



# Data mobilisation at the Fund of Invertebrates of the State Museum of Natural History of the NAS of Ukraine

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## Abstract

### Background

The described dataset contains occurrence records of invertebrate specimens deposited at the State Museum of Natural History of the NAS of Ukraine, Lviv, Ukraine (SMNH NASU). It combines diverse taxonomic groups, mostly belonging to the class Insecta of the phylum Arthropoda, that were selected as prioritised for digitisation in war conditions. Selected specimens were ascertained as those being the most vulnerable to hostilities and requiring virtual preservation. Such virtual preservation is essential in the war realities as collection can be lost or damaged at any moment, resulting in a significant retrospective biodiversity data gap. At the same time, collection virtualisation and its deposition on the internet grant remote access to scientists who cannot visit it in person due to the war. Moreover, we believe that the mobilisation of the data from the Ukrainian collections and their publication online are essential for the integration of Ukrainian research facilities into a global scientific biodiversity pool.

## New information

A total of 3,660 occurrence records mobilised in 2023-2024 from the collection of invertebrates of the SMNH NASU, were published. This dynamic dataset will be continually supplied by new records during further digitisation work.

## Keywords

Arthropoda, Oribatida, Coleoptera, Lepidoptera, Nematoda, invertebrates, museum collection, data mobilisation, Ukraine

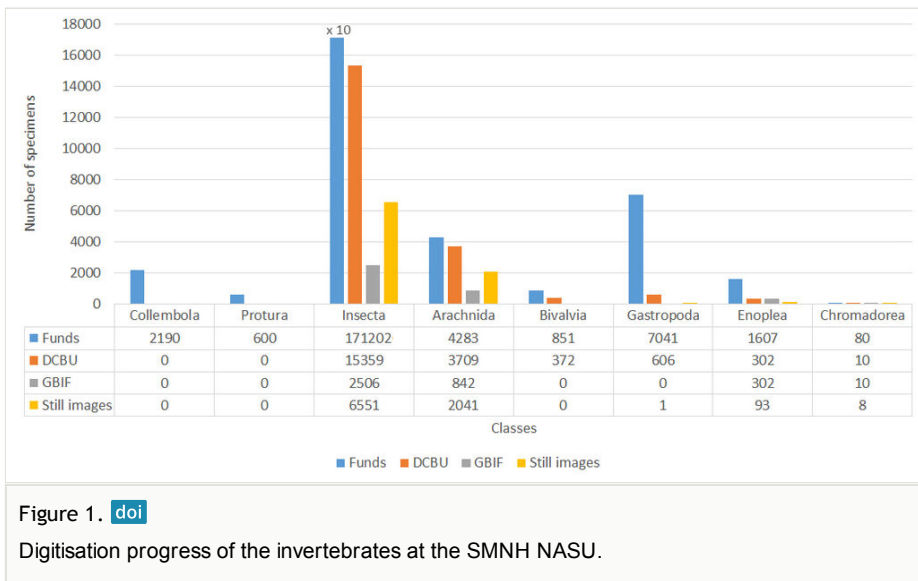
## Introduction

The digitisation of natural history collections and mobilisation of biodiversity data are crucial tasks significantly influencing modern science, providing access to growing data arrays (Nelson et al. 2015, Wetzel et al. 2018, Ball-Damerow et al. 2019). It is realised in multiple ways, including numerous local initiatives (e.g. Vattakaven et al. (2016), Grattarola et al. (2019), Guzmán-Jacob et al. (2021), Novotný et al. (2022), Gyeltshen and Pem (2022)), citizen-science platforms like iNaturalist (2024), Observation International (2024) and eBird (2024), as well as global aggregators like GBIF (2024a) or iDigBio (2024). Mobilised data contributes to an extendable number of biogeographical, taxonomical, phylogenetical, ecological and other biodiversity-related investigations (Causey et al. 2004, Holmes et al. 2016, Nelson and Ellis 2018, Shultz et al. 2020, Heberling et al. 2021). In light of the continuing hostilities in Ukraine, the mobilisation of biodiversity data and, particularly, digitisation of nature history collections, acquires a new sense.

SMNH NASU, being located in Lviv, far from the war line, is, however, suffering from indirect impacts such as lack of financial support due to governmental budget transfer to the prioritised defence policy and damage to hosted collections as a result of blackouts and lack of heating. The scientific fund of invertebrates of the SMNH NASU comprises several independent collections each curated by their custodians and curators. There are collections of extant and fossil insects, molluscs, microscopic slides of the soil invertebrates (nematodes, flatworms, springtails, protura, oribatid and mesostigmatic mites etc.) and a few memorial collections. In general, the fund is subdivided into the principal and supplementary subfunds. The principal subfund of invertebrates includes ca. 188,000 storage units and the supplementary subfund has over 13,000 storage units. There are represented specimens collected since the end of 19<sup>th</sup> and the beginning of the 20<sup>th</sup> centuries by many famous regional naturalists, including Kazimierz Smulikowski, Marian and Jarosław Łomnicki, Maksymilian Nowicki, Michał Świątkiewicz, August Stöckl and Stanisław Kapuściński (Starzyk 2004).

The digitisation of the collections at the SMNH NASU started in the early 2000s when separated datasets were created locally by curators. In 2017, the Data Centre

“Biodiversity of Ukraine” (DCBU) has been launched (State Museum of Natural History of the NAS of Ukraine 2024). Since then, it has served as the main entry point to host and operate with digitised materials (Rizun and Scherbachenko 2019, Rizun et al. 2020). By 2024, 20358 records about invertebrate specimens hosted at SMNH NASU, were deposited at the DCBU, including 19068 records of Arthropoda (Insecta - 15359, Arachnida - 3709), 978 records of Mollusca (Bivalvia - 372 and Gastropoda - 606) and 312 records of Nematoda (Enoplea - 302 and Chromadorea - 10). Thus, today, the DCBU contains data about 11% of the total number of invertebrate specimens hosted at SMNH NASU. Since late 2023, to provide wider access, the integration of mobilised data to the GBIF platform has begun. At the moment, data for only about 2% of the total number of invertebrate specimens hosted at SMNH NASU were published in GBIF and represented in the current dataset. Only 5% of the hosted specimens had images of different quality, which were captured at different times. Currently, many of these images are archived on the internal SMNH NASU servers and their publishing online through the DCBU and other platforms is still in progress. (Fig. 1).



## Project description

**Title:** Digitisation of natural history collections damaged as a result of hostilities and related factors: development of protocols and implementation on the basis of the State Museum of Natural History of the National Academy of Sciences of Ukraine (Nr 2022.01/0013)

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**Study area description:** The study is focused on the invertebrate specimens collected mostly in the western part of Ukraine. However, the dataset also contains many occurrence records from other adjacent territories and occasional important records from remote areas such as Morocco, Kazakhstan, Kyrgyzstan, Sri Lanka and the Kuril Archipelago.

