Annual Report for Period: 07/2005 - 07/2006 **Submitted on:** 06/29/2006

Principal Investigator: Wiegmann, Brian M. **Award ID:** 0334948

Organization: North Carolina State U

Title:

AToL: Building the Dipteran Tree: Cooperative Research in Phylogenetics and Bioinformatics of True Flies (Insecta: Diptera)

Project Participants

Senior Personnel

Name: Wiegmann, Brian

Worked for more than 160 Hours: Yes

Contribution to Project:

Lead PI, organization and development of project objectives, oversight of project management, budget and data collection. Molecular phylogenetic data collection, analysis, graduate and undergraduate student training in molecular systematics.

Name: Courtney, Gregory

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI, organization and development of project objectives - especially pertaining to the lower Diptera, oversight of project management, morphological data collection, supertree construction, interactive keys, taxon sampling. Phylogenetic data collection, analysis, graduate and undergraduate student training in morphological systematics, collecting and curation, natural history data informatics.

Name: Friedrich, Markus

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI, organization and development of project objectives - especially pertaining to mitochondrial genome sequencing and oversight of project management. Phylogenetic data collection, analysis, graduate and undergraduate student training in molecular genetic techniques and systematics.

Name: Meier, Rudolf

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI, organization and development of project objectives - especially pertaining to the Cyclorrhapha, oversight of project management, morphological data collection, supertree construction, taxon sampling. Phylogenetic data collection, analysis, graduate and undergraduate student training in molecular and morphological systematics, collecting and curation, natural history data informatics, combined data analysis.

Name: Yeates, David

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI, organization and development of project objectives - especially pertaining to the lower Brachycera, oversight of project management, morphological data collection, supertree construction, interactive keys, taxon sampling. Phylogenetic data collection, analysis, graduate and undergraduate student training in morphological systematics, collecting and curation, natural history data informatics.

Name: Thompson, F.

Worked for more than 160 Hours: Yes

Contribution to Project:

Data managment coordinator, organization and development of project objectives - especially pertaining to the natural history informatics, website development, nomenclature, databases, interactive keys.

Name: Kampmeier, Gail

Worked for more than 160 Hours: Yes

Contribution to Project:

Website development and implementation, database development, web tools development.

Name: Irwin, Michael

Worked for more than 160 Hours: Yes

Contribution to Project:

Collecting, data management, database development, taxon sampling, biodiversity inventories and comparative analysis of lower brachyceran flies.

Name: Beckenbach, Andrew

Worked for more than 160 Hours: Yes

Contribution to Project:

Beckenbach serves as a consultant contributor to the mitochondrial genomic sequencing components of the project.

Name: Skevington, Jeffrey

Worked for more than 160 Hours: Yes

Contribution to Project:

CNC Research Scientist (Ottawa, Canada). Dr. Skevington is contributing to the morphological and molecular analysis of lower cyclorrhaphan Diptera. He is also contributing to the compilation and scoring of the morphological dataset and analysis for all Diptera (tier 1 and 2 taxa).

Post-doc

Name: Blagoderov, Vladimir

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Blagoderov is collecting morphological and paleontological data on basal dipteran lineages in the Courtney lab at Iowa State University. He is resposible for morphological scorings, image capture and databasing, collecting and rearing lower Diptera and data analysis.

Name: Lambkin, Christine

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Lambkin is coordinating morphological dataset compilation and analysis, scoring lower brachyceran Diptera, and conducting supertree analysis. She is organizing datasets for the first tier analysis of Diptera.

Name: Barr, Norman

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Barr is sequencing multiple nuclear genes in the Wiegmann lab (NCSU) for the first tier Diptera analysis. Barr is responsible for nuclear gene primer design and for multigene phylogenetic analysis to determine phylogenetic utility of genes.

Name: Kim, Jung-wook

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Kim is sequencing multiple nuclear genes in the Wiegmann lab (NCSU). Hes is responsible for development of primers and characterization of the GART locus in Diptera and 5 additional loci.

Graduate Student

Name: Trautwein, Michelle

Worked for more than 160 Hours: Yes

Contribution to Project:

Project PhD student collecting data for thesis research on fly phylogeny; Graduate stipend and tuition are supported.

Name: Bertone, Matthew

Worked for more than 160 Hours: Yes

Contribution to Project:

Project PhD student collecting data for thesis research on fly phylogeny;
Graduate stipend and tuition are supported.

Name: Kutty, Sujatha

Worked for more than 160 Hours: Yes

Contribution to Project:

Fulltime sequencing of Calyptrates. Graduate stipend funded through National University of Singapore.

Name: Balasubramanian, Suchitra

Worked for more than 160 Hours: Yes

Contribution to Project:

Wayne State University Biotechology Master's Program student. Dipteran mitochondrial genome sequencing, stipend partially supported by project funds.

Name: Walker, Mitchell

Worked for more than 160 Hours: Yes

Contribution to Project:

Wayne State University Biotechology Master's Program student. Dipteran mitochondrial genome sequencing, stipend partially supported by project funds.

Name: Petersen, Matthew

Worked for more than 160 Hours: Yes

Contribution to Project:

Iowa State University PhD student. Phylogeny and systematics of Tipuloidea;
project supported some stipend and research funds.

Name: Curler, Greg

Worked for more than 160 Hours: No

Contribution to Project:

Iowa State University MS student. Phylogeny and systematics of
Psychodidae; project supports some research funds, stipend support from
BS&I project of co-PI Courtney.

Name: Caravas, Jason

Worked for more than 160 Hours: Yes

Contribution to Project:

Wayne State University Ph.D. graduate student (also NSF IGERT program fellow); Mitochondrial genomics of Diptera, project funds provide partial support of research costs.

Name: Petersen, Frederik

Worked for more than 160 Hours: Yes

Contribution to Project:

Petersen is a Graduate Student of the University of Copenhagen, Zoological Museum. He is conducting molecular and morphological studies of the fly superfamily Hippoboscoidea. He is supported by a ZMUC fellowship; NSF project funds supported some research costs for an 8-month molecular systematics internship in the Wiegmann lab (NCSU) 10/03- 5/04.

Name: Su, Kathy

Worked for more than 160 Hours: Yes

Contribution to Project:

Fulltime sequencing of Sepsidae. Graduate stipend funded through National University of Singapore

Undergraduate Student

Name: Singh, Dang

Worked for more than 160 Hours: Yes

Contribution to Project:

Sequencing of fly family Coelopidae, project supports materials and supplies.

Name: Hanrahan, Bob

Worked for more than 160 Hours: No

Contribution to Project:

Mr. Hanrahan is contributing to mitochondrial genome data collection and analysis in the Friedrich lab (Wayne State Univ.)

Name: Shiyang, Kwong

Worked for more than 160 Hours: No

Contribution to Project:

Undergraduate research in Meier lab (NUS) on Sepsidae phylogenetics.

Name: Lim, Gwynne

Worked for more than 160 Hours: No

Contribution to Project:

Undergraduate research in Meier lab (NUS) on Dolichopodidae phylogenetics.

Name: Hwang, Wei Song

Worked for more than 160 Hours: No

Contribution to Project:

Undergraduate research in Meier lab (NUS) on Dolichopodidae phylogenetics.

Technician, Programmer

Name: Cassel, Brian

Worked for more than 160 Hours: Yes

Contribution to Project:

Amplification and sequencing of nuclear genes for phylogenetic objectives in the Wiegmann lab. Project funds support a portion of salary.

Name: Yavorenko, Ivanna

Worked for more than 160 Hours: No

Contribution to Project:

Mrs. Yavorenko is contributing to mitochondrial genome data collection and analysis in the Friedrich lab (Wayne State Univ.)

Name: Gill, Dilip

Worked for more than 160 Hours: No

Contribution to Project:

Mr. Gill contributed to computational sequence analysis in the Friedrich lab (Wayne State Univ.)

Other Participant

Research Experience for Undergraduates

Organizational Partners

Illinois Natural History Survey

INHS servers host FLYTREE project website; support research of senior personnel Kampmeier

Iowa State University

Subcontract award supports contributions of co-PI Courtney and students.

University of Illinois at Urbana-Champaign

Subcontract supports contributions of senior personnel, Irwin and Kampmeier

Wayne State University

Subcontract agreement supports contributions of co-PI Friedrich and students.

National University of Singapore

co-PI Meier is supported by facilities and salary resources provided by NUS.

CSIRO Division of Entomology

CSIRO supports project co-PI Yeates and postdoctoral associate Lambkin

Simon Fraser University

Simon Fraser supports the participation of molecular systematist Andrew Beckenbach

University of Copenhagen

Other Collaborators or Contacts

Art Borkent (Royal British Columbia Museum, Victoria)
Jeffrey Cumming (CNC, Ottawa)
Brad Sinclair (Museum Koenig, Bonn)
Shaun Winterton, (California Department of Agriculture, Sacramento)
Thomas Pape (Zoological Museum, Copenhagen)
Bernhard Merz (Museum d'Histoire Naturelle, Geneva)
Sonja Scheffer (USDA, ARS, SEL, Beltsville).
Steve Marshall (University of Guelph, Guelph)
Stephen Gaimari (California Department of Agriculture, Sacramento)
Wayne Mathis (Smithsonian Institution, Washington DC)
Neal Evenhuis (Bishop Museum, Honolulu)
Urs Schmidt Ott (University of Chicago, Chicago)
Jerry Wilkinson (University of Maryland, College Park)
Marco V. Bernasconi, Zoological Museum, University of Zurich-Irchel
Patrick Grooteart, Royal Belgian Institute of Natural Sciences
David Barroclough (Natal Museum, Pietermaritzbug)
J. Kevin Moulton (University of Tennessee, Knoxville)
Marion Kotrba (Zoologische Staatssammlung, Munich)
Dalton de Souza Amorim (Unversidade de Sao Paulo)
Adrian Pont (Oxford University)
Benjamin Reddlings (NC State University)
John Logsdon (University of Iowa)
Michael B Eisen (UC Berkeley)
Mathias Buck (University of Guelph)
Owen Lonsdale (University of Guelph)

Activities and Findings

Research and Education Activities:

Diptera ATOL (FLYTREE)

Taxa for first and second tier phylogenetic projects have been gathered from multiple sources. The 45-taxon first tier taxon set is assembled and is being distributed among collaborators. Specimens of immature life stages are being accumulated by collaborators and distributed.

