

The status of syntaxonomy in Norway

E. FREMSTAD

*Norwegian University of Science and Technology - Museum of Natural History and Archaeology -
N-7004 Trondheim, Norway*

Telephone +47 73 59 22 56 - Telefax +47 73 59 22 49 - E-mail Eli.Fremstad@vm.ntnu.no

ABSTRACT. In Norway syntaxonomical work started approximately at the same time as in Central Europe. R. Nordhagen was the pioneer, making the basis for the classification of especially alpine communities, followed by E. Dahl and O. Gjaerevoll, also focusing on alpine vegetation. The works of J. Kielland-Lund are fundamental for classification of forest vegetation. During the 1970-80's a large number of syntaxonomical studies were made on a diversity of topics; most of these studies were never published. The rather species-poor flora and the difficulties of applying the concept of character species have caused Norwegian botanists to develop a classification system of their own, as a summary of present knowledge. The next step should be to rework a large number of relevés with numerical methods to form the basis of a national vegetation survey.

KEY WORDS: Syntaxonomy, Norway, status

Norway is a newcomer to the «Working Group of the European Vegetation Survey». This presentation is an introduction to our participation in the international network.

The Nordic countries are no newcomers to syntaxonomy. Nordic botanists made important contributions to the theoretical basis of syntaxonomy before the end of World War I (for instance Hult, 1881; Warming, 1895; Raunkiaer, 1909; Durietz *et al.*, 1918) and a number of important syntaxonomical studies were published in the Nordic countries at the same time as syntaxonomy emerged as a scientific activity in Central Europe (Trass & Malmer, 1973).

THE PIONEERS

Prior to 1920, the work of several Norwegian botanists was based upon the fact that «plants grow in certain, repeatedly occurring species combinations, which can be defined to floristically defined types, to plant communities» (Dierschke 1994, p. 18). The studies were based on relevés and aimed to typify and classify plant communities, although the methods used were still not fully developed. Resvoll-Holmsen (1912, 1914a, b, 1920) and Nordhagen (1917, 1923, 1928) were the Norwegian pioneers. In his work from the Sylane mountains,

Nordhagen (1928) discussed the concept of «Charakterarten» thoroughly, and in 1936 he proposed a hierarchical system for classification of the subalpine and alpine vegetation in Scandinavia based upon a large number of relevés. Here, for the first time, he adopted «Charakterarten» in the sense of the Zürich-Montpellier School. His cornerstone for Norwegian syntaxonomy was published in Norwegian (Nordhagen, 1943) which made this very important work on north boreal and alpine communities inaccessible to his Central and South European colleagues. «Sikilsdalen and the mountain pastures of Norway» was not only an analysis of plant communities in a particular alpine area in South Norway, it also compared relevés from different parts of Scandinavia and compared Scandinavian plant communities with those of Central Europe, in a phytosociological frame. In that work, and in a previous one (Nordhagen, 1928) Nordhagen also discussed the theoretical basis and concepts of syntaxonomy, as he did on many other occasions.

Nordhagen has had many successors. Up to approximately 1970, the main syntaxonomical studies in Norway were carried out in alpine areas, particularly by Gjærevoll (1956, snow patches) and Dahl (1957). Other syntaxonomical studies comprised xerophilous communities (*Sedo-Scleranthetea* and related syntaxa: Kleiven, 1959; Sunding, 1963; Marker, 1969) and coniferous woodlands (Kielland-Lund, 1965; 1967). Working groups under the International Biological Programme (IBP) published important proposals for the classification of alpine, woodland, mire and seashore vegetation (IBP, 1971; 1973). Between, 1970 and 1985, a large number of students took their master's degrees on phytosociological studies, especially on woodland vegetation. Most of these woodland studies were never published (exceptions are Bjornstad, 1971; Aune, 1973; Fremstad, 1979 and Bjorndalen, 1981) and the vast number of relevés these and other studies (on a wide variety of topics) presented have never been synthesized in a proper way. In the same period, several surveys of Norwegian syntaxa were presented (Kielland-Lund, 1981; Vevle, 1983; Dahl, 1987), partly in order to make the Norwegian studies on vegetation more accessible to colleagues abroad. Surveys of syntaxonomical works were published by Fægri (1961) and Sunding (1988).

