

## Arachnolibrary: digital library for arachnological literature

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**ABSTRACT:** This article aims to describe the process of creation and filling in the comprehensive bibliographic database of arachnological literature of the post-Soviet region along with the development of its user-friendly interface to access it online. In this article we present both, the applied principles of bibliographic compilation, and the purpose, usage and technical features of the developed application. Based on decades of bibliographic work, the database currently contains nearly 5,300 publications, 22% of which include full-text files. We assume the database to be regularly updated with missing and newly published works. The engine and the interface offer potential to expand on other regions and taxa. How to cite this article: Sozontov A.N., Mikhailov K.G. 2024. Arachnolibrary: digital library for arachnological literature // *Invert. Zool.* Vol.21. No.4. P.526–533. doi: 10.15298/invertzool.21.4.08

**KEY WORDS:** Araneae, spiders, arachnology, literature search, bibliography, biodiversity informatics.

## Arachnolibrary: цифровая библиотека арахнологической литературы

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**РЕЗЮМЕ:** В статье описано создание, разработка и наполнение библиографической базы данных арахнологической литературы с постсоветского пространства вместе с пользовательским интерфейсом для доступа к ней по сети. Описаны принципы сбора библиографии, а также назначение, использование и технические особенности приложения. Основанная на многолетнем учете литературы, база данных на данный момент содержит порядка 5300 записей, из которых 22% сопровождаются полными текстами. Предполагается регулярное дополнение пропущенными и вновь выходящими публикациями. Ядро и интерфейс приложения имеют потенциал для расширения на другие регионы и таксоны.

Как цитировать эту статью: Sozontov A.N., Mikhailov K.G. 2024. Arachnolibrary: digital library for arachnological literature // *Invert. Zool.* Vol.21. No.4. P.526–533. doi: 10.15298/invertzool.21.4.08

**КЛЮЧЕВЫЕ СЛОВА:** Araneae, пауки, арахнология, поиск литературы, библиография, информатика биоразнообразия.

## Introduction

The USSR-Russia spiders' bibliography gathering was started by K.G. Mikhailov in 1980. This bibliographic list was published as a part of "Catalogue of the spiders of the former Soviet Union" (Mikhailov, 1997 — more 1900 references) with a few following addendums (Mikhailov, 1998, 1999, 2000). However, the decision to combine a checklist of spider species and a bibliography — unrelated to one another within a single book — caused criticism (Heptner, 1998). Consequently, the catalog (Mikhailov, 2013, 2024a) and the bibliography (Mikhailov, 2012, 2024b) were separated later. By 2012 the bibliography included 3,560 references and had been revised in the following way: translations of Russian publications and transliterations/translations of the Russian sources into English were excluded. In this format, the bibliography and two subsequent addendums were published later (Mikhailov, 2019, 2022) containing 750 and 745 publications respectively. These three books have covered the period from 1770 to 2020 and include 5,145 references. In 2024 an updated bibliography was released (Mikhailov, 2024b), encompassing 5,267 published scholarly works from 1770 to 2022 (Fig. 1).

The published bibliography has been a valuable resource for literature search, playing a crucial role in the development of Russian arachnology. However, the timing of print publications lagged behind the current needs of specialists and text search remained significantly limited. Even the release of a digital version would only partially handle these search limitations. Moreover, simply listing sources is no longer sufficient; publication aggregators now tend to collect the full texts and provide organized access to them. For example, this objective (concerning taxonomical literature) has been successfully achieved in the World Spider Catalog (WSC, 2024). Thus, there is an urgent need for a comprehensive database and a digital repository of scientific publications on arachnology from the post-Soviet region, providing a user-friendly access to this digital resource.

Efforts to establish a national repository of arachnological literature using forums, cloud storage, or other ready-made solutions have not succeeded. Consequently, in early 2024, the decision was made to develop a custom system for

standardized references gathering and its texts storage. This decision was influenced by A.N. Sozontov's initiative to digitize literature data on Ural spiders (Sozontov, 2022), which entered an active phase in the beginning of 2024 (Sozontov, 2024). Scaling this work up to a broader region seemed simple and reasonable, prompting us to combine K.G. Mikhailov's bibliographic list with A.N. Sozontov's software. The outcome of this collaboration is the digital repository of arachnological literature for the post-Soviet region, described in this article and freely accessible at [kmkjournals.com/arachnolibrary/index.html](http://kmkjournals.com/arachnolibrary/index.html) and [sozontov.cc/arachnolibrary](http://sozontov.cc/arachnolibrary).