Postdoctoral associates Barr and Kim and laboratory technician, Brian Cassel, in the Wiegmann lab are generating
data from 14 nuclear genes for first tier taxa. Sequencing is being completed for 45 taxa for the nuclear genes. The full gene by taxon matrix is 75% complete. Genes that are currently being sequenced include, CAD, GART, 28SrDNA, 18SrDNA, SIA, SNF, PER, PGD, AATS, PUG, TPI, STX, G6PD, PEPCK.
Primers have been designed and synthesized to amplify these genes.

Graduate student Michelle Trautwein
is sequencing CAD and 28S rDNA for relationships of Bombyliidae and lower Brachycera/Asiloidea.
Graduate student Matthew Bertone has sequenced
full-length 28S rDNA for 60+ species of lower Diptera (Nematocera).
Phylogenetic analysis have been conducted for lower Diptera and lower Brachycera for meeting presentations and to assess phylogenetic utility of sampled genes. Secondary structure inference was used to explore alignment ambiguity.
Bayesian phylogenetic analysis of protein encoding genes,
SIA, SNF, PER, GART, PGD and TANGO were conducted to assess phylogenetic signal.
A Bayesian mulitiple sequence alignment methodology was used to assess alignment ambiguity for each protein encoding gene with collaborator Benjamin Reddlings.

Members of the Wiegmann lab began collecting data for a diverse sample of Holometabola designed to test the placement of Diptera and identify its sister-group. Four nuclear genes are being sequenced for 30 holometabolan taxa.

Collaborating scientists, Jeffrey Skevington (CNC, Ottawa) and Sonja Scheffer (USDA, ARS, SEL) are generating molecular data sets based on multiple gene regions for basal Aschiza and Cyclorrhapha (Skevington) and Agromyzidae/Opomyzoidea (Scheffer).

Co-PI Courtney, postdoctoral associate Blagoderov, and students compiled a morphological matrix and accompanying set of images (light and SEM micrographs) for lower Diptera, especially 1st tier and other taxa.

Graduate student Matthew Petersen gathered exemplars of major Tipuloid genera and, through collaboration with NCSU student Matthew Bertone, has scored adult morphological and molecular characters for collected taxa

Co-PI Meier and students at NUS are compiling the following project data sets:
Calyptrates:
A data set with 42 taxa from 12 of the 13 families was generated and analyzed using DNA sequences from 12S, COI, CytB, 28S, 18S.

Sarcophagidae:

A data set with 75 taxa is being generated using the same genes as utilized for the calyptrate relationships.

Scathophagidae:
A data set with 67 of the approximately 200 species from 22 genera was generated and analyzed using DNA sequences from 12S, COI, CytB, 28S, 16S, Ef1a, and RNA Polymerase subunit II.

Sepsidae:
Data set extended from 44 species to 71 species. Increase in gene coverage from 5 genes (COI, COII, 12S, 16S, Ef1a, 28S) to 7 (additional genes: CytB, Histone 3). Given the lack of support for some internal branches, we are adding two additional genes to the dataset.

Coelopidae:
Data set with 32 species extended to also include CytB and Histone 3 in addition to 12S, 16S, COI, 28S, and Ef1a.

Hippoboscoidea:
Extension of Petersen & Wiegmann data set with 42 taxa (CAD, 28S) to also include COI and 16S. Dataset has been analyzed and publication is close to submission.

Dolichopodidae:
Start of combined sequencing and morphological project for the SE Asian radiations of Teuchophorus and Thinophilus.

Morphological Research:
Research on the first-tier taxa is ongoing in preparation for the Morphology workshop in mid-July in Copenhagen. Training in confocal microscopy for the imaging of insect specimens at the American Museum of Natural History. Successful transfer of the technique to the confocal microscope at the National University of Singapore.

Eight project members, Wiegmann, Yeates, Meier, Pape, Courtney, Sinclair, Skevington, and Lambkin met at a week long Morphology workshop in mid-July 2005 in Copenhagen. A list of 484 morphological characters prepared in collaboration with the morphological team from previous works amalgamated and disseminated by Lambkin prior to the workshop was discussed, character by character and state by state. By the end of the workshop, the list was refined and reduced to 367 characters. Lambkin prepared and disseminated referenced morphological character lists, and empty NEXUS matrices to the entire group. In January 2006, it was discovered that some of the team had scored earlier versions of the matrix. Lambkin brought those matrices up-to-date for rescoring. Lambkin continues to refine the morphological character list, and NEXUS matrix and disseminate changes to the team. Lambkin and Kampmeier are investigating methods for storing images from the project in Morphbank and the possibility of disseminating those images through NEXUS Illustrator.

Research is beginning on the Calyptratae; a specimen collection with 76 species was assembled and the DNA extractions and sequencing has started.
All gene sequences for 6 genes from Genbank and two morphological data sets for Calyptrates have been compiled into a supermatrix

The FLYTREE website http://www.inhs.uiuc.edu/cee/FLYTREE/ debuted 23 April 2004. The website features information about the Diptera Tree of Life project, its participants and collaborators; information about flies and links to

more information for many interests and interest levels about flies; fly morphology and phylogeny, including a current conception of supertree of the Diptera; links to the BioSystematic Database of World Diptera and the Tree of Life; publications and products related to the project; and pictures or links to pictures of flies. Species pages for the targeted species in the 1st tier study are under development.

Co-PI Friedrich and students at Wayne State Univ. Species have completed sequencing the full coding region of the mitochondrial genomes of the following species:
Haematopota pluvialis, Musca domestica,Glossina morsitans
Lonchoptera uniseta.
Species for which mt genome sequencing has been completed during the past year of funding: Sepsis cynipsea, Delia radicum, Sarcophaga bullata, Scatophaga stercoraria.
Species for which mt genome sequencing is currently in progress:
Exorista larvarum (40%), Phytomyza ilicicola (20%), Minettia spec. (80), Megaselia scalaris (20%), Episyrphus balteatus (20%),
Sequence assembly and evaluation are now fully computationally executed using Phred and Phrap software on a designated PC work station.
Suchitra Balasubramanian defended her M.S. thesis: Sequencing the mitochondrial genome of the horse fly, Haematopota pluvialis
Graduate student Jason Caravas has begun annotating completed mitochondrial genome sequences using DOGMA (Automatic annotation of organellar genomes with DOGMA. Wyman SK, Jansen RK, Boore JL, Bioinformatics 2004 20(17):3252-3255.), and analyzing preliminary trees using ML, NJ, and Bayesian methods.

Beckenbach and students are generating full mitochondrial genome sequences for 18 dipteran taxa and two outgroups: Tipula abdominalis (90% complete - 90%), Protoplasma fitchii (30% complete - 4.6 kb), Arachnocampa flava (75% complete - 11.4 kb), Bradysia amoena (75% complete - 11.7 kb), Mayetiola destructor (60% complete - 8.9 kb), Nymphomyia dolichopeza (20% complete - 3.0 kb),Edwardsina gigantea (70% complete - 10.5 kb); Chironomus tepperi (87% complete - 13.0 kb), Sylvicola fenestralis (55% complete - 8.4 kb),
Exeretonevra angustifrons (45% complete - 7.0 kb),
Hermetia illucens (70% complete - 10.6 kb), Ogcodes basalis (20% complete - 3.0 kb), Asilis crabroniformis (85% complete - 13.5 kb), Acrosathe novella (10% complete - 2.0 kb), Bombylius major (95% complete - 14.5 kb), and outgroups Xenos vesparum (25% complete - 3.2 kb), Microchorista philpotti (60% complete - 9.1 kb).

Co-PI Yeates, CSIRO has continued the development of the interactive key to fly families, and the interactive glossary of fly anatomy. In addition Yeates, Lambkin, Wiegmann, and Meier continued analyses of supertrees covering the entire order Diptera.
Lambkin is completing a paper on her supertree analyses which summarize 24 phylogenetic studies using modern techniques to produce the first overall phylogeny for the family Therevidae.
Lambkin has submitted the paper on supertree analyses of the Family Therevidae.

Lambkin has amalgamated a morphological character list developed for the lower Diptera (Courtney), lower Brachycera (Yeates and Sinclair), and Schizophora (Pape, Meier, Thompson) including immature, pupal, and adult characters. This list describing 405 characters and states has been disseminated, in both word and NEXUS formats, to all groups for preliminary scoring and refinement.

Lambkin amalgamated a list of 484 morphological characters for the July 2005 workshop, in Copenhagen. After discussion, the list was reduced to 367 characters. Lambkin continues to refine and disseminate changes to the referenced morphological character list

and NEXUS matrix to the entire team.
Lambkin and Kampmeier are investigating methods for storing images from the project in Morphbank and the possibility of disseminating those images through NEXUS Illustrator.

Co-PI Courtney, postdoctoral associate Blagoderov, and students compiled morphological matrix for lower
Diptera, especially 1st tier and other taxa. Special emphasis was given to image capture and scoring larval morphology of lower dipteran taxa, including Axymyiidae, Nymphomyidae, Tanyderidae, Thaumaleidae, Trichoceridae, Lygistorrhinidae, and Keroplatidae.

Database Activities
After the Tangalooma meetings (post-International Congress of Entomology, August 2004), Gail Kampmeier began building a registration database in FileMaker 7 that was to be accessible via the web to collaborators for tracking work being done or proposed on various tiers of taxa for the FLYTREE project. This database has been available since January 2005 to registered users.

Mandala 6.5, will be the last version of the Mandala database to utilize FileMaker Pro 5.x/6. The database structure is undergoing a massive overhaul in anticipation of its migration to FileMaker 7, which is significantly different from previous versions of this database engine. Vestigial appendages in this 10 year old Mandala database structure are being pruned, all field names, relationships among files/tables, scripts, layouts, & value lists are being renamed with core conventions that should make it easier for users and future developers to find the information they need to manage their data. New features include management of bioinventories and tools for conducting a biodiversity blitz (outreach event), and the registration database will become a part of the suite once Mandala is in version 7 (with FileMaker 7). Proposed Darwin Core 2 fields <http://darwincore.calacademy.org/Documentation/DarwinCore2Draft_v1-30_HTML> are included and named as appropriate.

