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I.N. G.A.

NEWSLETTER OF THE INTERNATIONAL NETWORK OF GELECHIOID AFICIONADOS



Dear Gelechioid Aficionados,

Much time has passed since the last issue of I.N.G.A. and many things have happened in the meanwhile. To start with, two of the co-editors, Maria Heikkilä and Mari Kekkonen, have moved from Finland to North America (Maria to the U.S. and Mari to Canada) to work as postdoctoral fellows. In addition, we are very happy to welcome Vazrick Nazari, who will join us as the fifth co-editor. Vazrick is a Lepidoptera Systematist working at the Canadian National Collection (CNC), especially focusing on gelechiids. Many of you have probably seen his fascinating presentations at LepSoc and SEL meetings about lepidopterans in art and history, which one of his other topics of interest.

We would also like to announce a change in the publishing schedule. When a group of gelechioid enthusiasts decided to start producing I.N.G.A. newsletter back in 2012, we ambitiously wanted to publish two issues per year. Since then, we have realized that this goal is quite challenging to meet, mainly due to the time constraints of the co-editors. As we do not want to lose the fun of working on I.N.G.A. and turn it into a tedious and stressful task, we have decided to switch from two to one annual issue. We hope that all of you would understand our decision and continue enjoying the newsletters.

The current issue introduces two gelechioid aficionados, Ian McMillan and Mark Metz, and presents the latest insights on the phylogeny of the Gelechioidea. Also, remember to take a look at a very peculiar gelechioid moth, *Struthoscelis* sp..

As always, we would be most delighted to receive any contributions from the community to be published in the coming issues and greatly thank Jaakko Kullberg, Ian McMillan, Elina Manninen, Mark Metz, Kenji Nishida, Kari Nupponen and Jae-Cheon Sohn for providing texts and images for the current newsletter.

Finally, we are proud to announce the first I.N.G.A. symposium, which will be held at the next SEL meeting in Croatia in 2017. Stay tuned for further information!

Best wishes and very happy holidays to all!

I.N.G.A. team

Bits and pieces of gelechioid diversity



From top to bottom:

Thudaca mimodora
(Depressariidae:
Hypertrophinae) from
Australia

Photo by BIO Photography
Group, Biodiversity Institute of
Ontario/ CSIRO

Elachista adscitella
(Elachistidae) from Finland

Stathmopoda lychnacma
(Stathmopodidae) from
South Africa

Photos by BIO Photography
Group, Biodiversity Institute of
Ontario

First page: Robert Hoare
collecting (perhaps
gelechioids) in gorgeous
landscape of New Zealand.
Photo by Jaakko Kullberg

Gelechioid Aficionado:

Ian McMillan



I'm working on a revision of the taxonomy of the Australian Xyloryctinae, and for the last few years. I've been reviewing the published records and examining the methods and systematic tools used by Meyrick, Turner, Lucas, and Lower.

As everybody knows, morphological studies carried out by these entomologists in the 19th and early 20th centuries were principally based on male antennal pectination, the form of the labial palpi, and the appearance and structure of the wings. Wing venation particularly was used to erect genera; this was guided by the establishment of a few apparently simple rules that have been honoured more in the breach than the observance. A great deal of confusion has ensued.

Many existing genera are poorly defined, and most determinations are informed judgments, seen through the lens of intuition and experience.

By the time the value of genitalic studies was established, the greater part of the Australian xyloryctine taxonomy had already been published. Subsequent revision, it would seem, would depend on further dissection of genitalia, which would undoubtedly lead to a more firmly based understanding of generic relationships. However the xyloryctine male genitalia are notoriously difficult to interpret, and their study, in the presence of an inexact taxonomy, has contributed less than might have been expected. Only sporadic specimens have been dissected; without a full set of examples it is impossible to form a model that can enable any conclusion to be drawn. Evolutionary history and its relationship to subsequent morphological change is a particularly opaque subject; and at best what can be attained from speculation about morphogenesis is an awkward assemblage of partial and unfocussed views, only made even less functional by incomplete data.

