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INTRODUCTION

A *thing* is defined as much by what it isn't as by what it is. *Nomina Insecta Nearctica* is not a catalog. Nor is it even a check list by conventional standards. Rather *Nomina Insecta Nearctica* is a directory of the scientific names applied to the insects of North America. These names include senior synonyms, junior synonyms, junior homonyms, unavailable names (in the sense of the Code of Zoological Nomenclature), and in some cases misspellings and misidentifications. Junior synonyms, homonyms, and so forth, are arranged chronologically under the valid species name. All other levels of organization are alphabetical. Species are arranged alphabetically under the current generic name. Genera are alphabetical within families, and families are arranged alphabetically within orders.

Nomina Insecta Nearctica is not an original piece of scientific research. It is a compilation of the current literature, a snapshot of the current published status of the classification. This check list contains no new combinations or synonymies. If one genus has been synonymized with another, but no formal combinations were made for each of the included species, a principle of implied combinations is used. Specifically these new combinations are credited to the original synonymizer of the generic name by implication even if no formal new combinations were made. No objective replacement names are proposed even for clearly identified junior homonyms. Homonyms without an available replacement name are indicated by brackets. Further clearly wrong arrangements of junior and senior synonyms in the literature are not corrected. For example if a younger name is listed in the literature as the valid name for a species in preference to an older name, the synonymy is given as recorded, although indicated by a question mark. This happens more commonly than you might think.

Although *Nomina Insecta Nearctica* contains the word Nearctic, a more proper definition of the region covered by this publication is North America north of the Mexican border. Significant portions of Mexico are properly part of the Nearctic region. The check list has been limited to north of the Mexican border for practical reasons. Adding the Nearctic portions of Mexico to the list would have made the compilation of the list considerably more difficult, if not nearly impossible. The Mexican border has been used as the standard boundary in the majority of publications from which this list was compiled. Many users of this list

will find a politically based division more useful than the more scientific one. Finally the division between the Nearctic and Neotropical zones is nebulous at best, both in the United States and Mexico and the Antillies. Mexico is considered to be entirely Neotropical for purely practical reasons and will be so treated in any future portion of the *Nomina* series covering the Neotropical insect fauna.

Nomina Insecta Nearctica has very specific and limited goals. The ultimate ideal of every systematist is to create a network of printed publications and computer databases containing all known information about every described species in the world. The first step in attaining this Holy Grail of systematics is a listing of the species of the world and of the names that have been applied to them. The *Nomina* series is such a first step and *Nomina Insecta Nearctica* is the part covering the insects of North America, the dominant component (perhaps as much as three-fourths) of the flora and fauna of the Nearctic region.

The *Nomina* series has two guiding principles: Stability and utility. Complete stability, of course, is impossible in any developing science, such as systematics, and is not even completely desirable. On the other hand systematics must also consider the needs of the users of systematic systems. Systematics does not happen in isolation nor are systematists the final users of the systems proposed. Therefore the *Nomina* series will approach classifications from a conservative position and will not adopt major changes in the classification of a group unless or until it meets one or more of two criteria. Is the change necessary to break up polyphyletic or paraphyletic groupings? Has the change gained general acceptance within the systematic **and** user communities? Users of systematic systems tend to concentrate on primary levels of classification; order, family, genus and species. An unfortunate tendency exists these days to break up already monophyletic order, family, and generic concepts into smaller and smaller groups. If the changes in the classification of a group are merely changes in rank (e.g. changing subfamilies to family rank), we feel that these changes are usually not justified. The usual reason given for such subdivision of existing and utilized groupings is that the new groupings more accurately reflect the evolutionary history of the group. It is the opinion of the editors of the *Nomina* series that the concepts of superfamily, subfamily, tribe, and subgenus exist for just this purpose. We suggest that these subordinate categories be used for refinement of the classification

and that order, family, and generic concepts be kept as stable as possible for the user community. The splitting of primary groups will not be followed unless they satisfy one of the two criteria listed above.

Nomina Insecta Nearctica employs only primary groups; Class, Order, Family, Genus, and Species. Subordinate groupings such as Superfamily, Subfamily, Tribe, Subgenus, and Subspecies are not listed in the main body of the directory, although subordinate categories to the subfamily level are given in the classification portion of this publication. Names originally proposed, or currently treated, as subgenera or subspecies are treated as simple synonyms. The absence of subordinate categories in the body of the check list, particularly subgenera and subspecies, is not a statement, positive or negative, about the utility of such categories.

