

ISSN 0253-4738

# The BRYOLOGICAL TIMES

Newsletter of the International Association of Bryologists

October, 1988

No. 48

## RECENT WORK ON A WORLD WIDE REVISION OF THE BRYOIDEAE (MUSCI)

by  
Harumi Ochi

Until around 1950, moss floras of various continents and regions were very inconsistent in recognizing similar species. At that time, almost no revisionary works had been carried out on a world-wide basis except for that of Brotherus (1924), whose revisions were still insufficient. Such a case was especially true for the Bryoideae (Bryaceae). This may be due to the fact that the Bryoideae includes such large and difficult genera as *Brachymerium* and *Bryum* (s. lat.) both of world-wide distribution. Valid species numbers for the genera of Bryoideae have been summarized on a world-wide basis in earlier literature, and shown in Table 1.

In my younger years, I have been engaged in revising several large families in Japan and adjacent regions (Ochi, 1959, 1962-63, 1968a, b) but, more recently, I have concentrated on the subfamily Bryoideae on a world-wide basis. The Australasian (Ochi, 1970, 1973, 1984), African (Ochi, 1972-73), Neotropical (Ochi, 1980-81), southern South American (Ochi, 1982), and South, Southeast and East Asian (Ochi, 1985) bryaceous floras were revised one after the other, and included changes and additions in the taxonomy of the group. A total of about 900 valid species (plus illegitimate taxa) of the Bryoideae recorded in *Index muscorum* (1959-67) were revised mostly with types (see Table 1). In parallel with these papers, some small groups in *Bryum* were studied taxonomically or floristically by Crundwell & Nyholm (1964), Syed (1973), and Mohamed (1979, 1981, 1982).

My generic concepts in the Bryoideae can be summarized by the following synopses.

Leaves relatively broad, elliptic to ovate or obovate to ovate (sometimes obovate) - lanceolate, cells relatively broad, mostly hexagonal or rhomboid-hexagonal, generally less than 4:1, if longer (linear or vermicular), abruptly shorter and broader in the basal part; capsules terminal, with double peristome.....Subfamily Bryoideae.

Plants appearing rich in chlorophyll, capsules usually erect, symmetric, with a small operculum and a short neck; endostome consisting of a high basal membrane, segments reduced or lacking, cilia none.....*Brachymerium*

Plants ± whitish, appearing poor in chlorophyll; capsules inclined to horizontal, much elongated and clavate, asymmetric with a small operculum and a long neck; endostome well developed, segments keeled and perforate, longer than exostome teeth, cilia well developed.....*Plagiobryum*

Plants appearing rich in chlorophyll; capsules inclined to horizontal, usually much elongated, asymmetric, with a much swollen theca, large operculum and an abruptly narrowed, long neck; endostome consisting of a low basal membrane,

(Continued on p.2)

A contribution to the Taxonomic Column, edited by D. H. Vitt (Mosses). For address see back page.

## COMPUTER ASSISTED MOSS DETERMINATION

by  
Gillis Een

In the spring of 1981 we moved house and I had to pack away all my mosses. At that time I was dealing with species of *Campylopus* from the Mascarene Islands. I had made some notes but most of the observations were in my head.

In the summer of 1987 I unpacked my herbarium, and began where I had left off in 1981. I soon found that I had forgotten practically everything and had to start from scratch.

During the six years that had passed, two developments of importance in this context had taken place. In 1985 Jan-Peter Frahm published his study of the African species of *Campylopus*, and the personal computer (PC) had become available for a very reasonable price.

I tried to use the dichotomous keys in the bryological literature, but found it difficult for reasons known to every bryologist. Many characteristics are variable within the species. The hyaline hairpoint and the alar cell group may serve as examples in *Campylopus*. Thus I decided to use the PC and build my own expert system.

I started by reading about *Campylopus* in Smith (1978). The purpose was to get a feeling for important characteristics in the genus and to learn a proper and useful English vocabulary. A PC is very fussy and requires a consistent use of unique keywords. (Continued on p. 4)

A contribution to the Computer Column edited by J.-P. Frahm and B. J. O'Shea. For address see back page.

