THE EUROPEAN POSITION OF DUTCH PLANT COMMUNITIES

J.A.M. Janssen, I. Keizer-Sedláková, J.H.J. Schaminée, S.M. Hennekens

Alterra Wageningen UR, Department of Ecology and Environment
P.O Box 47, 6700 AA Wageningen - The Netherlands

Abstract – In this paper it is analyzed for which plant communities (alliances) the Netherlands has an international responsibility. Data has been brought together on the range and distribution of alliances in Europe, the area of plant communities in the Netherlands and surrounding countries and the occurrence of endemic associations in the Netherlands. The analysis resulted in a list of 34 out of 93 alliances in the Netherlands which are important from an international point of view.

Key words - Europe, The Netherlands, syntaxonomy, international perspective

Introduction

Organisms and communities don't keep to national borders, whereas often nature conservation policy is still carried out on a country level. However, due to large scale changes in land use and environment (global warming), nature policy more and more requires an international approach. In this perspective, it is important for any country to know what national nature values are important from an international point of view. Such species and ecosystems may have priority in protection and management. In this paper we present an overview of plant communities for which the Netherlands has an international responsibility. The study is part of a broader study on both ecosystems and plant and animal species (Janssen & Stumpel, 2007).

In the Netherlands, several studies have been carried out on the international position of plant and animal species (Verkaar *et al*., 1992; Siepel *et al*., 1993a & b), ecosystems (Janssen & Schaminée, 2004) and landscape types (Farjon *et al*., 2001). However, most of these studies are not or only partly based on hard data, which certainly goes for the studies on ecosystems. From a nature policy point of view, there is a clear need for a more objective analysis, based on underlying data. Due to the development of computer techniques and the building up of large ecological databases in many countries in Europe, it has become possible to carry out studies on an international level. Examples are the development of the expert system SynBioSys

(Hennekens *et al*., 2001; Schaminée & Hennekens 2001, 2004, 2005; Schaminée *et al*., 2007) and the built up of large data bases, both on the level of species, as in the project Target Species (Ozinga & Schaminée, 2005), and the level of plant communities. The national vegetation databank of The Netherlands, for instances, comprises more than 460,000 computerized relevés (Schaminée & Janssen, 2006). The combination of large ecological databases and other (geographical) information gives rise to complete new types of analyses, resulting in a new field of study, known as eco-informatics (Ozinga & Schaminée, 2004).

The aim of the here described study is to make an overview of (non marine) ecosystems for which the Netherlands has international responsibility. For this aim we used the European overview of plant communities from Rodwell *et al*. (2002). For the sake of nature conservation, we studied whether the international important communities are recognized as target types in national and international nature policy.

Material and methods

Syntaxonomy

For the analysis, a standard list is needed of plant communities occurring in the Netherlands and other European countries. On the national level the series 'The Vegetation of the Netherlands' (Schaminée *et al*., 1995, 1996 & 1998; Stortelder *et al*., 1999) presents a hierarchical system of plant communities. For getting insight in the international position of these vegetation units, comparisons must be made with classification systems from other (surrounding) countries. And here the difficulty arises that in other countries other syntaxonomic concepts are in use, which - in many cases - makes it hard to assess whether certain communities are synonymous or not.

Therefore, it is important to work with a system that is stable throughout Europe. Recently, for the first time, an overview of plant communities has been published for whole Europe at the level of alliances (Rodwell *et al*., 2002). This overview has been used to assess the international importance of the ecosystems present in the Netherlands. In our study, we also used an unpublished version of the overview of European alliances, which contains a list of synonyms.

Firstly, we checked which alliances from Rodwell *et al*. (2002) occur in the Netherlands. For a few alliances this gave rise to discussion. For three European alliances, the lower rank syntaxa are considered as basal communities in the Netherlands. These are the alliances *Phalaridion arundinaceae*, *Salicion arenariae*, and *Aegopodion podagrariae*. These alliances have not been included in the study. Three other alliances from Rodwell *et al*. (2002) are supposed to be synonyms to other alliances (at least in our country), and therefore have not been treated separately. These are the *Utricularion vulgaris* (= *Lemno minoris-Hydrocharition morsus-ranae*), the *Ceratophyllion demersi* (= *Parvopotamion*) and the *Arnoseridion minimae* (= *Scleranthion annui*). The final result is a list of 93 internationally defined alliances which have been included in the study.

