

BIENNIAL REPORT FROM THE BRYOPHYTE CONSERVATION COMMITTEE MEMBERS

Below are the members reports for 2005-2006

AUSTRALIA

BELGIUM

BRASIL

CANADA

CZECH REPUBLIC

GERMANY

JAPAN

KENYA

NEW ZEALAND

REPUBLIC OF PANAMA AND CENTRAL AMERICA

RUSSIAN FEDERATION

SWEDEN

UNITED KINGDOM

USA

VENEZUELA

References

AUSTRALIA

Overview

The conservation status of bryophytes in Australia has been assessed at the national level (1997), but at the state or territory level this has been done only in Victoria (2005) and Tasmania (1996).

Legal protection of rare or threatened species is extremely poor. Only one species is protected nationally. Species have been protected under state or territory legislation only in Victoria (12 species) and Tasmania (one species).

In all states and territories a permit or license is required to collect or otherwise interfere with native plants, including bryophytes. However, timber harvesting and other large-scale operations and developments are generally exempt from these requirements.

National

A list of bryophytes considered to be rare or threatened nationally was published in 1997. However, this did not give legal protection to the species, and it has not been updated.

To be legally protected nationally, taxa must be listed under the Australian *Environment Protection and Biodiversity Act 1999*. At present only one bryophyte, *Pseudocephalozia paludicola*, has been nominated and listed. In 2003 a proposed ski-field development near the only known locality of this taxon on mainland Australia was delayed while an assessment of the impact on the population was made by a bryologist. The assessment found that the population would not be affected by the development.

At least 200 taxa would qualify for listing under the Act, but there is no coordinated program for nominating bryophytes. A proposal for such a program will be discussed at the Australasian Bryological Workshop in Tasmania in December 2007.

Victoria

The conservation status of all bryophytes that occur in the state was assessed in 2005 by David Meagher (University of Melbourne) and David Cameron (Department of Sustainability & Environment). In 2006 this information was added to the State Government's Flora Information System (an electronic database). This is a very useful resource for managers of public lands (national parks, state forests, etc.) but has no legal status.

To obtain legal protection, taxa must be listed as threatened in the state under the state's *Flora and Fauna Guarantee Act 1988*. Nominations for listing are assessed by an Scientific Advisory Committee appointed by the State Government. To date 18 bryophyte taxa have been nominated for listing (Table 1). 12 have been subsequently listed, 4 have been recommended for listing by the Scientific Advisory Committee, 1 is yet to be assessed by the Committee, and 1 has been rejected for listing because records turned out to be another species. Many other species would qualify for listing under the Act.

Table 1. Status of nominations of bryophytes for listing under the Victorian *Flora and Fauna Guarantee Act 1988*.

TAXON	STATUS
Bryophyta	
<i>Anoetangium bellii</i> Broth. ex Dixon	L
<i>Bartramia subsymmetrica</i> Cardot	L
<i>Brachydontium intermedium</i> I.G.Stone	R
<i>Breutelia elongata</i> (Hook.f. & Wilson) Mitt.	X
<i>Calomnion complanatum</i> (Hook.f. & Wilson) Lindb.	L
<i>Climacium dendroides</i> (Hedw.) Weber & Mohr	R
<i>Drepanocladus polygamus</i> (Schimp.) Hedenäs	L
<i>Leptodon smithii</i> (Hedw.) F.Weber & D.Mohr	R
<i>Orthotrichum cupulatum</i> Hoffm. ex Brid. var. <i>cupulatum</i>	L
<i>Orthotrichum hortense</i> Bosw.	L
Marchantiophyta	
<i>Bazzania hochstetteri</i> (Rchdt) E.A.Hodgs.	L
<i>Colura pulcherrima</i> Jovet-Ast	L
<i>Pedinophyllum monoicum</i> (Steph.) Grolle	L
<i>Pseudocephalozia paludicola</i> R.M.Schust.	L
<i>Riella spiculata</i> J.Tayl.	L
<i>Riccardia eriocaula</i> (Hook.) Besch. & C.Massal.	L
<i>Treubia tasmanica</i> R.M.Schust. & G.A.M.Scott	N
<i>Triandrophyllum subtrifidum</i> (Hook.f. & Wilson) Fulford & Hatcher	R

Key: L = listed, R = recommended for listing, N = nominated for listing, X = rejected for listing.

