# RUBI IN THE NORTHEASTERN PART OF THE NETHERLANDS

#### (A floristic and vegetational study)

#### BY

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"The almost inexhaustable power of nature to vary is illustrated very beautifully by this differentiation of the blackberry populations into innumerable local floras. (Å. GUSTAFSSON (1943), l.c. p. 156)

#### I. INTRODUCTION

There is no uniformity in the geographical distribution of the various European *Rubus* species and not only the main phytogeographical districts but even much smaller areas appear to possess their own combinations of species. A survey of the available data has been given in 1943 by A. GUSTAFSSON in his fine book: "The genesis of the European Blackberry Flora".

The knowledge of the distribution of the brambles within the Netherlands at that time distinctly lagged behind that of their distribution in the surrounding countries, viz. in N. W. Germany, Belgium, Great Britain and Scandinavia, where the investigations of various serious batologists already had laid a sound foundation.

In N. W. Germany the pioneer work of K. E. WEIHE and C. G. NEES VON ESENBECK (1822—1827) had been followed by the painstaking studies of W. O. FOCKE, Bremen, that were continued for more than 60 years and led to a valuable insight into the distribution of the various species. Another result of these studies was the description and classification of many species and forms that so far had been overlooked or that were unsufficiently known.

FOCKE's lifework has become a classic in its kind. It has laid the foundation for a more exact knowledge of the European brambles, a branch of science, in which so much amateurish work has been done that it had got into utter confusion. The number of local forms of which descriptions had been published had become enormous and the descriptions themselves were often unsatisfactory.

The singling out among the overpowering wealth of forms (FOCKE's "Formen-Schwärme"), of species with a larger area of distribution, was the great merit of this investigator, who may be acknowledged as the first batologist with modern views. His numerous publications appeared between the years 1868 and 1914.

For Belgium we have at our disposal a paper published by A. CHARLET, L. MAGNEL and A. MARÉCHAL in 1928 and for England the publications of C. C. BABINGTON (1846, 1869), W. M. ROGERS (1900), H. J. RIDDELSDELL (1920) and W. WATSON (1946).

A survey of the Scandinavian *Rubi* (Norway, Sweden and Denmark) is given in the studies of C. E. GUSTAFSSON (1938) and A. GUSTAFSSON (1943).

The most complete report on the distribution of species up to 1913 is to be found in H. SUDRE's big monograph: "Rubi Europae" (1908—1913). The classification given in this standard work has in the main been followed by us.

In the Nederlandsch Kruidkundig Archief, 13 (1903) L. VUYCK gave a list of *Rubus* species that might be expected in the Netherlands or had already been collected there. This list was based on the work of FOCKE. In 1919 H. HEUKELS, in his "Flora van Nederland" gave descriptions of the species that were known at that time, and a list of these species is found also in the 11th edition of the "Geïllustreerde Schoolflora voor Nederland" by HEUKELS and WACHTER. This list, however, is by no means complete and it contains moreover several errors.

Further may be mentioned here the notes by A. DE WEVER on the brambles of the southern part of the province of Limburg (1915). His specimens were revised by FOCKE and by SUDRE.

Moreover under the heading: "Nieuwe vindplaatsen" (in: "De Levende Natuur" and in "Nederl. Kruidk. Archief" and in several other places in the latter periodical (i.a. in the excursion reports of the K.N.B.V.) the presence of various hitherto unreported *Rubi* has been mentioned. Extensive bramble collections are found in the larger herbaria in the Netherlands, in particular in the "Rijksherbarium" and in the herbarium of the K.N.B.V. at Leyden. The naming of these collections was not always satisfactory but a large part of the specimens has now been revised by us. J. H. KERN and TH. REICHGELT have started with the compilation of our knowledge of the Dutch Rubi for the "Flora Neerlandica". Much aid has been given to us by these two botanists, to whom we are truly thankful. Our first contribution to the knowledge of the brambles of the Netherlands appeared in 1950: "De voornaamste bramen in het Drentse District"; in this publication 20 species were enumerated and discussed, and a key to these species was given.

It is our intention to continue this series of contributions with separate studies of the most important bramble centra in our country, and also with papers on other questions relating to this group of plants. They are meant as preliminary steps to a monograph of the brambles of the Netherlands. The third contribution, will give a complete survey of the brambles occurring in the phyto-geographical Drenthian district; it will also contain a number of new findings. This district has already proved to be rich in species that are rare or absent in other parts of the country.

We hope that this fourth contribution which deals not only with floristic details but also with the distribution of the species and with the part they play in various plant communities, will rouse an interest in this vast and engaging genus and its multifarious problems.



Fig. 1. Phyto-geographical districts of the Netherlands (after J. L. VAN SOEST; slightly changed) ..... borders of the districts. Dotted = Drents district ("Drenthian district"). I Fluviatiel district. II Haf district. III Gelders district. IV Subsentreuroop district. V Kempens district. VI Krijt district. VII Duin district. VIII Wadden district. IX Löss district. X Vlaams district.

### II. THE DRENTHIAN DISTRICT

The area that forms the subject of this study extends in the east as far as the German frontier and is bordered in the N.W. and S. by an imaginary line drawn from Nieuweschans past Groningen, Dokkum, Leeuwarden, Heereveen to Dalfsen and from here eastward along the valley of the river Vecht past Marienberg to Almelo and Oldenzaal. It includes moreover Gaasterland, Vollenhove and parts of Wieringen and Texel (Fig. 1).

Characteristic for this area, which the Dutch plantgeographers call the "Drenthian District" are loamy sands resting on a slightly undulating ground moraine.

In a former period these deposits must have been covered by stagnant water; this is proved by the presence of extensive peat formations, which reach to the soil's surface, and by that of hardpans in the sands themselves. The district comprises in the first place sands and loams, marshes, moors and brook deposits, but not the clays that are here and there found transgressing its boundaries.

The surface of this weakly undulating landscape lies between  $\pm 0$ and 25 m above sea level ("N.A.P."). On the map of the stations where the bramble flora was studied (Fig. 3), the river systems have been indicated and also the provincial borders, the railway Zwolle— Groningen and the principal villages.

The Angiospermous flora of this district contains northern (boreal and montane) as well as atlantic elements.

According to H. WALTER (1927) the following species belong to the firstnamed category:

. . . . . . .

Parnassia palustris L. Phyteuma nigrum Schm. Polygonatum verticillatum All. Rubus saxatilis L. Scheuchzeria palustris L. Sparganium affine Schm. Stellaria nemorum L. Trientalis europaea L. Vaccinium Myrtillus L. Vaccinium Oxycoccus L. Vaccinium Vitis-idaea L.

The atlantic group of species comprises:

Corydalis claviculata Lam. et DC Erica Tetralix L. Galium saxatile L. Genista anglica L. Genista pilosa L. Hypericum elodes L. Ilex Aquifolium L. Illecebrum verticillatum L.

Lobelia Dortmanna L. Hammarbya paludosa O. Kuntze Cicendia filiformis Delarb. Myrica Gale L. Narthecium ossifragum Huds. Pedicularis sylvatica L. Primula acaulis Grufb. Sarothamnus scoparius Wimm.

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On the whole there is a close connection with the flora of N.W. Germany; Central-European species on the other hand, are rare. Many species that are known from Germany, France and Belgium, and that are also met with in the southern part of the Netherlands are altogether absent.

In topographical respect it is noteworthy that the district shows no important differences in level, the surface sloping gradually to the N. and S.W..

The valleys formed by the brooks are shallow but often of great width. Along and within these valleys remains of the *Alnetum* and of the *Querceto-carpinetum* are still to be found; and although the extent of these rests may be very small, they often harbour a very remarkable flora and fauna.

The long-established coppice woods as well as the hedges and the often luxurious scrub along ancient country and cattle tracks, the socalled "Drentse wildgroei" may also contain rests of the original flora, i.e. of the former oak and birch woods on the higher soils. These soils are now mostly used for agricultural purposes.

Originally extensive heaths formed also an important element of this district. Since the beginning of this century these heaths have almost all been brought into cultivation, and this has caused a total change in the landscape.

Many of the earlier floral and faunistic dorados have given room to monotonous food-producing fields. May at least those parts that have been set apart as nature reserves been spared for the benefit of future generations.

A widely different element in the landscape is formed by the aeolian sands with inland dunes, low lying, wind-swept plains, cliffs, moors and pools. These areas have now for the greater part been afforested, but some plots that were considered valuable from a scenic or a biological point of view have been spared as nature reserves. The extensive peat-formations have for the greater part been drained and converted into fields.

The streams were originally strongly meandering and as their meanders constantly changed their position, there was every opportunity for the development of marshy moorland with all its floristic wealth. In the higher parts of the valleys deciduous forests, rich in species, were found. By the normalisation of the streams and the advance of agricultural practice these picturesque valley landscapes too have lost much of their original character. As relicts of the flora of the former forests, moors and catchment areas we may find here species like Primula acaulis, Phyteuma nigrum, Anemone nemorosa, Anemone ranunculoides, Lamium Galeobdolon, Adoxa moschatellina, Chrysosplenium alterniflorum, Parnassia palustris and various Carices.

Amongst the woody plants found in the valleys the following species are noteworthy from a phyto-geographical point of view: Salix pentandra, Rhamnus cathartica, Euonymus europaea, Populus tremula, Corylus avellana, sometimes Ulmus campestris var. suberosa, the cork elm and Acer pseudoplatanus. Less characteristic but components are a.o.: Ilex aquifolium, Crataegus monogyna, Rosa canina, Viburnum Opulus, Prunus spinosa, Salix Caprea. The following orchids are present: Orchis Morio, Orchis latifolia and Platanthera bifolia. They are found associated with Caltha palustris, Cardamine pratensis and Lychnis Flos-cuculi in boggy meadows. Viola palustris too is still present in large numbers. It may be said that the Drenthian District notwithstanding the deterioration of its flora belongs to those parts of the Netherlands where many species have been saved that elsewhere since long have disappeared. How far this impoverishment is reflected in the bramble flora will be discussed in the following paragraph.

The bramble-flora undoubtedly belongs like the flora of heath and moorland and of alderbogs to those that are most strongly menaced by mankind. As they are considered a nuisance, brambles during the wintermonths are regularly mowed down and burned. Heath and forest fires too have contributed to their destruction, in the first place by destroying the brambles communities themselves, but also by giving species with a stronger spreading power, a chance to occupy the vacant spaces. It is interesting to follow the result of this struggle between man and the bramble in this mosaic of landscapes.

The types of soil on which brambles are growing are of many kinds but they always possess a high content of organic material and of water. On dry sands and on purely mineral, alkaline soils brambles are generally absent and in case they do occur, their growth, as a rule, is stunted. For the rest they are found on peat, sand and loam, on forest soils rich in organic material, and on cultivated soils rich in nitrogen.

According to FOCKE brambles avoid those climatic regions where rainless periods are frequent.

