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Editorial

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The Early Land Plants Today project (ELPT): A community-driven effort and a new partnership with *Phytotaxa*

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Abstract

There remains a critical need to synthesize the vast amount of nomenclatural, taxonomical and global distributional data for liverworts and hornworts. This is fundamental in the efforts towards developing a working list of all known plant species under the auspices of the Convention on Biological Diversity (CBD). Such a synthesis has far reaching implications and applications, including providing a valuable tool for taxonomists and systematists, analyzing phytogeographic and diversity patterns, aiding in the assessment of floristic and taxonomic knowledge, and identifying geographical gaps in our understanding of the global liverwort and hornwort flora. We here outline and discuss the methodology as part of an international consortium referred to as the Early Land Plants Today (ELPT) project. There are three fundamental components to the project: 1) a worldwide checklist of liverworts and hornworts; 2) regional or local distribution checklists; and 3) the synthesis of the taxonomy, systematics, and nomenclature on a taxonomic group-by-group basis. The latter, in particular, represents the first endeavour of its kind and will appear as a series of forthcoming papers in *Phytotaxa*, where ELPT collaborates closely with taxonomic specialists validating and verifying nomenclatural and type data, authorities, original citations, as well as auxiliary data associated with specific taxonomic groups. A brief account of the compilation of regional or local checklists is also provided; these also will be published periodically.

Key words: CBD, classification, distribution, GBIF, hornworts, liverworts, nomenclature, taxonomy

Introduction

The critical biological, environmental and evolutionary significance of liverworts (Marchantiophyta) and hornworts (Anthocerotophyta) is well documented (e.g., Hallingbäck & Hodgetts 2000, O'Neill 2000, Gignach 2001, Gradstein *et al*. 2001, Shaw & Renzaglia 2004, Qiu *et al.* 2007, Bates 2009). Recently, there has been a major internationally coordinated effort to synthesize the vast amount of nomenclatural, taxonomical and global distributional data for this unique group of land plants (Söderström *et al*. 2008, von Konrat *et al*. 2008a, b). Prior to this effort there remained no central source that attempted to harness core data from the immensely scattered literature. However, there existed two large independent databases with nomenclatural, taxonomical, and distributional data on liverworts and hornworts: Söderström (Trondheim) created and maintained such a database spanning over two decades, and more recently Hagborg and von Konrat (Chicago) developed a similar effort. The merger of these two large datasets formed the basis of the GBIF funded project entitled 'Early Land Plants Today (ELPT).'

ELPT has far reaching implications and applications, including providing a valuable tool for taxonomists and systematists, analyzing phytogeographical and diversity patterns, aiding in the assessment of floristic and taxonomic knowledge, and identifying geographical gaps in our understanding of the global liverwort flora (von Konrat *et al*. 2008a). Moreover, the ELPT project is providing the foundation on which to develop a

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working checklist of liverworts worldwide—a concept recently endorsed by 31 hepaticologists at an international meeting hosted by the Biodiversity Synthesis Center of the Encyclopedia of Life (see http://www.early-land-plants-today.org/elpt to eol). This is significant because the Convention on Biological Diversity (CBD) adopted the Global Strategy for Plant Conservation (GSPC) that set the target date of 2010 to complete a widely accessible working list of all known plant species (Lughadha 2004). The critical need for this target to be achieved and the implications for conservation, taxonomy, and botanical science was recently been outlined by Paton *et al*. (2008).

A second set of critical products is the output of regional or local distribution checklists for liverworts and hornworts. Knowledge of the spatial distribution of biodiversity is crucial for its further exploration, use and conservation (Mutke & Barthlott 2005). Detailed information about spatial patterns of phytodiversity is a central prerequisite to fulfill targets set by the Convention on Biological Diversity (CBD) and the Global Strategy on Plant Conservation (GSPC), which includes protecting 50% of the most important centers of plant diversity and to conserve 60% of the world's most threatened species *in situ* by the year 2010 (Barthlott *et al*., 2005). The significance of checklists is summarized by Söderström *et al*. (2007, 2008), including outlining the utility of checklists as powerful and important tools, and their applicability to taxonomy, systematics, and conservation. Although there are checklists of these plants for many areas throughout the world, there alarmingly remain substantial portions of the globe that either lack checklists entirely or have checklists that are woefully out of date (Söderström *et al*. 2008). Currently, ELPT along with collaborators, has produced checklists for Jamaica (Söderström *et al.* in press) and Java (Söderström *et al*. this issue).

