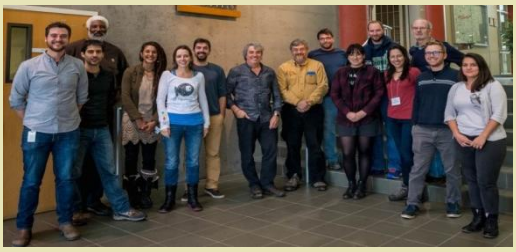
CIEE / ICEE

Canadian Institute of Ecology and Evolution / Institut canadien d'écologie et d'évolution

NEWSLETTER

Issue 9 - Winter 2017






CIEE's Thematic Working Groups involve participants from 29 Canadian Institutions and are currently working on: the impacts of missing data in genotyping-by-sequencing datasets; a cross-ecosystem approach to designing effective protected areas; testing the conservation value of phylogenetic diversity, and; determination of how fish community changes in eelgrass habitats along disturbance gradients.

IN THIS ISSUE:

1. Working Group Meetings, 2. New Working Groups, 3. The CIEE in the International Synthesis Consortium, and 4. Upcoming CIEE activities, and 5. other important information.

Canadian Institute of Ecology and Evolution: Accelerating scientific progress through programs that synthesize current knowledge and develop future leaders.

Peter Leavitt, Director

Greetings from the CIEE! We have a number of exciting activities to tell you about, including working group meetings that took place during the last few months. We anticipate that this year will see continued strong growth of CIEE and its activities. One of our central priorities is to build on the successes of the Thematic Working Groups, better outreach, and additional training activities to increase our Institutional membership. As you may know, the CIEE achieves its mission principally through funding from, and co-operation among, a consortium of Canadian institutions. As a result, the more members we have, the more activities we can support! If you recognize the importance of having a national centre for advancing eco-evolutionary synthesis in Canada, please contact us via our dedicated email: ciee-icee@uregina.ca.

Dr. Peter R. Leavitt
CIEE Director

1. Working Group Meetings and Activities

1.1. The Thematic Working Group "**Genomic data in ecology, evolution and conservation: The impacts of missing data in genotyping-by-sequencing datasets**", led by Jean-Sébastien Moore, Louis Bernatchez, Anne-Laure Ferchaud (Laval University), and Thierry Gosselin (Independent consultant, Otterburn Park, QC), involves 18 participants from 12 Institutions including the Canadian Universities of Laval, McGill, UBC, Dalhousie, Regina, Toronto and Calgary, as well as Aarhus University (Denmark), University of Washington (Seattle, US) Fisheries and Oceans Canada (St. John's), NOAA Northwest Fisheries Science Center (Seattle, US), and the NOAA Southwest Fisheries Science Center (Santa Cruz, US).

Next-generation sequencing methods such as genotyping-by-sequencing (GBS) are gaining in popularity because they give unparalleled access to the entire genome of non-model organisms at a relatively low cost. Genome-wide data allows researchers to answer fundamental evolutionary and ecological questions that were formerly inaccessible with smaller genetic datasets, and are rapidly being integrated in the toolkit of conservation biologists and resource managers. Currently, one key drawback of these methods is that each genotyped individual will have a high proportion of missing genotypes. Missing data can have important consequences on subsequent analyses, though they have not been substantially evaluated yet for GBS. Currently, researchers have access to many statistical tools to impute missing genotypes, but guidelines with contexts on how to use the different imputation methods remain unclear.

The "Genomic Data" working group brings together 18 participants from 12 institutions from Canada, US and Denmark. Photo credit: Thierry Gosselin.

The group met on 26-28 October 2016 at the Institut de Biologie Intégrative et des Systèmes (IBIS) of Laval University. During the meetings this working group assessed the effects of missing data in genomics data sets on different types of analyses commonly used in molecular ecology and conservation genetics such as genome scans, population and parental assignment, demographic inferences, and NE estimations. To do so, workshop participants used simulated data sets with varying proportions of missing genotypes artificially introduced, based on available GBS data sets from a broad range of organisms with different life histories. The group sought to address two main objectives: gain insights on the statistical conditions and the biological contexts where missing data have the biggest impact on inferences, and; systematically evaluate the effects of the different imputation methods on common analytical methods. These analyses enabled workshop participants to make key recommendations about (i) analysis and programs robustness to missing data, (ii) biological contexts and thresholds of missing data that can potentially introduce bias, (iii) the best imputation methods to overcome these biases. The group is currently working on publication arising from these findings.

The "Genomic Data" Group at the Institut de Biologie Intégrative et des Systèmes (IBIS) of Laval University. 26-28 October 2016. Photo credit: Thierry Gosselin.

