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Coleoptera Poloniae: Tenebrionoidea (Tenebrionidae, Boridae)

Critical checklist, distribution in Poland and meta-analysis

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Warszawa 2012

COLEOPTERA POLONIAE

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***Natura optima dux* Foundation**

Website: http://www.biomap.pl

Abstracted in: Current Contents*/Agriculture, Biology, and Environmental Sciences; Entomological Abstracts and Zoological Record

The title partly sponsored by the Ministry of Science and Higher Education, Warsaw
[Tytuł częściowo sponsorowany przez Ministerstwo Nauki i Szkolnictwa Wyższego, Warszawa]
Biodiversity Map [Mapa Bioróżnorodności] – Grant No. 762/N-GBIF/2010/0;
KSIB – Polish Biodiversity Information Network [Krajowa Sieć Informacji o Bioróżnorodności]

Cover illustration: *Eledonoprius armatus* (Panzer, 1799) by Lech Borowiec
(Iconographia Coleopterorum Poloniae)

ISBN 978-83-935107-1-9

Printed in Poland by PAN, Warszawska Drukarnia Naukowa, Warszawa

Coleoptera Poloniae

Tenebrionoidea

This publication should be cited as follows:
Iwan D., Kubisz D., Tykarski P. 2012. *Coleoptera Poloniae*: Tenebrionoidea (Tenebrionidae, Boridae). Critical checklist, distribution in Poland and meta-analysis. University of Warsaw – Faculty of Biology, *Natura optima dux* Foundation, Warszawa, 480 pp.

Coleoptera Poloniae: Tenebrionoidea (Tenebrionidae, Boridae)

Critical checklist, distribution in Poland and meta-analysis

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Abstract

The book provides a summary of data on occurrence of Tenebrionidae and Boridae in Poland. The presence of 73 species of Tenebrionidae and 1 Boridae species is confirmed, while 28 tenebrionid taxa are considered doubtful or needing confirmation, although reported in the past. Data on distribution of the confirmed taxa cover localities, UTM 10×10 km grid coordinates, dates, collections that hold specimen, and source references, accompanied by distribution maps generalized to the UTM grid. A separate chapter gives an overview of Palaearctic distribution of all the discussed taxa, including subspecies when applicable. Detailed taxonomic checklist of the group including synonymy is also provided separately. The distribution catalogue part is followed by the meta-analysis built upon a database covering all the presented information. A number of analytical and generalization techniques was used, giving synthetic views on research intensity and number of species known in different parts of the country, commonness-abundance relationship and relative species richness analyses as a result, to mention the most important of the outcomes. The publication gives a new quality to traditional faunistics, being paired with the database that will be available online through the Biodiversity Map and Coleoptera Poloniae websites, served by the Polish Biodiversity Information Network (KSIB).

Key words

Coleoptera, Tenebrionoidea, Tenebrionidae, Boridae, biodiversity, faunistics, zoogeography, distribution, meta-analysis, checklist, museum collections, Poland

Contents

Preface

The role of a catalogue is to provide an inventory of objects of interest. This is one of the aims also of this book, to document all available published data on distribution of Tenebrionidae and Boridae in Poland. In this regard, we continue the work of our great predecessors, revising and verifying information accumulated until now. The novelty of this book is the synergy of the conservative and modern approach to faunistics. The traditionally fashioned main chapter is followed by the analytical part showing synthetic views on the catalogued data, seen from different perspectives. This could not be possible without a database built upon the catalogued data. Using GIS techniques made it possible to produce maps of species occurrences and visualise results of data analyses.

Moreover, through the database, the content of the catalogue constitutes a part of a long-term scientific project *Coleoptera Poloniae* and will be available through the project website. Facilitated with browsers and mapping tools, linked with pictures, bibliography and other materials, it can become an important source of information on tenebrionids. It is possible to use it when planning research, e.g. to spot areas of interest. The analytical methods used here for darkling beetles can easily be applied to other groups. On the other hand, the book can be treated as a paper backup of the Coleoptera Poloniae database. Although electronic media provide an efficient way to acquire and analyse new occurrence records that is able to take over functions of the traditional publishing system, the transition to the digital environment does not make the paper form obsolete. On the contrary, it should be used to document the database content once a part of data is completed.

The current infomation technology and interactive databases can foster progress of the knowledge of tenebrionids and other groups to the extent unthinkable in the past. However, as science is made by humans and not machines, the essential condition to achieve it is understanding of common profits from sharing information by entomologists. We hope that this catalogue and our approach brings us closer to this point.

Taxonomy and species checklist

(–) species of not confirmed or doubtful presence in Poland

Family **TENEBRIONIDAE** Latreille, 1802

Subfamily **LAGRIINAE** Latreille, 1825

Tribe **Belopini** Reitter, 1917

Genus ***Centorus*** Mulsant, 1854

Subgenus ***Belopus*** Gebien, 1911

Calcar Dejean, 1821
Calcar Latreille, 1829

(–) ***Centorus elongatus elongatus*** (Herbst, 1797)

Tenebrio elongatus Herbst, 1797
Trogosita calcar Fabricius, 1801

Tribe **Laenini** Seidlitz, 1896

Genus ***Laena*** Dejean, 1821

Laena Latreille, 1829
Catolaena Reitter, 1900
Psilolaena Heller, 1923
Ebertius Jedlička, 1965

Laena reitteri Weise, 1877

Laena ormayi Reitter, 1887

Tribe **Lagriini** LATREILLE, 1825

Subtribe **Lagriina** LATREILLE, 1825

Genus ***Lagria*** FABRICIUS, 1775

Subgenus ***Lagria*** FABRICIUS, 1775

Lachna BILLBERG, 1820

Lagria atripes MULSANT et GUILLEBEAU, 1855

Lagria puncticollis SEIDLITZ, 1898
Lagria tenuicollis SEIDLITZ, 1898

Lagria hirta (LINNAEUS, 1758)

Chrysomela hirta LINNAEUS, 1758
Cantharis spadicea SCOPOLI, 1763
Lagria glabrata FABRICIUS, 1775
Tenebrio villosus DE GEER, 1775
Cantharis flava GEOFFROY, 1785
Lagria lurida KRYNICKI, 1832
Lagria depilis MULSANT, 1856
Lagria nudipennis MULSANT, 1856
Lagria caucasica MOTSCHULSKY, 1860
Lagria fuscata MOTSCHULSKY, 1860
Lagria pontica MOTSCHULSKY, 1860
Lagria limbata DESBROCHERS DES LOGES, 1881
Lagria seminuda REITTER, 1889

Subfamily **PIMELIINAE** LATREILLE, 1802

Tribe **Asidini** FLEMING, 1821

Genus ***Asida*** LATREILLE, 1802

Subgenus ***Asida*** LATREILLE, 1802

Dolichasida REITTER, 1917
Euryasida REITTER, 1917
Leptasida REITTER, 1917
Insulasida ESCALERA, 1922
Rugasida ESCALERA, 1922

(–) ***Asida sabulosa sabulosa*** (FUESSLIN, 1775)

Tenebrio sabulosus FUESSLIN, 1775
Tenebrio rugosus GEOFFROY, 1785
Platynotus morbillosus FABRICIUS, 1801
Platynotus undatus FABRICIUS, 1801
Asida glabricosta SOLIER, 1836
Asida helvetica SOLIER, 1836
Asida vicina SOLIER, 1836
Asida catenulata MULSANT, 1854
Asida insidiosa MULSANT, 1854
Asida consanguinea ALLARD, 1869
Asida obesa ALLARD, 1869

Tribe **Tentyriini** ESCHSCHOLTZ, 1831

Genus ***Tentyria*** LATREILLE, 1802

Subgenus ***Tentyria*** LATREILLE, 1802

Heliodromus BRULLÉ, 1832

(–) ***Tentyria nomas nomas*** (PALLAS, 1781)

Tenebrio nomas PALLAS, 1781
Tentyria rugulosa GERMAR, 1824
Tentyria podolica STEVEN, 1829
Tentyria sibirica GEBLER, 1829
Tenebrio gebleri BESSER, 1832
Tentyria salzmanni SOLIER, 1835
Anatolica saisanensis MOTSCHULSKY, 1845

Subfamily **TENEBRIONINAE** LATREILLE, 1802

Tribe **Palorini** MATTHEWS, 2003

Genus ***Palorus*** MULSANT, 1854

Caenocorse THOMSON, 1859
Eba PASCOE, 1863
Platyotus GERSTAECKER, 1871
Circomus FLEISCHER, 1900
Stenopalorus BLAIR, 1930

Palorus depressus (FABRICIUS, 1790)

Hypophlaeus depressus FABRICIUS, 1790
Ips unicolor OLIVIER, 1790
Caenocorse formiceticola MUNSTER, 1928

Palorus ratzeburgii (WISSMANN, 1848)

Hypophloeus ratzeburgii WISSMANN, 1848
Hypophloeus ambiguus WOLLASTON, 1857
Hypophloeus floricola MARSEUL, 1876
Caenocorse galilaea SAHLBERG, 1913

Palorus subdepressus (WOLLASTON, 1864)

Hypophloeus subdepressus WOLLASTON, 1864
Palorus bifoveolatus BAUDI DI SELVE, 1876

Tribe **Bolitophagini** KIRBY, 1837

Genus ***Bolitophagus*** ILLIGER, 1798

Boletophagus ZETTERSTEDT, 1828

Bolitophagus interruptus ILLIGER, 1800

Bolitophagus goedeni PANZER, 1803

Bolitophagus reticulatus (LINNAEUS, 1767)

Silpha reticulata LINNAEUS, 1767
Sylpha boleti PILLER et MITTERPACHER, 1783
Hispa cornuta THUNBERG, 1784
Opatrum crenatum FABRICIUS, 1792

Genus ***Eledona*** LATREILLE, 1796

Eledona agricola (HERBST, 1783)

Opatrum agricola HERBST, 1783
Dermestes sulcatus THUNBERG, 1784
Eledona fungicola HORN, 1870
Eledona turcica SEIDLITZ, 1891

Genus ***Eledonoprius*** REITTER, 1911

Eledonoprius armatus (PANZER, 1799)

Opatrum armatum PANZER, 1799

Tribe **Tenebrionini** LATREILLE, 1802

Genus ***Bius*** DEJEAN, 1834

Bia HOPE, 1840
Dendroscopius GISTEL, 1848

(–) ***Bius thoracicus*** (FABRICIUS, 1792)

Trogosita thoracica FABRICIUS, 1792
Tenebrio laevis STEPHENS, 1835

Genus ***Neatus*** LECONTE, 1862

Neatus picipes (HERBST, 1797)

Tenebrio picipes HERBST, 1797
Tenebrio loripes STURM, 1807
Tenebrio transversalis DUFTSCHMID, 1812
Tenebrio badius SAY, 1824
Tenebrio laticollis STEPHENS, 1832
Tenebrio ventralis MARSEUL, 1876
Tenebrio intermedius FIORI, 1903

Genus ***Tenebrio*** LINNAEUS, 1758

Menedrio MOTSCHULSKY, 1872
Tenebrionellus CROTCH, 1873

Introduction

The superfamily Tenebrionoidea, in early works that do not include a part of families included in it nowadays, was defined as section Heteromera of superfamily Cucujoidea (Crowson 1981). According to currently accepted systematics (Lawrence and Newton 1995, Lawrence et al. 2011), it consists of 30 families, which encompass more than 30,000 species all over the world. Specimens of 20 families have been found in Poland so far: Lymexylidae, Mycetophagidae, Ciidae, Tetratomidae, Melandryidae, Mordellidae, Ripiphoridae, Zopheridae, Tenebrionidae, Prostomidae, Oedemeridae, Meloidae, Mycteridae, Boridae, Pythidae, Pyrochroidae, Salpingidae, Anthicidae, Aderidae and Scraptiidae.

In spite of large number and diversity of beetles representing this superfamily nowadays, rather few fossilized specimens have been found so far, which may indicate its late differentiation. *Wuhua jurassica* Wang et Zhang, described from Middle Jurassic in China (Daohugou), ca. 164–165 Ma (Wang and Zhang 2011), is thought to be its earliest specimen. The species shows both common features with some modern families and unique ones, due to which some authors classify it as family *incertae sedis*. In the family Tenebrionidae, the oldest fossil to be found so far is *Jurallecula grossa* Medvedev, discovered in Late Cretaceous layers of Karatau in Kazakhstan (Medvedev 1969).

Nowadays, the family Tenebrionidae comprises almost 20,000 species of beetles forming about 2,300 genera. They occur mainly in tropics and temperate zone, rarely exceeding the 50th parallel N, similar pattern to be found in the southern hemisphere (Matthews and Bouchard 2010). The family Boridae is small and occurs in temperate regions of the northern and southern hemisphere (Pollock 2010). Four species are found in 3 genera: *Boros* *schneideri* (PANZ.) (northern Palaearctic), *B. unicolor* SAY (Canada and the United States), *Lecontia discicollis* (LECONTE) (the southwest United States), and *Synercticus heteromerus* PASCOE (Australia and New Guinea). In this work, *Boros schneideri* PANZ. was included, as it is the only representative of the family to be found in whole northern part of Eurasia in areas covered with coniferous forest, also in Poland.

The earliest faunistic data from the territory of modern Poland were published in 1792 by KUGELANN. They deal with three species: *Palorus depressus,* reported in Gdańsk (Danzig), described by FABRICIUS (1790) only 2 years before, and *Neomida haemorrhoidalis*, also described by FABRICIUS (1787), localized in Olsztynek (Allenstein'sche Glashütte). At the same time, KUGELANN (1794) described for the first time the species *Corticeus fraxini*, indicating Ostróda (Osterode) as *locus typicus*. Unfortunately, the type specimens and the ones investigated by KUGELANN were not preserved, so FERRER and LUNDBERG (2003) selected a neotype for the species, kept at present in MIZ PAS (Białowieża, ex. coll. S. TENENBAUM).

