

The problem of hemihomonyms and the on-line hemihomonyms database (HHDB)

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Abstract

Hemihomonyms (same nomina which are used for taxa from different nomenclature jurisdictions) are an overlooked but genuine nuisance in biological nomenclature. We compiled the first list of hemihomonyms for nomina in bacteriological, botanical and zoological nomenclatures and prepared an on-line database, the “Hemihomonym database” or *HHDB* (<<http://herba.msu.ru/shipunov/os/homonyms/index.php>>). *HHDB* now includes 1164 nomina, including 12 triple hemihomonyms. A simple suffix-based solution (like “*Oenanthe* (z)” for *Oenanthe* in zoology) could be used in case of hemihomonymy. More effort should be afforded towards the resolution of long-standing nomenclature confusing situations such as hemihomonymy, including regarding the nomina of higher taxa, nomina of intermediate ranks and ambiregnal nomina.

Keywords: hemihomonyms, homonyms, biological nomenclature, databases

Introduction

If a scientific name or nomen is used for more than one species, genus or other taxon, this nomen is considered to be a homonym. The common opinion is that homonyms are invalid in biological nomenclature. However, historical development of biological taxonomy led to the establishment of different Codes of nomenclature. Homonyms are “illegal” within every Code (i.e., “*incorrect*” in botanical nomenclature, “*invalid*” in zoological nomenclature” or “*inadequate*” according to the terminology of Dubois 2011b), but what happens if the nomina in question are under the jurisdiction of different Codes? This situation is not regulated by any Rules and therefore the same nomina for different taxa are not homonyms in the strict sense. Starobogatov (1991) proposed the term “hemihomym” for such situations. Hemihomonyms (like the plant generic nomen *Oenanthe* and the bird generic nomen *Oenanthe*) are often considered as nomenclatural curiosities which probably was the right approach in previous centuries. *The International Code of Zoological Nomenclature* (Anonymous 1999) simply states that “*The name of an animal taxon identical with the name of a taxon which has never been treated as animal is not a homonym for the purposes of zoological nomenclature*”. However, contemporary large-scale databases and search engines revive the problem of hemihomonyms. The simple experiment with Google image search for *Oenanthe* will immediately show the problem: whereas scientific names are often considered to be unique identifiers, the hemihomonyms will spoil the result: the user will retrieve images for both the plant and the bird. Therefore, as long as hemihomonyms exist, and the result of such a search is not unambiguous, we cannot achieve the ultimate goal of nomenclature, i.e., a one-to-one relation between nomen and taxon. In large databases, hemihomonyms will not only hamper the effectiveness of the system, but could also be misleading. Computer-based tools do not

“understand” the jurisdictions of the Codes, so any database which contains nomina from different Codes will always be a potential “security hole”. Databases like *USDA Plant*, *IPNI* or *Index Fungorum* become now commonly used scientific tools, and without a hemihomonyms check, they may be a source of mistakes similar to well-known cases related with the use of office software (Zeeberg *et al.* 2004).

The level of hemihomonyms knowledge is, however, surprisingly small. Before this work, nobody knew the number of hemihomonyms or even its order of magnitude, and no published list of hemihomonyms did exist. This could have the same reason as the existence of hemihomonyms themselves: interdisciplinary researches employing many nomina following different Codes are still rare. Nevertheless, I am almost positive that, as these investigations will become more common in the near future, the problem of hemihomonyms should be solved as soon as possible.

It is worth mentioning here that Codes like those of nomenclature of bacteria (Lapage *et al.* 1992), animals (Anonymous 1999) and plants and fungi (McNeill *et al.* 2006) have slightly different approaches regarding “normal” homonyms. For example, the zoological Code distinguishes between primary and secondary homonyms, and also strictly regulates the use of similarly spelled nomina in some cases (“parahomonyms”). This Code regulates only nomina up to the level of superfamily, which means that nomina of higher taxa (e.g., orders and classes) may in theory be “legal” homonyms. Among different Codes, the bacteriological one has probably the most advanced approach saying that “*The name should not be a later homonym of a previously validly published name of an alga, bacterium, fungus, protozoon, or virus...*” This has, however, only limited consequences since other Codes do not do the same, and even the bacteriological Code does not consider the nomina of higher plants or animals.

The idea of making a single Code for all biological nomina (the “*BioCode*”) have a tough history. The most recent proposal (Greuter *et al.* 2011) does not deal with hemihomonyms, but if the *BioCode* was to be finally implemented, clarification of hemihomonyms would become unavoidable. Instead of a published text, the future *BioCode* could also become an overlaying Web service maintaining all Codes’ Rules together (Shipunov *et al.* 2009), and in this case the service will need a hemihomonyms database.

Materials and methods

The starting list of nomina was compiled from different and unequal sources: the *Catalogue of Life 2008 Checklist* (Bisby *et al.* 2008), the *Wikispecies List of Valid Homonyms* (Anonymous 2009b), the *Taxacom archives* (Anonymous 2009a) and a variety of personal communications and individual submissions directly to me.

All lists were normalized: converted to comma separated text format with standardized columns (nomen, ancestry, rank, source and ID) and merged. For merging, a specific R (Anonymous 2011) program was written. The database itself uses flat text file as a data source, PHP interface to the flat list plus DataTables JavaScript application (<<http://datatables.net/index>>), which produces the spreadsheet-like output interface. There is also a simple submission page which accepts comments from users, and rudimentary API allowing the checking of single nomina with two possible answers (“yes” if the nomen is in the database, and “no” if it is not).