1.2. The thematic Working Group "**Canadian protected areas in a changing climate: A cross-ecosystem approach to designing effective networks of protected areas**", led by Marie-Josée Fortin and Cassidy D'Aloia from the University of Toronto, and Ilona Naujokaitis-Lewis (Environment Canada & Carleton University), is bringing together 13 researchers from 8 Canadian Institutions including the Universities of Toronto, UBC, McGill, Memorial and Québec, and professionals from Environment Canada, Fisheries & Oceans Canada, the Woods Hole Oceanographic Institution, and the Ontario Ministry of Natural Resources and Forestry.

Across the globe, species ranges are changing (shifting, contracting, and expanding) in response to climate change. One of the most widely-implemented conservation strategies to protect natural populations is the creation of protected areas (including parks, reserves, and no-take zones). Thus, a major question in conservation biology has become; how do we effectively design networks of protected areas that account for varied responses among species to climate change? Diverse species responses may result from direct effects of climate change, or indirect effects mediated by time lags, scale effects, or biotic interactions. One approach that has been proposed is to protect areas based on abiotic rather than biotic diversity. However, this approach may be better-suited to some ecosystems over others (e.g. terrestrial, freshwater, or marine) and has not been assessed across ecosystem types. Similarities and differences in patterns of biotic and abiotic diversity among ecosystem types can lend insight into the processes that drive diversity and inform system-specific conservation solutions.

The main goal of this working group is to develop a cross-ecosystem synthesis for the design of protected area networks in the context of climate change. Their specific objectives are to: (i) synthesize the merits of abiotic- versus biotic-filter approaches to protected area design with a particular emphasis on identification of thermal refugia; (ii) propose a unifying framework to optimize species persistence within protected area networks in the face of climate change; and (iii) apply the framework to regional data from terrestrial, freshwater, and marine ecosystems in Canada. The results of this working group will have strong policy relevance, given predicted distribution changes of native and non-native species in Canada.

In pursuing of these goals, the group met twice in 2016, on May 30-June 1, and on December 5-7, 2016. The meetings, which took place at the University of Toronto, were full of stimulating discussions that were directed towards the outline of three manuscripts under the following working titles: 1. "*Developing a 'geo-language' for coarse filter conservation approaches across ecosystem realms*", led by Cassidy D'Aloia and Ilona Naujokaitis-Lewis; 2. "*Matching climate change adaptation strategies for protected areas to conservation objectives in marine, freshwater, and terrestrial ecosystems*", led by Emily Darling and Jennifer Sunday; and 3. "*Integrating cross-ecosystem fluxes into protected area networks"* led by Fred Guichard, Marie-Josée Fortin and Shawn Leroux. The leaders of each project are in charge of delegating tasks to other members of the group and ensuring continued progress. To facilitate this collaborative writing, the leaders have created a group Google Drive folder with background literature, detailed meeting notes, and a preliminary outline for the manuscripts. In addition, the leaders are coordinating regular Skype meetings to ensure advancements on the outlined papers. Thus, while the in-person meetings are complete for this working group, Skype meetings and collaborative work will continue through 2017. Main results from this project are being presented in a Symposium at the upcoming CSEE Annual Meeting in Victoria (see details below, 4.1).




The "Protected Areas" Working Group met twice during 2016. The last meeting on December 5-7, was attended in-person by Marie-Josée Fortin (University of Toronto), Ilona Naujokaitis-Lewis (Environment and Climate Change Canada), Casssidy D'Aloia (Woods Hole Oceanographic Institution), Frédéric Guichard (McGill University), Cindy Chu (OMNRF), Shawn Leroux (Memorial University), Emily Darling (University of Toronto/Wildlife Conservation Society), Christopher Blackford (University of Toronto), and Alexandre Martensen (University of Toronto). Two additional members, Jennifer Sunday (UBC) and Amanda Xuereb (University of Toronto), joined via Skype.

1.3. The Thematic Working Group **"Diversity and structure of coastal eelgrass communities along environmental and human disturbance gradients"**, led by Julia Baum and Josephine Iacarella from the University of Victoria is meeting 20 professionals from 16 Canadian Institutions including the University of Victoria, UBC, Department of Fisheries and Oceans, Hakai Institute, Seagrass Conservation Working Group, Precision Identification Biological Consultants, Project Watershed Society, Skeena Fisheries Commission, Nuu-chah-nulth Tribal Council fisheries department, Nile Creek Enhancement Society, Nootka Sound Watershed Society, Raincoast Conservation Foundation, Pacific Salmon Foundation, Gwaii Haanas National Park, Gulf Islands National Park, and Pacific Rim National Park.

