

## Introduction

The *Neuropterida Species of the World* (NSW or Catalogue below) is a systematic catalogue of the world species-group taxa of the four insect orders Neuroptera (lacewings, antlions, owlflies, and their allies), Megaloptera (fishflies and Dobsonflies), Raphidioptera (snakeflies), and Glosselytrodea (glosselytrodeans), which are treated here collectively as the superorder Neuropterida. Version 3.0 of the Catalogue documents and synthesizes information on more than 10,200 individual species-group names (ca. 7300 valid) that are currently, or were formerly, placed within the neuropterid orders. Access to information about these names is provided through a searchable dataset of more than 19,000 distinct combinations of neuropterid genus- and species-group names.

The latest version of the catalogue documents and integrates taxonomic and nomenclatural information on the Neuropterida from more than 3300 different papers and books, published mostly between 1758 and 2013 in more than 680 different journals and in at least 22 languages. The Catalogue owes much to the variety of regional synopses and family-level checklists, catalogues and monographs (see [Baseline Taxonomic References](#)) that have become available over the past several decades. With respect to the cataloguing of basic taxonomic and nomenclatural data for the Neuropterida, the catalogue may be viewed as the successor to Herman Hagen's 1866 "Hemerobidarum Synopsis synonymica", Herman van der Weele's 1910 "Megaloptera. Collections Zoologiques du Baron Edm. de Selys Longchamps.", and Horst Aspöck et al.'s 1991 "Die Raphidiopteren der Erde", which represent the last printed works in which the world species of the orders Neuroptera, Megaloptera and Raphidioptera (respectively) were comprehensively catalogued. The *Neuropterida Species of the World* catalogue is the only modern work that contains comprehensive species-group coverage of all three orders on a global scale, and the only catalogue that includes both extant and fossil taxa across this complete taxonomic domain.

Additional information on several general aspects of Catalogue content and development is given below. Further information on the organization, content and detailed presentation of Catalogue pages and data can be accessed by selecting [Help](#) from the navigation bar found at the bottom of all Catalogue pages. For comparative notes on the different versions of the Catalogue see the [Versions](#) page.

### **Updates and Corrections**

The author bears full responsibility for all errors of omission and commission in the catalogue and is committed to a regular program of catalogue improvement. Users who discover errors of either commission or omission are urged to report them so that they may be corrected in future versions. Error reports or other comments should be sent to [j-oswald@tamu.edu](mailto:j-oswald@tamu.edu). All communications will be acknowledged as received.

### **Scope**

The *Neuropterida Species of the World* catalogue is comprehensive in geographic scope and includes information on both extant and fossil taxa. The catalogue provides detailed information on the taxonomy and nomenclature of neuropterid species-group names. Detailed information about genus-group names is not provided in this work. Individual Catalogue Record pages are provided for all available neuropterid species-group names databased as of the version posting date. The following classes of unavailable species-group names are also reported on separate Catalogue Record pages: (1) unavailable "specimen label names" that are known to be explicitly mentioned in the published scientific literature; (2) taxon names that were inadvertently published in an unavailable manner prior to their subsequent publication as available names (for each such name only the earliest known unavailable use is given a separate Catalogue Record; citations to other unavailable uses published between the earliest unavailable use and the earliest available use are generally included in the General Notes data field of the record for the unavailable name); (3) other neuropterid species-group names mentioned in the scientific literature that do not meet the criteria of availability defined in the Code, except for the following classes of names (which are explicitly excluded): (a) known, but unavailable "thesis/dissertation

and names with incorrect nomenclatural gender endings).

The long history and diverse taxonomies of the name/taxon "Neuroptera" have been the source of several special problems for this catalogue. Used in Linnaeus' 10th edition of the *Systema Naturae* in 1758 as a polyphyletic receptacle of convenience for species now included in numerous orders scattered across the Holometabola and non-Holometabola, the taxonomic history of the Neuroptera has been characterized by successive waves of reductionism, and its concept has been refined over the years primarily through the sequential removal of more internally cohesive segregates. During most of its history, multiple, substantially different, concepts of the Neuroptera have co-existed in parallel in the scientific literature. One historical consequence of this pluralism has been that for much of its history (particularly prior to ca. 1910) at least one very broad concept of the Neuroptera has existed in which diverse (now extraordinary) insects could be included. Throughout the late 19th and early 20th centuries, many taxa that are now considered extraordinary were placed within broad concepts of the Neuroptera. As the major concepts of the Neuroptera continued to narrow during the late 19th and early 20th centuries most of the extant taxa falling outside of our present concept of the superorder Neuropterida were removed from the Neuroptera. However, because many fossil taxa remained poorly known and weakly documented, some fossil "neuropteroid" taxa of dubious ordinal position have remained in the group up until the present day, or have only very recently been removed. To better document the taxonomic position of these taxa, a small number of names belonging to species that were formerly included in one or more of the three orders comprising the current Neuropterida, but which have since been excluded from the superorder, are also included in the catalogue as separate Catalogue Records. These records are included as a convenience to users, and may be particularly helpful to users interested in the relatively poorly documented literature on the fossil Neuropterida.

