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PERLA
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MANAGING EDITOR:

Boris C. Kondratieff
Department of Bioagricultural Sciences
and Pest Management
Colorado State University
Fort Collins, Colorado 80523 USA
E-mail: Boris.Kondratieff@Colostate.edu

EDITORIAL BOARD:

Richard W. Baumann
Department of Biology and
Monte L. Bean Life Science Museum
Brigham Young University
Provo, Utah 84602 USA
E-mail: richard_baumann@byu.edu

J. Manuel Tierno de Figueroa
Dpto. de Zoología
Facultad de Ciencias
Universidad de Granada
18071 Granada, SPAIN
E-mail: jmtdef@ugr.es

Shigekazu Uchida
Aichi Institute of Technology
1247 Yagusa
Toyota 470-0392, JAPAN
E-mail: uchida@ce.aitech.ac.jp

Peter Zwick
Schwarzer Stock 9
D-36110 Schlitz, GERMANY
E-mail: pleco-p.zwick@t-online.de
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**PERLA SUBSCRIPTION POLICY**

Dues for membership in the International Society of Plecopterologists are $15 U.S. per year. Members will automatically receive PERLA. Libraries or other institutions may receive PERLA by making a $10 annual donation, or through an exchange of publications agreement approved by the Managing Editor and Editorial Board. Five dollars ($5) of the dues will become part of the Scholarship Fund of the Society, to be used for helping active and deserving workers or students participate in future symposia.

Persons or institutions who have no support or are financially unable to pay dues may continue to receive PERLA by writing a brief note to the Managing Editor requesting a waiver of dues and to be retained on the mailing list.

*It is therefore important that you respond to this receipt of PERLA 38 (2020) in one of the following ways, in order to be kept on the mailing list for PERLA 39 (2021): (1) pay your annual dues, (2) make a $10 donation (institutions), or (3) request a waiver. A form and self-addressed envelope are included with this issue, (PERLA 38) for your convenience in responding.*

You may send your dues or donation in the form of a personal check, bank note, cashier's check, or postal money order designated in U.S. funds to the Managing Editor. Because of high bank costs for exchange in some countries, you may send cash, in which case the Managing Editor will respond with a personal acknowledgment when received. NO CREDIT CARD CHARGES CAN BE ACCEPTED.

Dues and donations are used to help pay the costs of publishing and mailing PERLA, for Lifetime Achievement Award plaques presented by the Society at International Symposia and for the Scholarship Fund. The Managing Editor will make a financial report to the International Committee at each International Symposium Business Meeting or at any other time when requested.

Members or institutions whose dues remain unpaid for two consecutive years, or have not been granted exchange, waiver or emeritus status, will be dropped from the PERLA mailing list.
It hardly seems possible, but the North American Plecoptera Symposium met for the 12th time in its history on 16-19 May 2019. This was the second time (1st 2006) it was held at the Springs Agricultural Experiment Station in the beautiful Shawnee National Forest of southern Illinois. Attendees totaled 19, a small but powerful group. We enjoyed 15 presentations. Attendees included Bill Stark, Charlie Nelson, Jane Earle, Boris Kondratieff, Scott Grubbs, Ed DeWalt, John Sandberg, Audrey Harrison, Luke Myers, Steve Beaty, Victor Holland, Chris Verdone, David Rees, Jason Robinson (a trichopterist!), and were most pleased to have four graduate students attend and present their work: Taylor McRoberts (WKU), Madeline Metzger (WKU), Eric South (U-IL), and Evan Newman (U-IL). Last but not least, we were well fed and organized for meals by the very efficient Lesley Deem (U-IL).

A significant development occurred at our business meeting. Dr. Charlie Nelson proposed that we postpone our next NAPS meeting until 2023 (not 2022). This would give NAPS members incentive to attend the international meeting without the added cost of a North American meeting in the next year. This would also provide some incentive for members to donate funds to Perla in order to support student travel grants.

We were treated to 15 presentations (see titles and abstracts below) that ranged from species descriptions, to state and regional faunistic studies, and proposals to rank imperilment for species in northeastern states. All presentations may be viewed from the
following link: double click on a presentation and then chose “Open with” and “Google Slides”, then under tab “View”, click “Present”: https://drive.google.com/drive/folders/1QvgeCOfTiugx5xuOBWeuJRBUYp-Z52o?usp=sharing

1. A COLLABORATIVE NORTHEAST REGIONAL SGCN FOR STONEFLIES (INSECTA: PLECOPTERA)

We argue that insects in the order Plecoptera (stoneflies) are highly imperiled in the Northeast USA due to habitat destruction, urbanization, and most recently by changing climate and are worthy of protection and the funding necessary to formally establish their conservation status. Stonefly larvae inhabit streams of all sizes and some high latitude or altitude lakes. They are food for myriad predators and help to process organic matter. The adults feed both aquatic and terrestrial predators, but also transport nutrients and energy back to the terrestrial environment. These insects have poor dispersal capabilities and are highly sensitive to environmental changes and therefore are used as indicators of water quality. Range loss, extirpation, and extinction have been documented in many areas of the world, including several states in the USA Midwest and many locations in Europe. Climate modeling has predicted dramatic shifts northward for the distribution of stonefly genera in North America. At least 246 species of stoneflies are known from the 13 states in the US Fish and Wildlife Service (USFWS) Northeast Region. Species richness is concentrated in five large or altitudinally diverse states, ranging from 109 (MD) to 188 (VA). A unique consortium of stonefly scientists, state and federal biologists, and conservation organizers has formed and met remotely several times to generate a list of 33 Regional Species in Greatest Conservation Need (RSGCN). These 33 species form the basis of a USFWS Competitive State Wildlife Grant proposal currently being drafted to formally establish conservation status of species by gathering specimen data from literature, museums, and through rigorous fieldwork across the region in collaboration with local, state, and federal biologists. This presentation is being shared remotely with The NE Fish and Wildlife Diversity Technical Committee that is simultaneously meeting.