Tasmania

Species may be listed as rare or threatened in Tasmania under the state's *Threatened Species Protection Act 1995*. Although many species would qualify for listing under the Act, only one is listed: *Ambuchanania leucobryoides* Yamaguchi et al. (status: rare). The conservation status of bryophytes in Tasmania was assessed in 1996, but has not been updated.

Other States and Territories

Species may be declared to be rare or threatened in other states or territories under the following legislation:

Australian Capital Territory — *Threatened Species Protection Act 1995*

New South Wales — *Threatened Species Conservation Act 1995*

Northern Territory — *Territory Parks and Wildlife Conservation Act 1979*

South Australia — *National Parks and Wildlife Act 1972*

Queensland — *Nature Conservation Act 1992*

Western Australia — *Wildlife Conservation Act 1950*

However, no bryophytes have been listed under any of these Acts, and the conservation status of bryophytes in these states and territories has not been assessed.

Recent developments

The first draft of a list of rare or threatened liverworts and hornworts in Australia is well advanced. The list will be circulated to interested bryologists for comment before the Australasian Bryological Workshop in Tasmania in December 2007. We hope that the final list will include both national and state/territory conservation status. The preparation of a similar list for mosses will be discussed at the Workshop.

David Meagher, MELU

Belgium

Dr Geert Raeymaekers reported that as far as Belgium is concerned, the species listed in the annexes of the Habitats Directive are protected under the respective legislations of the three regions (Flanders, Wallonia and the Brussels Capital Region). There is at this moment a checklist of the bryophytes of Belgium (Sotiaux *et al.* 2006). However, there is no recent Red List of bryophyte species (although discussions are ongoing to prepare regional checklists). One of the concerns is that preparing a Red List for the country, as a whole, is not a priority. There are some good reasons for this: (a) in the regions that already have a competent form of nature conservation bryophytes are currently included, so preparing a countrywide Red List would not be very effective at increasing bryophyte conservation; and (b) phytogeographically the two main administrative and political regions (Flanders and Wallonia) differ significantly, Flanders being Atlantic (mostly loamy or sandy soils) and Wallonia being mostly Continental and having a wide array of geological bedrocks.

Brazil

In 2005 Dr Denise Pinheiro da Costa and three other Brazilian bryologists (Dr. Olga Yano the coordinator, Dr Kátia Cavalcanti Porto and Msc. Denilson Peralta) were involved in the Brazilian red listing of plants (including 17 bryophytes). However, this list is not yet officially approved by the Brazilian Environment Ministry. In this list a total of 1,500 plants were indicated by the 40 taxonomists present in the workshop.

In 2006 Denise and three Brazilian bryologists (Dr. Olga Yano, Dra. Kátia Cavalcanti Pôrto and Nivea Dias dos Santos) were involved in the coordination of the revision of the Red List from Minas Gerais. The BIODIVERSITAS has now finished the work and the result will be published on the web in 2007 (26 bryophytes are included in this list).

Denise and two students have also published a similar evaluation from Rio de Janeiro state (155 spp are considered threatened in the state). See also da Costa *et al.* (2005).

Recently seven Brazilian bryologists (Denise Pinheiro da Costa, Kátia Cavalcanti Pôrto, Anna Luiza Ilkiu-Borges, Andréa Luiz-Ponzo, Paulo Eduardo Aguiar Saravia Câmara, Cid José Passos Bastos, Silvana Vilas Boas-Bastos) and Steven Churchill begun to work on a guide to Brazilian mosses and they hope to finish this work in 2009. This will help the Brazilian bryologists to better evaluate the conservation status of the Brazilian mosses.