Gail Kampmeier was invited to attend the GBIF (Global Biodiversity Information Facility http://www.gbif.org) experts workshop on identifying the impediments to databasing entomological collections in Columbus, OH 24-25 February 2005 and presented a talk, ôDatabasing Insect Collections: A View from a PEET.ö Her participation in this workshop was likely a catalyst to be nominated, through TDWG (Taxonomic Databases Working Group, of which she is a member), to GBIFÆs DIGIT (Digitization of Natural History Collections) Science Subcommittee http://www.gbif.org/GBIF_org/whoiswho/; she is now serving a 2-year term on this committee. She also had the opportunity to serve on the NSF review panel for Biological Research Collections 26-28 October 2005. Here she gained additional perspective on grantsmanship and came away realizing how important it will be to ôDiGIRizeö Mandala, the database system originally designed for the NSF PEET (Partnerships for Enhancing Expertise in Taxonomy), so that it will be able share its data on a broader scale within the taxonomic community (http://www.digir.net/)

Kampmeier was invited to the Canadian National Collection to talk with scientists and present the Mandala database system 29-31 March 2005. They made the decision to use Mandala 7 when it was released, to document their collections and it is being modified for their use at an institution level. Because of the development (summer 2005) with the UIUC Office of Technology Management of a non-exclusive research/internal business use license to the Mandala database software, which is now distributed with all Mandala demos, all users should be able to benefit from the advances being made by the CNCÆs institutional implementation of Mandala and their working in making it compatible with

the DiGIR protocol.

The FLYTREE database tracks the progress and stewardship of the data being developed by researchers attached to the project around the world. It has been available since January 2005 to authorized users via instant web publishing through a browser, and through FileMaker Pro 7/8. The results of the tier 1 progress are featured on the FLYTREE website http://www.inhs.uiuc.edu/cee/FLYTREE/speciespgs.html and links to species pages are under development. The features developed in the FLYTREE database will be folded into Mandala's structure, now that the transition to FileMaker 7/8 has been made. The upgrade of Mandala 7.01c was released in March 2006, and culminates nearly a year of work completely reviewing, renaming (to a more standardized and logical format), and revamping the database layouts, scripts, value lists, relationships, and field names and doing extensive structural 'cleaning' before upgrading it to FileMaker Pro 7/8. A chapter was also finished in February 2006 on Mandala's structure and history (see publications).

The FLYTREE website (http://www.inhs.uiuc.edu/cee/FLYTREE/) was updated in February and further in March 2006 after meeting 10-13 March with the PIs of the project at the joint meeting of all of the NSF AToLs and Pubis (Planetary Biodiversity Inventory) at Duke University. Mandala will be serving species pages to the web once the new web interface debuts. Also in conjunction with FLYTREE, I attended the lecture and workshop for the National Center for Biotechnology InformationÆs (NCBI) Field Guide to GenBank and Molecular Biology Resources on 22 September 2005.

A FileMaker database was developed by postdoc, J. Kim, to hold data that will be used to generate species pages that will be served by the FLYTREE website.

Expeditions:
COWEETA HYDROLOGIC LAB LTER, NC. 11/04. Courtney, Wiegmann, Blagoderov, Peterson, and Bertone collected lower dipteran larvae and adults. Several target taxa were collected including Thaumeleidae, Nymphomyiidae, Tanyderidae, Axymyidae, and Trichoceridae.

SAN BERNADINO MTNS, CALIFORNIA. 5/05. Wiegmann, Yeates, Irwin, Trautwein, Winterton, and Gaimari collected Diptera in the Angeles Crest and San Bernadino Mtns near Wrightwood and in the Owens Valley nr Lone Pine. Malaise traps, hand netting and yellow pan traps were used to obtain a large sample of important fly specimens for the ATOL project. The rare species, Apystomyia elinguis (Hilarimorphidae) was collected in large numbers for the first time since the 1940's.

AUSTRALIA: VICTORIA & NSW. Lambkin began a long-term trapping program for flies through the Gippsland area and the coastal regions of south-eastern Victoria, in the isolated, inaccessible Tinderry Nature Reserve and the state forests and National Parks of south-eastern New South Wales. 8 large Hocks and 20 smaller Sharkey Malaise traps were erected, and checked monthly for 5 months from early December 2004 to late April 2005, over summer and autumn. Light trapping was carried out in Tinderry Nature Reserve in December. Hand collecting occurred at each sample collection visit. Several target groups were collected including Therevids, Acrocerids, and Xylophagids.

COWEETA HYDROLOGIC LAB LTER, NC. March, 2005. Courtney, Blagoderov, and Peterson collected lower dipteran larvae and adults. Several target taxa were collected including Thaumeleidae, Nymphomyiidae, Tanyderidae, Axymyidae, and Trichoceridae.

MALHEUR FIELD STATION and ANDREWS EXPERIMENTAL FOREST LTER, OR. August, 2005. Courtney, Skevington, Blagoderov, and Peterson collected lower dipteran larvae and adults.

Several target taxa were collected including Thaumeleidae, Blephariceridae, and various Tipuloidea and lower Brachycera.

MALAYSIA: various locations in Johor state were sampled by Meier and students.

Skevington continues to build the CNC tissue collection (available to all members of FlyTree). 2005 trips included Alaska, Denmark, Fiji and Oregon.

Findings:

Sequences have been obtained for newly characterized nuclear genes for dipteran systematics. The following genes have been completed for the first tier (45 taxa total): PER: 33 taxa, TANGO 10 taxa; CAD 44 taxa; GART (segment A and B): segment A, 21 taxa; segment B, 10 taxa; SNF: 37 taxa; SIA: 37 taxa; PGD: 43 taxa; AATS: 40 taxa G6PD: 29 taxa ;PEPCK 33 taxa ;PUG: 26; STX 11; TPI: 37 taxa; 18S rDNA 45 taxa; 28S rDNA: 45 taxa.

Preliminary analysis of the first tier data set reveals strong support for major lineages of Diptera. Bayesian and parsimony analysis supports: Diptera, Culicomorpha, Bibionomorpha, Brachycera, Heterodactyla, Eremoneura, Cyclorrhapha, Schizophora and Calyptratae. The molecular data support a generally robust and well-resolved topology, but individual genes conflict in their support for specific resolutions in weak areas to of the topology. A major finding is that no single gene supports the best fitting toplogy with positive Bremer values throughout the tree.

Postdoctoral associate Kim developed new primers for the protein encoding gene GART for a broad range of flies. The target region of GART is about 2.2K, which was divided into two segments for amplification (segment A and B). Each PCR amplification should yield 1.1K size of products. Primer modification proves necessary for amplification across broad taxonomic ranges. Both GART segments amplified well with a modified touch-down PCR program. The aligned sequences showed levels of divergence that should help resolve higher-level of dipteran relationships.
SNF and SIA:
Seven in absentia (sia or sina) is easily amplified using Drosophila-based primers. Sans fille (snf) also can be easily amplified for sequencing. Modified primers for both genes were developed for easier amplification of diverse dipteran taxa.
New candidate genes:
Syntaxin, phosphogluconate dehydrogenase (pgd), and glycogen synthase are good candidates based on successful PCR amplification. After analyzing the available primers for these genes, we developed new primers based on D. melanogaster and A. gambiae sequences for taxon specific exon amplifications.

Phylogenetic analysis of full-length 28S rDNA in basal Diptera using Bayesian and parsimony methods yield well-supported clades among basal Diptera. In particular, molecular data support the monophyly of the order, a basal position for the Deuterophlebiidae, monophyly for the Tipuloidea, monophyly for the Culicomorpha, Psychodomorpha, and Bibionomorpha. This data supports a the Brachycera as sister-group to the Bibionomorpha. Secondary structure based alignment improves support for tree estimates from these data.

Phylogenetic analysis of 28S and CAD in the Bombyliidae shows only weak support for expected groupings based on comparative morphology. Notable findings include, monophyly for the family including a basal position for the Mythicomyiidae and support for several subfamilies. Increased sampling of

genes and taxa is underway.

Analysis of 28S rDNA and CAD in Asiloidea and Eremoneura reveals strong support for family-level groups. The enigmatic genus Apystomyia is placed as a basal eremoneuran taxon sister to all Cyclorrapha. Morphological and additional molecular data corroborate this finding.

Assessment of clade support in Calyptratae based on the analysis of the supermatrix of concatenated GENBANK sequences shows little resolution among major lineages. GENBANK coverage is still too sparse to provide phylogenetic support for most dipteran lineages.

First instar larval and pupal stages for scoring of morphological characters is proving difficult. In many cases immature stages have never been recorded for the taxa specified, not even at the generic or tribal level. Even specialized collecting events may not provide specimens as taxonomic identification is difficult, if not impossible, unless the immature develops into an adult.

Supertree analysis for the Order Diptera based on 13 published works shows strong support for major lineages, with some areas of controversy surrounding complex morphological interpretations (basal Eremoneura) or ancient radiations (lower Diptera).

Data for Scathophagidae have been subjected to an extensive sensitivity analysis and results are will be published in Cladistics (in press). The Hippopboscoidea has been fully analyzed and a manuscript has been prepared for publication. The Calyptrate, Sarcophagidae, and Sepsidae datasets have been subjected to analysis and points of weakness have been identified which are being addressed through additional sequencing.

Training and Development:

Michelle Trautwein, Frederik Petersen, Jason Caravas, Mitchell Walker, Suchitra Balasubramanian, Sujatha Kutty, Brian Cassel, matthew Petersen, Owen Lonsdale, and Matthew Bertone gained valuable laboratory and analytical training in molecular genomics techniques applied to the successful amplification, sequencing and analysis of nuclear protein encoding genes for insect systematics.

Project graduate students, Matthew Bertone, Michelle Trautwein, Sujatha Kutty and Frederik Petersen attended the FLYTREE workshop, Tangalooma Australia (9/2004).