We also found that several large name databases like *CU*STAR* (<<http://starcentral.mbl.edu>>) or *GNI* (<<http://www.globalnames.org/GNI>>) were not simple to analyze, probably due to the vast amount of misspellings listed. These databases were not used for the primary list.

Nevertheless, since not all reliable nomen sources were analyzed, we cannot be sure that our database is complete. If a nomen is not in the database, there still is a possibility that it may be a hemihomonym. Another approach to the hemihomonymy problem is now being implemented in *IRMNG* (<<http://www.cmar.csiro.au/datacentre/irmng/homonyms.htm>>).

Results

As for 1st August 2011, the “Hemihomonym database” (*HHDB*; <<http://herba.msu.ru/shipunov/os/homonyms/index.php>>; mirror: <<http://ashipunov.info/shipunov/os/homonyms/index.php>>) has 1164 nomina. Most hemihomonyms are results of clashes between the botanical and zoological Codes (1113 nomina, i.e. 96 %), and much less are between bacteriological and botanical nomina and between zoological and bacteriological nomina (8 nomina, i.e. 1 % and 31 nomina, i.e. 3 %, respectively). Twelve nomina (1 %) are triple hemihomonyms.

The shortened variant of *HHDB* including only nomina is given here in Table 1. On the Web site, it is also possible to retrieve so-called “ancestry”, i.e., the data about the taxonomical position of the nominal taxon.

Discussion

Since the hemihomonym database is now established, it is possible to identify the situations of hemihomonymy between the three Codes considered. In order to avoid ambiguity, I propose here that whenever a nomen is a hemihomonym, it should be followed with a postfix “(b)”, “(p)” or “(z)” for nomina covered by the bacteriological, botanical and zoological Codes of nomenclature, respectively. To check the possibility of being a hemihomonym, one could use Table 1, the main Web page of *HHDB*, or the proposed API (<<http://herba.msu.ru/shipunov/os/homonyms/index.php>>).

A few additional situations which may cause ambiguity in nomenclatural research are not yet resolved:

(1) Nomina of higher taxa. This is an “Achilles heel” of modern nomenclature. Multiple efforts were done towards a resolving of higher taxa problem, rule- or database-based (Reveal 2008; Shipunov 2009; Kluge, 2010 and his earlier Russian publications; Dubois, 2011a and his other publications) but the current Codes still almost completely ignore the problem.

(2) Nomina of “intermediate levels” of nomenclatural hierarchy. It is common for most databases and sometimes even monographs to skip tribal, section or other levels intermediate between the “main” ones. This is often considered as a fundamental problem for all rank-based nomenclature (R. Olmstead, pers. comm.). As a result, we simply do not know how many homonyms are hidden here.

(3) The nomen could be an “unstable” hemihomonym if it is unclear which Code should be used for it (“ambiregnal names”; see Patterson 1991). Many protists’ nomina are ambiregnal.

(4) Three other Codes of nomenclature exist which may also contain hemihomonyms: the Codes for viruses (Anonymus 2002) and cultivated plants (Brickell *et al.* 2009; it does not control nomenclature at the generic level), and the *PhyloCode* (Cantino & de Queiroz 2010; it is not an officially recognized Code). The nomina recognized under these Codes may later be added to the *HHDB*.

Acknowledgements

I am very grateful to David Patterson, Patrick Leary and Dmitry Mozzherin (EOL) for their invaluable help in the creation of *HHDB* and to Alain Dubois for his great assistance in the manuscript preparation.

TABLE 1. Hemihomonyms from realms of three main codes of nomenclature (according to HHDB, last accessed 1st August 2011).