(Continued from p.1)

Table 1. Valid species numbers in the subfamily Bryoideae from in the earlier literature and from my recent revisions.

| Genera<br>(Total of<br>examined<br>—> valid<br>species) | Brotherus<br>In Engler<br>& Prantl<br>(1924) | Index<br>muscorum<br>1 & 4<br>(1959,<br>1967) | Walther<br>In Engler<br>Syllabus<br>(1983) | Austr.<br>(1970,<br>1973,<br>1974) | Results from Ochi's revisions |                          |                          |                            |
|---|--|---|--|------------------------------------|-------------------------------|--------------------------|--------------------------|----------------------------|
|   |  |   |  |                                    | Africa<br>(1972-<br>1973)     | Notr.<br>(1980<br>-1981) | S.-S.<br>Amer.<br>(1892) | S.-SE.<br>E.Asia<br>(1985) |
| <i>Brachy-<br/>menium</i><br>(152->58)                  | 127  | 173   | 117  | 5                                  | 21<br>(+19)*                  | 22<br>(+20)              | 5<br>(+2)                | 22<br>(+12)                |
| <i>Acidodon-<br/>tium</i><br>(17->11)                   | 16   | 16  | 18   | - -                                | 11<br>(+0)                    | 1                        | -                        | -                          |
| <i>Plagio-<br/>bryum</i><br>(6->6)                      | 5  | 6   | 6  | 1                                  | 1<br>(+1)                     | 1<br>(=1)                | -                        | 4<br>(+3)                  |
| <i>Bryum</i><br>(Anomo-<br>bryum)<br>(44->22)           | 42   | 59  | 54   | 1                                  | 5<br>(+5)                     | 7<br>(+6)                | 4<br>(+1)                | 11<br>(+9)                 |
| ( <i>Bryum</i> )<br>(594->140)                          | 813  | 682   | 796  | 33                                 | 61<br>(+45)                   | 51<br>(+25)              | 46<br>(+11)              | 54<br>(+26)                |
| ( <i>Rhodo-<br/>bryum</i> )<br>(65->20)                 | 43   | 45  | 44   | 2                                  | 10<br>(+9)                    | 10<br>(+7)               | 3<br>(+1)                | 6<br>(+1)                  |
| <i>Roellia</i>  | -  | -   | -  | -                                  | -                             | -                        | -                        | -                          |

\* Numbers in brackets ( ) indicate the additional (net) number of recognized species for the respective continents or regions in comparison to the total number of species in the areas cited in the left side column(s).

short, forked segments and no (sometimes rudimentary) cilia .....*Acidodontium*

Plants usually appearing rich in chlorophyll; capsules usually nutant to pendulous, usually symmetric, mostly with a large operculum and a short neck; endostome usually consisting of a high basal membrane, long, keeled and perforate segments and mostly long (often appendiculate) cilia.....*Bryum*

Plants pale green, strongly lustrous; cells very large -- up to 150 x 30 um; capsules horizontal to inclined; endostome with very broad, widely perforated segments.....*Roellia*

The North American and European species were mostly studied in comparison to those of the other continents and regions cited above, or in relation to the project "Illustrated Moss Flora of Arctic North America and Greenland" (Bryaceae issue may be

published in 1988). However, the species of the U.S.S.R. (including Siberia), inland China, and the Middle to Near East regions have been little studied.

The results obtained from my revisions up to 1979 were used by Walther (1983). As seen in Table 1, valid species in each genus (subgenus) of the subfamily did not become much smaller in his work than in earlier literature except in *Brachymenium*. However, considering the results obtained, mostly by myself up to 1985, the number of valid species in large genera (sub-genera) are much smaller than in the earlier literature, for example, 1/2 (*Anomobryum*) - 1/3 (*Brachymenium* and *Rhodobryum*) - 1/4 (*Bryum*). By contrast figures have been nearly the same or not so much changed before and after revisional works in the smaller genera, *Acidodontium*, *Plagiobryum* and *Roellia*. As well, a total of about 260 species in 5 genera has been recognized as valid in the Bryoideae of the world

in my sense up to the present.