Scandinavian botanists developed what Dierschke (1994) calls «eine etwas abweichende Arbeitsrichtung» – the «Uppsala school» (Trass & Malmer, 1973). The main reason for the differing opinions and methods of the Scandinavians compared to Central European concepts is the comparatively species-poor flora and vegetation (compared to the Central and South European ones) where a large number of species occur in a wide array of plant communities, and where frequency and cover of species (dominance) are more important for describing plant communities than the mere presence and indicator value of single species. For a long time, the main topic of the discussion was whether the «association» or the «sociation» should be the basic unit of syntaxonomy. This was, sometimes, and especially by Central European colleagues, considered to be a syntaxonomical problem (Moravec, 1993).

THE PRESENT STATE

Most of the works mentioned previously were faithful to the concept of «character species», but the regional and local difficulties connected to the concept resulted, partly, in fruitless discussions about the status of species and delimitations of syntaxa with low rank and limited geographical validity. Diekmann (1994a, b, 1995) has demonstrated in a convincing way how phytosociological units of various rank can lose their character (as defined in Central Europe) in the Nordic countries and the difficulties of applying strict phytosociological definitions and terminology in boreo-nemoral and boreal areas.

Syntaxonomical research in the traditional sense more or less came to an end when numerical methods, especially Tabord and Twinspan classification and ordination techniques, became prevailing tools approximately 15 years ago. Relevés were still grouped, but the groups attained were not always related to the phytosociological hierarchy. From being a major activity at the botanical institutes of the universities, the «pure» syntaxonomy (based on the phytosociological hierarchy) shrank to almost zero. After only a few years, syntaxonomy, or «plant sociology» as we called it, was a «non-topic» in research, and almost so in teaching. At present few Norwegian botanists are working on classification of vegetation and still fewer are faithful to the Zürich-Montpellier hierarchy. Some attempts have been made to synthesize older and new data (Moen, 1990), but such attempts are too few.

Over the years, some Norwegian botanists developed a less dogmatic, more pragmatic view on plant communities or «vegetation types». Contributions to the IBP (1971, 1973) were forerunners in this respect. We felt uncomfortable with the syntaxonomical hierarchy and character species, but we badly needed a system for vegetation classification, based entirely on our own material which had grown enormously over the years. The system of Hesjedal (1973) was developed for mapping purposes, as was a system evolved at the University of Trondheim (Moen & Moen, 1975); both were insufficient to cover the entire country. Norway has a much larger diversity of plant communities than most Central and South European colleagues are aware of, and it is a work of art to make a vegetation type system which reflects the main ecological gradients in the country: from the south to the north (a span of 13 degrees of latitude, i.e. from nemoral to hemiarctic conditions, cf. Dahl *et al.*, 1986), from sea level to high alpine areas and from the strongly oceanic coast to the more continental areas in the east (section O3t to C1, *sensu* Moen, 1997). The longitudinal span is 25 degrees, equal to the distance from Brussels to Kiev.

In 1983-86, a group of Norwegian botanists agreed to develop a new classification system, also aimed at vegetation mapping. «Units for vegetation mapping» (Fremstad & Elven, 1987) is primarily based on vegetational variations along ecological gradients, and on the recognition of vegetation types by means of species groups, not by means of character species. In Scandinavia, the gradient approach was first developed for mire vegetation (Tuomikoski, 1942; Sjörs,

1948), but has later been adapted for other vegetation types. In several respects, the Norwegian vegetation type system is more related to the British National Vegetation Classification (Rodwell, 1991-95) than to the Central European hierarchical system. We agree with Rodwell when he comments the view of Poore (1955) that «the really valuable element in the phytosociological method might be not so much the hierarchical definition of plant associations, as the meticulous sampling of homogeneous stands of vegetation on which this is based».

