



CANADIAN SOCIETY FOR ECOLOGY AND EVOLUTION
 SOCIÉTÉ CANADIENNE D'ÉCOLOGIE ET D'ÉVOLUTION

www.ecoevo.ca
 executive@ecoevo.ca

Recommendations from the Canadian Society for Ecology and Evolution (CSEE) flowing from the Council of Canadian Academies' (CCA) report on the state of taxonomic science in Canada.

Introduction and background observations

In November 2010 the Council of Canadian Academies released a report, “Canadian Taxonomy: Exploring Biodiversity, Creating Opportunity” that had been commissioned by the Federal Minister of Canadian Heritage. The expert panel that wrote the report was chaired by Thomas Lovejoy and included several members of the Canadian Society for Ecology and Evolution (CSEE). It received considerable media attention, and can be accessed at www.scienceadvice.ca.

The CCA panel was asked to undertake an evidence-based assessment rather than to make any specific policy recommendations (CCA report, pg. 9). CSEE, with input from experts from Canada and abroad, has developed a list of recommended actions in response to the CCA report. These actions are based on the following conclusions drawn in the CCA report:

- (i) Interest in taxonomy among students remains high, but opportunities within academia have become limited.
- (ii) Canadian taxonomists ranked #6 in new species descriptions worldwide during the 1980's and now rank #14.
- (iii) Research funding for taxonomy is currently stagnant
- (iv) Canada has extensive biodiversity collections, with >50 million specimens conservatively valued at over 0.25 \$billion, and a strong digital infrastructure, but most of the taxonomic data on biodiversity are not publically available.
- (v) Given Canada's recent history of taxonomic expertise and practice, modest investments for training and curation would ensure continuity.

It is our view that a collective understanding of Canadian biodiversity is urgently needed. We have international commitments under the Convention on Biological Diversity and our country is changing at a remarkable rate due to anthropogenic stressors. Taxonomy must be at the forefront of this endeavour, so the timing for renewed focus on the topic is auspicious.

We are encouraged by very recent undertakings to coordinate taxonomic databasing (e.g., the Canadensys initiative: www.canadensys.net) and to preserve collections (e.g., the recent report of the Association of Natural History Museums of Canada:

www.naturalhistorymuseums.ca/documents/ANHMC_English_StrategyPaper.pdf). We believe that further actions in response to the CCA report will benefit society and will build strong and internationally recognized expertise in Canadian taxonomy. For maximal effect, there must be action at an administrative level (Federal, Provincial, and University/College level), as well as action within the biology profession, as detailed below.

Recommendations for action: Administrative

Recommendation 1. *Universities and colleges, partnered with museums and herbaria, should offer certificates in taxonomy.*

Given the pace of environmental change, expanding human activities on the landscape, and an increased acknowledgement of the need for environmental stewardship, there is a growing need for taxonomic expertise for studies of local Canadian biota. Many institutions offer certificates in teaching to graduate students, and these provide a possible guide. Training would include, *inter alia*, modules on bioinformatics, specimen curation, phylogenetics and taxonomy, and a critical internship component to work with a mentor taxonomist in order to acquire expertise in a specific group of organisms. Importantly, the certificate should be open to both graduate students and to informally-trained experts. We suggest that this certificate program be run at the institutional scale and note that it would require only modest financial investment.

Recommendation 2. *To maintain capacity in taxonomy, institutions must actively reverse the declining trend in academic job opportunities.* A lack of job opportunities was cited as the largest impediment in the career pipeline of taxonomists. Targeted university chairs in Taxonomy and Systematics (e.g., through the federal CRC programme) would be an effective means to build the necessary capacity in this regard.

Recommendation 3. *Taxonomic groups should be identified for which strategic research investments would bolster Canada's ability to assess its own biodiversity, as well as to make international contributions.* A body such as the CSEE, NSERC, or the Canadian Museum of Nature could help identify such opportunities. Canadian species need to be identified before being studied and monitored, and yet the CCA report highlighted a growing taxonomic gap in the identification of important organisms (e.g. pollinating insects, freshwater molluscs, lichens). Internationally, Canada is already a world leader both in taxonomic work on single-celled organisms (supported by CIFAR), and in DNA-based species identification and bioinformatics (supported by various levels of government). In order to fill gaps of particular concern to Canada and act on opportunities for international contributions, a national strategy should be developed to identify taxonomic priorities, then to target research and training funds to them.

Recommendations for action: Biologists

Recommendation 4. *We should collect and synthesize more detailed information on the full worth of taxonomic information.* The CCA report is clear that Taxonomy is of foundational importance, but short-term uses of taxonomic identification and species discovery should also be quantified as fully as possible to assess the costs of a taxonomic gap. What are the social and economic benefits of species discovery, identification, and classification, and what would be the costs of failing in this enterprise in Canada? The CCA report discusses the practical value of identification, and there are case studies available (e.g. those highlighted at www.bionet-intl.org/opencms/opencms/caseStudies/default.jsp), but quantification of overall benefits is lacking.

Recommendation 5. *We should change how taxonomic work is officially recognized by our peers.* Giving credit to others who have done necessary antecedent work is fundamental to science. However, we are required neither to cite the authority when we identify study organisms in our publications, nor to cite the keys we use to identify organisms. This is a convention that we can change, most directly by urging journals to require this form of recognition.

Recommendation 6. *We should push for including taxonomic expertise as a named skill in relevant job ads.* Job ads often list skills that would be considered a positive attribute in a potential candidate. Simply by adding

taxonomic expertise to this list wherever appropriate, we would be signaling that the biological community values this expertise. In particular, it would signal to trainees that developing taxonomic skills would contribute to their career prospects, helping to counteract the sentiment of students surveyed in the CCA report who felt that taxonomic expertise is seen as less important than other skills.

Recommendation 7. The teaching of taxonomy across Canada should be better coordinated and supplemented in areas of strategic concern. We should increase internal networking efforts to identify courses and workshops available for taxonomic training across Canada. Additionally, we should develop courses and workshops to address taxonomic gaps of strategic importance (e.g., through the Canadian Institute for Ecology and Evolution <ciee-icee.com>).

We hope that these recommendations can help guide Canada's renewed focus on Taxonomy as a foundational science and an important part of Canada's knowledge base.

Dr. Spencer Barrett, FRS, FRSC
President, CSEE
Univ. of Toronto ON

Dr. Sarah Otto, FRSC
Director, Biodiversity Research Centre
Univ. of British Columbia BC

Dr. Marco Festa-Bianchet
CSEE Biodiversity Committee
Univ. de Sherbrooke PQ

Dr. Jade Savage
Bishop's University PQ

Dr. Wayne Maddison, Co-Director
Beaty Biodiversity Museum
Univ. of British Columbia BC

Dr. Fredrik Schram
Professor Emeritus of Systematics
Univ. of Amsterdam NL
Research Assoc., Burke Museum WA

Dr. Arne Mooers
CSEE Biodiversity Committee
Simon Fraser University BC

Dr. Joseph D. Shorthouse, President
Biological Survey of Canada
Laurentian University ON

Dr. Laurence Packer
York University ON

Dr. Felix Sperling, Curator
E.H. Strickland Entomological Museum
University of Alberta AB

Dr. Heather Proctor
Chair, Policy & Planning
Museums & Collections Services
University of Alberta AB

Dr. Jeannette Whitton, Co-Director
Beaty Biodiversity Museum
Univ. of British Columbia BC