As I stated previously, about 80 - 90% of the species on each continent or region were studied with types or other good specimens: some additional species may be recognized when other types or other good specimens are available in the future. For example some 16 additional species will be added to the flora of arctic North America and Greenland; several more species are to be expected in South America, New Guinea, and the Pacific Islands (including *Bryum pancheri* Jaeg. in New Caledonia), while several more may be added to the floras of little studied regions. These additions are expected to be mostly in *Bryum*. With these additions, a total of about 300 species in five genera will include all Bryoideae in the world, circumscribing the genus and species in my sense.

From the results of my revisions, the following can be revealed or confirmed. (Continued on p. 3)

World-Wide Revision (Cont. from p.2)

1. It is unfortunate that even now there are many differences among taxonomists in circumscribing species and few definite standards. I may be a terrible "lumper", but after revising numerous species in a detailed manner, the large genus (subgenus) *Bryum* still remains distinct.

2. Endemism appears to be high in two groups: i) that with robust plants as in *Rhodobryum* and ii) that with medium-sized to large, mostly epiphytic plants with medium-sized to large, papillose spores, as in *Brachymerium* Sect. *Brachymerium* and in *Acidodontium*.

Acknowledgments

I very much appreciate Dale H. Vitt's helpful comments on the manuscript and his assistance with the English.

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A contribution to the Taxonomic Column, edited by D. H. Vitt (Mosses). For address see back page.

## REQUEST FOR INFORMATION ON GRANT-SUPPORTED BRYOLOGICAL RESEARCH PROJECTS

by  
Diana G. Horton

I would like to request that anyone who currently has grant support for research on bryophytes forward an abstract of the research project, name of the granting agency and time period covered by the grant to me. This information will be published in the *Bulletin of Bryology*. I believe that including such information in the *Bulletin* accords well with the purpose of the *Bulletin* to communicate, not only to bryologists but also to other botanists, about international bryological activities, and to enhance the image of bryologists and bryological research. A review of grant-supported projects will draw attention to the fact that research on bryophytes is supported by funding agencies and will highlight some of the innovative approaches that are being incorporated into bryological research. I would like to have this information by the end of October. Your support of this request will be very much appreciated!

## Bulletin of Bryology

The *Bulletin of Bryology* is edited for the International Association of Bryologists by Diana G. Horton and is published twice a year in TAXON. Members who do not receive TAXON personally and/or do not have it in their institutional library can obtain a free copy of the *Bulletin* from either the Secretary of I.A.B., Dale H. Vitt, Department of Botany, University of Alberta, Edmonton, Alberta, Canada T6G 2E9 or the Editor, Diana G. Horton, Department of Botany, University of Iowa, Iowa City, Iowa 52242, U.S.A.

Moss Determination

(Continued from p.1)

The next step was to design a suitable format for the *Campylopus* register. I had already a simple, low cost program (\*), which I used mainly for addresses. After many trials and errors I developed a format with space for 38 fields per record. The fields are either numerical or descriptive.

I collected keywords for the descriptive fields and compiled them into a kind of thesaurus, which naturally grew and also changed to a small degree as work proceeded.

The fourth step was to load my expert system with facts about *Campylopus* species, using the selected keywords. As sources of information, I used Smith (1978), Bizot and Kilbertus (1979), Frahm (1985) and a few other publications. I also included my own descriptions of about ten specimens of *Campylopus* from the Botanical Museum in Stockholm (S). This gave me about 100 more or less complete records.

The fifth and final step was to analyse my own 63 specimens of *Campylopus* from the Mascarenes, to put the observations on record and to match them against the records in the expert system.

The result of this was very interesting and very rewarding. It is my opinion that this is a good way of working with mosses, at least for an amateur with a separate profession to occupy the mind most of the time.

An amateur bryologist often has to be content with spending a few odd hours now and then with the hobby. You tend to forget between. It is also a great temptation to be eager and careless and to be carried away. To work with a computer is a sobering experience as it demands discipline and consistency. Another fact is that an amateur usually cannot afford to have a reference library or herbarium at home.

In the hope that the amateur bryologist is not regarded as an extinct species, I would like to share with you what I learned from my work with the *Campylopus* expert system.

