



## The Trichoptera World Checklist

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### Abstract

The Trichoptera World Checklist (TWC) is a project of the successive International Symposia on Trichoptera, with the responsibility for its policy and maintenance assigned to the international Trichoptera Checklist Coordinating Committee. The TWC originated 20 years ago and has been available on the worldwide web for over 11 years, providing ready access to data regarding caddisfly taxa. Security is assured by daily backup of the database. Trichoptera scientists everywhere are urged to continue sending their published research to the Editor. As of June 2009, the TWC included records for 13,574 valid, extant species and 308 valid, extant subspecies in 609 genera of 47 families. It also included 650 valid, extinct (fossil) species, 113 extinct genera, and 8 extinct families. The density of species among biogeographic regions is variable, with known species density in the Oriental Region about 7.5 times that in the Afrotropical Region.

**Key words:** classification, literature, synonyms, taxa, types

### Introduction

The Trichoptera World Checklist (TWC) is a project of the successive International Symposia on Trichoptera, with the responsibility for its policy and maintenance assigned to the international Trichoptera Checklist Coordinating Committee. Currently, Dr. John C. Morse is the Editor.

The TWC was initiated by Morse about 1990 with data from the Trichopterorum Catalogus (Fischer 1960–1973), Zoological Record (1961–2008), and publications received in exchanges from colleagues. In 1995, it was transliterated from its original WordPerfect software (Corel WordPerfect® version 5.1) to FileMaker Pro software (Claris® FileMaker Pro® version 3.0) with support from the Integrated Taxonomic Information System (ITIS, <http://www.itis.gov/>) and programming assistance from Ms. Susan Petracco. The work on the TWC was reported in 1995 to the participants in the 8<sup>th</sup> International Symposium on Trichoptera (Morse 1997). At that same meeting, the original Taxonomic Checklist Coordinating Committee was elected. A searchable website for the TWC was launched 22 May 1999 from a server using a MySQL database, which is hosted by Clemson University <http://entweb.clemson.edu/database/trichopt/index.htm>. Updates for the TWC have been posted to that website irregularly several times since then.

Records in the TWC concern names of extant and extinct (fossil) taxa that are regulated by the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature 1999), i.e., family-group, genus-group, and species-group names. Records also are provided for order Trichoptera and for 4 subordinal names.

The purpose of the TWC is to promote and facilitate scientific investigation in Trichoptera, helping scientists throughout the world to initiate biosystematic studies, investigate biodiversity and distribution, serve as a reference for Trichoptera names and literature, provide key words for information storage and retrieval, and build catalogues, bibliographies, and other uses. The TWC is intended neither to impose a standard classification for Trichoptera nor to restrict scientific opinion.

Advantages for providing the TWC on the worldwide web, rather than as a printed work, include making it more readily accessible and without cost to scientists throughout the world, more readily searchable for data combinations, more amenable for continual updating, and more readily reviewable by the TCCC and other experts. The principal disadvantage for an electronic version of this resource is that it is less permanent and secure than a widely distributed printed version.

## Fields

Currently, the TWC data fields are as follows: Taxon, Status, Superfamily, Family, Subfamily, Tribe, Genus, Subgenus, Notes, Type Information, Type country, Biogeographic Region, Synonyms, and Included Taxa.

The “Taxon” field is the title field of the record and provides the name of the taxon for which the record was established together with the following data:

- (1) The genus name if the record pertains to a species or subspecies or, if the record pertains to some other category, the name of that category.
- (2) The most-recently validated taxon name.
- (3) The given-name initials and the family name of the taxon’s author or authors.
- (4) The year the taxon was made available.
- (5) The name of the book or journal in which the name of the taxon was made available. This bibliographic reference is usually abbreviated. If the book or article in which the name was made available is an edited work or was authored by person(s) other than the author(s) of the scientific name, the name of the editor(s) or author(s) is(are) provided.
- (6) The volume number and issue number of the journal or series, if there is any.
- (7) The taxon-specific page number or numbers, if they are known.
- (8) The taxon-specific figure number or numbers, if there are any or if they are known.
- (9) The name of the original genus for a species or subspecies of a changed combination, i.e., if the species name is now combined with a different genus.
- (10) The type country is then cited if the taxon is a subspecies.