Canada

René Belland reports that the COSEWIC, the Canadian committee charged with assessing status of species at the national level, is still actively listing mosses for legal protection. In the two years 2005-06, six mosses were assessed and listed by this national committee. You can view details of all the species at http://www.cosewic.gc.ca/eng/sct1/searchform_e.cfm (just search for mosses in the taxonomic group box). Also visit: http://www.speciesatrisk.gc.ca/default_e.cfm

The province of Newfoundland and Labrador also has an endangered species program (<http://www.releases.gov.nl.ca/releases/2006/env/1218n03.htm>) and listed *Bryum porsildii* in late 2006. *B. porsildii* now receives legal protection in that province.

The province of Alberta also had a status report produced for *Bryum porsildii*, but assessment has been delayed because of changes in the government committee.

A new volunteer organization was started in Alberta called **Adopt-A-Plant Alberta**. The goal of this organization is to train volunteers to search for rare plants in the province and gather the data needed for writing status reports on the species. The volunteers "adopt" plants from a pre-determined list, and experts train the volunteers on the species' habitat, morphology, taxonomy etc. Year 2006 was the inaugural year for the program and had 33 keen volunteers join. They were able to locate numerous sites for rare species. Preparations are underway for the 2007 season.

Czech Republic

The latest version of the Red List of Czech republic (Kučera & Váňa 2005) used the latest IUCN categorisation system (Kučera & Váňa 2005).

In 2007, the Czech Agency for the conservation of nature will initiate a monitoring programme of some critically endangered species of bryophytes. Projects of monitoring of some species (for example *Meesia triquetra*, *Paludella squarrosa*, *Oxymitra incrassata*, *Mannia triandra* etc) are being prepared and reviewed, and monitoring intensity will be dependent on the amount of money available.

The Agency also prepared the first report according to Article 17 of 92/43/EHS (from 21.5.1992), it should be reviewed in early May 2007 and 6 bryophytes are included: *Buxbaumia viridis*, *Dicranum viride*, *Hamatocaulis vernicosus*, *Mannia triandra*, *Leucobryum glaucum* and *Sphagnum* ssp. (the last two are from our point of view not

threatened, but the European Commission requested that they be included). Jiri Váňa was asked by the vice-director to review this report.

Europe (ECCB, Lars Söderström)

ECCB (European Committee for Conservation of Bryophytes) has concentrated its work on updating the Red List of hepatics. An updated checklist for Europe and Macaronesia with all new Red List treatments in different countries will be published this year. ECCB has also organized a workshop on red listing of Hepatics in Uppsala. There a number of specialists worked actively with evaluating many species. The evaluation for the species treated so far can be found on www.bio.nt.ntnu.no/ECCB/. However, a number of species are yet to be evaluated.

Less work has been done on mosses, but a European checklist is published (Hill *et al.* 2006). This will form the basis for Red List evaluation of the mosses.

There are seven new national Red Lists published the last 5 years, all with the new IUCN Categories. This is for Luxembourg (Werner 2003), for Switzerland (Schnyder *et al.* 2004), Serbia and Montenegro (Sabovljević *et al.* 2004), the Czech Republic (Kučera & Váňa 2005), Sweden (Gärdenfors 2005) and Norway (Kålås *et al.* 2006). They, together with earlier published ones, form a solid base for our work.

ECCB will have its next conference in Cluj, Romania, September 2007, in connection with the Planta Europa conference. There issues of bryophyte conservation will be discussed, with a focus on South-eastern Europe.

The work in Europe has during the last two years been successful with implementation of the habitat directive of European Union, which include a number of rare bryophyte taxa as well as habitats important for bryophytes. The work of the Natura 2000 network of protected sites is underway.