I used a format with 38 fields plus space for free text corresponding to one A4 page. I reserved four fields for filing purposes with data such as page

or herbarium number, species, etc. Another 12 fields were descriptive and used for keywords describing characteristics such as leaf point, cell shape, etc. The remaining 22 fields were numerical containing mainly leaf and cell measurements.

In the end I found that I had really used only five of the descriptive fields with any degree of regularity. The possibilities would have been even more limited if it had not been for the fact that Frahm (1985) in his descriptions was extremely consistent in using the same set of characteristics for every single species.

The five characters I refer to are:

- the presence of a hyaline leaf point;
- the presence of thick and irregular cell walls in the lower part of the lamina;
- the presence of distinct alar cells;
- the section of the nerve with ridges or lamellae on the back;
- the section of the nerve with size, shape and number of ventral cells in relation to median cells.

This points to the weakness of this method as I have used it so far. If you take all your basic data from literature only, you would in most cases be in trouble, because every author uses his favourite characteristics. Thus I think that the real value of my approach becomes apparent only if you collect the bulk of your basic data from an examination of herbarium specimens and preferably from type material.

I think that the use of a PC has improved the quality of my bryological work in many ways. Here are some of the arguments:

1. I was forced to use a standardised vocabulary.
2. I was forced to quantify and as far as possible avoid general terms such as 'thick' or 'large'.
3. I was forced to follow a checklist and make notes about every characteristic on the list.
4. I discovered weak points and lack of logic in the descriptions in the bryological literature.
5. I could carry out complex searches using several characteristics simultaneously. This is a tremendous improvement compared with a dichotomous key.

6. I discovered similarities between species that the bryological authors had not pointed out.
7. I discovered new separating characteristics for certain species that the bryological authors had not pointed out.
8. Variable characteristics are no problem. Simply use all the keywords required for covering the variation in the species or specimen.

A computer register of this kind can be used in two different ways. In the beginning my starting point was some of the most common species in the area such as *C. pilifer*. I put the characteristics of the species according to Frahm (1985) into a matrix and searched the register for matching records. As a byproduct I usually got a few other species that Frahm regards as related. After some checking I was soon able to name my specimens with a great deal of confidence.

When I worked in the other direction I started out from one of my own specimens, put its characteristics into a matrix and searched the register for matching records. As a byproduct I usually got a few additional species of the same or closely related species.

As a final check, after having named all my specimens, I printed lists of selected characteristics with the data sorted in species order. This makes it possible to discover gross errors in the determinations - or in the recording of data.

Next time I start a new expert system for another group of mosses I shall do many parts of the work in a different way. Selection of keywords is really the key to success. These words should be limited to three or four characters and be absolutely unique and not ambiguous. General terms such as 'long' or 'short' should be avoided, unless clearly defined, and ratio be replaced with numerical terms such as the length:width of leaves.

A few words about numerical data. I have recorded minimum, median and maximum measures for many characteristics such as leaf length. I find now that I really only used the median measures. When searching, I use rather broad intervals in order to catch all the variation within reasonable limits.

(Continued on p. 5)

\*\* Two more new IAB Publications \*\*

**Hungary** **Berlin**

**Proceedings of the IAB  
Conference of Bryoecology**

Budapest - Vácrátót, Hungary.

5-10 August 1985

Has been published as:

Pócs, T., Simon, T., Tuba, Z. & J. Podani, 1987. Proceedings of the IAB Conference of Bryoecology Budapest-Vácrátót, Hungary 5-10 August, 1985. Part A & B. *Symposia Biologica Hungarica*, 35: [i-] v-xix, [1-] 3-547 [-548] (Part A); [i-] v-x, [549-] 551-902 (Part B). 237 x 165 mm, hard covers.

Available from: Akadémiai Kiadó, Budapest, Price US\$89 (cloth).

**Proceedings of the Bryological  
Symposia of the XIVth  
Interantional Botanical Congress,**  
Berlin (West), 24 July to 1 August 1987.

Will be published in:

Journal of the Hattori Botanical Laboratory, No. 64, before the end of 1988.

Available Either as part of No. 64, 460 pp. Price ¥9600 (Hardback, incl. postage overseas) or ¥9100 (Softback, incl. postage overseas) or as a 269 page separate of No. 64 Price ¥5580 (Softback, incl. postage overseas). Price to IAB members ¥3900 (Softback, incl. postage overseas).