### Classification and Baseline Taxonomic References

The major taxonomic monographs, catalogues and checklists of global or broad regional scope that have been used as "baseline taxonomic references" for this work are shown in Tables 1 and 2 below. The taxonomic information contained in these works (e.g., generic combinations, synonyms and higher classifications) has generally been followed in this catalogue, unless altered by subsequent work. Where recent works present different opinions about the proper taxonomic treatment of particular taxa, the author has used his personal judgment in determining the usage presented in the catalogue. In many such cases, the General Notes field of the appropriate Catalogue Record contains information on alternative views. The higher classification used in the current NSW dataset is shown on the [Classification](#) page.

Subgenera that are commonly recognized and cited in the recent taxonomic literature are generally included in the combinations shown in the Catalogue Record, Current Combination field, unless phylogenetic work has shown that the recognition of subgenera is inadvisable because of the likelihood of applying subgeneric names to paraphyletic groups. It should not be assumed that the genera and subgenera used in the catalogue are monophyletic unless specific phylogenetic data are available to substantiate such conclusions.

Table 1. Baseline Taxonomic References: works primarily restricted by taxon. The works included in this table are relatively recent works that cover broad geographic regions and wide taxonomic domains (world wide and family wide unless otherwise indicated). Revisions/reviews of individual genera have been excluded. Works included in Table 2 are not repeated here.

Taxon	References
<b>Neuroptera</b>	New 1989 [r#6615]; Oswald & Penny 1991 [r#7138]
Ascalaphidae	Ghosh 1988 [r#9656] (E. India); New 1984 [r#4490] (Australia); Penny [1982] [r#5105] (New World); Sziráki 1998 [r#9362] (Asia and Pacific islands); Tjeder 1992 [r#7246] (Afrotropical Haplogleniinae); Tjeder & Hansson 1992 [r#7247] (Afrotropical Ascalaphini)
Berothidae	U. Aspöck 1986 [r#1425]; U. Aspöck 1990 [r#1430] (Africa); U. Aspöck & Mansell 1994 [r#7532] (Rhachiberothinae); Nel et al. 2005 [r#11744] (fossil Rhachiberothinae)
Chrysopidae	Brooks 1997 [r#9322]; Brooks & Barnard 1990 [r#6991]; Ghosh 1990 [r#9484] (India); Nel et al. 2005 [r#11761] (fossils); New 1980 [r#4464] (Australia); Tsukaguchi 1995 [r#8409] (Japan); Winterton & Brooks 2002 [r#10215] (Apochrysininae); X.-K. Yang 1997 [r#8956] (China)
Coniopterygidae	Johnson 1980 [r#3144] (North America); Meinander 1972 [r#4121]; Meinander 1990 [r#4147]; Engel 2004 [r#11170] (fossils); Sziráki 2011 [r#14094]
Dilaridae	Monserat 1988 [r#4308] (Iberian peninsula); Oswald 1998 [r#9236]
Hemerobiidae	Monserat 1990 [r#4311]; New 1988 [r#4514] (Australia); Oswald 1993 [r#7349]