In S. Europe with its rainless summer months *Rubus* species are much scarcer than in Central Europe. Very dry localities are generally avoided, in our own region too. This is seen in the inner dunes, the higher parts of our heaths and dry woods. But very moist localities are also avoided, even by the species that are found occasionally in catchment-areas, on stream banks and in marshy woods or that show a preference for such stations. Several *Suberecti* such as *R*. *Nessensis*, *R. nitidus* and *R. integribasis* belong to the latter group, but disappear as soon as the water becomes stagnant and the locality boggy. This proves that they require well aerated soils.

The humus content of the soil, in itself a function of the local saturation deficit (law of JENNY), decides whether a seedling will be able to develop to a fullgrown and vital plant. The rooting of stemtips and probably the formation of buds on the roots (as in the case of the *Suberecti*) will probably also depend for a large part upon this factor.

Further the nutritional value of the soil water is evidently of great importance. A high amount of nitrogen and a weakly acid reaction of the substrate, which means easily available nitrogen compounds are necessary for a good development. It is therefore of little importance whether the substrate by which this combination of factors is provided, consists of loam, clay, sand or gravel, and it explains therefore the occurrence of brambles in seemingly very different surroundings. What we have to prove is that the selective influence of these environments is determined by the first-named factors.

Only when these factors have become known for a particular organism, we will be able to place the latter in its most suitable surroundings.

It is however, not a simple task to obtain such an insight, for besides the few principal factors discussed above, there are many other ones that may influence the life of the organism! The combination of all these external factors together with the idiosyncrasy of the organism itself, i.e. its vitality, adaptibility and migration power, decide the result.

It is still far beyond us to give satisfactory insight into these matters.

#### III. THE METHOD OF INVESTIGATION

When in 1949 we began with the exploration of the bramble flora in the vicinity of the Biological Station, Wijster, first of all a herbarium was made of specimens taken from plants that were duly marked so that they might later on, if necessary, be found back. This herbarium has formed the base for a closer investigation, floristical and ecological of the bramble flora in the Drenthian district.

The parts we collected were: 1° the typical foliage leaves, i.e. those inserted on the central part of the annual shoot (turion); and they were preferably collected during the months of July and August, sometimes a little later, the middle part of the turion was cut into pieces with a pair of secateurs, leaving one or two full-grown leaves attached to each stem fragment; 2° one to several well developed inflorescences, if possible with fresh flowers and with withered ones in order to judge the position of the sepals and the anthers during and after anthesis.

It is absolutely necessary to pay careful attention to the origin of these shoots, because we must have certainty that they are taken from the same individual. If they do not belong to the same individual, it may easily occur that two species are mixed, and this might make identification impossible. This urgent condition is not always easily fulfilled as a bramble vegetation generally is a tangle of prickly branches, often so intermixed that it is very difficult to separate one individual from another. After locality and date were noted and after the collected parts had been labelled, the latter were at once pressed. Notes on the locality, on habit, flower colour, etc. may prove useful.

To identify the species the monographs of FOCKE (1877, 1903, 1914) and SUDRE (1908—1913) were chiefly consulted. The following floras were sometimes also consulted: SCHINZ u. KELLER, Flora der Schweiz, 2nd ed., I a II (1905); LINDMAN, Svensk Fanerogam Flora, 2nd ed. (1926); BABINGTON, Manual of British Botany, 9th ed. (1904), in which to be found a survey of the British Rubi taken from

ROGERS, Handbook of British Rubi (1900), and WATSON'S List of British Species of Rubus (1946).

As to nomenclature and taxonomy SUDRE's large monograph of the European Rubi has chiefly been followed, although the clear and extensive descriptions of FOCKE have also been consulted.

The study of herbarium sheets only does not enable us to recognise the species in the field. After we had identified the species, it was necessary to return to the plant from which the specimen had been taken. It is remarkable how quickly the beginning batologist learns to recognise a certain number of well distinguishable species among the much larger number of forms that are as yet unknown to him.

Encouraged by this first success he will go on, and as the number of recognizable species is gradually rising, he will gain confidence. Then the moment arrives, that it becomes more difficult, when differences of opinion arise and mistakes are made. We are now coming to the less frequent species, of which only a single group, or even a single individual is met with. Then doubt and uncertainty will arise, for one has to deal now with the vast number of local and transitional forms and hybrids. The student who wishes to master all these forms, may easily spend the rest of his life with them, for their number is endless. For practical reasons, therefore one is obliged to draw a line. Most of these minor forms and hybrids have proved to be passing appearances or perhaps recently formed species, that possess insufficient vitality or migratory power. They may be regarded as experiments in the production of new species by this more or less unstable group of plants.

For this reason this investigation has been confined to species that are more or less widely distributed, also outside the Netherlands.

After the principal species of the Drenthian district had been identified, a more detailed investigation of their distribution and their occurrence in special plant communities could follow. To this end many excursions had to be made. By way of control the vegetation records were usually taken down by both authors. Notes were made on the occupied area, on the mode of growth, on vitality and on periodicity. These records have been brought together in a simplified and more easily surveyable form in a single list. In the tables 1—3 one may see respectively:

- 1. A survey of the distribution of the *Rubus* species in 84 different stations within the district.
- 2. A survey of the occurrence of special combinations of *Rubus* species in the same stations.
- 3. Vegetation records of the phanerogamic flora, the *Rubi* included, in 28 of these stations.

The map (Fig. 3) show the various stations.

Besides an extensive *Rubus* herbarium, a collection of living plants belonging to the species studied by us, has been brought together. It forms the *Rubus* fruticetum of the Biological Station, Wijster. Development and periodicity of flower- and fruit-formation as well as the morphology of the plants may be studied here under practically the same ecological conditions.

Lastly seedlings have been grown from some species, to obtain an idea of the constancy of the species. This was done also by BABINGTON, ARESCHOUG and FOCKE. The last named had, already in 1877, pointed out the importance of a collection of living brambles. He himself at that time possessed in the neighbourhood of Bremen two gardens with a fair amount of European species.

#### IV. THE RUBUS FLORA OF THE DRENTHIAN DISTRICT

Before we begin with our survey of the *Rubus* species met with in the Drenthian district it seems desirable to explain in what way the term "species" is used by us, and what taxonomic system and nomenclature we have followed.

CARL VON LINNÉ in 1753 distinguished but two species, among the European brambles viz. R. caesius and R. fruticosus; they comprised all the European brambles that are now brought together in the section Moriferi. This lumping together of a large number of forms was the consequence of the artificial method of classification then in use. This method consisted in the application of a limited group of differential characters, mostly morphological ones.

Later on however, the importance of genetic factors and of geographic distribution for the delimitation of the species was gradually realized. The European bramble flora in reality comprises thousands of genetically different forms (mutually connected by transitions) each with its own area.

That LINNÉ regarded these forms as representing a single species, was a practical and altogether understandable solution.

However a more detailed study of these "forms" showed that a certain number of these were well-recognizable, and reappeared, in exactly the same way in different parts of Europe. When BABINGTON (1869), ARESCHOUG (1876), and FOCKE (1877) grew a large number of these forms from seed, it appeared that most of them were entirely or almost entirely true to type. The Linnean classification therefore had to be abandoned. FOCKE rightly remarks in his Synopsis Ruborum Germaniae (p. 24): "Es ist ein Wahn, zu glauben, dass sich alle Gruppen organischer Formen in gleichwertige Species eintheilen lassen müssen", but he added "Natürlich würde es höchst thöricht sein, wenn man nun nach der andern Seite hin fehlgreifen und das Vorhandensein von Arten überhaupt leugnen wollte". A restricted number of "species" may, after some practice, be distinguished with certainty by their habit and morphological characters.

FOCKE (1877) himself distinguished 72 of such main species or "species-complexes" for Germany and SUDRE (1913) 110 for Europe. Round these circle species certain subspecies ("micro-species" of GUSTAFSSON) and minor forms ("named varieties" of GUSTAFSSON) and their hybrids have been grouped. We are dealing here with "form swarms" which have spread across the European continent. This is shown schematically in fig. 2. Local forms, varieties and hybrids may also detach themselves in their distribution from the main species. This may happen when the new form breeds true and possesses sufficient power to multiply and to spread. In that case they become of greater importance than the numerous forms that disappear very soon or that maintain themselves with difficulty in a minor area.

SUDRE (1913), distinguishes 7 categories of taxa, beginning with the main species and ending with the hybrid. FOCKE (1877) distinguishes



Fig. 2. Scheme of the interrelations between, and the geographic distribution of species, subspecies, varieties, forms, local strains and hybrids belonging to the european Moriferi.  $\bullet$  means species ("circle-species");  $\bigcirc$  = subspecies ("microspecies");  $\bullet$  = variety;  $\circ$  = local strain;  $\cdot$  = hybrid; ---- areal boundary; .......... Nearest genetic relations amongst the species, subspecies and varieties

five so-called "Wertstufen", and GUSTAFSSON (1943) too accepts 5 categories, viz: "primary species", "circle species", "micro species", named variety and hybrid. We follow this last subdivision, although "primary species" probably the ancestral species, i.c. those provided with the diploid number of chromosomes, 2n = 14, are lacking in this part of the country.

The only representative of this group in the Netherlands is *R. ulmifolius* Schott, which grows in the southern part of the country. When the whole of Europe and N-Africa are considered, we find the following other diploid species: *R. tomentosus* Borkh., *R. canescens* DC, *R. Bollei* Focke and *R. moschus* Juz., i.e. 5 species in total.

The remaining species of which the chromosome number has been determined, are polyploids (see GUSTAFSSON, 1943, pp. 90-93). The vast majority of the European "circle species" is tetraploid (2n = 28). Exceptions are: *R. nitidus* Wh. et N. (2n = 21), *R. candicans* Lasch

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(2n = 21) and R. Bellardii Wh. (2n = 35); the first named and the third named species occur in our district too.

In the list following below, we have distinguished only main species ("circle species") and species ("micro species"). Local forms have not been listed. Main species have been indicated by an asterisk (\*). In total 48 species are enumerated, two of which, viz. R. saxatilis L and R. Idaeus L., do not belong to the true brambles.

The numerous hybrids with R. caesius have been omitted, since in many cases they are difficult to distinguish and to identify, literature on this subject being scarce. Each district possesses different "Corylifolii", and the descriptions of these forms are either inadequate or they may be lacking altogether.

Our list of main species, subspecies and varieties in the Drenthian district is probably still incomplete. Completeness indeed can hardly be realized. The thorough exploration of a district as to its bramble flora is no simple task and would require several years.

Still, the number of main species that have already been met with (37), is larger than that reported in the literature for well explored districts of similar extent. FOCKE gives in his Synopsis the following figures:

Mecklenburg (Betke)	. 12 species
The Unterweser-district (Focke)	. 20 species
Mennighüffen (Weihe)	. 22 species
Henneberg (Metsch)	. 17 species
Weissenburg (P. J. Müller)	. 35 species
(a district famous for its wealth	of species)
Schaffhausen (Gremli)	. 18 species
N-Switzerland (Gremli)	. 23 species

These reports date already from some time ago, and it is not improbable that since 1913 some more species have been found in these districts. However, as a top-number for floras of districts in the N.W. part of Germany FOCKE reports 40—50 species. In regard to its bramble flora the Drenthian district undoubtedly belongs to the richest parts of our country. This will be shown in Chapter VII.

