1763)	single individual
* <i>Phaeaphodius rectus</i> (Motschulsky, 1866)	rare specimens
<i>Plagiogonus arenarius</i> (G.-A. Olivier, 1789)	rare specimens
* <i>Planolinus fasciatus</i> (G.-A. Olivier, 1789)	rare specimens
<i>Rhodaphodius foetens</i> (Fabricius, 1787)	single individual
<i>Teuchestes fossor</i> (Linnaeus, 1758)	common specimens
<i>Volinus sticticus</i> (Panzer, 1798)	common specimens
<i>Pleurophorus caesus</i> (Panzer, 1796)	rare specimens
<i>Rhyssenus germanus</i> (Linnaeus, 1767)	rare specimens
<b>Scarabaeinae Latreille, 1802</b>	
<i>Copris lunaris</i> (Linnaeus, 1758)	rare specimens
<i>Euoniticellus fulvus</i> (Goeze, 1777)	rare specimens
<i>Caccobius schreberi</i> (Linnaeus, 1767)	common specimens
<i>Onthophagus furcatus</i> (Fabricius, 1781)	single individual
<i>Onthophagus taurus</i> (Schreber, 1759)	single individual
<i>Onthophagus coenobita</i> (Herbst, 1783)	single individual
<i>Onthophagus fracticornis</i> (Preyssler, 1790)	common specimens
<i>Onthophagus gibbulus</i> (Pallas, 1781)	common specimens
<i>Onthophagus nuchicornis</i> (Linnaeus, 1758)	common specimens
<i>Onthophagus ovatus</i> (Linnaeus, 1767)	common specimens
<i>Onthophagus semicornis</i> (Panzer, 1798)	common specimens
* <i>Onthophagus medius</i> (Kugelann, 1792)	single individual
<i>Onthophagus vitulus</i> (Fabricius, 1777)	rare specimens
<b>Melolonthinae Leach, 1819</b>	
<i>Hoplia parvula</i> Krynicki, 1832	numerous specimens
<i>Melolontha hippocastani</i> Fabricius, 1801	numerous specimens
<i>Amphimallon altaicum</i> (Mannerheim, 1825)	common specimens
<i>Amphimallon solstitiale</i> (Linnaeus, 1758)	numerous specimens
<i>Maladera holosericea</i> (Scopoli, 1772)	common specimens
<i>Omalopia nigromarginata</i> (Herbst, 1786)	rare specimens
<i>Omalopia spiraeae</i> (Pallas, 1773)	rare specimens
<i>Serica brunnea</i> (Linnaeus, 1758)	numerous specimens
<b>Rutelinae W.S. MacLeay, 1819</b>	
<i>Anisoplia agricola</i> (Poda von Neuhaus, 1761)	single individual
<i>Anisoplia brenskii</i> Reitter, 1889	single individual
<i>Anisoplia deserticola</i> Fischer von Waldheim, 1824	rare specimens
<i>Anisoplia austriaca</i> (Herbst, 1783)	rare specimens
<i>Chaetopteropia segetum</i> (Herbst, 1783)	common specimens
<i>Anomala dubia</i> (Scopoli, 1763)	numerous specimens

Table 2. Cont.

Taxa	Approximate Estimate of the Number
<i>Mimela holosericea</i> (Fabricius, 1787)	single individual
<i>Phyllopertha horticola</i> (Linnaeus, 1758)	numerous specimens
<b>Dynastinae W.S. MacLeay, 1819</b>	
<i>Oryctes nasicornis polonicus</i> Minck, 1918	rare specimens
<b>Cetoniinae Leach, 1815</b>	
<i>Cetonia aurata</i> (Linnaeus, 1758)	numerous specimens
<i>Protaetia speciosissima</i> (Scopoli, 1786)	common specimens
<i>Protaetia affinis affinis</i> (Andersch, 1797)	single individual
<i>Protaetia marmorata</i> (Fabricius, 1792)	numerous specimens
<i>Protaetia cuprea volhyniensis</i> (Gory & Percheron, 1833)	common specimens
<i>Protaetia fieberi</i> (Kraatz, 1880)	numerous specimens
<i>Oxythyrea funesta</i> (Poda von Neuhaus, 1761)	numerous specimens
<i>Osmoderma barnabita</i> Motschulsky, 1845	single individual
<i>Gnorimus variabilis</i> (Linnaeus, 1758)	rare specimens
<i>Trichius fasciatus</i> (Linnaeus, 1758)	numerous specimens
<i>Valgus hemipterus</i> (Linnaeus, 1758)	rare specimens

\*—first record for Republic of Mordovia.

