

## Spiders in Fauna Europaea: dual use of the database

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doi: 10.5431/aramit4305

**Abstract:** The history and current work of the project Fauna Europaea is outlined. The different sources used for building up the database and the efforts to keep it updated are described. Available models of national checklists are discussed and the ideal checklist is described. The double use of the database as a matrix behind the official site of Fauna Europaea – as well as a directly visible document on the website of the European Society of Arachnology – are indicated and the differences in transparency, links to literature sources, and facilities such as distribution maps and calculations of numbers of scores per species or of species per country are discussed. The future of the project is briefly outlined. The need for a European identification tool for spiders is stressed.

**Key words:** Araneae, checklist, European distribution, European project, European Society of Arachnology, identification tool, PESI

Fauna Europaea is an initiative set up and funded by the European Commission. The actual work started in 1999 with the establishment of a Central Bureau and the organization of the work load. The goal was to set up a database of published distribution records of all valid terrestrial and freshwater animal species, including synonyms. All European countries as politically defined (European parts of Russia, satellite archipelagos of Spain and Portugal) were included: EU and non-EU, and smaller member-states such as Monaco, the Vatican, and Andorra. Registration of species distributions was expected to be carried out at country level (or parts of countries for the larger countries, such as European Russia, or with known distribution barriers or zoogeographical districts within the country, such as Greece, Portugal, and Spain). The site (FAUNA EUROPAEA 2011) thus aims to inform the user about the presence or absence of a given species in the selected country or region. Literature sources should also be provided.

This goal was achieved by bringing together one or more specialists for each taxonomic group to serve as group-coordinators. The Fauna Europaea website mentions more than 500 experts, including the 63 group-coordinators. The website was launched in 2004.

## Sources

### General sources

I built up the database for the spiders in 2003 and subsequently try to keep it up-to-date with the much appreciated help of many colleagues from all over Europe, and based on different sources.

The available literature forms the ever increasing primary source for the database. I started to work with Platnick's World Catalog (PLATNICK for the years 2002–2003), extracting all the names of spider species in Europe, and next browsed the literature – libraries, the internet, Zoological Record – for distribution data and newly described species. Platnick provides a fresh version of his Catalog twice a year and the changes in his catalogue, nomenclatorial changes as well as new species and distribution data, form one of the sources for the regular update of the Fauna Europaea database. Platnick's Catalog is a reliable source for taxonomic registration but less detailed in its indication of the distributions, which are summarized where appropriate (e.g. Palearctic, Western Mediterranean). For zoogeographic purposes, therefore, all possible literature sources are browsed, such as papers published in journals, checklists published on paper, or on the internet.

Many people are helpful through supplying recently published information or by pointing out administrative errors which have crept into the database.

### Available sources per country

Checklists and catalogues apparently serve different meanings in different countries. The two terms are used indifferently. In my opinion a checklist is just a

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list of names, while a catalogue includes references to the sources.

In its most simple and ideal form a country checklist should list the names of all species with published records for that country in a directly visible overview. Recent synonyms should be added for the sake of convenience and for newly added names a source reference should be given. The following examples demonstrate what I think is the most practical format for a country checklist, supplying all the relevant information needed, and which formats are impractical.

#### *The Danish checklist*

The Danish checklist (SCHARFF & GUDIK-SØRENSEN 2011) complies with all the above criteria. It shows the names of all species occurring in Denmark in a simple, readable way, while recent name changes and relevant historical particulars are made visible. Families, genera within the family, and species within the genus are in alphabetical order. The list carries the date of the last update, so the user can see the status (age) of the list. The new additions to the list are marked in a distinct way making the user aware of recent changes at a glance.

#### *The Portuguese checklist*

In the Checklist of Portugal (CARDOSO 2011) maps and literature references can be brought forward for each species, giving such a checklist the character of a catalogue. This looks very attractive and makes use of the most recent software developments, but is restricted with regards to obtaining an overview of the fauna of the country. For instance, it is not possible to extract a complete list of the spider fauna of the country, and even though the date of the last update is mentioned one cannot detect which changes were made because they are not marked. The additional information on literature sources and the distribution maps form excellent extras, but the basic information remains concealed. On the website there is a link to the Catalogue of the spiders of Portugal which has the same construction and therefore the same lack of overview of the complete spider fauna of Portugal.

There are several examples of this type of checklist or catalogues on websites.