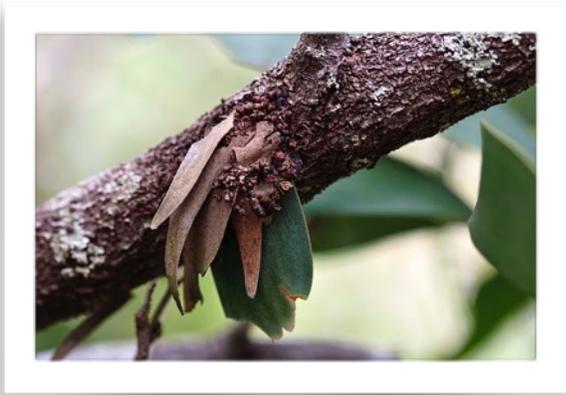
The most complete set of data and one that contains a wealth of information in terms of structural groupings is the Barcode data collected by BIO and published on the BOLD project. I have been intrigued for some time by how many familiar groupings, previously suspected from their morphology, are present in the xyloryctine Taxon Tree.

For example, one fairly small but very distinct barcode cluster contains three species assigned to *Cryptophasa*, three species assigned to *Pilostibes*, and one assigned to *Xylorycta*. Examination of male genitalia in three of these moths has confirmed exactly what the barcode data suggests, that they are closely related, and I have been able to group these species together into a proposed new



Philarista sp.

Photo by BIO Photography Group,
Biodiversity Institute of Ontario/ CSIRO



An unidentified xyloryctine larval habitus on *Acacia aulacocarpa*. The larva tunnel goes down the branch, below the opening which is sealed with silk to which frass, feculae and *Acacia phyllodes* leaves are attached. The larva feeds on the *phyllodes*, which it gathers by night, as they dry out.

Photo by Ian McMillan (<http://xyloryctinemothsofaustralia.blogspot.ca/pl/xyloryctinae.html>)

genus. This is a far from unusual occurrence. Some genera like *Lichenaula* or *Xylorycta* have accumulated large numbers of members from very tenuous evidence. Barcoding allows a great clarification of these taxonomic nightmares; not every problem has a solution, but it has been possible, paying attention to the groupings already present in the Taxon Tree, to build a reasonable framework for a taxonomy that is far more finely tuned and more appropriate to the fauna in question. Other genera sink and disappear; some merge and others can't be found. I'm not deducing a phylogeny from this data; my taxonomy, though sequential, has no categories between the genus and the subfamily. Tribal groupings do suggest themselves, but the information provided by barcoding does not lend itself to their exact definition.

I'm setting up what I think is a stable and functional hypothesis. Work is progressing well but I am looking forward to getting back to some collecting and more microscopy when I've put a working document together.

Gelechioid Aficionado:

Mark Metz

If there is such a thing as a non-taxon-based systematist, I would fit that bill. I have published systematics on four orders of insects (Diptera, Homoptera, Hymenoptera, and Lepidoptera), and although the studies and publications associated with my Ph.D. were in the family Therevidae (Diptera) I have spent the majority of my professional career studying, curating, and doing systematics on Lepidoptera. I am most fascinated with the process and methods of systematics, so it has been a pleasure and I think an advantage to have a background in taxa with such diverse morphologies and biologies. Now, I am one of the newest research entomologists with the Systematic Entomology Laboratory (SEL, United States Department of Agriculture) specializing on Gelechioidea.



As a research entomologist with SEL my responsibilities include the identification of all families of microlepidoptera intercepted at US ports of entry. The majority of these specimens are larvae, but we do get some adults in rather bad condition, making species determinations difficult. Some of the more difficult hours of my day might include trying to determine the genus of an intercepted adult moth that has not been spread, has few wing scales, no palpi, no proboscis, no antennae, and is a female! I help other laboratories (e.g., biocontrol, ecology, IPM, etc.) identify species of importance in their research and have that as a vehicle for building collaborations. Another component of my position is collection-based, as I am the curator of many of the microlepidopteran families at the United States National Museum of Natural History. Currently, I am happy to meet the needs of my colleagues any way I can, including quick, digital images of specimens and/or their dissection(s). I am a techie person and pretty good with photography.