Our main division of the genus into subgenera and sections is that given by FOCKE (1914), while our further subdivision into subsections, series and subseries has been based on SUDRE's "Rubi Europae" (1913). However, in our classification the position of the groups has gone down in the hierarchy by one degree, so that SUDRE's sections have become subsections, his subsections series, etc. *Moriferi* marked with an asterisk (\*) correspond with SUDRE's main species and with "circle species" of GUSTAFSSON (1943). Those marked with a dot ( $\bullet$ ) are micro species with a smaller area. Where a specific epithet differring from SUDRE's Rubi Europae has been used the latter's name has been cited between brackets.

List of *Rubi* collected up to October 15th, 1951 in the N.E. part of the Netherlands.

#### Genus: RUBUS L.

- Subgenus V: CYLACTIS Rafin.
- 1 \* Rubus saxatilis L.
- Subgenus X: IDAEOBATUS Focke 2 \* Rubus Idaeus L.
- Subgenus XII: EUBATUS Focke Sectio 6: Moriferi Focke A. HOMALACANTHI Dum.
- Subsectio I: Suberecti P. J. Müll. 3 \* Rubus Nessensis W. Hall (= R.
- suberectus Anders.) 4 \*
- Rubus fissus Lindl.
- 5 \* Rubus sulcatus Vest.
- 6 \* Rubus plicatus Wh. et N.
- 7 Rubus opacus Focke?
- 8 \* Rubus nitidus Wh. et N.
- 9 Rubus integribasis P. J. Müll. 10 Rubus affinis Wh. et N.
- 11 \* Rubus emergens Boul. et Malb.?
- 12 Rubus ammobius Focke.
- 13 Rubus senticosus Koehl.
  - Subsectio II: SILVATICI P. J. Müll. Series A: Grati Sudre
    - Subseries a: Eu-grati Sudre
- 14 \* Rubus carpinifolius Wh.
- 15 \* Rubus vulgaris Wh.
- 16 \* Rubus gratus Focke
- 17 Rubus sciocharis Sudre (fa.?)
- 18 \* Rubus chaerophyllus S. et S.
- 19 \* Rubus badius Focke

Subseries b: Sprengeliani Focke

- 20 \* Rubus Arrhenii J. Lange 21 \* Rubus Sprengelii Wh.
- 22 \* Rubus chlorothyrsus Focke
- 23 \* Rubus bracteosus Wh. (fa.?)

Series B: Eu-virescentes Gen. Subseries b: Piletosi Gen.

- 24 \* Rubus pyramidalis Kaltenb.
- 25 Rubus macrophyllus Wh. et N.
- 26 \* Rubus leucandrus Focke (= R. montanus Libert; "circle species" of FOCKE) (fa.?)
- 27 \* Rubus Schlechtendalii Wh.

Subseries c: Nemorenses Sudre

- 28 \* Rubus silvaticus Wh. et N.
- 29 Rubus armoricus Sudre

- 30 Rubus amphichlous Sudre
- 31 \* Rubus egregius Focke ("circle species" of GUSTAFSSON, 1943)
  - Series C: Discoloroides Gen.
- 32 \* Rubus villicaulis Koehl.
- 33 \* Rubus Lindleyanus Lees
- Subsectio III: Discolores P. J. Müll Series B: Hedycarpi Focke
- 34 \* Rubus geniculatus Kaltenb. Series C: Candicantes Focke
- 35 Rubus phyllostachys P. J. Müll. (R. thyrsoideus Wimm. ssp. phyllostachys Sudre in Rubi europae)<sup>1</sup>
- 36 Rubus Leventii Sudre B. HETERACANTHI Dum.
  - Subsectio IV: Appendiculati Gen. Series B: Vestiti Focke Subseries a: Hypoleuci Sudre
- 37 \* Rubus vestitus Wh. et N.
  - Subseries b: Virescentes Sudre
- 38 \* Rubus mucronifer Sudre Series C: Radulae Focke Subseries a: Micantes Sudre
- 39 \* Rubus Radula Wh.
- 40 \* Rubus Genevieri Bor.
- 41 \* Rubus apiculatus Wh.
  - Subseries b: Concolores Sudre
- 42 \* Rubus flexuosus M. et Lef. (R. foliosus Wh. et N. ssp. flexuosus Sudre)

Series D: Rudes Sudre

- 43 Rubus rudis Wh. Series E: Hystrices Focke
- 44 Rubus horridicaulis P. J. Müll. Series F: Glandulosi P. J. Müll.
- 45 Rubus derasifolius Sudre
- 46 \* Rubus Bellardii Wh.
- 47 \* Rubus serpens Wh.
- Subsectio V: Caesii Focke (SUDRE: Triviales P. J. Müll.)
  - Grex A: Caesii veri Focke (1914)
- 48 \* Rubus caesius L. Grex B: Corylifolii Focke (1914) (Many unidentified forms)

The way in which the species are distributed over the 4 subsections of the *Moriferi* is shown in the following table:

<sup>1</sup> R. thyrsoideus Wimm. is a collective species, split up by SUDRE himself.

Suberecti: 11 species, of which 7 are main species and 4 are subspecies. Silvatici: 20 species, of which 17 are main species and 3 are subspecies. Discolores: 3 species, of which 1 is a main species and 2 are subspecies. Appendiculati: 11 species, of which 9 are main species and 2 are subspecies.

From this it appears that the *Silvatici* are numerically by far the most important group. Still, the *Suberecti* are, at least relatively, equally well represented: this is due to the fact that in this subsection a much smaller number of species has been described.

According to GUSTAFSSON the subsections of the Moriferi are represented in Europe in the following way: the Suberecti with 7 main species, 19 subspecies and 40 named forms; the Silvatici with 41 main species, 160 subspecies and 316 named forms; the Discolores with 11 main species, 76 subspecies and 244 named forms and the Appendiculati by 50 main species, 440 subspecies and 1327 named forms.

It is a remarkable fact that we did not yet find a single pure *R. caesius* in our district, although several *caesius* hybrids (*Corylifolii*) proved to be present.

#### V. DISTRIBUTION OF THE SPECIES

Of all species and subspecies discussed here, specimens are preserved in the Rijksherbarium, Leyden, as well as in the herbarium of the Biological Station, Wijster.

First of all, some remarks will be made here on the geographical distribution of the various species in and outside the Drenthian district. The species are dealt with according to their taxonomic position.

1. Rubus saxatilis L Spec. p. ed. I p. 494 (1753).

Occurrence in the district: In the Netherlands exclusively known from this district, surroundings of Ter Apel, where it grows abundantly in some woods along the river Ruiten-Aa.

General distribution: S. Greenland, N. Asia, C. and N. Europe, more southwards in the mountains only. In N. Germany fairly frequent along the coast of the Baltic and of the Northsea. Further inland scarce in the plains and more frequent in the mountains.

2. Rubus Idaeus L. Spec. p. ed. I p. 492 (1753).

Occurrence in the district: This is the *Rubus*-species that is most widely spread in the district. It occurs in most bramble communities. General distribution: Throughout Europe, the extreme North and South excepted. In the mediterranean region as a mountain plant only. In N. America escaped from culture and established from New England to Minnesota.

3. Rubus Nessensis W. Hall, Transact. Soc. Edinb. III, p. 20 (1794). (syn.: *R. suberectus* G. Anders. in Transact. Linn. Soc. XI p. 218)

Occurrence in the district: In many places, especially in woods on a soil that contains much humus and along streams. Also along roads and tracks. General distribution: Common throughout N. and C. Europe. In Norway, Sweden, and W. Russia up to ca 60° N. Lat., eastwards as far as Moscou. Throughout Germany, particularly in the N.W. part, in Galicia, Bohemia, the Alps and N. Italy, in N. and C. France, common in England, especially in the northern part, on the other hand only locally in Scotland and Ireland.

4. Rubus fissus Lindl. Syn. Brit. Fl. ed. 2, p. 92 (1835).

Occurrence in the district: Fairly common on slightly acid and poor soils, even on the heath, but also in the same stations as R. *Nessensis* General distribution: In the Netherlands in the first place on the higher, sandy soils in the east and centre (Veluwe, the range of hills in the province of Utrecht, Achterhoek).

In S. Limburg, so far in one station only. In the rest of Europe along the coast of the Baltic, S. Sweden, Denmark, S. Norway, Scotland, locally in England and Ireland, Belgian Ardennes, N. Germany. From France there are as yet no records.

5. Rubus sulcatus Vest. in Trott. Ros. III (1828).

Occurrence in the district: estates "Oldenhof" near Vollenhove (Ov.), "Hoge Lutte" near Oldenzaal and "Lieftincksbroek" near Vlagtwedde (Gr.). Typical for humid woods. General distribution: Fairly rare in the Netherlands, the other records being the "Slangenburg" near Doetinchem, "Plasmolen" near Mook (L.), "Kloosterbos" and "Wijnandsrader Bos", both in S. Limburg. Outside our borders in Great Britain, Belgium, Germany, Switzerland, Austria and Hungary, France and N. Italy.

6. **Rubus plicatus** Wh. & N. Rub. Germ. p. 15 (1822). (syn.: *R. fruticosus* L. Spec. pl. ed. I p. 493 pro parte (1753).)

Occurrence in the district: Common along woods, borders and in scrub also along roadsides.

General distribution: In the N. German plain one of the commonest species, especially on sand and peat (FOCKE). Lacking east of the Kurische Nehrung. Southwards in the lower mountains and in the lower part of the Alps (Innsbruck). Seems to occur as far east as Hungary and as far south as Locarno. In Gr. Britain it becomes rarer towards the south and it is rare in Ireland. In France too it becomes rarer towards the South. Naturalized in S. Africa (var. Bergii Cham.) and in the mountains of Java!

7. **Rubus opacus** Focke (?) in Alpers Gef. Pflz. Stad. p. 25 (1875). Occurrence in the district: Our finds are, so far, doubtful and restricted to two spots, at Rhebruggen and along the road Wittelte— Assen (Dr.).

General distribution: From our country there are so far but few trust-worthy records (Amersfoort, Nijmegen, Heerlen). The species is known from N.W. Germany, Belgium, France (Saône) and England (Sussex).

8. **Rubus nitidus** Wh. & N. Rub. Germ. p. 19 (1822).

Occurrence in the district: Amen and Springendal near Ootmarsum.

General distribution: Appears to occur sporadically throughout

our country (N. Brabant, Gelderland). Further in N. W. Germany,

Denmark, Belgium, France, Austria, Switzerland and England. 9. Rubus integribasis P. J. Muell. in Boulay, Ronces des Vosges 23, a. 21 (1866).

Occurrence in the district: So far from N. Drente only, where it occurs fairly frequently in several places along the streams.

General distribution: Surroundings of Nijmegen (TH. REICHGELT), N. Brabant, S. Limburg. Known from W. Germany, Belgium, N. and W. France, Portugal.