In unison with the development of a worldwide liverwort checklist, as well as the production of regional checklists, the ELPT project has been actively collaborating with taxonomic specialists validating and verifying nomenclatural and type data, authorities, original citations, as well as auxiliary data associated with specific taxonomic groups. This is the first endeavour of its kind and will represent the most comprehensive catalogue on a group by group basis, synthesizing the taxonomy, systematics, and nomenclature. The results from this international effort will be submitted and published (pending peer review) as a series of papers in the journal *Phytotaxa*. These are to appear on an *ad hoc* basis throughout any particular year with no particular taxonomic sequence or regularity for the simple fact that the processing and assessment of data and the submission of manuscripts is dependent on feedback from specialists.

The objective of this paper is to outline and discuss the methodology undertaken for the forthcoming series of taxonomic synthesis papers including: the structure and content of subsequent papers; the international standards adopted; the data components, sources and quality control; the approach to classification adopted; and briefly describing the internal standard operating practices of the project. The first synthesis paper in this series by Váňa *et al*. (in press) entitled "Early Land Plants Today: Taxonomy, systematics and nomenclature of Gymnomitriaceae" will follow in a future issue of *Phytotaxa*. An equally informative and important product of the project is the production of regional and local checklists. This has been an ongoing effort led by L. Söderström. A brief account of the structure and background data to the production of these checklists is also provided.

Data availability and information needs

von Konrat *et al*. (2008a) provided a brief review and assessment of nomenclatural data availability and information needs for liverworts and hornworts. There are many outstanding nomenclatural indexing and similar projects, including: MOSs TROPICOS (http://www.mobot.org/MOBOT/tropicos/most/iom.shtml); *Index Hepaticarum*, which includes all effectively published liverwort epithets spanning 12 volumes with the closing date of 1973 (see Gradstein, 2006 for an assessment of that publication); *Index of Hepatics* by Crosby & Engel (2005) providing an equally valuable nomenclatural resource and catalog of names at all ranks for liverworts and hornworts published during 1974 to 2000; and the recent indices of the citations for names published for bryophytes for the years 2001–2004 (Crosby & Magill 2005) and 2005 (Crosby & Magill 2006).

von Konrat *et al*. (2010) continued this series in the form of an Index for Liverworts and Hornworts 2006 to 2008. Recently, another useful web accessible resource became available online—the electronic version of *Index Hepaticarum* (http://www.ville-ge.ch/musinfo/bd/cjb/hepatic/index.php).

The usefulness of all these indices is beyond dispute, but they are mainly useful to a specialist and of limited utility to users with broader interests. The indices mentioned above are all purely nomenclatural and make no distinction between accepted taxa and synonyms. Type data is also limited or scant in several of them, and data on the distributional range is completely lacking. A central data source that works towards reaching a consensus on accepted taxa and that unifies nomenclatural data and global distribution data remains a critical need. This is one of the aims for the ongoing ELPT project.

Overview of the working data set

The present working data sets includes a stellar bibliography of 13,500 publications; approximately 35,000 published liverwort names (including "accepted" taxa, synonyms, invalid and illegitimate names); over 400,000 geographical observations (a single observation is a record of one taxon from one geo-political unit); and, to date, almost 1400 active geo-political units, e.g., local region, state, province, country. There are two core elements of the working data set: nomenclatural data and geographical data. The nomenclatural and taxonomical data includes name, authority, original citation, type data (protologue and specimen data), extensive annotations and notes for publishing, source of information for all elements, and internal operational tasks as well as auxiliary nomenclatural data. The geographic data includes the known distribution of a taxon, as well as the source of the data. Secondary components that are being implemented in an ongoing effort, include taxonomic descriptions, images of illustrations, plates and protologues, voucher specimen data derived from monographs and revisions, and records of other resources such as web URL's, abstracts, etc. More than 3,500 journal articles and monographs have been used so far as input for this data.