Coastal ecosystems provide critical ecosystem services that are in decline globally owing to ongoing anthropogenic stressors. Seagrass ecosystems in particular are highly valued for the provision of nursery and

refugee habitat for commercially-important species, but are heavily impacted by human disturbance. The loss of such habitat has fueled monitoring efforts across the coast of British Columbia, although, to-date, these organizations have worked independently and been restricted to local-scale inferences. This working group is bringing together government, NGO, and academic researchers with expertise in BC's coastal communities, to assemble existing eelgrass datasets across coastal BC, with the objective of determining changes in biodiversity and community structure of fishes in eelgrass habitats along environmental and human disturbance gradients. In short, this collaborative effort is developing the most spatio-temporally comprehensive assessment of eelgrass biodiversity to-date, fostering a network for long-term monitoring and aiding in the prioritization of marine management.

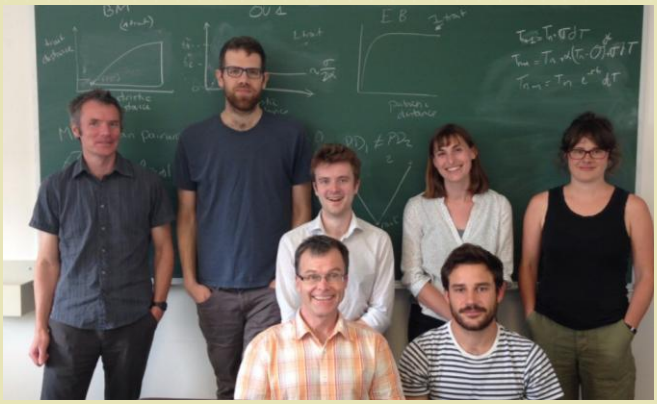
The "Eelgrass Communities" Working Group met twice at the University of Victoria, in February and November 2016.

The group met twice during this year, on 25-26 February and 3-4 November 2016, both at the University of Victoria. The meetings were held in partnership with the Smithsonian Marine Global Earth Observatory (www.marinegeo.si.edu) branch based at the Hakai Institute in BC. The working group revised the existing eelgrass datasets across coastal BC and discussed on the necessity of complementary datasets. The group also advanced on the data processing and meta-analyses of the information. This synthesis work resulted in two ongoing projects: 1. *Beta-diversity of eelgrass fishes across human disturbance gradients along the coast of BC*; and 2. *The role of eelgrass meadows in the early life history of salmon across BC*. The first project covers 9 regions, with fish and eelgrass surveys spanning 89 sites; the second project includes 5 regions, each with paired sites and repeat surveys of juvenile salmon and invertebrate prey across the outmigration season.

1.4. The Thematic Working Group "**Testing the conservation value of phylogenetic diversity**" is led by Arne Mooers (Simon Fraser University) and Caroline Tucker (University of North California). This project joins ecologists, evolutionary biologists and paleontologists (most early career) from 4 Canadian Universities including SFU, UBC, McGill, Toronto, and those from 8 institutions in Germany, Spain, Italy, France, UK,

Argentina, Singapore and the USA. This working group is being co-funded with the Synthesis Centre for Biodiversity Sciences of Germany (sDiv).

Phylogenetic diversity (PD) as a metric of conservation prioritization is popular in academia, and has been the focus of recent high impact papers. However, adoption by practitioners has been slow, likely due to the lack of strong conceptual and empirical links between phylogenetic diversity and the more traditional aspects of biodiversity that humanity considers valuable. Higher PD is assumed to lead to higher total trait diversity and so increased biological goods and ecosystem services for direct use, increased option value (i.e., goods useful in the future), and the raw material for future biodiversity production via evolution. These arguments have either failed the limited tests to which they have been subjected, or, in the case of evolutionary potential, have never been tested at all. This working group is testing all these arguments for conserving PD, using simulated and empirical phylogenetic and trait data at large temporal and spatial scales.



The "Conservation and Phylogenies" working group met on 21-24 September 2016 at the University of Ottawa. Clockwise from left top: Jonathan Davies (McGill), Matt Pennell (UBC), Will Pearse (U Utah), Caroline Tucker (CNRS/Chapel Hill), Evelyn Jensen (UBC-O), Arne Mooers (SFU), Florent Mazel (SFU/Grenoble).

Second meeting of the "Conservation and Phylogenies" working group on 5-8 December 2016 at the Synthesis Centre for Biodiversity Sciences of Germany (sDiv), in Leipzig, Germany. Attendees in this meeting were Tracy Aze, Marc Cadotte, Juan Cantalapiedra, Chelsea Chisholm, Sandra Diaz, Giulio Della Riva, Danwei Huang, Florent Mazel. Arne Mooers, Will Pearse, Matt Pennell, Caroline Tucker, and Marten Winter.