10. Rubus affinis Wh. & N. Rub. Germ. p. 18 (1822).

Occurrence in the district: Common, especially, along the borders and in the undergrowth of pine-plantations. Also along roadsides and in scrub.

General distribution: Known from several places in our country, also along the W. coast, a.o. at the foot of the dunes. Further: Belgium, N. W. Germany, N. and W. France and S. Sweden. Common in England.

Rubus emergens Boul. & Malb. Assoc. rub. p. 9 (1873). 11. Occurrence in the district: This bramble, which is considered by SUDRE a subspecies of R. affinis, has been collected by us in several stations.

General distribution: Not yet reported from other parts of our country. In France along the lower course of the Seine.

12. **Rubus ammobius** Focke Syn. Rub. Germ. p. 118 (1877).

Occurrence in the district: Apparently still more common than R. plicatus, along road sides, wood borders and in scrub, also on poor sand soils.

General distribution: Especially common in the N. E. part of our country and in the "Achterhoek", also reported from Nunspeet, Loenen and Zwolle (Agnietenberg). South of our large rivers it appears to be rare. Locally in N. W. Germany, especially in Lower Saxony and Westfalia. According to C. E. GUSTAFSSON also in Denmark. R. Rogersii Linton, may be identical with this species; it has been reported from England and is common in Scotland.

13. Rubus senticosus Koehl. in Wimm. & Graebn. Fl. Sil. p. 51 (1829), (syn. R. montanus Wirtg. Fl. Rheinprov. p. 150).

Occurrence in the district: the "Spannen" near Wijster (Dr.) and Rhebruggen (Dr.).

General distribution: Other stations in our country from where we have seen specimens are Nunspeet, Nijmegen, S. Limburg (Schinnen), the "Achterhoek" and "Twente". Further occurring in W. and C. Germany. In W. Germany northward as far as Bentheim, southward as far as Darmstadt, Silesia, Bohemen, Hungary, in the latter country especially in the mountains.

14. Rubus carpinifolius Wh. in Bönningh. Prodr. Fl. Monast. p. 152 (1824).

Occurrence in the district: In Drente fairly common along roads and in scrub, along woodborders and in woods.

General distribution: In the remaining parts of the country collected

in S. Limburg (DE WEVER), Twente, Achterhoek and the surroundings of Nijmegen (KERN and REICHGELT). Further in Belgium, N. France, N. W. Germany, England and Tsjecho-Slovakia.

15. **Rubus vulgaris** Wh. & N. Rub. Germ. p. 38, 40 (1835). Occurrence in the district: Amen and Ansen (Dr.) and near De Lutte (Ov.).

General distribution: N. W. Germany, Belgium, Bohemia and France. In our country from the Peel (N. Br.).

16. Rubus gratus Focke in Alpers Verz. Gef. Pflz. Stad. p. 26 (1875).

Occurrence in the district: Extremely common in all kinds of habitats, in cultivated land, along roads and in hedges, along wood borders and in woods, even entering the heath. A forma *laciniata* has been found in the wood of Westerbork (Dr.).

General distribution: In the Netherlands one of the most common brambles, Further in N. W. Germany and Pomerania, Denmark, Belgium, Gr. Britain and N. France.

17. Rubus sciocharis Sudre Bat. p. 68 (1907) (fa.?).

Occurrence in the district: a single station near Hoogeveen (Stuifzand), with pink flowers and beautiful red filaments. For the rest as in the original description.

General distribution: Not known with certainty from elsewhere in the Netherlands. Known from Denmark and Germany.

18. Rubus chaerophyllus Sagorski & Schultze, Deutsche Bot. Monat. XII (1894).

Occurrence in the district: This species is rare in our country. It has been reported i.a. from Neerbosch near Nijmegen (Kern and REICHGELT). The related form "fa. *brachythyrsoides* Sudre" has been collected by us at the "Lokhorst" near Amersfoort and at "Salentijn" near Nijkerk (G.), possibly also near Zuidwolde (Dr.), while "fa. *euchlooides* Sudre" was found on the "Baast" (N. Br.). The typical form occurs in Germany and Belgium, the two other forms in France.

19. Rubus badius Focke. Syn. Rub. Germ. p. 276 (1877).

Occurrence in the district: Common, especially in hedges and scrub, also along wood borders and in woods (Fig 7).

General distribution: N. W. Germany, Gr. Britain.

20. Rubus Arrhenii J. Lange Haandb. Dansk. Fl. ed. 3, p. 386 (1864).

Occurrence in the district: In many places, but chiefly in rests of former woods and along streams (Fig. 5). At Bruntinge a turion of this species was collected with divided topleaves, i.e. with 6—7 leaflets to a leaf.

21. Rubus Sprengelii Wh. in Flora II, p. 18 (1819).

Occurrence in the district: Common, especially in deciduous woods, also in pine plantations. Sometimes in old coppice woods and at times even entering the heath.

General distribution: Fairly common throughout our country, but especially in the N. E. part. Common in N. Germany and Belgium.



Fig. 3. Map of Drenthe. The stations where the bramble flora was studied are indicated by a cross. The figures refer to the rests of former woods mentioned in table I: 1, Amerbos; 3, Hegebos near Exlo; 4, Grolloër Holt; 5, Bruntinger Bos; 6, Mantinger Bos; 9, Kynholt; 10, Asser Bos; 11, Norger Holt; 21, De Klencke; 23, Huize Echten; 53, Dickninge; 71, De Grote Schere near Gramsbergen

From the Frische Nehrung through Germany westwards to the Rhine near Coblenz.

22. Rubus chlorothyrsus Focke, Abh. Nat. Ver. Bremen II, p. 462 (1871).

Occurrence in the district: Heemse (Ov.) and Hoge Lutte near Oldenzaal (Ov.).

General distribution: Collected by W. W. SCHIPPER at Slogteren (Gr.). We found the species in the former Beekbergen Forest. Otherwise unknown in our country. Further in Mecklenburg, Schleswig-Holstein, frequent in N. W. Germany and Belgium.

23. **Rubus bracteosus** Wh. ap. Lej. et Court. Comp. Fl. Belg. II p. 162 (1831) (fa.?).

Occurrence in the district: Known only from Lieveren (Dr.) in a deviating form.

General distributions: Elsewhere in our country unknown. Occurring in Gr. Britain, Belgium and Germany.

24. Rubus pyramidalis Kaltenb. Fl. v. Aachen. Beckens p. 275 (1845).

Occurrence in the district: common.

General distribution: Gelderland (Achterhoek, Veluwe), near Nijmegen (KERN and REICHGELT), S. Limburg etc. Also in Gr. Britain, Germany, Denmark, S. Sweden, Switzerland, Austria, C. and E. France. The area of distribution is therefore fairly large.

25. Rubus macrophyllus Wh. & N. Rub. Germ. p. 35 (1835).

Occurrence in the district: In the N. E. part of our country this species appears to be rather rare. Collected at Orvelte, Geesteren— Tubbergen, Albergen (Ov.).

General distribution: In our country fairly frequent i.a. in the Achterhoek and near the Hague and especially S. of the large rivers, viz. round Nijmegen, in N. Brabant and S. Limburg. Further in Belgium, Gr. Britain, Denmark, W. and S. Germany, Switzerland, Austria, C. and N. France.

26. **Rubus leucandrus** Focke (fa.?) in Alpers Verz. d. Gefpflz. Stade, p. 27 (1875).

Occurrence in the district: Wijster, Oud Avereerst and Steenbergen (near Zuidwolde, Dr.).

General distribution: N. W. Germany, southwards to the Harz and westwards to Westfalen and to the Lower Rhine, frequent round Aachen, Eupen and Malmedy, further Gr. Britain and N. France.

27. Rubus Schlechtendalii Weihe ap. Boenngh. Prodr. Fl. Monast. (1824) p. 152.

Occurrence in the district: By us up till now collected only at Oldenzaal (Hoge Lutte, Ov.). A specimen from Vollenhove (de Oldenhof) in the Rijksherbarium.

General distribution: Collected in the "Mastbos" near Breda, in the region of the former "Beekbergerwoud" near Apeldoorn and by KERN and REICHGELT at Beek near Nijmegen. Known from Germany (Westfalia, Minden), France, Gr. Britain.

28. Rubus silvaticus Wh. & N. Rub. Germ. p. 41 (1825).

Occurrence in the district: Common in woods, especially in long established ones (Fig. 4). In N. E. Overijsel apparently already less frequent.

General distribution: In our country presumably restricted to the N. E. part. Further in Schleswig-Holstein and N. W. Germany, Denmark, Gr. Britain, Austria, Bohemia, Moravia, N. and C. France and Belgium. It is therefore a species with an extensive area of distribution.

29. Rubus armoricus Sudre, Rubi Europae, p. 51 (1913).

To be regarded as a form of R. silvaticus Wh.

Occurrence in the district: In S. E. Friesland, S. of Beetsterzwaag and N. of St. Nicolaasga. In Drente along the road from ten Arlo to Echten.

General distribution: Not known to us from other localities. Occurring in France.

30. Rubus amphichlous Sudre, Rub. Tarn. (1909).

Occurrence in the district: Collected in some stations in S. E. Friesland and N. Drente.

General distribution: In France.

31. Rubus egregius Focke in Abh. Nat. Ver. Bremen, II, p. 463 (1871).

Occurrence in the district: Common, chiefly in woods (Fig. 5). Occasionally outside these woods and then mainly along streams.

General distribution: In our country further only in the Haarlemmer Hout (Haarlem). In N. W. Germany, according to Focke (1903) l.c. p. 537: "eine scharf von allen andern Brombeeren geschiedene Art", Schleswig-Holstein, Westfalia, also Schwarzwald, Belgium, Denmark, France, Austria.

32. **Rubus villicaulis** Koehl. in Wh. & N. Rub. Germ. p. 43 (1825).

Occurrence in the district: Collected in S. E. Friesland only.

General distribution: Should probably be regarded as more or less rare in our country. So far known only from the Jansberg near Mook (REICHGELT) S. Limburg (DE WEVER), Kotten near Winterswijk and the former "Beekbergerwoud".

33. Rubus Lindleyanus Lees Phyt. III, p. 361 (1838).

Occurrence in the district: Fairly common along roads and in hedges, less common in woods.

General distribution: In our country known from De Lutte near Oldenzaal, Beek near Nijmegen and the former Beekbergerwoud (G.). In Gr. Britain (frequent), N. W. Germany, along the dutch-german border (FOCKE) and in France.

34. Rubus geniculatus Kaltenb. Fl. Aach. Beckens p. 267 (1845).

Occurrence in the district: Fairly frequent in woods as well as in scrub.

General distribution: In our country known from several stations a.o.: Plasmolen, Spaubeek (S.L.), Geulle (S.L.), Ommen and Loenen, Wassenaar, Oosterbeek and Weert (N. Br.). Very common in S. Limburg. In the rest of Europe: Westfalia, Weser-area, Rhine province, Aachen, Elberfeld, Belgium and N. France. 35. Rubus phyllostachys P. J. Müll. in Flora, XLI, p. 133 (1858).