«Units for vegetation mapping» was a synthesis of our knowledge eight years ago, and a rather subjective synthesis. Its main principles are that the vegetation types shall be 1) floristically characterized, 2) ecologically definable, and 3) have a definable distribution.

The system has been increasingly used for a multitude of purposes, even in teaching at universities and colleges. Its success is based on the fact that most of the «units» are rather easily recognized in the field, at least for those who have some basic botanical training.

THE FUTURE

The system has recently been revised (Fremstad, 1997). The new edition is also a rather subjective summary of published and unpublished material and field experience; it is not based on computerized reworking of relevés. That remains to be done – if it will ever be possible to raise funding for such activities. However, we have plans to computerize parts of our data, as was recommended by Mucina & van der Maarel (1989).

In Norway, we have developed our own tool for vegetation classification; why, then, do we want to participate in «European Vegetation Survey» (EVS) and «Vegetation of Europe»? By participating in long-term, international projects and working groups on vegetation some of us are hoping for inspiration and mental support to continue the investigations of Norwegian vegetation. We still have large gaps in our data, but there is also a considerable amount of data which is worthwhile processing.

There are more reasons to participate in the working group of EVS. We feel uncomfortable at the thought that Norwegian data (only a small part of which is accessible to foreigners) should be processed without Norwegian participation, and that the vegetation of Norway should be described solely by colleagues who have only a modest and insufficient knowledge of the character of Norwegian nature. It is extremely complex and even the most experienced Norwegian botanists have much to learn.