The “Status” field states the category of the record and clarifies whether the name is extant, fossil, incertae sedis (of uncertain placement in the classification), or is not a taxon of Trichoptera. The purpose of this field is to assist with enumerations when searched either alone or in combination with terms in other fields.

The “Superfamily” and “Family” and “Subfamily” and “Tribe” and “Genus” and “Subgenus” fields provide data for each of these more-inclusive categories for the name in the “Taxon” field. Each citation in these fields has data similar to those provided for a “Taxon” field, i.e., the name of the category and items 2–8 in the list above.

The “Notes” field provides annotated references in chronological order for taxonomic opinions and changes, descriptions of various life history forms, distributional data, phylogeny, biology, and other information.

The “Type Information” field supplies details about the primary type of a species, the type species of a genus-group taxon, or the type genus of a family-group taxon. Primary type details for a species-group record include the kind of primary type (holotype, syntype, lectotype, or neotype), its life history form, collection locality, any accession number, any preservation method information,

and repository. Type species details for a genus-group record include the original name of the species, its author, and manner of fixation (e.g., original designation, subsequent designation, monotypic/monobasic, absolute tautonomy, or other type fixation method). Type genus details for a family-group record include the name of the genus and its author and year of publication.

For a species record, the “Type Country” field gives the name of the nation of the holotype locality. If the nation is divided by a biogeographic region boundary (China, Indonesia, Mexico, or Russia) or if the holotype locality occurs on an island, the name of the state or province of that nation or the name of the island is shown in parentheses after the name of the nation.

For a species record, the “Biogeographic Region” field shows the 2-letter abbreviation for 1 or more biogeographic regions from which a species is known. The 7 biogeographic regions include the following: Afrotropical, Australasian, East Palearctic, Nearctic, Neotropical, Oriental, and West Palearctic Regions (AT, AU, EP, NA, NT, OL, and WP, respectively). These are a modified version of the 6 biogeographic regions identified by Wallace (1876), for which the Palearctic Region was undivided and some names were different. Because locality data, especially for older data, are often rather imprecise, the boundaries of the biogeographic regions are defined to correspond mainly with political boundaries. A detailed definition of each of the 7 biogeographic regions is provided.

The “Synonyms” field lists synonyms in alphabetical order, with each synonym in its original spelling and combination, its author, year, and bibliographic reference. The author, year, and bibliographic reference for the synonymizing act are provided in parentheses. The type country is then cited if the synonym is a species-group taxon or the type species is cited if the synonym is a genus-group taxon.

The “Included Taxa” field can be used to track taxa up or down through the classification hierarchy from order Trichoptera to subspecies. It lists in alphabetical order the included taxa of the next-less-inclusive category with their author, year, bibliographic data, and (if a changed species combination) original genus. For example, if the record (i.e., the “Taxon” field) pertains to a species, the “Included Taxa” field may list included subspecies; if the record is for a subgenus, the “Included Taxa” field shows its valid species; if the record is that of a genus, the “Included Taxa” field may list either its subgenera or, if there are none, its valid species.