**Design description:** As it was initially mentioned in our previous publication (Novikov et al. 2024), the project aims to: (a) develop digitisation protocols for the most valuable and vulnerable natural history collections; (b) mobilise and publish the data about such collections deposited at SMNH; and (c) digitise prioritised specimens deposited at SMNH, including those belonging to the herbarium collection and the collection of invertebrates. However, the digitisation workflow for invertebrate specimens differs from those for the herbarium material described by Novikov et al. (2024). In the case of digitisation of the herbarium material, there are two stages of capturing images - the first, preliminary, when the images of the herbarium labels are taken and the second, main, when the images of the entire herbarium sheets are taken. The data from the herbarium labels are manually transferred to the dataset and later verified for taxonomic consistency and other issues. Only after such verification, specimens meeting preselection and quality criteria, are digitised using a hi-res photo camera. In the case of invertebrates, the traditional digitisation workflow (Flemons and Berents 2012, Nelson et al. 2015, Blagoderov et al. 2017, Harris and Marsico 2017, Dupont et al. 2020, Nieva de la Hidalgo et al. 2020) has been chosen - the specimens are preselected by curators, based on the preliminary outlined criteria and digitised. The data are later mobilised from the original images. Such a protocol simplifies the digitisation procedure and is excellent for routine

digitisation of the entire collection. However, it loses in specimens preselection, resulting sometimes in the digitisation of less important specimens, misidentified specimens, mix of specimens from different regions and occasional records with low data quality (e.g. unknown collection date, uncertain locality etc.).

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## Sampling methods

**Sampling description:** Similarly to the botanical fund (Novikov et al. 2024), three levels of priority for digitisation and data mobilisation were defined in other funds of SMNH NASU (Fig. 2). The first, red, group comprises the most valuable specimens that are, at the same time, the most vulnerable (e.g. can be easily and heavily damaged by moisture, fire, mould etc.). The second, yellow, group combines valuable specimens that are relatively resistant to damage and specimens that also can be easily damaged, but have moderate importance. The third, green, group includes specimens of regular species and specimens from supporting (e.g. loan and educational) collections that are either resistant to damage or have limited scientific value.

Although the mentioned priority classification (Fig. 2) is not constant, we believe that general logic of designation of the priority groups by multiplication of the specimen value by its vulnerability could be useful for other digitisation projects. In particular, such priority classification can serve as a good point to focus the digitisation in emergency situations. At the same time, the number of value and vulnerability levels, as well as their order, can be determined individually, depending on the collection peculiarities (e.g. presence of type material and preservation technique) and certain digitisation goals (e.g. in case of long-term flow digitisation, such priority groups can be neglected or bulked).

**Step description:** 1. To designate the digitisation priority, the working table with classes of value (from 1 to 10) and vulnerability (from 1 to 8) of the specimens has been created (Fig. 2). Each specimen was evaluated following these two principal criteria and received cumulative points. For example, if the specimen is a herbarium voucher (7<sup>th</sup> level of vulnerability) representing the endemic taxon (7<sup>th</sup> level of value), it received 49 (7 x 7) cumulative points. If the same herbarium voucher also represents the type material (10<sup>th</sup> level of value), then it received 70 (7 x 10) cumulative points. In such a case, the highest points (i.e. 70) were taken into account and this specimen was digitised at the first priority, while other specimens with lower points were digitised later, in order of received points.

2. The prioritised specimens were generally checked for preserving condition and presence of the readable labels. They also were preliminarily evaluated to fit the digitisation protocols and available technical facilities at SMNH NASU.

			Vulnerability, from 1 (min) to 8 (max)							
			8	7	6	5	4	3	2	1
			Invertebrates macropreparates	Herbarium vouchers	Microslides	Other zoological materials	Samples in amber	Paleomaterials	Minerals	Soil samples
Value, from 1 (min) to 10 (max)	10	Type materials	80	70	60	50	40	30	-	-
	9	Other authentic materials	72	63	54	45	36	27	18	9
	8	Author's collections	64	56	48	40	32	24	16	8
	7	Specimens of the taxonomic revisions	64	56	48	40	32	24	-	-
	7	Specimens of endemic taxa	56	49	42	35	28	21	-	-
	6	Specimens of rare taxa	48	42	36	30	24	18	-	-
	5	Specimens locus classicus	40	35	30	25	20	15	-	-
	4	Specimens with published molecular data	32	28	24	20	16	12	-	4
	4	Region representing (regular) specimens	32	28	24	20	16	12	8	4
	3	Specimens from inaccessible territories (including occupied ones and battlefields)	24	21	18	15	12	9	6	3
	2	All other regular specimens	16	14	12	10	8	6	4	2
	1	Specimens from the supporting and educational collections	8	7	6	5	4	3	2	1

Figure 2. [doi](#)

Simplified priority evaluation applied for the digitisation of the natural history collections at the SMNH NASU. Scores are calculated by multiplication of specimen value by its vulnerability. Three priority groups are ascertained - red (highest) with scores over 35; yellow (moderate) with scores between 20 and 35; and green (lowest) with scores under 20.

3. The still image of each specimen has been captured using different photosystems available at SMNH NASU. For microslides, the digitisation photo camera Canon EOS 800D (24 Mp) with Canon EF-S 18-55mm f/3.5-5.6 IS STM lens mounted on the horizontal tripod over the light box has been applied. The following presets were set up:

ISO 200, f/5.6, exposition 1/250, automatic white balance. Additionally, the camera Olympus DP72 mounted on the trinocular microscope Olympus BX51 has been used for microphotography purposes. For the digitisation of pinned and fixed specimens, the photo camera Canon EOS 800D (24 Mp) with Canon EF 100mm f/2.8L Macro IS USM lens also mounted on the horizontal tripod over the lightbox has been applied. The images were saved simultaneously in RAW (master file) and JPEG (distributive file) formats in the highest possible resolution. At the moment, the resulting images are stored on the internal SMNH NASU server and only a portion of them has been published online.

4. The data from the labels have been manually filled from the images into Excel tables mapped following DarwinCore standard (TDWG 2024) and separated by taxonomic group.

5. The first step of data quality control has been manually realised by assistants, who checked the initial datasets for typos, technical mistakes and errors.

6. The occurrence records were georeferenced using the data from the field "locality" and OpenStreetMap facilities (OpenStreetMap contributors 2024). The OpenStreetMap has been chosen over other similar web map services as it is well-developed, openly provided under ODbL licence and has extended functionality, allowing checking the elevation. Many toponyms in the OpenStreetMap are provided along with spelling variants and there is an option to add new or correct existing information on the map. This results in better identification of the locality described on the label. The coordinates accuracy has been evaluated in metres and filled in the respective field in the dataset.

7. The second step of data quality control has been realised by collection curators, checking for consistency of provided coordinates and localities descriptions.

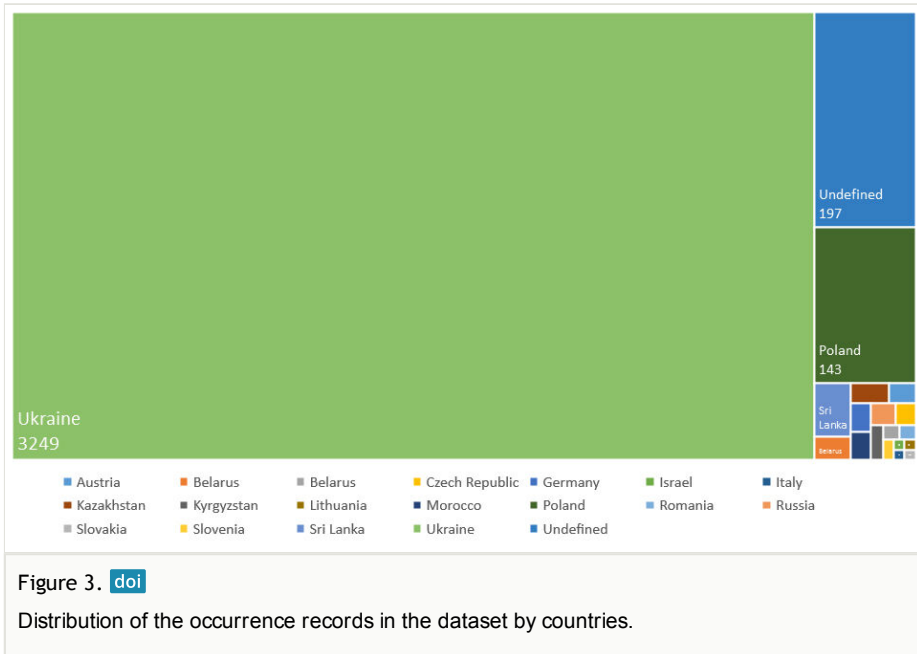
8. Separate datasets were merged into the common dataset by the project PI (AN).