REFERENCES

- AUNE E.I., 1973 – *Forest vegetation in Hemne, Sor-Trondelag, Western Central Norway*. K. norske Vidensk. Selsk. Mus. Miscellanea 12: 1-87.
- BJORNDALLEN J.E., 1981 – *Classification of basiphilous pine forests in Grenland, Telemark, SE Norway*. Norw. J. Bot. 27: 139-161.
- BJORNSTAD A., 1971 – *A phytosociological investigation of the deciduous forest types in Sogne, Vest-Agder, South Norway*. Norw. J. Bot. 18: 191-214.
- DAHL E., 1957 – *Rondane. Mountain vegetation in South Norway and its relation to the environment*. Norske Vidensk. Akad. Oslo. Skr. I. Mat.-naturv. Kl. 1956, 3: 1-374.
- DAHL E., 1987 – *Alpine-subalpine plant communities of South Scandinavia*. Phytocoenologia 15: 455-484.
- DAHL E., ELVEN R., MOEN A. & SKOGEN A., 1986 – *Vegetasjonsregionkart over Norge 1:1.500 000. (Vegetation regions)*. Statens kartverk, Nasjonalatlas for Norge, Kartblad 4.1.1.
- DIEKMANN M., 1994a – *En jämförande studie av nordiska backängsvegetation. (Thermophilous forest edge vegetation in northern Europe - a comparative study)*. Svensk bot. Tidskr. 88: 227-236.
- DIEKMANN M., 1994b – *Deciduous forest vegetation in Boreo-nemoral Scandinavia*. Acta phytogeogr. Suec. 80: 1-112.
- DIEKMANN M., 1995 – *Delimitation of syntaxa in northern Europe - a case study*. Annali di Botanica LIII: 65-79.
- DIERSCHKE H., 1994 – *Pflanzensoziologie. Grundlagen und Methoden*. Ulmer Verlag, Stuttgart.
- DURIETZ G.E., 1949 – *Huvudenheter och huvudgränser i svensk myrvegetation. (Main types and borders in Swedish mire vegetation)*. Svensk bot. Tidskr. 43: 274-309.
- DURIETZ G.E., 1954 – *Die Mineralbodenwasserzeigergrenze als Grundlage einer natürlichen Zweigliederung der nord- und mitteleuropäischen Moore*. Vegetatio 5/6: 571-585.
- DURIETZ G.E., FRIES T.C.E. & TENGWALL T.A., 1918 – *Vorschlag zur Nomenklatur der soziologischen Pflanzengeographie*. Svensk bot. Tidskr. 12.
- FREMSTAD E., 1979 – *Phytosociological and ecological investigations of rich deciduous forests in Orkladalen, Central Norway*. Norw. J. Bot. 26: 111-140.
- FREMSTAD E. & ELVEN R. (eds.), 1987 – *Enheter for vegetasjonskartlegging i Norge. (Units for vegetation mapping in Norway)*. Okoforsk Utredning 1987, 1.
- FREMSTAD E., 1997 – *Vegetasjonstyper i Norge. (Vegetation types of Norway)*. NINA Temahefte 5. Norwegian Institute for Nature Research, Trondheim.
- FÆGRI K., 1961 – *Bibliographia phytosociologica*. Excerpta Botanica, Sectio B 3: 1-9.
- GJÆREVOLL O., 1956 – *The plant communities of the Scandinavian alpine snow-beds*. K. norske Vidensk. Selsk. Skr. 1956, I: 1-405.
- HESJEDAL O., 1973 – *Vegetasjonskartlegging. (Vegetation mapping)*. – Ås. 118 pp.
- HULT R., 1881 – *Försök til analytisk behandling af växtformationerna. (An attempt to analytical treatment of the plant formations)*. Thesis. Helsingfors.
- IBP International Biological Programme, 1971 – *IBP i Norden 1971*, 7. 76 pp.
- IBP International Biological Programme, 1973 – *IBP i Norden 1973*, 11. 206 pp.
- KIELLAND-LUND J., 1965 – *Fichtenwaldgesellschaften in NO-Polen und SO-Norwegen*. Mater. Zabl. Fitosoc. Stosowanej 6: 37-41.
- KIELLAND-LUND J., 1967 – *Zur Systematik der Kiefernwälder Fennoscandiens*. Mitt. flor.-soz. Arb.-Gemein. 11/12: 127-141.
- KIELLAND-LUND J., 1981 – *Die Waldgesellschaften SO-Norwegens*. Phytocoenologia 9: 53-250.