My systematics research emphasis in Gelechioidea for the next several years will be in the Gelechiinae. I hope to clarify the relationships among the *Recurvaria*-group and complete descriptive systematics within the contained genera. I would especially like to revisit the genus *Coleotechnites* Chambers as it contains pine needle-mining forest pests, but also species with quite different feeding habits. I think this begs an investigation of the natural grouping. The holotype of *Coleotechnites citriella* Chambers is missing its abdomen so it is already a challenge at the outset and will prove to be interesting venture throughout! I am



Coleotechnites quercivorella

Photo by BIO Photography Group, Biodiversity
Institute of Ontario

also collaborating with Jean-François Landry and Vazrick Nazari on the generic placement of the important pest *Phthorimaea absoluta* Meyrick, 1917 using modern cladistic methods. And there will be a smattering of other projects in the next several years, such as the revision, placement, and descriptions of new species of *Pseudochelaria* Dietz and the identification and description of Costa Rican species amassed by Daniel Janzen and his group over the years, which will increase data density in the Barcode of Life Database. Why does Janzen get so many Dichomeridinae?

Besides the wealth in taxon diversity and the need for systematic treatments among the gelechoids, the thing that most attracts me to the group is the diverse and

unique morphology of the male genitalia. Being a functional morphologist at heart, I am looking forward to exploring these seemingly bizarre structures and their muscular attachments. I think my experience with other insect taxa will aid deciphering morphological homologies, too. As a fan of microdissection, insect morphology, and 3-D structure the gelechoids to me are like being a kid in a candy shop! I look forward to meeting all the new taxa and all the new workers of Gelechioidea!

Phylogeny of the megadiverse Gelechioidea: recent progress

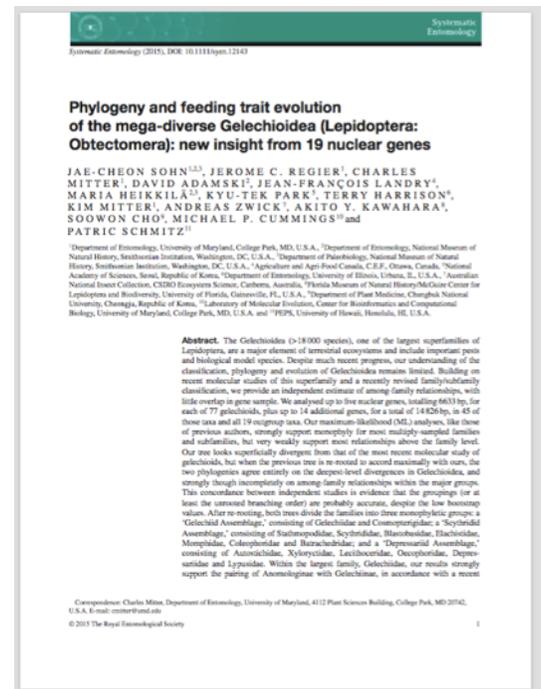
Jae-Cheon Sohn and Maria Heikkilä

Why is a certain evolutionary lineage more diverse than others? Gelechioidea provide a good example for such long-standing questions. This superfamily represents the largest radiation among microlepidopterans. A reliable classification and phylogeny are prerequisites to understanding their evolutionary history and explore the reasons underlying the success of Gelechioidea in extant global biodiversity. However, their explosive diversification has led to convergence in their morphology and posed challenges in establishing a natural classification for the group. Proposed classifications have not gained universal consensus and different classifications have been in contention.

This situation has remarkably changed due to recent progress in molecular systematics and the use of these methods in phylogenetic studies on Gelechioidea. Importantly, these efforts have observed repeated phylogenetic signals (i.e. recurring similarities in the results of studies on the relationships among taxa) with independent data sets that were limited in the previous morphological approaches. Recently, Heikkilä *et al.* (2014) expanded the molecular data and taxon sampling of Kaila *et al.* (2011) to 155 taxa representing the diversity of Gelechioidea and combined these with morphological data. Based on their phylogeny, they proposed a revised classification for Gelechioidea into 16 monophyletic families. About a third of these, however, had very weak statistical support, and with one exception, relationships among the families were very weak. As part of the Lepidoptera Tree of Life (“Leptree”) project, we (Sohn *et al.* (2015))* sought to test and extend the conclusions of Heikkilä *et al.* (2014) by analyzing an independent data set of up to 19 genes sequenced from 70 gelechioids. Interestingly, our study largely agreed with the recent classification of Gelechioidea by Heikkilä *et al.* (2014), often with better support values, and found some previously undetected phylogenetic relationships (for example, the lecithocerid association of *Idioglossa*). The taxon sampling in our study was, however, lower and for example no species of the family Pterolonchidae were included.