Occurrence in the district: Hoge Lutte near Oldenzaal (Ov.). General distribution: Collected by us in the wood of Bekendelle near Winterswijk (G.), for the rest unknown in our country. Occurring in France, Germany, Switzerland and Belgium.

36. , Rubus Leventii Sudre Rub. Hb. Bor. p. 34 (1902).

According to SUDRE a subspecies of *R. phyllostachys* P. J. Muell. Occurrence in the district: den Ham (Ov.).

General distribution: Collected by us at Doetinchem, Winterswijk (G.), Doorn. (U.) and Tegelen (L.). Known from France and S. Germany.

37. Rubus vestitus Wh. in Bluff et Fing. Comp. Fl. germ. I p. 684 (1825).

Occurrence in the district: In Drente at Wijster only, in N. Overijsel in several localities. In hedges and along roads, also along wood borders.

General distribution: In S. Limburg one of the commonest species, also occurring round Nijmegen (KERN and REICHGELT). Further throughout G. Europe, on calcareous as well as silicious souls, Denmark, W. and S. Germany as far southwards as Vienna (Austria), Switzerland, N. and C. France, Gr. Britain, Ireland, Portugal. Is said to have been introduced in N. Sealand (ROGERS).

38. **Rubus mucronifer** Sudre Rub. Hb. Bor. p. 56 (1902). Occurrence in the district: Although not frequent, yet found in various localities belonging to three different catchment-areas.

General distribution: Not yet known from other localities in the Netherlands. Gr. Britain, Ireland, W. France, Denmark, N. Germany, Belgium.

39. Rubus Radula Wh. in Boeningh. Prodr. Fl. Monast. p. 152 (1824).

Occurrence in the district: Known so far from a single but extensive area situated W. of Dalfsen (Ov.).

General distribution: In our country round Nijmegen and in S. Limburg. Denmark, Germany W. of the river Weichsel, Belgium, Austria, Hungary, N. Tirol, Switzerland (but not south of the Alps), France and Gr. Britain.

40. **Rubus Genevieri** Bor. Fl. Cent. ed. 3, II, p. 193 (1857). Occurrence in the district: Cadoelen near Vollenhove (O.).

General distribution: The ssp. *brevistachys* Sudre collected by us in the "Liesbos" near Breda. Known from N. W. France, S. Germany and Portugal.

41. **Rubus apiculatus** Wh. in Bluff et Fingerh. Comp. Fl. Germ. I, p. 680 (1825).

Occurrence in the district: Heemse and Rheeze (O.).

General distribution: Gr. Britain, N. France, Belgium, W. Germany southwards to the Alps, Westfalia and Schleswig-Holstein, also in Switzerland, Austria, Russia (Caucasus).

42. Rubus flexuosus Müll. & Lef. in Poll. p. 241 (1859).

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Occurrence in the district: Very frequent in woods, also in pine plantations, along wood borders and in scrub, chiefly along streams.

General distribution: In our country known from various localities i.a. Loosduinen, Vlagtwedde, S. Limburg, N. Brabant. Further occurring in Gr. Britain, Belgium, Austria, Switzerland, N. E. France, Schleswig, N. W. Germany, Rhine province, Schwarzwald.

43. **Rubus rudis** Weihe ap. Bluff et Fingerh. Comp. Fl. Germ. I, p. 687 (1825).

Occurrence in the district: In Drente only near Hoogeveen (Spaarbankbos), in Overijsel near Vollenhove (Oldenhof) and at Hoge Lutte near Oldenzaal.

General distribution: Collected by us in the Haarlemmer Hout (Haarlem), near Winterswijk and at Nijmegen; in S. Limburg frequent. Also Gr. Britain, Belgium, Germany, Switzerland, Austria, C. and N. E. France.

44. **Rubus horridicaulis** P. J. Muell. in Bonpl. p. 284 (1861). Occurrence in the district: "Klencke" near Oosterhesselen (Dr.). General distribution: In our country not further known. Occurring in France, Germany, Switzerland.

45. **Rubus derasifolius** Sudre in Bull. Soc. Bot. Fr. p. 334 (1905). Occurrence in the district: Amen (Dr.), Lheebroek (Dr.) and Boyl (Fr.).

General distribution: No other localities known from the Netherlands. Found in France, Germany, Belgium, Hungary.

46. **Rubus Bellardii** Wh. in Bluff et Fingerh. Comp. Fl. germ. I, p. 688 (1825).

Occurrence in the district: Frequent in rests of former woods, rare outside the latter. Tolerates fairly deep shade, in sheltered places evergreen.

General distribution: In our country a.o. in S. Limburg (Bemelen, Houthem). Also in Germany, Denmark, S. Sweden, Gr. Britain (rare), E. France, Switzerland, Silesia, on the whole therefore with an extensive area of distribution. I.c. typical for mountain woods in C. Europe (the Alps). A very constant species, easily distinguishable by its characteristic leaf shape. Preferring moist woods, in the plain as well as in the mountains.

47. **Rubus serpens** Wh. in Lej. et Court. Compt. Fl. Belg. II, p. 172 (1821).

Occurrence in the district: Grolloër Holt near Grollo (Dr.), Echten, Exlo (Fig. 4) and Meerbos near Weerdinge (Dr.), not frequent.

General distribution: Not yet found elsewhere in our country. Occurring in Germany (Schleswig, Harz, Lausitz, Posen, Silesia), the Lesser Carpathes, throughout C. and S. E. Germany, the Belgian Ardennes, Hungary, Austria, Tirol, Switzerland, France, in the latter country chiefly in the Pyrenees, but also in Meurthe and Moselle, therefore with an extensive area of distribution. It is like the closely related *R. hirtus* W. et K. extremely rich in forms.

48. Rubus caesius L., Spec. pl. ed. I, 706 (1753).

Occurrence in the district: this species itself has not yet been

found in the district, although it occurs along its border, viz. near Vollenhove (O.), Texel and hybrids of *R. caesius* are common in the district.

General distribution: In the Netherlands chiefly along the large rivers, in the sea dunes and on the calcareous soils of S. Limburg. Widely distributed throughout Europe and N. Asia.

#### VI. THE PLANT-COMMUNITIES IN WHICH THE RUBI OCCUR

Our survey of the bramble distribution in our district will already have made clear that many species are bound to soils that are suitable to silviculture. Below we will consider the question whether among the brambles species or groups of species are found that are more or less distinctly bound to special communities. On table III vegetational records are given of 28 stations. In most of these stations the following species are regularly met with:

Betula pubescens	Frangula Alnus
Quercus Robur	Hedera helix
Sorbus aucuparia	Lonicera Periclymemum
Ilex aquifolium	Stellaria Holostea
Rubus <sup>1</sup> Idaeus	Corydalis claviculata
Rubus Nessensis	Epilobium angustifolium
Rubus gratus	Öxalis Acetosella
Rubus Sprengelii	Maianthemum bifolium
Rubus egregius	Holcus lanatus
Rubus flexuosus	Polygonatum multiflorum
Rubus badius	20

These elements are typical for the plant communities in oak-birchand oak-hornbeam woods. There are many transitions between the typical representatives of these two associations and several woods in the Drenthian district belong to the latter, e.g. the habitats rich in brambles in long-established woods and in rests of former woods (Fig. 4).

It is noteworthy that the remains of well-known former woods often contain bramble-species, that are rare or lacking elsewhere in our country or are found only in localities of a similar nature. (Bruntinge, N. Lage near Mantinge (Fig. 5), near Rolde). These species, therefore, remain to a certain measure faithful to their original habitat.

Besides there are several *Rubus* species, that occur in long-established woods as well as in plantations of more recent origin, no matter whether the latter consist of conifers or of deciduous trees.

A third category of species is chiefly met with along roadsides and in fields and but rarely in woods.

In the fourth and last group we have brought together the species which have only occasionally been met with, so that a more detailed knowledge of their distribution and their connection with definite plant communities is still lacking.

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Fig. 4. Hegebos near Exloo (Dr.). Rest of a former forest with undergrowth of R. silvaticus, R. serpens, R. Nessensis and R. badius



Fig. 5. Noord-Lage near Mantinge. Roadside growth with R. plicatus, R. gratus, R. badius and R. Arrhenii in a former forest

The 4 categories mentioned above are composed of the following species:

I. Species that are typical for long-established woods and for remains of such woods in the Drenthian district. (The numbering corresponds with that of the list of page 336 and that of table I):

19.	<i>R</i> .	badius	38. R. mucronifer
20.	<i>R</i> .	Arrhenii	46. R. Bellardii
28.	<i>R</i> .	silvaticus	47. R. serpens
31.	<i>R</i> .	egregius	-

II. More common species, also occurring in plantations of more recent date elsewhere in our country:

3.	<i>R</i> .	Nessensis	21.	<b>R</b> .	Sprengelii
10.	<i>R</i> .	affinis	24.	<i>R</i> .	pyramidalis
16.	<i>R</i> .	gratus	42.	R.	flexuosus

III. Species with their main distribution along roads and in fields, but sometimes also met with in coppice woods and in scrub and penetrating into the heath and into plantations:

4.	<i>R</i> .	fissus	12. <i>R</i> .	ammobius
6.	<i>R</i> .	plicatus	14. <i>R</i> .	carpinifolius
8.	<i>R</i> .	nitidus	33. <i>R</i> .	Lindleyanus

9. R. integribasis

IV. Species that have only occasionally been met with and of which consequently no main distribution can be given:

7.	<i>R</i> .	opacus (?)	32. R.	villicaulis
11.	<i>R</i> .	emergens	34. R.	geniculatus
12.	<i>R</i> .	senticosus	37. R.	vestitus
15.	<i>R</i> .	vulgaris	39. R.	Radula
22.	<i>R</i> .	chlorothyrsus	41. R.	apiculatus
23.	<i>R</i> .	bracteosus (fa.?)	43. R.	rudis
25.	<i>R</i> .	macrophyllus	44. R.	horridicaulis
26.	<i>R</i> .	leucandrus (fa.?)	45. R.	derasifolius
30.	<i>R</i> .	amphichlous	36. R.	Leventii a.o.

The species enumerated above recur in the 4 vertical colums of table II, where they are indicated by their numbers.

Some of the *Rubus* stations from table I have been described in detail in order to give an idea of plant communities in which the brambles occur (Table III). The map too should be consulted.

### A. Examples of long-established woods and of forest remains:

1. The former forest of Amen. This has been strongly influenced by mankind (roads, woodcutting) and has now been reduced to scrub in which oak, hazel, and birch are present; borders the meadows along a stream called Amer diepje. As the vegetation

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of the surrounding area was included, no clear picture of the true forest flora is obtained. Chromotop. map 1: 25000, p. 187.