The CIEE funded the first of 3 meetings of this working group, which took place in Ottawa, on 21-24 September, 2016. At that first meeting, the working group (i) clarified the basis for using PD in conservation and (ii) planned the analyses appropriate to test this question using simulated and empirical phylogenetic and trait data at large temporal and spatial scales. The group is focusing on two themes. The first is an ecology-focused study (organized by Jonathan Davies and Caroline Tucker) that is identifying the form of the relationship between PD and functional diversity under the most common models of macroevolution and most

common measures of functional diversity. The second theme (organized by Matt Pennell and Arne Mooers) is more conservation-focused and will test the conjecture that max PD will do better than random at capturing total feature diversity under any process model of trait evolution and subset size on a tree. Preliminary results from both these studies were presented for discussion and elaboration in the second meeting in Leipzig, Germany, on December 2016.

This second meeting quickly focussed on a surprising observation that grew out of the September meeting: it turns out that there are reasonable situations where maximizing evolutionary history does positively _worse_ than choosing species at random for sampling phenotypic diversity. This comparison of choosing a set of species based on maximizing phylogenetic diversity vs. choosing at random percolated through the emerging projects: two groups began looking at empirical data sets at various taxonomic and geographic scales (including within conservation reserves) while another group asked whether choosing maximum PD sets of species in the past would do better than random choice for predicting species diversity in the present. The data sets for these first projects spanned foraminifera, hard corals, fossil horses, and bird and mammal families. In parallel, the entire group continued to come to grips with what the literature says PD offers conservation biology more generally, which arguments are testable, which tested, and which pass or fail. The group will convene again in early May 2017 in hopes of moving the entire field forward on this issue.

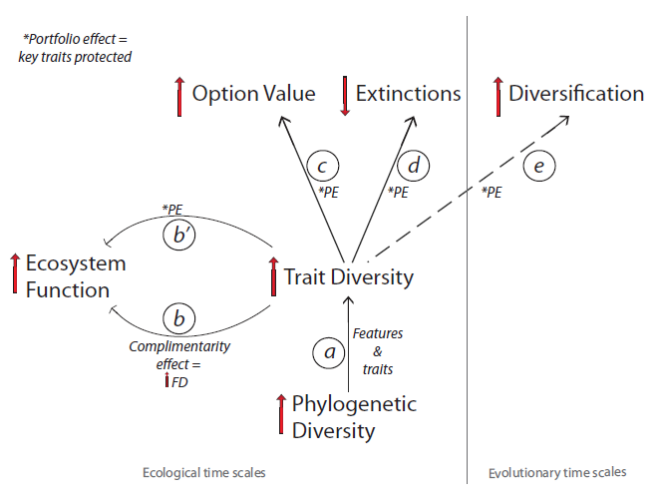
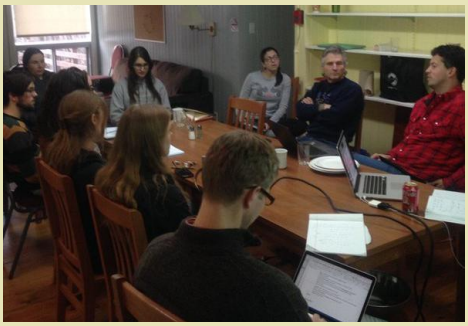


Diagram clarifying the arguments for preserving phylogenetic diversity. In particular, The "Conservation and Phylogenies" working group: examined the difference between complimentary and portfolio effects; highlighted how pervasive the portfolio effect argument is; distinguished the difference in temporal scale between decreasing extinction and increased diversification, and; included option value for specific traits as a separate instrumental value.

1.5. The working group "**Adaptation versus maladaptation in response to environmental change**", led by Andrew Hendry, Rowan Barrett, Alison Derry and Gregor Fussmann, met on December 5-9, 2016 at the McGill's Gault Nature Reserve in Mont St Hilaire, Quebec. This working group, co-funded by the CIEE and the Quebec Center for Biodiversity Science (QCBS), brought together 26 researchers from 13 Canadian Universities - including McGill, UQAM, Montréal, Sherbrooke, Guelph, Concordia, Queen's, Carleton, Memorial, UBC, Dalhousie, Saskatchewan and Alberta - and 4 US universities.





The working group "Adaptation versus maladaptation" met twice at the McGill's Gault Nature Reserve (Mont St Hilaire, QC), on 7-10 December 2015 (top-left picture) and 5-9 December 2016 (top-right, and bottom pictures). Photos: @ecoevoevoeco via #stressadapt on twitter.