There are details on the distribution and abundance of a few species that can be classified as low abundance and of limited distribution in the region.

*Trypocopris vernalis* is a species with a disjunct distribution. It is found within the region, only in forests. The species thrives on cattle manure, wild ungulate dung and plant residues from forest litter. In the republic, there is a single population in the Mordovia State Nature Reserve. This population is located at the southern border of its range in central European Russia [31]. This is a rare species and is included in the Red Book of the Russian Federation [32].

Within its range, *Odonteus armiger* inhabits semi-arid and dry fields and meadows, dry larch forests, sandy floodplains, quarries, parks and gardens. The larva lives freely and develops in the underground parts of fungi. Adults are found on the fruiting bodies of mushrooms and in manure [33]. The beetles are active at twilight and at night; adults fly to light. In the Republic of Mordovia, three localities are known in which adults are constantly observed (including the National Park “Smolny”).

*Ceruchus chrysomelinus* is a European forest species; in Russia it inhabits the taiga and forest zone. It prefers old spruce and mixed forests and oak groves. Beetles can be found on rotten logs. In Mordovia State Nature Reserve, sporadic specimens were found in oak forests from 2012 to 2016. Only one stable population is known in the Republic of Mordovia—in Mordovia State Nature Reserve [31]. The species is rare and is included in the Red Book of the Russian Federation [32].

*Dorcus parallelipedus* is found in Europe, North Africa and West Asia. It occurs in deciduous and mixed forests. Larvae develop in decaying and dying wood of deciduous trees (aspen, oak, etc.) for 2–3 years. Adults are found under the bark of stumps and rotten logs, sometimes on wood sap. The species has been found only rarely. There are five known localities in the Republic of Mordovia.

*Lucanus cervus* is widespread in Europe, although absent in some countries [34]. It is listed as a protected species in the majority of countries where it occurs. Larvae develop in the subterranean part of the dead wood of various broadleaf tree species [35]. It prefers forested areas with good soil heated and dry forests with an abundance of deciduous trees [36]. We have not found this species during our studies. There are reports on its occurrence in different parts of the region [24]. It is a rare species and is listed in the Red Book of the Russian Federation [32].

*Psammoporus sabuleti* is fairly widespread in northern and central Europe and northern Kazakhstan. It is a stenotope, a psammobiont. It is a local, rare species. It is found mainly on sandy riverbanks, under stones or under decaying wood and roots [37]. The only find was made on a riverbank on sand.

The range of *Acrossus bimaculatus* is quite wide. However, in recent years, the species has become much rarer, and the bulk of discoveries were made more than 60 years ago [38]. It is possible that a population of the species existed in the second half of the 20th century, but at present its discoveries require confirmation. It is absent from our collections. This is a rare species and is included in the Red Book of the Russian Federation [32].

*Agoliinus isajevi* inhabits steppe habitats [39]. It is a specialized pholeophilous inhabiting ancient marmot colonies (*Marmota bobac*). According to some earlier publications, this species has not been found in the marmot reacclimatization sites [40]. The latter statement was usually quoted afterwards by all authors. In the conditions of the Republic of Mordovia, the marmot inhabited until the 1930s, was reacclimatized in the 1960s–1970s, and in the mid-1980s native populations survived in only two areas [41]. However, a record of *Agoliinus isajevi* was made in a colony of *Marmota bobac* that appeared in 2011–2012. Prior to that, the marmot had not been observed in this biotope [41]. Thus, *Agoliinus isajevi* was found and is also found in burrows of reacclimatized marmots.

*Mimela holosericea* has an extensive range. It is found in Kazakhstan, some northern provinces of China, Mongolia, the Korean Peninsula and Japan. In Russia, it is found in the Far East, the Urals, Siberia, the Volga region and Central Russia. The species is abundant in the eastern part of its range. However, in the western part of the range, the species occurs sporadically and its numbers are very low. In the Republic of Mordovia, it is found only in two localities [42].

In the Republic of Mordovia, only one population of *Protaetia affinis* is known in the southwestern part of the region. Apparently, the northern and eastern borders of the species' range pass here.