Criteria

In our study we applied five criteria for the analysis of international importance of both species and ecosystems. These are:

1. Amount of the European distribution range;
2. Amount of the European area;
3. Position within the European range;
4. Internationally threatened communities;
5. Presence of endemic associations.

Criteria 1 and 2 have been assessed in three classes: A: > 50 % of the European range/area is situated in the Netherlands; B: > 10 % of the European range/area is situated in the Netherlands; C: > 1 % of the European range/area is situated in the Netherlands.

For the assessment of the importance of plant communities only four of these criteria could be applied. Criterion 4 could only be applied for species, using the international Red Lists of the IUCN. For plant communities, such an international list of threatened nature values does not exist. Even on the country level, such lists are rare. Only a few countries, like Germany (Anonymus, 1986) and The Netherlands (Weeda *et al*., 2005) have developed Red Lists for plant communities. The only international red list of syntaxa, as far as known, has been proposed for the Wadden Sea region (Westhoff *et al*., 1993).

To assess criteria 1 and 3 for all European alliances that exist in The Netherlands, it was studied in which European countries these alliances occur, using a large set of literature (Louis & Lebrun, 1942; Lebrun *et al*., 1949; Braun-Blanquet & Tüxen, 1952; Passarge, 1964; Passarge, 1966; Passarge & Hofmann, 1968; Hadač, 1970; Hadač, 1971; Hadač, 1972; Oberdorfer, 1977; Oberdorfer, 1978; Brise, 1980; White & Doyle, 1982; Oberdorfer, 1983; Vevle, 1983; Matuszkiewicz, 1984; Mucina & Maglocký, 1985; Preising, 1990; Oberdorfer, 1992; Pott, 1992; Grabherr & Mucina, 1993; Hohenester & Welss, 1993; Mucina *et al*., 1993a & b; Preising, 1993; Brullo *et al*., 1995; Camarda & Satta, 1995; Ferrari, 1995; Mariotti, 1995; Moravec, 1995a & b; Pignatti & Pignatti, 1995; Poldini & Vidali, 1995; Preising, 1995; Valachovič *et al*., 1995; Borhidi, 1996; Colomakha, 1996; Dierßen, 1996; Coldea, 1997; Diekmann, 1997; Jarolímek *et al*., 1997; Preising, 1997; Rivas-Martinez *et al*., 1997; Kojic *et al*., 1998; Rašomavičius, 1998; Rodwell *et al*., 1998; Wils *et al*., 1998; Borhidi *et al*., 1999; Passarge, 1999; Durwael *et al*., 2000; Lawesson, 2000; Moravec *et al*., 2000; Rodwell, 2000; Jermacane & Laiviņš, 2001; Matuszkiewicz, 2001; Valachovič, 2001; Vandenbussche, 2002a, b & c; Borhidi, 2003; Haskoning, 2003; Bardat *et al*., 2004; Papastergiadou *et al*., 2005; Chytrý, 2006; Rusina, 2006). This literature study provided us distribution data on a country level, of which an example is shown in Figure 1. These distribution data were used to assess the relative amount of the European distribution range in The Netherlands (criterion 1) and the position of our country within this range (criterion 3). Criterion 3 was scored according to the classes used by Schaminée *et al*. (1992), which were developed to indicate the