The results are summarized below:

1) In our analyses, as in Heikkilä *et al.* (2014), support for the monophyly of most families and subfamilies is strong, but most relationships above the family level are very weakly supported.



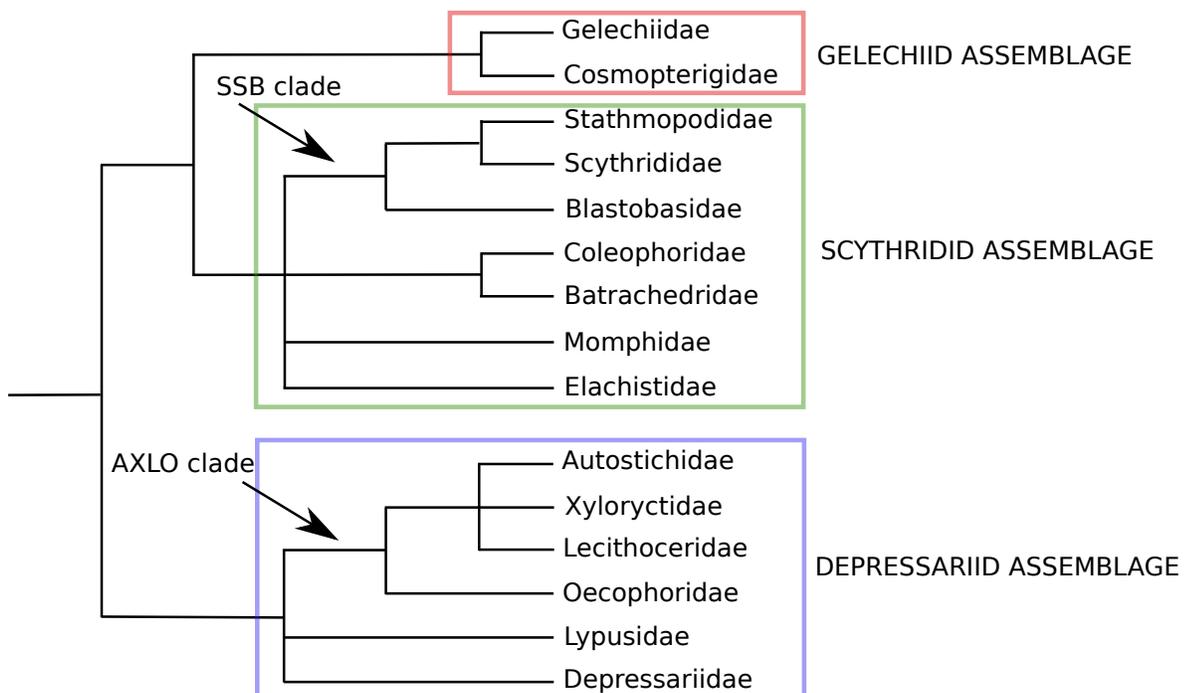
2) Nonetheless, when the tree of Heikkilä *et al.* (2014) is re-rooted (i.e. the place of the ancestral lineage changed) to agree maximally with our tree, the two trees agree entirely on the deepest-level divergences within Gelechioidea. This concordance between independent studies is evidence that the groupings (or at least the unrooted branching structure) are real, despite the low support values.

3) After re-rooting, both trees divide the gelechioid families into three monophyletic groups: a 'Gelechiid Assemblage' consisting of Gelechiidae and Cosmopterigidae; a 'Scythridid Assemblage' consisting of Stathmopodidae, Scythrididae, Blastobasidae, Elachistidae, Momphidae, Coleophoridae and Batrachedridae; and a 'Depressariid Assemblage' consisting of Autostichidae, Xyloryctidae, Lecithoceridae, Oecophoridae, Depressariidae and Lypusidae.

4) The Gelechiid Assemblage is weakly supported in our results, but has a very strong support in Heikkilä *et al.* (2014).

5) Within the largest family, Gelechiidae, our results strongly support the pairing of Anomologinae with Gelechiinae, also seen in the gelechiid study by Karsholt *et al.* (2013), albeit with weak support. Relationships among the other subfamilies, however, conflict moderately to strongly between studies, leaving intra-familial phylogeny unsettled.