The three basic evolutionary outcomes in response to environmental change are adaptation, maladaptation, or non-adaptation (no response). Among these outcomes, by far the most commonly invoked is adaptation. However, closer examination of the data reveals a substantial number of instances of apparent non-adaptation and even maladaptation. The overarching goal of their group is to develop an understanding of different evolutionary responses to contemporary environmental change.

In the last meeting on December 2016, the group; i. analyzed and refined a conceptual framework, ii. built predictive models, iii. conducted a synthetic analysis from the database, and iv. outlined further draft manuscripts reporting the models and analysis.

The outcomes of this working group will help to develop a basic and applied understanding of the fates of species affected by contemporary environmental change. This effort will further develop the knowledgebase of expertise held by Canadian scientists and natural resource managers. By gaining insight into the various adaptive (or maladaptive or nonadaptive) trajectories of populations, managers can more effectively develop conservation targets. Many of the topics will be directly relevant to Canada's natural resources, such as responses to pollution, climate change, and invasive species. At the same time, the knowledge gained will avail framework building, database development, model construction, and synthesis with global relevance and application. Finally, the organizers will leverage the insights gained through this group to develop external proposals (e.g. NSERC Strategic Project Grants) to support database maintenance and to fund both empirical and synthetic research on conservation evolution topics relevant to Canada and its natural resources.

2. New Thematic Working Groups

We are pleased to announce that three new Synthesis Working Groups have been selected for funding by CIEE to be staged on 2017, including:

i. ***The evolution of microbial metabolic and genomic diversity at multiple scales***, led by Stilianos Louca, Laura Parfrey and Michael Doebeli from the University of British Columbia. This working group is bringing together 11 professionals from five Institutions including UBC, Dalhousie University, Simon Fraser University, University of California, and the Massachusetts Institute of Technology.

ii. ***Determining marine hotspots in Arctic Canada using tracking data from multiple species***, presented by Mark Mallory (Acadia), Marie Auger-Méthé (Dalhousie) and David Yurkowski (Manitoba). This working group will meet 12 participants from 10 institutions including Acadia University, Dalhousie University, University of Manitoba, University of British Columbia, University of Alberta, Carleton University, University of Windsor, University of Regina, Environment and Climate Change Canada, and Fisheries and Oceans Canada.

iii. ***Functional response of understory plants to climate, soil and disturbance regimes across Canadian boreal forest ecosystems (Co-VITAS)***, led by Alison Munson, Bright Kumordzi (Laval) and Isabelle Aubin (Canadian Forest Service). This working group, co-funded with the Canadian Forest Service, in bringing together 21 researches from 13 Institutions including Université Laval, Université du Québec en Outaouais, Université du Québec à Rimouski, Université de Quebec à Montreal , Université du Québec en Abitibi-Témiscamingue, University of Guelph, University of Alberta, Ministère des Forêts, de la Faune et des Parcs (QC), Ontario Ministry of Natural Resources, Ontario Forest Research Institute, Northern Hardwoods Research Institute (NB), Canadian Forest Service, and the Centre d'écologie fonctionnelle et évolutive (CNRS, France)

We had a great response to the last Call for Proposals and received very interesting applications from across the entire country. The quality of most applications was exceptional, but as is often the case, requests for funding exceeded available resources, so several well-regarded proposals could not be supported.

***The selection process*:** We are proud of our selection process. This comprehensive and rigorous peer-review evaluation allows us to optimize selection of the most relevant and impactful proposals. As in the past, the assessment of the proposals was carried out by the members of CIEE's Scientific Advisory Group (SAG). Every year we expected a desirable turnover on some of the members of the SAG, always looking to keep scientific excellence and expertise diversity. The current SAG members are: Micheline Manseau (Manitoba), Ira Tanya Handa (UQAM), Steve Perlman (Victoria), Michael Russello (UBC), Marc Cadotte (Toronto), Dennis Murray (Trent), Sean Rogers (Calgary), Mark Brigham (Regina), Root Gorelick (Carleton), Anthony Ricciardi (McGill), Eric Lamb (Saskatchewan), and Amy Hurford (Memorial). We take this opportunity to thank this-year's reviewers, Steve Perlman, Dennis Murray, Sean Rogers, Root Gorelick , Anthony Ricciardi and Amy Hurford for their outstanding work.

In general, scientific excellence and likelihood of success were the main criteria for evaluation, although consideration was also made for the degree to which proposals helped CIEE demonstrate broader benefits to Canada, fiscal responsibility, and benefits to sustaining member organizations.