Germany (Hessen)

Dr Uwe Drehwald report from southern Germany (Hessen) that he has mapped a number of bryophytes and lichens in numerous block fields and rocks in contribution to the Natura 2000 Program. He has also been walking through many forests looking for *Dicranum viride* and he has installed many permanent plots for long term studies. For this year some block fields are still left to assess (Meissner and others) and for autumn he has the *Notothylas* in the Vogelsberg on his programme.

Japan

A revised Red List of Japanese bryophytes has been much progressed by five bryologists, Z. Iwatsuki, H. Kanda, and M. Higuchi for mosses, and T. Furuki and J. Hasegawa for liverworts. Dr Zen Iwatsuki and co-workers made a data base of the specimens of endangered species located in major herbaria in Japan, such as The Hattori Botanical Laboratory, Hiroshima University, National Science Museum, Tsukuba, etc. The total number of specimens in this data base are some 8,000. Considerable revision will be made in our new red list which will be open by the summer of 2007.

New information on endangered species of bryophytes was reported in Bryological Research published by the Bryological Society of Japan.

Information reported in 2006 includes *Clastobryopsis rousta*, *Leptodontium pergemascens*, *Luisierella barbula*, *Oedipodium griffithianum*, *Podperaea krylovii*, *Symphodon perrottetii*, *Syrrhopodon yakushimensis*, *Taxiphyllopsis iwatsukii*, *Zygodon viridissimus* var. *rupestris*, and *Radula chinensis*.

Kenya

Min Chuah-Petiot is in the process of creating a bryological laboratory, a working laboratory where all her publications, reprints, papers on bryological interests will be arranged properly, specimens will be kept there with laboratory equipment including a compound and dissecting microscope, so that students, staff and visitors can have a working space with all the specimens and literature are close at hand.

New Zealand

Dr Allan Fife report from New Zealand that this area is arguably the most important “hotspot” of liverwort diversity in the world when considered from the perspectives of species density, degree of endemism, and the presence of a strong archaic element in the flora. New Zealand has more species than the whole of Europe, and has the highest density of species for any country for which a recent checklist is available (Glenny & Fife 2005).

New Zealand Dept. of Conservation has just published (both on line and in hard copy) a list of Threatened species (including both mosses and hepatics) in New Zealand. Twenty-one species of mosses are listed there in the highest threat category (“nationally critical”). The list attempts to be all-inclusive because it is based on DOC’s precautionary approach to species conservation. Hence there are a large number of undescribed liverworts, particularly in the Data Deficient category. The list, as a result, also indicates priorities for taxonomic research.

The threat categories and their criteria are explained in detail in Molloy *et al.* (2002). The criteria are in two parts: status (current numbers and numbers of separate populations) and trend (decline in the last 100 years and predicted decline in the next 10 years). The categories that have bryophytes assigned to them are briefly described below.

Nationally critical: very small population or a very high predicted decline.

Nationally endangered: small populations and moderate to high recent or predicted decline.

Nationally vulnerable: small to moderate population and moderate decline.

Sparse: naturally or unnaturally rare and not restricted to a small geographical area.

Range restricted: naturally or unnaturally rare, restricted to a small geographic area, a very specific habitat or substrate.

Data deficient: species for which information is too poor to assign them to one of the categories above.

No New Zealand bryophytes have been assigned to the “extinct” category. Although a few bryophyte species (e.g., *Bartramia alaris* or *Isotachis westlandica*) have not been observed for many decades it is difficult to be certain of their absence. This is particularly so when the localities and habitats of early collections are poorly

documented or where the original collections are from areas that have received little subsequent bryological attention.

The most subjective part of the assessment for a species is estimating past and future decline, since collections of rare species are too infrequent to allow the documentation of a progressive loss of habitat.

The habitats where losses have been greatest are lowland forests, particularly in Northland and the eastern North and South Islands. There are few liverwort collections from these habitats and estimations of decline of species confined to these habitats must be made on the basis of the known decline of the habitat itself.