- 3. The Hegebos, S. E. of Exloo, on the Hondsrug. This is a fairly well-preserved oakwood,  $\pm 25$  m above N.A.P. Chromotop. map 1: 25000, p. 207 (Fig. 4).
- 4. The Grolloër Holt, S. of Grollo,  $\pm 20$  m above N.A.P. Oak wood, probably planted long ago on ancient forest soil. Chromotop. map 1: 25000, p. 188.
- 5. The Bruntinger-Bos. Remain of a former forest along a stream, E. of the village of Bruntinge. This wood consists chiefly of oak trees and the undergrowth is rich in bracken. Moist. Chromotop. map 1: 25000, p. 223.
- 6. The Mantinger Bos near Mantinge. This is said to have been known from  $\pm 1000$  A. D., according to monastery chronicles. Moist scrub with many old hollies and much bracken, also some old oak and beech trees, although mostly oak and birch. Chromotop. map 1:25000, p. 223 (Fig. 7).
- 9. The Kynholt, S. of Hoogeveen. A small rest of what in earlier times, according to the archives, must have been an extensive forest. Composed of high oak and beech trees with undergrowth a.o. of holly and hazel, and sitated along a stream called Echtener Stroompje. Poor in *Rubus* species, but characterized by the absence of the categories III and IV. Chromotop. map 1 : 25000, p. 239.
- 10. The Asser Bos. The southern and most ancient part of the municipal wood containing old high oaks and much undergrowth of holly and hazel; moist. Chromotop. map 1 : 25000, p. 139.
- 11. The Klencke, Southern part. Oak wood, already known as a wooded estate in 900 A.D. A dense undergrowth of brambles, chiefly *R. Bellardii* and *R. flexuosus*. Chromotop. map 1 : 25000, p. 241.
- 23. Estate of Echten. A long-established wood west of the ancient mansion; new plantations have been added. Some old specimens of hornbeam and heavy beeches. The surrounding area too has been included in the vegetation record, so that no true picture of the forest flora has been obtained. Chromotop. map 1:25000, p. 256.
- 71. The estate "Grote Schere" near Gramsbergen. Old oak wood, with an undergrowth of brambles, which though dense is rather poor in species (7). Characterized by the absence of the categories III and IV. Chromotop. map 1: 25000, p. 275.

## **B.** Examples of plantations, sometimes with an ancient nucleus:

- 18. The Sterrebos near Frederiksoord. A plantation consisting of various kinds of woody plants, sporadically with an undergrowth of brambles. Chromotop. map 1: 25000, p. 202.
- 19. Pine wood, West of Wijster, planted in 1901. Now after 50 years, with a rich undergrowth of brambles. Moist, here and there loamy sand soil. Chromotop. map 1 : 25000, p. 223.

- 24. Near Hollandse Veld, a village east of Hoogeveen. Woods planted in the first half of the 19th century, now mostly dug up and felled. Chromotop. map 1 : 25000, p. 257.
- 28. Hollandse Veld, southward. High woods of *Pinus silvestris* with many brambles in the undergrowth. Chromotop. map 1 : 25000, p. 257.
- 32. The Eeze near Steenwijk. Mostly pine and oak, locally with many brambles. Chromotop. map 1 : 25000, p. 220.
- 54. Woods of Eleveld, along the Pesserdijk, S. E. of Hoogeveen. Humid pine woods with many mosses. Chromotop. map 1:25000, p. 240.
- 73. Woods east of Beetsterzwaag. Oak woods on sand soil, much scrub. Chromotop. map 1: 25000, p. 148.

#### C. Examples of roadsides and fields with brambles

- 7. Eursinge, near Ruinen. The meadows along the stream are surrounded by scrub with an abundant growth of brambles. Chromotop. map 1: 25000, p. 239.
- 47. Sandy road near Zuidwolde. Dense bramble hedge between the road and the meadows with but few other woody plants. Chromotop. map 1: 25000, p. 256.
- 56. Kraloo. A wild bramble growth along a sand road bordering cornfields east of Kraloo. Chromotop. map 1 : 25000, p. 222.
- 68. Heemse, opposite Hardenberg. Scrub with brambles, surrounding a field; also along a sandy road. Chromotop. map 1 : 25000, p. 291.
- 57. Spannen, east of Wijster, Sandy road along the valley's edge, with many brambles. Chromotop. map 1 : 25000, p. 223.
- 76. Rome, South of Beetsterzwaag, a grassy dyke formerly used by the tramway; it accompanies the paved road leading to Gorredijk.

A less pronounced bramble flora is found in:

**D.** Valleys, of which the following examples are given: no 8, 41, 42, 50, 59, 60, 61, 72 and 78.

### **E.** Shelter-belts, formed by coppice woods, with the following examples: 7, 26, 29, 30, 47.

J. HOUZEAU DE LEHAIE (1928) has drawn the attention to the part, that *Rubus* communities may play in the succession leading to forest. These communities would owe their origin to seeds dropped by birds in suitable places. When the young plants are not disturbed they grow vigorously and spread in all directions.

The bramble community, in its turn, would form a very suitable bed for the seedlings of *Cupuliferae*, which by the favourable and quick conversion of nitrogen compounds in the soil below the brambles have a good chance to succeed. When treegrowth becomes denser, the growth of the bramble community is stopped. In one special case this happened after 10 years. Subsequently it begins to shrink and in the wood just mentioned the original bramble community had

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Fig. 6. Pure stand of R. egregius in the undergrowth of a wood at Rhebruggen



Fig. 7. Along the margin of the wood at Mantinge. R. badius flowering

in 30 years' time been reduced to half of its largest extension. He ends his exposition with the following pronouncement: "La place des *Rubus* dans les formations forestières est désormais accessoire. Ils doivent se confiner a la lisière des massifs d'arbres, ou dans leurs parties les moins denses".

With regard to the light requirement of the brambles FOCKE (1877, p. 22) remarks: "Die Lichtbedürftigkeit der verschiedenen Brombeerarten ist nicht die nämliche. Im Waldesschatten, in welchem manche *Glandulosi* üppig gedeihen und reichlich Blüthen und Früchte bringen, erhalten sich andere Arten nur kümmerlich. Im Allgemeinen ist bei den Schattenformen die Consistenz der Blätter schlaffer und der Filz der Blattunterflächen geringer, während die Sonnenformen häufig ledrige, unterseits weissfilzige Blätter haben. Indess sind nicht alle Arten in diesen Beziehungen gleich veränderlich. Manche Arten bekommen in der Sonne keine Spur von Filz, während andere (z.B. *R. bifrons*) auch im Schatten ihre weissen Unterflächen behalten. Allgemein gültige Regeln lassen sich darüber nicht aufstellen, sondern jede einzelne Art besitzt ihre besonderen Eigentümlichkeiten".

R. TÜXEN (1950, pp. 165—171) reckons the Rubus stands to the nitrophilous weed communities of the Euro-siberian region. He includes them in the order Epilobietalia angustifolii (VLIEGER, 1937), of the class Epilobieta angustifolii Tx. et Prsg. 1950, by which he means the "Schlagpflanzen-Gesellschaften" i.e. the associations that establish themselves in those parts of the woods where the trees have been felled. These associations are found in all deciduous and coniferous woods with the exception of those in the higher parts of the mountains, the alder bogs and the Betula-pubescens association on peat. They are lacking in the mediterranean-region. The species he regards as typical for this order are: R. Idaeus L, Epilobium angustifolium L. and Calamagrostis epigeios (L.) Roth.

The Rubus communities of N. W. Germany could be brought together in 2 alliances, 1° the Lonicero-Rubion silvatici Tx. & Neumann 1950 and 2° the Sambucus-Salicion Capreae Tx. & Neumann 1950. As typical species for the first alliance are given (l.c. p. 169):

R. silvaticusWh. & N.R. SchleicheriWh. & N.R. SprengeliiWh.R. pyramidalisKaltenb. a.o.RubiR. affinisWh. & N.R.Providential ScienceRubi

As differentiating species of this alliance (eventually typical species) he mentions:

Sorbus aucuparia L. Quercus Robur L. Betula pendula Roth. Frangula Alnus Mill.

adding as a note:

"Sehr häufige Initial-Gesellschaft des natürlichen Waldes auf älteren Schlägen oder auf Lichtungen, besonders in Kiefern-Forsten auf den Standorten von *Quercion-roboris-sessiliflorae*-Wäldern im subatlantischen N. W. deutschen Flachland. Wahrscheinlich vielweiter verbreitet. Die Gesellschaften dieses Verbandes sind hervorragende Verarbeiter von Rohhumus und für die Sanierung des Bodens von höchstem Wert. Lebensformen: vorwiegend Lianen "Assoziationen":

1° Rubus gratus — Ass. Tx. & Neumann 1950, with the regionally typical species:

R.	nitidus Wh. &	N.	R. fissus Lindl.	
R.	gratus Focke		R. pallidus Wh. & N. a.c	).

Differentiating species: Molinia coerulea (L.) Moench. This would be the initial phase of the native Querceto-roboris Betuletum on silicious soil, poor in alkali of the N. W. german plain and of the lower hill districts. It occurs also in clearings in pine woods and is especially frequent in the Querceto-roboris-Betuletum molinietosum.

 $2^{\circ}$  Rubus silvaticus-R. sulcatus Ass. Tx. & Neumann 1950; the regionally typical species of this association are:

R. sulcatus Vest.

R. suberectus Anders.

R. hypomalacus Focke R. Bellardii Wh.

R. vulgaris Wh. & N.

In this association we would have the initial phase of the natural forest that develops on sandy soils with a small amount of loam or influenced by slightly alkaline soil solutions. It occurs chiefly in open spaces (clearings, enclaves) in pine woods and in slightly more eutrophic stations in the Querceto-Betuletum of the N. W. german lowland and hills.

The typical species of the second alliance i.e. the Sambucus-Salicion Capreae Tx. & Neumann 1950, are according to TÜXEN:

Sambucus nigra L.	Rubus rudis Wh. & N.
Salix Caprea L.	R. thyrsoideus Wimm.

This would be the pioneer community of the regenerating woods in clearings in the *Fagetalia* and in the conifer plantations that have come in their stead, on hills and mountains of N. W. Germany, with further distribution in N. W. Europe.

Only two rather vaguely difined associations were to be considered here, firstly the R. vestitus association Tx. & Neumann 1950, which is found where the soil is loamy and the soil solution alkaline. Its only typical species is R. vestitus and the association is connected with the trees of the Querceto-Carpinetum. Secondly the Rubus-Eubatus-association (Oberdorfer 1938).

How far the idea that the brambles belong to the "weed" communities is right will not be discussed here. However, it is worth noting that in woods bramble vegetations are, in our experience, able to persist during a period of 30 years and more.

Since original forests, i.e. woods that are completely untouched by man, are at this moment unknown in this region, it seems rather futile to make statements on them, it is doubtless better to keep to facts.