#### *The British checklist*

In the checklist of the British Isles (BRITISH ARACHNOLOGICAL SOCIETY 2011) the families are grouped in taxonomic clusters, which make such a list slightly less user-friendly. The alphabetical order is not used,

not even within a family, which renders the list extremely user-unfriendly and frustrating. In this particular case one sticks to a traditional sequence followed in identification literature which is not functional even there and lacks a scientific or practical basis. For example, the taxonomic clustering within the Linyphiidae does not have any phylogenetic basis and is not explained. Recent changes are not marked and it is not clear if and when updates were carried out. The consultation of such a checklist thus becomes a tedious job.

#### **The website of Fauna Europaea**

The website has not changed its visual format since its launch in 2004, but the possibilities and facilities have greatly improved since. The site allows the user to check the occurrence of all known spider species in all European countries. Using the “Distribution” button one can request an overview of the distribution (presence or absence per country) of each species, or extract a distribution map showing the country distribution. One can find the numbers of species within a family or a genus occurring in Europe and can request a map of the distribution of that taxon. Detailed information is offered on the number of European species within a genus. Through the “Taxon Tree” one can zoom in on every taxonomic unit, from family down to (sub)species and find answers to the above questions.

However, it is impossible to extract a complete list of all spider species for a country. Likewise it is impossible, or is apt to fail, to get an answer to the number of species for a country. The database holding all the data remains hidden behind the screen. There is also no entry to literature references. This should be improved upon in the future.

#### **Hosting by the European Society of Arachnology**

The same database in spreadsheet format was offered by the author to the European Society (ESA) for general use; an initiative welcomed by ESA. The database is accessible through links on the ESA website for two Excel spreadsheets, one for nomenclature (“Taxonomic Sheet”) and one for distribution (“Faunistic Sheet”). In the last column of the taxonomic sheet the numbers of literature references can be found which relate to the numbered list in the separate document “References”. The second part of the latter document contains entries to the main faunistic sources for each country, such as printed catalogues and checklists as well as links to internet sites with such information.

There are no facilities to convert the data into maps. Since the original spreadsheets are available for examination one can immediately see which species occur in each country and from which countries each species has been recorded. One can also count the species for each country, by counting through the columns or automatically via spreadsheet facilities. This is already carried out for each new version which appears on the ESA website where the bottom row and the last column but one provide these additions.

The presence of a species is indicated by a "P". Nomina dubia and imported (non-native or invasive) species are indicated in the database, as "nd" and "Pi", respectively, but are not included in the automatic count, thus excluding them from the "Indigenous fauna" of the country, here called "true species".

**Tab. 1:** Composition of the spider fauna of Europe.

A. Species (incl. subspecies) (end of 2011)	4892
B. Nomina dubia	302
C. Introduced species	99
D. "True" indigenous species (A – (B + C))	4491
E. Unique records / endemics	2041
World-wide (PLATNICK 2011)	42473

**Tab. 2:** Numbers and percentages of unique records / endemics in certain families. For explanation of "true" and "unica", see text and Tab. 1.

Number of "true" species	Number and percentage of unica	
All European spiders	4491	2041 (45.4%)
Agelenidae	200	93 (50.0%)
Araneidae	150	56 (40.0%)
Dysderidae	331	227 (70.5%)
Gnaphosidae	480	178 (41.3%)
Linyphiidae	1366	534 (42.4%)
Lycosidae	303	124 (44.1%)
Nemesiidae	62	36 (61.0%)
Philodromidae	106	38 (41.8%)
Salticidae	400	136 (39.4%)
Theridiidae	258	72 (30.2%)
Thomisidae	193	64 (36.2%)
Zodariidae	111	60 (55.0%)

The taxonomic table allows nomenclatorial changes to be followed and the tracking of changes in taxonomic status (synonymies, changes in taxonomic level).

### Possibilities for statistical analysis

Analysis of this last but one column reveals – excluding nomina dubia and non-native (imported) species – a strikingly large number of records from only one country or region (Tab. 1). Such unique records form 45.4% of all species; a surprisingly high score (Tab. 2). Among these are, of course, all the endemic species found in a single country. Among these "unica" we may also expect potential synonyms awaiting recognition by revisers. If we carry out the analysis for families we find for some families even higher scores than the 45.4% for the overall European spider fauna (Tab. 2). Families with much higher percentages of such unica or one-country species are the Dysderidae (70%), Nemesiidae (58%), and Zodariidae (57%). This agrees with the recognized speciation patterns in these families as indicated in the literature. In these three families the rates of dispersal are low and isolated populations develop relatively easy into separate taxonomic units. Of course one should consider the possibility of a relatively high percentage of one-country species in families which have been neglected taxonomically and are waiting for revision. This may be true for

the Nemesiidae (DECAE 2005, 2012, DECAE et al. 2007) which still need a lot of taxonomic attention, but hardly can be the case in the Dysderidae, which were revised by Deeleman and others (DEELEMEN & DEELEMEN 1988, ARNEDO et al. 2007, ŘEZÁČ et al. 2008) and the Zodariidae, which were studied thoroughly by PÉKAR et al. (2003, 2005, 2011) and BOSMANS (1994, 1997, 2009).