Ithonidae	Riek 1974 [r#5415] (Australia), Barnard 1981 [r#1510] (Rapismatidae), Archibald & Makarkin 2006 [r#11800] (fossils [Polystoechotidae])
Mantispidae	Hoffman 1992 [r#8849] (New World Mantispinae); Lambkin 1986a,b [r#3615, 3616] (Australia); Ohl 2004 [r#11556]; Penny 1982 [r#5106] (New World); Penny & da Costa [1985] [r#5113] (Brazil)
Myrmeleontidae	Ghosh 1984 [r#2587] (India); Hölzel 1972 [r#2968] (near Asia), 1987 [r#3001] (Distoleonini); New 1985a, b, c [r#4494, 4495, 4496] (Australia); Stange 1989 [r#6545] (Dimarini), 1994 [r#7533] (Brachynemurini), 2004 [r#11168]; Stange & Miller 1985 [r#5823] (Acanthaclisini), 2003 [r#10553] (Taiwan)
Nemopteridae	Hölzel 1975 [r#2980] (Crocinae); Mansell 1983 [r#4008] (Crocinae); Tjeder 1967 [r#6050] (S. Africa)
Nevrorthidae	Monserrat 1977 [r#4246]
Nymphidae	New 1996 [r#4465] (Australia)
Osmylidae	New 1983 [r#4476] (Australian Kempyninae); New 1988 [r#6510] (Irian Jaya); New 1991 [r#7212] (Oriental region)
Psychopsidae	Andersen 2001 [r#10152] (fossils); New 1988 [r#6511] (Australia and Oriental region); Oswald 1993 [r#7341]
Sisyridae	Flint 2006 [r#11913] (New World); Monserrat 1977 [r#4246], 1981 [r#4272] (Oriental region)
<b>Megaloptera</b>	Theischinger 1983 [r#6004] (Australia); Oswald & Penny 1991 [r#7138]; New & Theischinger 1993 [r#7701]; Yang & Liu 2010 [r#13492] (China)
Corydalidae	Glorioso 1981 [r#2625] (Corydalinae)
Sialidae	Hayashi & Suda 1995 [r#7774] (Japan); X.-y. Liu & D. Yang 2006 [r#11697] (Oriental China); Vshivkova 1985 [r#6189] (Europe & Caucasus); Whiting 1994 [r#6988] (North America); Wichard & Engel 2006 [r#11833]
<b>Raphidioptera</b>	H. Aspöck et al. 1991 [r#6999]; Oswald & Penny 1991 [r#7138]; Engel 2002 [r#10270] (fossils)
Inocelliidae	H. Aspöck et al. 1991 [r#6999]
Raphidiidae	H. Aspöck et al. 1991 [r#6999]

**Columns:** *Taxon* – Neuropterida order or family; *References* – format: Author year [Bibliography of the Neuropterida reference #] (taxonomic or geographic domain of reference).

Table 2. Baseline Taxonomic References: works primarily restricted by geographic region. Works included in this table are prominent national or regional faunas that treat the entire Neuropterida (unless otherwise indicated). No attempt has been made to include all recent national faunal lists.

Region	References
Nearctic	Oswald et al. 2002 [r#10033] (Mexico); Penny et al. 1997 [r#8867] (America north of Mexico)
Neotropical	Oswald et al. 2002 [r#10033] (Mexico); Penny 1977 [r#5098] (South America); Penny [ed.] 2002 [r#10000] (Costa Rica)
Palaearctic	H. Aspöck et al. 1980 [r#6747] (Europe); H. Aspöck et al. [r#9847] (western Palaearctic); Kuwayama 1962 [r#10914] (Japan); Makarkin 1995a, b [r#8360, 8361], Vshivkova 1995 [r#8504] (eastern Russia); Nielsen 2015 [r#15913] (Denmark); Rintala et al. 2014 [r#15679] (Finland)
Ethiopian	---
Oriental	New 2003 [r#10897] (Malesia)
Australian	New 1996 [r#8585] (Australia); Wise 1991 [r#7137] (New Zealand)
Oceania	Zimmerman 1957 [r#6440] (Hawaiian Islands)

**Columns:** *Region* – world biogeographic region; *References* – format: Author year [Bibliography of the Neuropterida reference #] (geographic domain of reference).

### **Nomenclature**

The fourth edition of the International Code of Zoological Nomenclature ("the Code") has been applied to matters of nomenclature throughout the catalogue. Considerable effort has been expended in an attempt to represent information concerning names and nomenclatural acts in a Code-compliant manner, without individual bias. In cases where interpretation of the Code has seemed problematic, external opinions from authorities on zoological nomenclature have frequently been sought and followed.

### **Gender Matching of Species-Group Names**

All species-group names included in the catalogue are searched (and reported) only in the name forms that are believed to be correct, given the nomenclatural genders of the genus names with which they are combined. The masculine, feminine, and neuter forms of all species-group names, as used in the Catalogue, are given in the Gender Forms data field on the

Catalogue Record for the relevant name. Whether or not these gender forms have been specifically researched for correctness is also indicated. Approximately 65% of the ca. 30,600 gender forms cited in the catalogue have been researched to date.

### **Data Completeness**

During the lengthy period of data collection for this catalogue the priorities of data capture have shifted several times to address intermediate objectives. Consequently, not all Catalogue Records are equally complete, and certain classes of information are more thoroughly represented across the full range of species. Some general notes are presented below regarding the relative completeness of several important classes of catalogue data.

### **Original Publication Data**

The original publication data associated with 99.9+% of catalogue names have been verified by the author from personal examination of originals or facsimile copies (e.g., photocopies, digital scans, published facsimile reprints [not "separates"]) of the relevant literature. The Verified data field in each Catalogue Record indicates whether original publication data have been verified for individual taxon names. The working Catalogue Records for unverified names may contain particularly incomplete and non-standard data entries.