## Bibliography elaboration

Only a comprehensive bibliography fully serves its purpose. According to this requirement all publications on spiders of Russia and the former USSR territories are included, encompassing even popular science ones. In addition to monographs and articles in peer-reviewed journals, the bibliography contains PhD dissertation abstracts, congress and conference proceedings, as well as some other materials, such as educational guides. The bibliography includes scholar works whether by Russian and post-Soviet authors on spiders from other regions worldwide or, to some extent, works by foreign authors on non-Soviet territories published in Russian. Russian authors working abroad and having emigrated before the mid-1990s are classified as foreign authors, other ones are classified as local.

The bibliography excludes publications on other arachnid groups (such as scorpions, solifuges, harvestmen, and mites), as well as abstracts of publications that appeared in the "Science News" section of the journal "Priroda" from 1990 to 2016. BSc, MSc and PhD dissertations, and other unpublished manuscripts are also omitted. Digital publications on Russian-Soviet spiders that were appropriately distributed are absent.

A brief overview of the history of arachnological research across the entire post-Soviet region is available (Mikhailov, 2004), along with various regional surveys (Popova, 2003; Trilikauskas, 2003; Marusik *et al.*, 2004, 2006; Polchaninova, Prokopenko, 2006; Mikhailov, 2011, 2016; Omelko, 2011; Kovblyuk, Kastrygina, 2015; Zhukovets, 2017; Hirna, Zhukovets, 2022; Ponomarev, 2022, etc.). The arachnolo-

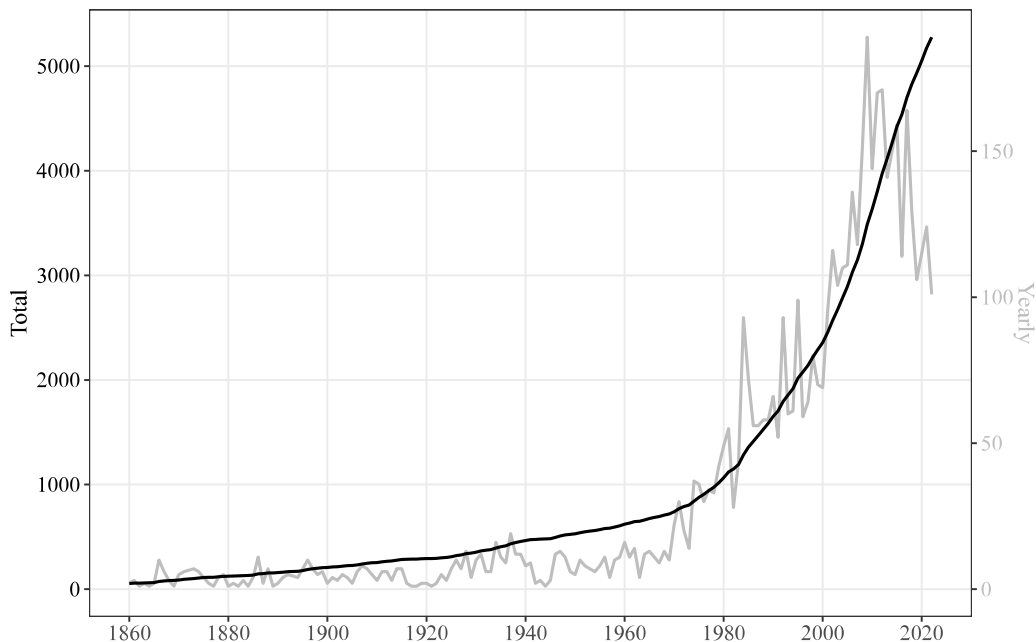


Fig. 1. Number of accounted arachnological publications yearly (grey) and in total (black).