Data quality and standards

DATA QUALITY: There is an intense systematic effort focusing on data quality. In the vast majority of cases nomenclatural data is verified against original publications. Monographs, revisions, books, and authoritative works are extensively used for quality control in terms of cross-referencing with checklists for synonymy and verification of distribution. Data for specific taxonomic groups is prepared chiefly by the last two authors, Söderström and Hagborg. Whenever possible ELPT actively solicits validation, review and corrections from specialists of taxonomic groups. For example, the treatment of Gymnomitriaceae, in a forthcoming issue of *Phytotaxa*, was reviewed and prepared by Dr. Jiří Váňa**,** a worldwide expert on this family. Since the formal inception of the ELPT project, over the last three years we have received participation from more than 20 bryologists worldwide towards our preliminary data set and we will continue to foster this relationship. Community participation is critical to the quality of the finished products since it is at this stage that the project can receive critical taxonomic judgment, addressing the problem of differing taxonomic opinions and validating synonymy and geographical records.

STANDARDS: The ELPT project follows a strict protocol in the preparation of the data set uniting nomenclature, taxonomy and geography. The authors and participants are constantly working towards maintaining the highest levels of data quality and compatibility and we follow existing standards to achieve this. For authorities and for the citation abbreviations, we follow those standards set by the on-line version of *Authors of Plant Names* at the Royal Botanical Gardens, Kew Website (http://www.ipni.org), with whom we collaborate closely and provide with updated data records. We are also preparing an extended version of the TDWG's World Geographical Scheme for Recording Plant Distributions (Brummitt 2001).

NOMENCLATURE: For nomenclatural elements we follow the *Vienna Code of Botanical Nomenclature* (McNeill *et al*. 2006). Throughout the taxonomic treatments, attempts have been made to update previously published or online sources where articles of the *Code* have been applied. This has been done so as to reflect and provide easy reference to Articles representing the latest *Code*, i.e., McNeill *et al*. (2006).

Funding

The project in its current form has received funding from the Global Biological Information Facility (GBIF) and is receiving supplementary funds from the National Science Foundation (NSF) with related synergistic activities. The project recently received sponsorship from the Encyclopedia of Life (see http://www.eol.org) for a large international meeting of 31 liverwort taxonomists worldwide to further consolidate the projects aims and objectives. This was held at the Field Museum, Chicago, U.S.A., between 26 and 29 May, 2009. The meeting was significant as it 1) secured the liverwort communities commitment to produce a worldwide checklist by the end of 2010; 2) received the support of specialists to act as custodians with the objective of producing a taxonomic and nomenclatural synthesis of various taxonomic groups—the concept outlined in this paper; and 3) underscored the desire of the liverwort community to have open access to the powerful data sets created by Söderström and Hagborg.

Distribution and Mapping

Distribution data are widely scattered throughout the literature and much of it is in local publications that are difficult to find and many areas are lacking recent checklists (Söderström *et al*. 2008) or the checklists are for very large areas. It is our aim to classify distribution to units in the order of 50–75,000 km², approximately the size of Latvia or Lithuania, or in case of very well separated areas as the different islands and archipelagos in the Pacific, even smaller units will be used. Another problem with distribution reports is that erroneous reports are continuously reappearing in the literature even long after they have been proved incorrect. Much of these erroneous reports are due to misidentification of material, a complicated nomenclature that is uncritically used, or very old reports where (mostly European) taxa were misapplied to taxa unknown at that time. The ELPT project therefore also aims to identify all such erroneous reports in an effort to prevent the reemergence of incorrect distribution range data. For the taxonomic synthesis papers that will be appearing in *Phytotaxa*, distribution is recorded to Level 2 following Brummitt (2001), in order to provide a general overview. Otherwise, regional or local checklists will be produced on an *ad hoc* basis, but with no dedicated journal. Methodology will be described in each individual paper, but the underlying principles and standards remain much the same as for the taxonomic synthesis papers that are described here. A very brief account is provided below for the checklists.

Systematics and classification

In the past several years, the application of molecular phylogenetics to the unraveling of liverwort phylogeny has generated new insights into the evolutionary history of the group and revolutionized liverwort classification (Crandall-Stotler *et al*. 2009). Recently, Crandall-Stotler *et al*. (2008, 2009) provided an outstanding treatise summarizing historical and contemporary liverwort classification. In the latter paper, Crandall-Stotler *et al*. (2009), provided a comprehensive and phylogenetic classification scheme that attempted to integrate morphological data with current molecular hypotheses, as well as discussing major modifications and novel alignments of taxa. Recent works on liverwort systematics and phylogeny include

incorporation of several hypotheses generated from molecular data proposing modification to the higher levels of the taxonomic hierarchy of liverworts (e.g., Frey & Stech, 2005, 2008, Heinrichs *et al*., 2005, Forrest *et al*., 2006, He-Nygrén *et al*., 2006, Long 2006, Crandall-Stotler 2008, 2009).