Specific criteria for evaluations included: i. Project rationale - scientific significance of the questions, evidence of novel synthesis, evidence of benefit to Canadian environmental and economic well being; ii. Project description - clarity of objectives, outcomes, work plan, meeting schedule; iii. Expertise of applicants and participants; iv. Participant diversity: (geographic-institutional diversity and gender balance); v. Potential for defined scientific products, including refereed publications, and; vi. Budget adequacy and feasibility (complete estimates and coherent justification).

Each proposal received a minimum of five independent reviews. Reviewers were asked to rank all proposals to each criterion on the same absolute scale of 1 (weak) to 5 (strong). Relative rankings were then synthesized to achieve a final numerical valuation on each proposal. In addition, reviewers also provided a short written summary of the relative merits of each proposal, in order to provide applicants with formal feedback on the strengths and weaknesses of their proposals. After awarded applicants effectively responded to reviewers' feedbacks and addressed critical comments from the CIEE Direction, Funding Agreements between parts (CIEE and grantees) was developed. These formal agreements describe rights and responsibilities of the parties, allowing a clear, organized and justified use of funding.

3. Meeting of the "International Synthesis Center Consortium"

The CIEE is an active member of "The International Synthesis Consortium" (ISC, http://synthesis-consortium.org/), a global network linking more than ten Synthesis Centres in Ecology, Evolution and Environment across North America, Europe, China and Australia. The ISC envision an expanding network that meets the growing need for synthesis research in all corners of the globe and facilitates foster collaborative research on an international scale.

To strengthen this network, representatives of eight synthesis centres, including CIEE, met at the John Wesley Powell Center for Analysis and Synthesis, in Fort Collins CO, USA, during 12-15 September 2016. Participants included Jill Baron (Powell Center), Thomas Meagher (EOS, UK), Marten Winter (iDIV, Germany), Alison Specht (CESAB, France), Ben Halpern (NCEAS, USA), Colleen Jonsson (NIMBios, USA), John Parker (Arizona State, USA), Margaret Palmer (SESYNC, USA), Jim Boyd (SESYNC, USA), Stephanie Hampton (Washington State, USA), Pam Bishop (NCEAS, USA), Jonathan Kramer (SESYNC, USA), Kevin Gallagher (Powell Center, USA), Marty Goldhaber (Powell Center, USA), and Peter Leavitt and Diego Steinaker (CIEE). In addition, we had representatives from prospective institutes in Brazil, Quebec and New Zealand in attendance.

During the meeting, the international consortium advanced on joint project collaborations among synthesis centres, discussed about more effective ways to evaluate the impact of synthesis activities beyond citations, shared common tools to promote synthesis and debated on science policy relevance and the future of synthesis centres.

International Joint Synthesis Centre Meeting held at the John Wesley Powell Center for Analysis and Synthesis in Fort Collins (US), on 12-15 September 2016.

As a product from this meeting, we completed a manuscript recently accepted for publication in *BioScience*, under the title of "*Synthesis Centers as Critical Research Infrastructure*". This paper reviews the active role played by synthesis centers in group dynamics, management, computing and informatics, and social interactions to advance synthesis in a wide range of ecological and earth science issues. In this paper we also present the history and rationale for synthesis centers and explore different challenges and opportunities to long-term sustainability.

The Syntheses Consortium workshop also provided a forum to outline opportunities for joint funding of working groups. Presently, CIEE is co-sponsoring two working groups with the Synthesis Centre for Biodiversity Sciences of Germany (sDiv) including: "*Testing the conservation value of phylogenetic diversity*", led by Arne Mooers (SFU) and Caroline Tucker (U. North Carolina); and "*Understanding biodiversity change across spatial and temporal scales*", organized by Mary O'Connor (UBC), Andrew Gonzalez (McGill) and Jon Chase (iDiv, Germany). Details on these projects are described above and in our previous newsletter.

4. Upcoming Activities

4.1 The CIEE at the "2017 CSEE Annual Meeting" in Victoria, BC.

As every year, we anticipate active participation in the Annual CSEE Meeting, this year taking place in Victoria on 7-11 May. This year CIEE is hosting a **symposium** on "**Ecological, Evolutionary and Environmental Synthesis in the 21st century**", which will bring together the top ecologists and evolutionary scientists from Canada and beyond to highlight advances in synthesis research. We anticipate presentations which demonstrate the power of the integrative approach through comprehensive data aggregation, robust methods of computation and analysis, conceptual synthesis, and application of outcomes to generate broader impacts. Invited speakers have been selected to represent a wide range of system, scale and conceptual approaches, as well as the broad diversity of the synthesis research community. Following a tutorial-introductory talk, nine leaders of CIEE-based and international synthesis working groups will present the most recent and relevant findings from their collaborative and interdisciplinary projects.