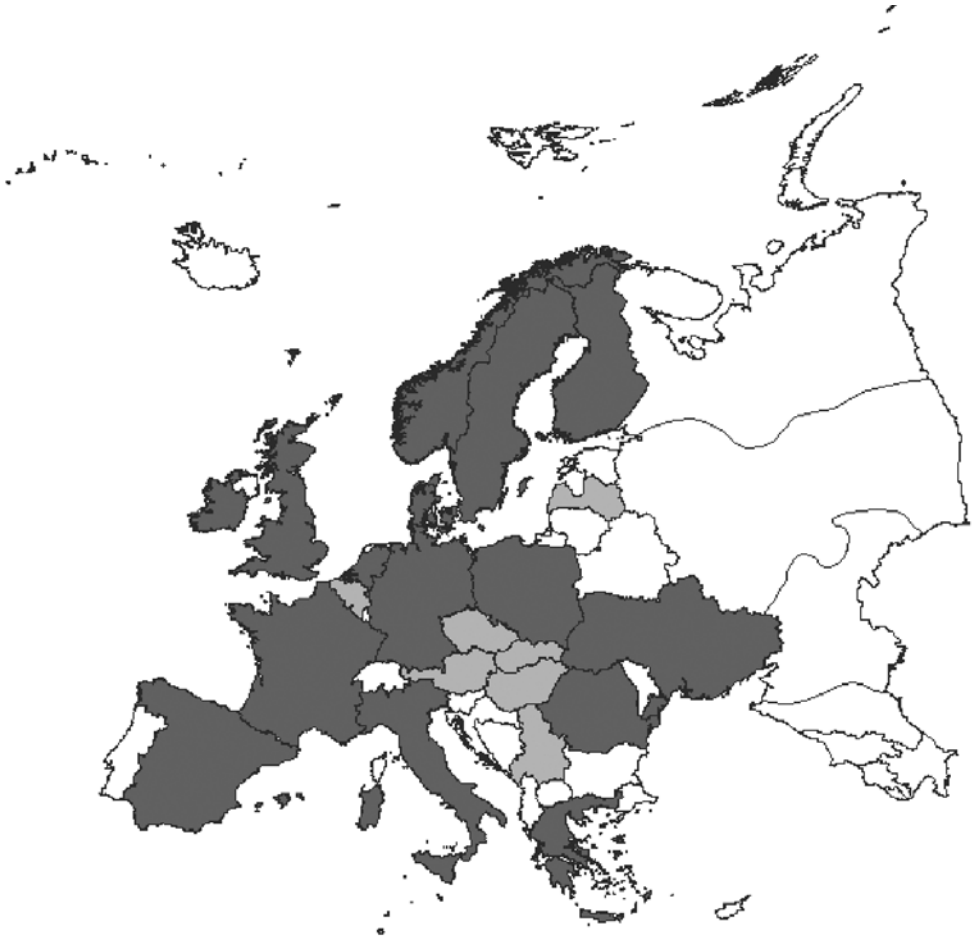

FIGURE 1 - Distribution of the alliance Zosterion marinae in Europe (green = present; gray = not present; white = no data).

position within the range of plant species in the Netherlands. Only the score 'outpost' was considered to be of importance, because (1) disappearance will directly result in a decline in the European range, and – with respect to species - (2) outpost populations often are genetically divergent. In the Netherlands, several plant species are considered to be 'outposts', referring to either true outposts or to relict situations, but no plant community fulfilled this criterion. Criterion 2 was mainly based on expert knowledge and information from 'The Vegetation of the Netherlands' (Schaminée *et al*., 1995-1998; Stortelder *et al*., 1999). Criterion 5 finally, dealing with the question whether an alliance contains endemic associations in The Netherlands, was based on the literature sources that have been mentioned before.

Nature target types

For the plant communities which have - according to the previously mentioned criteria - a positive score for 'international importance', we analysed whether they have received attention from national and international nature policy. Natura 2000 is the main topic in European nature policy. We checked whether the plant communities are part of any of the Annex I habitat types of the EU Habitats Directive (92/43/EEC), this according to the European Manual of Habitat Types (European Commission, 2003), the Dutch interpretation of the habitat types of the EU Habitats Directive (Janssen & Schaminée, 2003) and unpublished 'profiles' of these habitat types occurring in The Netherlands (www.minlnv.nl). For the national nature policy, we checked whether the selected communities are part of the so-called Nature Target Types (Bal *et al*., 2001).

Results

From the analysis it appears that The Netherlands has a high international responsibility for 34 alliances (Table 1). First of all, 15 alliances in our country cover more than 1 % of the distribution range in Europe, resulting in a score C or higher for criterion 1. These are two types of wet heath land and bogs (*Ericion tetralicis*, *Oxycocco-Ericion*), two aquatic types of buffered pools (*Potamion graminei*, *Hyperico elodis-Sparganion*) and eight grassland alliances (*Armerion maritimae*, *Puccinellion maritimae*, *Puccinellio-Spergularion salinae*, *Junco-Molinion*, *Sedo-Cerastion*, *Koelerion arenariae*, *Polygalo-Koelerion* en *Plantagini-Festucion ovinae*). Of the latter, the *Sedo-Cerastion* and *Polygalo-Koelerion* are more or less restricted to our country (A-score). The resulting three alliances refer to *Empetrum nigrum* stands in the coastal dunes (*Empetrion nigri*) and to a forest community (*Quercion roboris*) and a fringe community (*Lonicero-Rubion silvatici*) from sandy, nutrient-poor soils. As an example, the distribution maps of four of these communities are shown in Figure 2.

