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INTRODUCTION TO APHID SPECIES FILE, HTTP://APHID.SPECIESFILE.ORG

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Favret C., Eades D.C. – Introduction to Aphid Species File, <http://aphid.speciesfile.org>.

Aphid Species File (ASF) is a comprehensive web-accessible aphid taxonomy database: <http://Aphid.SpeciesFile.org>. We aim for it to contain all the published taxonomic and synonymic information for all Aphidomorpha taxa, extinct and extant, including Aphidoidea, Phylloxeroidea (Adelgidae and Phylloxeridae) and related taxa. Along with a complete list of aphid names and a taxonomic bibliography, Aphid Species File can also serve specimen data and publish interactive electronic identification keys.

Over 10,000 aphid taxa names are listed hierarchically, each name being a hypertext link to its subordinate taxa and the full synonymic and bibliographic history of the taxon. Likewise, each aphid literature reference has a hypertext link to a list of the aphid taxa cited therein. Nomenclatural and taxonomic information served on ASF is first published elsewhere and then entered into the database, so ASF is not a publisher of primary data.

A solicitation is made to the world's aphidologists to use and contribute to ASF to build it into an increasingly powerful tool in aphid taxonomy.

KEY WORDS: Taxonomy; Nomenclature; Bibliography; Database; Aphididae; Aphidomorpha.

INTRODUCTION

The cataloguing of taxa, their various names, and other taxonomic and nomenclatural data may seem to lack glamour. Yet, what aphid taxonomist does not refer to the *Catalogue* (REMAUDIÈRE and REMAUDIÈRE, 1997) on a frequent basis? Prior to that, the *Survey* (EASTOP and HILLERIS LAMBERS, 1976) was the most important summary of over 200 years of aphid taxonomy and nomenclature since LINNAEUS, 1758. The value of such catalogues, surveys, lists, etc., cannot be disputed. Unfortunately, these works require enormous inputs of time, resources, and expertise and too soon become outdated as species names are given new combinations, new species are described, old names are synonymized, and revisions to the nature and structure of higher taxa are proposed. Hundreds of new species have been described and countless other taxonomic decisions proposed since 1997 (EASTOP and BLACKMAN, 2005 alone contributed 163), but the paper bound *Catalogue* will never contain these new data.

Given the power and ubiquity of electronic media and the universal accessibility, updatability and relative cost-effectiveness of publishing over the Internet, we have begun building a lasting synoptic compendium of aphid taxonomy, nomenclature, and literature. We here publicize and introduce a taxonomic, nomenclatural, and bibliographic database of the aphids of the world, Aphid Species File (ASF), available on the World Wide Web at <http://Aphid.SpeciesFile.org>.

SPECIES FILE SOFTWARE

DATABASE AND WEB PROGRAMMING

Aphid Species File is one of ten species files built on the Species File Software platform, developed by David C. Eades and the Species File Group under the auspices of the Illinois Natural History Survey. These species files

currently record 50,173 valid species, 283,093 citations and 70,175 images. The species file database itself is built with Transact SQL (Microsoft SQL Server). The web pages are published using HTML 4, the Active Server Pages (ASP) use Visual Basic Script, and client side programming is done using JavaScript.

Species File databases each contain 51 tables and draw on an additional 31 tables shared across all species files, full descriptions of which are not possible here; please see <http://Software.SpeciesFile.org>. Species File Software is under constant improvement and development and is the beneficiary of a financial endowment ensuring the longevity of the database products. The databases are backed-up and archived nightly.

APHID DATA

The core datasets of Species File Software are Taxa, Literature, Specimens, and Identification Keys. ASF currently holds no specimen or key data, although some specimen data will be added soon. The taxa data consist of a hierarchically arranged table of all names of Aphidomorpha taxa, extinct and extant, including Aphidoidea and Phylloxeroidea (Adelgidae and Phylloxeridae) and related taxa. Junior synonyms of all kinds (objective, subjective, misspellings, homonyms, *nomina oblita*, etc.) are listed under their respective senior synonyms. Each name within the hierarchy is a hypertext link to its subordinate taxa, including valid and invalid names, and a list of the literature dealing with that particular taxon. Literature references are joined to taxa through citations, which are mentions of specific taxa within a particular reference. References can be nested within other references up to four times allowing situations such as WILSON, 1923 (also known as WILSON in PATCH in BRITTON, 1923). Bibliographic literature references are themselves hypertext links to lists of data including citations and original descriptions.