2. DRUMMING DESCRIPTIONS OF TWO STONEFLIES (PTERONARCYS BILOBA NEWMAN AND ACRONEURIA FRISONI STARK & BROWN) FROM NEW YORK STATE

The drumming signals of two species of stoneflies from northeastern New York are described: Acroneuria frisoni Stark & Brown and Pteronarcys biloba Newman. Pteronarcys biloba intersexual exchanges were 3 way with decreasing varied beat interval call pattern similar to previous descriptions for males of this species from North America. We also provide the first drumming description of Acroneuria frisoni. Male calls consisted of a diphasic rub tap call with intersexual exchanges ranging from 2 to 3
way. Variables measured included, ambient air temperature, age of reared adults, interbeat interval pattern, number of beats per signal, rub duration, mean interbeat interval (call, answer and response), interval difference (ID) and call answer exchange interval (MFEI and FMEI). Charts providing the complete interval pattern and raw character data are included.

3. EFFECTS OF STREAM PERMANENCE ON STONEFLIES (PLECOPTERA) IN THE MAMMOTH CAVE REGION
Taylor McRoberts and Scott A. Grubbs, Western Kentucky University.

Protected natural areas (i.e. national parks) are important refuges for native flora and fauna. Understanding the distribution of species across environmental gradients can aid land managers in the creation of conservation and protection initiatives. Aquatic insects, including stoneflies (Insecta, Plecoptera), have evolved life history strategies to survive periods of extended, seasonal droughts. The objective of this study is to assess if stream permanence influences stonefly distributions in the Mammoth Cave Region, mainly at Mammoth Cave National Park (MACA). Several questions are being addressed, including:

1. How many species and what proportion of the regional pool are present?
2. Do biological traits of species correlate with habitats available?

Three collecting events have occurred across 44 unique sites from December 2018–March 2019. A timed, structured sampling design has been implemented based on a collection of adults for 30 minutes per site. Monthly sampling will continue through October. The number and types of sites chosen are intended to fully characterize the stonefly fauna across the full gradient of stream size and flow permanency patterns present, especially within MACA. Only 13 species have been collected through the first two sampling events, but several more are anticipated, especially in families Leuctridae and Perlidae, with spring and summer sampling. In addition, benthic sampling for stonefly larvae will occur in late winter-early spring 2020 to capture species that are typically less commonly-collected as adults.

4. ALTITUDINAL DISTRIBUTION OF PLECOPTERA (STONEFLIES) IN MOUNT MITCHELL STATE PARK AND PISGAH NATIONAL FOREST
Madeline Metzger and Scott A. Grubbs, Western Kentucky University.

Stoneflies are good water quality indicators due to their high sensitivity to organic pollution and environmental changes. A predicted temperature increase of 1.8–4.0 °C is expected by the year 2100. This increase will affect cold-adapted species due to a change in dissolved oxygen levels. Climate change is known to impact species ranges and can lead to summit traps in montane environments. Understanding which species exist across environmental gradients will allow for futuristic climate modeling, ultimately contributing to a variety of applications in ecology and conservation efforts. Mount Mitchell State Park and adjacent Pisgah National Forest provide a protected landscape with a ca. 1,000 km elevation gradient from which to sample species, many of which ranges could decrease or be lost altogether with increasing temperatures. At a minimum, the following questions will be addressed:
1. What portion of the regional species pool is present and why?
2. Do diversity hotspots exist? (e.g. specific stream size or elevation range)
3. Is there evidence of or potential for species loss over time?

Sampling efforts have occurred seasonally (spring, summer, fall and winter) from 2014–2017 and represent the broadest ranges of altitudes and stream sizes present within the sampling area. To date, over the course of 12 sampling trips, 41 species have been collected from 86 unique sites. More species are expected with further *Isoperla* identifications and sampling trips. Approximately 4–6 sampling trips are scheduled through 2019. Results to date are limited. Species altitude ranges using box plots were generated in R to assess how many species are habitat generalists versus specialists. Distributional data could be further mapped for temperature increases using Maxent software.

5. **NOTE ON THE EGG OF *UTAPERLA GASPESIANA* (PLECOPTERA: CHLOROPERLIDAE)**

   Charles H. Nelson, University of Tennessee at Chattanooga.

   The egg of *Utaperla gaspesiana* (Harper & Roy, 1975) is described and illustrated using scanning electron photomicrographs. Information on structure (general shape, cross-section shape and chorionic detail), color and egg and collar size is provided.

6. **MOLECULAR PHYLOGENY OF THE NORTH AMERICAN PLECOPTERA**


   Stonefly phylogenetic hypotheses proposed since the mid-20th century have shown incongruence and/or unresolved relationships. The advent of Next Generation Sequencing (NGS) and genomics/transcriptomics provides a new opportunity to propose a well-supported and fully-resolved stonefly phylogenetic hypothesis. Transcriptomes, complete sets of RNA molecules which reflect all gene expressions in an organism at a specific point in time, contain protein coding sequences from which numerous phylogenetically informative genes can be selected to ultimately yield well-supported phylogenetic hypotheses. The primary objective of this study is to develop a robust phylogeny of the North American Plecoptera using multiple genes selected from transcriptomes. RNA transcripts have been assembled for 52 of the 109 North American genera, representing all nine families, 14 subfamilies, and 12 tribes. RNA extractions for an additional 27 genera have been prepared for sequencing.