9. The third step of data quality control has been realised by the project PI (AN), checking for consistency of provided data in the merged dataset.

10. The dataset has been published using the GBIF IPT (GBIF 2024b).

## Geographic coverage

**Description:** The SMNH NASU mainly hosts natural history collections representing regional flora and fauna. Only certain specimens were collected out of the western part of Ukraine. Therefore, most of the occurrence records provided in the dataset are from Ukraine (3249) and adjacent territories of Poland (143) - Fig. 3. Other currently provided occurrence records cover Sri Lanka (18), Belarus (8), Kazakhstan (7), Austria (5), Germany (5), Morocco (5), the Russian Federation (5) and the Czechia (4), Kyrgyzstan (4), Bosnia and Herzegovina (2), Romania (2), Slovenia (2), Israel (1), Italy (1), Lithuania (1) and Slovakia (1).



### Taxonomic coverage

**Description:** The dataset contains occurrence records belonging to two phyla, Arthropoda and Nematoda (Fig. 4 and Table 1).

Table 1.  
The list of invertebrate species and the number of their occurrence records represented in the dataset.

Phylum	Class	Order	Family	Genus	Species	Records
Arthropoda	Arachnida	Sarcoptiformes	Achipteriidae	<i>Achipteria</i>	<i>Achipteria coleoptrata</i>	114
Arthropoda	Arachnida	Sarcoptiformes	Achipteriidae	<i>Parachipteria</i>	<i>Parachipteria fanzagoi</i>	5
Arthropoda	Arachnida	Sarcoptiformes	Achipteriidae	<i>Parachipteria</i>	<i>Parachipteria punctata</i>	50
Arthropoda	Arachnida	Sarcoptiformes	Autognetidae	<i>Autogmeta</i>	<i>Autogmeta willmanni</i>	6
Arthropoda	Arachnida	Sarcoptiformes	Carabodidae	<i>Carabodes</i>	<i>Carabodes labyrinthicus</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Cepheusidae	<i>Cepheus</i>	<i>Cepheus cepheiformis</i>	3
Arthropoda	Arachnida	Sarcoptiformes	Cepheusidae	<i>Cepheus</i>	<i>Cepheus latus</i>	2



Phylum	Class	Order	Family	Genus	Species	Records
Arthropoda	Arachnida	Sarcoptiformes	Cepheusidae	<i>Reticulocepheus</i>	<i>Reticulocepheus grandis</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Cepheusidae	<i>Tritegeus</i>	<i>Tritegeus bisulcatus</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Ceratozetidae	<i>Ceratozetes</i>	<i>Ceratozetes mediocris</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Ceratozetidae	<i>Euzetes</i>	<i>Euzetes globulus</i>	6
Arthropoda	Arachnida	Sarcoptiformes	Ceratozetidae	<i>Melanozetes</i>	<i>Melanozetes mollicomus</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Ceratozetidae	<i>Melanozetes</i>	<i>Melanozetes mollicomus</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Chamobatidae	<i>Chamobates</i>	<i>Chamobates birulai</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Chamobatidae	<i>Chamobates</i>	<i>Chamobates borealis</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Chamobatidae	<i>Chamobates</i>	<i>Chamobates voigtsi</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Collohmanniidae	<i>Collohmannia</i>	<i>Collohmannia gigantea</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Crotoniidae	<i>Camisia</i>	<i>Camisia spinifer</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Crotoniidae	<i>Heminothrus</i>	<i>Heminothrus peltifer</i>	55
Arthropoda	Arachnida	Sarcoptiformes	Crotoniidae	<i>Heminothrus</i>	<i>Heminothrus targionii</i>	4
Arthropoda	Arachnida	Sarcoptiformes	Crotoniidae	<i>Heminothrus</i>	<i>Heminothrus thori</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Ctenobelbidae	<i>Ctenobelba</i>	<i>Ctenobelba pectinigera</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Ctenobelbidae	<i>Ctenobelba</i>	<i>Ctenobelba pilosella</i>	4
Arthropoda	Arachnida	Sarcoptiformes	Damaeidae	<i>Allobelba</i>	<i>Allobelba macerochaeta</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Damaeidae	<i>Belba</i>	<i>Belba corynopus</i>	4
Arthropoda	Arachnida	Sarcoptiformes	Damaeidae	<i>Damaeus</i>	<i>Damaeus auritus</i>	8
Arthropoda	Arachnida	Sarcoptiformes	Damaeidae	<i>Damaeus</i>	<i>Damaeus boreus</i>	3
Arthropoda	Arachnida	Sarcoptiformes	Damaeidae	<i>Damaeus</i>	<i>Damaeus onustus</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Damaeidae	<i>Damaeus</i>	<i>Damaeus riparius</i>	12
Arthropoda	Arachnida	Sarcoptiformes	Damaeidae	<i>Damaeus</i>	<i>Damaeus smirnovi</i>	3
Arthropoda	Arachnida	Sarcoptiformes	Damaeidae	<i>Metabelba</i>	<i>Metabelba papillipes</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Damaeidae	<i>Metabelba</i>	<i>Metabelba pulverulenta</i>	6
Arthropoda	Arachnida	Sarcoptiformes	Damaeidae	<i>Metabelba</i>	<i>Metabelba rohdendorfi</i>	2

Phylum	Class	Order	Family	Genus	Species	Records
Arthropoda	Arachnida	Sarcoptiformes	Damaeidae	<i>Subbelba</i>	<i>Subbelba partiocrispa</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Damaeolidae	<i>Damaeolus</i>	<i>Damaeolus asperatus</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Eniochthoniidae	<i>Hypochthoniella</i>	<i>Hypochthoniella minutissima</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Eremaeidae	<i>Eremaeus</i>	<i>Eremaeus hepaticus</i>	5
Arthropoda	Arachnida	Sarcoptiformes	Eulohmanniidae	<i>Eulohmannia</i>	<i>Eulohmannia ribagai</i>	3
Arthropoda	Arachnida	Sarcoptiformes	Euphthiracaridae	<i>Acrotritia</i>	<i>Acrotritia ardua</i>	3
Arthropoda	Arachnida	Sarcoptiformes	Euphthiracaridae	<i>Acrotritia</i>	<i>Acrotritia duplicata</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Euphthiracaridae	<i>Euphthiracarus</i>	<i>Euphthiracarus monodactylus</i>	6
Arthropoda	Arachnida	Sarcoptiformes	Euphthiracaridae	<i>Euphthiracarus</i>	<i>Euphthiracarus reticulatus</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Euphthiracaridae	<i>Microtritia</i>	<i>Microtritia minima</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Galumnidae	<i>Allogalumna</i>	<i>Allogalumna longipluma</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Galumnidae	<i>Galumna</i>	<i>Galumna lanceata</i>	8
Arthropoda	Arachnida	Sarcoptiformes	Galumnidae	<i>Pergalumna</i>	<i>Pergalumna altera</i>	4
Arthropoda	Arachnida	Sarcoptiformes	Galumnidae	<i>Pergalumna</i>	<i>Pergalumna formicaria</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Galumnidae	<i>Pergalumna</i>	<i>Pergalumna myrmophila</i>	3
Arthropoda	Arachnida	Sarcoptiformes	Galumnidae	<i>Pergalumna</i>	<i>Pergalumna nervosa</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Galumnidae	<i>Pergalumna</i>	<i>Pergalumna obvia</i>	18
Arthropoda	Arachnida	Sarcoptiformes	Gymnodamaeidae	<i>Gymnodamaeus</i>	<i>Gymnodamaeus bicostatus</i>	5
Arthropoda	Arachnida	Sarcoptiformes	Hermanniellidae	<i>Hermanniella</i>	<i>Hermanniella dolosa</i>	4
Arthropoda	Arachnida	Sarcoptiformes	Hermanniidae	<i>Hermannia</i>	<i>Hermannia gibba</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Hypochthoniidae	<i>Hypochthonius</i>	<i>Hypochthonius luteus</i>	7
Arthropoda	Arachnida	Sarcoptiformes	Hypochthoniidae	<i>Hypochthonius</i>	<i>Hypochthonius rufulus</i>	16
Arthropoda	Arachnida	Sarcoptiformes	Liacaridae	<i>Adoristes</i>	<i>Adoristes ovatus</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Liacaridae	<i>Liacarus</i>	<i>Liacarus brevilamellatus</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Liacaridae	<i>Liacarus</i>	<i>Liacarus coracinus</i>	4