Boros schneideri was described by PANZER in 1796 from *terra typica* "Germania borealis". From the territory of Poland, the first precise information was given by LENTZ in 1879 (Ostróda), quoting data by KUGELANN, so dating back more or less to the time of description of the species (end of the 18^{th} century).

The most important catalog work of beetles of Poland that has appeared so far was "Katalog Fauny Polski (Catalogus Faunae Poloniae)", further referred to as KFP, issued in the end of 20^{th} century. Volumes 11, 13 and 14 (BURAKOWSKI et al. 1986a, b, 1987) contained data on the occurrence of species of 20 families, presently belonging to the Tenebrionoidea superfamily. The work included, among others, taxa discussed in this book. According to the earlier developed scheme, it contained data on taxonomy, distribution, bibliography and biology of the species which were accounted in literature to the fauna of Poland in its present geographical borders. The taxonomic system used by the authors of KFP was modified in later works (BOUCHARD et al. 2005). For this reason, the Tenebrionidae family, as interpreted presently, comprises three taxa treated in the catalog of 1987 as separate families: Tenebrionidae (58 taxonomic names with catalog numbers), Lagriidae (2) and Alleculidae (22). The number of names is not equal to the number of species as some of them were later recognized as synonyms (in KFP, two names were given as two different species), e.g. *Nalassus dermestoides* (ILLIGER, 1798) = *Helops picipes* KÜSTER, 1850, *Stenomax aeneus* (SCOPOLI, 1763) = *Stenomax lanipes*

(LINNAEUS, 1771), *Isomira murina murina* (LINNAEUS, 1758) = *Isomira semiflava* (KÜSTER, 1852). Additional information on two species occurring in Poland was published in a supplement to KFP (BURAKOWSKI et al. 2000). Both volumes of the KFP included mainly data coming from earlier publications (mostly from the 19th century), but they also comprised faunistic data not published previously, with a note "B. BURAKOWSKI*", concerning Tenebrionidae and many other families. Most of this information comes from labels on specimens studied by B. BURAKOWSKI and kept mainly in the collections of the Museum and Institute of Zoology of Polish Academy of Sciences (MIZ), but also in that of the Institute of Systematics and Evolution of Animals of Polish Academy of Sciences (ISEA) and in other collections, including private ones.

In "Fauna of Poland" checklist of species, IWAN (2004) stated that 86 species of the darkling beetles (according to the present interpretation of the family) can be expected to occur in Poland. The largest and most recent (especially in terms of systematics) "Catalogue of Palaearctic Coleoptera" (LÖBL and SMETANA 2008) also confirms the occurrence of 86 species. However, virtually all faunistic data concerning Polish beetles discussed therein come from Volume 14 of the KFP.

In recent years, apart from a range of smaller faunistic works, a large compilation appeared (IWAN et al. 2010), encompassing results of faunistic investigation of beetles belonging to the family Tenebrionidae, basing on data concerning more than 10,500 specimens belonging to 78 species deposited in three largest entomological collections in Poland (ISEA, MIZ and USMB). It was accompanied by a work presenting new methods of analysis of faunistic data, utilizing databases and GIS techniques (TYKARSKI 2010). The oldest specimen of darkling beetles preserved in the studied collections belongs to *Isomira murina murina* (LINNAEUS, 1758), and was collected by A. WAGA in 1859 (Kielce, Świętokrzyskie Mts., ISEA collection). The authors of the compilation (IWAN et al. 2010) verified identification of particular specimens, whereupon they verified reports on occurrence of some species in Poland, important for the catalog of the local fauna. The voucher specimen (deposited in the MIZ collection) used in publications by TENENBAUM (1918, 1923) and secondarily cited by KFP, captured by F. FEJFER (Roztocze Upland, Florianka), belongs in fact to *Crypticus quisquilius* (L.), and not to *Pedinus helopioides* AHR. The voucher specimens (ISEA collection) used in the publication by SZYMCZAKOWSKI (1973) and secondarily cited by KFP, captured in the Radomyśl, actually belong to *Oodescelis melas* (FISCH.) and not *Oodescelis polita* (STURM). The voucher specimen (ISEA collection) used in the publication by SZYMCZAKOWSKI (1973) and secondarily cited by KFP, captured by that collector in the vicinity of Ojców, belongs in fact to *Isomira murina* (L.) and not *Isomira icteropa* (KÜST.), thus the latter one should be deleted from the list of species occurring in Poland. The voucher specimen (MIZ collection) used in KFP, and referred to as B. BURAKOWSKI*, captured by B. BURAKOWSKI (Łomianki), belongs in fact to *Palorus subdepressus* WOLL. and not *Palorus ratzeburgii* (WISSM.). The voucher specimen (MIZ collection) collected and used for publication by FEJFER (1924) and secondarily cited by KFP, found in Roztocze Upland, Florianka, belongs actually to *Corticeus linearis* (F.), and not *Corticeus suberis* (LUC.).

The work by IWAN et al. (2010) and a number of other publications that appeared after issuance of the relevant volume of KFP (1987) contributed a significant amount of new or verified data on occurrence of Tenebrionidae and Boridae in Poland. Additionally, the new classification that joined Tenebrionidae, Alleculidae and Lagriidae in one family, and included numerous synonimizations, encouraged the authors to prepare this book. This is a synthesis presenting the state of art and including results of analyses carried out by the authors, regarding occurrence of beetles of both families in Poland.

The issuance of the book accompanies the set-off of the project "Biodiversity Map" (TYKARSKI 2011a), run by the University of Warsaw as an initiative of the Polish Biodiversity Information Network (Krajowa Sieć Informacji o Bioróżnorodności, www.ksib.pl), providing modern IT tools for faunistic investigations in Poland (www.biomap.pl). Products of the project include databases and online applications with a mapping GIS tool allowing the users to filter and view data from diverse perspectives. The tools and the database system support the long-term program "Coleoptera Poloniae" aimed at integrating data on beetles of Poland (coleoptera.biomap.pl). The present work and a database built upon the data (see chapter "Meta-analysis of occurrence data") constitute a part of the system. The data and maps of species distributions will be available online.

Materials and methods

The data for analyses of occurrence of Tenebrionidae and Boridae beetles in Poland, included in this work, were obtained by review of information contained in 456 publications which appeared in 1792–2012.

The results of studies are presented in two chapters: "Species with confirmed presence in Poland" and "Species with doubtful or not confirmed presence in Poland (Tenebrionidae)". Analysis of data on general distribution of species and their occurrence in the territory of Poland in the present borders, and information found in literature, helped the authors to make decisions and determine the list of species reported in Poland. It includes beetles that occur in natural conditions and undergo here the full developmental cycle in span of many years, taking into account climatic conditions, as well as synanthropic species, permanently connected with homesteads (regardless whether accepted by people or not), reported in Poland in the analyzed period. The chapter does not include species which have been introduced accidentally and occasionally (e.g., with food or other biological materials, or with vehicles), and cultured or captured forms, imported to Poland to be kept as pets. Literature data on these species can be found in the second chapter.

At the level of subfamily, tribe and subtribe, the systematic level of family Tenebrionidae is basing on classification proposed by Bouchard et al. (2005). Attribution of species and genera to higher taxa and categories, as well as synonyms at the level of species and genera, follow Löbl and Smetana (2008), taking into account further corrections to Catalogue of Palaearctic Coleoptera (Errata for vol. 1–5) and additional unpublished information (Ivan Löbl pers. com., corrections by the authors of this catalogue).

The names of the faunistic regions are given according to Catalogus Faunae Poloniae, and referred to as KFP regions (BURAKOWSKI et al. 1987). For species that are present in Poland, confirmed, all the KFP regions are listed for the clarity. If no data are available, a symbol of three asterisks is used (***). This allows quick and easy access to general information (present/absent) on the occurrence of the particular species in a specific region, and adding hand-written comments in future. We treat the KFP regions as a legacy division, used here only in an ancillary role for sorting data in species documentation. It should be replaced as soon as possible by a more appropriate regionalization system, respecting physiography of the country, and suitable for faunistic uses (TYKARSKI 2011b).

All localization data consist of the following 5 elements: the site name, its UTM code, the collection date, the collection holding the voucher specimens (optional), and the source of the data (quotation). Lack of any of these elements is also marked with the *** symbol. The authors applied the rule that only published data are taken into account.

All names of localizations are in Polish. Former German names of towns and villages indicated in the original labels have been given in parentheses, for example: Koszalin (Coeslin, Köslin), Szczecin (Stettin). If a name has been written in other language than Polish in the original publication, it has been translated with the original form given in parenthesis, e.g. Gdańsk (Danzig). All localization names are listed in alphabetical order in the Index of Geographical Names.

To all localizations, UTM 10×10 km grid codes are attributed, given in square brackets. In case of places comprised by more than one UTM square (such as Wrocław), an arbitrary code has been used, i.e., UTM code of one of the squares, preceded with "a.", e.g. Poznań [a.XU30]. For general localizations, but limited to a single region (e.g. Poznań Voivodship), the UTM codes have not been given. General locations that are situated within the boundaries of Poland but exceed boundaries of a single KFP region, such as "Przemyśl vicinity", "powiat zamojski i biłgorajski" (i.e. Zamość and Biłgoraj districts), have been listed as "General". Having no UTM coordinates, they have not been mapped.

The "Comments" paragraph contains three types of information:

– name of the species and its number according to KFP (BURAKOWSKI et al. 1987); bearing in mind the high popularity and quotability of the Catalogus, we want to allow the readers to quickly identify the data included in the KFP and this work;

– data on the species habitat, its population size and frequency in Poland;

– protection status according to data published in the Red List of Threatened Animals in Poland (PAWŁOWSKI et al. 2002) and Polish Red Data Book of Animals (KONWERSKI 2004, KUBISZ 2004b, c).

For each species, the general distribution has been determined on the basis of the Catalogue of Palaearctic Coleoptera (LÖBL and SMETANA 2008), including data on distribution of relative subspecies, where relevant. The distribution maps are assembled in a separate chapter.

The literature consists of a list of publications containing original faunistic data or works supplying such data. The list does not include works that are obviously secondary and contain generalized data on occurrence of a given species, e.g., "reported in the territory of Poland". The authors are of the opinion that quoting such positions gives no new information on distribution of the species in the country; to the contrary, it might significantly distort its understanding. For example, constant repeating of the primary (e.g., from the 19th century) single information suggests constant findings of the species in the given area, until present. Giving too general information was the reason to exclude, in most cases, the first Polish catalog, "Wykaz chrząszczów czyli Tęgopokrywych (Coleoptera) ziem polskich" ("*Catalogus coleopterorum Poloniae*") (ŁOMNICKI 1913). It is unfortunately impossible to establish whether information given therein applies to Poland in its present boundaries. Taxonomic literature is quoted only in single cases, as the main goal of this book is to give the summary of distribution data and not of taxonomy of species.

All maps were produced using ArcGIS 10.0 software. Maps of Poland in the catalogue and in the meta-analytic chapter are shown in PUWG 1992 projection, while maps of general distribution of species were prepared in Times projection. For better readability of maps of occurrence of species, a convention was used to show UTM squares as dots surrounding their centroid points. As centroids of squares that intersect the border line of Poland may fall outside the border, occurrence of species may in such cases seem to be placed outside, which is obviously not true for the Baltic Sea or is beyond the scope of this catalogue in the remaining cases. Being a consequence of the convention, they should be interpreted as related to those parts of a square that remain within the (terrestrial) borders of Poland.

In order to facilitate finding information about species, alphabetic order of species is used in the checklist, parts of the catalogue and the chapter on the general distribution. The complete taxonomy is presented as a separate chapter, and its simplified form is shown in Table 2 in the meta-analytic chapter (p. 318).

Abbreviations

Names of institutions:

ISEA – Institute of Systematics and Evolution of Animals of PAS in Cracow,
MIZ – Museum and Institute of Zoology of PAS in Warsaw,
USMB – Upper Silesian Museum in Bytom.

Other abbreviations:

AC – author's collection,
KFP – Catalogus Faunae Poloniae (BURAKOWSKI et al. 1987),
nat. res. – nature reserve,
L.P. – landscape park,
N.P. – national park.

The administrative division of public forests in Poland is as follows: forest divisions (f. div.; "nadleśnictwo") are divided into forest districts (f. distr.; "leśnictwo"), and the latter are subdivided into forest compartments (f. comp.; "oddział").

The newest data on occurrence of *Boros schneideri* in Poland (BUCHHOLZ et al. 2012) appeared at the stage of final processing of the text before printing and therefore they were not included in the meta-analysis chapter.

Species with confirmed presence in Poland

TENEBRIONIDAE Latreille, 1802

Allecula morio (Fabricius, 1787)

Distribution in Poland (Fig. 1)

Baltic Coast: Gdańsk-Oliwa (Oliva) [CF33], *** (Lentz 1857, 1879, Bercio and Folwaczny 1979); Koszalin (Köslin) [WA70], *** (Lüllwitz 1916); Międzyzdroje (Misdroy) [VV67], *** (Habelmann 1854); Puck (Putzig) [CF36], *** (Lentz 1857, 1879, Węgrzecki 1932, Bercio and Folwaczny 1979).