7. **HISTORICAL RECONSTRUCTION OF A ONCE DIVERSE FAUNA: STONEFLIES OF THE MIDWEST USA**

   R. Edward DeWalt¹, Scott A. Grubbs², Jason L. Robinson¹, Matt Yoder¹. ¹Illinois Natural History Survey. ²Western Kentucky University

    Plecoptera are sensitive to water and habitat quality changes. Copious museum specimens allow for reconstruction of the Midwest stonefly assemblage. In Illinois long-lived, predatory species are in the process of being lost from a large portion of their range.
Similar losses are predicted for other Midwest states due to dominance by agriculture and urbanizations. We used museum specimen data and recent collections to reconstruct the historical distributions, richness patterns, and assemblage structure of stoneflies in Iowa, Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. Specimens constituting 32,000 species-level records from 25 museums/agencies and recent collections were examined. Legacy records were georeferenced and the locations projected into United States Geological Survey Hierarchical Unit Code scale 6 (HUC6) watersheds. At least 154 species were recovered including several new and undescribed species with predictions to 162 species. Assemblage clusters resulted for unglaciated and nearby glaciated HUC6 drainages, a Great Lakes assemblage of drainages, and a prairie oriented assemblage. Richest HUC6 drainages were in unglaciated landscapes of eastern latitudes and higher slope, wooded HUC6s of the east and north. Naturally low richness areas also occurred. Lake Superior HUCs afforded refuge for several cold-water adapted species. These data will be used in the future to assess conservation status by species and state and distribution modeling of past and future ranges. Broader impacts include the training of several graduate and undergraduate students, the salvage of decades-old specimens from obscurity and decay, the identification of all specimens to current taxonomic standards, and the sharing of digital specimen records conforming to global data standards.

8. REFORESTING THE LOWER MISSISSIPPI RIVER: NEW EFFORTS TO PROVIDE SUBSTRATES FOR CLINGING INVERTEBRATES
Audrey B. Harrison, Army Corps of Engineers.

A novel study focusing on invertebrate colonization on natural and artificial riverine substrates is in progress in the Lower Mississippi River, USA. In February 2019, baskets containing different substrates were attached to buoys and deployed in a secondary channel near Helena, Arkansas. Retrievals were timed in three-week increments over a 12-week study period, in order to quantify colonization rates. Initial results indicate unexpected levels of invertebrate drift during this period, particularly for stoneflies, including *Hydroperla* and *Isoperla* (Plecoptera: Perlodidae). This study marks the beginning of a three-year study focused on Mississippi River invertebrates. Additionally, recent cooperation with river engineers and managers is promising for large river invertebrates, including stoneflies, mayflies, caddisflies, and true flies. Efforts to create wood jams in Lower Mississippi River secondary channels are ongoing. Herein, project plans are discussed, and suggestions welcomed.

9. PLECOPTERA OR STONEFLIES (INSECTA) OF INDIANA: DIVERSITY AND CONSERVATION STATUS OF SPECIES
Evan A. Newman and R. Edward DeWalt, Illinois Natural History Survey, Scott A. Grubbs, Western Kentucky University

Stoneflies (Plecoptera) are indicators of water quality and have been lost in dramatic numbers from Midwest states, including Indiana. This study synthesizes over 5,000 specimen level records from museums and recent fieldwork to build a current species list, assess watershed level species richness, and calculate state level conservation
assessments using NatureServe’s Conservation Rank Calculator. Results include 1,050 positive occurrence records that yielded 92 species. Among these is one recently described species, a new species not yet described, and three previously described species new to Indiana. We have also found additional locations for rare species and confirmed the presence of a few species thought to be extirpated. United States Geological Survey Hierarchical Unit Code scale 6 (HUC6) drainages with the highest species richness values were the Patoka-White (73 species), Lower Ohio-Salt (60 species), and the Wabash River (57 species). The other seven drainages produced from five to 28 species, being limited by low gradient streams due to lake plain landscapes and by stream nutrient enrichment from agriculture. Eleven species were rated as extirpated or presumed extirpated, leaving 81 extant species. Of these, 17 were rated as critically imperiled (S1), 26 imperiled (S2), 25 vulnerable (S3), while only 13 species were rated as secure (S4 & S5). Watersheds and specific streams were discussed for their ability to support individual species or rich assemblages.

10. *Taeniopteryx harpi* (Plecoptera: *Taeniopterygidae*), a new species of willowfly from Quebec, Canada and New York state, USA
R. Edward DeWalt and Nicole Gamble. Illinois Natural History Survey

Dr. Peter Harper hosted DeWalt at his home in Montreal during March 2016 to prepare borrowed Leuctridae specimens for return to USA colleagues. Before leaving, Harper and DeWalt enjoyed three days of winter stonefly collecting from several locations in Quebec. This effort yielded a new willowfly. The name of the new species, *Taeniopteryx harpi* honors both Peter and Francois Harper for their many contributions to Plecoptera and aquatic insect science. The 9th sternum of the Males narrows at the midpoint rearward, forming an excavated posterior margin. The male paraprocts are unique in having a narrow basal sclerite and a detached, dorsally directed arm forming a short, apically curled tip. The female's subgenital plate is U-shaped with a sclerotized, semicircular plate that lacks the quadrate tab of other species. A new, potentially useful character is a darkly pigmented area on the head that encompasses the anterior ocellus. This pigment pattern is not known from other *Taeniopteryx*. We illustrate these characters using light microscopy. *Taeniopteryx harpi* is similar to *T. parvula* Banks, 1918 and *T. metequi* Ricker & Ross, 1968 with which it has been confused in the past. The type locality is the Riviere Doncaster, Ste-Marguerite-Du-Lac-Masson at Chemin du Ste-Marguerite, 46.02764, 74.06409. The species occurs in lower Quebec, adjacent to New York and Maine. It is likely to occur in other states and provinces near the USA/Canada border to the east.