6) Within the Scythridid Assemblage, both trees support an 'SSB clade' consisting of Blastobasidae+ (Scythrididae+Stathmopodidae). These relationships are supported weakly by Heikkilä *et al.* (2014) but strongly by our results. Coleophoridae+Blastobasidae is supported, albeit weakly, in both trees, and only Momphidae differs in position between them.



Consensus tree of Sohn *et al.* (2015) and Heikkilä *et al.* (2014), excluding Pterolonchidae, not sampled by Sohn *et al.*

7) Within the Depressariid Assemblage, both trees support an 'AXLO' clade consisting of Autostichidae, Xyloryctidae, Lecithoceridae and Oecophoridae. Monophyly of this clade and relationships therein are supported weakly in Heikkilä *et al.* (2014) but strongly in our results. Depressariidae, monophyletic in Heikkilä *et al.* (2014), are paraphyletic with respect to both the AXLO clade and Lypusidae in our tree, but the evidence against depressariid monophyly is very weak. There is moderate support for a core group of Depressariidae consisting, among the seven subfamilies we sampled, of Depressariinae, Aeolanthinae and Hypertrophinae.

8) Based on the most recent phylogeny, feeding on live plants seems to have been the ancestral condition in Gelechioidea and saprophagy has evolved multiple times, but is concentrated primarily in the 'AXLO' clade. Among feeders of living-plant material, concealed external feeding has probably been the ancestral state. The multiple origins of internal feeding of various kinds seem to be restricted mostly to the Scythridid and Gelechiid Assemblages.

Like any previous molecular study for Gelechioidea, our study was based on a limited taxon sampling. Molecular data are still unavailable for many important groups that may help fill the gaps among unique lineages. A better sampling scheme in genes and taxa will help resolve uncertainties in recent molecular studies. Our study shows a promise of molecular phylogenetics in resolving the mega-diverse Gelechioidea. Encouraged by this promise, the Leptree team is currently applying the 'Next-Generation Sequencing' technology to the phylogeny of Gelechioidea. This advance may enable to establish an all the more robust classification for Gelechioidea.

*The full article **Phylogeny and feeding trait evolution of the mega-diverse Gelechioidea (Lepidoptera: Obtectomera): new insight from 19 nuclear genes**, authored by Jae-Cheon Sohn, Jerome C. Regier, Charles Mitter, David Adamski, Jean-François Landry, Maria Heikkilä, Kyu-Tek Park, Terry Harrison, Kim Mitter, Andreas Zwick, Akito Y. Kawahara, Soowon Cho, Michael P. Cummings and Patrick Schmitz was recently published in *Systematic Entomology*. <http://dx.doi.org/10.1111/syen.12143>

Other research cited in the text:

Heikkilä, M., Mutanen, M., Kekkonen, M. & Kaila, L. (2014) Morphology reinforces proposed molecular phylogenetic affinities: a revised classification for Gelechioidea (Lepidoptera). *Cladistics* 30: 563–589.

Kaila, L., Mutanen, M. & Nyman, T. (2011) Phylogeny of the megadiverse Gelechioidea (Lepidoptera): adaptations and determinants of success. *Molecular Phylogenetics and Evolution* 61: 801–809.

Karsholt, O., Mutanen, M., Lee, S. and Kaila, L. (2013) A molecular analysis of the Gelechiidae (Lepidoptera, Gelechioidea) with an interpretative grouping of its taxa. *Systematic Entomology* 38: 334–348

On the need for a Global Online Catalogue of Gelechioidea

Vazrick Nazari

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Since the birth of the “International Network of Gelechioidea Aficionados” in 2012, the I.N.G.A. newsletter has strived to serve as a news outlet for and a means for communication between gelechioid workers across the world, in the same way similar networks and newsletters have served this purpose among lepidopterists specializing on other groups of moths. The most prominent parallels to I.N.G.A. are the The Pyraloid Planet (<http://www.pyraloidea.org/index.php?id=16>) for pyraloid specialists, and TORTS (<http://www.tortricidae.com/torts.asp>) for those who work on tortricid moths.