Pomeranian Lake District: "Kuźnik" nat. res. [XU19], IX 1999–XI 2001, *** (Ruta and Melke 2002); "Kuźnik" nat. res., buffer zone [XU19], 1999–2008, *** (Ruta 2009); Szczecin [a.VV72], *** (Burakowski et al. 1987).

Masurian Lake District: "Dęby w Krukach Pasłęckich" nat. res. [DE18], IV–XI 2002, *** (Byk and Byk 2004); Gardzień [DE04], VII 2003, *** (Gawroński and Oleksa 2006); Kamieniec [CE95], VII 2003, *** (Gawroński and Oleksa 2006); Międzychód [DE16], VII 2003, *** (Gawroński and Oleksa 2006); Szymbark [DE04], VII 2003, *** (Gawroński and Oleksa 2006); Urowo [DE15], VII 2003, *** (Gawroński and Oleksa 2006).

Wielkopolska-Kujawy Lowland: Buszenko lake [WU10], 26 VII 2001, AC (Bunalski et al. 2007); Dziembówko [XU28], 12 VII 1999, AC (Bunalski et al. 2007); Karszew [CC57], V–VII 2000, AC (Bunalski et al. 2007), 5 VII 2000, ISEA (Iwan et al. 2010); Koło [CC38], 28 VI 1999, AC (Bunalski et al. 2007); "Krajkowo" nat. res. [XT38], 2–5 VII 2005, *** (MOKRZYCKI et al. 2008); Nowa Sól (Neusalz) [WT43], *** (BURAKOWSKI et al. 1987), 14 VII 1906, MIZ (IWAN et al. 2010); Otyń [WT44], *** (BURAKOWSKI et al. 1987); Osowa Góra [XT29], 16 VII 1994, AC (BUNALSKI et al. 2007); Poznań, Cytadela [XU30/31], 5 VII 2001, AC (BUNALSKI et al. 2007); Poznań-Dębina [XU20], *** (SZULCZEWSKI 1922); Poznań, Warta meadows [XU31], 17 VII 1992, AC (BUNALSKI et al. 2007); Rogalin [XT38], 30 VI–5 VII 2007, *** (MOKRZYCKI et al. 2008); Ruszków [CC38], X 2002–IV 2003, AC (BUNALSKI et al. 2007).

Mazovian Lowland: Piaseczno [EC06], 8 VII 1906, USMB (IWAN et al. 2010); Podkowa Leśna [DC87], 15–29 VI 1934, MIZ (IWAN et al. 2010); Sieraków [DC89], 2 VIII 2010, AC (MARCZAK et al. 2010); Świder [EC17], 28 VII 1900, MIZ (IWAN et al. 2010); Świdry Małe [EC17], 14 VI 1964, MIZ (IWAN et al. 2010); Urle [ED41], 30 IV 1967, MIZ (IWAN et al. 2010); Warszawa-Agrykola [EC08], 2–10 III and 2 VI 1959, MIZ (IWAN et al. 2010); Warszawa-Bielany [DC99], *** (BURAKOWSKI et al. 1987, 1997), 18–27 VI 1888, USMB, 5 VII 1947, 23 XII 1951, 26 IX 1954, 30 I 1955, 16 V 1958, 31 V 1961, 11 XII 1964, 6 VII 1965, 12 V 1969, MIZ (IWAN et al. 2010); Warszawa-Buchnik [DC99], *** (BURAKOWSKI et al. 1987), 19 VII 1956, 23 III 1960, MIZ (IWAN et al. 2010); Warszawa-Łazienki [EC08], 23 III 1977, MIZ (IWAN et al. 2010); Warszawa-Młociny [DC99], 29 XI 1953, MIZ (IWAN et al. 2010); Warszawa-Morysinek [EC07], *** (BURAKOWSKI et al. 1987), 8 VI 1956, MIZ (IWAN et al. 2010); Warszawa-Natolin [EC07], ***, MIZ (IWAN et al. 2010); Warszawa-Ogród Saski [EC08], *** (BURAKOWSKI et al. 1987).

Podlasie Lowland: ***

Białowieża Primeval Forest: Białowieża N. P. [FD94], V–X 2000, *** (BYK 2001a), f. comp. 340 [FD94], 19 IV 1967, MIZ; Białowieża [FD94], 16 VII 1992, ISEA (IWAN et al. 2010); Białowieża Primeval Forest [a.FD94], 2000, 2004, *** (BYK et al. 2006).

Lower Silesia: Borowa Oleśnicka [XS57], 23 VI 1977, MIZ (IWAN et al. 2010); Legnica vicinity (Liegnitz) [WS87], ***(SCHOLZ 1923a); Ligota Wielka (Ellguth Ottmachau) [XR49], VIII 1909, 7 VII 1926, USMB (IWAN et al. 2010); Raszówka [WS88], *** (BURAKOWSKI et al. 1987); Słup [XS17], *** (BURAKOWSKI et al. 1987); Wrocław, Park Szczytnicki [XS46], 19 VI 1970, MIZ (IWAN et al. 2010); Wrocław vicinity (in der Nähe Breslau's), *** (SCHNEIDER 1856).

Trzebnickie Hills: ***

Upper Silesia: Bolęcin [CA95], 12 VI 1902, ISEA (Iwan et al. 2010); Chełmek [CA75], 15–23 VII 1878, ISEA (Iwan et al. 2010); "Las Murckowski" nat. res. [CA56], 1996–1997, AC (Szafraniec and Szołtys 1997); Łubowice (Lubowitz) [CA06], *** (Roger 1856); Pokój (Carlsruhe O/S) [XS94], 10 VI 1928, USMB (Iwan et al. 2010); Rudy Raciborskie (Rauden) [CA16], *** (Roger 1856); Zaborze [CA74], 5–6 VIII 1902, ISEA (Iwan et al. 2010); Żarki [CA84], 16–20 VI 1881, ISEA (Iwan et al. 2010).

Kraków-Wieluń Upland: Babice, Lipowiec castle [CA84], 29 V 1882, ISEA (Iwan et al. 2010); Czatkowice [DA05], 9 VII 1903, ISEA (Iwan et al. 2010); Częstochowa [CB63], 4 XI, *** (Lgocki 1908); "Diabla Góra" nat. res. [CA86], 1998, AC (Szafraniec et al. 1999); Kraków [a.DA24], 1914, MIZ (Iwan et al. 2010); Kraków-Bielany [DA14], VII, *** (Kulczyński 1873); Kraków-Las Wolski [DA14], 14 II 1957, MIZ (Iwan et al. 2010); Kraków-Śródmieście [DA24], 28 VII 1985, ISEA (Iwan et al. 2010); Ojców [DA16], *** (Burakowski et al. 1987, Iwan et al. 2010); Ojców N. P.: Chełmowa Mt. [DA16], 3 VIII 1907, MIZ, 15–22 VII 1964, 13–17 VII 1966, 8 VII 1967, ISEA (Pawłowski et al. 1994, Iwan et al. 2010).

Małopolska Upland: "Spała" nat. res. [DC40], 2006–2007, *** (Jaskuła et al. 2009).

Świętokrzyskie Mts.: Nowa Słupia [EB03], *** (Burakowski et al. 1987), 11 V 1956, MIZ (Iwan et al. 2010); Świętokrzyski N. P., Podgórze f. distr. [DB94], 2006, *** (Byk 2007); Świętokrzyski N. P., Święty Krzyż f. distr. [EB03], 2006, *** (Mokrzycki 2007); Świętokrzyskie Mts., IV–X 2006, *** (Mokrzycki 2011).

Lubelska Upland: Kazimierz Dolny [EB68], *** (Burakowski et al. 1987), V 1934, MIZ (Iwan et al. 2010); Puławy [EB69], 21 VI 1900, *** (Zajcew 1908), 2 VII 1953, MIZ (Iwan et al. 2010).

Roztocze Upland: Florianka [FB30], ***, MIZ (Iwan et al. 2010); Zwierzyniec [FB30], 4 VIII, *** (Tenenbaum 1913), 4 VIII 1911, MIZ (Iwan et al. 2010).

Sandomierska Lowland: Księżpol [FA28], 24 VII, *** (Tenenbaum 1913), 25 VII 1911, MIZ (Iwan et al. 2010); Jarosław [FA24], 20–30 VI 1888, ISEA (Iwan et al. 2010); Leżajsk [FA06], *** (Jabłoński 1869); Tarnów [a.DA94], 1892, ISEA (Iwan et al. 2010).

Western Sudety Mts.: Czerniawa-Zdrój [WS24], *** (Burakowski et al. 1987); Jedlina-Zdrój (Charlottenbrunn) [WS91], VIII 1917, 10 VI 1928, USMB (Iwan et al. 2010); Wleń [WS41879,5], *** (Burakowski et al. 1987); Kotlina Jeleniogórska (Burakowski et al. 1987).

Eastern Sudety Mts.: ***

Western Beskidy Mts.: Babia Góra Mt. [CV99], VII, *** (Stobiecki 1883), (Pawłowski 1967); Czarna Wisełka Valley [CV59], 19 VI 1962, MIZ (Iwan et al. 2010); Gorzków [DA32], 1 VII 1920, MIZ (Iwan et al. 2010); Kraków-Wróblowice [DA23], 15 VIII 1998, 17 VII 2003, 25 VII 2005, ISEA (Iwan et al. 2010); Łąkta Górna [DA62], VII 1935, *** (Stefek 1939); Mordarka [DA60], 16 VII 1903, ISEA (Iwan et al. 2010); Paleśnica [DA81], 1987, 30 VIII 1989, ISEA (Iwan et al. 2010); Polanka Wielka [CA73], 6 VII 1900, ISEA (Iwan et al. 2010); Ponice [DV29], 30 VII 1911, ISEA (Iwan et al. 2010); Rytro [DV78], 22 VII 1899, 15 VII 1901, ISEA (Iwan et al. 2010); Sieraków [DA32], 20 VI 1909, ISEA (Iwan et al. 2010); Skawica [DA00], 7 VII 1983, 11 VIII 1996, 26 VII 2002, ISEA (Iwan et al. 2010); Skawina

Fig. 1. Occurrence of *Allecula morio* in Poland.

[DA13], 4 VIII 1986, ISEA (IWAN et al. 2010); Skomielna Czarna [DA10], *** (BURAKOWSKI et al. 1987), VII 1934, MIZ (IWAN et al. 2010); Ustroń [CA40], 1873, ISEA (IWAN et al. 2010), *** (ROGER 1856); Zakliczyn [DA82], VII 1983, ISEA (IWAN et al. 2010); Zawoja [CV99], ***, MIZ (IWAN et al. 2010).

Nowotarska Dale: Poronin [DV26], *** (BURAKOWSKI et al. 1987), 19 VII 1949, MIZ (IWAN et al. 2010).

Eastern Beskidy Mts.: Jasło [EA31], VII 1921, ISEA (IWAN et al. 2010); Krasiczyn [FA11], *** (BURAKOWSKI et al. 1987), 22 IX 1962, MIZ (IWAN et al. 2010).

Bieszczady Mts.: ***

Pieniny Mts.: ***

Tatry Mts.: Czerwony Stawek [DV25], 23 VII 1904, ISEA (IWAN et al. 2010).

General: Przemyśl vicinity (TRELLA 1923a).

Comments

KFP: 3999. *Allecula morio* (FABRICIUS, 1787).

Probably living in all KFP regions in Poland, even in lower mountain localities, usually only single specimens caught. It is a saproxylophage, comparatively rarely captured due to its nocturnal activity pattern. For the Palaearctic distribution see Fig. 100.

Allecula rhenana BACH, 1859

Distribution in Poland (Fig. 2)

Baltic Coast: ***

Pomeranian Lake District: ***

Masurian Lake District: Kamieniec [CE95], VII 2003, *** (GAWROŃSKI and OLEKSA 2006).

Wielkopolska-Kujawy Lowland: “Krajkowo” nat. res. [XT38], 2–5 VII 2005, *** (MOKRZYCKI et al. 2008); Nowa Sól vicinity [a.WT43], ***, (BURAKOWSKI 1976); Otyń [WT44], *** (BURAKOWSKI et al. 1987), 22 IV 1971, MIZ (IWAN et al. 2010); Rawicz (Rawitsch) [XT22], VII 1903, MIZ (IWAN et al. 2010); Rogalin [XT39], 21 VII 1996, AC (BUNALSKI et al. 2007).

Mazovian Lowland: Klembów [ED20], *** (BURAKOWSKI et al. 1987), 13 V 1958, MIZ (IWAN et al. 2010); Warszawa-Bielany [DC99], ***

(BURAKOWSKI et al. 1987, 1997), 7 III 1954, 10 V 1962, MIZ (IWAN et al. 2010); Warszawa-Młociny [DC99], *** (BURAKOWSKI et al. 1987), 29 XI 1953, 11 XII 1955, MIZ (IWAN et al. 2010); Warszawa-Morysinek [EC07], *** (BURAKOWSKI et al. 1987), 31 I 1960, 26 V 1968, 19 IV 1970, MIZ (IWAN et al. 2010); Warszawa-Ogród Saski [EC08], 13 VIII 1974, 8–28 VII 1975, MIZ (IWAN et al. 2010); Warszawa vicinity, *** (BURAKOWSKI 1976, BURAKOWSKI et al. 1987).

Podlasie Lowland: ***

Białowieża Primeval Forest: Białowieża N. P. [FD94], V–X 2000, *** (MOKRZYCKI 2001).

Lower Silesia: ***

Trzebnickie Hills: ***

Fig. 2. Occurrence of *Allecula rhenana* in Poland.