11. 2021 XVIth International Conference on Ephemeroptera and XXIth International Symposium on Plecoptera in Fort Collins, Colorado, USA
Boris C. Kondratieff, Colorado State University, R. Edward DeWalt, Illinois Natural History Survey

A proposal to host the international mayfly and stonefly meeting in 2021 at the Mountain Campus of Colorado State University was presented at the 2018 meeting in Brazil. The proposal was enthusiastically accepted. The Mountain Campus is a high elevation (be
prepared) enclave west of Fort Collins that provides dormitory and private housing, a cafeteria, and conference facilities set in idyllic surroundings. Proposed inclusive dates are Sunday 25 July through 1 August. Registration will start the afternoon of the 25th, oral and poster sessions would be held 26-27 and 29-30. A group field trip will occur on the 28th. The conference wraps up business with a farewell banquet and awards ceremony will be held Friday evening the 30th. Stay another day for the post-conference trip (optional) on Saturday. A full program for accompanying guest is being planned with trips to local attractions. Local costs are moderate. Abundant volunteer opportunities exist! Please consider donating to Perla to support student travel costs. We hope to see all of you there.

12. SOYEDINA RICKER, 1952 (PLECOPTERA: NEMOURIDAE) IN THE EASTERN NEARCTIC REGION: REVIEW OF SPECIES CONCEPTS AND PROPOSAL OF MORPHOLOGY-BASED SPECIES GROUPS
Scott A. Grubbs, Western Kentucky University and Richard W. Baumann, Brigham Young University

The eastern Nearctic species of the genus Soyedina Ricker, 1952 (Plecoptera: Nemouridae) are reviewed. Morphology-based species groups are proposed based on characteristics of the epiproct.

13. PENNSYLVANIA CHLOROPERLIDAE
Jane Earle, Mechanicsburg, PA

The nineteen species of Chloroperlidae have interesting distributions, many based on ancient river basin connections and ecoregions. Few species are found in the Piedmont of southeastern Pennsylvania, due to the more extensive urban-suburban development, fewer forested area, and warmer waters. Only Alloperla atlantica Baumann, 1974, Haploperla brevis (Banks, 1895), and Sweltsa onkos (Ricker, 1936) have been collected from the southeastern Pennsylvania Piedmont. The Allegheny Front, which separates the Ridge and Valley from the Allegheny Plateau is also a major dividing line for species distribution. The Potomac River, part of the Chesapeake Bay drainage, shares several species with its ancient river connection to the present day Ohio River-Gulf of Mexico drainage. Several species are found in the Ohio River Basin plus the West and North Branch Susquehanna River drainages north of the Allegheny Front.

14. MITIGATING THE MORASS: THE STATUS OF ISOPERLA NYMPHAL-ADULT ASSOCIATIONS IN NORTH CAROLINA
Steven R Beaty, North Carolina Department of Environmental Quality

The number of known species of Isoperla in North Carolina was previously thought to be 30 species based on published records. However, three additional undescribed species are now thought to occur within the state and at least one more previously described species has also now been collected in North Carolina. This brings the total number of known Isoperla species to 34 within the state. Of these 34 species, we have reared and associated 24, 15 of which are new associations with the remaining associations confirming
published nymphal descriptions. The status, challenges, and goals of these rearing and collection efforts will also be discussed.
Examine specimens, discuss projects, ask questions, rest until dinner.

15. PRELIMINARY NOTES ON THE WINTER EMERGING STONEFLY FAUNA OF NORTH CAROLINA
Chris J. Verdone, North Carolina Department of Environmental Quality

In the winter of 2018-2019, winter emerging stoneflies were collected from the various ecoregions of North Carolina. An overview of the winter emerging stonefly fauna of North Carolina is presented, including historical background, new distributional data, and the description of a new species of Zealeuctra Ricker. Data are given as photographs and maps.

Director of Operations, Dr. R. Edward DeWalt checking details during the meeting. Dr. Kondratieff, Luke Myers, Dr. Robinson, the future PhD Eric South, Steven Beaty, Chris Verdone, Jane Earle, Drs. Charles R. Nelson, Audrey Harrsion, Bill Stark all paying close attention.
Dr. Audrey Harrison, U.S. Army Engineer Research and Development Center presenting her talk, with Drs. Charles R. Nelson, John Sandberg, Bill P. Stark, and Scott Grubbs listening to every detail.

ANNOUNCEMENTS

2021 XVITH INTERNATIONAL CONFERENCE ON EPHEMEROPTERA AND XXIXST INTERNATIONAL SYMPOSIUM ON PLECOPTERA

Organizers: Boris C. Kondratieff, Colorado State University, Director C. P. Gillette Museum, 1177 Campus Delivery, Fort Collins, Colorado 80523, boris.kondratieff@colostate.edu. R. Edward DeWalt, Illinois Natural History Survey, 1816 S Oak St., Champaign, Illinois 61820, dewalt@illinois.edu

The dates of the meeting are Sunday 25 July through 1 August 2021. It will be held at the Mountain Campus, Colorado State University, Fort Collins, Colorado, USA. The meeting website will be up by Spring 2020. The site is a high elevation enclave west of Fort Collins, Colorado, about three hours North of Denver Colorado. The facility provides dormitory and private housing, a cafeteria, and conference facilities in an idyllic setting. They are no restrictions in regard to collecting insects and other invertebrates in the nearby mountain streams, ponds, and wetlands. The Ephemeroptera and Plecoptera fauna

Dr. Scott Grubbs presenting his review of the eastern Nearctic nemourid genus Soyedina.

Colorado State University Mountain Campus
a research and education village in the Rocky Mountain Front Range

The preliminary schedule of activities:

- arrival Sunday 25th
- Monday and Tuesday 26th-27th, paper and poster sessions
- Wednesday 28th, group field trip
- Thursday and Friday 29th-30th paper and poster sessions and awards banquet
- Saturday 31st, checkout or after conference trip (optional, additional cost)
- Sunday 1 August, checkout
Accompanying Guests Activities: A full week of activities is planned to local attractions (Rocky Mountain National Park, Shambhala Mountain Center (Buddhist retreat), Fort Collins shopping and breweries, hiking, museums, dude ranching).

Scholarships: Participant support costs are being sought, mayfly and stonefly groups have travel funds for students, additional funds are being sought. Make donations to your respective group’s funds now.