But one conspicuous difference between I.N.G.A. and these other groups is that both pyralid and tortricid specialists enjoy the benefits of having an immensely useful online global catalogue of their respective groups, containing a vast amount of up-to-date taxonomic information immediately available to them. The Global Information System on Pyraloidea (GlobIZ), <http://www.pyraloidea.org> boasts in having “24,755 pyraloid names for 2,090 genera (+1,391 synonyms) and 15,207 species (+ 6,067 synonyms)” (Nuss, Pyraloid Planet 9:2), all accompanied by original references and history of generic transfers and status changes given in detail. The website, coordinated and hosted by the Senckenberg Collection of Natural History, Museum of Zoology (Dresden) and maintained and updated by a team of Pyraloid specialists led by Bernard Landry (Genève) and Matthias Nuss (Dresden), is a wiki-like community catalogue where everyone is

welcome to verify the information, report missing data or mistakes, and add their own contributions. Anyone can make queries to quickly find global answers, all free of charge, and contributions by community editors count as publications and are to be cited according to each contributor’s name. In addition, in every issue of the “Pyraloid Planet”, a small section is dedicated to reporting the latest updates and progress report on the latest news from the online GlobIZ catalogue.

Similarly, the online catalogue of the Tortricidae (<http://www.Tortricidae.net>)

global information system on pyraloidea

introduction systematics database newsletter feedback links acknowledgements

introduction team

Welcome to GlobIZ!

GlobIZ is an online platform for specialists working on Pyraloidea (snout moths), one of the most species rich groups of Lepidoptera (butterflies and moths); information edited in GlobIZ is freely provided at this website via the search options.

The abbreviation GlobIZ is based on the German title Globales Informationssystem Zünslerflüger, which could be translated as Global Information System on Pyraloidea. The title goes back to the originality in Germany initiated and funded project (see acknowledgements).

GlobIZ provides information on scientific names of Pyraloidea, and nomenclatorial changes applied to these names. Data editing strictly follow the rules of the International Code of Zoological Nomenclature (1999). Information given comprises the original description of a name, its current status and rank as well as generic combination of species. The information is linked to the literature references, where the nomenclatorial changes have been published.

Team members are editing data quite regular. The innovations become available to this website on a daily basis. However, editing preferably concentrates on data which are needed in the course of current projects. As a consequence, not all names are yet included or finally edited. Citations of type localities are by no means political statements.

How to cite GlobIZ

Nuss, M., B. Landry, B. Malby, F. Vegliante, A. Trübner, F. Bauer, J. Hayden, A. Segener, R. Schouten, H. Li, T. Trefilova, M. A. Sells, J. De Prins & W. Speidel 2003–2015: Global Information System on Pyraloidea. – www.pyraloidea.org

Global Information System on Pyraloidea (GlobIZ),
<http://www.pyraloidea.org>

(T@RTS), an editable digital version of the Tortricidae Catalogue published by Apollo Books (Brown, 2005), contains records for all described species of tortricids and is regularly updated by a community of contributors. The latest version available online (v.3, 2014) contains 1742 genera and 15,099 species (including synonyms) of the world Tortricidae. The website is hosted and maintained by Todd Gilligan (Fort Collins, Colorado). Besides the hierarchical representation and the possibility of searching the catalogue at various taxonomic levels, photographs of many of the primary types are also available in the online catalogue. New additions and corrections are also reported on the TORTS newsletter.

So why is it that the gelechioid community does not have a similar online platform yet?

A third example worth mentioning is the Global taxonomic database of Gracillariidae (<http://www.gracillariidae.net>). This online catalogue for Gracillariidae, created and edited by Jurate and Willy De Prins (2005) and hosted by the Belgian Biodiversity Platform, serves a similar purpose for the gracillariid community: A fully searchable catalogue that, beside full taxonomic citation, includes information about distribution, host plants, known parasitoids, and images of types of all gracillariids. As of November 2015, the database includes 147 genus-group and 2678 species-group names and 1490 photographs.

Besides these catalogues, all of these website offer many other useful features, including their online downloadable newsletter, information on higher classification, useful links, a literature library with downloadable free pdf files, and in the case of T@RTS, a host-plant database as well as links to the DNA library.