## Data

At the time of our meeting in June 2009, the TWC was up-to-date through the last edition of Zoological Record and included records for 13,574 valid extant species and 308 valid extant subspecies in 609 genera of 47 families (Table 1). It also included 650 valid extinct (fossil) species,

**TABLE 1.** Numbers of known, valid, extant taxa in the Trichoptera World Checklist in 1997 (Morse 1997) and 2009.

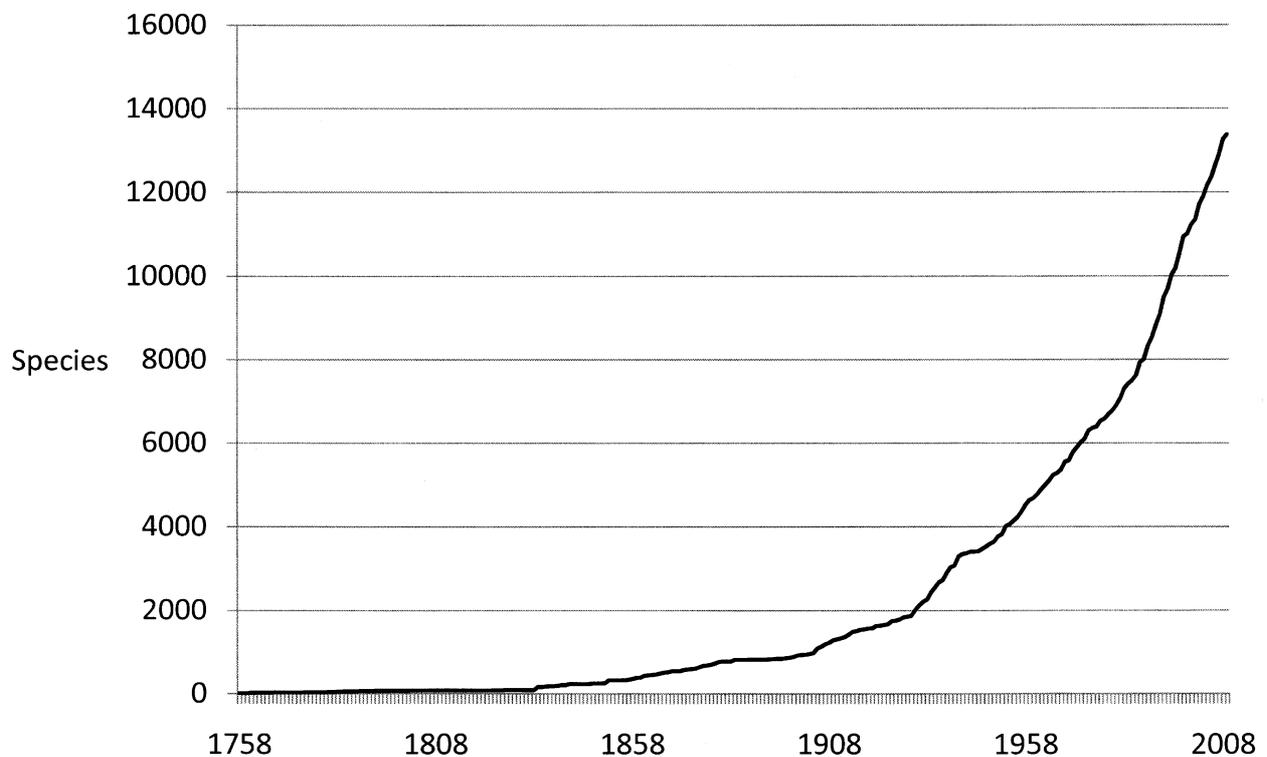
Year	1997	2009
Superfamilies		10
Families	45	47
Subfamilies		51
Tribes		31
Genera	626	609
Subgenera		100
Species	9,610*	13,574
Subspecies		308

\*includes total species and subspecies combined.

113 extinct genera, and 8 extinct families, as well as additional taxa in Protomeropina, which doubtfully belong in Trichoptera (Table 2). It is especially noteworthy that the rate at which new extant and extinct caddisfly species have been described has risen steadily (Fig. 1) since Linnaeus (1758) described 12 currently valid species of Trichoptera (among 17 species of his genus *Phryganea*).

**TABLE 2.** Numbers of known, valid, extinct taxa in the Trichoptera World Checklist in 1997 (Morse 1997) and 2009, including true Trichoptera (and true Trichoptera + Protomeropina).