In the forthcoming series of papers, we will largely adhere to the higher classification presented by Crandall-Stotler *et al*. (2009) namely from class to suborder, and the majority of family and genera arrangements provided therein. In addition to the higher levels of classification, the taxonomy of each group will include subfamilial (N.B., not presented by Crandall-Stotler *et al*. 2008, 2009) and infrageneric classification where applicable. However, there remains a number of ambiguous placements and many areas of contention, particularly at the familial and generic level. As noted by Crandall-Stotler *et al*. (2009) many small families have not been sampled, and many of the large families and genera that have been sampled appear to be either polyphyletic or paraphyletic. For example, the delimitation and classification of the large, cosmopolitan liverwort family Lophoziaceae remains controversial, and even in its strictest sense, internal classification has varied widely among different treatments (de Roo *et al*. 2007, Konstantinova &Vilnet 2009, Söderström *et al*. 2010). Obviously, the reconstructing of the phylogenetic history of the Marchantiophyta remains an ongoing effort and liverwort classification remains fluid. Therefore, a critical section in each of the forthcoming papers will be a review of the historical and contemporary classification of the respective taxonomic groups, especially highlighting any departure from existing schemes.

Web initiatives and capacity building

Updated information about ELPT can be found at http://www.early-land-plants-today.org which also includes active participants, sample taxon pages, and auxiliary resources. As part of the ELPT project, von Konrat *et al*. (2008a) promoted web-based technology as a medium to enable the bryological community to work effectively in identifying and recording the immensely scattered data. Scoble (2004) reviewed web-based taxonomic information systems concluding that the web offers taxonomists a very different medium with special advantages for providing wide access to data. The ELPT project promotes capacity building and open collaboration with other international databasing efforts, e.g., IPNI, GBIF, ITIS, Catalogue of Life, Species 2000, DiscoverLife, MOSs TROPICOS, Index Hepaticarum, and large research projects such as the NSF funded Liverwort Tree of Life. The ELPT project has already contributed materials to these efforts. More comprehensive information on nomenclature, taxonomy and geography will be disclosed on the web in the future. This will include data that for space constraints is more conducive to the web, e.g., full type data details, full protologue information, and full type specimen details (as often type data derived from the protologue is not precisely the same as the label data from the type specimens). Other data includes specific distribution, images, descriptions, voucher specimen data, and other auxiliary data. Currently, the ELPT project has been utilizing the Botany Taxon Pages project (see http://emuweb.fieldmuseum.org/botany/botanytaxon.php) which also collaborates closely with the Encyclopedia of Life (www.eol.org).

Structure and content of forthcoming papers

Taxonomic synthesis papers

ELPT is currently collecting both taxonomic/nomenclatural data and distribution data. However, in order for the distributional data to be effective, accurate and useful, it is fundamental to arrive at a satisfactory taxonomy. We are therefore starting a series of publications on the taxonomy, while all the distributional data will become available for the broader public in a later phase.

The focus of each forthcoming taxonomic synthesis paper is on nomenclature and accepted names for a particular taxonomic group, typically a family. Each paper begins with a general introduction that attempts to synthesize, in broad terms, knowledge to date relating to modern and historical classification, recent

molecular and phylogenetic studies, as well as highlighting any interesting aspects of the biology, conservation and broad distribution patterns. Immediately following this is the detailed taxonomy and nomenclature section. Although the taxonomic treatment may identify new synonyms, the treatment will not include novelties such as new taxa, new combinations, attempts to validate invalid names, or new lectotypes. Such taxonomic and nomenclatural novelties will, if needed, be published in separate papers.

Specifically, the taxonomy will include the following nine elements:

i. The taxonomy and classification of all ranks.
ii. Accepted, valid and legitimate name. Note: orthographic variants, including various spelling, compounding, and inflectional forms of a name or its epithet, are typically not included unless otherwise noted.
iii. Distribution. This is recorded to Level 2 following Brummitt (2001), the corresponding units are illustrated in Figure 1.
iv. Basionym and homotypic synonyms.
v. Heterotypic synonyms, including invalid and illegitimate names.
vi. An abbreviated citation for the place of publication exists for all names.
vii. Original publication for all names.
viii. Type data where available for all basionyms, which will include country, nearest locality, date collected, collector, herbarium. Treatments also attempt to identify where typification maybe needed.
ix. Annotated notes where applicable.