Travel Arrangements: Flights into Denver International Airport (DEN) are the most convenient. We will be arranging for Broome Travel (a shuttle service, your cost) transport to Ft. Collins, where you will meet passenger vans for a 1-1.5 hr trip to Mountain Campus (included in registration).

Registration Costs: Registration covers food, housing (prices vary), mixers, group field trip, and transportation to and from Fort Collins to the Mountain Campus. Cost varies by housing style:

<table>
<thead>
<tr>
<th>Private and semiprivate cabins</th>
<th>dormitory style housing</th>
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<tr>
<td>Dormitory housing (multiple occupancy, 3 meals per day)</td>
<td>Conference Center Cabins (6 cabins, each with 6 rooms, each room with private bathroom, linens included)</td>
</tr>
<tr>
<td>$69/night + $10 for linens</td>
<td>Single occupancy $136/night/person</td>
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<td></td>
<td>Double occupancy $116/night/person</td>
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<td></td>
<td>Triple occupancy $96/night/person</td>
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<tr>
<td>Example registration</td>
<td>Dormitory: 6 nights * $69/night + $10 linens + $60 incidentals = $484</td>
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<tr>
<td></td>
<td>Private single: 6 nights * $136/night/person + $60 incidentals = $876</td>
</tr>
<tr>
<td></td>
<td>Double occupancy: 6 nights * $116/night + $60 incidentals = $756</td>
</tr>
<tr>
<td></td>
<td>Triple occupancy: 6 nights * $96/night + $60 incidentals = $636</td>
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Additional costs for accompanying guest outings are unknown at this time, but please budget for $250-$300. These are estimated prices that will likely increase slightly by 2021.

Map of the Mountain Campus of Colorado State University, Colorado.
Illiesia, The International Journal of Stonefly Research, was founded by Bill Stark and Nace Sivec in 2005 as a taxonomic journal counterweight to publication models with high page charges and limited access. Illiesia provided a model that was free and completely open access, a noble goal that helped authors to publish 231 articles and two monographs issues (see graph).

Though the pay-to-play model is still alive and well, there are now venues where publication is free and access is open or at nominal cost (Zootaxa is one example). Often these journals allow posting of pdf copies of articles on social media sites to promote...
access for educational/research purposes. Many of the reasons for the creation of *Illiesia* are now gone.

The editors of *Illiesia* (Ed DeWalt, Bill Stark, and Nace Sivec) have recently witnessed a decline in the number of submitted manuscripts. We believe that this is due to our inability to offer certain services to our authors. The lack of an impact factor is key among these services. Unfortunately, the amount of effort it would take the editors to develop impact factors for *Illiesia* is prohibitive and nearly impossible with our small yearly output.

The dwindling submissions, lack of key modern services, and an aging web infrastructure has led the editors to the unfortunate decision to close the journal, effective immediately. We will work to archive all volumes and articles with ClockSS (archival service) and Ed will keep the website open for the next several years. There are a few manuscripts that have been reviewed and have been in the authors’ hands for many months without revision. We realize this is a major inconvenience, but authors are requested to re-submit at another journal for publication. To all of you who have published in *Illiesia*, thank you for supporting the journal. You have contributed greatly to the science and knowledge of Plecoptera and it has been a pleasure publishing your papers.

![Published Papers and Cumulative Papers](image-url)
OBITUARIES

Dr. Ollie Flint 1931 – 2019.

Dr. Oliver S. Flint, Jr. the long-time Smithsonian National Museum of Natural History (NMNH) curator of Aquatic Insects and Neuropterida passed away on 18 May 2019. Ollie, as he was fondly known to us dedicated his life to the systematic study of aquatic insects, especially the Trichoptera, but also extensively collected and identified Odonata, Ephemeroptera, Plecoptera, as well as Neuropterida, and Mecoptera. Through his efforts, the NMNH has one if not the best representations of these insect groups worldwide, representing more than 12,000 species and almost 400,000 specimens. Ollie received his bachelor’s and master’s degrees from the University of Massachusetts before earning his Ph.D. in Entomology from Cornell University in 1960. He joined the NMNH Department of Entomology in 1961 as Curator of Neuropteroids, serving in this role for 35 years before becoming an Emeritus Curator in 1996.

Ollie authored more than 230 papers and books on aquatic insects. This remarkable scientific output spanned almost 70 years; his first paper was in 1951 and there are publications still in press. The majority of his research output focused on the
systematics of Neotropical caddisflies, a group for which he was a world-recognized authority. Ollie described more than 1,200 species, 21 genera, and one family of caddisflies during his career. Many of us have fond memories of joining Ollie on collecting trips, enjoying his wit and his amazing expertise.

Throughout his career, Ollie held key positions and received significant honors from organizations including the Entomological Society of America, the Society of Freshwater Science and the Virginia Museum of Natural History Foundation. Ollie made special efforts to attend regional and international meetings including those that centered on the Plecoptera. Ollie participated in the Tenth North American Plecoptera Symposium hosted by Jane Earle and the late Larry Jackson at Lock Haven University’s Sieg Center Field Station in Pennsylvania. He always freely made material available for loan that he collected or acquired to experts and students for scientific study.