Upper Silesia: ***
Kraków-Wieluń Upland: ***
Małopolska Upland: ***
Świętokrzyskie Mts.: Łysa Góra Mt. [EB03], *** (BURAKOWSKI et al. 1987), 27 X 1968, MIZ (IWAN et al. 2010); Świętokrzyski N. P., Święty Krzyż f. distr. [EB03], 2006, *** (BYK 2007).
Lubelska Upland: Puławy [EB69], *** (BURAKOWSKI et al. 1987), 22 VII 1951, MIZ (IWAN et al. 2010).
Roztocze Upland: ***
Sandomierska Lowland: Leżajsk [FA06], *** (BURAKOWSKI et al. 1987), 20 IX 1957, MIZ (IWAN et al. 2010).
Western Sudety Mts.: ***
Eastern Sudety Mts.: ***
Western Beskidy Mts.: Wisła-Głębce [CV49], *** (BURAKOWSKI et al. 1987), 22 VI 1967, 25 VI 1968, MIZ (IWAN et al. 2010); Beskid Cieszyński (BURAKOWSKI 1976, BURAKOWSKI et al. 1987).
Nowotarska Dale: ***
Eastern Beskidy Mts.: Przemyśl [FA21], 1938, *** (HORION 1956).
Bieszczady Mts.: ***
Pieniny Mts.: ***
Tatry Mts.: ***
General: Przemyśl vicinity (TRELLA 1923a, BURAKOWSKI 1976).

Comments

KFP: 4000. *Allecula rhenana* BACH, 1859.

A saproxylobiotic species, very close to *A. morio* in terms of distribution and biology. As it is not so often captured, its occurrence is poorly documented in publications for most of the territory of Poland. For the Palaearctic distribution see Fig. 101.

Alphitobius diaperinus (PANZER, 1796)

Distribution in Poland (Fig. 3)

Baltic Coast: Cedry Wielkie (Gr. Zünder) [CF51], *** (LENTZ 1857, 1879, BERCIO and FOLWACZNY 1979); Gdańsk (Danzig) [a.CF42], *** (PFEIL 1857, Horion 1956); Gdynia [CF44], *** (Burakowski et al. 1987), 9 VII 1938, ISEA (Iwan et al. 2010).

Pomeranian Lake District: "Kuźnik" nat. res. [XU19], 12 V 2000, 22 VI 2001, *** (Ruta and Melke 2002); "Kuźnik" nat. res., buffer zone [XU19], 1999–2008, *** (Ruta 2009).

Masurian Lake District: Dziarny [DE03], 27 V 2007, AC (Marczak et al. 2010); Gardzień [DE04], VII 2003, *** (Gawroński and Oleksa 2006); Kamieniec [CE95], VII 2003, *** (Gawroński and Oleksa 2006); Karpowo [DE05], VII 2003, *** (Gawroński and Oleksa 2006); Olsztyn *** [DE65], 23 VIII 2004, AC (Marczak et al. 2010); Pisz f. div., Szast f. distr. [EE53], 2005–2007, *** (Gutowski et al. 2010).

Wielkopolska-Kujawy Lowland: Byszewice [XU38], 9 VII–27 VIII 2001–2006, *** (Ruta 2007); Komorniki [XT29], 3 VIII 2008, 12 VII 2010, AC (Bunalski et al. 2011); Lusowo [XU11], 1 XI 1997, 22 XI 1997, 30 V 1999, 30 I 2000, 1 IV 2000, AC (Bunalski et al. 2011); Międzychód [XT36], 27 VIII 2008, AC (Bunalski et al. 2011); Osowa Góra [XT29], 16 VII 1994, 25 VII 1994, AC (Bunalski et al. 2011); Piła [XU18], 30 VIII 1999, AC (Bunalski et al. 2011); Piła-Leszków [XU28], 20 IV 2001, AC (Bunalski et al. 2011); Poznań-Ogrody [XU20], 26 VI 2006, 6 VII 2008, 29 VII 2008, AC (Bunalski et al. 2011); Poznań-Plewiska [XU20], 25 VIII 2009, AC (Bunalski et al. 2011); Poznań-Rataje [XU30], 1 VII 1998, 1 VII 1999, 28 VII 2001, AC (Bunalski et al. 2011); Puszczykowo [XT29], 16 VIII 1985, USMB (Iwan et al. 2010); Rybojedzko [XT19], 12 VIII 1992, ISEA (Iwan et al. 2010); Rzadkowo [XU28], 29 VII 2007, AC (Bunalski et al. 2011); Sycyn Dolny [XU13], 20.25 IV 1997, 18 V 1997, 20 III 2000, 15 VII 2007, AC (Bunalski et al. 2011); Trzebaw [XT29], 13 VII 2006, AC (Bunalski et al. 2011); Winna Góra [XT 68], 3 IX 2008, *** (Klejdysz 2011); Żagań [WT21], 20 XII 1994, *** (Greń 2003).

Mazovian Lowland: Kampinoski N. P., Pociecha [DC89], 16 VI 2009, AC (Marczak et al. 2010); Warszawa [a.EC08], *** (Tenenbaum 1923a), *** (Burakowski et al. 1987).

Podlasie Lowland: Różanka [FC72], *** (Burakowski et al. 1987).

Białowieża Primeval Forest: ***

Lower Silesia: Wrocław (Breslau) [a.XS46], *** (Horion 1956); Wrocław-Karłowice, Czajkowski str., barracks [XS94], 20 VI 1989, ISEA (Iwan et al. 2010).

Trzebnickie Hills: ***

Upper Silesia: Ruda Śląska [CA47], 10–30 X 2001, *** (MELKE and GRZYWOCZ 2003).

Kraków-Wieluń Upland: Biskupice [CB72], 14 VII 2008, *** (KLASIŃSKI and MINKINA 2008); Konopiska [CB62], 20 VII 2005, *** (KLASIŃSKI 2005); Kraków-Salwator [DA14], 21 VIII 2003, ISEA (IWAN et al. 2010); Kraków-Śródmieście [DA24], V 1996, ISEA (IWAN et al. 2010); "Sokole Góry" nat. res. [CB72], 2006–2007, *** (KLASIŃSKI 2007).

Małopolska Upland: ***

Świętokrzyskie Mts.: Kielce [DB73], 27 IX 2007, *** (BIDAS 2007);

Lubelska Upland: ***

Roztocze Upland: Florianka [FB30], MIZ (IWAN et al. 2010).

Sandomierska Lowland: ***

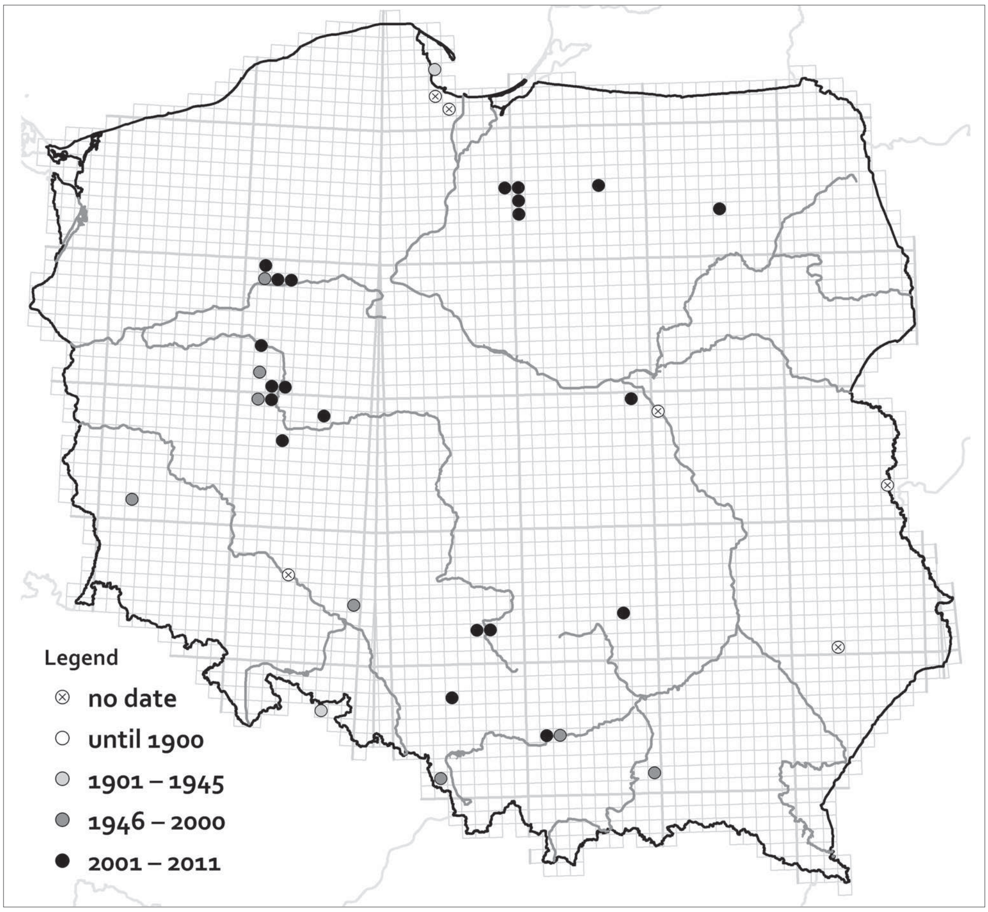

Fig. 3. Occurrence of *Alphitobius diaperinus* in Poland.

Western Sudety Mts.: ***
Eastern Sudety Mts.: Biskupia Kopa Mt. (Bischoffskoppe-Hubertusplatz) [XR76], 1910, *** (HORION 1956).
Western Beskidy Mts.: Dębowiec [CA31], 2 XI 1995, *** (GREŃ 2003); Polichty [DA91], 5 V 1999, ISEA (IWAN et al. 2010).
Nowotarska Dale: ***
Eastern Beskidy Mts.: ***
Bieszczady Mts.: ***
Pieniny Mts.: ***
Tatry Mts.: ***

Comments

KFP: 3982. *Alphitobius diaperinus* (PANZER, 1797).

A synanthropic and cosmopolitan species. It is extremely difficult to establish which data concern its occurrence in natural conditions on the basis of checklists, catalogs and other summarizing publications. KFP indicates only several locations of reported occurrence of *A. diaperinus* in Poland, with a comment that it is very rarely found outside storehouses, flour mills and human settlements (usually under loose tree bark). Interestingly, the number of published records of occurrence of this species outdoor in Poland has remarkably increased in the last decade (*inter alia,* KUBISZ and TSINKEVICH 2001, GREŃ 2003, MELKE and GRZYWOCZ 2003, RUTA 2007, KLASIŃSKI and MINKINA 2008, GUTOWSKI et al. 2010). For the Palaearctic distribution see Fig. 102.

Alphitobius laevigatus (FABRICIUS, 1781)

Distribution in Poland (Fig. 4)

Baltic Coast: Gdynia [CF44], 2–22 VIII 1938, MIZ (IWAN et al. 2010).
Pomeranian Lake District: Szczecin [VV71], 1977–1979, *** (PRĄDZYŃSKA 1988).
Masurian Lake District: ***
Wielkopolska-Kujawy Lowland: ***
Mazovian Lowland: Warszawa [a.EC08], 27 VI 1906, V 1916, 6 X 1917, MIZ (IWAN et al. 2010); Warszawa, Krakowskie Przedmieście [EC08], 13 III 1915, MIZ (IWAN et al. 2010); Warszawa-Praga [EC08], 21 VIII 1927, MIZ

Species with doubtful or not confirmed presence in Poland

Accanthopus velikensis (Piller et Mitterpacher, 1783)

Distribution in Poland

Lower Silesia: Wrocław vicinity (in der Nähe Breslau's) [a.XS46], *** (Schneider 1856).
General: Galicja (Nowicki 1864, 1856).

Comments

KFP: *Enoplopus dentipes* (Rossi, 1790).

Reported in Poland basing on works dating back to mid-19th century, which has not been further supported either in the list of Silesian beetles (Gerhardt 1910), or in the catalogue by Łomnicki (1913). More recent sources (e.g. Horion 1956) generally doubt about its occurrence in the Central Europe. It is supposed that the quoted reports based on erroneous identification of specimens. The bionomy of the species is unknown; it is found under pieces of wood lying on the ground and under decaying plant remains. For the Palaearctic distribution see Fig. 99.

Asida sabulosa sabulosa (Fuesslin, 1775)

Distribution in Poland

General: Polska (Łomnicki 1913).

Comments

KFP: *Asida sabulosa* (FUESSLIN, 1775).

Undoubtedly, the species has not been reported in Poland in its modern borders; the general remark in the catalogue by ŁOMNICKI (1913) probably pertained by Podole Upland (Ukraine), where the species is found. Due to its general range, it is rather unlikely that it might inhabit Poland. An epigeic species, inhabiting dry and warm open areas of xerothermic or psammophilous type. For the Palaearctic distribution see Fig. 105.

Bius thoracicus (FABRICIUS, 1792)

Distribution in Poland

Białowieża Primeval Forest: f. comp. 370 [FD94], 8 VI 1930, *** (KARPIŃSKI 1948).

Comments

KFP: 3987. *Bius thoracicus* (FABRICIUS, 1792).

A boreal mountain relic of primeval forests, observed in Poland only once, more than 80 years ago. Although the site in Białowieża Primeval Forest lies within the general range of the species, new data are required to include it into Polish fauna. In spite of intensive faunistic research in this area, no such findings have been recorded so far. A saproxylobiotic species, settles in dead and dying coniferous and broadleaf trees, feeding under detached bark, in decaying wood and in galleries of larvae of other cambio- and xylophages (e.g. Cerambycidae or Ptinidae).