Year	1997	2009
Families	(13)	8 (12)
Genera	(101)	113 (127)
Species	(567)	650 (680)



**FIGURE 1.** Trichoptera species accumulation by year from 1758 through 2008.

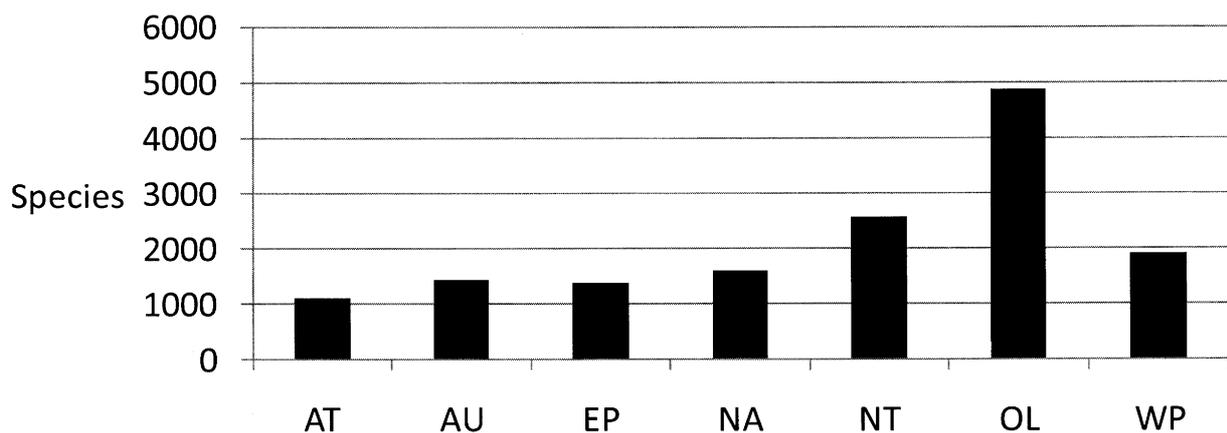
The number of families in the different biogeographic regions is nearly the same (Table 3), with the smallest numbers (23 famm.) in the Afrotropical and Neotropical Regions and the greatest numbers (29 famm.) in the Australasian and East Palearctic Regions. The presence/absence of each family in the different biogeographic regions was provided by Morse (2009).

By contrast, the number of known, valid, extant species is unevenly distributed among biogeographic regions (Table 3, Fig. 2), with the smallest number (1,099 spp.) reported from the Afrotropical Region and the greatest number (4,865 spp.) reported from the Oriental Region.

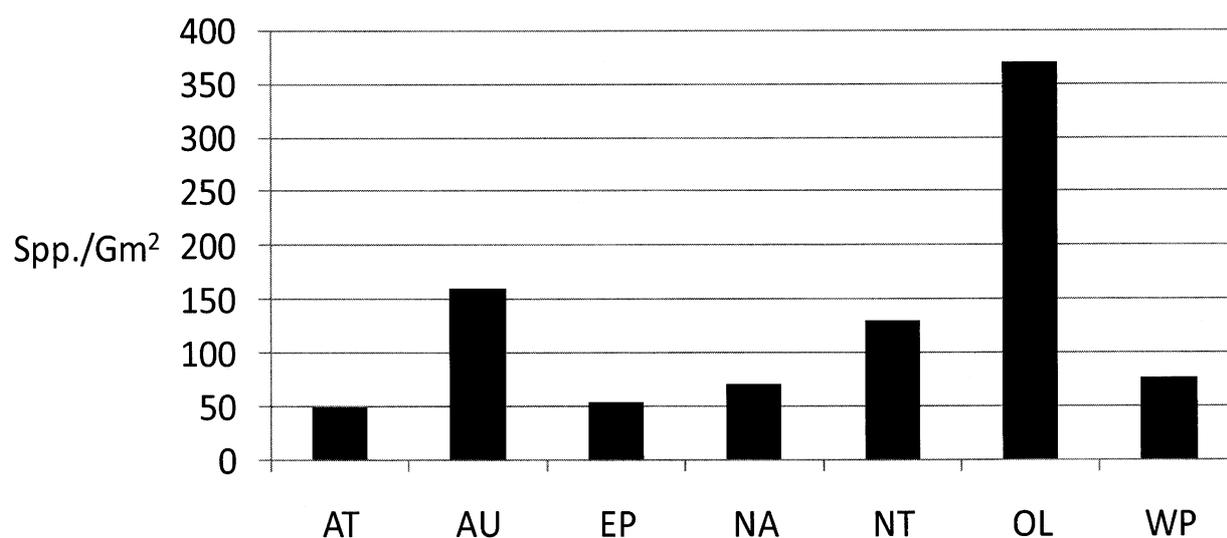
Furthermore, the differences in density of known, valid, extant species are even greater among the regions, with about 7.5 times as many species per square gigameter (Gm<sup>2</sup>) in the Oriental Region as in the Afrotropical Region (Table 3, Fig. 3).