A remarkable measure of the great impact that Ollie has had on his beloved insect groups, is that three genera and 91 species in 11 orders of insects have been named after him and his wife Carol who joined him for most of his many collecting forays and expeditions worldwide, by 87 authors, including the following stoneflies:

- Acroneuria flinti Stark & Gaufin, 1976
- Alfonsopterla flinti McLellan & Zwick, 2007
- Anacroneuria flinti Stark & Sivec, 1998
- Enderleina flinti Stark, 1989
- Gripopteryx flinti Froehlich, 1993
- Macrogynoplax flinti Stark, 1996
- Megaleucrea flinti Baumann, 1973
- Neoperla flinti Sivec, 1984
- Tupiperla flinti Froehlich, 2002

Dr. Pierre-Paul Harper 1942 – 2019

Pierre-Paul (aka Peter) Harper died peacefully in his sleep, 29 April 2019, at home in Saint-Hubert, Quebec. Peter was born 4 September 1942 in Masson, a small town in southwestern Quebec. His Scottish father was from Tignish, Prince Edward Island, whereas his mother was a French-Canadian from Buckingham, in the same vicinity as Masson. Peter enjoyed his Catholic secondary schooling at the Collège Saint-Alexandre, Gatineau, and thought he had found his calling early on, that of teaching priest in Africa. He went on to earn a B.A. degree in classics (Greek and Latin) at Laval University in Quebec City. He continued with a biology degree at the University of Montreal, still with the intention of becoming a missionary. He did receive his B.Sc. in 1966, but during these years, two events altered his trajectory. First, Peter worked as a summer intern at the University’s biological research station at Saint-Hippolyte, now known as the Station de Biologie des Laurentides. He worked on a botanical inventory of the station with Brother Roland Germain. In so doing, he discovered the fauna and flora of the Laurentians and became a fervent naturalist; surveying the research station became a significant part of the rest of his life. Second, having previously attended boys’ schools, he discovered the fairer sex: he fell in love with his colleague, Françoise Delorme, and his dream of the priesthood and teaching in the French colonies faded away.

Peter reoriented his professional life towards research. He pursued a master’s degree at the University of Montreal under the tutelage of Étienne Magnin, with whom he had already developed a friendship during his undergraduate work, one that would persist the
rest of their lives. Magnin, a free-living Frenchman from Savoie, renowned for his work on sturgeon, supervised Peter’s work on the stoneflies of the Saint-Hippolyte research station. Working side by side with Françoise, she on mayflies, the two sparked a long-term research collaboration, both receiving their M.Sc. degrees in 1967. Peter continued his education at the University of Waterloo, earning a Ph.D. in 1971 with the eminent stonefly expert and father of modern stream ecology, H.B. Noel Hynes. During this time, Françoise gave birth to their one and only child, Catherine.

The young family left for Europe when Peter took a postdoctoral position at University Paul Sabatier in Toulouse, France, in the hydrobiology lab of Eugène Angelier. He explored the Pyrenees and surveyed back-country streams, collecting avidly. After their year in France, Peter returned to Canada to a professorship in the Department of Biological Sciences at the University of Montreal. Peter held that position from 1972 until his early retirement in 2004, when he devoted himself to the care of Françoise who had fallen ill and subsequently died of a degenerative form of Parkinson’s disease.

At the University of Montreal, Peter’s teaching load was composed of undergraduate-level courses including entomology, introductory ecology, the history of biology, and bio-ethics. He had a phenomenal memory and knowledge that extended well beyond biology. He taught for hours without notes, his lectures were full of historical, philosophical, and other anecdotes, and his former students still comment on his impressive erudition. He had a way of sparking student interest, for example by introducing higher Diptera as “shit-lovers”.

Throughout his career, Peter took on various administrative tasks. He was the director of the Saint-Hippolyte Research Station from 1975 to 1986. During these years, he spent his summers in a nearby chalet and, net in hand, surveyed the terrain of the station and its environs. Emergence traps were installed on its lakes and streams from May through October every year. Impressive inventory series were collected and analyzed, provisioning multiple student theses, dissertations, and publications. Peter was also the curator of the Ouellet-Robert Entomological Collection and its aquatic insect collections grew considerably during his tenure.

Every year, Peter collected insects across the territory of Quebec and eastern Canada. These days were overfilled and those who accompanied him knew what to expect: cover great distances, collect as much as possible to make the travel worthwhile, and stop at villages along the road to discover the region, its history, its culture, and the local food. The abundant identified material, now integrated into the Ouellet-Robert Collection, makes first class of our knowledge of the aquatic insects of Quebec and the Maritimes. Peter’s almost 100 publications mostly covered the ecology and taxonomy of stoneflies, mayflies, caddisflies, and aquatic Diptera. His last scientific publication was with Ed Masteller on empidids in Puerto Rico.

His scholarly interests went beyond biology; Peter earned a bachelor’s degree in theology at McGill University (1998-1993) and later focused on eastern Orthodox theology, earning a certificate (1998-2003) and then a master’s degree (2003-2013) from
Sherbrooke University. During the 1970s, Peter joined the “Red Roof Church” community at Saint John the Evangelist. He was an active member and remained strongly attached to this particular and unique downtown Montreal Anglican high church. He penned a number of documents about its history, its architecture, and its succession of priests. He loved everything about the site and its people, and he led guided tours of the church and its cemetery in order to pass on his love of this special place. A great traveler devoted to his faith and a lover of history, Peter visited many countries on several continents, never forgetting to stop at places of worship. As Françoise’s illness began to keep him more at home, he began genealogical research on the Harper and Soucy (maternal) families. He found long-lost cousins and made fun discoveries about his family’s past.

From his marriage to Françoise was born Catherine, for whom his devotion was limitless. She had two sons that were the pride and joy of their grandfather. Peter loved recounting stories about his daughter, son-in-law, and grandsons. Always interested in history, people, and places, Peter wrote his memoires during his last year in order to pass on the family history.

Peter was presented in absentia the Lifetime Achievement in Plecopterology at the XII International Conference on Ephemeroptera and the XVI International Symposium on Plecoptera held in June 2008 at the Staattliches Museum für Naturkunde in Stuttgart, Germany for his exemplary contributions to the study of teh Plecoptera. This contributions are summarized in Perla No. 27, 2009.

Most of the above was written by Louise Cloutier, translated and edited by Dr. Colin Favret, University of Montreal. Bulletin de la Société d’entomologie du Canada. 51(4) Décembre 2019

Dr . Peter Harper’s papers:


Dr. Donald C. Tarter 1936 – 2019.