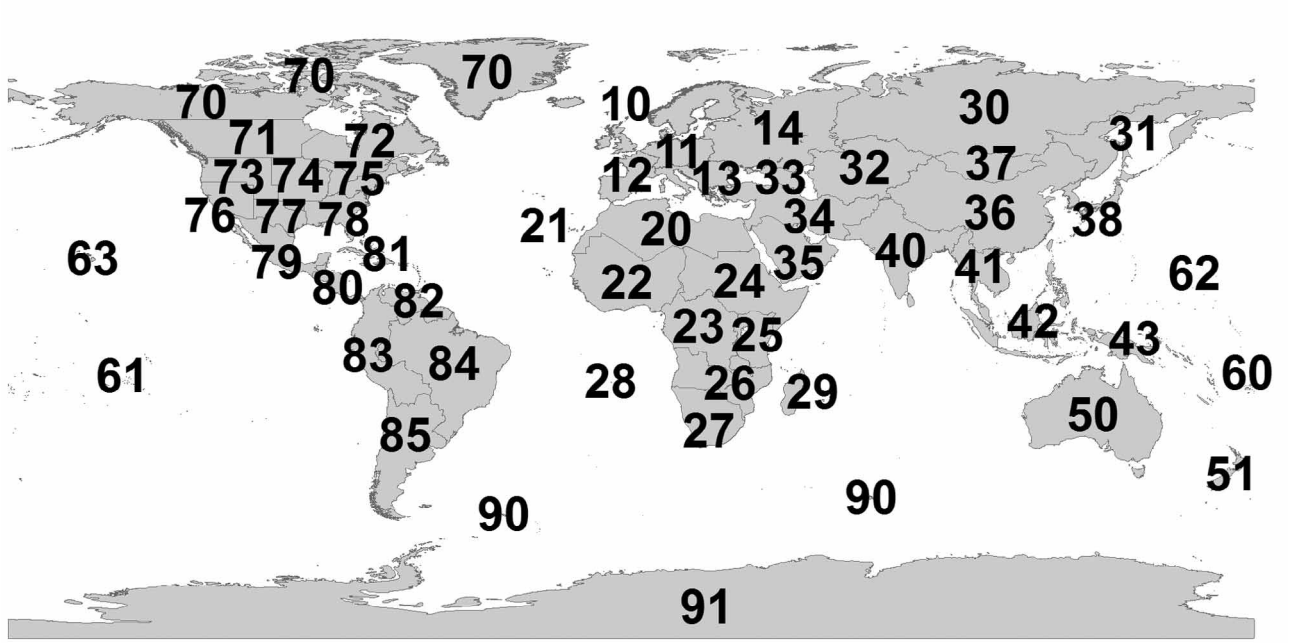

FIGURE 1. Units used to report the distribution at a large-scale following the level 2 areas of Brummitt (2001). See Table 1 for translation of the number codes.

Unranked names from literature before 1890 are as far as possible cited verbatim. Thus, “var.”, “f.” etc., are included only when present in the original text or when the addition is supported by article 35.4 in the ICBN (McNeill *et al*. 2006). We have, thus, taken a much stricter position here that deviates from, e. g., the Index Hepaticarum. The latter, like most other sources, always translated unranked taxa to currently used ranks, which we interpret as against the code and we would like to go even one step further and abandon article 35.4 to reduce the level of interpretation.

The detailed taxonomy section is followed by the following sections: Excluded taxa, Synopsis of accepted taxa, Summary of all names, and References.

TABLE 1. A list of level 1 (region identified in capital letters) and 2 areas following Brummitt (2001) accompanied with the numerical code (see Figure 1).