Orders to: Dr. S. Hattori, Hattori Botanical Laboratory, 3888 Obi-Honmachi, Nichinan-shi, Miyazaki-ken 889-25, Japan.

Watch these columns for an announcement about the availability of Glime, J. on Methods in Bryology. Proceedings of the Bryological Methods Workshop, Mainz, W. Germany, Aug. 17-23, 1987 to be published by the Hattori Botanical Laboratory.

Moss Determination (Cont. from p.4)

Finally a piece of advice based on bitter experience with this particular register program. Keep paper copies of all your computer records! They are very useful to have at your desk beside the microscope when you want to modify or supplement a record. Furthermore the program is far from foolproof and a very short and scarcely noticed interruption of the power supply at the wrong moment may cause a loss of data. This you may not discover at once and the loss could be transferred to your back-up.

(\*) I use a program called 'Filing' (Scandinavian PC Systems, Box 5004, S-35005 Växjö, Sweden - cost about £40) on a COPAM PC-401 Turbo (with about 900Kb memory and 20Mb hard disk - costs about £1,000).

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- Karlbergsvägen 78, S-11335 STOCKHOLM, Sweden.

**IAB CONFERENCE  
ON TROPICAL BRYOLOGY**

**MISSOURI BOTANICAL GARDEN, ST. LOUIS**

**30 July through 3 August 1989**

The conference will feature:

- (i) A symposium on taxonomy and systematics of tropical bryophytes presented by invited speakers;
- (ii) Several sessions of contributed papers dealing with all aspects of tropical bryology;
- (iii) A discussion on current threats to the tropics.

The symposium speakers have been chosen to provide stimulating discussions on systematics in the region of the tropics where they live and/or conduct their research. The symposium will also explore relationships between tropical and temperate floras.

A circular outlining the conference topics, registration information, the procedure for contributing a paper, and pre-conference foray details will be sent to all IAB members. Those needing a formal letter of invitation should write to: Marshall R. Crosby, IAB Tropical Bryology Conference, Missouri Botanical Garden, P.O. Box 299075, Saint Louis, MO 63166-0299, U.S.A. The conference dates have been specifically chosen to allow travel time for those wishing to attend the 1989 AIBS meetings in Toronto.

Watch these columns for further announcements!

Marshall R. Crosby, Vice President IAB, Conference Convenor, Missouri Botanical Garden.

## Obituary

Liivia Laasimer 1918-1988

Professor Livia-Maria (Liivia) Laasimer died in Tartu, Estonia, on 26 February 1988. She was born on 21 June 1918.

She was the last surviving student of the 1930's, among Estonian botanists, of the distinguished Prof. Th. Lippmaa. In the 1950's she published two small handbooks on Estonian bryophytes, one on hepatics ("Eesti NSV tähtsamate maksasammalde määräja" 1955), and the other on *Sphagnum* (L. Laasimer, S. Talt & E. Varep (1954) "Eesti NSV turbasamblad").

Bryophytes are also frequently cited in her major work on Estonian phytogeography and vegetation ecology, entitled "Eesti NSV taimkate" (1965). In recent decades she became the leading phytogeographer and ecologist in Estonia, and was also known as the chief editor of the 11-volume vascular plant flora ("Eesti NSV flora"). For most of her life she worked in the Zoological and Botanical Institute of the Estonian Academy of Science in Tartu, where her collections are housed.

Teuvo Ahti, Department of Botany, University of Helsinki, Unioninkatu 44, SF-00170 Helsinki, Finland.

## DIARY

For explanation of acronyms, see *Bryol. Times*, 31:7-8, 1985.