In October 2004, Gail Kampmeier attended a 4-day intensive training course in FileMaker Pro 7 in Reston, VA, sponsored by The Support Group. Her goal was to more quickly absorb the implications of the changes and new techniques that would be needed to convert Mandala from its current form to the new relational structure in FMP 7, with advantages in security, better web hosting, and efficiencies of a multiple table file structure.

Additional education/training efforts include:
-Graduate student training in phylogenetic methods at CSIRO Entomology, supervised by Lambkin, provided to David Carlisle. Carlisle, is working on an Honours project at Australian National University, examining the phylogenetic signal from the male genitalia in the first comprehensive morphologically-based phylogeny of the Australian Therevidae, including 55 Australian taxa.

-Training of one undergraduate student, Chris Manchester, and one graduate student, Sarah Fayed, in capture, rearing, and species recognition of leaf mining flies (Diptera: Agromyzidae),their hosts and hymenopteran parasitoids at CSIRO Entomology, supervised by Lambkin, John La Salle, Scheffer, and Yeates, as part of a three month CSIRO Summer studentship from Dec 2005 to Feb 2006.

-Training in molecular techniques at CNC, course coordinated by Skevington and provided to Diana Barnes, Lisa Bartels, Andy Bennett, Patrice Bouchard, Scott Brooks, Jeff Cumming, and Anthony Davies. Since Skevington needed to train his new technician (Bartels), he decided to coordinate training for all departmental staff who were interested. Bartels is working directly for Skevington, sequencing lower cyclorrhaphan flies for FlyTree. Barnes and Bennett are working on the Hymenoptera Tree of Life project, sequencing ichneumonoids.

- Graduate student, Jason Caravas and postdoctoral student, Norman Barr attended the ATOL meeting, Arlington VA (11/04).

- Graduate student, Jason Caravas completed the 2005 Woods Hole Marine Biological Laboratory Workshop ôMolecular Evolutionö

- training of two graduate and one undergraduate student (Singapore)

- grad student training in mitochondrial sequencing at Wayne State

- graduate student training in phylogenetic methods at Iowa State University.
-undergraduate research training experiences supported in the Friedrich and Meier laboratories.

- Graduate Student training internships in molecular systematics in the Wiegmann lab for the use of nuclear protein coding genes were completed by the following students: Nathalie Erbout (9/05; Belgium), Torsten Dikow (6/05; Cornell), Sujatha Kutty (12/06; Singapore), Matthew Petersen (1-4/06; Iowa State); Owen Lonsdale (1-4/06; Guelph); Daniela Takiya (Illinois; 6/05).

Project graduate students, Matthew Bertone, Michelle Trautwein, Matthew Petersen, Greg Curler attended the North American Dipterists Society meeting, Malheur Field Station, Oregon (August 2005).

Courtney taught Advanced Systematics (Bot/Ent 568), including introduction of a novel assignment on species descriptions. The assignment included descriptions of actual new species that had been collected by the instructors. Outcomes (thus far) include the following peer-reviewed publications: 3 published papers, 1 paper in press, 1 paper in review, and 2 papers close to being submitted. Students are lead authors on all publications. A news release on this activity is at http://www.las.iastate.edu/newnews/systematics.shtml

-Co-PI Friedrich directed undergraduate and high-school traineeships for Ivanna Yavorenko,Dilip Gill and Mithun Neral (high school student from Detroit Country Day High School).

Laboratory Exchanges:

Brian Wiegmann and Greg Courtney visited CSIRO ANIC September 2004 working with Yeates and Lambkin after the International Congress of Entomology.

Frederik Petersen (University of Copenhagen) came to the Meier lab for one month to add additional genes after starting the Hippoboscoidea data set in the Wiegmann lab (10/04)

Christine Lambkin visited Irwin's lab June 2004 and WiegmannÆs lab in July 2004.

Wiegmann visited the Courtney lab to present a seminar, interact with students, and exchange data(3/05).

Sujatha Kutty visited the Wiegmann lab for one month, 12/05.

Matthew Petersen visited the Wiegmann lab in January and February 2006.

Sonia Scheffer (USDA, ARS, SEL, Beltsville) visited CSIRO in December 2005 to collect and helped supervise the work of two students on Australian leaf mining flies.

Outreach Activities:

Additional print and media releases: Diptera web products featured in NCSU Perspectives Magazine Spring 2004; http://www.cals.ncsu.edu/agcomm/magazine/spring04/beautiful.htm

Science, Web Watch, 11/04.
2005.03.18. Interview for Channel News Asia (TV).
2005.02.28. Interview for Tamil Murusa (newspaper)
2005.02.05. Interview for Vasantham Central (TV)

Kampmeier coordinated the databasing activities and volunteers for the 2005 Busey Woods BioBlitz (24-25 June), and subsequently wrote an article for INHS Reports 386: ô24 hours: the 2005 Busey Woods BioBlitzö (http://www.inhs.uiuc.edu/~gkamp/downloads/24hrs_BWBB.pdf).

Wiegmann presented 'Flies, Flies, Flies' to Raleigh primary school's Science Night. 5/05.

Journal Publications

Yeates, D.K., Harvey, M. and Austin, A., "New estimates for terrestrial arthropod species-richness in Australia.", Records of the South Australian Museum Monograph Series, p. 231, vol. 7, (2004). Published

Yeates, D. K. R. Meier, and B. M. Wiegmann., "Phylogeny of true flies (Diptera): A 250 million year old success story in terrestrial diversification.", Entomologische Abhandlungen, p. 119, vol. 61, (2003). Published

Lambkin, C.L., and Yeates, D.K., "Partitioned Bremer support localises significant conflict in bee flies (Diptera: Bombyliidae: Anthracinae)", Invertebrate Systematics, p. 351, vol. 18, (2004). Published

Wiegmann, B.M., B. K. Cassell, and D. K. Yeates., "Phylogenetic relationships of the dipteran suborder Brachycera (Insecta); a synthesis of multiple nuclear genes and morphology.", Systematic Entomology, p. , vol. , ( ). in Preparation

Laamanen, T. R., R. Meier, M. A. Miller, A. Hille, and B. M. Wiegmann, "Phylogenetic analysis of Themira (Sepsidae: Diptera): sensitivity analysis,
alignment, and indel treatment in a multigene study", Cladistics, p. 258, vol. 21, (2005). Published

Savage, J., T. A. Wheeler, and B. M. Wiegmann, "Phylogenetic analysis of the genus Thricops Rondani (Diptera: Muscidae) based on molecular and morphological characters", Systematic Entomology,, p. 395, vol. 29, (2004). Published

Austin, A. D., Yeates. D. K., Cassis, G., "Insects down under - Diversity, endemism and evolution of the Australian insect fauna: examples from select orders", Australian Journal of Entomology, p. 216, vol. 50, (2004). Published

Clarke, A.R., K.F. Armstrong, A.E. Carmichael, J.R. Milne, S. Raghu, G.K. Roderick and D.K. Yeates, "Invasive phytophagous pests arising through a recent tropical evolutionary radiation: The Bactrocera dorsalis complex of fruit flies", Annual Review of Entomology, p. 293, vol. 50, (2005). Published

Wiegmann, B. M., Yeates, D. K., Hill, H.N., J.K. Moulton, Yang, L. L., Hauser, M., Holston, K. and M. E. Irwin, "Phylogeny of the Therevidae based on multiple nuclear genes", Insect Systematics and Evolution, p. , vol. , ( ). In Preparation

Lambkin, C.L., Recsei, J.M. and Yeates, D.K., "Systematic revision of Johnmannia Irwin and Lyneborg (Diptera: Therevidae): Atypical metallic stiletto flies from Australian mesic habitats", Zootaxa, p. 1, vol. 866, (2005). Published

Schnell e Schuehli, G., C. J. Barros de Carvalho, and B. M. Wiegmann., "Regarding the Taxonomic Status of Ophyra, 1830 Robineau-Desvoidy (Muscidae): A Molecular Approach.", Zootaxa, p. 1, vol. 712, (2004). Published

Meier, R., and Farhan Ali, "Software Review. The newest kid on the parsimony block: TNT (Tree analysis using new technology)", Systematic Entomology, p. 179, vol. 30, (2005). Published

Damgaard, J., N. M. Andersen, and R. Meier, "Effects of alignment and taxon sampling in combined molecular and morphological analyses of water strider phylogeny (Hemiptera-Heteroptera, Gerromorpha)", Systematic Entomology, p. 289, vol. 30, (2005). Published

Hartley, C.J., Newcomb, R.D., Russell, R.J., Yong, G.G., Stevens, J.R., Yeates, D.K., La Salle, J. and Oakeshott, J.G., "Amplification of DNA from preserved specimens shows blowflies were preadapted for the rapid evolution of insecticide resistance.", Proceedings of the National Academy of Sciences of the U.S.A., p. 8757, vol. 103, (2006). Published

Bowman, D. and Yeates, D.K., "A remarkable moment in Australian biogeography", New Phytologist, p. 208, vol. 170, (2006). Published

Yeates, D.K., Irwin, M., and Wiegmann, B.M., "Evocoidae (Diptera: Asiloidea), a new family name for Ocoidae, based on Evocoa, a replacement name for the Chilean genus Ocoa Yeates Irwin and Wiegmann 2003.", Systematic Entomology, p. 373, vol. 31, (2006). Published

Lambkin, C. L. and Yeates, D. K., "Kapu (Diptera: Bombyliidae: Anthracinae: Exoprosopini), a replacement name for the Australian genus Kapua Lambkin and Yeates 2003.", Invertebrate Systematics, p. 161, vol. 20, (2006). Published

Ferguson, D. J. and Lambkin, C. L., "Behavioral observations of Australian stiletto flies from south-eastern New South Wales (Diptera: Therevidae).", The Australian Entomologist., p. , vol. , ( ). Accepted

Allsopp, P.G. and Lambkin, C.L., "Canegrubs and cladistics: what story do adult, larval and ecological characters tell?", Australian Journal of Entomology, p. 55, vol. 45, (2006). Published