Phylum	Class	Order	Family	Genus	Species	Records
Arthropoda	Arachnida	Sarcoptiformes	Liacaridae	<i>Liacarus</i>	<i>Liacarus lencoranicus</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Liacaridae	<i>Liacarus</i>	<i>Liacarus nitens</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Liacaridae	<i>Liacarus</i>	<i>Liacarus subterraneus</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Liacaridae	<i>Liacarus</i>	<i>Liacarus tubifer</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Liebstadiidae	<i>Liebstadia</i>	<i>Liebstadia longior</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Nanhermanniidae	<i>Nanhermannia</i>	<i>Nanhermannia nana</i>	4
Arthropoda	Arachnida	Sarcoptiformes	Neoliodidae	<i>Poroliodes</i>	<i>Poroliodes farinosus</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Nothridae	<i>Nothrus</i>	<i>Nothrus anauniensis</i>	6
Arthropoda	Arachnida	Sarcoptiformes	Nothridae	<i>Nothrus</i>	<i>Nothrus anauniensis</i>	10
Arthropoda	Arachnida	Sarcoptiformes	Nothridae	<i>Nothrus</i>	<i>Nothrus palustris</i>	8
Arthropoda	Arachnida	Sarcoptiformes	Nothridae	<i>Nothrus</i>	<i>Nothrus pratensis</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Oppiidae	<i>Berniniella</i>	<i>Berniniella bicarinata</i>	3
Arthropoda	Arachnida	Sarcoptiformes	Oppiidae	<i>Dissorhina</i>	<i>Dissorhina ornata</i>	3
Arthropoda	Arachnida	Sarcoptiformes	Oppiidae	<i>Kulievia</i>	<i>Kulievia paradecipiens</i>	16
Arthropoda	Arachnida	Sarcoptiformes	Oppiidae	<i>Multioppia</i>	<i>Multioppia glabra</i>	8
Arthropoda	Arachnida	Sarcoptiformes	Oppiidae	<i>Multioppia</i>	<i>Multioppia laniseta</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Oppiidae	<i>Oppiella</i>	<i>Oppiella neerlandica</i>	16
Arthropoda	Arachnida	Sarcoptiformes	Oppiidae	<i>Oppiella</i>	<i>Oppiella neerlandica</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Oppiidae	<i>Ramusella</i>	<i>Ramusella furcata</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Oppiidae	<i>Rhinoppia</i>	<i>Rhinoppia media</i>	6
Arthropoda	Arachnida	Sarcoptiformes	Oppiidae	<i>Rhinoppia</i>	<i>Rhinoppia subpectinata</i>	7
Arthropoda	Arachnida	Sarcoptiformes	Oribatulidae	<i>Oribatula</i>	<i>Oribatula tibialis</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Phenopelopidae	<i>Eupelops</i>	<i>Eupelops acromios</i>	4
Arthropoda	Arachnida	Sarcoptiformes	Phenopelopidae	<i>Eupelops</i>	<i>Eupelops caucasicus</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Phenopelopidae	<i>Eupelops</i>	<i>Eupelops occultus</i>	5
Arthropoda	Arachnida	Sarcoptiformes	Phenopelopidae	<i>Eupelops</i>	<i>Eupelops plicatus</i>	25
Arthropoda	Arachnida	Sarcoptiformes	Phenopelopidae	<i>Eupelops</i>	<i>Eupelops subuliger</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Phenopelopidae	<i>Eupelops</i>	<i>Eupelops torulosus</i>	18
Arthropoda	Arachnida	Sarcoptiformes	Phenopelopidae	<i>Peloptulus</i>	<i>Peloptulus phaeonotus</i>	1

Phylum	Class	Order	Family	Genus	Species	Records
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Atropacarus</i>	<i>Atropacarus phyllophorus</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Atropacarus</i>	<i>Atropacarus striculus</i>	47
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Hoplophthiracarus</i>	<i>Hoplophthiracarus illinoisensis</i>	3
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Phthiracarus</i>	<i>Phthiracarus ferrugineus</i>	7
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Phthiracarus</i>	<i>Phthiracarus globosus</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Phthiracarus</i>	<i>Phthiracarus laevigatus</i>	5
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Phthiracarus</i>	<i>Phthiracarus laevigatus</i>	32
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Phthiracarus</i>	<i>Phthiracarus lentulus</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Phthiracarus</i>	<i>Phthiracarus ligneus</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Phthiracarus</i>	<i>Phthiracarus longulus</i>	64
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Phthiracarus</i>	<i>Phthiracarus spadix</i>	18
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Steganacarus</i>	<i>Steganacarus applicatus</i>	4
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Steganacarus</i>	<i>Steganacarus carinatus</i>	32
Arthropoda	Arachnida	Sarcoptiformes	Phthiracaridae	<i>Steganacarus</i>	<i>Steganacarus spinosus</i>	3
Arthropoda	Arachnida	Sarcoptiformes	Punctoribatidae	<i>Minunthozetes</i>	<i>Minunthozetes pseudofusiger</i>	3
Arthropoda	Arachnida	Sarcoptiformes	Punctoribatidae	<i>Minunthozetes</i>	<i>Minunthozetes semirufus</i>	10
Arthropoda	Arachnida	Sarcoptiformes	Punctoribatidae	<i>Punctoribates</i>	<i>Punctoribates zachvatkini</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Quadropiidae	<i>Quadroppia</i>	<i>Quadroppia quadricarinata</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Scheloribatidae	<i>Euscheloribates</i>	<i>Euscheloribates samsinaki</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Suctobelbidae	<i>Kuklosuctobelba</i>	<i>Kuklosuctobelba tuberculata</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Suctobelbidae	<i>Suctobelba</i>	<i>Suctobelba trigona</i>	6
Arthropoda	Arachnida	Sarcoptiformes	Suctobelbidae	<i>Suctobelbella</i>	<i>Suctobelbella alloenasuta</i>	5