### **Distribution Data**

Summary data on the geographical distributions of essentially all valid neuropterid species and subspecies are included in the catalogue. Most distribution data statements are either "country lists" or regional "summary statements". In general, where the documented distribution of a taxon consists of five or fewer countries, a complete list of those countries is reported. Where a taxon is documented from six or more countries, its distribution is generally described in a summary statement. For some larger countries (especially Australia, Canada, Mexico and the United States, and with somewhat less consistency Brazil, China and Russia) first-order political subdivisions within the country (e.g., states, provinces) are included in the distribution statements, generally in abbreviated format. Most of the baseline taxonomic reference works shown in Tables 1 and 2 below have provided significant amounts of distributional information for the catalogue. Other distributional data have been derived from hundreds of additional publications, including taxonomic revisions and country and regional faunas. While the geographical distributions reported in the Catalogue are believed to be substantially correct, as a practical matter it is difficult to keep up with all newly-published distribution records reported worldwide in a group of 7000+ valid species, even records at the "country level". Catalogue distribution statements are, however, continuously reviewed and updated as new records become known to the author.

With very few exceptions, the reported distribution data have been derived from the published scientific literature. The few exceptional records are based on reliably identified specimens examined by the author or other neuropterists. Individuals wishing to learn the specific sources of the distribution data cited for particular taxa may contact the author for additional information. Distributions reported for unavailable names generally cite the country(ies) of origin of the specimens attributed to those names in the publications in which the names originally appeared in unavailable form.

### **Primary Type Data**

Complete or partial primary type data (principally type kind, sex, depository and type locality) are currently reported for ca. 87% of all available species-group names included in the catalogue. Many of these data are preliminary, being based on an assessment of some, but not yet all, of the relevant literature. Primary type data are actively being updated as additional literature is examined for type-relevant information. In order to provide users with a basis for assessing the status and quality of the primary type data presented for particular names, direct quotes from the source(s) from which the standardized data statements given for each species have been derived are provided in the Type Extracts data field of the Catalogue Record. With few exceptions, only the sources quoted in the Type Extracts field have been used to derive data for type-related catalogue fields. Thus, if a type-relevant statement is found by a user in a publication that is not cited in the Type Extracts field, it can generally be assumed that that statement has not been considered when entering data for type-relevant catalogue fields. Hence, users should consider such statements, together with the data presented in the catalogue, to determine the correct type information of interest. For more detailed information about the content and format of type-related catalogue fields, including type locality statements, see [Help](#) for the [Catalogue Record](#) page.

### **Fossil Taxon Data**

The current version of the Catalogue contains records for ca. 930 species-group names pertaining to fossil neuropterans. In general, the level of data capture for these species is

somewhat less than that for extant species. The capture of data relevant to fossil neuropterans continues to be an active area of catalogue development.

### **Combinations**

Access to individual Catalogue Records is provided through interactive search functionality. User-entered search criteria are used to generate Search Results pages that display lists of combinations (any different arrangement of genus- and species-group names) that match the user's criteria. More than 19,000 different combinations are available for matching in the current catalogue's data set. Some reported combinations involving juxtapositions of generic and subgeneric names may not be technically correct nomenclaturally, and are included only as representations of combinations found in the literature. However, all combinations given in the Original Combination, Current Combination and Current Name fields on Catalogue Record pages are nomenclaturally correct to the best knowledge of the author.

### ***Variety and Form names***

In accordance with Art. 15.2 of the Code, names originally published as varieties or forms after 1960 are treated as infrasubspecific, and thus unavailable. Variety and form names published before 1961 have been interpreted as subspecific, and thus available, except in cases where the intent of the original author is very clear that such names were intended to be infrasubspecific (Art. 45.6). Under this interpretation, the vast majority of variety and form names proposed by authors such as Navás and Lacroix are available names. Although some such names have been cited by later authors as either valid names or synonyms, this catalogue contains a number of variety and form names that appear to have been overlooked or ignored by previous catalogers and revisors. In this catalogue, previously overlooked variety and form names are generally treated taxonomically as invalid junior synonyms of the species names with which they were originally combined (rather than as valid subspecies of the originally combined species), and are included here in the synonymy of the appropriate valid species (either the originally combined species or its senior valid synonym). While this procedure is consistent with the species placement of these variety/form names by their original authors, and has the added benefit of relegating most of these generally poorly documented names to synonymy, it should be noted that until the types of such names have been located and examined this procedure has the potential to include as synonyms some names that may turn out eventually to be valid subspecies or species names.