Moulton, J. K. and B. M. Wiegmann, "The phylogenetic relationships of flies in the superfamily Empidoidea (insecta: Diptera).", Molecular Phylogenetics and Evolution, p. , vol. , (2006). Accepted

Scheffer, S. J., Winkler, I.S., and B. M. Wiegmann, "Phylogenetic Relationships and Host-Use Evolution within the Leafmining Flies (Diptera: Agromyzidae)", Molecular Phylogenetics and Evolution, p. , vol. , (2006). Accepted

Holston, K. C., Wiegmann, B. M., and M. E. Irwin, "Monophyly and phylogenetic relationships of Thereva and therevine genus groups (Insecta: Diptera: Therevidae) based on EF-1a, 28S rDNA, and mt16S rDNA sequences", Invertebrate Systematics, p. , vol. , ( ). Submitted

Winterton, S. L., Wiegmann, B. M., and E. I. Schlinger, "Multiple gene phylogeny does not reflect traditional morphology based classification

of
small-headed flies (Diptera: Acroceridae).", Systematic Entomology, p. , vol. , ( ). Submitted

Schnell e Schuli, G., Carvalho, C. and B. M. Wiegmann, "Muscidae (Diptera, Calyptratae) molecular phylogeny: new ideas in a congruence context", Invertebrate Systematics, p. , vol. , ( ). Submitted

Wiegmann, Kim, J., and N. Barr, "The use of protein-coding genes in the reconstruction of higher-level relationships in insects: standard genes and newcomers", Entomologische Abhandlungen, p. , vol. , ( ). in preparation

Simon, C., T.R. Buckley, F. Frati, J.B. Stewart and A.T. Beckenbach, "Mitochondrial phylogenetics from the perspective of the data and an updated compilation of
conserved PCR primers", Annual Review of Ecology and Systematics, p. , vol. , (2007). Accepted

Gibson, J.F., & G.W. Courtney, "Revision of the net-winged midge genus Horaia Tonnoir and its phylogenetic relationship to other genera within the tribe Apistomyiini (Diptera: Blephariceridae)", Systematic Entomology, p. , vol. , ( ). Submitted

Curler, G.R., J. Phasuk, J. Chanpaisaeng, & G.W. Courtney., "A new species of Horaiella Tonnoir (Diptera: Psychodidae) from Thailand", Proceedings of the Entomological Society of Washington, p. , vol. , (2006). Accepted

Phasuk, J., J. Chanpaisaeng. & G.W. Courtney, "A preliminary report of black flies (Diptera: Simuliidae) of Khao Yai National Park, Thailand", Thai Journal of Agricultural Science, p. , vol. , ( ). Accepted

Jacobson, A.J., J. Phasuk, J. Chanpaisaeng, & G.W. Courtney, "The net-winged midges (Diptera: Blephariceridae) of Khao Yai National Park, Thailand, with
description of a new species of Blepharicera Macquart", Aquatic Insects, p. 67, vol. 28, (2006). Published

Phasuk, J., J. Chanpaisaeng, P.H. Adler, & G.W. Courtney., "Chromosomal and morphological taxonomy of larvae of Simulium (Gomphostilbia) (Diptera:
Simuliidae) in Thailand.", Zootaxa, p. 49, vol. 1052, (2005). Published

ngram, K. K., T. Laamanen, N. Puniamoorthy, and R. Meier, " Lack of coevolution between male forelegs and female wings in Themira (Sepsidae: Diptera:
Insecta)", Biological Journal of the Linnean Society, p. , vol. , ( ). Submitted

Blanckenhorn, W. U., A. F. G. Dixon, D. J. Fairbairn, M. W. Foellmer, P. Gibert, K. van der Linde, R. Meier, S. Nylin, S. Pitnick, C. Schoff, M. Signorelli, T. Teder, and C. Wiklund., "Proximate causes of Rensch?s rule: Does sexual size dimorphism in arthropods result from sex differences in development time?", American Naturalist, p. , vol. , ( ). Submitted

Kutty, S. N., M. V. Bernasconi, F. Sifner, and R. Meier, "Sensitivity analysis, molecular systematics, and natural history evolution of Scathophagidae
(Diptera: Cyclorrhapha: Calyptratae)", Cladistics, p. , vol. , (2006). Accepted

Memon, N., R. Meier, A. Mannan, and K. Feng-Yi Su., "On the use of DNA sequences for determining the species limits of a polymorphic new

species in the stinkbug genus Halys (Heteroptera: Pentatomidae) from Pakistan", Systematic Entomology, p. , vol. , (2006). Accepted

Klass, K. D, and R. Meier, "A phylogenetic analysis of Dictyoptera (Insecta) based on morphological characters", Entomologische Abhandlungen (Dresden), p. , vol. , (2006). Accepted

Meier, R., S. Kwong, G. Vaidya, and P. K. L. Ng, "DNA Barcoding and taxonomy in Diptera: a tale of high intraspecific variability and low identification success", Systematic Biology, p. , vol. , (2006). Accepted

Clements, R, L. P. Koh, T. M. Lee, R. Meier, and D. Li, "Importance of reservoirs for the conservation of freshwater molluscs in a tropical

urban
landscape.", Biological Conservation, p. 136, vol. 128, (2006). Published

Lambkin, C. L., J. W. H. Trueman, D. K. Yeates, K. C. Holston, D. W. Webb, M. Hauser, M. A. Metz, H. N. Hill, J. H. Skevington, L. Yang, M. E. Irwin, and B. M. Wiegmann, "Supertrees and the Tree of Life: Generating a metaphylogeny for a diverse invertebrate family (Insecta: Diptera: Therevidae) using constraint trees and the parsimony ratchet to overcome
low taxon overlap", BMC Evolutionary Biology, p. , vol. , (2006). Submitted

Skevington, J. H., "Revision of Nearctic Nephrocerus Zetterstedt (Diptera: Pipunculidae)", Zootaxa, p. 1, vol. 977, (2005). Published

Skevington, J. H., "Revision of Fijian Collinias Aczél (Diptera: Pipunculidae)", Bishop Museum Occasional Papers: Fiji Arthropods, p. , vol. , (2006). Submitted

Skevington, J. H., J. A. Goolsby, and M. Setamou, "New Records of Pipunculidae attacking Proconiine sharpshooters ? the implications for parasitism of Homalodisca coagulata (Auchenorrhyncha: Cicadellidae: Proconiini).", The Canadian Entomologist, p. , vol. , (2006). Submitted

Skevington, J. H., C. Kehlmaier, and G. Ståhls, "Molecular barcoding: Mixed results for big-headed flies (Diptera: Pipunculidae)", Zootaxa, p. , vol. , (2006). Submitted

Books or Other One-time Publications

Yeates, D. K., and B. M.
Wiegmann, "Phylogeny and evolution of
Diptera: recent insights and new
perspectives", (2005). Book, Published
Editor(s): Yeates, D. K., and B. M.
Wiegmann
Collection: The Evolutionary Biology of Flies
Bibliography: Columbia University Press

Meier, R., "The Role of Dipterology in
Phylogenetic Systematics: The
Insight of Willi Hennig", (2005). Book, Published
Editor(s): Yeates, D.K, and Wiegmann, B.
M.
Collection: The Evolutionary Biology of Flies
Bibliography: Columbia University Press

Yeates, D.K., and Wiegmann, B.
M., "The Evolutionary Biology of Flies", (2005). Book, Published
Bibliography: Columbia University Press

Meier, R, "DNA Sequences in Taxonomy:
Opportunities and Challenges", ( ). Book, Accepted
Editor(s): Wheeler, Q.
Collection: The New Taxonomy
Bibliography: Systematics Association Special Volume

Dikow, T., R. Meier, G. G. Vaidya, J. Londt, "Biodiversity Research Based on
Taxonomic Revisions - A Tale of
Unrealized Opportunities", ( ). Book, Accepted
Editor(s): Bickel, D., R. Meier, T. Pape
Collection: Diptera Diversity: Status, Challenges, and

Tools
Bibliography: Brill Academic Publishers

Bickel, D., R. Meier, T. Pape, "Diptera Diversity: Status, Challenges, and Tools", ( ). Book, Accepted
Editor(s): Bickel, D., R. Meier, T. Pape
Collection: Diptera Diversity: Status, Challenges, and Tools
Bibliography: Brill Academic Publishers

Courtney, G.W., & R.W. Merritt, "Aquatic Diptera: Part one: Larvae of aquatic Diptera", (2006). Book, Accepted
Editor(s): R.W. Merritt, K.W. Cummins, & M.B. Berg
Collection: An Introduction to the Aquatic Insects of North America. Fourth Edition
Bibliography: Kendall / Hunt Publishing Co., Dubuque, Iowa

Courtney, G.W., R.W. Merritt, K.W. Cummins, & D.W. Webb, "Ecological and distributional data for larval aquatic Diptera", (2006). Book, Accepted
Editor(s): R.W. Merritt, K.W. Cummins, & M.B. Berg
Collection: An Introduction to the Aquatic Insects of North America. Fourth Edition
Bibliography: Kendall / Hunt Publishing Co., Dubuque, Iowa

Kampmeier, G.E. and M.E. Irwin, "Meeting the interrelated challenges of tracking specimen, nomenclature, and literature data in Mandala", ( ). Book, Accepted
Editor(s): Pape, R. Meier, and D. Bickel
Collection: Diptera Diversity: Status, Challenges and Tools
Bibliography: Brill Academic Publishers: Leiden

Rafael, J. A., and J. H. Skevington, "Pipunculidae", ( ). Book, Accepted
Editor(s): Brown, B.
Collection: The Diptera of Central America
Bibliography: INBio, San Jose

Skevington, J. H., F. C. Thompson, and S. Camras, "Conopidae", ( ). Book, Accepted
Editor(s): Brown B.
Collection: The Diptera of Central America
Bibliography: INBio, San Jose

Web/Internet Site

URL(s):
http://www.inhs.uiuc.edu/cee/FLYTREE/
Description:
This is the primary project website that will disseminate information on the Dipteran tree, explain project objectives, serve products from the project, and

function as a portal for other Diptera websites.

www.diptera.org is being developed within the project to be a major dissemination tool for information on flies, their diversity, evolution, nomenclature and identification. This site is now undergoing changes to reflect its connection to the Diptera ATOL project (FLYTREE).