Phylum	Class	Order	Family	Genus	Species	Records
Arthropoda	Arachnida	Sarcoptiformes	Suctobelbidae	<i>Suctobelbella</i>	<i>Suctobelbella palustris</i>	2
Arthropoda	Arachnida	Sarcoptiformes	Suctobelbidae	<i>Suctobelbella</i>	<i>Suctobelbella perpendiculata</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Suctobelbidae	<i>Suctobelbella</i>	<i>Suctobelbella similis</i>	5
Arthropoda	Arachnida	Sarcoptiformes	Suctobelbidae	<i>Suctobelbella</i>	<i>Suctobelbella subcornigera</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Suctobelbidae	<i>Suctobelbella</i>	<i>Suctobelbella subtrigona</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Tectocepheidae	<i>Tectocepheus</i>	<i>Tectocepheus velatus</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Thyrisomidae	<i>Banksinoma</i>	<i>Banksinoma lanceolata</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Trhypochthoniidae	<i>Trhypochthonius</i>	<i>Trhypochthonius tectorum</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Xenillidae	<i>Xenillus</i>	<i>Xenillus tegeocranus</i>	1
Arthropoda	Arachnida	Sarcoptiformes	Zetorchestidae	<i>Zetorchestes</i>	<i>Zetorchestes falzonii</i>	8
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Blemus</i>	<i>Blemus discus</i>	19
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Calosoma</i>	<i>Calosoma auropunctatum</i>	4
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Calosoma</i>	<i>Calosoma denticolle</i>	7
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Calosoma</i>	<i>Calosoma elegans</i>	3
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Calosoma</i>	<i>Calosoma inquisitor</i>	30
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Calosoma</i>	<i>Calosoma investigator</i>	1
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Calosoma</i>	<i>Calosoma reticulatum</i>	1
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Calosoma</i>	<i>Calosoma sycophanta</i>	14
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela altaica</i>	2
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela campestris</i>	78
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela coerulea</i>	2
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela granulata</i>	4
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela hybrida</i>	89
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela littoralis</i>	3
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela maritima</i>	4

Phylum	Class	Order	Family	Genus	Species	Records
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela nordmanni</i>	7
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela sachalinensis</i>	1
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela sahlbergii</i>	2
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela soluta</i>	9
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela sylvatica</i>	47
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cicindela</i>	<i>Cicindela sylvicola</i>	53
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cylindera</i>	<i>Cylindera arenaria</i>	51
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Cylindera</i>	<i>Cylindera germanica</i>	141
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Duvaliopsis</i>	<i>Duvaliopsis pilosella</i>	17
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Duvalius</i>	<i>Duvalius corpulentus</i>	25
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Duvalius</i>	<i>Duvalius microphthalmus</i>	2
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Duvalius</i>	<i>Duvalius procerus</i>	2
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Duvalius</i>	<i>Duvalius roubali</i>	28
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Duvalius</i>	<i>Duvalius ruthenus</i>	5
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Duvalius</i>	<i>Duvalius subterraneus</i>	47
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Duvalius</i>	<i>Duvalius transcarpathicus</i>	62
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Epaphius</i>	<i>Epaphius rivularis</i>	4
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Epaphius</i>	<i>Epaphius secalis</i>	43
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Lophyra</i>	<i>Lophyra flexuosa</i>	5
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Omophron</i>	<i>Omophron limbatum</i>	50
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Omophron</i>	<i>Omophron rotundatum</i>	2
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Perileptus</i>	<i>Perileptus areolatus</i>	22
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Thalassophilus</i>	<i>Thalassophilus longicornis</i>	10
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechoblemus</i>	<i>Trechoblemus micros</i>	13
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus alpicola</i>	2
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus amplicollis</i>	15
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus austriacus</i>	2
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus cardioderus</i>	2

Phylum	Class	Order	Family	Genus	Species	Records
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus carpaticus</i>	19
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus fontinalis</i>	39
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus latus</i>	97
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus obtusus</i>	1
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus ovatus</i>	3
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus pilisensis</i>	52
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus plicatulus</i>	24
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus pseudomontanellus</i>	35
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus pulchellus</i>	41
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus pulpani</i>	17
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus quadristriatus</i>	101
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus rotundipennis</i>	1
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus rubens</i>	23
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus splendens</i>	5
Arthropoda	Insecta	Coleoptera	Carabidae	<i>Trechus</i>	<i>Trechus striatulus</i>	113
Arthropoda	Insecta	Lepidoptera	Brahmaeidae	<i>Lemonia</i>	<i>Lemonia dumii</i>	12
Arthropoda	Insecta	Lepidoptera	Brahmaeidae	<i>Lemonia</i>	<i>Lemonia taraxaci</i>	6
Arthropoda	Insecta	Lepidoptera	Drepanidae	<i>Cilix</i>	<i>Cilix glaucata</i>	12
Arthropoda	Insecta	Lepidoptera	Drepanidae	<i>Drepana</i>	<i>Drepana curvatula</i>	8
Arthropoda	Insecta	Lepidoptera	Drepanidae	<i>Drepana</i>	<i>Drepana falcataria</i>	18
Arthropoda	Insecta	Lepidoptera	Drepanidae	<i>Falcaria</i>	<i>Falcaria lacertinaria</i>	8
Arthropoda	Insecta	Lepidoptera	Drepanidae	<i>Sabra</i>	<i>Sabra harpagula</i>	6
Arthropoda	Insecta	Lepidoptera	Drepanidae	<i>Watsonalla</i>	<i>Watsonalla binaria</i>	6
Arthropoda	Insecta	Lepidoptera	Drepanidae	<i>Watsonalla</i>	<i>Watsonalla cultraria</i>	20
Arthropoda	Insecta	Lepidoptera	Endromidae	<i>Endromis</i>	<i>Endromis versicolora</i>	28
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Arctia</i>	<i>Arctia caja</i>	26
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Callimorpha</i>	<i>Callimorpha dominula</i>	12
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Catocala</i>	<i>Catocala electa</i>	7
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Catocala</i>	<i>Catocala elocata</i>	8
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Catocala</i>	<i>Catocala fraxini</i>	6

Phylum	Class	Order	Family	Genus	Species	Records
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Catocala</i>	<i>Catocala fulminea</i>	6
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Catocala</i>	<i>Catocala nupta</i>	11
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Catocala</i>	<i>Catocala promissa</i>	9
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Catocala</i>	<i>Catocala sponsa</i>	17
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Coscinia</i>	<i>Coscinia cribraria</i>	2
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Coscinia</i>	<i>Coscinia striata</i>	10
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Diacrisia</i>	<i>Diacrisia sannio</i>	15
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Diaphora</i>	<i>Diaphora mendica</i>	8
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Epatolmis</i>	<i>Epatolmis luctifera</i>	1
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Epicallia</i>	<i>Epicallia villica</i>	15
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Eucharia</i>	<i>Eucharia festiva</i>	3
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Euplagia</i>	<i>Euplagia quadripunctaria</i>	10
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Hyphoraia</i>	<i>Hyphoraia aulica</i>	17
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Miltotricha</i>	<i>Miltotricha miniata</i>	6
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Nudaria</i>	<i>Nudaria mundana</i>	1
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Parasemia</i>	<i>Parasemia plantaginis</i>	17
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Pericallia</i>	<i>Pericallia matronula</i>	8
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Phragmatobia</i>	<i>Phragmatobia fuliginosa</i>	6
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Rhyparia</i>	<i>Rhyparia purpurata</i>	10
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Spilarctia</i>	<i>Spilarctia lutea</i>	9
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Spilosoma</i>	<i>Spilosoma lubricipeda</i>	7
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Spilosoma</i>	<i>Spilosoma urticae</i>	2
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Tyria</i>	<i>Tyria jacobaeae</i>	5
Arthropoda	Insecta	Lepidoptera	Erebidae	<i>Utetheisa</i>	<i>Utetheisa pulchella</i>	1
Arthropoda	Insecta	Lepidoptera	Lasiocampidae	<i>Cosmotriche</i>	<i>Cosmotriche lobulina</i>	1
Arthropoda	Insecta	Lepidoptera	Lasiocampidae	<i>Dendrolimus</i>	<i>Dendrolimus pini</i>	12
Arthropoda	Insecta	Lepidoptera	Lasiocampidae	<i>Euthrix</i>	<i>Euthrix potatoria</i>	5
Arthropoda	Insecta	Lepidoptera	Lasiocampidae	<i>Gastropacha</i>	<i>Gastropacha populifolia</i>	8
Arthropoda	Insecta	Lepidoptera	Lasiocampidae	<i>Gastropacha</i>	<i>Gastropacha quercifolia</i>	8