**TABLE 3.** Number of Trichoptera families, number and percent of known, valid, extant Trichoptera species, area in square gigameters (Gm<sup>2</sup>), and species density (Species/Gm<sup>2</sup>) for each biogeographic region. [The total number of species in all regions is greater than 13,574 (14,829) and the total percent of species in all regions is greater than 100% (109.2%) because some species occur in more than 1 region.]

Biogeographic Region	Number of families	Number of species	Percent of species	Area (Gm <sup>2</sup> )	Species/Gm <sup>2</sup>
Afrotropical	23	1,099	8.1%	22.116	49
Australasian	29	1,439	10.6%	8.986	160
East Palearctic	29	1,372	10.1%	25.110	54
Nearctic	27	1,604	11.8%	22.736	70
Neotropical	23	2,562	18.9%	19.574	130
Oriental	28	4,865	35.8%	13.127	370
West Palearctic	26	1,888	13.9%	24.662	76
Antarctic	0	0	0%	13.986	0
WORLD	47	13,574	100%	150.297	90



**FIGURE 2.** Number of known, valid, extant Trichoptera species in each biogeographic region. AT = Afrotropical, AU = Australasian, EP = East Palearctic, NA = Nearctic, NT = Neotropical, OL = Oriental, WP = West Palearctic.



**FIGURE 3.** Density of known, valid, extant Trichoptera species in each biogeographic region (Species/Gm<sup>2</sup>). AT = Afrotropical, AU = Australasian, EP = East Palearctic, NA = Nearctic, NT = Neotropical, OL = Oriental, WP = West Palearctic.