Bacteriological Code	Botanical Code	Zoological Code
Abas	Abas	Abas
Aberia	Aberia	Aberia
Abietinella	Abietinella	Abietinella
Abronia	Abronia	Abronia
Acantharia	Acantharia	Acantharia
Acanthocarpus	Acanthocarpus	Acanthocarpus
Acanthoccephalus	Acanthoccephalus	Acanthoccephalus
Acanthopale	Acanthopale	Acanthopale
Acharia	Acharia	Acharia
Achleena	Achleena	Achleena
Achiya	Achiya	Achiya
Acheta	Acheta	Acheta
Ads	Ads	Ads
Acrasia	Acrasia	Acrasia
Acrocephalus	Acrocephalus	Acrocephalus
Acrophylum	Acrophylum	Acrophylum
Acrotylus	Acrotylus	Acrotylus
Adaeae	Adaeae	Adaeae
Adcidium	Adcidium	Adcidium
Adindendron	Adindendron	Adindendron
Adinopellis	Adinopellis	Adinopellis
Adamsia	Adamsia	Adamsia
Adenophora	Adenophora	Adenophora
Aegle	Aegle	Aegle
Afrelia	Afrelia	Afrelia
Agarista	Agarista	Agarista
Agathis	Agathis	Agathis
Agnesia	Agnesia	Agnesia
Agnis	Agnis	Agnis
Alania	Alania	Alania
Alaria	Alaria	Alaria
Albertinia	Albertinia	Albertinia
Alectoria	Alectoria	Alectoria
Alberitia	Alberitia	Alberitia
Alina	Alina	Alina
Allotropa	Allotropa	Allotropa
Allophia	Allophia	Allophia
Alsophila	Alsophila	Alsophila
Amara	Amara	Amara
Amayllis	Amayllis	Amayllis
Amorphilla	Amorphilla	Amorphilla
Amorphia	Amorphia	Amorphia
Amphianthus	Amphianthus	Amphianthus
Amphibolia	Amphibolia	Amphibolia
Amphinema	Amphinema	Amphinema
Amphorula	Amphorula	Amphorula
Anabasis	Anabasis	Anabasis
Ancistrodes	Ancistrodes	Ancistrodes
Ancistrophora	Ancistrophora	Ancistrophora
Ancylistes	Ancylistes	Ancylistes
Andersonia	Andersonia	Andersonia
Andrea	Andrea	Andrea
Andresia	Andresia	Andresia
Andrewsiella	Andrewsiella	Andrewsiella
Anaura	Anaura	Anaura
Angelina	Angelina	Angelina
Anisochaeta	Anisochaeta	Anisochaeta
Anisocycla	Anisocycla	Anisocycla
Anisoptera	Anisoptera	Anisoptera
Anisophrix	Anisophrix	Anisophrix
Anomora	Anomora	Anomora
Anomallesia	Anomallesia	Anomallesia
Antirella	Antirella	Antirella
Antillea	Antillea	Antillea
Antonina	Antonina	Antonina
Anura	Anura	Anura
Aotus	Aotus	Aotus
Aphrodite	Aphelia	Aphelia
Apluda	Apluda	Apluda
Apodasmia	Apodasmia	Apodasmia
Apona	Apona	Apona
Apocates	Apocates	Apocates
Apocarinis	Apocarinis	Apocarinis
Archidia	Archidia	Archidia
Archophila	Archophila	Archophila
Arearia	Arearia	Arearia
Argentina	Argentina	Argentina
Aria	Aria	Aria
Aradne	Aradne	Aradne
Anopsis	Anopsis	Anopsis
Aristotella	Aristotella	Aristotella
Articulata	Articulata	Articulata
Ascoidea	Ascoidea	Ascoidea
Ashtonia	Ashtonia	Ashtonia
Asterina	Asterina	Asterina
Asterococcus	Asterococcus	Asterococcus
Asterodon	Asterodon	Asterodon
Astrea	Astrea	Astrea
Ateleia	Ateleia	Ateleia
Atractomorphia	Atractomorphia	Atractomorphia
Augusta	Augusta	Augusta
Auricularia	Auricularia	Auricularia
Auricula	Auricula	Auricula
Autoroe	Autoroe	Autoroe
Azila	Azila	Azila
Bacillus	Bacillus	Bacillus
Bacteridium	Bacteridium	Bacteridium
Baileya	Baileya	Baileya
Ballella	Ballella	Ballella
Baloghia	Baloghia	Baloghia
Banksia	Banksia	Banksia
Barnardia	Barnardia	Barnardia
Baronia	Baronia	Baronia
Barramia	Barramia	Barramia
Bartschella	Bartschella	Bartschella
Bassia	Bassia	Bassia
Batesia	Batesia	Batesia
Batis	Batis	Batis
Beaufortia	Beaufortia	Beaufortia
Bequerella	Bequerella	Bequerella
Bedfordia	Bedfordia	Bedfordia
Belardia	Belardia	Belardia
Belondium	Belondium	Belondium
Berkeleya	Berkeleya	Berkeleya
Berlesiella	Berlesiella	Berlesiella
Betula	Betula	Betula
Beyria	Beyria	Beyria
Binuria	Binuria	Binuria
Binghamia	Binghamia	Binghamia
Blachia	Blachia	Blachia
Blancoa	Blancoa	Blancoa
Bodo	Bodo	Bodo
Bogoriella	Bogoriella	Bogoriella
Bolia	Bolia	Bolia
Bonania	Bonania	Bonania
Bonatea	Bonatea	Bonatea
Bonia	Bonia	Bonia
Bornella	Bornella	Bornella
Bostrychia	Bostrychia	Bostrychia
Bougainvillea	Bougainvillea	Bougainvillea
Brachypeza	Brachypeza	Brachypeza
Bremia	Bremia	Bremia
Breyria	Breyria	Breyria
Briana	Briana	Briana
Brooksia	Brooksia	Brooksia
Broughtonia	Broughtonia	Broughtonia
Bruchia	Bruchia	Bruchia
Buchanania	Buchanania	Buchanania
Buchnera	Buchnera	Buchnera
Buchneria	Buchneria	Buchneria