Рис. 1. Динамика количества учтенных арахнологических публикаций по годам (серый) и в сумме (черный).

gists, having more than 60 articles published, are listed in the Table 1.

## Resource development

The database is created and maintained in PostgreSQL v. 16.4. The main table with publications contains 15 fields (Table 2). Each entry has a unique identifier (“publ\_id”). The bibliographic description of each source are divided into five fields: author(s), year, title, publication details, and type of publication (article/book/book chapter). Fields “pdf\_file”, “bib\_file”, and “arj\_file” store filenames for the attached full texts, bibliographic description files, and archives with supplementary materials, respectively. Fields “language” and “resume” list the publication languages and summaries, separated by a delimiter if multiple. Field “ural” indicates whether information on spiders recorded in the Ural region is present. Additional technical fields specify presence of defined species (spec), material (occs), and geographic coordinates (coords). Telegram bot “Data web” ([https://t.me/faunistica\\_2\\_bot](https://t.me/faunistica_2_bot)) manages registration and passwords issuance, not requiring users’ personal data provision.

The core of the application is written in the R programming language v. 4.3 (R Core Team, 2024). The DBI v. 1.2.2 (Wickham, Müller, 2024) and RPostgreSQL v. 0.7 (Conway *et al.*, 2024) packages manage connection to the database. Communication with the Telegram bot is implemented using the telegram.bot package v. 3.0 (Benedito, 2022). The web interface and server-side logic are developed using the Shiny framework v. 1.8 (Chang *et al.*, 2023) and its extension, shinyalert v. 3.1.0 (Attali, Edwards, 2024). The application is hosted on a server running Ubuntu OS v. 24.04 LTS and is translated to web via nginx v. 1.24. The SSL security certificates are obtained using certbot v. 2.9.0, a tool provided by Let’s Encrypt.

## Resource usage

The web application interface (Fig. 2) consists of a main window and a search criteria panel on the left. The default language is Russian at startup, with an option to switch to English. In the main window, the “About the Project” panel tab provides a brief description of the resource and its usage. A password entry form is located in the upper-right corner, unlocking additional

Table 1. Russian or post-Soviet arachnologists, having more than 60 articles published.  
Таблица 1. Российские и постсоветские арахнологи, опубликовавшие более 60 работ.

Author	Publications	Author	Publications
Marusik Yu.M.	662	Omelko M.M.	121
Logunov D.V.	212	Polchaninova N.Yu.	107
Esyunin S.L.	194	Prokopenko E.V.	102
Mikhailov K.G.	186	Fedorjak M.M.	98
Tanasevitch A.V.	184	Zonstein S.L.	82
Ponomarev A.V.	158	Eskov K.Yu.	73
Kovblyuk M.M.	125	Azarkina G.N.	68
Koponen S.	121	Trilikauskas L.A.	66

Table 2. The database structure of the web application.  
Таблица 2. Структура базы данных веб-приложения.

Field	Type	Description
publ_id	integer	Unique identifier of the publication.
type	text	Publication type, with one of the following values: “A” (Article) — Journal article “S” (Section) — Part of non-periodical volume, such as monograph chapter or proceeding. “B” (Book) — Complete book, monograph, PhD dissertation abstract.
author	text	List of authors, separated by «, » if there are two or more.
year	integer	Year of publication.
name	text	Title of the publication.
external	text	All bibliographic information, excluding authors, year and title. Remarks for some records are enclosed in square brackets.
language	text	Language(s) of the publication text, abbreviated as three letters: rus, eng etc. A few languages listed via “ ” separator.
resume	text	Language(s) of the publication resume (abstract) language, abbreviated as three letters: rus, eng etc. A few languages listed via “ ” separator.
pdf_file	text	Name of pdf file attached containing the full text.
bib_file	text	Name of bib file attached containing the bibliographic description.
arj_file	text	Name of zip file attached containing the supplementary materials archived into the single file.
spec	integer	Notion on presence (1) or absence (0) species names in the text.
occs	integer	Notion on presence (1) or absence (0) label data (material) in the text.
coords	integer	Notion on presence (1) or absence (0) geographical coordinates in the text.
ural	integer	Notion on presence (1) or absence (0) data on the Ural spiders in the text.

application features upon authorization (see below). The pop-up window displays the current statistics on the total number of publications and the number of full texts available.