Subgeneric names, in particular, are an important component of the classifications of parts of the Diptera. The editors of the *Nomina* series are not using subgeneric names for a variety of reasons:

1. The addition of subgeneric names would have added a level of complexity to the compilation of the series we were unwilling and unable to deal with.
2. The inclusion would also make the purely alphabetical arrangement of names difficult if not impossible.
3. Subgeneric names are not used consistently within the Insecta. These names are used heavily in some groups, but not at all in others. Even within groups some authors use subgeneric names and others do not.
4. Subgeneric names are sometimes not used consistently between geographical regions. Although a consistent synonymy of subgeneric names on a world-wide basis exists for some groups, in others there appears to be separate sets of subgeneric names by biogeographical region.
5. A corollary of point 4 is the increased difficulty of creating an integrated classification of the insects on a world-wide basis, the ultimate goal of the *Nomina Insecta* series. Although this integration of classifications problem occurs on the generic level as well, the addition of subgeneric names would increase the difficulty of this task by an order of magnitude.
6. The editors of the *Nomina* series feel that an informal system of species groups and species complexes serves the same purpose as

subgeneric names without introducing the complexity of formally proposed scientific names.

An accurate representation of the evolutionary history of a group is *not* among the limited goals of the *Nomina* series nor should it be. Other publications and databases exist, or should exist, for this purpose. The compilers of *Nomina Insecta Nearctica* are authorities only in their own limited groups and could never satisfactorily produce a phylogenetically arranged list. Secondly the addition of subordinate categories would have materially lengthened each volume in the series when the volumes are already enormous. Although information about subordinate categories and phylogenetic arrangements is not given in either the printed version or in the CD-ROM accompanying the series, references to these categories and arrangements can be often be found in the source field of the database contained on the CD-ROM. The source field is discussed later in the introductory material.

Both printed and computer versions of the *Nomina Insecta Nearctica* database are being produced for practical reasons. Printed publications and computer databases have different and complimentary strengths and weaknesses. A computer database is readily and quickly searched for information. A series of CD-ROMS or online databases occupies far less space than a series of printed volumes (if one ignores the space taken by the computer). A printed publication, on the other hand, is far more portable and easier to use for checking specific names or curating collections. A printed publication is easier on the eyes, is easier to learn to use, and just "feels" better. Some of the weaknesses of "searchability" of the printed publication can be made up for with a thorough indexing of the material such as we have attempted in the printed version.

Each order in this volume is divided into three main parts. The first part contains a synopsis of the current classification of the order to the subfamily level with genera listed alphabetically within each subfamily. Higher categories are listed in "phylogenetic order", the source or sources of the order given in the introduction to this section of the check list. The second section composes the check list proper with an alphabetical arrangement of families within the order, genera within each family, and species within each genus. The final portion of the volume consists of two indices. The first index comprises all of the genus group names and where to find them. The second index contains the species group names and their location in the check list. Because of the alphabetical arrangement employed in

the series, no page numbers are used in the index. Rather for any species group name one finds the family in the body of the list by searching the page footers, then finding the genus, and then finding the valid species. More details on the index are given later in the introductory material.

STRUCTURE OF THE CHECK LIST

The structure of the check list is very simple. The list consists of the primary check list followed by two indexes. All names are arranged alphabetically in the two indices. The body of the check list is arranged alphabetically by family. The genera are listed alphabetically within the family, and the valid species names alphabetically within genera. Junior synonyms, junior homonyms, unavailable names, misspellings, and so forth are listed chronologically under the valid species. A valid species is defined as the senior synonym for a species. A typical portion of the check list, in this case from the Muscidae (Diptera), is:

Hydrotaea Robineau-Desvoidy 1830

Ophyra Robineau-Desvoidy 1830 Syn.

Blainvillia Robineau-Desvoidy 1830 Syn.

Lasiops Meigen 1838 Syn.

Onodontha Rondani 1856 Syn.

Psiloptera Lioy 1864 Homo.

Microcera Lioy 1864 Homo.

Hydrothea Pandelle 1898 Emend.