Burenia	Burenia	Burenia
Bursaria	Bursaria	Bursaria
Buritia	Buritia	Buritia
Butleria	Butleria	Butleria
Byolis	Byolis	Byolis
Calamus	Calamus	Calamus
Calantica	Calantica	Calantica
Callicarpa	Callicarpa	Callicarpa
Calliderma	Calliderma	Calliderma
Callicepis	Callicepis	Callicepis
Calopteryx	Calopteryx	Calopteryx
Calospatha	Calospatha	Calospatha
Calycella	Calycella	Calycella
Calyptopogon	Calyptopogon	Calyptopogon
Calypta	Calypta	Calypta
Camensia	Camensia	Camensia
Campanella	Campanella	Campanella
Camploboma	Camploboma	Camploboma
Campyloporis	Campyloporis	Campyloporis
Canarium	Canarium	Canarium
Candelabrum	Candelabrum	Candelabrum
Caneophora	Caneophora	Caneophora
Cantharellus	Cantharellus	Cantharellus
Carnegie	Carnegie	Carnegie
Carpetaria	Carpetaria	Carpetaria
Catena	Catena	Catena
Catenococcus	Catenococcus	Catenococcus
Catenula	Catenula	Catenula
Cathella	Cathella	Cathella
Cavernularia	Cavernularia	Cavernularia
Cavia	Cavia	Cavia
Celerina	Celerina	Celerina
Centipeda	Centipeda	Centipeda
Centropogon	Centropogon	Centropogon
Cerapoda	Cerapoda	Cerapoda
Cerataulina	Cerataulina	Cerataulina
Ceratocephala	Ceratocephala	Ceratocephala
Ceratoceolax	Ceratoceolax	Ceratoceolax
Ceratosigma	Ceratosigma	Ceratosigma
Cerastoma	Cerastoma	Cerastoma
Cereus	Cereus	Cereus
Ceron	Ceron	Ceron
Chaetacanthus	Chaetacanthus	Chaetacanthus
Chaetoceras	Chaetoceras	Chaetoceras
Chaetoderma	Chaetoderma	Chaetoderma
Chaetonema	Chaetonema	Chaetonema
Chaetophora	Chaetophora	Chaetophora
Chaetopsis	Chaetopsis	Chaetopsis
Chaos	Chaos	Chaos
Chara	Chara	Chara
Charybdis	Charybdis	Charybdis
Chavinia	Chavinia	Chavinia
Chelidonium	Chelidonium	Chelidonium
Chemnitzia	Chemnitzia	Chemnitzia
Chenia	Chenia	Chenia
Chevalerella	Chevalerella	Chevalerella
Chione	Chione	Chione
Chlandophora	Chlandophora	Chlandophora
Chloracantha	Chloracantha	Chloracantha
Chloris	Chloris	Chloris
Chondracanthus	Chondracanthus	Chondracanthus
Chondrilla	Chondrilla	Chondrilla
Chosenia	Chosenia	Chosenia
Chrysonema	Chrysonema	Chrysonema
Chrysopogon	Chrysopogon	Chrysopogon
Cidaris	Cidaris	Cidaris
Cinctidium	Cinctidium	Cinctidium
Cladonema	Cladonema	Cladonema
Clappa	Clappa	Clappa
Clathrella	Clathrella	Clathrella
Clathrus	Clathrus	Clathrus
Clausia	Clausia	Clausia
Clavulina	Clavulina	Clavulina
Clemontia	Clemontia	Clemontia
Clevelandia	Clevelandia	Clevelandia
Climacoptera	Climacoptera	Climacoptera
Clivia	Clivia	Clivia
Cusia	Cusia	Cusia
Cypella	Cypella	Cypella
Cypsolium	Cypsolium	Cypsolium
Cnestrum	Cnestrum	Cnestrum
Coccoldea	Coccoldea	Coccoldea
Codon	Codon	Codon
Codonorchis	Codonorchis	Codonorchis
Coemansia	Coemansia	Coemansia
Coenonia	Coenonia	Coenonia
Cola	Cola	Cola
Colax	Colax	Colax
Collaria	Collaria	Collaria
Collinsia	Collinsia	Collinsia
Colocasia	Colocasia	Colocasia
Cometes	Cometes	Cometes
Comperia	Comperia	Comperia
Compsoneura	Compsoneura	Compsoneura
Coniophora	Coniophora	Coniophora
Conostoma	Conostoma	Conostoma
Contarinia	Contarinia	Contarinia
Cookella	Cookella	Cookella
Cora	Cora	Cora
Cordia	Cordia	Cordia
Cordyla	Cordyla	Cordyla
Coris	Coris	Coris
Coronilla	Coronilla	Coronilla
Cortium	Cortium	Cortium
Corynaea	Corynaea	Corynaea
Coryne	Coryne	Coryne
Corynephorus	Corynephorus	Corynephorus
Corythophora	Corythophora	Corythophora
Cota	Cota	Cota
Cowanla	Cowanla	Cowanla
Crambe	Crambe	Crambe
Crassula	Crassula	Crassula
Cremophila	Cremophila	Cremophila
Crepidotus	Crepidotus	Crepidotus
Cressa	Cressa	Cressa
Crocidium	Crocidium	Crocidium
Crosslandia	Crosslandia	Crosslandia
Crossosoma	Crossosoma	Crossosoma
Crucianella	Crucianella	Crucianella
Cruculum	Cruculum	Cruculum
Cryphaea	Cryphaea	Cryphaea
Cryptochloris	Cryptochloris	Cryptochloris
Cryptococcus	Cryptococcus	Cryptococcus
Cryptolechia	Cryptolechia	Cryptolechia
Cyponema	Cyponema	Cyponema
Cyrtoporus	Cyrtoporus	Cyrtoporus
Cyrtophrele	Cyrtophrele	Cyrtophrele
Ctenophora	Ctenophora	Ctenophora
Ctenopsis	Ctenopsis	Ctenopsis
Cucumella	Cucumella	Cucumella
Culcita	Culcita	Culcita
Cyanea	Cyanea	Cyanea