There are species on the list which are rare in New Zealand but common outside of New Zealand, for example *Dumortiera hirsuta* and *Goniomitrium acuminatum*, and these have a qualifier "Secure Overseas" added. There is some uncertainty whether to add this qualifier to some species shared with Australia or other regions. For example, is *Brevianthus flavus* "secure" in Tasmania? It is not listed in Scott (1997). Is *Erpodium glaucum* "secure" in any portion of its widely scattered range? Stone (1997) recorded single localities in both N. S. W. and Queensland as well as occurrences in Argentina, Brazil, Mexico, and Sri Lanka. Is *Macromitrium angulatum* "secure" in Samoa (see Vitt and Ramsay, 1985, p. 411)? We are unable to answer these questions.

It became apparent at the 2004 meeting that considerable effort has gone into searching for most of the species on the list in the last 10 or so years. This effort has confirmed in some cases (particularly in the case of mosses) that the species are indeed rare, while in other cases, more localities have been found and the threat category can be set more accurately. Where the threat category is least likely to be correct is for species that have been recently described or recently found in New Zealand. A good example of the latter is the hepatic *Mnioloma fuscum*, found first in New Zealand in 2003 (Renner, 2003) and now known from three widely spread localities (Fiordland, central Westland, Coromandel Peninsula). It is rated as Sparse, but further searching is likely to result in the species being deleted from the list.

There were relatively few changes to the moss list (10 were added and 12 deleted), while there were 75 additions and 14 deletions from the liverwort list. This reflects a much better knowledge of the mosses than the liverworts, but it has to be admitted, there is a difference in attitude among the bryologists. The muscologists are disinclined to admit a species to the list unless reasonably sure of its rarity, while the hepaticologists take the precautionary approach more seriously and put any species on the list that on current evidence are rare, but are likely to turn out to be merely uncommon.

The function of this list needs to be made clear. In contrast to the situation in Australia and the United States, these listed species and varieties do not have any legal protection. The list is equivalent to the Australian State threatened plant lists. The function of the list is to help DOC manage threatened species on the conservation estate that it administers, and to advocate their protection on other land. DOC has a mandate to advocate conservation on all land in New Zealand. Whenever permission is sought to develop land under the Resource Management Act (RMA), if there is any threat to conservation interests, DOC makes submissions to a regional council, and if the development is opposed, to the Environment Court. The presence of a species on the threatened plant list ensures that it won't be overlooked by DOC staff preparing RMA submissions, or by anyone proposing or opposing a development on the land.

Panama and Central America

Dr. Noris Salazar Allen and bryologists from **Central America and the Caribbean** are submitting a proposal to the Secretariat of Science and Technology (SENACYT) of Panama to hold a meeting of CA and Caribbean bryologists to work on the list of bryophytes of the region and elaborate the first red list of bryophytes and their endangered habitats.

Activities developed by Dr **Noris Salazar Allen** during the last years, include her teaching of a one-week seminar on bryophytes at the Museum of Natural History in San Salvador, El Salvador. Personnel from herbaria in El Salvador (ITIC, LAGU), Nicaragua (ULE) and Guatemala (BIGU) attended as well as personnel from the Ministry of the Environment and professors of the University of El Salvador. There were two field trips related to this seminar. The first one was to collect samples for the seminar. The second, to botanize in Parque Nacional Montecristo (750-1000 m). The seminar was financed by the NORAD project, to develop expertise and infrastructure for Central American herbaria. The grant for this project came from the Norwegian government.

A second project developed after a seminar that took place in Guatemala under the sponsorship of the NORAD project. The project aim was to gather all information on the mosses of Guatemala. This was a joint project with the Universidad del Valle de Guatemala and the University of San Carlos. Two publications have appeared in the book Biodiversidad de Guatemala, Vol. 1. These are: Introducción a las briofitas de Guatemala (Virginia Freire & Noris Salazar Allen) and Aporte al catálogo de musgos de Guatemala (Noris Salazar Allen, José E. De Gracia & Clementina Chung). Five hundred and eighty species are reported with their synonyms, sexual condition, bibliographic references and distribution in Guatemala and worldwide. A catalogue of the Types is also provided with their protologue, synonyms and herbaria in which they are deposited. For each family the number of genera, species and infraspecific taxa are given in parenthesis besides the name.