Dr. Donald Cain Tarter passed away on May 9, 2019 at the age of 82. Don was a professor in the Biology Department with Marshall University, Huntington, West Virginia for more than 32 years. Don completed his undergraduate degree at Georgetown College in Georgetown, Kentucky, a Master of Science degree at Miami University, Miami, Ohio and his PhD at the University of Louisville. Throughout his long distinguish scholarly career, he was interested and published extensively on several taxonomic groups of aquatic animals from fish, crayfish, leeches to aquatic insects. Don and his undergraduate and graduate students were active studying the life histories of aquatic insects and inventorying the aquatic insects of West Virginia and surrounding states. He corresponded with many of us faithfully and sent us specimens to identify or verify. Don was honored with several patronyms including the peltoperlid stonefly *Peltoperla tarteri* Stark and Kondratieff, 1987.

Donald C. Tarter’s papers on Plecoptera:


Howard Allen Rhodes, 83, passed away January 20, 2020 in Cheyenne, Wyoming. He was born August 22, 1936 in Virginia. He served in the U. S. Air Force. He initiated a Ph.D program at Colorado State University, but left for a position with the U.S. Forest Service and retired from that agency. He loved aquatic entomology and maintained a large personal collection. He was a co-author of two papers on Plecoptera:


**MEMBER NEWS**

**DeWalt Laboratory Work conducted in 2019 and proposed in the future.**

**Plecoptera of Indiana: using museum data to determine spatial distribution patterns and conservation need**

Evan A. Newman, Master’s student, University of Illinois, Entomology Department. Additional authors R. Edward DeWalt and Scott A. Grubbs

Stoneflies (Plecoptera) are indicators of water quality and have been lost in dramatic numbers from Midwest states, including Indiana. For this study, we are using over 5000 records of Plecoptera from more than 2000 unique collection events to build a list of known species from the state of Indiana. We intend to answer four questions: First, how many species are native to Indiana? Second, what is the conservation status of each native species (using NatureServe criteria)? Third, do patterns exist in stonefly species assemblages across unique HUC8 watersheds? Fourth, what are the causal agents of differences in diversity across HUC8s? Results include 1,050 positive locality records that yielded 92 species. Among these is one recently described species, a new species not yet described, and three species previously unknown to Indiana. We have also found additional locations for rare species and confirmed the presence of a few species thought to be extirpated. Eleven species were rated as extirpated or presumed extirpated, leaving 81 extant species. Of these, 17 were rated as critically imperiled (S1), 26 imperiled (S2), 25 vulnerable (S3), while only 13 species were rated as secure (S4 & S5). Watersheds and specific streams were discussed for their ability to support individual species or rich assemblages. Regarding distribution patterns, southern unglaciated drainages supported the most species-rich assemblages. Watersheds that were most recently glaciated (Wisconsinan) held fewer species. Deep ravine systems act as cold water refugia where glaciated and unglaciated areas meet. The East Fork of the White River, Tippecanoe River, and the St. Joseph River drainage (a tributary to Lake Michigan) harbor several large river species. The next step in this project is to determine which factors are most important to Plecoptera species richness and to gather data on rare species and under-collected drainages.

**Molecular phylogeny of the North American Plecoptera**

Eric J. South, PhD student, University of Illinois, Department of Entomology. Additional authors: Rachel K. Skinner, R. Edward DeWalt, Boris C. Kondratieff, Kevin P. Johnson, Mark A. Davis, Jonathan J. Lee, Richard S. Durfee

The primary objective of this study is to develop a well-supported and fully-resolved phylogeny of the North American Plecoptera using multiple genes selected from transcriptomes. A total of 373 live adult specimens across 132 species and 92 genera representing all North American families, subfamilies, and tribes were collected and
processed for RNA transcript assembly. A preliminary coalescent-based species tree estimation for 51 taxa was generated using 1,715 identified orthologous genes. The remaining 41 taxa have been sequenced and the data are being cleaned and modified for inclusion in a complete concatenated nucleotide transcriptome data set to be used to construct a Randomized Axelerated Maximum Likelihood (RAxML) analysis. Preliminary analyses demonstrate highly supported family groups with a few surprises to be announced later. This analysis will provide a strong backbone for higher taxa through to the genus in the Nearctic. It is hoped then that this analysis, with the help of significant collaboration, to build a phylogeny of Plecoptera at the global level. Having a stable backbone phylogeny will support other analyses focusing on more specific relationships such as barcoding of species.

**Conservation status assessment of Watchlisted mayflies, stoneflies, and caddisflies of Illinois**
R. E. DeWalt, University of Illinois, Illinois Natural History Survey
Evan A. Newman, Eric J. South, Lily V. Hart, Nicole Gamble

Significant funding was secured for a 3-yr project to search for 72 EPT species placed on a Watchlist within Illinois. This work will help to formally designate imperilment rankings for species. Several of the Watchlist species are thought to be extirpated; others were historically abundant and widespread, but now are rare in the state. In our first year, we conducted over 130 unique collecting events that spanned the months of January through August. Winter work in small, upland streams of the Shawnee National Forest of southern Illinois found several new locations for the rarely collected *Allocapnia smithi*, *Prostoia hallasi*, *Zealeuctra fraxina*, and *Z. narfi*. All but *Z. fraxina* can inhabit the smallest of streams that are only seasonally wet. Elsewhere on large rivers that border the east and west sides of the state, a few exuviae of *Isogenoides varians* were taken. This species was thought to have been extirpated from Illinois. At multiple locations, we examined over 60 *Hydroperla fugitans* exuviae in order to find a single exuviae of *I. varians*. Large river stoneflies are among the most imperiled in Illinois. Unfortunately, record floods on the Mississippi River limited access along the river. This often forced our team to work in adjacent states where high ground adjacent to the river was available. Despite this, two ultraviolet light trapping events at widely separated locations attracted a total of five *Attaneuria ruralis* specimens, another species thought extirpated from Illinois. With the help of our friends attending the North American Plecoptera Symposium a new state record, *Alloperla hamata*, was added to the Illinois list. Unfortunately, many large, long-lived species still appear to be absent from the interior of the state where agriculture occupies up to 95% of land cover. We were successful in recovering new specimens of several large river mayflies and several new state record mayflies from a variety of stream sizes. Several rare and one new state record caddisfly species also resulted. A big year of fieldwork is planned for 2020 with the hope of finding more ghosts from the past century.