*Protaetia speciosissima* has an extensive range, but numbers are low everywhere. It lives mainly in old-growth broad-leaved forests. Larvae develop in oak, linden and some other deciduous trees. Previously, few localities of this species were known in the region. However, the use of crown fermental traps has given much more information on the species distribution and abundance [18,43]. There are currently 25 known localities in the region. In some localities, the abundance is relatively high [31,44]. The species is rare in Russia and is included in the Red Book of the Russian Federation [32].

*Protaetia fieberi* is a species with a wide range. It inhabits deciduous and mixed forests of various types and origins. The species was thought to be scarce in the northern regions of Russia, while it is more common in southern regions [45]. However, as the studies using fermental traps showed, the distribution of *P. fieberi* is much wider, and the abundance in some localities is one of the highest among all Cetoniinae species [18,43]. At present, more than 50 localities are known in the Republic of Mordovia. In some localities in the Republic of Mordovia, the abundance is relatively high [31,44,46]. In Russia, the species is rare and is included in the Red Book of the Russian Federation [32]. However, the need to protect it has been questioned [45].

The range of *Osmoderma barnabita* is wide, but numbers of the species are low everywhere. It occurs on stumps, in hollow trees, on oak sap by day, sometimes flying at dusk. The numbers are steadily low, and occurrences are sporadic. In the Republic of Mordovia, only three stable populations are known at present, inhabiting old-growth broad-leaved forests [25,46,47]. In Russia, this is a rare species and is included in the Red Book of the Russian Federation [32].

*Gnorimus variabilis* is common in Europe and Turkey. It occurs in broad-leaved, mixed and coniferous forests, preferring oak and birch forests. There are 25 known localities in the Republic of Mordovia. More often it occurs as single specimens, but in some biotopes its numbers are relatively high. Our observations have shown that in these habitats there is a considerable amount of good birch undergrowth, as well as dry birch trunks.

*Valgus hemipterus* has an extensive range. Adults are found on flowers and leaves of hardwood trees. Larvae develop in badly rotted stumps and in deciduous hardwood. There are 29 known localities in the Republic of Mordovia. Numbers are relatively high in some old-growth forests. The northern border of the species' range probably runs through

the Republic. In the Chuvash Republic, located to the north of Mordovia, the species has not been found in many years of research.

Figure 1 shows the abundance (in absolute terms) of the most numerous species of Scarabaeoidea. These include *Protaetia marmorata*, *Anoplotrupes stercorosus*, *Cetonia aurata*, *Protaetia cuprea volhyniensis*, *Oxythyrea funesta*, *Platycerus caraboides*, *Serica brunnea*, *Melolontha hippocastani*, *Trichius fasciatus* and *Protaetia fieberi*. These 10 species accounted for 76.3% in number and 67.9% in occurrence of all studied individuals.