A third project involves the incorporation of the databases on bryophytes and lichens in the Web site of the University of Panama. This is the first herbarium in Central America that includes bryophytes in its Web site. This project is a joint effort by NORAD, the University of Panama and the Smithsonian Tropical Research Institute. Liverwort and lichen databases are complete but the moss part is still under construction since digitalization of the herbarium has not been completed.

In February 5-9 (2007) Noris Salazar attended the First Congress on the Biodiversity of Western Panama sponsored by the Autonomous University of Chiriquí (UNACHI). Noris presented a talk on the "Diversity of the bryophyte flora of Panama, a preliminary report". Also one of her students presented jointly with Noris a poster on the diversity of lichens in Western Panama. She also made some botanizing during the last days of the symposium and collecting *Dumortiera* with one of her undergraduate students who is working on the morphology and distribution of species of *Dumortiera* in Panama. She is in conversations with Mgstr. Clotilde Arrocha, the resident bryologist in Chiriquí, to develop joint projects.

From the 5-7 of March (2007), Noris participated in a workshop for park rangers of Campana National Park. There were two days of conferences and one day of field trips. She was in charged of the bryophytes and lichens sections of the workshop. This is the

second group of rangers that receive training on bryophytes and lichens of any park in Panama. This is also the second workshop given to park rangers of Campana National Park. In 1996 there was a joint project with vascular plant professors of the University of Panama (Prof. Mireya Correa and Claudia de Peralta) to make a field guide for a nature trail and the Park. This project was financed by the Womens Committee of the Smithsonian Institution. This is the first field guide for any park in Panama that has bryophytes as one of its major components.

Russia

Dr Nadya A. Konstantinova reports from Russia that the 61 threatened bryophyte species were included in the list of species protected in Russia by law. The list was confirmed by Russian Government in October 2006. The data sheets of 61 bryophytes for Red Data Book of Russia were prepared by a group of bryologists. The Red Data Book of Russia should be published 2007. A number Red Data Books for different Republics and Provinces of Russia were published in the last 2 years particularly a Red Data Book of Lipetsk Province, Red Data Book of Belgorodskaya Province, Red Data Book of Tatarstan Republic, Red Data Book of Volgograd Province, Red Data Book of Kamchatka Peninsula, Red Data Book of Krasnoyarskii Kraj, Red Data Book of Nenetskii Autonomus Okrug (Archangelsk Province). All of them were included Bryophytes. The new edition of Red Data Book of Komi Republic and Red Data Book of Kareliya are now in preparation, as well as first edition of Red Data Book of Krasnodarskij Kraj. There is some progress in the study of the bryophyte flora of f Strict Nature Reserves of Russia. At the beginning of 2005 "The present-day state of Biological Diversity within protected areas. Issue3. Lichens and Bryophytes (2004) was published. It includes 2 species of Anthocerotae and 325 species of Hepatics reported from 46 Nature Reserves of Russia (Konstantinova, 2004) as well as 907 species of Mosses reported from 63 Strict Nature Reserves (Ignatov & Ignatova, 2004). After publication of this list annotated lists of hepatics were prepared for Strict Nature Reserves "Kerzhenskii" (Middle of European part of Russia), "Bol'shaya Kokshaga" (Middle of European part of Russia), "Volzhsko-Kamskii"(Middle of European part of Russia), Visherskii" (Urals), Basegi (Urals), "Komandorskii" (Far East). Some bryologically interesting areas in Murmansk Province were studied and proposed for protection. Description and other necessary papers were forwarded to the authorities of Murmansk Province. See also Konstantinova (2002).

Sweden

During the last three years the conservation efforts in Sweden involving bryophytes have mainly been focused on four projects: New Red List, Natura 2000, Species Action Plans and field studies.