Skevington, J. H. 2005b. Pipunculidae (D. R. Maddison, and K.-S. Schulz, eds.). The Tree of Life Web Project. http://tolweb.org/tree?group=Pipunculidae

Other Specific Products

Product Type:

Teaching aids

Product Description:

Yeates, D., Hastings, A., Hamilton, J., Colless, D., Lambkin, C., Bickel, D., McAlpine, D., Schneider, M., Daniels, G. and Cranston, P. (2004). Anatomical Atlas of Flies. (Produced by: Anne Hastings, David Yeates, and Joanna Hamilton; CSIRO Entomology AUSTRALIA.) www.ento.csiro.au/biology/fly/fly.html.

This Interactive Glossary to Diptera Morphology was developed by co-PI Yeates and colleagues, with partial support from ABRS and the Diptera ATOL.

This innovative, web-based interactive anatomical atlas was featured in Science magazine?s Netwatch segment in 19 November 2004 (http://www.sciencemag.org/content/vol306/issue5700/netwatch.shtml; Volume 306: 1269) and also in Biotechniques Journal Webwatch segment in June 2005 (http://www.biotechniques.com; Volume 38 (6): 845).
The Anatomical Atlas of Flies website was also chosen to be catalogued at Natural Selection (http://nature.ac.uk/) a subject-specific gateway to the natural world, jointly co-ordinated by The Natural History Museum in London and Biome, part of the Resource Discovery Network.

Sharing Information:

This glossary is served on the project website (http://www.inhs.uiuc.edu/cee/FLYTREE/index.html) and will be included in an interactive key to fly families (in development).

Product Type:

Interactive Key

Product Description:

Winterton, S.L., Skevington, J.H. & Lambkin, C.L. (2005) ?Stiletto flies of Australasia (Diptera: Therevidae)?. Lucid3 key. California Department of Food & Agriculture, CSIRO Entomology Australia, and Agriculture Canada, ver 1. (online publication). [An Interactive key to genera of Therevidae throughout Australasia; the first ever Lucid 3 key published online]. This website http://www.cdfa.ca.gov/phpps/ppd/therevidopen.htm, debuted in early 2005 and includes a Lucid3 interactive key to genera and taxon pages for all Australian genera of the Therevidae including biology, systematics, and numerous digital images of live flies. The website is featured on the CSIRO Divisional website and the ANIC website, and was written up in the CSIRO Divisional Bulletin ?Gnatter?, and was submitted for inclusion in the CSIRO Board Report

Sharing Information:

This website http://www.cdfa.ca.gov/phpps/ppd/therevidopen.htm, debuted in early 2005.

Product Type:

Interactive Keys

Product Description:

The Courtney lab currently is working on multi-access (LucID) keys to the larvae of aquatic Diptera families and to adults of Tipuloid genera. Matrices for both are finished. Completion of taxon pages are a priority for the next several months.

Sharing Information:

These keys will be available on the project website and on CD-ROM.

Product Type:

Software (or netware)

Product Description:

Hamilton, J., Yeates, D.K. et al 2006. On the Fly: An Interactive Key, Guide and Anatomical Atlas for the Australian Fly Fauna. CD ROM. Canberra: ABRS Identification Series.

Sharing Information:

CD-ROM and links to project website.

Contributions

Contributions within Discipline:

We have contributed primers and made recommendations to more 10 laboratories that are now using these nuclear genes in projects in Diptera, Hymenoptera, Neuroptera, Coleoptera, Lepidoptera, and Trichoptera. New gene development and analysis should provide several new markers for insect phylogenetics.

We have provided specimens, taxonomic and phyogenetic information to collaborators conducting research on dipteran comparative genomics (M. Eisen, UC Berkeley; J. Logsdon, U. Iowa), developmental biology (U. Schmidt-Ott, U Chicago), insecticide resistance (J. Oakschott, U Queensland), and behavior (W. Blankenhorn, Geneva).

Divergence time estimation in Brachycera and the estimates for therevoid radiations are providing baseline data for similar studies of insect and dipteran evolutionary history.

Empirical studies of supertree methods and partitioned Bremer support (PBS) are contributing to analytical and theoretical development of these areas of systematic biology.

Studies of nucleotide alignment dynamics and sensitivity analysis provide instructive empirical examples for systematic biology.

Conferences & Workshops Organized

David Yeates chaired the organising committeee of the Combined Invertebrates conference in December 2005 in Canberra Australia (www.invertebrates2005.com)

He also organised a symposium at the conference on Evolutionary Radiations in the Australian Biota at the meeting

David Yeates is co-organising the following symposia at the International

Congress of Entomology (August 2004)
1. With Dr Thomas Pape-Global goals and collaboration: Diptera in the 21st Century
2. With Dr Lyn Cook-Evolutionary radiations of Australian Terrestrial Arthropods: biological success stories from the driest continent

David Yeates Co-convenes a series of workshops (2006-2008) funded by the Australian Research Council on the Evolution of the Australian Biota http://nesuab.ees.adelaide.edu.au/page/default.asp?site=1

Yeates was invited to organize two workshops (one on Supertrees, and another on Interactive Keys) at the biennial Partnerships Enhancing Expertise in Taxonomy conference in Champaign, Illinois in September 2004. He is currently chair of the organizing committee of the combined conferences of the 7th Invertebrate Biodiversity and Conservation Conference, Australian Entomological Society, Society of Australian Systematic Biologists, and other groups, in Canberra in December 2005 (http://www.invertebrates2005.com).

A large group of FLYTREE participants and collaborators met at Tangalooma, Moreton Island, Queensland from the 22-26 August 2004 for a combined Therevid PEET and FLYTREE Conference. Wiegmann, Yeates, Courtney, Meier, Pape, Kampmeier, Thompson, Irwin, Lambkin, Winterton, Skevington, Trautwein, Bertone, Petersen, and Kutty spent three days discussing the progress so far, web-based registration system of specimens, species pages for first tier taxa, a Morphobank for Diptera, and the morphological character list prepared by Lambkin from amalgamation of Yeates, Courtney, and Pape studies. Many morphological characters for Schizophora were added by Meier, Pape, Thomson, and Skevington.

Gail Kampmeier organized the Database Mania workshop for the PEET V conference ôSpatial & Temporal Issues in Taxonomyö held in Urbana, IL September 2004. She was also Secretary of the organizing committee for the conference.

Greg Courtney organized a meeting of the North American Dipterist Society, which was held in August, 2005, at Malheur Field Station in SE Oregon. The meeting was attended by several project participants, including Courtney, Skevington, Blagoderov, Petersen, Bertone, Trautwein, and Curler. In addition to collections around Malheur Field Station, samples were gathered in the Cascade Range around the Andrews Experimental Forest LTER.

Invited Presentations

Yeates, D.K. 2004. Supertrees, Supermatrices, and HennigÆs Legacy: The Relationships of Diptera. Departmental Seminar, State University of Iowa, Ames, Iowa, February.

Lambkin, CL, DK Yeates, B Wiegmann and ME Irwin Evolutionary Radiation of Stiletto Flies in Australia Terrestrial Arthropod Radiations. Biodiversity & Biogeography, International Congress on Entomology 2004 (ICE 2004) in Brisbane, Australia, 15 - 21 August 2004.

Lambkin, CL, ME Irwin, GE Kampmeier, DK Yeates, and BM Wiegmann Rewards and Challenges of Global, Collaborative taxonomy: The Paradigm Shift Offered by PEET Global Goals & Collaboration: Diptera In The 21st Century. Systematics & Phylogeny, International Congress on Entomology 2004 (ICE 2004) in Brisbane, Australia, 15 - 21 August 2004.

Wiegmann, BM, and JK Moulton Comparative Genomics of Diptera: Mining Data Resources from GenBank to FlyBase. Diptera In The 21st Century. Systematics & Phylogeny, International Congress on Entomology 2004 (ICE 2004) in Brisbane, Australia, 15 - 21 August 2004.

Wiegmann, BM, R Meier, DK Yeates, GW Courtney, and FC Thompson. FLYTREE: Cooperative Research in Phylogenetics and Bioinformatics Towards a Dipteran Tree of Life. Diptera In The 21st Century. Systematics & Phylogeny, International Congress on Entomology 2004 (ICE 2004) in Brisbane, Australia, 15 - 21 August 2004.

Wiegmann, B. M. Multigene Systematics of Diptera: Pathways Toward a Fly Tree of Life Systematics and Biodiversity Seminar, CSIRO, Entomology, Canberra, Australia, September 2, 2004.

Trautwein, M. 2004. The phylogeny of bee flies. Entomological Society of American Annual Meeting, Salt Lake City Utah, November, 16, 2004.

Wiegmann, B. M. Flies in the Tree of Life: Strategies for Taxon Sampling in the FLYTREE ATOL, Symposium Speaker, Challenges of Incorporating Large BS & I Grants, TOL and Other Major NSF Programs, Entomological Collections Network, Meeting, December 13, 2004.

Wiegmann, B. M. FLYTREE: Cooperative Research in Phylogenetics and Bioinformatics Toward a Dipteran Tree of Life' National Science Foundation, Assembling the Tree of Life (ATOL) Conference, December 17, 2004.

Wiegmann, B. M. Flies in the morphological, fossil and molecular record Department of Entomology, The University of Illinois, Champaign-Urbana, 1/05.

Wiegmann, B. M. Genes, Fossils and the Evolutionary History of Flies, Seminar Speaker, Department of Entomology, Iowa State University, Ames, IA, 3/05.

Wiegmann, B, M. and J. Damgaard 'The use of protein-coding genes in the reconstruction of higher-level relationships in insects: standard genes and newcomers', 2nd International Meeting on Insect Relationships, Dresden Germany, September 25, 2005.

Freidrich, M. ôInterordinal insect relationships: insights from the visual system', 2nd International Meeting on Insect Relationships, Dresden Germany, September 25, 2005.

Wiegmann, B. M. 'Steps toward a dipteran 'Tree of Life' Entomological Society of America Annual Meeting, Fort Lauderdale, FL, November 8, 2005.