Eight plant communities are added to Table 1, because of a high percentage of the area (> 1 %) within Europe. These imply two salt-marsh communities (*Thero-Salicornion* and *Saginion maritimae*), a grassland type (*Corynephorion canescentis*), dry heathlands (*Genistion pilosae*), two forest types (*Alnion glutinosae*, *Salicion albae*), one fringe community (*Melampyrion pratensis*) and one aquatic alliance (*Lemno minoris-Hydrocharition morsus-ranae*). Other alliances which score under criterion 2 did already score under the first criterion. For two alliances, the score for 'area' is higher than for 'range' (*Junco-Molinion*, *Ericion tetralicis*).

Finally, eleven alliances have been added to the list of international important alliances, because of the occurrence of endemic of nearly endemic associations. These are the alliances: *Nanocyperion flavescentis*, *Caricion davallianae*, *Caricion fuscae*, *Alopecurion pratensis*, *Calthion palustris*, *Violion caninae*, *Trifolion medii*, *Alnion incanae*, *Berberidion vulgaris*, *Dauco-Melilotion* and *Senecionion fluviatilis*. Table 2 lists the relevant associations.

The 34 qualifying alliances contain a large number of grassland types (14), whereas also heathlands are relatively well covered (4). The number of aquatic alliances is relatively low (3), compared to the existing total number in the Netherlands. This probably is caused by the relatively large range that aquatic syntaxa generally cover. Over

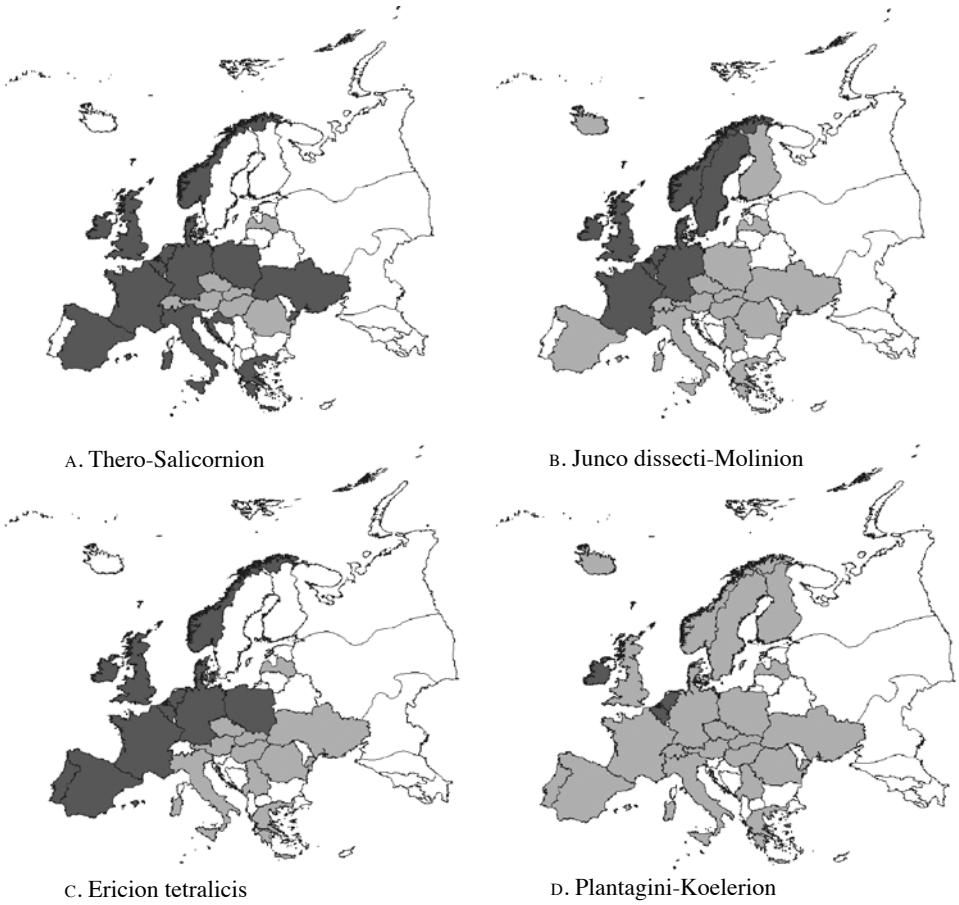

FIGURE 2 - Example of distribution maps of four alliances (green = present, gray = absent, white = no data).