There are several criteria for publications searching, with the date range (“Year” field) be-

ing the only required one. In the “Author” field users can enter the last name in any variant, as far the application includes a dictionary linking to alternative spellings. For example, entering “Zyuzin” will also retrieve publications with the names “Зюзин” and “Zjuzin”. Users can select

The screenshot shows the main interface of the Arachnolibrary web application. At the top, the title "Arachnolibrary: digital library for arachnological literature" is displayed. Below the title, there are navigation tabs: "About the library", "Search results", "Edit records", and "Add new record". The "Search results" tab is active.

On the left side, there is a search filter panel with the following sections:

- Author(s)**: A text input field with a hint "Better to use Family Name only".
- Year**: Two input fields, both containing "2015".
- Search**: A blue button and a "Clear" button.
- Download list of results**: Two buttons labeled "Excel" and "Zotero (bib)".
- Publication type**: Three checked checkboxes: "Book", "Journal article", and "Section in monograph/proceedings".
- Language & files**: Three checked checkboxes: "RUSian", "English", and "others".
- PDF file...**: Three radio buttons: "Present", "Absent", and "No matter" (selected).
- BIB file...**: Three radio buttons: "Present", "Absent", and "No matter" (selected).
- Additional files...**: Three radio buttons: "Present", "Absent", and "No matter" (selected).
- Additional filters**: A section with "Urals only" and "Species listed", each with three radio buttons: "Yes", "No", and "No matter" (selected).

On the right side, there is a login section with a text input field for a password and a "Log in" button. Below this, there is a "Statistics" button and a paragraph of text: "Arachnological literature data digitization is progressing on the separated resource Faunistica 2.0, which has been developed with the support of RSP № 24-24-00460."

Further down, there is a "Citation:" section with the text: "Sozontov A.N., Mikhailov K.G. 2024. Arachnolibrary: digital library for arachnological literature // Invertebrate zoology, Vol.21, No.4, P.XXX-XXX".

Below that is an "About the app" section with "Functions" and "Development log" buttons. It contains a list of publication categories: "Article (A)", "Book (B)", and "Section (S)", each with a brief description. It also lists "All site visitors" and provides instructions for searching and downloading files.

At the bottom, there are two sections for user permissions: "После авторизации с правами пользователя доступны:" and "После авторизации с правами администратора доступны:", each with a list of available features.

Fig. 2. The interface of the “Arachnolibrary” web application, main panel tab.  
 Рис. 2. Интерфейс веб-приложения “Arachnolibrary”, главная вкладка.

the publication language and type with three categories available: “Book”, “Book section”, “Journal article” (Table 2).

Other search criteria are the presence or absence of files attached to the bibliographic record: full texts (in PDF format), bibliographic description files (in BIB format), and supplementary materials (in a single ZIP archive). Finally, filtering is possible based on the publication’s content (in the “Additional Filters” section): the presence of spider species names, label data (material), geographic coordinates, or association with a specific geographic region. Publications are manually categorized into these characters, and currently, only the Ural region is available as a geographic filter. The list of regions will be expanded as the project develops.

Pressing the corresponding button after selecting several criteria, launches the search process. Search results are displayed in a separate “Search Results” panel tab as a table (Fig. 3). The table includes fields “Type”, “Author”, “Year”, “Title (+pdf)”, and “Publication Details (+bib)”, with the descriptions provided in Table 2. The last two columns, marked with “+pdf” and “+bib”, are converted to a file’s URLs link, if download is available.

Sorting is available in ascending or descending order within all columns. In such event, row

numbers remain fixed as in the initial results display. This is essential feature for managing records and files (see below). The display limit is 200 publications. The full list of found publications can be exported as an MS Excel table or as a collection of bibliographic records (BIB file) for subsequent import into bibliographic managers (Zotero, Mendeley, EndNote, etc.) independently of overlmit conditions.