- KIELLAND-LUND J., 1994 – *Syntaxonomy of Norwegian forest vegetation 1993*. Phytocoenologia **24**: 299-310.
- KLEIVEN M., 1959 – *Studies of the xerophile vegetation in Northern Gudbrandsdalen, Norway*. Nytt Mag. Bot. **7**: 1-60.
- MARKER E., 1969 – *A vegetation study of Langoya, Southern Norway*. Nytt Mag. Bot. **16**: 15-44.
- MOEN A., 1990 – *The plant cover of the boreal uplands of Central Norway. I. Vegetation ecology of Solendet nature reserve; haymaking fens and birch woodlands*. Gunneria **63**: 1-451, map.
- MOEN A., 1997 – *Vegetasjonsregioner i Norge. (Vegetation regions of Norway)*. Nasjonalatlas for Norge. In print.
- MOEN A. & MOEN B.F., 1975 – *Vegetasjonskart som hjelpemiddel i arealplanleggingen på Nerskogen, Sor-Trondelag. (Vegetation maps as a tool in area planning)*. K. norske Vidensk. Selsk. Mus. Rapp. Bot. Ser. 1975, **5**: 1-168, maps.
- MORAVEC J., 1993 – *Syntaxonomic and nomenclatural treatment of Scandinavian-type associations and sociations*. J. Veg. Sci. **4**: 833-838.
- MUCINA L. & VAN DER MAAREL E., 1989 – *Twenty years of numerical syntaxonomy*. Vegetatio **81**: 1-15.
- NORDHAGEN R., 1917 – *Planteveksten på Froøene og nærliggende øer. (The plant cover of the Froøene and adjacent islands)*. K. norske Vidensk. Selsk. 1916, **7**: 1-151.
- NORDHAGEN R., 1923 – *Vegetationsstudien auf der Insel Utsire im westlichen Norwegen*. Bergens Mus. Aarb. 1920-21, Naturvit. R. **1**: 1-149.
- NORDHAGEN R., 1928 – *Die Vegetation und Flora des Sylenegebietes. Oslo*. Skr. norske Vid. Akad. Oslo. I. Mat.-naturv. Kl. 1927, **1**: 1-612, IX s.
- NORDHAGEN R., 1936 – *Versuch einer neuen Einteilung der subalpinen-alpinen Vegetation Norwegens*. Bergens Mus. Årb. Naturvit. R. **7**: 1-88.
- NORDHAGEN R., 1943 – *Sikilsdalen og Norges fjellbeiter. En plantesosiologisk monografi. (Sikilsdalen and the mountain pastures of Norway)*. Bergens Mus. Skr. **22**: 1-607.
- POORE M.E.D., 1955 – *The use of phytosociological methods in ecological investigations*. J. Ecol. **43**: 226-269, 606-651.
- RAUNKJÆR C., 1909 – *Formationsundersøgelse og formationsstatistik. (Formation investigations and formation statistics)*. Bot. Tidsskr. **30**.
- RESVOLL-HOLMSEN H., 1912 – *Om vegetationen ved Tessevand i Lom. (The vegetation at the Tesse lake)*. Vidensk. selsk. Skr. I. Kristiania.
- RESVOLL-HOLMSEN H., 1914a – *Statistiske vegetationsundersøgelser fra Maalselvdalen i Tromsø amt. (Statistical vegetation investigations from the Maalselv valley in Troms)*. Vidensk. selsk. Skr. I. 1913, **13**: 1-42.
- RESVOLL-HOLMSEN H., 1914b – *Statistiske vegetationsundersøgelser fra Foldalsfjeldene. (Statistical vegetation investigations in the Foldal mountains)*. Vidensk. selsk. Skr. 1914, **7**: 1-75.
- RESVOLL-HOLMSEN H., 1920 – *Om fjeldvegetationen i det østfjeldske Norge. (The alpine vegetation of eastern Norway)*. Arch. Mat. Naturv. **37**, **1**: 1-266, pl.
- RODWELL J.S., 1991-95 – *British plant communities*. 1-4. Cambridge University Press, Cambridge.
- SJØRS H., 1948 – *Myrvegetation i Bergslagen. (Mire vegetation in Bergslagen)*. Acta Phytogeogr. Suec. **21**: 1-299, pl.
- SUNDING P., 1963 – *En sosiologisk undersøkelse av den xerotherme vegetasjonen i lavlandet ved den indre del av Osloffjorden. (A sociological investigation of the xerothermic vegetation in the lowlands in the inner part of the Osloffjord)*. Thesis Univ. Oslo. Unpubl.
- SUNDING P., 1988 – *Bibliographia phytosociologica Norway. II. - Excerpta Botanica, Sectio B*. **25**: 215-246.

- TRASS H. & MALMER N., 1973 – *North European approaches to classification*. In WHITTAKER, R.H. (ed.) *Ordination and classification of communities. Handbook of vegetation science*. 5. W. Junk Publishers, The Hague. pp. 529-576.
- TUOMIKOSKI R., 1942 – *Untersuchungen über die Untervegetation der Bruchmoore in Ostfinnland. I. Methodik der Pflanzensoziologischen Systematik*. Ann. Bot. Soc. Vanamo **17**, 1: 1-203.
- VEVLE O., 1983 – *Norwegian vegetation types. A preliminary survey of higher syntaxa*. Tuexenia **3**: 169-178.
- WARMING E., 1895 – *Plantesamfund. (Plant communities)*. Kobenhavn.