TABLE 1. (continued).

	Cyanopsis Cybebus Cyclogramma Cyclophora Cyclorhiza Cynia Cynodon Cytophora Cytopsis Cytosia Cystophora Dacrydium Dactylanthus Dahlia Dallonia Danae Darlingtonia Dasypogon Davidsonia Dawsonia Decania Deckeria Decodon Deidamia Dendroplemon Desmanthus Desmoccocus Desmonema Devillea Diabole Diadema Dianema Diascia Diastella Diastema Diblemma Dichaelephora Dichranella Dicranophora Dictionella Didymia Didymocystis Dietzia Digilaria Dilophus Dinema Dinetus Dineta Dionaea Dioxys Diphyes Diposoma Dipodax Diporopsis Dipura Ditina Discia Discophora Discus Dispira Ditaxis Ditrus Donax Dorcadon Doryphora Dracaena Drosophila Drummondia Dryas Dymonia Dymophila Dugesia Dunbaria Duplicaria Duportia	Cyanopsis Cybebus Cyclogramma Cyclophora Cyclorhiza Cynia Cynodon Cytophora Cytopsis Cytosia Cystophora Dacrydium Dactylanthus Dahlia Dallonia Danae Darlingtonia Dasypogon Davidsonia Dawsonia Decania Deckeria Decodon Deidamia Dendroplemon Desmanthus Desmoccocus Desmonema Devillea Diabole Diadema Dianema Diascia Diastella Diastema Diblemma Dichaelephora Dichranella Dicranophora Dictionella Didymia Didymocystis Dietzia Digilaria Dilophus Dinema Dinetus Dineta Dionaea Dioxys Diphyes Diposoma Dipodax Diporopsis Dipura Ditina Discia Discophora Discus Dispira Ditaxis Ditrus Donax Dorcadon Doryphora Dracaena Drosophila Drummondia Dryas Dymonia Dymophila Dugesia Dunbaria Duplicaria Duportia	Dysphania Echinacea Echinaria Echinella Echinops Edgaria Eisenia Elachista Elegia Eminia Enallagma Encalypta Endotrichella Engelhardtia Ensifera Enteropogon Entomophaga Ephelis Ephenera Ephemerodea Ephemeropsis Epilitha Epiphora Eratio Eremaea Eremocharis Eremophila Eranthus Erica Eriksonia Erochilon Erochrysis Eruca Erycina Esenbeckia Esmeralda Eucharis Euclasta Eulalia Eupelte Eurhabdus Euryale Eurybia Euryomma Eutaxia Everardia Eversmannia Falcaria Fallica Faurea Fauriella Felipporeia Fennella Fergania Fergusonia Ficus Floria Fischeria Fissurina Fitchia Flintella Fluminicola Fortunella Fosterella Friederia Fritillaria Funaria Furcula Furia Furnariae Gaimardia Galearia	Dysphania Echinacea Echinaria Echinella Echinops Edgaria Eisenia Elachista Elegia Eminia Enallagma Encalypta Endotrichella Engelhardtia Ensifera Enteropogon Entomophaga Ephelis Ephenera Ephemerodea Ephemeropsis Epilitha Epiphora Eratio Eremaea Eremocharis Eremophila Eranthus Erica Eriksonia Erochilon Erochrysis Eruca Erycina Esenbeckia Esmeralda Eucharis Euclasta Eulalia Eupelte Eurhabdus Euryale Eurybia Euryomma Eutaxia Everardia Eversmannia Falcaria Fallica Faurea Fauriella Felipporeia Fennella Fergania Fergusonia Ficus Floria Fischeria Fissurina Fitchia Flintella Fluminicola Fortunella Fosterella Friederia Fritillaria Funaria Furcula Furia Furnariae Gaimardia Galearia	Galearia Galeopsis Galleria Gambella Ganonema Gattyia Gaudichaudia Gaussia Geminella Genaea Gentlingia Geococcus Gesneria Gilia Gilliesia Graudlia Glaucidium Glaucanema Gleniea Glyphis Glyphopellis Gnethia Goethalsia Goldmania Gomphus Gonodoma Goodia Gordonia Gouania Gouldia Graellsia Grahamia Graphis Graphium Grayia Gronovia Gustavia Gyptis Hainania Halocharis Halopteris Hamadryas Hamigera Hamburia Hancockia Hannonia Haplophylum Haploporus Harleya Harpella Harrisia Harrisonia Hawaila Heinsenlia Hemichroa Hemiloma Hendersonia Henrya Hepatica Herbertia Herdmania Heringia Hermannia Heterococcus Heteropogon Heteropsis Hibbertia Hildebrandtella Hilegardia Hillia	Galearia Galeopsis Galleria Gambella Ganonema Gattyia Gaudichaudia Gaussia Geminella Genaea Gentlingia Geococcus Gesneria Gilia Gilliesia Graudlia Glaucidium Glaucanema Gleniea Glyphis Glyphopellis Gnethia Goethalsia Goldmania Gomphus Gonodoma Goodia Gordonia Gouania Gouldia Graellsia Grahamia Graphis Graphium Grayia Gronovia Gustavia Gyptis Hainania Halocharis Halopteris Hamadryas Hamigera Hamburia Hancockia Hannonia Haplophylum Haploporus Harleya Harpella Harrisia Harrisonia Hawaila Heinsenlia Hemichroa Hemiloma Hendersonia Henrya Hepatica Herbertia Herdmania Heringia Hermannia Heterococcus Heteropogon Heteropsis Hibbertia Hildebrandtella Hilegardia Hillia	Hintonia Hippia Hoffmania Holmbergia Holmiella Hologedum Holubia Homoeothrix Homopholis Hopkinsia Hornera Hosseusia Houstonia Howea Huberia Hudsonia Humbertella Hydrocoryne Hydrophilus Hymenocaphtalus Hymenoclea Hymenodeps Hypaene Hypodema Hypsophila Hysosopus Hystrix Indospiraera Inezia Inga Iphigenia Iris Isanthus Isia Ismene Isothea Isotoma Iva Jacksonia Jacobia Jaliscoa Janesia Janella Janusia Jeffersonia Johnsonella Jonesia Jubula Kanaboa Karschia Kelerstenia Kelleria Kerria Kingella Kossia Kochia Kraussia Kraussia Kupea Kurzia Lacymaria Lactarius Laelia Laelopsis Lagurus Langia Lambia Lancea Lanceola Lapidaria Lasius Lauterborniella	Hintonia Hippia Hoffmania Holmbergia Holmiella Holubia Homoeothrix Homopholis Hopkinsia Hornera Hosseusia Houstonia Howea Huberia Hudsonia Humbertella Hydrocoryne Hydrophilus Hymenocaphtalus Hymenoclea Hymenodeps Hypaene Hypodema Hypsophila Hysosopus Hystrix Indospiraera Inezia Inga Iphigenia Iris Isanthus Isia Ismene Isothea Isotoma Iva Jacksonia Jacobia Jaliscoa Janesia Janella Janusia Jeffersonia Johnsonella Jonesia Jubula Kanaboa Karschia Kelerstenia Kelleria Kerria Kingella Kossia Kochia Kraussia Kraussia Kupea Kurzia Lacymaria Lactarius Laelia Laelopsis Lagurus Langia Lambia Lancea Lanceola Lapidaria Lasius Lauterborniella
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[illegible]