**DNA barcoding of North American Great Lakes Mayflies, Stoneflies, and Caddisflies**
R. E. DeWalt, Lily V. Hart, Nicole Gamble
A collaboration with the David Lodge laboratory at Cornell University has provided the opportunity to DNA barcode (COI barcode fragment) additional EPT species that are known to occur in the Great Lakes region. Because compiled databases of specimen level data are largely unavailable, we used published checklists and taxonomic papers with specimen data to build a comprehensive list of all EPT known to occur in states and provinces that border the North American Great Lakes. Published works suggest that >1200 species exist. Examination of the BOLD Systems (http://www.boldsystems.org/) demonstrated that many species were not represented in BOLD (which also pulls in GenBank records), many others were represented by only one or two sequences, while others were well represented but consisted of a large number of Barcode Index Numbers (BINs), which to me suggests that many specimens were misidentified. Still, others were represented by specimens from areas far removed from the Great Lakes region--who knows what they really are? To date, my laboratory has submitted over 400 stonefly specimens and another 800 mayfly and caddisfly specimens. This effort greatly improves barcode library coverage for stoneflies, mayflies, and caddisflies in the Great Lakes region.

NEW AVAILABLE PUBLICATION

distribution, tolerance values, trophic relationships, and functional adaptations of aquatic insects that allows an additional tool for categorizing them.

- Over 7000 references
- A chapter on *A Photographic Overview of Aquatic Insects of North America*
- A revision and expansion of keys, as well as new figures added to the taxonomic chapters
- Added figures to the *General Classification and Key to Orders* chapter
- All chapters have been updated with significant changes to chapters on Ephemeroptera, Plecoptera, Trichoptera, Coleoptera, Diptera and Tipuloidea
- Single chapters covering each order of all stages of aquatic insects

Chapter 16 Plecoptera was updated by R. E. DeWalt and B. C. Kondratieff from the original contributions by the P. P. Harper, P. P. Harper and K. W. Stewart, and K. W. Stewart and B. P. Stark.

RECENT PLECOPTERA LITERATURE (CALENDAR YEAR 2019 AND EARLIER). Papers made available after 1 February 2020 will be included in the next issue. **If papers were missed, please bring these to the attention of the Managing Editor.** Drs. Bill P. Stark, J. M. Tierno de Figueroa, and Peter Zwick are thanked for reviewing and providing additions to this present list.


Berlin, A. 2019. 25 Jahre ökologischer Fließgewässerrenaturierung am Tieflandfluss Nebel (Mecklenburg-Vorpommern) – Änderungen in der Besiedlung mit Eintagsfliegen (Ephemeroptera), Steinfliegen (Plecoptera) und Köcherfliegen (Trichoptera) \ 25 years ecological restorations of the lowland river Nebel (Mecklenburg-Western Pomerania) – Changes in the colonization with Mayflies (Ephemeroptera), Stoneflies (Plecoptera) and Caddisflies (Trichoptera). Lauterbornia 86: 175-194.


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Hills, K. A., R. V. Hyne, and B. J. Kefford. 2019. Species of freshwater invertebrates that are sensitive to one saline water are mostly sensitive to another saline water but an exception exists. Royal Society Philosophical Transactions Biological Sciences 374 (1764): DOI: 10.1098/rstb.2018.0003


Prokop, J., E. Krzeminska, W. Krzeminski, K. Rosova, M. Pecharova, A. Nel and M. S. Engel. 2019. Ecomorphological diversification of the Late Palaeozoic


Standing Committee
International Society of Plecopterologists

**John Brittain**
Natural History Museum
University of Oslo
P.O. Box 1172 Blindern
NO-0318 Oslo, NORWAY
E-mail: j.e.brittain@nhm.uio.no

**J. Manuel Tierno de Figueroa**
Dpto. de Zoología
Facultad de Ciencias
Universidad de Granada
18071 Granada, SPAIN
E-mail: jmtdef@ugr.es

**R. Edward DeWalt**
University of Illinois, Prairie Research Institute,
Illinois Natural History Survey,
1816 S Oak St., Champaign, IL, USA 61820
E-mail: dewalt@illinois.edu

**Romolo Fochetti**
University of Viterbo
v. A. Solario, 98 - 00142 Roma
E-mail: fochetti@unitus.it

**Boris Kondratieff**
Department of Bioagricultural Sciences
and Pest Management
Colorado State University
Ft. Collins, Colorado 80523, USA
E-mail: Boris.Kondratieff@colostate.edu

**Dávid Murányi**
Hungarian Natural History Museum
H-1088 Budapest
Baross u. 13, HUNGARY
E-mail: dmuranyi@gmail.com

**Pablo Pessaq**
CONICET, CIEMEP-LIESA
Universidad Nacional de la Patagonia
Roca 780, CP 9200
Esquel Chubut, ARGENTINA
pablopessaq@yahoo.com.ar

**Ignac Sivec**
Prirodoslovni Muzej Slovenije
Prešernova 20, POB 290
1001 Ljubljana, SLOVENIA
E-mail: isivec@pms-lj.si

**Mayumi Yoshimura**
Forestry and Forest Products Research Institute
Kansai Research Center
Nagai Kyutaro 68
Momoyama
Fushimi, Kyoto
612-0855 JAPAN
Email: Yoshi887@ffpri.affrc.go.jp