Code No.	Region	Code No.	Region
1	EUROPE	43	Papuasia
10	Northern Europe	5	AUSTRALASIA
11	Middle Europe	50	Australia
12	Southwestern Europe	51	New Zealand
13	Southeastern Europe	6	PACIFIC
14	Eastern Europe	60	Southwestern Pacific
2	AFRICA	61	Southeastern Pacific
20	North Africa	62	Northwestern Pacific
21	Macaronesia	63	Northeastern Pacific
22	West Tropical Africa	7	NORTH AMERICA
23	West-Central Tropical Africa	70	Subarctic America
24	Northeast Tropical Africa	71	Western Canada
25	East Tropical Africa	72	Eastern Canada
26	South Tropical Africa	73	Northwestern USA
27	Southern Africa	74	North-Central USA
28	Middle Atlantic Ocean	75	Northeastern USA
29	Western Indian Ocean	76	Southwestern USA
3	TEMPERATE ASIA	77	South-Central USA
30	Siberia	78	Southeastern USA
31	Russian Far East	79	Mexico
32	Middle Asia	8	SOUTH AMERICA
33	Caucasus	80	Central America
34	Western Asia	81	Caribbean
35	Arabian Peninsula	82	Northern South America
36	China	83	Western South America
37	Mongolia	84	Brazil
38	Eastern Asia	85	Southern South America
4	TROPICAL ASIA	9	ANTARCTIC
40	Indian Subcontinent	90	Subantarctic Islands
41	Indo-China	91	Antarctic Continent
42	Malesia		

CONFIDENCE LEVEL: Significantly, each accepted taxon would be qualified using a four level ranking system that indicates our level of knowledge about a taxon. The coding convention we are adopting uses one to three stars as well as a question mark. The conventions are briefly outlined below coupled with samples illustrating how these conventions are applied in practice. Note that an infraspecific taxon can not have more stars than the mother taxon and stars can only be assessed to valid and legitimate taxa (except when validation is in progress). The application of a confidence level to a taxon's status and whether it represents a genuine "species" that is reached through community consensus may go towards refining species estimates using an evidence-based approach (von Konrat *et al*. 2008a,b). Concluding each paper will be any updated information about the project.

? **Problem with the taxon name and value**. The taxon is invalid, illegitimate or orphaned in a synonymized genus but its correct placement is unknown.

Example: *Lophozia androgyna* Schuster (2002: 266) is invalidly described. The value of the taxon is unknown and it may either be synonymized with something, recognized and then in need of validation, or being transferred to another genus (also in need of validation).

* **Serious doubts**. There are doubts about the value of the taxon. It can be that there is conflicting views without any substantial evidence in any directions, conflicting views with substantiating evidence supporting one or both positions, or evidence points towards synonymization but it is premature to do it. Note that it is better to keep a taxon with one star (and a note) than to synonymize it too quickly.

Example: *Orthocaulis cavifolius* Buch & Arnell (1950: 71) sits in the middle of *O. atlanticus* (Kaalaas 1898: 11) Buch (1932: 94) in one molecular study but not in another. It needs to be studied more before a complete synonymization can be done or it can be fully recognized.

Example: The description of *Sphenolobus langkyrdumii* Singh & Nath (2007: 93) indicates that it may be a form of *Metahygrobiella albula* (Stephani 1909: 578) Grolle (1961: 1), but until the type is re-studied the formal synonymization should be avoided.

** **Knowledge problem**. The taxon is not well known by the person evaluating it. It may be a newly described species or a species originally not well described and not restudied recently.

Example: The genus *Riella* Montagne (1852: 11) has not been looked at worldwide in modern time. It is obvious that the type species, *R. helicophylla* (Bory & Montagne 1844: 229) Montagne (1852: 12) should be recognized (***) but some or several of the other taxa may be synonymized across the continents when someone looks into the problem. Thus, those are annotated with **.

Example: *Jungermannia erectii* Singh & Nath (2007: 117) was recently described and has not been independently studied by someone with a global overview. It is therefore difficult to evaluate.

*** **Accepted**. A good taxon as currently understood based on personal experience or on taxonomic revisions that is convincingly performed. Nomenclature and/or taxonomic position may, however, be questioned. Elements may be excluded from the taxon, but the taxon with the current type will still be accepted.

Example. *Aneura pinguis* (Linnaeus 1753: 1136) Dumortier (1852: 115) is generally recognized in Europe (type from Britain) since long although it has sometimes been treated as a member of the genus *Riccardia* Gray (1821: 679). Recently it has been shown that it includes cryptic taxa. Even if these will be excluded a taxon named *A. pinguis* will remain.