Included in the Polish Red List (PAWŁOWSKI et al. 2002), category EX? (probably extinct), which seems reasonable in light of the above. For the Palaearctic distribution see Fig. 106.

Centorus elongatus elongatus (HERBST, 1797)

Distribution in Poland

Mazovian Lowland: Świder [EC17], 15 VII 1900, USMB (IWAN et al. 2010).

Meta-analysis of occurrence data

Introduction

The need for documenting occurrences of species and summarizing scientific sources of the data was one of the main reasons for publishing traditional paper catalogues. These works, frequently costing their authors many laborious years, are often until now a valuable and useful source of information for current entomologists. One of the most remarkable examples is the Catalogue of Fauna of Poland, published as a series in years 1970–2000. Recent developments in information technology have made it possible to convert legacy paper information into a digital form, which has opened a new area for analyses that have not been possible ever before. It may also help to overcome limitations in access to catalogue data, as such literature was mostly issued in low numbers, available only for a narrow group of specialists.

The goal of this chapter is to present results of a meta-analysis conducted on data extracted from the main catalogue part of this book. Despite the long tradition of entomological research in the current Polish boundaries, the accuracy and intensity of studies of Tenebrionidae was not sufficient, and varied, depending on a region and a period. The summary of the knowledge about distribution of the family, beside its basic review role, may be useful for understanding its current status as well as for planning future research activities.

Methods

The analyzed material covered 74 tenebrionid species (including *Boros* for simplicity) with confirmed presence in Poland, represented by 8207 records, containing references to 916 UTM squares. The data were converted into a database, further augmented with GIS extensions necessary for spatial analyses in this part. The most basic unit in the database, i.e. a record, was an observation of a species at a place and time, usually connected with a reference publication. If a record was derived from a specimen then additional fields, such as collector and collection, were filled. Granularity of the location information was diverse, from quite accurate village names, through grid-based UTM 10×10 km squares, to a very general region level. Similarly, the time of occurrence observation was reported as year only (sometimes even year range), year and month or a full date, the latter present more frequently in case of collection specimens. As all but region-level defined records were ascribed to the UTM grid, square centroid coordinates were used as a basis for spatial operations and assignment of a record to a higher level divisions of the country. The maps were prepared with the ArcGIS 10.0 software.

Data dynamics

The history of entomological research in Poland and acquisition of data on distribution of species has been influenced by the complicated history of our country. The first studies on tenebrionids were conducted by German authors as early as in the last decade of the 18th century, about the time when Poland disappeared from the map. Over the 19th century, knowledge of species was improving, thanks to investigations of areas belonging then to Germany. In the mid-1800s, a half of the current number of tenebrionid species inhabiting the territory was known (Fig. 75). Later, in the south-eastern Polish lands, occupied by Austro-Hungary, in Galicja, southern elements were discovered and investigated by Polish entomologists, M. Łomnicki and M. Nowicki and then by their continuators. By the beginning of the 20th century, 60 species were identified. During a short, 20-years long, period of existence of the independent country, the number of the known tenebrionid species reached 72. This level was maintained over decades and changed only recently thanks to findings of two cosmopolitan species. This suggests that the fauna is probably completely recognized and the possible changes will result from changes of species ranges and occurrence of invasive elements.

The intensity of the research, measured with a number of scientific papers, was increasing until 1940s, with a deep collapse due to war times and the further recovery period (Fig. 76, light bars). In the 1980s, the next decrease happened, connected with economy crisis caused by the government system. A recent great increase of research activity has followed the transition to the

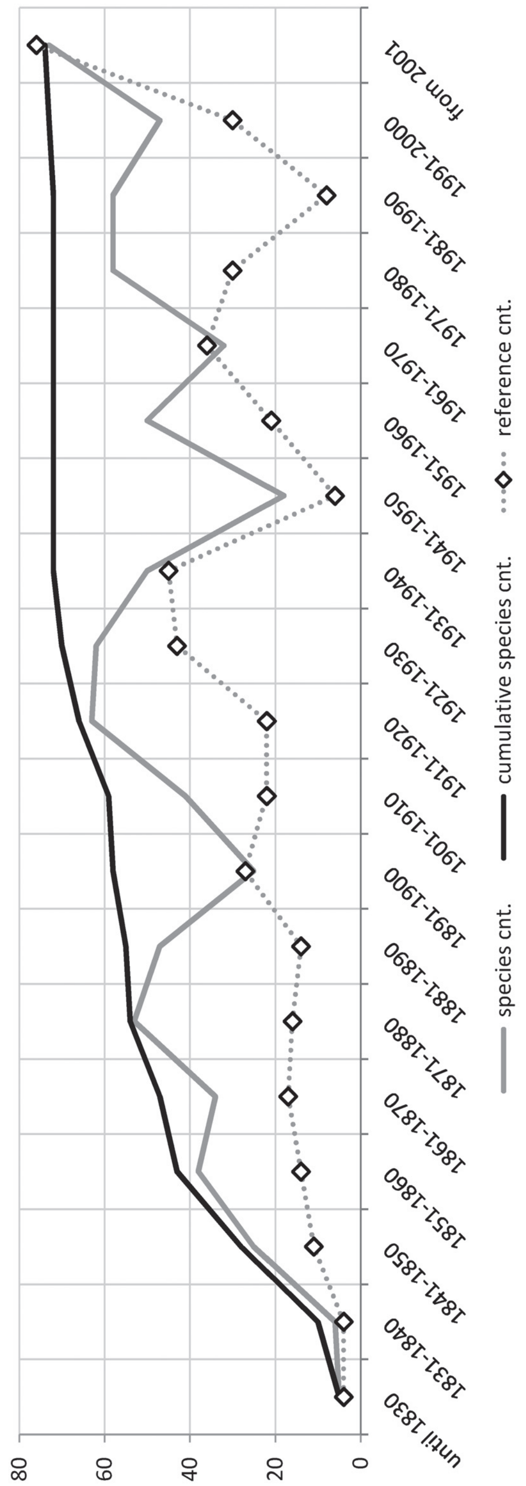

Fig. 75. Dynamics of data on tenebrionids in Poland.

full independence. It is evident that scientific research depended on social and political circumstances that frequently hindered or stopped activities of Polish entomologists. A number of species mentioned in publications was not always proportional to the publishing activity, as some papers included data on many species, while others might be focused on a single taxon.

The distribution of records over time shows that research activities were usually not followed by scientific publications, which is outlined at Fig. 76 (dimmed bars). In most decades, authors published only a minor part of the collected data. The rest of the material, at least in the part of which we are aware, remained in collections and was used more than two decades later. As the whole summary of the usage dynamics is an approximation, based only on the sources to this catalogue, we can suppose that the amount of unused data is even higher, awaiting their discovery in private collections.

Geography of the data sampling

The data originated from 916 UTM squares, which is less than one third of the total 3384 grid squares for Poland. The extent of exploration of individual localities was very unequal. Records from as many as 176 squares lack dates; usually they come from 19th century publications, and only in some cases we can suppose that the year of the observation equalled the year of the publication. For 139 squares, there is no data since 1946, and for 25, the last observations were recorded in the 19th century (Fig. 77). On the other hand, there are 90 areas where the first studies were done after 2000 (Fig. 78). Using data on the first and the last year of reported exploration of a UTM square, we can obtain a map of time span of research of tenebrionids at a place (Fig. 79). Most of areas having the highest values (the range between the first and the last reported year), i.e. more than 100 years, are concentrated around Warsaw, Cracow, Upper Silesia and Przemyśl vicinities in the South-East of the country. More than a half of the time-referenced UTM squares were examined during a short period – only one or two seasons.

The intensity of entomological exploration may be also expressed with the number of collectors (Fig. 80). As quite a big part of publications contained no explicit data about gathering agents of the cited records or quoted two persons as authors of one record, we had to simplify the data by treating such cases as done by one collective author, so the true number of collectors may be higher. The analysis shows that areas placed close to academic centres (e.g. Warsaw, Cracow, Poznań) and Białowieża Primeval Forest were visited by the

Table 1. Summary of information obtained from collections in the analyzed material.
ISEA – Institute of Systematics and Evolution of Animals PAS in Cracow, MIZ – Museum and Institute of Zoology PAS in Warsaw, USMB – Upper Silesian Museum in Bytom, Private – private collections.

Collection	Record cnt.	Species cnt.	Unique species cnt.	UTM square cnt.	Unique UTM square cnt.
ISEA	1600	64	4	331	186
MIZ	1494	66	2	274	140
USMB	669	56	–	177	85
Private	747	59	1	133	73

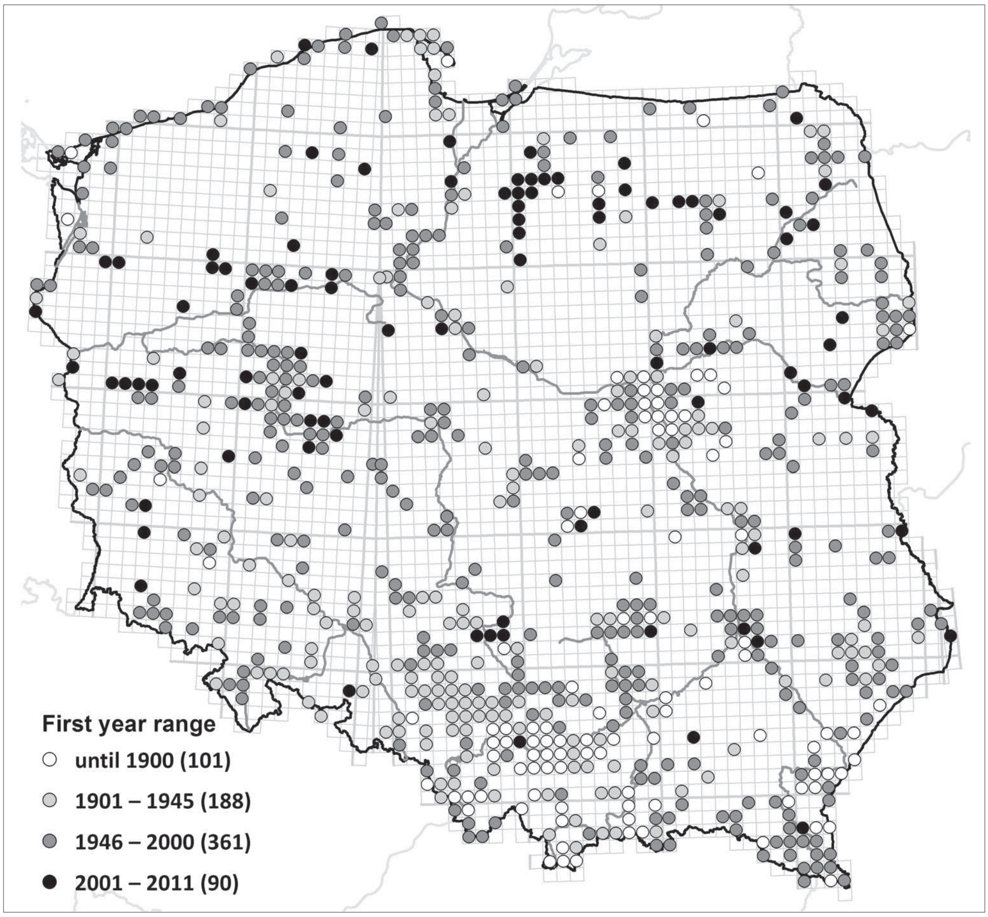

Fig. 78. Year of first research on tenebrionids per UTM square. Number of UTM squares for each class given in parentheses.

through private collections awaiting to be revealed. The abundance of data coming from the two museums is reflected also in the number of UTM squares visited by collectors of the specimens, 331 for ISEA and 274 for MIZ. The difference between these two sources and the remaining ones is distinct also in a number of UTM squares represented uniquely in the data from a collection (table 1). Interestingly, only 8 UTM squares were common for specimens from all collection groups.

Species data summary

The below-outlined species statistics are summarized in Table 2.