Phylum	Class	Order	Family	Genus	Species	Records
Arthropoda	Insecta	Lepidoptera	Lasiocampidae	<i>Lasiocampa</i>	<i>Lasiocampa quercus</i>	9
Arthropoda	Insecta	Lepidoptera	Lasiocampidae	<i>Lasiocampa</i>	<i>Lasiocampa trifolii</i>	5
Arthropoda	Insecta	Lepidoptera	Lasiocampidae	<i>Macrothylacia</i>	<i>Macrothylacia rubi</i>	8
Arthropoda	Insecta	Lepidoptera	Lasiocampidae	<i>Odonestis</i>	<i>Odonestis pruni</i>	14
Arthropoda	Insecta	Lepidoptera	Lasiocampidae	<i>Phylloidesma</i>	<i>Phylloidesma ilicifolia</i>	1
Arthropoda	Insecta	Lepidoptera	Lasiocampidae	<i>Phylloidesma</i>	<i>Phylloidesma tremulifolia</i>	3
Arthropoda	Insecta	Lepidoptera	Nolidae	<i>Bena</i>	<i>Bena bicolorana</i>	2
Arthropoda	Insecta	Lepidoptera	Nolidae	<i>Pseudoips</i>	<i>Pseudoips prasinana</i>	11
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Aglais</i>	<i>Aglais io</i>	12
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Aglais</i>	<i>Aglais urticae</i>	12
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Apatura</i>	<i>Apatura ilia</i>	44
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Apatura</i>	<i>Apatura iris</i>	10
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Araschnia</i>	<i>Araschnia levana</i>	18
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Euphydryas</i>	<i>Euphydryas aurinia</i>	10
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Euphydryas</i>	<i>Euphydryas maturna</i>	5
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Ladoga</i>	<i>Ladoga camilla</i>	14
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Limenitis</i>	<i>Limenitis populi</i>	32
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Melitaea</i>	<i>Melitaea cinxia</i>	5
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Melitaea</i>	<i>Melitaea didyma</i>	19
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Melitaea</i>	<i>Melitaea phoebe</i>	6
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Melitaea</i>	<i>Melitaea trivia</i>	3
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Mellicta</i>	<i>Mellicta athalia</i>	20
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Mellicta</i>	<i>Mellicta aurelia</i>	3
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Neptis</i>	<i>Neptis rivularis</i>	12
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Neptis</i>	<i>Neptis sappho</i>	16
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Nymphalis</i>	<i>Nymphalis antiopa</i>	5
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Nymphalis</i>	<i>Nymphalis polychloros</i>	6
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Nymphalis</i>	<i>Nymphalis xanthomelas</i>	5
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Polygonia</i>	<i>Polygonia c-album</i>	12

Phylum	Class	Order	Family	Genus	Species	Records
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Polygonia</i>	<i>Polygonia vaualbum</i>	1
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Vanessa</i>	<i>Vanessa atalanta</i>	16
Arthropoda	Insecta	Lepidoptera	Nymphalidae	<i>Vanessa</i>	<i>Vanessa cardui</i>	18
Arthropoda	Insecta	Lepidoptera	Pieridae	<i>Colias</i>	<i>Colias myrmidone</i>	68
Arthropoda	Insecta	Lepidoptera	Pieridae	<i>Gonepteryx</i>	<i>Gonepteryx rhamni</i>	5
Arthropoda	Insecta	Lepidoptera	Saturniidae	<i>Aglia</i>	<i>Aglia tau</i>	8
Arthropoda	Insecta	Lepidoptera	Saturniidae	<i>Saturnia</i>	<i>Saturnia pavonia</i>	16
Arthropoda	Insecta	Lepidoptera	Saturniidae	<i>Saturnia</i>	<i>Saturnia pyri</i>	12
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Acherontia</i>	<i>Acherontia atropos</i>	4
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Agrius</i>	<i>Agrius convolvuli</i>	8
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Deilephila</i>	<i>Deilephila elpenor</i>	9
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Deilephila</i>	<i>Deilephila porcellus</i>	5
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Hyles</i>	<i>Hyles euphorbiae</i>	16
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Hyles</i>	<i>Hyles gallii</i>	6
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Hyles</i>	<i>Hyles lineata</i>	5
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Hyles</i>	<i>Hyles vespertilio</i>	1
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Laothoe</i>	<i>Laothoe populi</i>	7
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Macroglossum</i>	<i>Macroglossum stellatarum</i>	6
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Mimas</i>	<i>Mimas tiliae</i>	9
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Proserpinus</i>	<i>Proserpinus proserpina</i>	2
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Smerinthus</i>	<i>Smerinthus planus</i>	7
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Sphinx</i>	<i>Sphinx ligustri</i>	9
Arthropoda	Insecta	Lepidoptera	Sphingidae	<i>Sphinx</i>	<i>Sphinx pinastri</i>	8
Arthropoda	Insecta	Lepidoptera	Thyrididae	<i>Thyris</i>	<i>Thyris fenestrella</i>	24
Nematoda	Chromadorea	Monhysterida	Monhysteridae	<i>Tridentula</i>	<i>Tridentula palustris</i>	1
Nematoda	Chromadorea	Plectida	Plectidae	<i>Plectus</i>	<i>Plectus acuminatus</i>	3
Nematoda	Chromadorea	Plectida	Plectidae	<i>Plectus</i>	<i>Plectus decens</i>	5
Nematoda	Chromadorea	Rhabditida	Cephalobidae	<i>Acromoldavicus</i>	<i>Acromoldavicus skrbjabin</i>	1
Nematoda		Dorylaimida	Aporcelaimidae	<i>Makatinus</i>	<i>Makatinus aquaticus</i>	9
Nematoda		Dorylaimida	Aporcelaimidae	<i>Makatinus</i>	<i>Makatinus ukrainicus</i>	5