large distances, the species composition of these communities only slightly changes, this in contrast to for example grasslands. Most of the international important alliances are found in the coastal areas (17) and in the inland sandy areas (13). At a second level, the riverine landscape (8), the fen district (8) and brook valleys (8) contain a relatively large number of international important plant communities.

The relationship between the 34 alliances and respectively EU habitat types and NL nature target types is shown in Table 1. The major part (30 of 34) syntaxa is included in habitat types. Four alliances are not (or only for a very small part) covered by habitat types: the *Calthion palustris* (a small part is included in habitat type 6410 or 7230), the *Melampyrion pratensis* (may be connected with habitat forest types),

TABLE 1 - Plant communities in The Netherlands that are important from an international point of view.

European alliance (Rodwell et al. 2002)		1 areaal	2 area	4 endem.	Habitat type (EC 2004)	Nature target type (Bal et al. 2001)
04B03	Thero-Salicornion	-	C	-	1310	3.40a. 3.41
05B01	Armerion maritimae	C	C	-	1330	3.40b, 3.40c, 3.41
05B03	Puccinellion maritimae	C	C	-	1330	3.40b, 3.40c, 3.41
05B06	Puccinellio-Spergularion salinae	C	C	-	1330	3.40b, 3.40c, 3.41
06B03	Saginion maritimae	-	C	-	1310	3.40b, 3.40c
17A03	Lemno m.-Hydrocharition morsus-r.	-	C	-	3150	3.17, 3.18
21A03	Hyperico elodis-Sparganion	C	C	-	3130, 2190	3.20, 3.22
21A06	Potamion graminei	C	C	-	3130, 2190	3.22
22C06	Nanocyperion	-	-	+	3130, 2190	3.22
24A02	Caricion davallianae	-	-	+	2190, 7230, 7140	3.26, 3.27, 3.29b
24B03	Caricion fuscae	-	-	+	2190, 7140	3.26, 3.28
25A01	Ericion tetralicis	C	C	-	4010, 7150	3.42a
25A03	Oxycocco-Ericion tetralicis	C	-	+	4010, 7110, 7120	3.42c, 1.1, 3.44b
26F01	Alopecurion pratensis	-	-	+	6510	3.32
26F02	Calthion palustris	-	-	+	-	3.30, 3.31
26F08	Junco-Molinion	C	B	-	6410	3.29c
29A03	Sedo-Cerastion	A	A	+	6120	3.39a, 3.49
29B01	Koelerion arenariae	C	C	+	2130	3.35
29B02	Polygalo-Koelerion	A	A	+	2130	3.35
29C02	Corynephorion canescentis	-	C	+	2130, 2330	3.33a, 3.34, 3.47
29D02	Plantagini-Festucion ovinae	C	C	+	6120, 6130	3.38b, 3.37a
30A08	Violion caninae	-	-	+	2130, 6230	3.33b, 3.34, 3.36b, 3.42b, 3.43
30C01	Empetrion nigri	C	B	+	2140	3.43, 3.46
30C02	Genistion pilosae	-	C	-	2310, 2320, 4030	3.45
31A02	Melampyrion pratensis	-	C	-	-	3.52
31B04	Trifolion medii	-	-	+	-	3.53, 3.54
53A02	Salicion albae	-	C	+	91E0	3.61
54A01	Alnion incanae	-	-	+	2180, 91E0, 91F0	3.57, 3.60, 3.61, 3.66
55A01	Alnion glutinosae	-	C	-	91E0 (deels)	3.57, 3.62, 3.63
56A01	Lonicero-Rubion silvatici	C	C	+	-	3.53b
58A02	Berberidion vulgaris	-	-	+	2160	3.54b
61B09	Quercion roboris	C	C	-	9190, 2180	3.56, 3.64, 3.65
69D04	Dauco-Melilotion	-	-	+	6120	3.49
70B06	Senecionion fluviatilis	-	-	+	6430	3.25, 3.40bc, 3.41

the *Trifolion medii* (is included in habitat type 6210 when occurring in mosaic with chalk grassland), and the *Lonicero-Rubion silvatici* (may be connected with habitat forest types). The latter three of these communities are fringe communities. Unfortunately, this species rich formation is missing from the list of EU habitat types. On the national level all international important plant communities get the attention they need by being covered by the national Nature Target Types.