The highest number of records (i.e. occurrence observations, regardless of

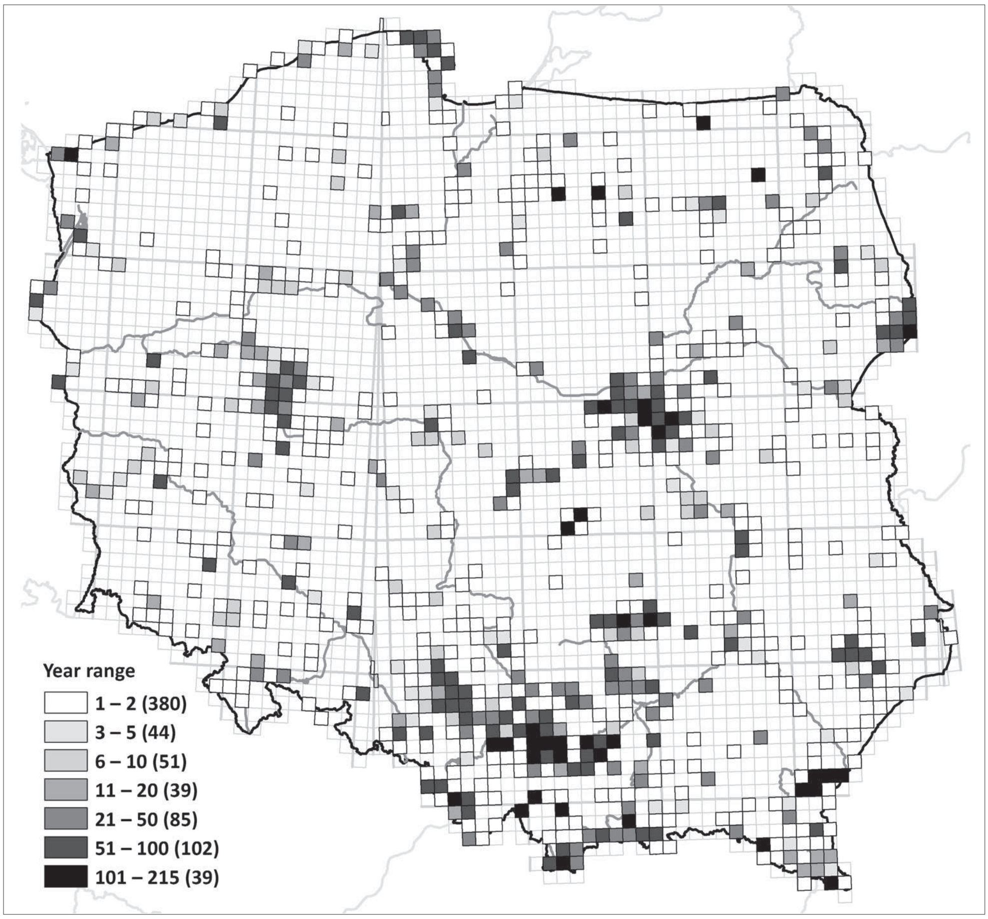

Fig. 79. Timespan of research on tenebrionids in Poland. Number of UTM squares for each class given in parentheses.

further treatment of the observed individual), as well as of records documented with specimens, was found for *Opatrum sabulosum sabulosum* (422 records, 312 specimen records), *Lagria hirta* (404, 252), *Tenebrio molitor* (357, 229), *Isomira murina murina* (332, 210) and *Diaperis boleti* (299, 150). The least abundant group with regard to general records was *Mycetochara obscura* (4), *Blaps halophila* (6), *Latheticus oryzae* (6), *Eledonoprius armatus* (9), *Hymenophorus doublieri* (9) and *Palorus subdepressus* (9). No data on specimens are available for *Boros schneideri* and *Gnaptor spinimanus*. 1 specimen record was found for *Blaps halophila*, *Eledonoprius armatus*, *Mycetochara obscura* and *Mycetochara pygmaea*, and 2 for *Hymenophorus doublieri*, *Nalassus laevioctostriatus* and *Palorus ratzeburgii*.

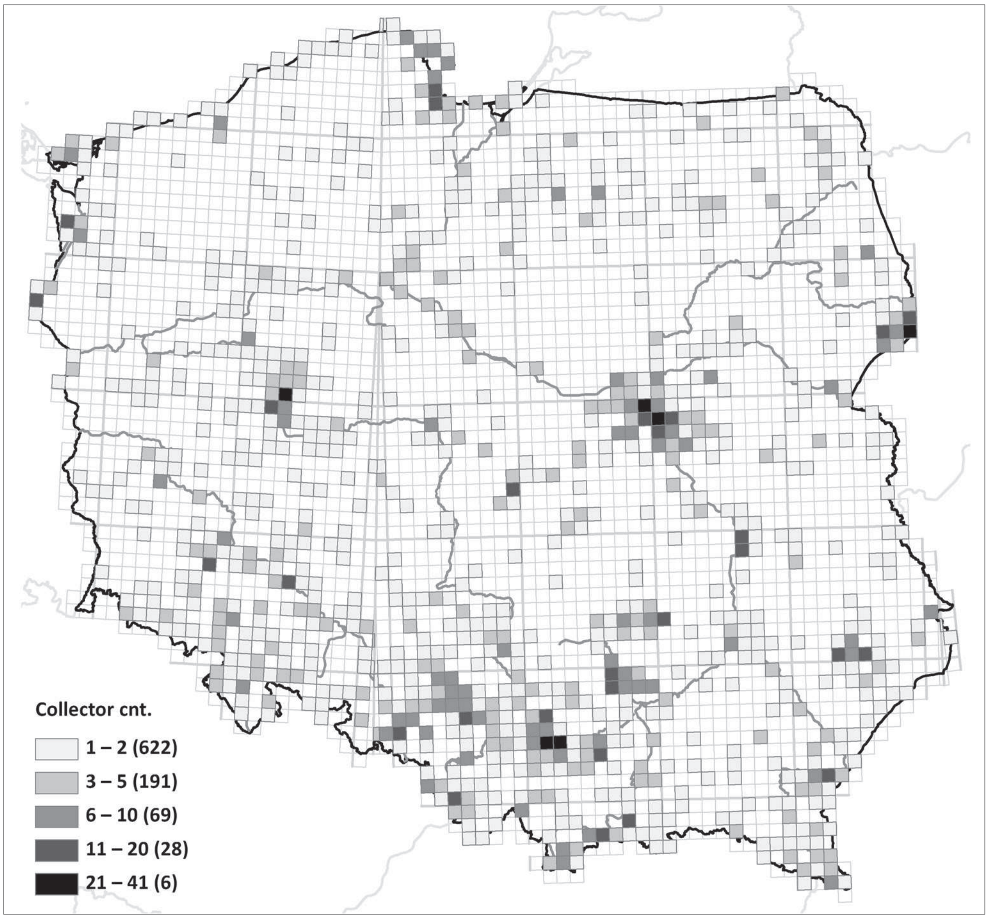

Fig. 80. Intensity of research on tenebrionids in Poland expressed as number of collectors per UTM square (see explanations in the text). Number of UTM squares for each class given in parentheses.

Table 2. Summary of data on tenebrionid species occurring in Poland, based on the analyzed material.

Column headers: recs – record count, spec. recs – specimen record count, UTM – number of UTM 10×10 km squares, district – count of districts, p. last yr – last year of publication, p. first yr – first year of publication, refs – references count, r. first yr – year of the first record, r. last yr – year of the last record, collectors – number of collectors, collections – collections holding specimens of the species; P – private collections, I – ISEA, M – MIZ, U – USMB

taxon	recs	spec. recs	UTM	districts	p. last yr	p. first yr	refs	r. first yr	r. last yr	collectors	collections
Tenebrionidae: Alleculinae											
Alleculini											
Allecula morio	155	90	83	57	2011	1854	38	1873	2010	23	P I M U
Allecula rhenana	40	18	16	12	2010	1923	11	1903	2006	2	P M
Gonodera luperus	93	41	52	41	2010	1846	21	1879	2006	15	P I M U
Hymenalia rufipes	93	32	46	39	2010	1852	26	1862	2005	17	P I M U
Hymenophorus doublieri	9	2	4	3	2010	1866	9	1861	2005	1	P M
Isomira murina murina	332	210	158	102	2010	1846	51	1859	2010	36	P I M U
Mycetochara axillaris	172	98	67	53	2010	1854	24	1853	2006	12	P I M U
Mycetochara flavipes	191	99	71	51	2010	1846	26	1879	2009	16	P I M U
Mycetochara humeralis	59	32	32	25	2010	1871	15	1888	2004	11	P I M U
Mycetochara maura	131	62	64	52	2010	1854	34	1853	2006	13	P I M U
Mycetochara obscura	4	1	3	3	2007	1919	4	1991	2006	–	I
Mycetochara pygmaea	14	1	7	6	2010	1889	10	1904	1904	1	I
Prionychus ater	207	108	104	75	2010	1840	40	1872	2009	30	P I M U
Prionychus melanarius	57	27	27	22	2010	1896	15	1890	2009	9	P I M U
Pseudocistela ceramboides	235	107	120	86	2011	1852	62	1853	2006	23	P I M U
Cteniopodini											
Cteniopus sulphureus	171	79	72	54	2010	1846	26	1881	2009	34	P I M U
Omophlus pubescens	145	72	92	67	2010	1853	25	1868	2006	26	P I M U
Tenebrionidae: Diaperinae											
Crypticini											
Crypticus quisquilius	293	199	168	113	2010	1846	48	1872	2008	52	P I M U

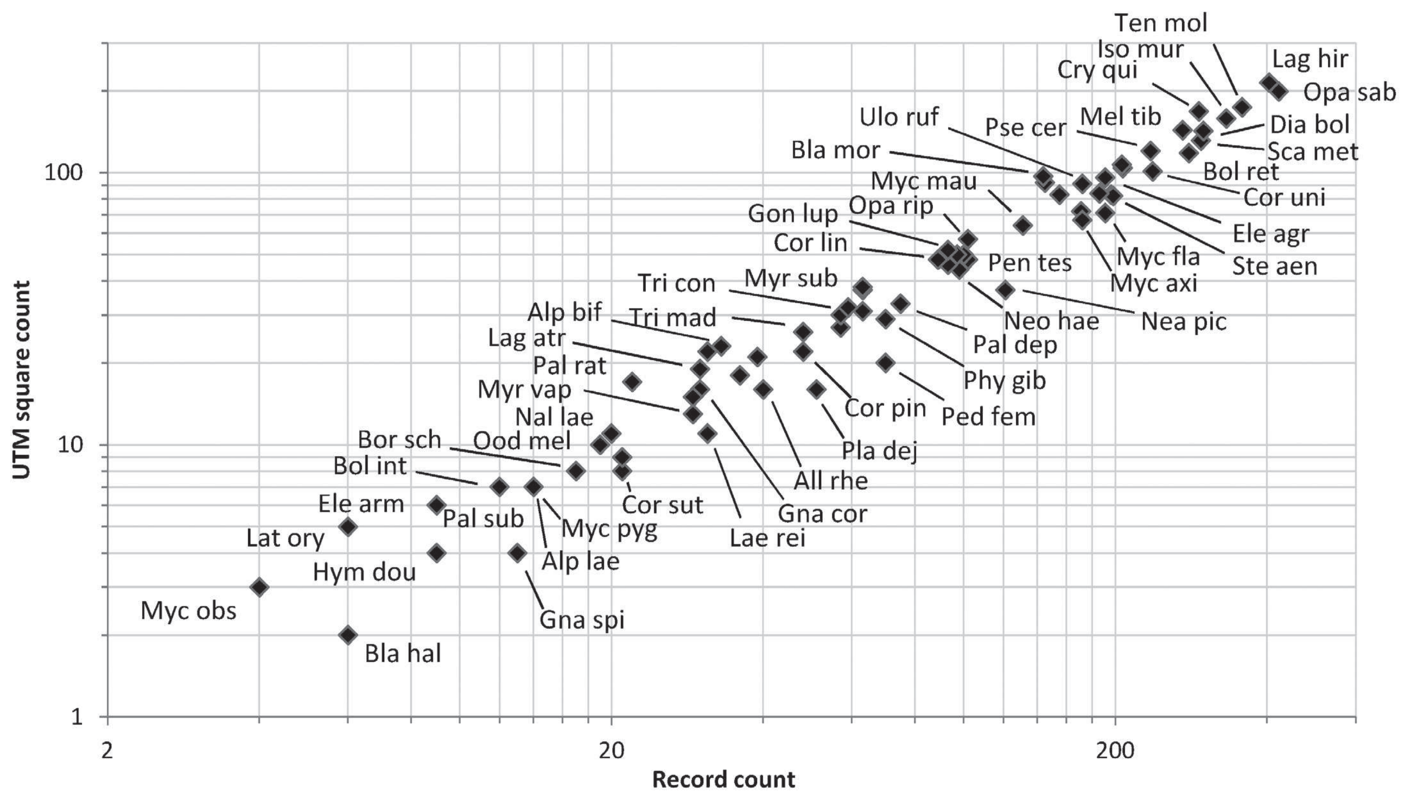

Fig. 83a. Abundance – coverage relationship for the analyzed species shown in logarithmic scale. Note the two orders of magnitude difference between the most and least abundant/common species. Species names abbreviated to the first 3 characters of genus and specific epithet.

of rarity or commonness of species, and how accurate it is, should be further investigated. There is no doubt, however, that species with extreme values obtained in the analysis do differ significantly.

Group-level analysis and data generalisations

Mapping pooled data on abundance and richness of species at different scales and divisions has a number of possible uses and implications. The UTM 10×10 km square grid is very useful as an example of a low-level generalization. It provides a quite convenient way to see distribution of a measured parameter, in this case a number of records and species. The map of record density (record count per square, Fig. 84a) reveals the effective sampling effort that was done during all years of studies on darkling beetles

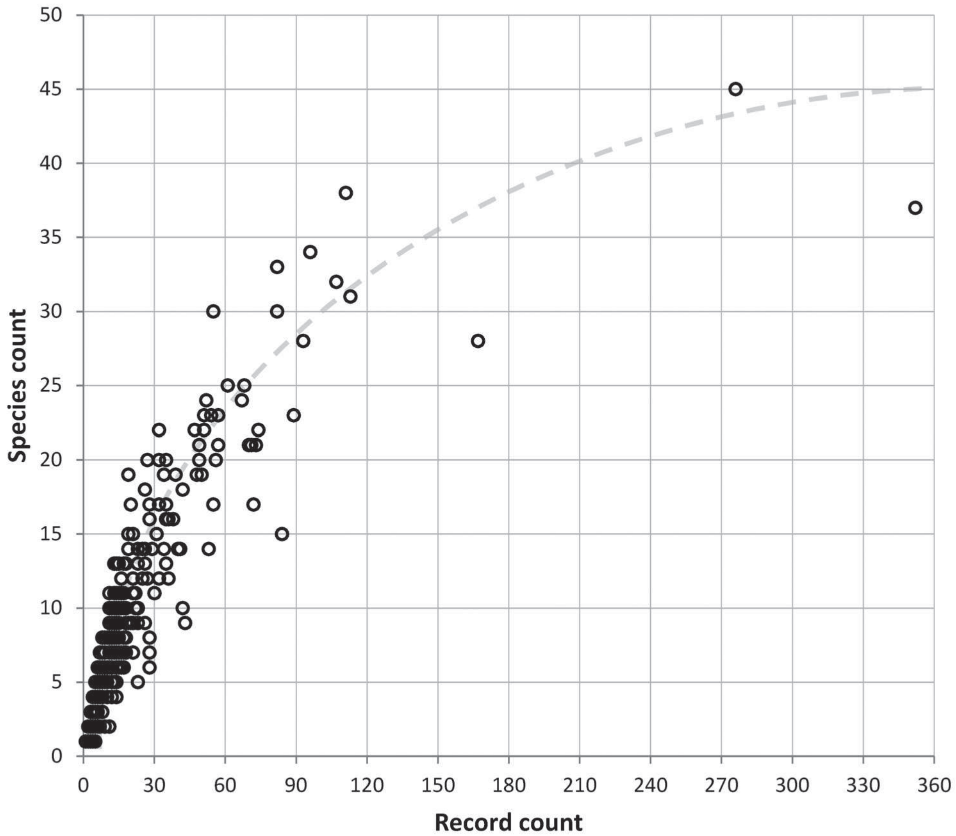

Fig. 84b. Relationship between the record count and species count per UTM square. The dashed line depicts a hypothetic curve of species richness for the analyzed data. See further explanations in the text.