The latest Swedish Red List (Gärdenfors 2005; www.artdata.slu.se) classified 216 out of the 1,000 known Swedish bryophyte species as red-listed. Fourteen of the red-listed species are included in EU Habitat and Species directive. The Natura 2000 network includes not only protection of a great number of sites, but also a baseline survey. The aim of this survey is to check the current status of the species on the EU Directive inside the Natura 2000 network. The work is quite laborious and includes, first of all, an estimate of the respective population sizes of the annex 2 species, as well as the occurrence of two kinds of other species: so called 'Typical' species and 'Character'

species for the listed habitats. These two categories are often good indicators of a high habitat quality. The main conservation goal with this work is that all listed species should regain a favorable population size, a size that indicate a long-term viability of the species, at least recover to the size of the population when the Directive came in into force. This survey includes 382 sites scattered all over Sweden.

Thirdly the Swedish Environmental Protection Agency has requested a number of National Species Action Plans to meet the environmental quality objectives defined and stated by the Swedish government. The following species will receive a National Species Action Plan: *Bryhnia novae-angliae*, *Dichelyma capillaceum* (already published: Wetterin 2004), *Dicranum viride*, *Hookeria lucens*, *Pterygonium gracile*, *Scapania massalongi*, *Scapania apiculata* and *Scapania glaucocephala*.

Fieldwork is needed in order to improve our knowledge of current trends better and actual status of the flora. Specifically more precise monitoring of population sizes and fertility is slowly being built up, not only for the annex 2 species, but also for less threatened taxa. Also skilled amateurs participate in this work. They frequently report their findings to the Species Information Centre, thereby contributing useful site information. Since 2006, this can be done through the Internet. Up till now approximately 13,000 findings of bryophytes have been reported directly to the web site called ArtPortalen (www.artportalen.slu.se). A longer review of current conservation work in Sweden can be found in Hallingbäck 2007, as well as in Hylander & Jonsson 2007. (Tomas Hallingbäck)

United Kingdom

Ron Porley is currently writing up his *Didymodon glaucus* work for Field Bryology, which serves an example where conservation action is directed at a specific bryophyte (some details already published in Bol. Soc. Esp. Briol. 26-27: 55-58 (2005)). Another currently active project in the UK is translocation of *Leptodontium gemmascens* and *Bryum schleicheri* (see Field Bryology 90). Other work includes the 3-yr Survey of Bryophytes of Arable Land project which is currently being written up, and Ron Porley is producing a 'popular' arable bryophyte booklet to complement the more technical papers. Also important in UK work is the *ex situ* project based at Kew (Margaret Ramsay *et al.*) although this has temporarily been suspended because of funding issues. The CBD (what is the CBD?) has also focused the UK government on producing Biodiversity Action Plans and as a result we have found resources to assess the status of many of our rarest and elusive species. The last BAP review has recommended the addition of many more bryophytes to this programme (essentially adopting the new Red List as the BAP list) - how we can increase our work output however to take on even more species is a challenge: the rarity of competent bryologists to do all that is needed is an issue. Much progress is also being made to incorporate bryophyte monitoring in Natura 2000 sites and our own SSSIs, and over the years Ron Porley has been developing the use of microchips, GPS & digital images to monitor a selection of rare bryophytes such as *Zygodon forsteri* and *Orthodontium gracile*. These are all very positive developments/results of work directed towards bryophyte conservation work in the UK.

Margaret Ramsay reports that the second phase of the *ex situ* bryophyte project came to an end in December 2006. The steering group of the UK conservation agencies and

RBG-Kew submitted a proposal to continue the work for a further 3 years but unfortunately funding is very tight at present. Both Natural England and Kew receive a large proportion of our funding from the government department DEFRA which has made substantial cuts. Our cryopreservation specialist also left in the summer and we have been unable to recruit this post.