Phylum	Class	Order	Family	Genus	Species	Records
Nematoda		Dorylaimida	Aporcelaimidae	<i>Metaporcelaimus</i>	<i>Metaporcelaimus concinnus</i>	6
Nematoda		Dorylaimida	Aporcelaimidae	<i>Metaporcelaimus</i>	<i>Metaporcelaimus declivicaudatus</i>	5
Nematoda		Dorylaimida	Aporcelaimidae	<i>Metaporcelaimus</i>	<i>Metaporcelaimus ovogranulosus</i>	7
Nematoda		Dorylaimida	Aporcelaimidae	<i>Metaporcelaimus</i>	<i>Metaporcelaimus petrophilus</i>	4
Nematoda		Dorylaimida	Aporcelaimidae	<i>Metaporcelaimus</i>	<i>Metaporcelaimus romanicus</i>	10
Nematoda		Dorylaimida	Dorylaimidae	<i>Crassolabium</i>	<i>Crassolabium neohimalum</i>	5
Nematoda		Dorylaimida	Longidoridae	<i>Longidorus</i>	<i>Longidorus attenuatus</i>	15
Nematoda		Dorylaimida	Longidoridae	<i>Longidorus</i>	<i>Longidorus caespiticola</i>	22
Nematoda		Dorylaimida	Longidoridae	<i>Longidorus</i>	<i>Longidorus danuvii</i>	32
Nematoda		Dorylaimida	Longidoridae	<i>Longidorus</i>	<i>Longidorus distinctus</i>	13
Nematoda		Dorylaimida	Longidoridae	<i>Longidorus</i>	<i>Longidorus elongatus</i>	13
Nematoda		Dorylaimida	Longidoridae	<i>Longidorus</i>	<i>Longidorus euonymus</i>	17
Nematoda		Dorylaimida	Longidoridae	<i>Longidorus</i>	<i>Longidorus intermedius</i>	18
Nematoda		Dorylaimida	Longidoridae	<i>Longidorus</i>	<i>Longidorus poessneckensis</i>	12
Nematoda		Dorylaimida	Longidoridae	<i>Paralongidorus</i>	<i>Paralongidorus rex</i>	12
Nematoda		Dorylaimida	Longidoridae	<i>Xiphinema</i>	<i>Xiphinema ifacolum</i>	18
Nematoda		Dorylaimida	Longidoridae	<i>Xiphinema</i>	<i>Xiphinema taylori</i>	6
Nematoda		Dorylaimida	Longidoridae	<i>Xiphinema</i>	<i>Xiphinema vuittenezi</i>	18
Nematoda		Mononchida	Anatonchidae	<i>Anatonchus</i>	<i>Anatonchus siddiqii</i>	5
Nematoda		Mononchida	Anatonchidae	<i>Tigronchoides</i>	<i>Tigronchoides andrassyi</i>	2
Nematoda		Mononchida	Cobbonchidae	<i>Comiconchus</i>	<i>Comiconchus zduni</i>	2
Nematoda		Mononchida	Mononchidae	<i>Clarkus</i>	<i>Clarkus patricius</i>	5
Nematoda		Mononchida	Mononchidae	<i>Parkellus</i>	<i>Parkellus menzeli</i>	2
Nematoda		Mononchida	Mononchidae	<i>Parkellus</i>	<i>Parkellus zschokkei</i>	3

Phylum	Class	Order	Family	Genus	Species	Records
Nematoda		Mononchida	Mononchidae	<i>Prionchulus</i>	<i>Prionchulus fistulosus</i>	20
Nematoda		Mononchida	Mononchidae	<i>Prionchulus</i>	<i>Prionchulus hygrophilus</i>	5
Nematoda		Mononchida	Mononchidae	<i>Prionchulus</i>	<i>Prionchulus kamchaticus</i>	2
Nematoda		Mononchida	Mononchidae	<i>Prionchulus</i>	<i>Prionchulus polonicus</i>	1
Nematoda		Mononchida	Mononchidae	<i>Prionchulus</i>	<i>Prionchulus pseudolongus</i>	2
Nematoda		Mononchida	Myonchulidae	<i>Paramylonchulus</i>	<i>Paramylonchulus japonicus</i>	4
Nematoda		Triplonchida	Tripylidae	<i>Tripyla</i>	<i>Tripyla glomerans</i>	2

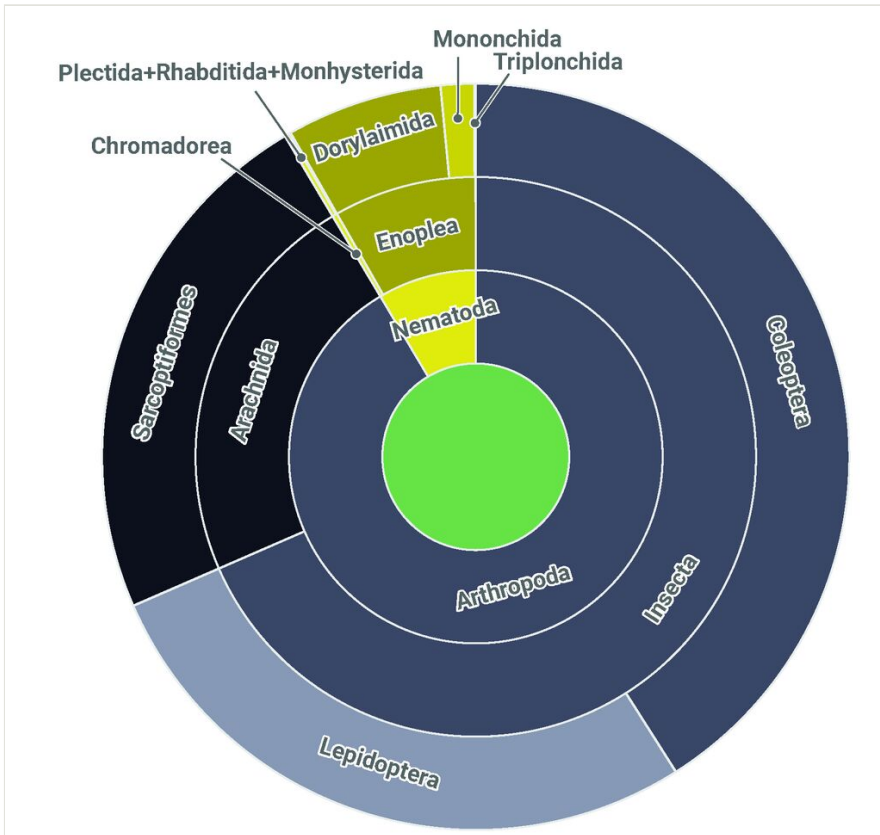


Figure 4. [doi](#)  
 Taxonomic structure of invertebrates represented in the dataset.

In the dataset, the phylum Arthropoda is the most diverse both in sense of taxonomy and represented occurrence records (3348 records or 91.5% of the total number of records). It includes holo- and paratypes of *Trechus pseudomontanellus* (35 specimens and respective occurrence records), *Duvalius transcarpathicus* (2 specimens) and *Duvalius werchratskii* (1 specimen). There are also occurrence records about 11 species endemic to the Carpathians (*Duvaliopsis pilosella*, *Duvalius corpulentus*, *D. roubali*, *D. ruthenus*, *D. subterraneus*, *D. transcarpathicus*, *Trechus carpaticus*, *T. fontinalis*, *T. latus*, *T. plicatulus* and *T. pseudomontanellus*). Finally, it includes information about the reference collection of oribatid mites typical and the oldest known collection of Lepidoptera for the western part of Ukraine.