Wiegmann, B. M. 2006. Phylogenomics and the value of multiple data sources: Insights from the fly tree of life. Symposium speaker, New Ideas and Projects in Biodiversity Research and Systematics in the Southeastern U.S. Entomological Society of America, Annual Meeting. Wilmington, NC, March 5-8, 2006.

Wiegmann, B. M. 2006. Multigene phylogenetics of flies in the tree of life. Seminar Speaker, Department of Invertebrate Biology, American Museum of Natural History, NY, May 5, 2006.

Kampmeier, G., and M. E. Irwin. Tracking Specimens, Taxonomic

Nomenclature, and Literature in Mandala. Bernice P. Bishop Museum, Honolulu, HI, February 2005.

Kampmeier, G., and M. E. Irwin. Tracking Specimens, Taxonomic Nomenclature, and Literature in Mandala. Canadian National Collection, Ottawa, Canada, March 2005.

Kampmeier, G.E. Databasing experiences from the therevid PEET project. Invited GBIF (Global Biodiversity Information Facility) workshop on Identifying the Impediments to Databasing Entomological Collections, Columbus, OH 23-24 February.

Lambkin C, Yeates, D. and Wiegmann, BM 2004 Supertree Analyses, NSF-PEET Conference, University of Illinois, Urbana-Champaign, September, 23, 2004.

Kampmeier, G.E. 2005. Databasing insect collections: A view from a PEET. GBIF (Global Biodiversity Information Facility) experts workshop 'Identifying the Impediments to Databasing Entomological Collections,' Columbus, OH, 24-25 February.

Kampmeier, G.E. & M.E. Irwin. 2005. Tracking specimens, taxonomic nomenclature, & literature in Mandala. Bernice B. Bishop Museum, Honolulu, HI, 1 March.

Kampmeier, G.E. & M.E. Irwin. 2005. Aphid movement: processes and consequences. Invited presentation in symposium 'Movement in Landscape Mosaics' at the North Central Branch meeting of the Entomological Society of America 21-23 March, Purdue University, West Lafayette, IN.

Kampmeier, G.E. & M.E. Irwin. 2005. Tracking specimens, taxonomic nomenclature, & literature in Mandala. Canadian National Collection, Ottawa, Canada 30 March.

Courtney, G.W. Fundamentals of aquatic invertebrate ecology, with emphasis on aquatic insects. Wetland Ecology and Wildlife: Considerations for Wetland Restoration and Management. Malheur Field Station, Oregon. August 2005

Courtney, G.W. Great Basin Dipterology ù Introduction to Malheur Wildlife Refuge, Steens Mountain, and the Alvord Basin. Meeting of the North American Dipterist Society. Malheur Field Station, Oregon. August 2005

Courtney, G.W. Tales of Thai torrenticoles: aquatic insects from streams in northern Thailand. Iowa State University, Ames, Iowa. February 2006

Courtney, G.W. Biosystematics of torrenticolous flies, with emphasis on net-winged midges (Diptera: Blephariceridae). University of Tennessee, Knoxville, TN. March 2006

Courtney, G.W. Taxonomy and identification of aquatic Diptera North American Benthological Society (Taxonomy Fair), Anchorage, AK. June 2006

Courtney, G.W. Studies of aquatic flies in the 21st Century: A renaissance in dipterology? North American Benthological Society, Anchorage, AK. June 2006

Lambkin, C. L., Yeates, D. K., Wiegmann, B. M., Thorne, J., Cassel, B. and Hauser, M. (2005). Divergence Time Estimates for the Evolutionary Radiations of Australian Stiletto Flies (Diptera: Therevidae) 36th Australian Entomological Society, 7th Invertebrate Biodiversity and Conservation, and Society of Australian Systematic Biologists Combined Conference, Canberra, ACT, AUSTRALIA. December 2005

R. Meier: ôDNA Sequences in Taxonomy: Opportunities and Challengesö Biennial Meeting of the Systematics Association, Cardiff.

R. Meier: ôUndergraduate Research' an oxymoron? Can undergraduates do research? Center for the Development of Teaching and Learning, National University of Singapore.

R. Meier: 'Comparative Primatology: How monkeys and apes can help us understand human behavior and cognition' Department of Psychology, National University of Singapore.

Other presentations:

Lambkin, CL, DK Yeates ME Irwin, and BM Wiegmann 2004. Supertree Analyses with Little Taxon Overlap Joint Meeting of the Society for the Study of Evolution, Society of Systematic Biologists, and American Society of Naturalists at the Colorado State University in Fort Collins, Colorado, USA in June 2004.

Kampmeier, G.E. and Irwin, M.E. Meeting the interrelated challenges of specimen, nomenclature, and literature data tracking in Mandala. Electronic poster, International Congress of Entomology 2004, Brisbane, Australia, 15 - 21 August 2004.

Kampmeier, G., and M. E. Irwin. Tracking Specimens, Taxonomic Nomenclature, and Literature in Mandala. Electronic poster. Abstract p. 63. PEET V conference ôSpatial and Temporal Issues in Taxonomy,ö Urbana, IL 20-23 Sept.

Kampmeier, G.E., N.E. Evenhuis, and M.E. Irwin. 2005. Using Mandala to manage bioinventories. Poster presented at the Annual meeting of the Entomological Society of America, 15-17 December, Ft. Lauderdale, FL.

Lambkin, C.L. (presenter), D.K. Yeates, T. Pape, G.W. Courtney, J. Skevington, B. Sinclair, R. Meier, & B.M. Wiegmann. FLYTREE: cooperative research moving towards a dipteran tree of life. Annual meeting of the Australian Entomologial Society; Adelaide, Australia. December 2005.

Moulton, J.K. (presenter), G.W. Courtney, & B. Sinclair. New nuclear genes for reconstructing late Mesozoic hexapod difergences. Annual meeting of the Entomologial Society of America; Fort Lauderdale, FL. [presentation by Moulton]. December.

Lambkin, C. L., Yeates, D. K., Pape, T., Courtney, G. W., Skevington, J., Sinclair, B. J., Meier, R. and Wiegmann, B. M. FLYTREE: cooperative research moving towards a dipteran tree of life 36th Australian Entomological Society, 7th Invertebrate Biodiversity and Conservation, and Society of Australian Systematic Biologists Combined Conference, Canberra, ACT, AUSTRALIA. December 2005

R. Meier: ôSupertree vs. Supermatrix: Preliminary Analyses Using a 67-Partition, 204-Taxon Primate Datasetö (with Farhan B. Ali*). XXIV. Meeting of the Willi Hennig Society, Fagernes, 2005 (with abstract).

R. Meier: ôDNA barcodes and DNA-based taxonomy: How Fuzzy are DNA Barcodes in Sepsidae (Diptera) Flies?ö (with Kwong Shiyang*, Gaurav Girish Vaidya, Peter Ng). XXIV. Meeting of the Willi Hennig Society, Fagernes, 2005 (with abstract).

R. Meier: ôEvolution of Acute Vision and Complex Prey Catching Behaviour in Basal Jumping

Spiders (Spartaeinae)ö (with Kathy Su*, and Daiqin Li). XXIV. Meeting of the Willi Hennig Society, Fagernes, 2005 (with abstract).

R. Meier ôA Comparative Study of Mating Behaviour in Sepsidae (Diptera)ö (with Nalini Puniamoorthy*). XXIV. Meeting of the Willi Hennig Society, Fagernes, 2005 (with abstract).

R. Meier: ôThe origin of big brains in Homo sapiensö (with Farhan B Ali*). USP Academic Festival: Workshop on ôSustainabilityö & USP Student Conference.

R. Meier: ôThe Phylogeny and evolution of long-legged flies (Diptera: Empidoidea: Dolichopodidae)ö (with Lim Shimin Gwynne*). USP Academic Festival: Workshop on ôSustainabilityö & USP Student Conference.

R. Meier: ôMonogamy in the Promiscuous Sepsidae: The unique mating system of Sepsis indicaö (with Ang Yuchen*). USP Academic Festival: Workshop on ôSustainabilityö & USP Student Conference.

Poster Presentations

Trautwein, M.D., Wiegmann, B.M. and D.K. Yeates. Phylogeny of the Bee Flies (Diptera: Bombyliidae).International Congress of Entomology 2004, Brisbane, Australia, 15 - 21 August 2004.

Wiegmann, B. M. Meier,R., Yeates, D.K., Courtney, G.W., Friedrich, M.F., Kampmeier, G. , and F.C.Thompson. FLYTREE (ATOL Diptera) Cooperative research in phylogenetics and bioinformatics of true flies. NSF ATOL PIs Meeting, Arlington VA. November, 2004.

Bertone, M. and B. M. Wiegmann. Molecular Phylogeny of the Nematocerous Diptera: The Earliest Diversification of Flies. Entomological Society of America, Southeastern Branch Meeting, Tunica, Mississippi. March 2005.

Jason Caravas, Suchitra Balasubramanian, Mitchell Walker, Robert Hanrahan, Mithun Neral, Vipin Chaudhary and Markus Friedrich: Towards a mitochondrial genome phylogeny of schizophoran flies. Poster presentation at 2005 IGERT program meeting, Washington DC.

R. Meier: ôThe Phylogenetic Relationships and Natural History Evolution of Scathophagidae (Diptera)ö (with Sujatha Kutty*, and M. Bernasconi). Poster, XXIV. Meeting of the Willi Hennig Society, Fagernes, 2005 (with abstract).

R. Meier ôAdult versus Larval Characters in Endopterygota: A Comparative Assessment of Tree Support and Homoplasyö (with Gwynne Shimin Lim*). Poster, XXIV. Meeting of the Willi Hennig Society, Fagernes, 2005 (with abstract).

R. Meier: ôThe Phylogenetic Relationships and Evolution of Direct Development in Macrobrachium (Crustacea).ö (with Victor Muthu*, Daisy Wowor, Cai Yixiong, and Peter K.L Ng). Poster, XXIV. Meeting of the Willi Hennig Society, Fagernes, 2005 (with abstract).