	Massadonia Mastophora Mazea Mecopus Meanelia Meandrochaeta Meandrogaster Meaenomma Melanodus Melasina Melbini Mentzella Merope Merterisia Metanema Metatrachia Meischnikowia Metzgeria Mexicoa Meyenia Microaspis Microcladia Micrococccus Microcodon Microcyclus Microdiscus Micropholis Microporus Microrhinus Microstigma Microstoma Miesia Milleria Mimulus Mitchella Mitriaria Mitrella Monadenia Monarda Monascus Monotaxis Monticola Morella Mora Morelia Morganella Morus Muehlenella Muehlenia Muka Myrnia Myronema Myrmecia Mytilopsis Myurella Myxa Nais Nambia Napaea Nauplius Naufococcus Nectria Nella Nelsonia Nemisia Neodesmus Neosiphonia Neta Newtonia Nidularia Notopleura	Massadonia Mastophora Mazea Mecopus Meanelia Meandrochaeta Meandrogaster Meaenomma Melanodus Melasina Melbini Mentzella Merope Merterisia Metanema Metatrachia Meischnikowia Metzgeria Mexicoa Meyenia Microaspis Microcladia Microcodon Microcyclus Microdiscus Micromonas Micropholis Microporus Microrhinus Microstigma Microstoma Miesia Milleria Mimulus Mitchella Mitriaria Mitrella Monadenia Monarda Monascus Monotaxis Monticola Morelia Mora Morelia Morganella Morus Muehlenella Muehlenia Muka Myrnia Myronema Myrmecia Mytilopsis Myurella Myxa Nais Nambia Napaea Nauplius Naufococcus Nectria Nella Nelsonia Nemisia Neodesmus Neosiphonia Neta Newtonia Nidularia Notopleura
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	Oscantites	Oscantites	Oscantites
	Odontella	Odontella	Odontella
	Odontophorus	Odontophorus	Odontophorus
	Odontostoma	Odontostoma	Odontostoma
	Odonitula	Odonitula	Odonitula
	Oenanthite	Oenanthite	Oenanthite
	Oenita	Oenita	Oenita
	Olea	Olea	Olea
	Oleria	Oleria	Oleria
	Oligochaeta	Oligochaeta	Oligochaeta
	Olyra	Olyra	Olyra
	Omanita	Omanita	Omanita
	Ommatophora	Ommatophora	Ommatophora
	Oncotylus	Oncotylus	Oncotylus
	Oncyphora	Oncyphora	Oncyphora
	Operculina	Operculina	Operculina
	Ophidon	Ophidon	Ophidon
	Ophioccephalus	Ophioccephalus	Ophioccephalus
	Orania	Orania	Orania
	Orchipedum	Orchipedum	Orchipedum
	Orestias	Orestias	Orestias
	Orygia	Orygia	Orygia
	Orcia	Orcia	Orcia
	Orina	Orina	Orina
	Ormosia	Ormosia	Ormosia
	Oroya	Oroya	Oroya
	Orthosia	Orthosia	Orthosia
	Oryctes	Oryctes	Oryctes
	Osa	Osa	Osa
	Ourococcus	Ourococcus	Ourococcus
	Ovidia	Ovidia	Ovidia
	Owenia	Owenia	Owenia
	Oxyphyllum	Oxyphyllum	Oxyphyllum
	Oyxopus	Oyxopus	Oyxopus
	Oxyrinchus	Oxyrinchus	Oxyrinchus
	Oxysigma	Oxysigma	Oxysigma
	Ozophora	Ozophora	Ozophora
	Pabellonia	Pabellonia	Pabellonia
	Pachystylus	Pachystylus	Pachystylus
	Palaeococcus	Palaeococcus	Palaeococcus
	Palmeria	Palmeria	Palmeria
	Palmodica	Palmodica	Palmodica
	Palumbina	Palumbina	Palumbina
	Pandoria	Pandoria	Pandoria
	Pandora	Pandora	Pandora
	Panus	Panus	Panus
	Papillaria	Papillaria	Papillaria
	Paracaphalia	Paracaphalia	Paracaphalia
	Paradrymonia	Paradrymonia	Paradrymonia
	Paragonia	Paragonia	Paragonia
	Paracoplia	Paracoplia	Paracoplia
	Parasterrella	Parasterrella	Parasterrella
	Parsia	Parsia	Parsia
	Parkia	Parkia	Parkia
	Paratoria	Paratoria	Paratoria
	Parmera	Parmera	Parmera
	Parthenope	Parthenope	Parthenope
	Passerina	Passerina	Passerina
	Patellina	Patellina	Patellina
	Paulinella	Paulinella	Paulinella
	Paxillus	Paxillus	Paxillus
	Pectinaria	Pectinaria	Pectinaria
	Peirna	Peirna	Peirna
	Pelea	Pelea	Pelea
	Pelaea	Pelaea	Pelaea
	Pennella	Pennella	Pennella
	Pentachaeta	Pentachaeta	Pentachaeta
	Pentagramma	Pentagramma	Pentagramma
	Peritodon	Peritodon	Peritodon
	Periboea	Periboea	Periboea
	Perigrapha	Perigrapha	Perigrapha
	Perilla	Perilla	Perilla
	Peripoca	Peripoca	Peripoca