However the good news is that overall the *ex situ* project has been a great success thanks to the work of Bryophyte Conservation Officers Dr Jane Burch and Dr Jennifer Rowntree. It has certainly raised the profile of bryophytes, particularly to garden visitors. Novel techniques for initiation and growth in aseptic culture have been developed and 22 species, most of high conservation concern, are now stored in cryopreservation and will continue to be maintained in storage. DNA from all cultures has been extracted and stored in Kew's DNA bank. Voucher specimens of the *ex situ* collection are now stored at the Herbarium of the National Museum of Wales

Several scientific papers in respected journals have been published outlining the methods developed for aseptic culture and cryopreservation (Burch & Wilkinson 2002, Burch 2003, Sarasan *et al.* 2006, Rowntree 2006). Further papers on the effect of cryopreservation on tissue and on molecular fingerprinting of *Orthodontium gracile* have been submitted/ in preparation. In terms of more general literature, a Kew information sheet was prepared http://www.kew.org/ksheets/pdfs/k32_bryo.pdf and there is information on the BBS site <http://rbg-web2.rbge.org.uk/bbs/Learning/exsitu/exsitu.htm>

A second reintroduction trial of *Orthodontium gracile* did not take place as planned. Cryopreserved material was transferred to sandstone chips and moved to glasshouse and then to a cold frame when conditions proved too hot. Prior to introduction, the chips were examined and it was found that other bryophyte species has established (from spore or fragments in rain) and so it was decided it would not be good practice to place these mixed colonies at Wakehurst Place. Instead the weaning and suggested reintroduction methods are to be written up.

In regard to the future of *ex situ* bryophyte conservation, there is still much to be done in expanding the number of species that are stored in cryopreservation (most species worked on are mosses, thallose liverworts have not been studied) and attempting some more reintroduction trials. I recently reported back on progress for the Global Strategy for Plant Conservation and the European Plant Conservation Strategy. Although we do have species of European conservation concern in our collections, this is because they are present in the UK. I would have liked to include species of European importance that are not necessarily of UK origin and had hoped that potential candidates for inclusion in *ex situ* conservation could be highlighted through the red listing process. Obviously we cannot do that at present but would wish to make that a component of any future work.

USA

Dr. Nat Cleavitt (USA) has sent out email surveys to both Heritage botanists and bryologists in US. The replies have been compiled and can be found at <http://www.fingerlakesnativeplantsociety.org/>. Nat Cleavitt has also set up a space on the local Native Plant Society website to allow exchange on bryophyte conservation issues and to make common names available. Common names were one of the main

requests from the Heritage Offices in the US. They feel common names help to make the bryophytes more accessible and endearing to the general public.

Nat Cleavitt has also been working with Nancy Slack and Sue Williams on revising the rare moss list for NY State. They presented a poster on this at the NY Natural History conference in April 2006. They plan to submit an *Evansia* article soon wherein they summarize this work, but also make a request for bryophyte nominations for the IUCN world list.

Venezuela

The bryology group lead by Dr **Yelitza León Vargas** in Mérida Botanical Garden started an educational campaign in 2004 to preserve bryophyte diversity. She collaborated with the environmental Direction of the State and many other organizations as (State government, City mayor office, National Park office etc). That year they accomplished a National governmental law that prohibits the extraction of bryophytes for a year. They also continued with a new effort in 2005 and 2006 and this law was extended for three years. The bryologists produced educational material that was distributed for free and raised a team of environmental educators to spread the message in paramo towns and villages. They associated the idea of bryophyte preservation to water conservation, so the case that bryophytes affects rural populations got attention.

In 2007 there are several research projects on cloud forest and paramo bryophytes growth (monitoring) together with the Environmental Direction of the State, survey of paramo ecosystems and paramo's wetland bryophyte communities. In addition they are doing research in vitro culturing of bryophytes (mosses) to study germination patterns and requirements and in vitro asexual propagation of some species of mosses (*Neckera*, *Pterobryum*, *Calypothecium*, *Hypopterygium*, *Cryphaea* and *Schoenobryum*). They continue to show the government officials the need of an extended conservation effort.

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