R. Meier: ôSex, Flies, and Video Tapes: the Evolution of Mating Behaviour in Sepsidae.ö (with N. Puniamoorthy, and K. Su*). Abstracts of the 10. Biological Sciences Graduate Congress, Singapore.

R. Meier: ôInvestigating the Evolution of Cave Adaptations in Three Families of Freshwater Crabs if South-East Asiaö (with P. Dang and D. Yeo*). Abstracts of the 10. Biological Sciences Graduate Congress, Singapore.

R. Meier: ôHow Well Do Supertree Methods Estimate a Supermatrix Tree?.ö (with F. Bin Ali*). Abstracts of the 10. Biological Sciences Graduate Congress, Singapore.

R. Meier: ôPhylogeny and Sexual Selection in Long-legged Flies (Insecta, Diptera, Dolichopodidae).ö (with Hwang, W. S., Lim S. G., Grootaert, P.*). Abstracts of the 10. Biological Sciences Graduate Congress, Singapore.

R. Meier: ôMolecular Phylogeny and Evolution of Larval Feeding Habits in the Family Scathophagidae (Diptera)ö (with S. Kutty,* and M. Bernasconi). Abstracts of the 10. Biological Sciences Graduate Congress, Singapore.

Professional Meetings Attended

Lambkin C.L. Joint Meeting of the Society for the Study of Evolution, Society of Systematic Biologists, and American Society of Naturalists at the Colorado State University in Fort Collins, Colorado, USA in June 2004

PEET V meeting, University of Illinois at Urbana-Champaign, 20-23 September 2004. Irwin, Yeates, Wiegmann, Kampmeier, Thompson.

Yeates, Wiegmann, Courtney, Meier, Thompson, Kampmeier, Irwin, Trautwein, Bertone, Petersen, Kutty, Winterton, Skevington, Pape. International Congress of Entomology 2004, Brisbane, Australia, 15 - 21 August 2004.

Wiegmann, B. M., Meier, R, Kampmeier, G.E., Courtney, G. W., Thompson, F.C. Trautwein, M., Annual Meeting of the Entomological Society of America, Salt Lake City, UT, November 2004.

Wiegmann, B.M., Kampmeier, G. E. Insect Collection Network, Annual meeting, Salt Lake City, UT November 2004.

Kampmeier, G.E. Invited conference of the 22 awardees of NSF Assembling the Tree of Life grants (2001-2004) on databasing and data management, Arlington, VA, November 2004.

Gail Kampmeier and Mike Irwin participated in post-congress (ICE) meetings at Tangalooma (Moreton Island, Australia) 22-26 August 2004 for the NSF FLYTREE grant.

FileMaker Pro Developer's Conference, Phoenix, AZ 28-31 August 2005.
GBIF experts workshop on ' Identifying the Impediments to Databasing Entomological Collections,' Columbus, OH, 24-25 February 2005.
North Central Branch, Entomological Society of America meeting, Bloomington, IL 26-29 March 2006

Wiegmann attended the ECN (Entomological Collections Network) annual meeting, Ft Lauderdale, 14-15 Dec. 2005.

Wiegmann, Kampmeier, Bertone and Trautwein attended the Entomological Society of America annual meeting, Ft. Lauderdale, FL, 15-18 December 2005.

Kampmeier attended the NCBI Field Guide to Genbank and Related databases, including Blast, 22 September 2005
at University of Illinois at Urbana-Champaign

Wiegmann, Kampmeier, Courtney and Yeates attended the joint meeting of AToL and PBI PIs at Duke University, 10-12 March 2006.

Courtney attended the North American Benthological Society, Anchorage, AK. June 2006

Kathy Su, Gwynne Lim, Rudolf Meier attended the XXIV. meeting of the Willi Hennig Society in Fagernes.

Kathy Su, Sujatha Kutty, Gwynne Lim, Wei Song Hwang, and Rudolf Meier attended the 10. Biological Sciences Graduate Congress in Singapore.

Rudolf Meier attended the Biennial Meeting of the Systematics Association in Cardiff.

Grants funded:
Terrestrial Arthropod Survey of Fiji. Subcontract to M.E. Irwin and G.E. Kampmeier from Bishop Museum for National Science Foundation Biodiversity Surveys and Inventories program. 8/2004-7/2007. $68,843, funded.

Beta-testing the new ABRS web-interface with Faunal Treatment for the Australian Stiletto Flies (Diptera: Therevidae) Contract to C. L. Lambkin from Australian Biological Resources Study. 7/2006-4/2007. $11,000 AUD, funded. A project to prepare Australian Faunal Directory Checklists for the Australian Therevidae (stiletto flies) and thus beta-test the programmes developed in the last year by ABRS to smooth the web interface for dissemination of AFD information.

R. Meier: 2005-2008: Faculty Research Grant: ôSpecies identification in the 21st century: Testing molecular taxonomy based on phylogeographical studies of Sepsidae (Diptera)ö (108.000 SGD)

R. Meier: 2005-2010: Academic Research Fund: Co-PI ôGenetic diversity and patterns of speciation in selected tropical SE Asian taxa: Using molecular tools to identify conservation priorities in a region undergoing catastrophic extinctionsö (678.911 SGD, PI: N. Sodhi, Co-PIs: Peter Ng, Rudolf Meier)

Proposals Submitted:

Evolution, Structure, and Function of bHLH-PAS Proteins. Atchley, W. R., Estes, P., Rose, B. and Wiegmann, B. National Institutes of Health, 12/2005-11/2010 $1.25M, unsuccessful.

Microsporidia PEET Project. L.F. Solter, J.J. Becnel, D.G. Boucias, PIÆs National Science Foundation Partnerships for Enhancing Expertise in Taxonomy. 5 years. pending

Courtney, Principal Investigator. Biodiversity of aquatic flies (Diptera) of Madagascar, with emphasis on net-winged midges (Blephariceridae) and crane flies (Tipuloidea). National Geographic Society. $28,940.

Courtney, Principal Investigator. Biodiversity of aquatic flies (Diptera) of Madagascar, with emphasis on net-winged midges (Blephariceridae) and crane flies (Tipuloidea). Conservation International. $35,000.

Courtney, Principal Investigator. Systematic investigation of the Tipuoidea (Diptera). National Science Foundation (Dissertation Improvement Grant for M. Petersen). $10,375.

PBI: Crossing the Finish Line: Therevidae of the World (Insecta: Diptera) Gaimari, S.D., Winterton, S.L. and Lambkin, C.L. NSF Program: Biodiversity Surveys and Inventories. 5 years. Unsuccessful.

Phylogenetic Relationships of Primates: Resolving the Position of Key SE Asian Species and Phylogeography of Tarsius and Orangutan in Borneo. To Academic Research Fund, Singapore, pending.

Professional Service
Wiegmann was Charman, Section A (Systematics) of the Entomological Society of America (2005).
Kampmeier serves (2004-2006) on the Governing Board of the Entomological Society of America representing Section C (Biology, Ecology, & Behavior). She was elected to one of two at large positions on the GBÆs Executive Committee for 2006. She was liaison to the Membership Committee (2004-2005), which saw the second year in a row of rising membership and is on track for a third year in 2006, and is currently liaison to the Publications Council (2006). She was nominated for another term on the GB by the members of Section C (election in the summer of 2006). She was a subject editor for arthropods in relation to plant disease, for the Journal of Economic Entomology for 3.5 years, ending in August 2005. During her tenure, there was a significant increase in the number of papers submitted to the journal in this category. She served on the Local Arrangements Committee for the 2006 North Central Branch meetings held in Bloomington, IL 26-29 March, coordinating the audiovisual aspects of the meeting.

Kampmeier was invited to participate on the NSF grant review panel on Biological Research Collections 26-28 October 2005.

Kampmeier was elected through TDWG (Taxonomic Databases Working Group) to the GBIF DIGIT (Digitisation of Natural History Collections) Science Subcommittee for a 2-year term, March 2006.

Kampmeier also serves on two Illinois Natural History Survey committees: she is a member of the WebTeam representing the Center for Ecological Entomology, and is chair the Information Technology Committee.

Awards:
In 2006, Kampmeier received a Certificate and Service Award pin for exceptional service on the Entomological Society's Committee for Strategic Planning (2000-2005). She also received a Certificate from the Entomological Society of America for outstanding service as Subject Editor for the Journal of Economic Entomology from 2002-2005.

Contributions to Other Disciplines:

Contributions to Human Resource Development:
D.K. Yeates co-organised and taught an undergraduate course in Entomology at the Australian National University (BIOL 3115).

Lambkin is co-supervising an Honours student, David Carlisle, at the Australian National University, enrolled July 2004 to May 2005. Two papers on the spatial and temporal emergence patterns of therevid larvae and the phylogenetic signal from the male genitalia in Australian Therevidae (with the description of a new genus of Therevidae) are planned from this work.

Gail Kampmeier created step-by-step tutorials in PowerPoint for novice data

entry personnel using Mandala for the Busey Woods Biodiversity Blitz. One tutorial focused on entry of specimens and observations; the other on the creation of new taxonomic names.

Lambkin, John La Salle, Scheffer and Yeates supervised an undergraduate student, Chris Manchester, and a graduate student, Sarah Fayed, in capture, rearing, and species recognition of leaf mining flies (Diptera: Agromyzidae),their hosts and hymenopteran parasitoids at CSIRO Entomology, by, as part of a three month CSIRO Summer studentship from Dec 2005 to Feb 2006. A paper is in preparation presenting the results.

R. Meier teaches 'Evolution' and 'Evolution and Comparative Genomics' modules at the National University of Singapore.

R. Meier supervised several undergraduate student research projects and three Honours theses.

Contributions to Resources for Research and Education:

R. Meier is investigating the efficacy of new approaches in undergraduate research training: He has presented his results, ôUndergraduate Research' an oxymoron? Can undergraduates do research? Center for the Development of Teaching and Learning, National University of Singapore, and has submitted a publication on the topic.

Contributions Beyond Science and Engineering:

Special Requirements

Special reporting requirements: None

Change in Objectives or Scope: None

Unobligated funds: less than 20 percent of current funds

Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:

Contributions: To Any Other Disciplines

Contributions: To Any Beyond Science and Engineering