Planococcus	Peronia	Peronia
	Perolis	Perolis
	Perolla	Perolla
	Petalium	Petalium
	Petamaria	Petamaria
	Petta	Petta
	Phaenopsis	Phaenopsis
	Pharia	Pharia
	Pharus	Pharus
	Phassolus	Phassolus
	Philippia	Philippia
	Philipsia	Philipsia
	Philyra	Philyra
	Phipsia	Phipsia
	Phoebe	Phoebe
	Pholidota	Pholidota
	Photini	Photini
	Phrynella	Phrynella
	Phyllanthus	Phyllanthus
	Phyllococe	Phyllococe
	Phylodon	Phylodon
	Phyllophaga	Phyllophaga
	Phylophora	Phylophora
	Phylporia	Phylporia
	Picconia	Picconia
	Pieris	Pieris
	Pileolaria	Pileolaria
	Pliophorus	Pliophorus
	Pindara	Pindara
	Pintoa	Pintoa
	Pinus	Pinus
	Placosoma	Placosoma
	Plagiogramma	Plagiogramma
	Plagiopus	Plagiopus
	Plagiotripis	Plagiotripis
	Planetella	Planetella
	Planococcus	Planococcus
	Plathymenia	Plathymenia
	Platycyamus	Platycyamus
	Platylabium	Platylabium
Platylabus	Platylabus	
Platyrina	Platyrina	
Pleocitera	Pleocitera	
Pleurotopsis	Pleurotopsis	
Polia	Polia	
Pumbago	Pumbago	
Puntalaria	Puntalaria	
Poodasa	Poodasa	
Pogonophora	Pogonophora	
Pogonopus	Pogonopus	
Polla	Polla	
Polychaeta	Polychaeta	
Polyleps	Polyleps	
Polymeria	Polymeria	
Polyphaga	Polyphaga	
Polypodium	Polypodium	
Polypon	Polypon	
Polystrictus	Polystrictus	
Polyura	Polyura	
Poneria	Poneria	
Pontogeneia	Pontogeneia	
Porella	Porella	
Poria	Poria	
Porpax	Porpax	
Portlandia	Portlandia	
Potisia	Potisia	
Poulsenia	Poulsenia	
Preussia	Preussia	
Prionodon	Prionodon	
Pritchardia	Pritchardia	
Proboscidea	Proboscidea	
Procris	Procris	
Proteomonas	Proteomonas	
Proteus	Proteus	

TABLE 1. (continued).