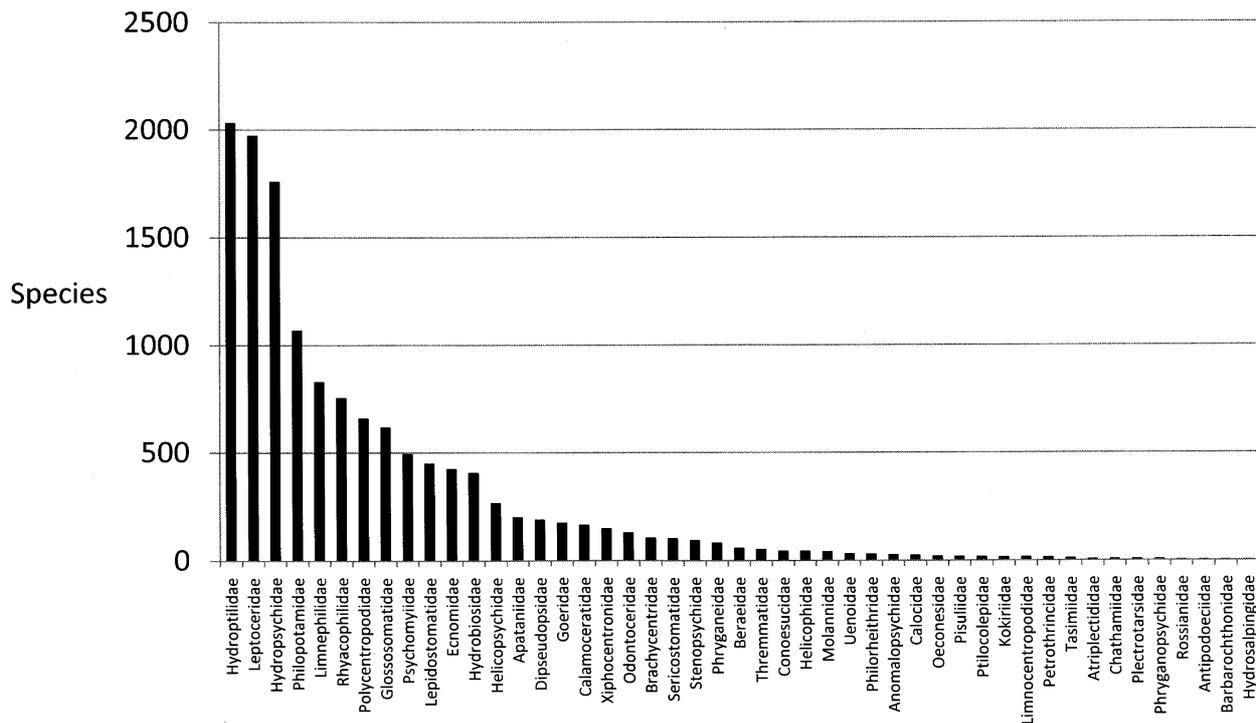
The number of known, valid, extant species also varies considerably among the different Trichoptera families, ranging from over 2,000 species in Hydroptilidae to just 1 species in each of Antipodoeciidae, Barbarochthonidae, and Hydrosalpingidae (Table 4, Fig. 4). The number of known, valid, extinct species ranges from 94 species in Polycentropodidae to none in 12 families (Table 5, Fig. 5).

**TABLE 4.** Number and percent of known, valid, extant species in Trichoptera families. See also Figure 4.

Family	Number of species	Percent of species
Hydroptilidae	2,029	15%
Leptoceridae	1,970	14%
Hydropsychidae	1,756	13%
Philopotamidae	1,068	8%
Limnephilidae	826	6%
Rhyacophilidae	753	6%
Polycentropodidae	656	5%
39 other families	4,516	33%
WORLD	13,574	100%

### Current status and future plans

The continuing task of updating the TWC database is accomplished by the Editor, J.C. Morse. *Zoological Records* is searched exhaustively to find new data for the TWC. However, original sources are used whenever possible—this helps to assure not only the accuracy of entries, but also to provide data that are not routinely available from Zoological Record. For this purpose, **Trichoptera scientists everywhere are urged to continue sending to me PDFs or photocopies or reprints of their published research!**



**FIGURE 4.** Number of known, valid, extant species in Trichoptera families. See also Table 4.

The database currently is managed with FileMaker Pro® (version 9.0v3) software on a Lenovo PC laptop computer. Uploads to the Worldwide Web are accomplished on a MySQL server by uploading in fragmented fashion (2 megabyte sections) Comma-Separated Text Format (CSV) files via FTP.

The database is secured with a daily “backup” to an external hard drive, otherwise kept separately from the computer when not in use. More or less monthly, the latest version is uploaded onto the Editor’s IBM PC computer in his Clemson University office. About 2–3 times each year, the most recent version is uploaded onto the Worldwide Web as described above. About every 5 years, the database is provided to the US Interagency Taxonomic Information System (ITIS) and the non-government organization NatureServe for storage and distribution through their current venues and outlets. Discussions are underway to deposit the database periodically with at least some members of the Trichoptera Checklist Coordinating Committee (TCCC), as an added measure of security.