Alloeonota Schanbl 1911 Syn.

Achaetina Malloch 1918 Syn.

Cryptophyra Michelsen 1978 Syn.

Hydrotaea acuta Stein 1898 (Hydrotaea)

Hydrotaea dissimilis Aldrich 1926 Syn.

Hydrotaea aenescens Wiedemann 1830 (Anthomyia)

Hydrotaea anxia Zetterstedt 1838 (Anthomyza)

Aricia bispinosa Zetterstedt 1845 Syn.

Hydrotaea armipes Fallen 1825 (Musca)

Anthomyia occulta Meigen 1826 Syn.

Hydrotaea riparia Robineau-Desvoidy 1830 Syn.

Hydrotaea floralis Robineau-Desvoidy 1830 Syn.

Anthomyia idyla Walker 1849 Syn.

Eriphia lata Walker 1849 Syn.

Hydrotaea basdeni Collin 1939 (Hydrotaea)

Hydrotaea capensis Wiedemann 1818 (Anthomyia)

Anthomyia anthrax Meigen 1826 Syn.

Ophyra rutilans Robineau-Desvoidy 1830 Syn.

Ophyra viridescens Robineau-Desvoidy 1830 Syn.

Anthomyia cadaverina Curtis 1837 Unav.

Ophyra cadaverina Megnin 1894 Syn.

The genus begins with the valid generic name followed by a chronological listing in italics of the junior synonyms, junior homonyms, emendations, and so

forth, for the genus. The genus, in this case, *Hydrotaea*, is followed by a list of subordinate name including several junior synonyms, two junior homonyms (*Psiloptera* Lioy 1864 and *Microcera* Lioy 1864), and one emendation (*Hydrothea* Pandelle 1898). All genus group names are listed without indication of whether or not the genus group name was originally or subsequently treated as a subgenus. If a genus group name was originally proposed as a subgenus, this information is available in the CD-ROM version of the check list if this information was readily available to the compilers of the database. The abbreviation at the end of each synonymy gives the current status of the name.

Syn. - A junior synonym

Homo. - A junior homonym. Specific details about the nature of the homonymy are contained in the database and will be available on the CD-ROM version of the check list.

Unav. - An unavailable name, either because the name is a *nomen nudum* or in some other way fails to satisfy the requirements of the Code of Zoological Nomenclature. Specific reasons for the unavailability of the name are contained in the database and will be available on the CD-ROM version of the check list. A generic name may also be listed as Unav. if the name has been suppressed by the ICZN in favor of a younger name.

Emend. - An emendation. Original orthography is utilized throughout this check list. By the standards of this check list there is no such thing as a justifiable emendation. Emendations are available names. Specific details about the emendation are contained in the database and will be available on the CD-ROM version of the check list.

Missp. - A misspelling. Misspellings are not available names. Specific information about misspellings are contained in the database and will be available on the CD-ROM version of the check list.

Misid. - A misidentification. Misidentifications are almost never used in the generic listing, but the possibility is kept for cases requiring them for clarity.

The species group names follow a similar structure. The valid species names are listed alphabetically under the genus name. Junior synonyms, homonyms, emendations, and so forth, are listed chronologically under the valid species name. All species group names are listed as binomials even if the species group name was originally proposed as a subspecific or infrasubspecific category such as subspecies, form,

variety, or aberration. The original status of these subspecific and infrasubspecific names is listed in the source field of the database and will be available in the CD-ROM version of the check list. The listing for the valid species *Hydrotaea capensis* is:

Hydrotaea capensis Wiedemann 1818 (Anthomyia)

Anthomyia anthrax Meigen 1826 Syn.

Ophyra rutilans Robineau-Desvoidy 1830 Syn.

Ophyra viridescens Robineau-Desvoidy 1830 Syn.

Anthomyia cadaverina Curtis 1837 Unav.

Ophyra cadaverina Megnin 1894 Syn.

The valid name is listed first and in plain text. Junior synonyms, homonyms, and so forth, are in italics, indented, and listed chronologically below the valid species group name. Unavailable names are listed chronologically below the valid species name if the unavailable name has been identified with the valid species. Unavailable names which have not been identified as a particular species but are considered to belong to a particular genus are listed alphabetically at the end of the generic listing, each unavailable name bracketed to indicate its unknown status.