Quadriflorus	Punella	Punella	Schineria	Sabina	Sabina	Stenocybe	Senia	Senia	Trichoneura	Trichoneura
	Pammodiscus	Pammodiscus		Sacconiza	Sacconiza		Stenocybe	Stenocybe	Trichopetalum	Trichopetalum
	Pseudoclausia	Pseudoclausia		Salix	Salix		Stenodermis	Stenodermis	Trichopteryx	Trichopteryx
	Pseudograptis	Pseudograptis		Salomonina	Salomonina		Stenomeris	Stenomeris	Tridens	Tridens
	Pseudoniza	Pseudoniza		Salvadora	Salvadora		Stenostomum	Stenostomum	Trigonaspis	Trigonaspis
	Pterococcus	Pterococcus		Sarcodon	Sarcodon		Stenodendria	Stenodendria	Trigonidium	Trigonidium
	Pterolepis	Pterolepis		Sarcophylon	Sarcophylon		Stenodus	Stenodus	Trinaria	Trinaria
	Pterozonium	Pterozonium		Schaefferia	Schaefferia		Stenopsis	Stenopsis	Triphora	Triphora
	Pterygota	Pterygota		Schilleriella	Schilleriella		Stereochilus	Stereochilus	Tristria	Tristria
	Ptilium	Ptilium		Schimperella	Schimperella		Stevensia	Stevensia	Tristria	Tristria
Quadriflorus	Punella	Punella	Schizothrix	Schindleria	Schindleria	Siccia	Siccia	Trochus	Trochus	
	Pseudoclausia	Pseudoclausia		Schismella	Schismella	Stigma	Stigma	Trochus	Trochus	
	Pseudograptis	Pseudograptis		Schistosoma	Schistosoma	Stigma	Stigma	Trochus	Trochus	
	Pseudoniza	Pseudoniza		Schizodonta	Schizodonta	Stigma	Stigma	Trochus	Trochus	
	Pterococcus	Pterococcus		Schizophragma	Schizophragma	Stigma	Stigma	Trochus	Trochus	
	Pterolepis	Pterolepis		Schizophyllum	Schizophyllum	Stigma	Stigma	Trochus	Trochus	
	Pterozonium	Pterozonium		Schizophyllum	Schizophyllum	Stigma	Stigma	Trochus	Trochus	
	Pterygota	Pterygota		Schlechtendalia	Schlechtendalia	Stigma	Stigma	Trochus	Trochus	
	Ptilium	Ptilium		Schoutenia	Schoutenia	Stigma	Stigma	Trochus	Trochus	
	Ptilothrix	Ptilothrix		Schrankia	Schrankia	Stigma	Stigma	Trochus	Trochus	
Quadriflorus	Punella	Punella	Sclerococcus	Schullesia	Schullesia	Symphylla	Symphylla	Urbana	Urbana	
	Pseudoclausia	Pseudoclausia		Scleroccephalus	Scleroccephalus	Symphylla	Symphylla	Urbana	Urbana	
	Pseudograptis	Pseudograptis		Sclerococcus	Sclerococcus	Symphylla	Symphylla	Urbana	Urbana	
	Pseudoniza	Pseudoniza		Sclerococcus	Sclerococcus	Symphylla	Symphylla	Urbana	Urbana	
	Pterococcus	Pterococcus		Sclerococcus	Sclerococcus	Symphylla	Symphylla	Urbana	Urbana	
	Pterolepis	Pterolepis		Sclerococcus	Sclerococcus	Symphylla	Symphylla	Urbana	Urbana	
	Pterozonium	Pterozonium		Sclerococcus	Sclerococcus	Symphylla	Symphylla	Urbana	Urbana	
	Pterygota	Pterygota		Sclerococcus	Sclerococcus	Symphylla	Symphylla	Urbana	Urbana	
	Ptilium	Ptilium		Sclerococcus	Sclerococcus	Symphylla	Symphylla	Urbana	Urbana	
	Ptilothrix	Ptilothrix		Sclerococcus	Sclerococcus	Symphylla	Symphylla	Urbana	Urbana	
Rhodobium	Punella	Punella	Stella	Sabina	Sabina	Thalophylla	Senia	Senia	Trichoneura	Trichoneura
	Pseudoclausia	Pseudoclausia		Sacconiza	Sacconiza		Stenocybe	Stenocybe	Trichopetalum	Trichopetalum
	Pseudograptis	Pseudograptis		Salix	Salix		Stenodermis	Stenodermis	Trichopteryx	Trichopteryx
	Pseudoniza	Pseudoniza		Salomonina	Salomonina		Stenomeris	Stenomeris	Tridens	Tridens
	Pterococcus	Pterococcus		Salvadora	Salvadora		Stenostomum	Stenostomum	Trigonaspis	Trigonaspis
	Pterolepis	Pterolepis		Sarcodon	Sarcodon		Stenodendria	Stenodendria	Trigonidium	Trigonidium
	Pterozonium	Pterozonium		Sarcophylon	Sarcophylon		Stenodus	Stenodus	Trinaria	Trinaria
	Pterygota	Pterygota		Schaefferia	Schaefferia		Stenopsis	Stenopsis	Triphora	Triphora
	Ptilium	Ptilium		Schilleriella	Schilleriella		Stereochilus	Stereochilus	Tristria	Tristria
	Ptilothrix	Ptilothrix		Schimperella	Schimperella		Stevensia	Stevensia	Tristria	Tristria
Rhodococcus	Punella	Punella	Spitulina	Sabina	Sabina	Thalophylla	Senia	Senia	Trichoneura	Trichoneura
	Pseudoclausia	Pseudoclausia		Sacconiza	Sacconiza		Stenocybe	Stenocybe	Trichopetalum	Trichopetalum
	Pseudograptis	Pseudograptis		Salix	Salix		Stenodermis	Stenodermis	Trichopteryx	Trichopteryx
	Pseudoniza	Pseudoniza		Salomonina	Salomonina		Stenomeris	Stenomeris	Tridens	Tridens
	Pterococcus	Pterococcus		Salvadora	Salvadora		Stenostomum	Stenostomum	Trigonaspis	Trigonaspis
	Pterolepis	Pterolepis		Sarcodon	Sarcodon		Stenodendria	Stenodendria	Trigonidium	Trigonidium
	Pterozonium	Pterozonium		Sarcophylon	Sarcophylon		Stenodus	Stenodus	Trinaria	Trinaria
	Pterygota	Pterygota		Schaefferia	Schaefferia		Stenopsis	Stenopsis	Triphora	Triphora
	Ptilium	Ptilium		Schilleriella	Schilleriella		Stereochilus	Stereochilus	Tristria	Tristria
	Ptilothrix	Ptilothrix		Schimperella	Schimperella		Stevensia	Stevensia	Tristria	Tristria
Rothia	Punella	Punella	Stella	Sabina	Sabina	Thalophylla	Senia	Senia	Trichoneura	Trichoneura
	Pseudoclausia	Pseudoclausia		Sacconiza	Sacconiza		Stenocybe	Stenocybe	Trichopetalum	Trichopetalum
	Pseudograptis	Pseudograptis		Salix	Salix		Stenodermis	Stenodermis	Trichopteryx	Trichopteryx
	Pseudoniza	Pseudoniza		Salomonina	Salomonina		Stenomeris	Stenomeris	Tridens	Tridens
	Pterococcus	Pterococcus		Salvadora	Salvadora		Stenostomum	Stenostomum	Trigonaspis	Trigonaspis
	Pterolepis	Pterolepis		Sarcodon	Sarcodon		Stenodendria	Stenodendria	Trigonidium	Trigonidium
	Pterozonium	Pterozonium		Sarcophylon	Sarcophylon		Stenodus	Stenodus	Trinaria	Trinaria
	Pterygota	Pterygota		Schaefferia	Schaefferia		Stenopsis	Stenopsis	Triphora	Triphora
	Ptilium	Ptilium		Schilleriella	Schilleriella		Stereochilus	Stereochilus	Tristria	Tristria
	Ptilothrix	Ptilothrix		Schimperella	Schimperella		Stevensia	Stevensia	Tristria	Tristria

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Submitted: 6 October 2011. Accepted: 2 December 2011. Published: 22 December 2011.
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