Overall, the Synthesis Symposium seeks to illuminate new advances in integrative Canadian and international research in ecological, evolutionary, environmental and human systems. Given advances in data availability and numeric techniques, synthesis science promises an unparalleled ability to find new meaning in existing data for the benefit of science and society. Through synthesis research, value is added to existing science to draw conclusions that are broader, more integrative, and more applicable than was possible from the original studies. With its culture of collaboration and innovation, synthetic research is ideally suited to 'big science' questions on fundamental and applied topics, including biodiversity, conservation, directed evolution, adaptation, climate change, resource management, and sustainable social development.

Tentative schedule for CIEE Symposium "Ecological, Evolutionary and Environmental Synthesis in the 21st century", which will take place at the CSEE 2017 Annual Meeting in Victoria.

Speaker	Affiliation	Presentation Title
Stephanie Hampton	Washington State University-CEREO Director	*Tutorial-Introductory Presentation*: Ecological, Evolutionary and Environmental Synthesis in the 21st century.
Mary O'Connor	University of British Columbia	Detecting and attributing biodiversity change in the 21st century
Roxane Maranger	Université de Montréal	Making science matter: stakeholder-engaged research through co-design and integrated social-ecological synthesis
Arne Mooers	Simon Fraser University	Predicting impacts of conservation spending and human pressures on biodiversity
Steven Brady	University of Vermont	Mal-adaptation: how common, how strong, how does it happen?
Shana Sundstrom	U of Nebraska-Lincoln- Powell Center Working Group	Cross-scale resilience from theory to practice: Results from a synthesis collaboration
Katherine Bannar-Martin	German Centre for Integrative Biodiversity Research (iDiv)	Integrating community assembly into biodiversity-ecosystem function relationships- the CAFE approach.
Eric Pedersen	University of Wisconsin-Madison	Dynamics of collapse and recovery in a marine community: synthesizing insights from multivariate, statistical, and theoretical approaches.
Donald Baird	Canadian Rivers Institute / University of New Brunswick	Reintroducing Environmental Change Drivers in Biodiversity–Ecosystem Functioning Research.
Andrew Gonzalez	Quebec Centre for Biodiversity Science, McGill University	Insights and discoveries by synthesis science at the Quebec Centre for Biodiversity Science.

In addition to the synthesis symposium, CIEE will be co-sponsoring two additional symposia at the CSEE Victoria meeting. The first, in collaboration with the Quebec Centre for Biodiversity Science, is organized by Andrew Hendry (McGill), Patrick Nosil (Sheffield), Kathie Peichel (Basel), Chris Darimont (UVic), and will be presented under the title of "**Living in the eco-evolutionary theatre: research guided and inspired by intensive field observations**".

The other symposium is organized by Cassidy D'Aloia (Toronto), Ilona Naujokaitis-Lewis (Carleton), and Marie-Josée Fortin (Toronto), and will be presented under the title of "**Canadian protected areas in a changing climate: a cross-ecosystem approach**". This symposium is presenting main findings from the CIEE Working Group detailed above (item 1.2)**.**

Finally, CIEE is sponsoring the **Workshop "Maps and Spatial Data with R"** that will take place on May 7, 2107, in conjunction with the CSEE Meeting. This workshop session will introduce participants to data visualization with the software application R, with a focus on spatial data. Instructors will begin with some R basics useful for making maps, and will then move on to more specialized methods for handling and visualizing spatial data.

4.2. Sponsorship of the 2017 Pacific Ecology and Evolution Conference (PEEC).

CIEE is a proud sponsor of the 2017 annual Pacific Ecology and Evolution Conference (PEEC). This conference, organized and run each year by students from Simon Fraser University, University of British Columbia and University of Victoria, will be held at the Bamfield Marine Science Centre, located on Vancouver Island, on February 24-26, 2017. Over the past 37 years, the PEEC has established a reputation as a conference that provides a unique opportunity for ecology and evolution grad students to present research, exchange ideas, and seek collaborations with peers from across Western Canada and the United States in a comfortable and intellectually stimulating environment. By supporting PEEC, CIEE seeks to help students and early-career scientists achieve a broader understanding of the scope of ecological and evolutionary science, a central theme of our synthesis activities and a critical component of all synthesis centre activities.

4.3. Sponsorship of the "Summer school in data-driven ecological synthesis"

CIEE is supporting the "Summer school in data-driven ecological synthesis" organized by Dr. Timothée Poisot (Université de Montréal) and Dr. Dominique Gravel (Université de Sherbrooke) with a small operating grant. Dr. Poisot is an Assistant Professor in Quantitative and Computational Ecology at the Université de Montréal, and is a certified Software Carpentry and Data Carpentry instructor who serves on the editorial board of both *Methods in Ecology & Evolution* and *PLOS Computational Biology*. Dr. Gravel is a professor of biogeography at the Université de Sherbrooke, and holds a Tier I Canada Research Chair.