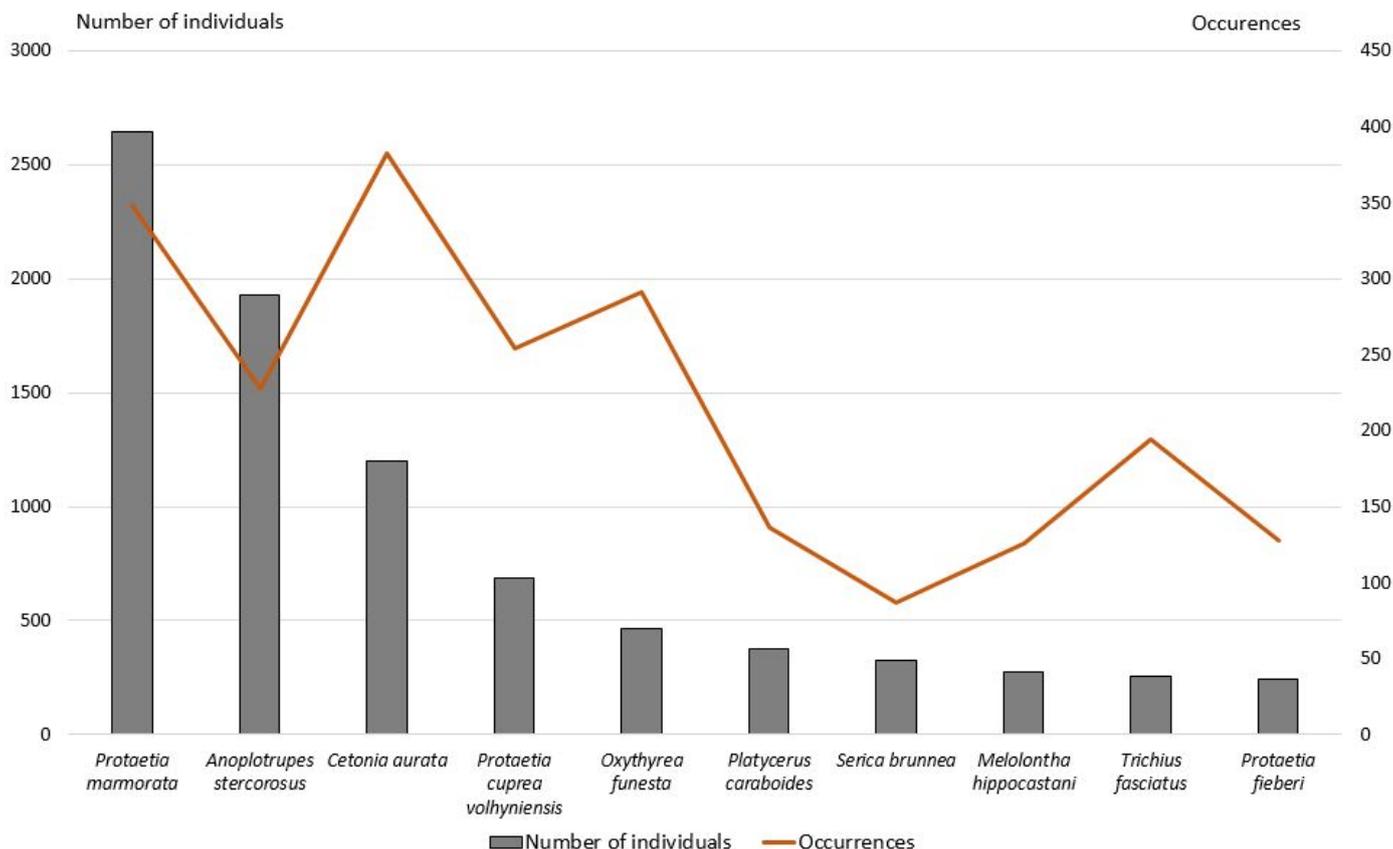


Figure 1. Species of Scarabaeoidea of the Republic of Mordovia with the highest occurrence and highest numbers represented in the dataset.

In the Coleoptera order, representatives of the superfamily Scarabaeoidea are one of the most studied groups. Faunistic data have been published for various regions of European Russia (Table 3).

Table 3. Comparison of Scarabaeoidea species diversity in some regions of European Russia.

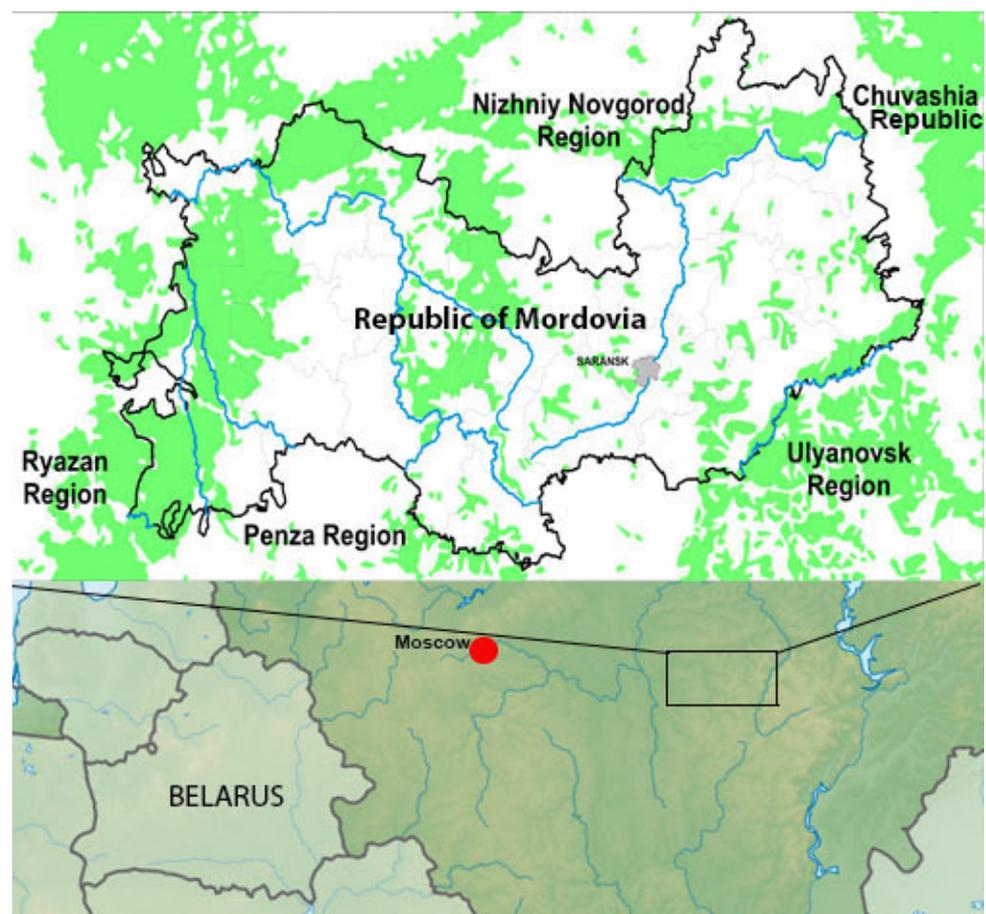
Region	Species Diversity	Data
Republic of Mordovia	95	Our data
Chuvash Republic	93	Data of the first author
Moscow region	110	[48]
Ulyanovsk region	129	[40,49]
Penza region	99	[50]
Republic of Tatarstan	89	[49]
Samara region	146	Data by A.S. Tilly
Udmurt Republic	90	[51]
Lipetsk region	96	[52]
Voronezh region	113	[53]
Volgograd region	169	[54]