So why is it that the gelechioid community does not have a similar online platform yet? It is time for the gelechioid aficionados to make a collective effort and create the first online global catalogue of available names in Gelechioidea. Many local, regional or global (albeit taxonomically restricted) catalogues already exist in print (e.g. Sattler 1973; Hodges 1986, 1999; Ponomarenko 1997; Huemer & Karsholt 1999, 2010; and many more). An initial hierarchical platform for such a database can be created relatively quickly by uploading the contents of some of these complementary books and catalogues in digital format. This basic framework can then be enhanced and updated, with additional data added by volunteers and experts in each group over time. The Catalogue can be hosted by a recognized institution (such as the Smithsonian, or the Mississippi State University, host of I.N.G.A.) and maintained by a team of volunteers of administrators.

I encourage a group discussion and brainstorming on this subject, and formation of a steering committee to spearhead the project. Volunteer organizations willing to host the Website should investigate the possibilities, terms and conditions,

Tortricid.net
TORTRICIDAE RESOURCES ON THE WEB
VERSION 2.0

HOME CATALOGUE HOST PLANTS LIBRARY TORTS BOOK TortricidDNA ABOUT SITE MAP

T@RTS
Online World Catalogue of the Tortricidae
by T. M. Gilligan¹, J. Baixeras², J. W. Brown³, and K. R. Tuck⁴
Version 3.0 (December, 2014) - Current through early 2014
running on MS SQL Server

Introduction
Tortricid.net is pleased to offer the complete World Catalogue of the Tortricidae (T@RTS). This is a complete list of all world species, utilizing the World Catalogue published in 2005 as the foundation for the database. Version 3.0 of the online catalogue contains 15,099 records representing 10,883 species. More than 1,600 records have been updated from Ver 2.0 (Jul, 2012), and more than 3,000 records have been updated from the original catalogue. The database is completely searchable and contains photos of over 1,200 type specimens.

Search

Suprageneric Classification

Catalogue Stats

Identification Photos

T@RTS will be updated regularly both with corrections from the original world catalogue and with additions since its publication. As such, these pages will serve as the most up to date information on current tortricid nomenclature. If you find any errors in the data presented here or have any questions/comments, please use the [contact form](#) to send the authors an email.

We are indebted to all of the original authors of the World Catalogue (J. W. Brown, J. Baixeras, R. Brown, M. Horak, F. Komai, E. Metzler, J. Razowski, and K. Tuck) for providing the basis for this project. We would also like to thank the dozens of individuals who have provided corrections or updates to the database since it was first placed online in 2007.

This resource should be cited as follows:
Gilligan, T. M., J. Baixeras, J. W. Brown & K. R. Tuck. 2014. T@RTS: Online World Catalogue of the Tortricidae (Ver. 3.0).
<http://www.tortricid.net/catalogue.asp>.

1. Colorado State University, Biosciences, Soils and Pest Management, 1377 Campus Delivery, Fort

Online catalogue of the Tortricidae (T@RTS)
(<http://www.Tortricidae.net>)

Global taxonomic database of Gracillariidae
<http://www.gracillariidae.net>

and possible costs. An I.N.G.A./Gelechioid Symposium during the next SEL meeting in Croatia would be a great opportunity to finalize and kick-start this campaign.

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Bizarre World of Gelechioids:

Struthoscelis sp. (Oecophoridae)

The forewing length is 8 mm. The habitat is a tropical rainforest at 500 m elevation in Braulio Carrillo National Park, Costa Rica. The moth came to light. The hind legs are extended backwards in the air, i.e. not touching the leaf surface. It appears to be mimicking a type of white wax-covered fulgorid (Hemiptera: Auchenorrhyncha).

Photos and text by Kenji Nishida,
identification by Mark Metz



Recent Publications on Gelechioidea

Compiled by Maria Heikkilä

Articles dealing with pest or biocontrol issues are not included. Please, see I.N.G.A. issues n. 1-4 for other articles published in 2014: http://mississippientomologicalmuseum.org.msstate.edu/Researchtaxapages/Lepidoptera/Gelechioidea/INGA_newsletter.html

2014

Agassiz, D. (2014) Book Review: The Afrotropical Scythrididae, Esperiana Memoir 7. Nota Lepidopterologica 37(2): 183-184. <http://dx.doi.org/10.3897/nl.37.8444>

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Beéche C., M. A. (2014) *Gildita*, a new genus of Oecophoridae from central Chile (Lepidoptera: Gelechioidea). Revista Chilena de Entomología 39: 13–21.

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Scythris laminella, Espoo, Finland. Photo by Elina Manninen & Kari Nupponen

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