The valid species group name consists of the current generic name, the species group name, the author, the date of publication, and followed by the original generic name in parentheses. Any field in a name not in the database at the time this check list was published is indicated by the notation [no entry]. Although an effort has been made to eliminate all of these [no entry] fields, a few remain because of either time constraints or the unavailability of the literature needed to find the information.

The species group name for both valid names and subordinate names uses original orthography, i.e. the original spelling as used by the author in the original description. The names have not been changed to agree in number and gender with the current generic assignment. For example if the original description listed the name as *Anthicus albus* Jones 1912 and *albus* was later transferred to the genus *Striata*, the name would be still be listed as *Striata albus* Jones 1912 (*Anthicus*). Original orthography is also used for all subordinate names. More will be said about the reasons for using original orthography in a later section of the introduction. The check list, however, supplies all of the information necessary to make the changes in endings if the user so wishes.

Junior synonyms, homonyms, unavailable names, and so forth, are listed chronologically under the valid species name and consist of the original generic name, species group name, authors, and date. The date given

is the actual date of publication. The convention of listing both the purported and actual date of publication, if different, is not used in this check list. The name is followed by an abbreviation indicating the status of the name. These abbreviations are essentially the same as those employed for genus group names.

Syn. - The name is a junior synonym of the valid name. In some cases the abbreviation Syn. may be followed by a question mark in parentheses. The question mark signifies an older species group name than the listed valid name and for which no reason was found in the sources used in compiling this list for its synonymy. Although an effort was made to resolve these problems, some remain and can probably be traced to one of several causes. The name may be a junior homonym but was not listed as such in any of the sources examined by the compilers. The name may be a misidentification. The systematic literature is plagued with misidentifications listed but not identified as misidentifications. The compilers have tried to eliminate as many of these as possible, but some still remain unidentified. The name may have been treated as a *nomen oblitum* by the author or authors of the source used in compiling the name, but not specifically stated as such. Finally sometimes the authors of the sources used just didn't want to use the older name. We emphasize that this list is a compilation. Therefore we have not tried to correct these synonymies and simply use the (?) convention to denote the problem. Only workers in the group involved are qualified to make these decisions.

Homo. - The name is a junior homonym. A junior homonym may be a junior primary homonym, a junior secondary homonym, and a former junior secondary homonym. These three types of homonymy cannot be distinguished in the printed check list. However, the database usually contains this information and it will be available on the CD-ROM version of the check list.

Emend. - An emendation of a species group name. Original orthography is employed throughout this list. Therefore for the purposes of this check list, there is no such thing as a justified emendation even if the original spelling is patently incorrect. Emendations are available names.

Missp. - A misspelling of a species group name. Misspellings are listed in this check list when they were readily available and identifiable in

the sources used during compilation. No special effort, however, was made to find misspellings.

Unav. - The name is unavailable in the sense of the Code of Zoological Nomenclature. Several reasons can exist for a name to be unavailable. Most commonly the name is a *nomen nudum* or infrasubspecific.

Misid. - The name is a misidentification. This category is rarely used in this list and only where absolutely necessary to clarify a particular situation. Listing all misidentifications would be an exercise in futility in any case.

Nomob. - *Nomen oblitum*. In those cases where the oldest name for a species is listed as a junior synonym and has been treated by the author of the source used by the compilers as a *nomen oblitum*, and if he or she clearly indicated this, the abbreviation Nomob. is used.

ORIGINAL ORTHOGRAPHY

Original orthography has been employed throughout this list whenever possible. Two reasons are advanced for using original orthography.

1. In the opinion of the compilers of the *Nomina* series, computers will come to play an ever increasing role in keeping track of biosystematic information. The changing of specific endings to reflect the number and gender of the current generic assignment is destabilizing and difficult to keep track of in a computer database such as the one employed in compiling the check lists of the *Nomina* series. In short computers do not speak Latin nor is there any simple way to make them. A critical element in designing a relational database or distributed database is the choice of a primary field for joining tables in the relationship. None of the standard categories such as genus or species is sufficient. However the combination of the original generic and the species name as originally spelled is invariant over time. For example a field such as ogenus_species where ogenus is the original generic name, species is the species group name, and the character " _ " merely serves to join the two names into a single name does not change with time. Moreover any valid species has one and only one ogenus_species because of the laws of homonymy. The name is invariant with time and will not change regardless of later shifts in generic assignment.