Administrator login grants access to additional features for managing bibliographic records in the database and their associated files in storage. To edit a publication, follow these steps: 1. Specify search criteria that include the publication of interest. 2. Run the search and locate the publication’s row number in the results table. 3. Switch to the “Edit Publication” panel tab. 4. Enter the row number from the table and click “Select Publication”. Having the above mentioned steps completed, the selected publication’s description appears, allowing verification of the correct selection and unlocking controls to upload new files, delete the existing ones, and edit both the bibliographic record and its metadata (publication language and summary, presence of species names, label data, and geographic coordinates). A new record can be added in “Add Publication” section, located in the main window’s final panel tab.

Arachnolibrary: digital library for arachnological literature

About the library Search results Edit records Add new record

Show 10 entries Search:

Type	Author	Year	Title (+pdf)	Impressum (+bib)
1 A	Arkhipov V.Yu., Mikhailov K.G.	2015	First record of the Striped Argiope, <i>Argiope bruennichi</i> in Novgorod Region (Aranei, Araneidae)	Vestnik zoologii. Vol.49. No.5. P.477
2 A	Azarkina G.N., Foord S.H.	2015	A review of three <i>Tusitala</i> (Araneae: Salticidae) species from southern Africa, with a new synonymy and description of a new species from Botswana	African Invertebrates. Vol.56. No.2. P.285-307
3 A	Azarkina G.N., Komenov M.	2015	Descriptions of two new species of <i>Aelurillus</i> Simon, 1884 (Araneae: Salticidae) from the Mediterranean, with the synonymization of <i>A. stellosi</i> Dobronika, 2002	ZooKeys. Vol.516. P.109-122
4 A	Azarkina G.N., Marusik Yu.M., Antonenko T.V.	2015	First description of the male of <i>Alopecosa azsheganovae</i> Esyunin, 1996 (Araneae: Lycosidae)	Zootaxa. Vol.4033. No.2. P.265-269
5 A	Bretting R.	2015	Taxonomic notes on dubious spider species (Arachnida: Araneae) from the Russian Far East	Arthropoda Selecta. Vol.24. No.4. P.477-481
6 S	Cera I., Stokmane M.	2015	Check list of mire spiders of Latvia	29th European Congress of Arachnology. 24-28 August, 2015 Brno, Czech Republic. Programme and Abstracts. P.45
7 A	Evtushenko K.V.	2015	The first record of the salticid spiders <i>Sibianor larvae</i> and <i>S. tantulus</i> (Araneae, Salticidae) in Ukraine	Vestnik zoologii. Vol.49. No.2. P.165-166
8 A	Evtushenko K.V., Polchaninova N.Yu., Esyunin S.L.	2015	Distribution of the spider <i>Zelotes azsheganovae</i> (Aranei, Gnaphosidae) on the East European Plain	Vestnik zoologii. Vol.49. No.4. P.305-310
9 S	Fedorik M.	2015	Spiders (Araneae) described between 1931-1939 by Romanian arachnologist Aleksandru Roşca	29th European Congress of Arachnology. 24-28 August, 2015 Brno, Czech Republic. Programme and Abstracts. P.156. [вкладыш с территории бытш. СССР не указаны]
10 S	Fedorik M., Voloshyn V.	2015	On the implementation of A.Rosca's data into the research of spiders of Bukovyna	Annual Scientific Meeting. Abstract Book. Faculty of Biology (22-24 October 2015 <sup>th</sup> last, Romania). P.2

Showing 1 to 10 of 64 entries Previous 1 2 3 4 5 6 7 Next

Fig. 3. The interface of the “Arachnolibrary” web application, search results panel tab.

Рис. 3. Интерфейс веб-приложения “Arachnolibrary”, вкладка с результатами поиска.

The bibliography uses traditional abbreviations for certain titles, as recommended by the All-Union (later All-Russian) Institute of Scientific and Technical Information (VINITI).