DISCUSSION

Although the present study gives some useful results, it is clear that the analysis may be improved when more detailed information will become available. Such improvements concern both the delimitation of the syntaxa, the level of detail of the distribution maps, and the cover of the available vegetation data.

TABLE 2 - List of near-endemic associations within alliances (# = alliance is only of international importance because of this criterion)

European alliance (Rodwell et al. 2002)			**(Near-)endemic association** (Schaminée et al. 1995-1998; Stortelder et al. 1999)	
22C06	Nanocyperion	#	28Aa4	Digitario-Ilecebretum
24A02	Caricion davallianae	#	9Ba5	Equiset variegati-Salicetum repentis
24B03	Caricion fuscae	#	9Aa1	Caricetum trinervi-nigrae
			9Aa2	Pallavicinio-Sphagnetum
25A03	Oxycocco-Ericion tetralicis		11Ba2	Sphagno palustris-Ericetum
26F01	Alopecurion pratensis	#	16Ba1	Fritillario-Alopecuretum pratensis
26F02	Calthion palustris	#	16Ab2	Rhinantho-Orchietum morionis
			16Ab3	Lychnido-Hypericetum tetrapteri
29A03	Sedo-Cerastion		14Bc1	Sedo-Thymetum pulegioidis
			14Bc2	Medicagini-Avenetum pubescentis
29B01	Koelerion arenariae		14Ca2	Sileno-Tortuletum ruraliformis
			14Ca3	Tortello-Bryoerythrophylletum
29B02	Polygalo-Koelerion		14Cb1	Taraxaco-Galietum veri
			14Cb2	Anthyllido-Silenetum
30A08	Violion caninae	#	19Aa3	Botrychio-Polygaletum
			19Aa4	Betonico-Brachypodietum
30C01	Empetrion nigri		20Ab1	Carici arenariae-Empetretum
31B04	Trifolion medii	#	17Aa2	Polygonato-Lithospermetum
53A02	Salicion albae		38Aa3	Cardamino amarae-Salicetum albae
54A01	Alnion incanae	#	43Aa3	Crataego-Betuletum pubescentis
56A01	Lonicero-Rubion silvatici		35Aa1	Rubetum grati
58A02	Berberidion vulgaris	#	37Ac1	Hippophao-Sambucetum
			37Ac3	Rhamno-Crataegetum
69D04	Dauco-Melilotion	#	31Ca2	Bromo inermis-Eryngietum campestris
70B06	Senecionion fluviatilis	#	32Ba1	Valeriano-Senecionetum fluviatilis
			32Ba3	Oenantho-Althaeetum

The results of the study depend strongly on the concept of the alliances on a European level. Plant communities with a narrow definition, in general, will have a higher score than alliances which are defined broadly. Therefore, it is important to use a generally excepted standard list of European alliances, such as recently has become available. This European overview of syntaxa, however, is a first attempt. It surely may be expected that in future concepts will change, which will influence the outcome of studies like the one here presented.

The study used information from literature. Although we have considered a wide range of references, the information is not complete. The accuracy and completeness of the study could be improved by sending out a questionnaire to national experts, asking them about the occurrence and relative amount of plant communities in their country. But a further and even more important improvement could be achieved by bringing together data on a more detailed scale. This will have a large impact on the

given distribution maps, especially for large countries. Some alliances, for example, only occur in the upper northwestern part of France. Other communities occur only in the southern, Atlantic part of Norway and surely not in the boreal or arctic zone of this country. In the present study, in both cases, the whole country is included in the distribution range. Finally, the analysis will improve in quality when the syntaxa (in future) can be studied and defined on the basis of relevés from the whole range of their distribution. It is for this kind of analyses that the European Vegetation Survey aims at building up a European database of vegetation types, relevés and their locations.

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