2. Changes in the endings of species group names to reflect the number and gender of the current generic assignment of the species has an esthetic value for those brought up speaking a romance language. However, one of the two compilers of the database sees no scientific value in such changes. In addition professional systematists often disagree about the correct endings of species group names. This complication can be avoided by simply not worrying about it. Never the less, if one wishes to conform to the current number and gender provisions of the Code of Zoological Nomenclature, the check list contains all of the information necessary to make such changes. Changes in specific endings to reflect number and gender are not emendations in the sense of the Code of Zoological Nomenclature.

SPECIES AND GENUS GROUP NAMES INDICES

A typical sample from an index of species group names is as follows:

ra Harriot Tritoxa (Otitidae) Tritoxa
 rabelloi Lane Stilobezzia (Ceratopogonidae) Stilobezzia
 rabida Walker Sarcophaga (Sarcophagidae) Ravinia querula
 rabiosa Alexander Tipula (Tipulidae) Tipula
 rabunensis Dodge Idoneamima (Sarcophagidae) Sarcophaga
 raca Garrett Anorostoma (Heleomyzidae) Anorostoma marginata
 raca Garrett Bolitophila (Mycetophilidae) Bolitophila
 racemi Felt Rhabdophaga (Cecidomyiidae) Rhabdophaga
 racemi Stebbins Cecidomyia (Cecidomyiidae) Contarinia
 racemicola Felt Rhopalomyia (Cecidomyiidae) Rhopalomyia
 racemicola Osten Sacken Cecidomyia (Cecidomyiidae) Schizomyia
 racemosa Zaitzev Allodia (Mycetophilidae) Allodia

A valid species name is indicated by a regular font and a junior synonym, homonym, emendation, and so forth by italics. Use *Contarinia racemi* Stebbins as an example. The entry for a valid name begins with the species group name (*racemi*) followed by the author or authors (Stebbins), the original generic name (*Cecidomyia*), the current family assignment in parentheses (Cecidomyiidae), ending with the current generic assignment of the species (*Contarinia*). To find this entry in the check list, go to the family in the alphabetical arrangement using the page footers, and then find the current genus in the alphabetical arrangement of genera.

A typical synonym is

rabida Walker Sarcophaga (Sarcophagidae) Ravinia querula

The entry begins with the species group name (*rabida*) followed by the authors (Walker), the original generic name (*Sarcophaga*), the family (Sarcophagidae), the current generic assignment (*Ravinia*) and the current valid name for this species (*querula*). To find this synonymous name, simply find the current valid name, *Ravinia querula*, using the same alphabetical procedure given above.

The genus group name index works in the same way as the species group list except that for synonymous names only the valid genus name needs to be listed.

STRUCTURE OF THE DATABASE

Each species group and genus group name consists of a record in a computer database from which the information in this printed publication is drawn. A species group record contains the species name as originally spelled by the author of the name (original orthography), the author or authors of the name, the date of publication, the original generic name used by the describer of the species, and the current status of the name. If a name is the not valid name for a species, the valid name for the species is also listed. In this printed publication the subordinate status of a name is indicated by listing it in italics chronologically beneath the valid name for the species.

The database also includes a breakdown of the distribution of a species by biogeographical region. Biogeographical breakdown is not applicable to *Nomina Insecta Nearctica* because all species occur in the Nearctic Region. Nor will further information on biogeographical regions be available in the accompanying CD-ROM because any further volumes in the *Nomina* series on insects will be compiled by biogeographical region. Any volume in the *Nomina* series covering a group small enough to be done in a single volume will contain information about occurrence by biogeographical region, the regions depending on whether the organism is terrestrial or marine.

Some fields of the database are internal to the functioning of the database (such as fields for creating relations between tables and a field denoting the current status of the editing process) and are not listed here. The final field in the database is a general listing of information called "source". The information in this field is not available in the printed publication, but will be given in the CD-ROM version of *Nomina Insecta Nearctica* released after completion of the published version. The source field contains specific information

about the name in question. If the homonymy, e.g. if the name is a junior secondary homonym, what name is it a junior secondary homonym of. Secondly the source field contains a listing of the publication or publications used during the compilation of the database. This "source" might be a printed check list, revision, or any publication including the paper or book in which the name was originally described. The source field can often be used to track down further information about a name or species including its original description, subsequent papers about its biology or distribution, and the like. However the database is a check list and a compilation and is not intended to take the place of catalogs or databases specifically created to provide this type of information.