The species diversity of Scarabaeoidea of the Republic of Mordovia is roughly similar in number of species to that of the neighboring or more northern regions. At the same time, in the more southern regions of European Russia (Samara region, Volgograd region and Voronezh region) the number of Scarabaeoidea species is much higher (Table 3). This confirms the previously noted pattern of increasing diversity from north to south in European Russia established for Aphodiini [39]. In total, the fauna of the Scarabaeoidea of southern Russia includes more than 330 species [55,56].

### 3. Methods

#### 3.1. Study Area

The Republic of Mordovia is located in the center of the Russian Plain between  $42^{\circ}11'$  and  $46^{\circ}45'$  east longitude and  $53^{\circ}38'$  and  $55^{\circ}11'$  north latitude on the southwestern periphery of the Volga basin in the interfluvium of Moksha and Sura [57]. The maximum length from west to east is 298 km, from north to south—up to 140 km (Figure 2). Most of the territory is located in the north-western region of the plast-tiered Volga upland, which in the west of the republic passes into the Oka–Don lowland formation. The Republic of Mordovia is located mainly in the forest-steppe landscape zone, although in its north-western part there is an array of forests of the southern taiga, and in the southern part there are still steppe areas preserved in places (in many areas there are quite a significant number of steppe areas that are small in area). The diversity of natural conditions determines the peculiarities of the fauna of the region [58].



**Figure 2.** Study area of information for the dataset.

#### 3.2. Design of Research, Identification and Taxonomic Position of Samples

We used traditional methods of collecting Scarabaeoidea, including manual collecting, light collecting, rotten remains and pitfall traps [59–61]. Pitfall traps were installed from

April–September. The traps were 0.5-L plastic cups containing 200 mL of a 4% formalin solution. We installed 10 traps in various biotopes. The distance between the traps was 2 m. A large number of samples were collected in traps with bait from beer and wine with added sugar and honey [62,63]. The studies were conducted in 2003–2022. The material from the Mordovia State Nature Reserve collections (samples from 1972 and 1986) was also used. For a rough estimate of the number of species, we used the following definitions: single individual means that single specimens of the species were found in 1–2 places in the region, rare species refers to species with an abundance of 10 or fewer specimens found in 3–5 localities, common species are Scarabaeoidea beetles with an abundance of up to 200 or fewer specimens found in 6–10 localities, and numerous species are Scarabaeoidea with a total abundance of over 200 specimens occurring in at least 50% of the studied localities.

The collected material was identified by L.V. Egorov, partly by A.B. Ruchin and S.K. Alekseev. Identification was performed in accordance with Medvedev [64], Frolov [65], identification keys on resources—<https://oleonet.de/coleo/texte/aphodius.htm>, <https://oleonet.de/coleo/texte/onthophagus.htm> (access on 26 April 2023). We followed the proposed nomenclature in the works of Löbl and Löbl [15].

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