Example: *Jungermannia dusenii* (Stephani 1891: 209) Stephani (1901: 74) is recognized as a good species, but it does not belong to *Jungermannia* (Linnaeus 1753: 1136) but to *Solenostoma* Mitten (1865: 51). However, it is not yet transferred to the new genus but should still be recognized.

Example: H. Bischler-Causse revised the genus *Marchantia* Linnaeus (1753: 1137) world-wide in a series of publications. Although she had a broad species concept, she also recognized infra specific taxa. The taxa that she recognized without doubt should be accepted unless new evidence against it exists. Adopting a narrower species concept so that many of her subspecies are elevated to species does not change her view of what a good taxon is.

Regional and local checklists

One outcome of the database is the ability to produce checklists for both various areas and purposes. Checklists can thus range from small areas to continental scales, separated into provinces or smaller units, and from simple name lists to lists including all known literature records. Two checklists produced so far are for Java (Söderström *et al.* 2010, this issue) and Jamaica (Söderström *et al.* in press). The records in checklists may be separated into four categories:

First hand records: Citing a specimen or an observation of material either in the field (and then locality fairly exact) or among collected specimens.
Ex. 1. Citing a type specimen (directly or indirectly).
Ex. 2. Citing a herbarium specimen.
Ex. 3. A list of species from a locality visited.
Second hand records: Merely citing a locality that is not exact enough to be searched for the species, and not apparently based on a specimen that can be found.
Ex. 1. Citing only countries or larger subdivisions of a country.
Doubtful records: There is doubt of the identity of the taxon or the accuracy of the report.
Ex. 1. The taxon name is preceded or followed by a '?' or contains a 'cf.'
Ex. 2. The location is far from the area where this taxon normally is found.
Ex. 3. The determination of the taxon is in doubt.
Rejected records: Records from this area are rejected either in earlier publications or in the current one.

A typical checklist will have the following elements and structure:

- i. Taxa are arranged in alphabetic order.
- ii. Invalid and illegitimate names that are unable to be placed in any synonymy are included, but no attempts have been made to validate these names.
- iii. The list will typically be in two parts, accepted reports and doubtful/excluded reports. The latter includes reported taxa not currently in synonymy of anything but for which the occurrence in a particular geographical area is considered erroneous or very doubtful.
- iv. The list has the following format:

***Acrolejeunea fertilis* (Reinw., Blume & Nees) Schiffn. JAV: **LECTOTYPE** of *Acrolejeunea wichurae*, **Reinwardt *et al.* 1824a** as *Jungermannia fertilis*, **Sande Lacoste 1857**, **1864** both as *Phragmicoma fertilis*, **Bonner 1962** also as *Acrolejeunea wichurae*, Bapna & Kachroo 2000b, **Gradstein *et al.* 2002**. BA: **Van Leeuwen 1936** as *Ptychocoleus fertilis*. JA: **Gradstein 1975**.

Each accepted taxon is qualified using a four level ranking system that is described above. Often, the authors will make numerous notes explaining the scoring for individual taxa, especially for taxa that that are denoted with '*'. Taxa that are invalid or illegitimate are always classified with '?' but not always followed by a note. We distinguish between first hand reports using bold and second hand reports using normal font, as described immediately above. The checklist will typically also include all types coming from the targeted geographical area. Attempts are made to distinguish between holotypes, lectotypes and syntypes, but no effort has been made to check all types. We therefore use the word "type" where we are not sure if it is a holotype or not. In order to condense the list we use the words "both as" or "all as" to denote that the author used this name(s) in both/all publications. The word "also as" means that the author(s) used the current accepted name in addition to another name.

Conclusion

For Marchantiophyta there remains no central source that provides a synthesis of core data on nomenclature, taxonomy and geography on a global scale. Unmistakably, this presents a major impediment for the study and analysis of species richness, conservation and systematic research at both regional and global scales. We contend that increased collaboration, working as a community and reaching consensus on taxonomy, nomenclature and distribution will help overcome these challenges. The Early Land Plants Today (ELPT) project, with it forthcoming papers, offers a conduit to achieve these goals and commitments. The project will help augment monographic and revisional work for many taxonomic groups and aid in identifying the need for increased floristic and survey work in many regions throughout the world. Although there are many challenges ahead to obtain high quality data, quantifying global liverwort diversity is a tractable, multi-faceted and scientifically important goal, and everyone stands to gain by fostering this endeavour. The success of the project will lie on strong collaboration between institutions and the bryological community in general.

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