As the data were acquired from ca. one third of UTM squares in the country, most of which were probably significantly undersampled, the conclusions from analyses based on generalization cannot be referred to the actual state of tenebrionid fauna in Poland. All comparisons may reflect only differences between areas with respect to the data content, and not to the real conditions. We can see how well particular areas were sampled and how much is known about the fauna.

The same data mapped onto a division with larger building elements facilitate specific analyses, depending on the purpose of the division. The following three examples are based on ascribing centroids of the UTM squares to larger division elements: districts and two regionalisations. For squares with centroids falling outside the border of the country, data from a square were

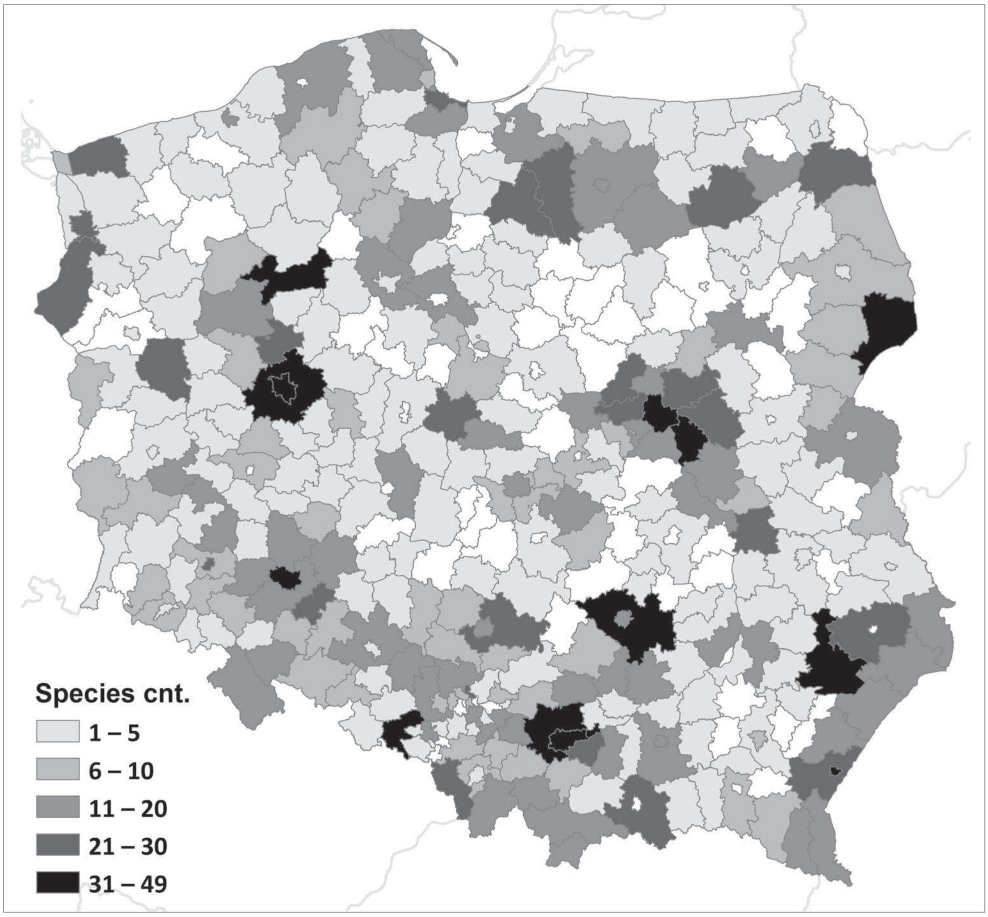

Fig. 87. Total number of species in the analyzed material per district.

ascribed to an area closest to its centroid. Beside counting records and species for an area, an index of uniqueness was calculated, in order to point areas with conspicuous composition of species, which in case of reliable data may serve as a tool for conservation value assessments. The index reuses the Corrected Weighted Endemism index described by CRISP et al. (2001) and LINDER (2001). For each area the index was calculated as follows:

$$idx = \left(\sum_{i=1}^{s} \frac{1}{n_i}\right) / s$$

where i = a species occurring in the area, s = a number of species in the area, n_i = total number of areas where the species i occurs.

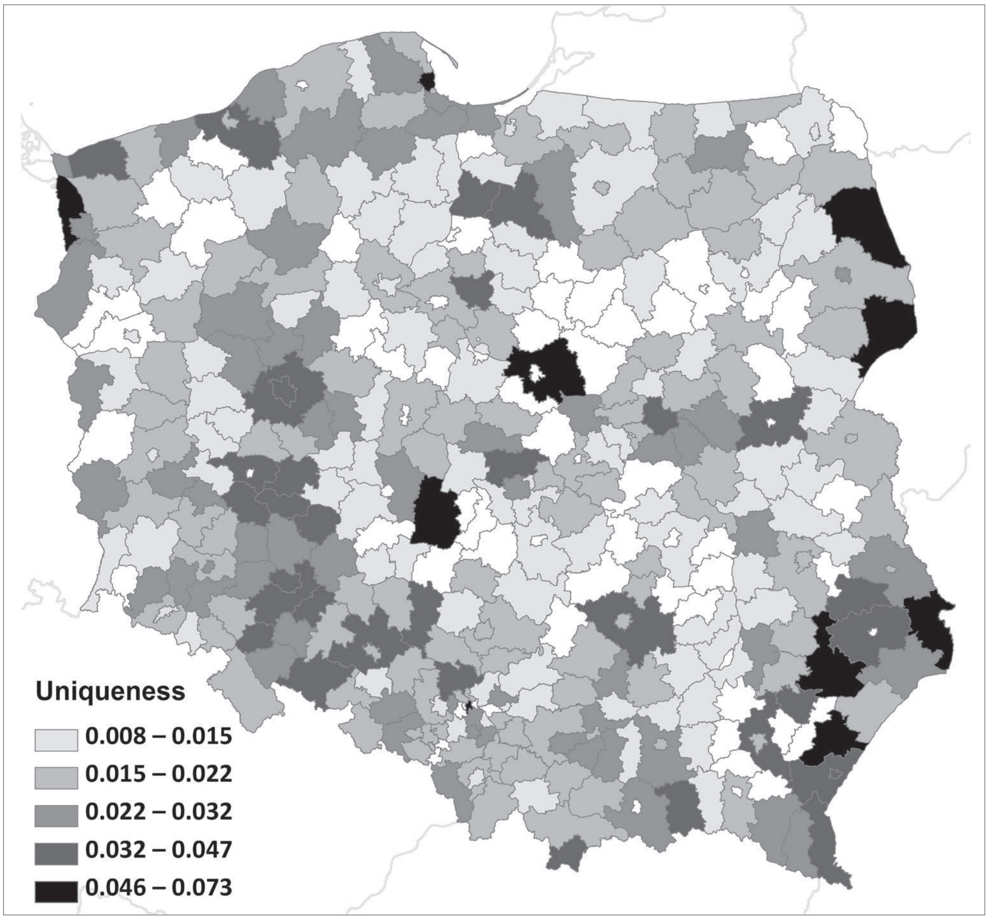

Fig. 88. Uniqueness index per district based on the analyzed material. The index measures proportion of rare species. See further explanations in the text.

As endemism is beyond the scope of the data, the index does not allow any inferences on biogeography of species, providing instead a method for finding more valuable areas, focussing more on presence of rare species.

At the level of districts (the middle level of the country administration system), the pooled number of records (Fig. 86) and species (Fig. 87) reflects values of UTM squares that composed them. This way districts having no data on tenebrionids (ca. 50) become clearly visible. This information, pertaining to areas lacking direct scientific importance, may be useful for e.g. local entomologists, motivating them to collect data. The maximum number of species per district does not reach 50 (Fig. 87). Noteworthy, the map of species counts per district gives much better orientation on the distribution of

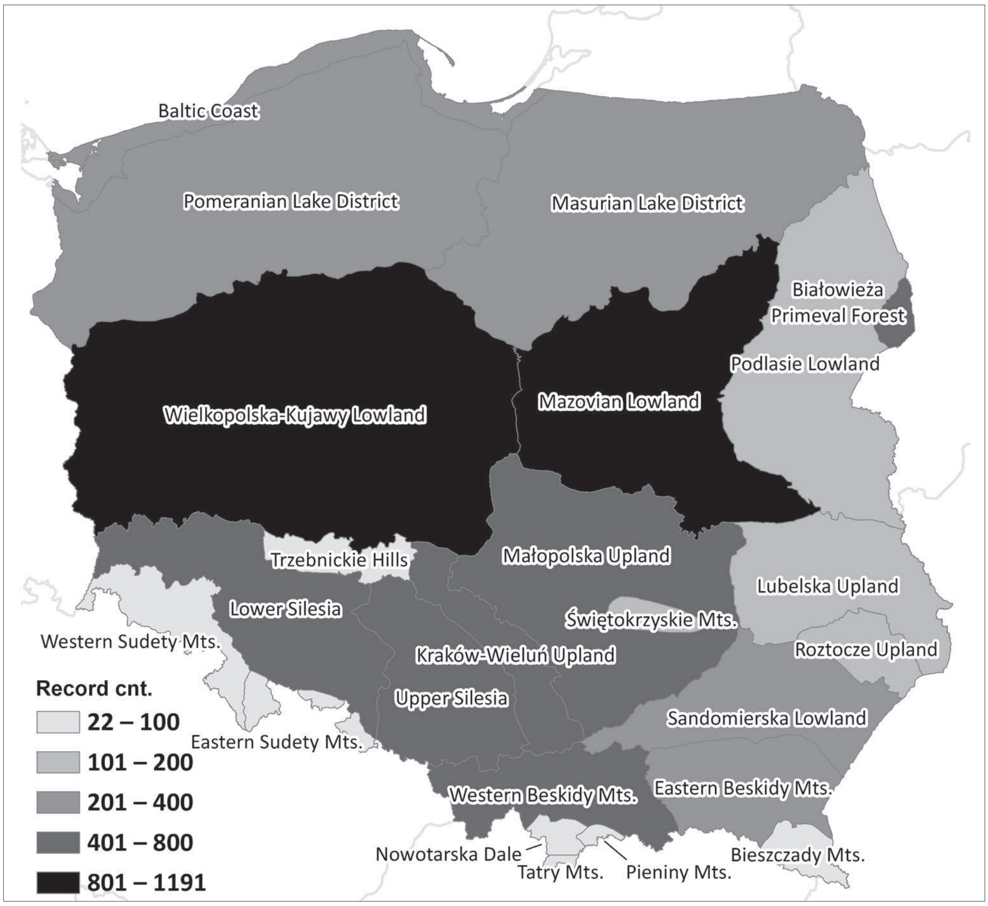

Fig. 89. Total number of records in the analyzed material per KFP region.

the parameter in the analysed data than the analogical map on the UTM grid. The map of distribution of uniqueness index values (Fig. 88) highlights districts that do not necessarily host rare species. At this level, the index is particularly sensitive to representativeness of data, which is not satisfactory in most of the areas. This way higher values may appear in areas with a few species, which are common, but only partially covered in the database. We could expect that the index applied to larger areas would be more reliable as species inventories are more complete then.