This lines up with some remarks made by FOCKE in 1877, when he stated that there are many differences in behaviour between the various bramble species that occur in woods. Undoubtedly changes will occur in the flora when parts of a wood are cut down or when the trees are thinned out. The bramble flora will then, locally and temporarily, receive light and space to develop more vigorously. But even in old, dark pinewoods we may find brambles that for several decades have been growing and flourishing there. On the other hand brambles may disappear completely from a particular wood, perhaps because of the formation of acid humus or because of the drying up of the soil, but this is not in contradiction with the observation that a particular group of brambles is rather closely connected with definite forest communities. The species belonging to this group may occasionally occur outside the wood, but this happens, as a rule, only in regions with a high percentage of moisture in the air and with moist soils, rich in humus.

Besides, there are many bramble species that prefer sunny and open habitats and develop well there. When they occur in shady stations, such as woods, they are showing distinct symptoms of etiolation.

Therefore, as long as no better founded reports are obtainable on bramble communities and their connection with the surrounding vegetation, we will accept the provisional division into 4 categories mentioned above.

This should only be regarded as an attempt to obtain an idea of special methods of adaptation met with in our native brambles.

FOCKE already has pointed out that each species has its own demands as to its environment. The value of classifications such as that proposed above and that of TÜXEN is therefore of restricted value only for our knowledge of the bramble ecology and the part the brambles are playing in the various bioconoses.

A close study of the edaphic and climatic factors in many stations, where but one species is growing (Fig. 6) may get us a little further, but in order to obtain a better founded insight experiments will have to be made.

Resuming we may say that the brambles of the categories I and II in the Drenthian district are more or less distinctly connected with the vegetation types that are known as the moist oak-birch wood (Querceto-Betuletum-molinietosum) and as the moist varieties of the oak-hornbeam wood (Querceto-Carpinetum).

The species of the *Rubi-Moriferi* that occur outside the woods cannot yet be connected with a special type of vegetation. They often occur in mosaic communities, or in transitions zones between two communities, consequently they give the impression of being rather ubiquistic. They must of course be living within the limits of their natural environment, which must be wider than those of the environment of the species that are bound to the woods. Their distribution may originally be caused by anthropogenic factors.

VII. COMPARISON WITH THE RUBUS FLORA OF OTHER PHYTO-GEO-GRAPHICAL DISTRICTS IN THE NETHERLANDS

As our own experiences are mainly confined to the Drenthian district, it may seem too early to consider already at this moment the bramble flora of the other districts. Still comparisons may already be made, because we possess a report on the brambles of S. Limburg by A. DE WEVER (1915) and another one on those in the surroundings of Nijmegen. The brambles in the latter part of the country have been studied by J. H. KERN and TH. REICHGELT. We will confine ourselves therefore to a comparison between the following three districts of our country: 1° the district of Drente, 2° S. Limburg and 3° Nijmegen and surroundings. The lists below contain:

1° Species that are occurring in S. Limburg as well as in the Drenthian district:

- 1. R. Nessensis W. Hall
- 2. R. fissus Lindl.
- 3. R. sulcatus Vest.
- 4. R. plicatus Wh. et N.
- 5. R. nitidus Wh. et N.
- 6. R. affinis Wh. et N.
- 7. R. senticosus Koehl.
- 8. R. carpinifolius Wh.
- 9. R. gratus Focke
- 10. R. Sprengelii Wh.

- 11. R. pyramidalis Kaltenb.
- 12. R. macrophyllus Wh. et N.
- 13. R. silvaticus Wh. et N.
- 14. R. geniculatus Kaltenb.
- 15. R. vestitus Wh. et N.
- 16. R. Radula Wh.
- 17. R. flexuosus M. et Lef.
- 18. R. rudis Wh.
- 19. R. Bellardii Wh.
- 20. R. caesius L.

2°. Species and subspecies of the district of Drente, which have so far not been recorded from S. Limburg:

- 1. R. ammobius Focke
- 2. R. integribasis P. J. Müll.
- 3. R. sciocharis Sudre, fa.?
- 4. R. chaerophyllus S. et S.
- 5. R. badius Focke
- 6. R. bracteosus Wh., fa?
- 7. R. Arrhenii Lange
- 8. R. chlorothyrsus Focke
- 9. R. leucandrus Focke, fa?
- 10. R. Schlechtendalii Wh.

- 11. R. amphichlous Sudre
- 12. R. egregius Focke
- 13. R. Genevieri Bor.
- 14. R. villicaulis Koehl.
- 15. R. Lindleyanus Lees
- 16. R. Leventii Sudre
- 17. R. mucronifer Sudre
- 18. R. derasifolius Sudre
- 19. R. serpens Wh.

3°. Species and subspecies of S. Limburg, that have so far not been recorded from the district of Drente:

- 1. R. ulmifolius Schott
- 2. R. bifrons Vest.
- 3. R. procerus P. J. Müll.
- 4. R. macrostachys P. J. Müll.
- 5. R. Muelleri Lef.?
- 6. R. micans God.?
- 7. R. glaucellus Sudre?
- 8. R. fuscus Wh.
- 9. R. insericatus M. et Wh.
- 10. R. pallidus Wh.
- 11. R. granulatus M. et L.

- 12. R. adornatus P. J. Müll.
- 13. R. Lejeunei Wh.
- 14. R. rosaceus Wh.
- 15. R. hebecarpus P. J. Müll.
- 16. R. Koehleri Wh.
- 17. R. Schleicheri Wh.?
- 18. R. humifusus Wh.
- 19. R. Kaltenbachii Metsch
- 20. R. rivularis M. et Wh.
- 21. R. incultus Wirtg.
- 22. R. biserratus P. J. Müll.

4°. Species recorded from the surroundings of Nijmegen (KERN and REICHGELT), which have so far not been found in either of the two other districts.

1. R. cardiophyllus L. et M.

- 2. R. polyanthemus Lindg.
- 3. R. macrothyrsus Lange
- 4. R. thyrsanthus Focke
- 5. R. Winteri P. J. Müll.
- 6. R. Muenteri Marss.
- 7. R. hypomalacus Focke
- 8. R. fusco-ater Wh.
- 9. R. anglo-saxonicus

It stands to reason that these lists, after a more minute inspection of the districts will have to be amended.

It is also possible that the names of some species that are still uncompletely known, will have to be corrected. Still, we may already see an important difference in composition, especially when attention is paid to those species of the list (pag. 336) marked with an asterisk. They are the most characteristic species and their identification may be accepted as correct.

VIII. COMPARISON WITH THE RUBI OF THE ADJOINING PARTS OF EUROPE

After having indicated the points of difference among the bramble flora of some districts within our own country, we will now try to give an impression of the points of resemblance and of difference between our local bramble flora and that of the adjoining countries.

The Drenthian district may geologically be considered a western offshoot of the N. W. german pleistocene. It is therefore plausible to compare its brambles first of all with those of N. Germany.

Much attention has been paid to the bramble flora of the N. W. district which excells in a wealth of species.

According to FOCKE (1877) l.c. p. 31, there is a well-marked increase in the number of species when we are going from the extreme N. E. part of the former Germany (now Polen) in a western direction. In the surroundings of Kalingrad (the former Königsberg) the only species are R. nessensis and R. caesius, perhaps also R. fissus and an occasional R. caesius-hybrid. In the vicinity of the eastern border of the beech area they are joined by R. plicatus and R. Bellardii. The last named species, a pentaploid one, is widely distributed in Europe, while R. caesius covers a still larger area, for it is found throughout the whole of Europe with the exception of the mediterranean region and N. Scandinavia (above 58° N.L.) and in S. Siberia as far eastwards as Altai. Along the Baltic coast R. Sprengelii and **R.** pyramidalis (a form) are soon joining in. West of the river Weichsel according to FOCKE R. thyrsanthus, R. villicaulis, R. Silesiacus and R. Radula appear; between Oder and Elbe still more species are added, but in Schleswig-Holstein and W. of the river Elbe the wealth of species really becomes impressive. Towards the South too the number

of species increases, but not towards the North. In Scandinavia the *Rubus* flora becomes poor in species and the *Moriferi* finally disappear altogether. So the further one goes westwards in Germany, the richer in species the bramble flora becomes and the more difficult therefore its study.

Along the northern slopes of the Alps and along the lower terrace of the Upper Rhine the strongest concentration of forms is to be found. The bramble flora of Lower Saxony and Westfalia shows a striking similarity with that of the Drenthian district. Nearly all the main species ("circle species") of our district are occurring there and, moreover, also those species that are rare or absent in other parts of the Netherlands, e.g. R. Arrhenii, R. chlorothyrsus, R. egregius, R. mucronifer and R. badius.

However striking this resemblance may be, we must realize that the same species have at least partly been found also in Denmark, England and Belgium. They may therefore be regarded as North-Atlantic species. The descriptions of the species and subspecies, that have not been recorded for N. W. Germany by Focke, 1914, are to be found in SUDRE (1913) among the "micro species" with a smaller area, e.g. R. emergens, R. amphichlous, R. derasifolius, R. horridicaulis and R. Leventii.

When comparing our species with the Belgian ones, a survey of which has been given by CHARLET, MAGNEL and MARÉCHAL (1928), we find a less far-going agreement. In their list we are missing: *R. ammobius*, *R. opacus*, *R. emergens*, *R. amphichlous*, *R. villicaulis*, *R. Lindleyanus*, *R. derasifolius*, *R. badius* and *R. horridicaulis*. Still a sufficient degree of similarity is present.

Among the Moriferi the total number of "circle species" too is much larger, viz. 86 (after GUSTAFSSON), (Suberecti 7, Silvatici 26, Discolores 8, Appendiculati 45). The most common species are R. nessensis, R. sulcates, R. plicatus, R. Bertrami, R. carpinifolius, R. gratus, R. Sprengelii, R. pyramidalis, R. macrophyllus, R. ulmifolius, R. bifrons, R. geniculatus, R. candicans, R. vestitus, R. fissus, R. flexuosus, R. Loehri, R. drymophilus, R. rudis and R. Bellardii. Remarkable is the absence of R. villicaulis and R. Lindleyanus, as these species occur in England, the latter one even very frequently and as most of our brambles are met with in Gr. Britain.

Of the main species only R. Arrhenii, R. chlorothyrsus and R. egregius seem to be absent and of the micro-species R. emergens, R. amphichlous and R. horridicaulis. All other species are present.

According to ROGERS (1900) the following 15 species are the most frequent ones in Gr. Britain: R. Lindleyanus, R. polyanthemus, R. rhamnifolius, R. vestitus, R. dasyphyllus, R. mucronifer, R. echinatus, R. plicatus, R. Selmeri, R. fissus, R. Sprengelii, R. Radula, R. macrophyllus, R. Nessensis and R. Hystrix. GUSTAFSSON records for Gr. Britain in total 69 circle species (Suberecti 6, Silvatici 25, Discolores 3 and Appendiculati 34).

Scandinavia has a much smaller number of brambles. C. E. Gus-TAFSSON (1938) enumerates in his survey for Norway only 9 Moriferi, viz. R. nessensis, R. fissus, R. plicatus, R. sulcatus, R. Selmeri, R. confinus (= R. insularis f. confinus), R. thyrsanthus, R. Lindebergii and R. Radula. Moreover, there are several Caesii. Of these 9 species of the Moriferi 5 belong to the Suberecti, 3 to the Silvatici and 1 to the Appendiculati.