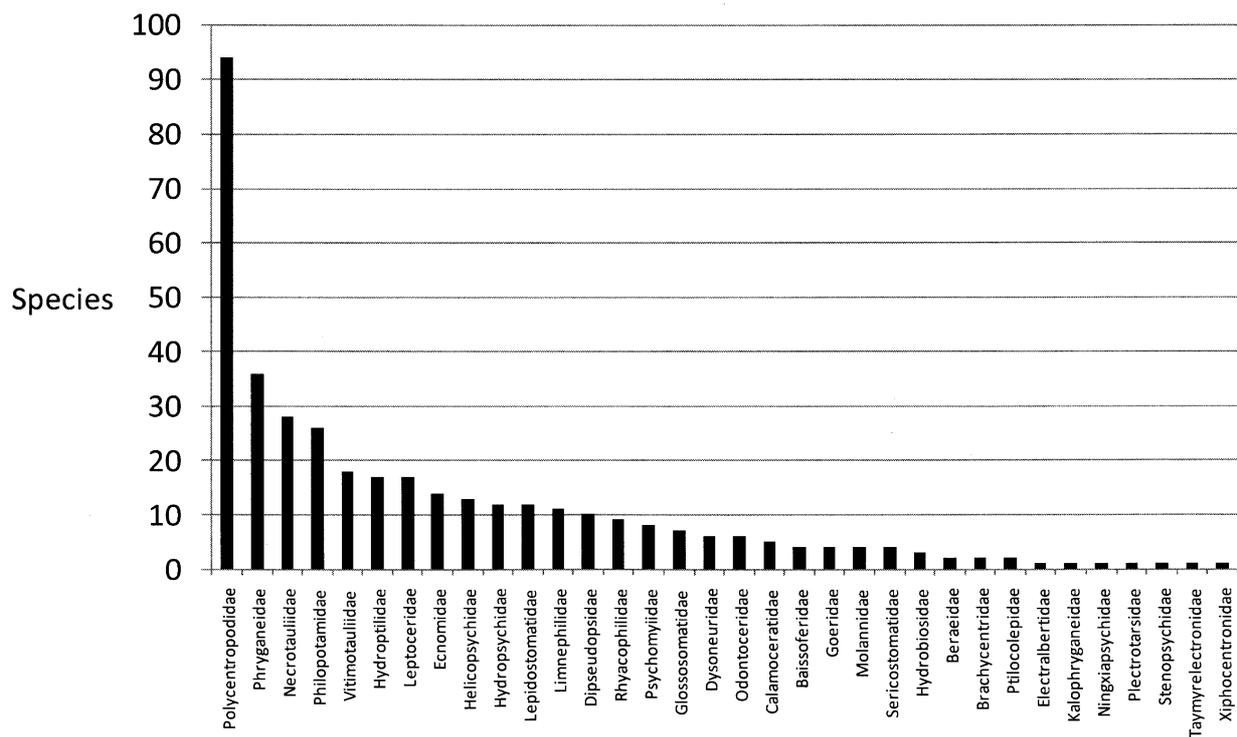
The TCCC represents the Trichoptera scientific community. Its members were originally elected by the participants in the 8<sup>th</sup> International Symposium on Trichoptera and continue to serve at the pleasure of participants in subsequent international symposia on Trichoptera. Current members of the TCCC are listed on the TWC website homepage. Their responsibilities include providing advice to the Editor for the improvement of the TWC, reviewing its data to check accuracy, and assuring its permanence, security, and global availability.

For the future, I am committed to continue editing the TWC for as long as I and the TCCC agree that I should. Under discussion is a field for each species in order to provide a Life Science Identification Number from the Index of Organism Names (ION, [www.organismnames.com](http://www.organismnames.com)). Plans also are to upgrade the user interface on the worldwide web to improve flexibility and versatility of searches. Among these improvements are intentions to provide means to search any field or any combination of fields in the database. Farther in the future, links may be added to other resources

such as the Trichoptera Literature Database <http://www.trichopteralit.umn.edu/> , the Barcode of Life <http://www.barcodinglife.org/views/login.php> , the Tree of Life <http://tolweb.org/tree/> , and the Encyclopedia of Life <http://www.eol.org/> .