Starting from the legacy KFP division of Poland, it becomes clear that summaries for larger areas may obscure the real distribution of analyzed parameters. While interpretation of distribution of records is quite intuitive,

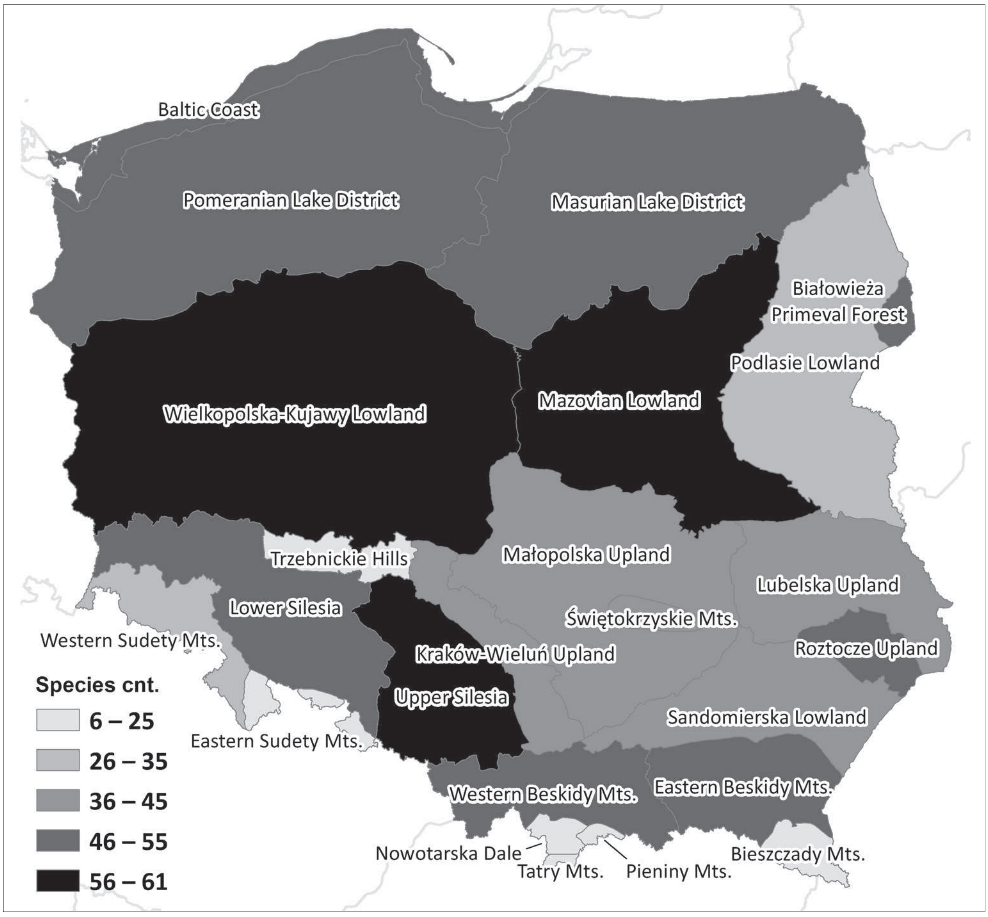

Fig. 90. Total number of species in the analyzed material per KFP region.

sampled areas that were hidden at the region level (Fig. 92): the eastern part of Baltic Coastlands, the northern and southern part of Mazovia, southern Podlasie, Sudety Foothills (adjacent from the North to Sudety Mts.) and eastern Beskidy Mts. The small (physiogeographically Subcarpathian), south-eastern part of Upper Silesia also turned out to be not sufficiently investigated. The most intensively studied area in the country was central Mazovia. Data on the number of species for subregions (Fig. 96) partially correlate with the record count (Fig. 95). It turned out that the high species richness of Wielkopolska-Lubusz is located (at least for the analysed data) in its northern,

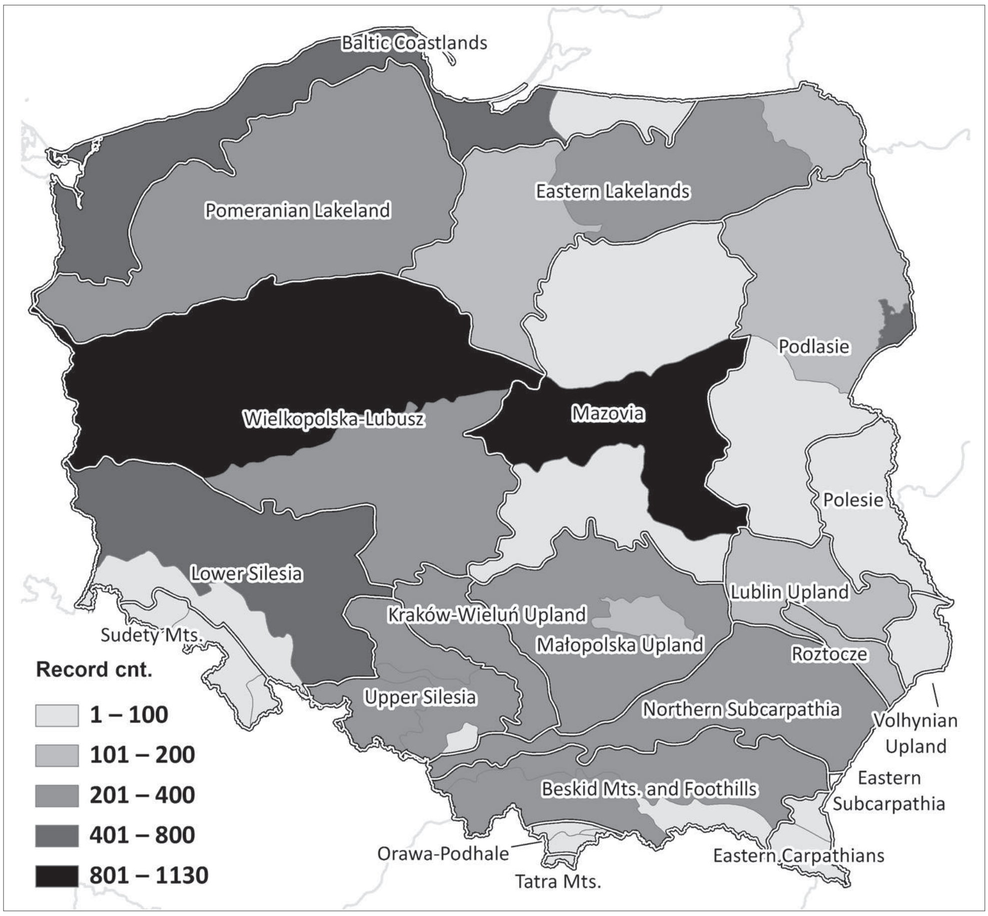

Fig. 95. Total number of records in the analyzed material at the subunit level of the proposed new faunistic regionalization. See the text for more information about the regionalization.

lakeland part. More species than elsewhere were reported also from central Mazovia and the northern, lowland part of Lower Silesia. Interestingly, the Świętokrzyskie Mts. subregion has more species than the rest of the Małopolska Upland, despite of being less sampled. Proportion of rare species was the highest at Volhynian Upland, then in the northern, lakeland part of Wielkopolska-Lubusz, Białowieża Primeval Forest, Roztocze, the northern part of Orawa-Podhale, Lower Silesia and the central-western part Baltic Coastlands (Fig. 97). At the regional level (Fig. 94), the same areas influenced results for the regions that they belong to and this is the reason of high

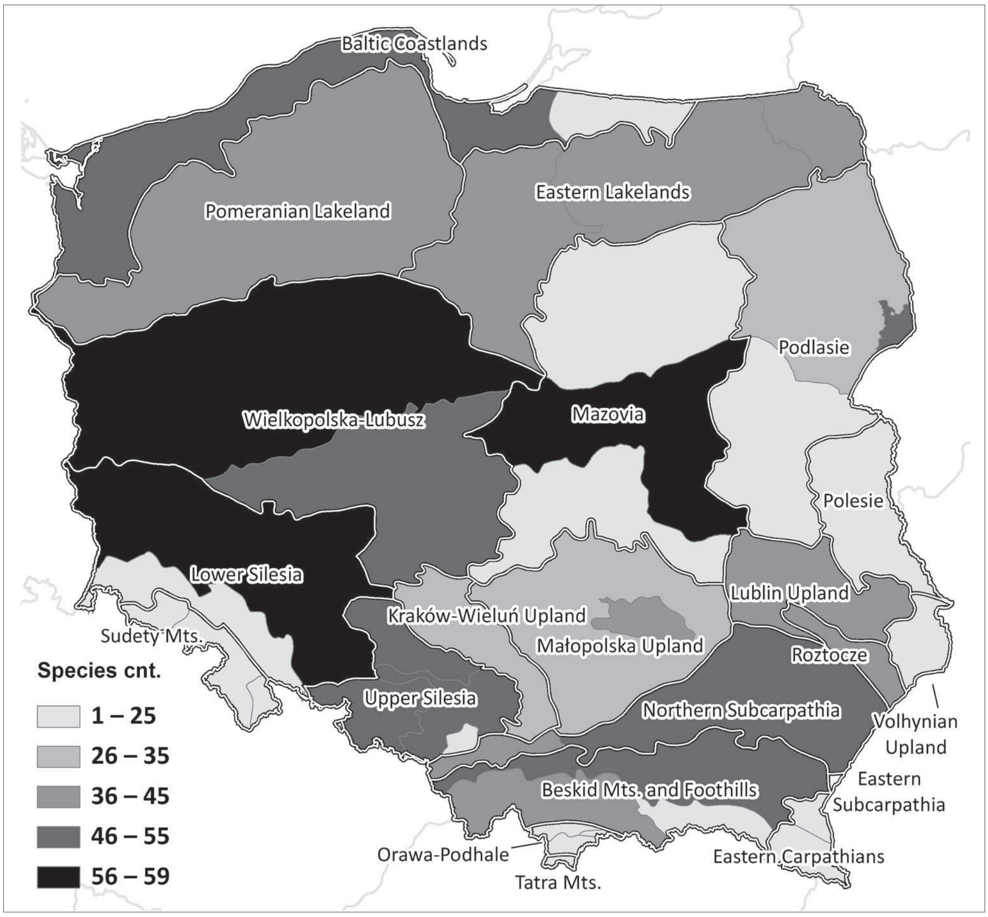

Fig. 96. Total number of species in the analyzed material at the subunit level of the proposed new faunistic regionalization. See the text for more information about the regionalization.

General distribution

Maps presented in this part have been made just as a supplementary material showing a general outline of distributions of the species in Palaearctic. They are not intended to present the accurate shape of ranges; in fact there is no data allowing to precisely delimit the geographical range of any of the species. As biogeography of species is not the main subject of this catalogue, we have used a simplified solution and depicted only countries or regions. In most cases, it is sufficient for presentation of the extent of the species' distributions. Visualization of occurrence countries instead of giving a simple text list helps also to show the possible gaps in data, which is evident in case of cosmopolitan species.

For subspecific taxa, the maps include Palaearctic ranges of remaining subspecies. This additional information may be helpful when considering current occurrence data and chances for range changes.

The maps for *Bius thoracicus*, *Corticeus bicoloroides*, *C. suberis*, *C. versipellis*, *Cteniopus sulphuripes*, *Gonocephalum granulatum pusillum*, *Isomira icteropa*, *Menephilus cylindricus cylindricus*, *Mycetochara roubali*, *Omophlus lividipes*, *Oodescelis polita*, *Pentaphyllus chrysomeloides*, *Phaleria cadaverina cadaverina*, *Podonta nigrita* and *Upis ceramboides* show corrections to the information in CPC (Löbl and Smetana 2008), marking the lack of reliable published data about presence of these taxa in Poland on the date of publication. For *Gnaptor spinimanus* and *Hymenophorus doublieri*, we marked presence of the species, correcting the omission in CPC. Non-native parts of distribution of species, noted in CPC as "invasive", were given a separate symbol.

light gray – land borders
gray – Palaearctic borders
dark gray – roughly defined areas ("Siberia")
black – distribution of a main taxon
black dots – non-native distribution of a main taxon
black crosses (for Poland) – presence in Poland confirmed
white crosses on black (for Poland) – presence in Poland doubtful
hatches – distribution of other Palaearctic subspecies

Fig. 99. Palaearctic distribution of *Accanthopus velikensis.*

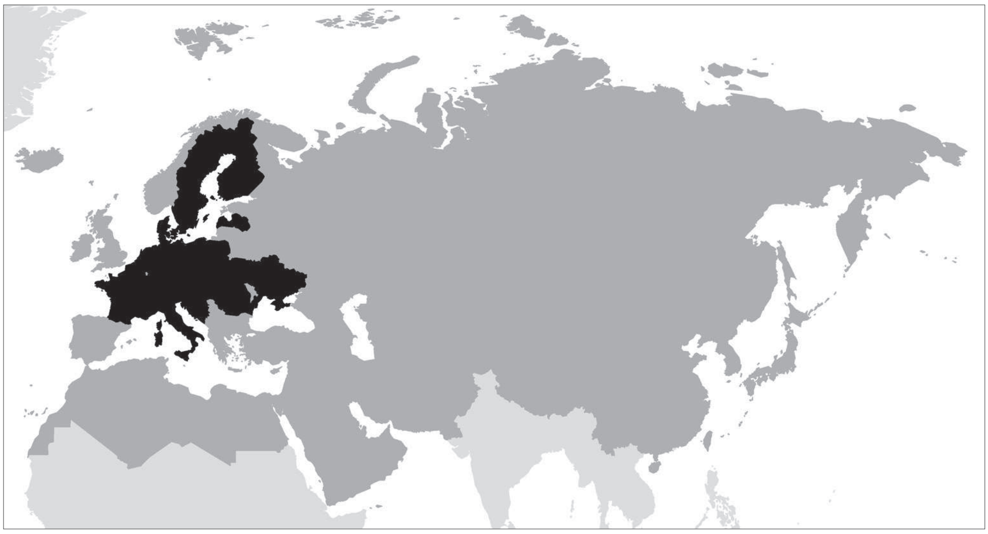

Fig. 100. Palaearctic distribution of *Allecula morio*.

Fig. 101. Palaearctic distribution of *Allecula rhenana*.

Fig. 102. Palaearctic distribution of *Alphitobius diaperinus*.

Fig. 103. Palaearctic distribution of *Alphitobius laevigatus*.

Fig. 104. Palaearctic distribution of *Alphitophagus bifasciatus*.

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