## 1988

- Oct. 18-23. SLAB Bogotá, Colombia. 1st Simposio Latinoamericano de Briologia. See *Bryol. Times*, 45:4. Further information from Prof. Jaime Aquirre C., I Simposio Latinoamericano de Briologia, Apartado Aéreo 7495, Bogotá, D.E., Colombia.
- Oct. 29-2 Nov. 4th WGMBE Meeting, Mont-Rigi, Belgium. Further information from Prof. Dr. R. Schumacker, Université de Liège, Station Scientifique des Hauts-Fagnes, B-4898 Waimes, Belgium.
- Nov. 19-20. BBS Bryological Workshop, Bristol. See this issue p. 13. Further information from the Local Sec.: Dr. D. H. Brown, Dept. of Botany, The University, Bristol, BS8 1UG.
- Nov. 26. VWGB Joint meeting with Royal Belgian Botanical Society. Further information from L. Smets, A. Van Dijkstraat 13, 2300 Turnhout, Belgium.
- Dec. 3-10. Australasian Bryological Foray, Hobart, Tasmania. Further information from Dr. R. D. Seppelt, Antarctic Division, Channel Highway, Kingston, Tasmania 7050, Australia.

## 1989

- Feb. 24-27. IAB Computer Workshop Mont Rigi, Belgium. See *Bryol. Times*, 46: 7 and this issue p. 8. Further information from Dr. J.-P. Frahm, Universität Duisburg, Fachbereich 6, Botanik, Postfach 101629, D 4100 Duisburg, F.R.G.
- Feb. or March. BBS Special overseas spring meeting, The Algarve.

Local Sec.: Mr. A. R. Perry, Dept. of Botany, National Museum of Wales, Cardiff, CF1 3NP.

- April. BBS Spring field meeting, Salisbury. Local Secs.: Mrs V. Williams, Two Bridges, Lyburn Road, Hamptworth, Salisbury, Wilts., SP5 2DB, and Mr. R. C. Stern, Botany Bay, Main Road, Fishbourne, Chichester, West Sussex, PO18 8AX.
- July or Aug. BBS Summer field meeting, Aberystwyth. Local Sec.: Mr. A. Orange, Dept. of Botany National Museum of Wales, Cathays Park, Cardiff, CF1 3NP.
- July 30-3 Aug. IAB Conference on Tropical Bryology, Missouri Botanical Garden. See this issue p.5.
- Aug. 4-6. BSJ. 18th Annual Meeting, Shuho-cho, Yamaguchi Prefecture, with lectures and field study. Further information from Mr. T. Shiomi, 8-17, Itoyone 1-chome, Yamaguchi-shi 753, Japan.
- Aug. 6-10. ABLs Annual Meeting in conjunction with AIBS Meeting, Univ. of Toronto, Canada.
- Sept. BBS A.G.M. and paper-reading meeting, Lincolnshire. Local Sec.: Dr. M. R. D. Seaward, Postgraduate School of Studies in Environmental Science, The University, Bradford, BD7 1DP.

## 1990

- July. 1-7. IV International Congress on systematic and Evolutionary Biology. Maryland, University of Maryland, College Park, U.S.A.
- Aug. 12-18. Helsinki, Symposium on SE Asian bryophytes. See preliminary announcement in *Bryol. Times*, 41: 4.

THE INTERNATIONAL ASSOCIATION OF BRYOLOGISTS publishes *The Bryological Times* every two months, the *Bulletin of Bryology* twice a year, and the *Advances in Bryology* irregularly. Material for the *Bryological Times* can be sent at any time, but submission dates for the *Bulletin* and the *Advances* should be discussed with the Editors, Dr. Diana G. Horton (University of Iowa) U.S.A. and Dr. Norton G. Miller (Albany) U.S.A. respectively. The Editors do not accept responsibility for the views of the authors. For details regarding membership of the International Association of Bryologists (currently U.S. \$8.00 p.a.), write to the Honorary Secretary, Dr. Dale H. Vitt, Department of Botany, University of Alberta, Edmonton, Alberta, Canada, T6G 2E9.

THE BRYOLOGICAL TIMES is published in Reading (U.K.) and distributed from Beijing (China), Eger (Hungary), Reading (U.K.), St. Louis (U.S.A.), Tokyo (Japan) and Utrecht (The Netherlands). All correspondence concerning mailing to: Rob Kruijt, Institute of Systematic Botany, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands. All items for future issues to be sent to the Editor, Dr. S. W. Greene, Department of Botany, The University of Reading, London Road, Reading RG1 5AQ, Berkshire, England (Telex 847813 RULIB) except those for the regular columns, which should go direct to the column editors.

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