ENDING DATE FOR THE CHECK LIST

This check list claims to cover all names published prior to December of 1994. This cut-off date corresponds to volume 131 of the *Zoological Record*.

METHODOLOGY AND QUALITY CONTROL

Several people asked us, after the publication of volume 1 covering the Coleoptera and Strepsiptera, how the list was compiled and what sources were used for the names. The simple answer is that there is no simple answer, the methodology and sources changing from family to family, sometimes genus to genus. Literally thousands of source publications have been used as the source of names and their status throughout the compilation of the first three volumes of the *Nomina* series. The difficulty of the task and the resulting quality and completeness of the product depend on the thoroughness of the source materials available to us.

The basic procedure is to find the most recent or most complete catalog, check list, or revision for a group and to compile the first version of the database for this group from this publication. If this primary source is lacking some component of the database structure, e.g. original orthography or original generic name, these missing pieces are added by examining the original publications in which the names appeared or revisions in which this information is listed. The editors then work forward from the cut-off date of the primary

source adding new species described or changes in generic status or synonymy published since the publication of the primary source. We rely extensively on the *Zoological Record*, but examine and compile from the original papers whenever possible. If no primary source is available for a group, the check list is compiled *de novo*.

This procedure was followed for those orders of non-holometabolous insects compiled by the editors of the series. Several orders have been compiled by authorities in their groups. Although the procedures used by each differ, their contributions are based on preexisting and much more thorough studies of the literature than has been possible for the remaining orders. These contributions and their compilers are: Ephemeroptera (W.P. McCafferty), Odonata (Rosser W. Garrison), Plecoptera (Bill P. Stark), and Orthoptera-Mantoida-Phasmida (Daniel Otte). The editors of *Nomina Insecta Nearctica* are very grateful to these contributors for the quality they have brought to these orders of the Insecta.

Every effort has been made to make the data in this directory as accurate and complete as possible. The compilers of the *Nomina Insecta Nearctica* series, however, are limited by two important constraints.

1. *Nomina Insecta Nearctica* is a compilation from the literature, not an original piece of scientific research. Although thousands of hours were spent checking original descriptions in order to compile correct spellings and original generic names, this checking of original sources, could not be done for all, or even most, or the names listed. Ultimately the quality and accuracy of the list depends upon the sources used in compiling this list. Many of the errors encountered in these sources have been found and corrected during the compilation process, but many still remain. We also recognize that despite both direct and computer assisted proof reading, we will have committed our own mistakes. **Entomological Information Services** promises to correct such mistakes in the database whenever such mistakes are found or brought to our attention.

2. The *Nomina* series and its publisher, **Entomological Information Services**, is a commercial operation. The company receives no outside funds either public or private. **EIS** depends upon a rigid and rapid schedule of publication for its continued financial existence. A leisurely search for perfection is not possible.

The compilers of **Nomina Insecta Nearctica** and the *Nomina* series will be extremely grateful to anyone

sending us corrections of any errors in the check lists. These corrections will be immediately added to the database and incorporated in any future revisions. We also strongly encourage everyone to publish lists of corrections and additions to the list consistent with the goals of the series.

It is the intention of **Entomological Information Services** to continuously update the databases used in creating the volumes of the *Nomina* series and to put out updated versions of the check lists when they are needed and financially viable. It would significantly assist us, and we would be extremely grateful, if authors could send us copies of their publications as they appear in print.

At last, among the many things *Nomina Insecta Nearctica* is not: it is not a Latin phrase. The proper Latin phrase is *Nomina Insectorum Nearcticae* (or at least we think it might be). The proper phrase does not exactly flow from the tongue and is not as informative as it could be. Therefore in the tradition of great taxonomists everywhere, we declare *Insecta* and *Nearctica* to be nouns in apposition. All letters, cards, e-mail messages, reviews, and other forms of communication correcting our Latin will be immediately recycled.