As of October 2024, the bibliographic portal contains information on nearly 5,300 publications, with full texts attached to 22% of them. Undoubtedly, this list will continue to grow, incorporating both, previously missed works and publications from subsequent years. All comments and suggestions can be sent via email to [mikhailov2000@gmail.com](mailto:mikhailov2000@gmail.com)

#### Compliance with ethical standards

**CONFLICTS OF INTEREST:** The authors declare that they have no conflicts of interest.

**Acknowledgements.** This labor-intensive bibliographic work, spanning over 40 years, would have been impossible without the invaluable assistance of numerous arachnologists, entomologists, zoologists, botanists, and historians of science, listed here in alphabetical order: G.M. Abdurakhmanov (†), G.N. Azarkina, S.K. Alekseev, Yu.G. Alekseenko, E.M. Antonova (†), V.Yu. Arkhipov, M.Yu. Bakanov, K. Batsatsashvili, E.A. Belosludtsev, A.A. Benedictov, M.V. Berezin, A.V. Bespyatykh, M.V. Bobrovskiy, N.V. Borisova, A.I. Vasilyev, A.K. Vilbaste (†), O.V. Voltzit, I.V. Ganitskiy, V.V. Glupov, V.A. Gnelitsa, S.I. Golovatch, V.B. Golub, K.B. Gongalsky, A.V. Gromov, S.Yu. Gruntal, E.F. Guseinov (†), S.N. Danilov, P.M.

Dunin (†), K.V. Evtushenko, L.V. Egorov, S. Eliseev, K.Yu. Eskov, S.L. Esyunin, G.Sh. Farzaliyeva, M.M. Fedoryak, V.Ya. Fet, I.O. Kamaev, N.A. Kalinichev, A.G. Koval, N.M. Kovblyuk, Yu.P. Krasnobayev, V.A. Krivokhatsky (†), D.K. Kurenshchikov, N.V. Lebedeva, D.V. Logunov, I.I. Lyubechenskii, Yu.M. Marusik, K.V. Makarov, D.A. Milko, G.K. Mikhailov (†), T.S. Mkheidze (†), A.A. Nadolny, A.B. Nenilin (†), V.I. Ovtsharenko, S.V. Ovtchinnikov (†), O.G. Ovtchinnikova, M.M. Omelko, V.G. Onipchenko, M.A. Oliger, T.I. Oliger, D.V. Osipov, N.Yu. Panteleeva, A.D. Petrova-Nikitina (†), T.V. Piterkina (Grushko), A.V. Ponomarev, N.Yu. Polchaninova, E.V. Prokopenko, V.D. Pkhakadze, V.N. Romanenko, L.B. Rybalov, M.K. Ryzhov, A.V. Sviridov (†), R.R. Seyfulina, P.S. Simonov, E.N. Singaevsky, N.Yu. Snegovaya, N.N. Spasskaya, M.T. Šternbergs (†), S.Yu. Storozhenko, G.M. Suleymanova, A.V. Tanasevitch, E.N. Temereva, I.I. Temreshev, L.A. Trilikauskas, T.K. Tuneva, L.G. Tselishcheva, A.Yu. Tselarius, S.E. Tshernyshev, A.S. Utochkin (†), V.V. Yanushev, V.I. Zheltukhina, E.M. Zhukovets, S.L. Zonstein, J. Gruber, S. Koponen, T. Kronstedt, H. Ono, N. Platnick (†), J. Prószyński, V. Rélyš and a great many others.

Several libraries have provided significant support for this work, specially the Russian State Library (formerly the Lenin Library), the library of the Zoological Institute of the Russian Academy of Sciences (ZIN RAS), the library of Moscow State University (MSU), the library of the Zoological Museum of Moscow State University (ZMMU), and the library of the Moscow Society of Naturalists (MOIP). K.M.’s

20 years of work as a VINITI abstractor served an important source of additional information. CIONT PIK VINITI provided numerous photocopies in the 1980s. Additionally, online forum “RusArachnology” and the World Spider Catalog (WSC, 2024) also were valuable sources of publications.

We thank E.V. Plakhina and A.V. Ustinova for their contribution to application testing and pdf files uploading. Artem Sozontov’s work is supported by the Russian Science Foundation (RSF project no. 24-24-00460).

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*Responsible editor E.N. Temereva*