All ASF records are taken directly from the original

sources, so errors that may have crept into the literature from publication to publication can be mitigated. Furthermore, Aphid Species File aims to publish a minimum of subjective content. The taxonomic hierarchy will be the one most commonly used by aphidologists, currently it is that of REMAUDIÈRE and REMAUDIÈRE, 1997. In the case of controversially erected taxa that may be alternately synonymized and reinstated, the taxonomic representation in ASF will simply be the most recently published. Because all of the literature citations are preserved, the full nomenclatural history, including alternations between validity and invalidity, will be recorded regardless of current status.

The data from ASF were exported to Species 2000 where it was incorporated into the 2009 Catalogue of Life. This annual catalogue is used as the leading source of the taxonomic hierarchy used by the Global Biodiversity Information Facility and the Encyclopedia of Life.

USERS

PUBLIC ACCESS

Multiple access levels are available to various categories of users ensuring the integrity of the database contents. Public access is completely open and allows searching and browsing the database. Searches can be made for particular taxa, using either single-word names or any genus-specific epithet combination ever proposed for a species. More complex taxonomic searches are also possible. Searches for literature begin with single or multiple authors, including any number of alternate names for the same author, and may include year of publication.

The Species File public interface can be personalized to include or omit synonyms, literature citations, fossil taxa, and other details, list all of a taxon's references or just the original description and most recent ones, or list from zero to three levels of subordinate taxa.

EDITOR ACCESS

Editing access, password protected, permits various forms of data entry, editing, and manipulation. The editor interface is structured similarly to that for public access so that forms remain familiar and easy to use.

The nomenclatural data are automatically screened as they are entered to ensure that they conform to the International Code of Zoological Nomenclature (INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE, 1999). Many other internal scripts screen data to minimize the entry and propagation of errors; for example, extant taxa cannot be added within extinct taxa and type species cannot be removed from their respective genera. When unusual data are entered, a warning is given before proceeding, for example, if a reference to a taxon predates the taxon's original description.

Subsets of the database can be exported and kept separately for private use and development during the course of a significant taxonomic revision. Once the revision is published, the private data can then be imported back into the main database and made public.

CURRENT STATUS AND FUTURE PLANS

As of this writing, ASF contains over 10,000 names but only 22,000 citations. This latter number will grow rapidly as references are added and linked to the pertinent taxa.

The taxonomic and nomenclatural content of the *Catalogue* (REMAUDIÈRE and REMAUDIÈRE, 1997) has been completely entered, containing 8,748 citations, 9 new taxon names, and 16 embedded references. Each of the *Catalogue* citations includes a note on the taxon's recorded author and date of original description. The inclusion of the *Catalogue* ensures that ASF minimally contains data current as of 1997, although more recent references are being added continually. Addition of data from the *Survey* (EASTOP and HILLE RIS LAMBERS, 1976) and previous aphid lists is underway.

Over 1,500 references are currently entered into ASF, although not all of them have yet been linked to taxa via citations. These references, if not already available in electronic format, have been digitally scanned and reprinted in portable document format (PDF). Because original references are examined as they and their citations are entered into ASF, creating a digital library of aphid literature is relatively expedient. We are currently investigating means to make publicly available digital aphid taxonomic literature not subject to copyright restrictions.

ASF has the capacity to hold specimen data, including label data, images, host associations, and mapable locality coordinates. We are developing the capacity to upload digitized specimen data, especially but not limited to that of primary types. Electronic identification keys using the Species File software can be developed and accessed from anywhere with an Internet connection. These keys can employ any type of image or text description and can be structured as dichotomous or fully interactive (polychotomous).

SOLICITATION OF ASSISTANCE

We hope this electronic taxonomic catalogue and bibliography will be of great help to aphidologists around the world and trust that its value will be apparent now and increasingly in the future. The continued development and success of Aphid Species File depends on the project soon becoming a significant collaborative endeavour.

The scope of the project lends itself most conveniently to geographically based editors, each acquiring the literature in their respective language and from their particular region of the world and entering the data directly into ASF. They will be given editor-level access to the database and listed on its home page.

A general appeal is made to other aphidologists who can participate as contributors but do not want the full responsibility of editorship. Contributors can help by

- 1) Providing electronic or hard copy primary literature, either reprints at the time of publication, or copies of historical literature.
- 2) Translating into English titles of references and publications of primary literature.
- 3) Providing other supplementary data (e.g., specimen data) that can be incorporated into ASF.
- 4) Catching errors and bringing them to the attention of editors for correction.

Most importantly, however, a specific appeal is made to all aphidologists to use ASF and make its availability known by citing it. As a community, we can develop Aphid Species File to be a valuable and powerful resource for aphid taxonomic research in today's competitive scientific environment.

ACKNOWLEDGMENTS

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