In contrast with these families, some other families (Theridiidae, Thomisidae) show a much lower percentage than the mean value of 45.4%. Apparently more species of these two families have, on average, a wider range.

### Future of Fauna Europaea

Presently, validation of the database is carried out through national Focal Points, while group-coordinators continue to supply the updates. The project



is now embedded in PESI (2011, A Pan-European Species-directories Infrastructure) under which the geographical coverage will probably expand to include the Caucasus and Turkey (first step), the Northern African countries bordering the Mediterranean Sea (step two) and possibly the Arabian Peninsula (step three) – but this is the present proposal and decisions still have to be taken in relation to the availability of funding.

Other initiatives such as the Catalogue of Life, Encyclopedia of Life, and Species 2000 all link through to the Fauna Europaea website and follow its nomenclature and faunal composition.

## Discussion

The differences between the two facilities – the official Fauna Europaea site and the one on the ESA website – are obvious. The spreadsheets on the ESA website are transparent and can be more easily checked for relevant information but lack facilities for mapping, while the official Fauna Europaea website only shows the derived information and keeps the basic information hidden away but offers the mapping facilities.

Keeping Fauna Europaea up-to-date is a never ending task because taxonomy is a dynamic process with new species being described all the time and distribution data being published continuously. Therefore regular updates are necessary; otherwise the database becomes obsolete and useless. This should have absolute priority over extending its geographical range.

The project being successful as it is, I personally had expected that other sets of countries would have started such projects, but so far I am not aware of any comparable initiative. It is unlikely that more detailed distributions for countries will be aimed at, for instance by subdividing larger countries (Germany, France, Italy) into smaller regions. Here we have to depend on the efforts of the individual countries, some of which have made available such overviews on the internet or in print already.

What is really urgently needed is a pan-European identification facility which would make identification easier and better and thus improve on the quality of published data and consequently on the quality of the Fauna Europaea database. Collections and published records contain too many misidentifications which are, at least partly, caused by insufficiently available identification tools. In these modern times with its advanced internet possibilities it should be possible to have a European identification key with supporting

illustrations and diagnoses for all European species, linked to distribution maps as supplied by Fauna Europaea. There exists an attempt to develop such an identification tool (NENTWIG et al. 2011) but its rate of progress is very low, new species are only added by name without illustrations and are not (yet) inserted into the identification key. Inclusion of the original illustrations would be a first step. This is not the place to discuss merits and flaws of that site, but it is evident that there is still a lot of work to be done.

A possible attractive alternative is the new series of books on European spiders which just started with a first volume (LE PERU 2011) and three more to follow. It presents diagnoses and illustrations for all European species, mostly of the genitalia, and distribution maps on a more detailed scale than Fauna Europaea in that it indicates – for some countries – the region where it occurs in a country and not the whole country (e.g. a coastal zone in southern France for truly Mediterranean species). However, there is no identification key, but only a non-dichotomous, synoptic characterization of genera in the introduction to a family (in contrast to the key for at least the larger part of the species in NENTWIG et al. 2011), while Europe is defined in a different way (e.g. the European part of Russia is not included and smaller stamp-sized countries or non-relevant regions, such as the Vatican, are fused with a neighbouring country). The book certainly might be a handy tool for quick recognition of species. Alas, it is not on the internet but printed which makes it outdated very soon.

## Acknowledgements

I want to thank Konrad Thaler (†) of the University of Innsbruck and Kirill Mikhailov of the Zoological Museum in Moscow for their support and help in finding relevant publications and records, and also the many arachnologists who regularly send in their new publications for inclusion of new data or comment on the database.

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Zeitschrift/Journal: [Arachnologische Mitteilungen](#)

Jahr/Year: 2012

Band/Volume: [43](#)

Autor(en)/Author(s): Helsdingen Peter J. van

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