**TABLE 5.** Number and percent of known, valid, extinct species in Trichoptera families. See also Figure 5. (+ = fossil family)

Family	Number of species	Percent of species
Polycentropodidae	94	14%
Phryganeidae	36	5%
+Necrotauliidae	28	4%
Philopotamidae	26	4%
+Vitmotauliidae	18	3%
Hydroptilidae	17	3%
Leptoceridae	17	3%
27 other families	417	64%
<b>WORLD</b>	<b>653</b>	<b>100%</b>



**FIGURE 5.** Number of known, valid, extinct (fossil) species in Trichoptera families. See also Table 5.

## Acknowledgements

Ms. Melinda M. Byrnes assisted with many of the original data entries from Fischer's (1960–1973) *Trichopterorum Catalogus*. Ms. Susan D. Petracco developed a program to transliterate the original

text file from WordPerfect to FileMaker Pro software. Mr. Ken Allen (Clemson University) helped to design the original database and web interface for the TWC and through all subsequent years has graciously uploaded the database onto the worldwide web as needed. The members of the TCCC have frequently encouraged me with sound advice for improving the TWC, provided corrections and additions to be incorporated in the TWC database, and offered their help to assure continuance and security for this on-going effort. Many members of the Trichoptera scientific community have lent similar encouragement and sent me corrections, additions, and original literature. The US Interagency Taxonomic Information System (ITIS) and NatureServe have provided some financial support for work on the TWC, for which I am truly grateful. This is Technical Contribution Number 5740 of the Clemson University Experiment Station.

## References

- Fischer, F.C.J. (1960–1973) *Trichopterorum Catalogus*, volumes I–XV. Nederlandse Entomologische Vereniging, Amsterdam.
- International Commission on Zoological Nomenclature. (1999) *International Code of Zoological Nomenclature*, 4<sup>th</sup> edition. International Trust for Zoological Nomenclature, London, United Kingdom, 306 pp.
- Linnaeus, C. (1758) *Systema Naturae per Regna Tria Naturae, Secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis*. Tomus I, Editio Decima Reformata. Cum Privilegio S:ae R:ae M:tis Sveciae. Holmiae, Impensis Direct, Laurentii Salvii, in 2 volumes: volume 1, pp. i–iv, 1–824; volume 2, i–iv, 825–1384.
- Morse, J.C. (1997) Checklist of world Trichoptera. *In*: Holzenthal, R.W. & Flint, O.S., Jr. (Eds.), *Proceedings of the 8th International Symposium on Trichoptera*. Ohio Biological Survey, Columbus, Ohio, pp. 339–342.
- Morse, J.C. (2009) Trichoptera. *In*: Resh, V.H. & Cardé, R.T. (Eds.), *Encyclopedia of Insects*, 2<sup>nd</sup> Edition. Elsevier, New York, New York, pp. 1015–1020.
- Wallace, A.R. (1876) *The Geographical Distribution of Animals, with a Study of the Relations of Living and Extinct Faunas as Elucidating the Past Changes of the Earth's Surface*. Harper & Brothers, New York, New York, in 2 volumes: volume 1, 21+503 pp., 13 pls., 5 maps; volume 2, 8+607 pp., 7 pls., 2 maps.
- Zoological Record (1961–2008) Trichoptera. Thomson Reuters. Available from [http://thomsonreuters.com/products\\_services/science/science\\_products/scholarly\\_research\\_analysis/research\\_discovery/zoological\\_record](http://thomsonreuters.com/products_services/science/science_products/scholarly_research_analysis/research_discovery/zoological_record) (accessed 9 November 2009).