This summer course will take place at the Station de Biologie des Laurentides (Université de Montréal), on May 1 to 7, 2017. The main goal of this course is to give early-career ecologists the tools they need to interact with open data, and use them to ask general questions. In particular, the participants will discuss how diverse data can be integrated to further ecological synthesis and analysis. Over the 7 day duration of the course, students will lead individual and group projects, while the instructors will cover diverse topics such as: good practices for data management; useful statistical and mathematical tools; data cleaning and data analysis tools;

notions of parallel computing for fast data processing; data visualisation and presentation protocols, and; analysis reproducibility. With the support of this training initiative, CIEE is contributing to reduce the existing gap in computational skills for management and analysis of data, key for successful synthesis research.

5. Other important information

5.1. New Contributing Member of the CIEE

We are pleased to welcome the Université de Montréal as a contributing member of the CIEE, starting January 2017. Dr. Roxane Maranger is the representative of the Université de Montréal at the CIEE Management Board. As part of it membership, UdM also provides its biological field station north of Montreal for use as an eastern locale for CIEE working groups. Furthermore, UdM is providing new computational support and data storage for all CIEE working groups, courtesy of Dr. Timothée Poisot.

5.2. Membership Drive

CIEE grows by adding partners from across Canada. Because CIEE achieves its mission principally through funding from, and co-operation among, a consortium of Canadian institutions, it is essential that we have representation from all regions and institutions. Currently, CIEE is financially supported by six Canadian universities (British Columbia, Carleton, McGill, Montreal, Regina, Simon Fraser), and the Canadian Society for Ecology and Evolution (CSEE). In this model, each member institution pays annual membership fees assessed on a sliding scale according to their NSERC Discovery Grant program funding in ecology and evolution. Importantly, all of the funding obtained from sustaining member organizations is used for direct support of CIEE scientific programs, whereas in-kind contributions help maintain staff and synthesis facilities. As a result, the more members we have, the more activities we can support!

To increase our membership, we are seeking CIEE representatives at all Canadian universities to act liaisons to local researchers and administration. Through your institution's membership, you will be able to: 1) foster your and your colleagues access to CIEE's scientific programs along with access by their highly qualified personnel (e.g., your institution's students and PDFs), 2) gain a seat on the management board that sets the mandate and direction of the CIEE, 3) receive priority consideration for CIEE initiatives and funding, and overall 4) play a pivotal role in shaping the future of ecology and evolution research and training in Canada. If you are interesting in joining us as a contributing Member, please do not hesitate to contact us for additional information.

Contact us, your input matters!

Tell us what you think. We are pleased to receive your questions, comments or concerns about the Canadian Institute of Ecology and Evolution. In particular, please let us know if you have an idea for a new member service or research activity. Thanks!

Dr. Peter R. Leavitt, *CIEE Director*, Dr. Diego F. Steinaker, *CIEE Associate Director*, Dr. Mark R. Forbes, *Chair of CIEE Executive*.

Many thanks to our Contributing Members for the continuing support!

THE UNIVERSITY OF BRITISH COLUMBIA

Carleton UNIVERSITY

CSEE SCEE

McGill UNIVERSITY

Université de Montréal

University of Regina

SFU SIMON FRASER UNIVERSITY

join us !

Your current CIEE Board Members, Directors and Representatives

Management Board: Mark Forbes (Carleton), Sarah Otto (UBC), Elizabeth Elle (Simon Fraser), Stephen C. Lougheed (Queen's), Christopher Somers (Regina), Andrew Hendry (McGill), Alison Derry (UQAM, CSEE), Roxane Maranger (U de Montréal) and Stephanie Hampton (WSU).

Direction: Peter Leavitt, Director (Regina), and Diego Steinaker, Associate Director (Regina)

Scientific Advisory Group: Micheline Manseau (Manitoba), Ira Tanya Handa (UQAM), Steve Perlman (Victoria), Michael Russello (UBC), Marc Cadotte (Toronto), Dennis Murray (Trent), Sean Rogers (Calgary), Mark Brigham (Regina), Root Gorelick (Carleton), Anthony Ricciardi (McGill), Eric Lamb (Saskatchewan), and Amy Hurford (Memorial).

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If you recognize the importance of having a national centre for synthesis in ecology and evolution, and are interested in acting as the formal CIEE representative to your Institution, please let us know via our dedicated email address ciee-icee@uregina.ca.