The phylum Nematoda is less represented in the dataset by the number of records (312 records or 8.5% of the total number of records). However, the provided data on the phylum Nematoda are extremely important since they represent holo- and paratypes of 15 species described from Ukraine, Poland and Russia – *Anatonchus siddiqii* (5 microscopic slides and respective occurrence records), *Clarkus patricius* (5 slides), *Comiconchus zduni* (2 slides), *Makatinus ukrainicus* (5 slides), *Metaporcelaimus concinnus* (6 slides), *M. declivicaudatus* (5 slides), *M. petrophilus* (4 slides), *Mylonchulus politus* Susulovsky, 2000 (4 slides), *Prionchulus fistulosus* (20 slides), *P. hygrophilus* (5 slides), *P. kamchaticus* (2 slides), *P. polonicus* (1 slide), *P. pseudolongus* (2 slides), *Tigronchoides andrassyi* (2 slides) and *Tridentulus palustris* (1 slide). Most other microscopic slides of nematodes cited in the dataset, contain the materials of re-descriptions serving as the basis for the contemporary taxonomic understanding of such species as *Acromoldavicus skrjabini* (1 slide), *Longidorus intermedius* (18 slides), *Makatinus aquaticus* (9 slides), *Metaporcelaimus romanicus* (10 slides), *M. ovogranulosus* (7 slides), *Parkellus menzeli* (3 slides), *P. zschokkei* (3 slides), *Plectus acuminatus* (3 slides) and *P. decens* (5 slides). For six species, i.e. *Longidorus caespiticola* (22 slides), *L. danuvii* (32 slides), *L. poessneckensis* (12 slides), *Paralongidorus rex* (11 slides), *Prionchulus fistulosus* (20 slides) and *Xiphinema ifacolum* (18 slides), the digitised material includes complete cycles of post-embryonic development, which is important for the taxonomy and phylogeny of nematodes.

## Temporal coverage

**Notes:** The general temporal coverage of the dataset is 1867-2017 (Fig. 5). Most of Coleoptera (i.e. Carabidae) specimens were collected in 1975-2006. Most of Lepidoptera specimens were collected in 1903-1940. Most of Sarcoptiformes (i.e. Oribatida) specimens were collected in 1974-1988. Most of Nematoda specimens were collected in 2013-2017.

## Collection data

**Collection name:** Invertebrates of SMNH NASU

**Collection identifier:** <https://ror.org/019qyzj84>

**Specimen preservation method:** dried, pinned, formalin, alcohol, glycerine, microscopic preparation

**Curatorial unit:** 188,000 +/- 1,000 specimens



Figure 5. [doi](#)

The temporal coverage of the dataset by years.

## Usage licence

Usage licence: Other

IP rights notes: Creative Commons Attribution License (CC BY 4.0)

## Data resources

Data package title: SMNH NASU Invertebrates collection

Resource link: <https://doi.org/10.15468/ugtaz7>

Alternative identifiers: <https://www.gbif.org/dataset/bdc8cabb-98c5-460b-8173-a7d3fa7b7b19>

Number of data sets: 1

Data set name: SMNH NASU Invertebrates collection

Character set: UTF-8

Download URL: <https://doi.org/10.15468/ugtaz7>

Data format: DarwinCore

**Description:** The tab-delimited TSV-formatted dataset was created following the DarwinCore standard. It contains 3,660 occurrence records on the digitised specimens of invertebrates deposited in the SMNH NASU (Rizun et al. 2024). This dataset will be dynamically updated with new data along with digitisation and data mobilisation progress.

Column label	Column description
institutionCode	The acronym in use by the institution having custody of the object(s) or information referred to in the record. In our case, it is SMNH NASU.
institutionID	An identifier for the institution having custody of the object(s) or information referred to in the record. In our case, it is ROR identifier.
basisOfRecord	The specific nature of the data record, for example, preserved specimen or field observation.
occurrenceID	An unique identifier for the Occurrence. In our case, it is UUID ver. 4.
catalogNumber	An identifier for the record within the collection.
verbatimScientificName	A string representing the taxonomic identification as it appeared in the original record.
scientificName	The full scientific name of the taxon including the genus name and specific epithet.
taxonRank	The taxonomic rank of the most specific name in the scientificName.
kingdom	The full scientific name of the kingdom in which taxon is classified.
phylum	The full scientific name of the phylum in which taxon is classified.
class	The full scientific name of the class in which taxon is classified.
order	The full scientific name of the order in which taxon is classified.
family	The full scientific name of the family in which taxon is classified.
genus	The full scientific name of the genus in which taxon is classified.
recordedBy	A person, group or organisation responsible for recording the original Occurrence.
verbatimEventDate	The date of record as it appears in the original publication or specimen label.
eventDate	The date during which an event (e.g. collection of the specimen, photographing of the plant or its registering in the field in any other way), occurred.
countryCode	The standard code (ISO 3166-1-alpha-2) for the country in which the locality occurs.
country	The name of the country in which the locality occurs.
language	The language of data representation for the occurrence record.
locality	The specific description of the place where the specimen was registered or collected.

habitat	The description of the habitat where the specimen was collected or observed.
minimumElevationInMetres	The lower limit of the range of elevation (altitude, usually above sea level), in metres.
maximumElevationInMetres	The upper limit of the range of elevation (altitude, usually above sea level), in metres.
geodeticDatum	The ellipsoid, geodetic datum or spatial reference system (SRS), upon which the geographic coordinates given in decimalLatitude and decimalLongitude are based. In our case, it is WGS84.
decimalLatitude	The geographic latitude (in decimal degrees, using the spatial reference system given in geodeticDatum) of the geographic centre of a locality.
decimalLongitude	The geographic longitude (in decimal degrees, using the spatial reference system given in geodeticDatum) of the geographic centre of a locality.
coordinateUncertaintyInMetres	The horizontal distance (in metres) from the given decimalLatitude and decimalLongitude describing the smallest circle containing the whole of the locality.
identifiedBy	A list of names of people who assigned the taxon to the subject.

## Additional information

### Summary

Despite the minute progress in the digitisation of the SMNH NASU funds (only 11% of invertebrate specimens were digitised and only 2% were published in GBIF), the current activity offers the hope. Over the past five years, there has been an intensification of the digitisation of SMNH NASU collections. If in 2019, the DCBU contained only about 7,000 records on invertebrates, today this database already contains over 20,000 records. Moreover, in 2023, SMNH NASU officially became the GBIF publisher and, since that time, published 12 datasets with ca. 26,000 records. Of this number, about 21,000 records concern herbarium entries and are not limited to collections stored directly in the SMNH NASU (some records concern the information gathered from other herbaria and data parsed from the publications). In this sense, the mobilisation of zoological data lags significantly, which is primarily due to the peculiarities and difficulties of digitising zoological specimens. The lack of experience in data mobilisation and publication in the GBIF also played a significant role in such a lag in the zoological data. However, given the current pace and volume of the SMNH NASU invertebrate collection, in the case of sufficient financial support, it can be fully digitised and presented at the GBIF within the next 10 years.

The current dataset which, at the moment, represents only a small part of the entire SMNH NASU invertebrate collection, will serve as a proxy point to access this virtual collection and will be updated along the digitisation progress. The current digitisation of



the SMNH NASU invertebrate collection is focused on the red priority group, limited by the fauna of Ukraine. This group is the most valuable and requires urgent digitisation, since its loss in the case of hostilities will leave an irrevocable legacy. Specimens collected from other countries are out of current digitisation plans and will be digitised only occasionally or on request. The next digitisation round (2025–2030) will involve the specimens belonging to the yellow priority group. The specimens of the green priority group and specimens from other countries will be digitised in the last digitisation round (2030-2035).

Besides the mentioned plans, we will gladly consider requests for prioritised digitisation from scientists worldwide. We believe that it is most important to digitise those materials that are urgently needed for research purposes. Therefore, please direct your requests to the collection curators, i.e. Coleoptera and other invertebrates - Volodymyr Rizun (novikoffav@gmail.com), Lepidoptera - Kateryna Hushtan (katrinantonyuk@gmail.com), Arachnida - Habriel Hushtan (habrielhushtan@gmail.com) and Nematoda - Andrii Susulovsky (susulovsky@gmail.com).

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