Sweden possesses 22 species (Suberecti 6, Silvatici 7, Discolores 2 and Appendiculati 7). From Denmark 34 circle species of the Moriferi are known, viz. Suberecti 6, Silvatici 13, Discolores 2 and Appendiculati 13.

This summary gives an idea of the character of our dutch bramble flora in comparison with that of the surrounding countries. The bramble flora of the Drenthian district shows by far the greatest similarity with that of the adjoining part of N.W. Germany, but contains at the same time some typical N. Atlantic elements, e.g. a relatively large number of Suberecti and Silvatici, but only a few Discolores and Glandulosi. The further South one comes, and the more one approaches the Pyrenees, Alps and Carpathes, the larger the number of Discolores and Appendiculati becomes, while the Suberecti are decreasing. The populations occurring there are vastly different, the diploid ancestral species and their nearest and more fertile allies serving as a centre. They are to be regarded as species that in refugia not covered by the mountains' ice-caps have survived the climate of the last glacial period. Since a great part of these mountain slopes have become ice-free, the surviving brambles have gradually immigrated into this new area, and have at the same time produced new forms. According to GAMS (1933) new plant species would originate during the periods that new areas, become inhabitable. During the postglacial period this happened in the southern part of the valleys, but further northward when the latter became flatter and wider, different topographical conditions arose, and here consequently different populations would have developed. The wealth of forms of C. Europe slowly decreases towards the North; the cold-resistent group of the Suberecti and the species R. Bellardii, R. serpens and R. caesius are the only ones that penetrated further northwards and here produced a number of hybrids with R. caesius (Corylifolii).

The northern climate and also the shortness of the ice-free period after the country was opened by the retirement of the Fenno-Scandinavian ice-cap, are probably the cause of the poorness of the bramble flora.

Our own country, the British islands and N. W. Germany owe their rich bramble flora to the milder climate, which is due to the nearness of the North Sea. The production of hybrids that by pseudogamic seed-formation or other kinds of apomixis are able to multiply, and the appearance of mutations will have been the cause of the great richness in forms observed in the W. european *Moriferi*. They give the impression of a strongly evolutive group of plants, and for that reason deserve our full attention.

#### SUMMARY

1°. Our study of the Rubus flora of the N. E. part of the Netherlands (Drenthian district) so far has led to the recognition of 46 Moriferi of which 35 are to be regarded as circle-species and 11 as microspecies. The list on p. 12b includes besides the Moriferi R. saxatilis L. and R. Idaeus L. R. caesius L., the typical dewberry itself, however, has not yet been found. Our 46 Moriferi belong to 4 different subsections: 11 species, viz. 7 circle-species and 4 micro-species to the Suberecti. 20 species, viz. 17 circle-species and 3 micro-species to the Silvatici, 3 species, viz. 1 circle-species and 2 micro-species to the Discolores, 11 species, viz. 9 circle-species and 2 micro-species to the Appendiculati.

 $2^{\circ}$ . The 3 tables give the following data:

I. The presence or absence of our 48 species in the stations, that have been studied by us, the number of species in each station (below) and the number of times that each species has been met with (on the right).

II. The classification of the *Rubus* species into 4 groups: 1° species that are typical for forestremains; 2° species that occur in all kinds of wood; 3° species found along road sides and in fields; 4° species so rarely met with, that their habitat is insufficiently known.

III. Vegetational records of 28 woods in which brambles were observed.

3°. On pp 15-42 the distribution of our 48 species and subspecies in and outside the area is discussed.

4°. The following species, all typical for the remains of former forests, occur also in the adjoining part of N. W. Germany but have not or only rarely been found elsewhere in our country: R. Arrhenii, R. silvaticus, R. egregius, R. mucronifer, R. badius, R. Bellardii and R. serpens. Common in woods are: R. Nessensis, R. affinis, R. gratus, R. Sprengelii, R. pyramidalis and R. flexuosus. Species chiefly found along roads and in fields are: R. fissus, R. plicatus, R. nitidus, R. integribasis, R. ammobius, R. carpinifolius and R. Lindleyanus.

5°. The two first-named groups of species are more or less distinctly associated with the Querceto—Betuletum—molinietosum and the more humid varieties of the Querceto—Carpinetum. The species from road sides and fields are not restricted to clear-cut communities, but occur also in mosaic communities and in transitional zones.

 $6^{\circ}$ . The *Rubus* flora of the Drenthian district has been compared with that of the Southern part of the province of Limburg and that of the environs of Nijmegen, as far as this for the moment was possible.

 $7^{\circ}$ . In conclusion the *Rubus* flora of the Drenthian district has been compared with that of the surrounding countries. It appears to be most closely related to that of N. W. part of Germany, but it contains also several N. Atlantic elements and in this respect it shows an approximation to the belgian, british and scandinavian bramble floras.

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Correction. Wherever the name Rubus apiculatus Wh. is used, read: Rubus spinulifer M. & Lef., a subspecies of R. Koehleri Wh.

	STATIONS: RUBUS SPECIES:	Amer-Bos	Autoren Hegebos near Exloo	Grolloër-Holt Bruntinger Bos	Druntunger Bos Mantinger Bos	Eursinge, gem. Ruinen	Uude Diepje near Hoogeveen Kynholt-Bos	Asser-Bos	Norger-Holt	Tonckens-Bos near Norg	Aalden	Weerdinger Meerbos Roelage-Ros near Ter Anel	Angelsloo	Frederiksoord, Sterbos	Wijster. W.	De Klencke. N. De Klencke S	De Melleke 3. Spaarbankbos n. Hoogeveen	Echten	Hollandse Veld, I	Hollandse Veld, II	Dwingeloo, Oldengaerde	Westerborker-Bos	Hollandse Veld, III Hamveld n Bruntinger	Westervelde	Zweeloo	De Eeze n. Steenwijk	Huis ter Heide n. Norg	Lieveren	Roden, Kymmell-Bos	Foxwolde	Nienoord n. De Leek	Zuidlaren, Laarwoud	Midlaren	Inoordlaarder-Bos Anderse Dienie	Looner Diepje	Roden-Peize	Drijber .	Lheebroek	Ruinen. N.	S. of Ansen Rhebruggen	Doldersum	Havikshorst n. Meppel	Tiendeveen	Zuidwolde	Dickninge n. De Wijk	Eleveld-Bos n. Hoogeveen	Kraloo-Ruinen	Spannen, E. of Wijster	Dalfsen	Den Ham Ootmarsum	Springendal n. Ootmarsum	Geesteren	Tubbergen	vasse Denekamp, N.	Tilligte-Denekamp	Breklenkamp	Heemse	Kheeze	De Grote Schere	Oud-Avereest	Beetsterzwaag, E.	Beetsterzwaag-Olterterp	Heidhuizen	Koningsdiep, S. of Beetsterzwaag Driehoek	Oldeberkoop	Molenbos, Oldeberkoop	Road t. Makkinga	Bekhofschans	
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6 7	R. plicatus Wh. et N	×	- ×		_   _	×	= =	-	- 2	<u>× </u> _		-   -	-   -	_	×	_   _	-   ×	<u> </u>	×	_	_	-	<u>× </u> ?	<u>× </u> -	-   ×	<u> </u>		× –	×	_	_	-	_	- }	<u>   -</u>	: =		<u>×</u>	×	×   ×	<  ×		<u>×</u>	<u>×</u>	_	-	<u>× -</u>	<b>×</b>		<u>× </u>		×	_	× -	:   ×	×	_	- 2	<u>× -</u>	:   :	_	_	_	× ×	×	-	_	-	
8	R. nitidus Wh. et N	×	-   -		-   -	-	-   -	-	-   ·	-   -	-	-   -	-	-	-	-   -	-   -	-	-   -	-	-	-	-   -	-   -	-   -	-   -	-	-	-	-	-	-	-	-   -	-   -	·   -	-	-	-	-   -	-   -	·   -	-	-	-	-   ·	-   -	-	-	-   -	-   ×	-	-	-   -	·   -	-	-	-   -	-   -	-   -	-	_	_	_   _	-	-	-	-	.
9 0	R. integribasis P. J. Mull R. affinis Wh. et N	×	_ _						×   ;	-   -		x	<b>Z</b>   =	$ \bar{\mathbf{x}} $	×	-   - x   >	$\mathbf{x} \mid \mathbf{x}$	$\frac{1}{x}$	x	-	_	x	- ;	-   × ×   ×	×   - ×   -	-   -	×	× –	<u>×</u>	× -	××	×	_	_   ,	<b>;</b>  =	: -	=	x	×	$\mathbf{x}$	-   <del>-</del>	×	$\left  \frac{1}{x} \right $	×	×	x	-   <del>-</del>			-   -	Ī		×	$\frac{-}{x}$	_	-x	$\overline{\mathbf{x}}$		-   - ×   ×	$\frac{1}{x}$	1	_	×	_   _	1	=	_	•	_
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3	R. senticosus Koehl.	_			_   _	-	= =		= [ :	$\hat{-}$	-			_	-		- 2	:  <u>-</u>	12	-	2	2	- :	2 2	2 2	-   -	-	-	-	-	_	-	-	2 -	- -	-	-	2	- 1	2 2	2 2	-	2	2	-	_ :	2 2	x	-	2 -	-   -	-	2		-	-	<b>^</b>	-   -	-   -	-   -	- ×	<b>~</b>	<u>~</u>	<u>~</u>  _	-	_	-		=
+	R. carpinifolius Wh.	X	-   <u>×</u>		-   ×	×	<u>× -</u>	×		-   <u>×</u>	<u>×</u>	=   =			×	_   _	-   -	:   <u>×</u>	× –	_	×	<u>×</u>	<u>× </u> :	-   ×	×   ×	<u>   -</u>	×	X	× _	× -	-	_	×   :	×   >	<   - -   -	×	-	× _	×	×   × ×   -	<u>   ×</u>	-	-	×	_	<u> </u>	<u>× ×</u>	×	-				-	-   ×	: -	×	×	<u>× </u> -	-   -	-   -	-	×	×	<u>× -</u>	12	-	_		_
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3	R. sciocharis Sudre (fa.?) R. chaerophyllus S. et S		= =	- · x ·			<u> </u>			= =		=   =	:   :		_	-   -		: =	_	-	-	_	-   :	-   -	-   -	-   -	_		-	17		_	_	_ _	-   -	-	=	-		-   -	] ]	=	_	×	_	= :	-   -	-			=	_	_		:   -		_	_   -	-   -	-   -		-	-	-   -	=	-	_		_
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1	R. Arrhenn J. Lange R. Sprengelii Wh	1 X	-   <del>-</del>	x	$\hat{\mathbf{x}}$		$\overline{\mathbf{x}}   \overline{\mathbf{x}}$	×	-	$\frac{1}{x}$		$\frac{1}{2}$	-   -	×	×	-   >	$\mathbf{x} \mid \mathbf{x}$	k   x	×	×	x	x	×   -	-   x	<   ^	-   ×	Îx.	-	x	×	x	×	×	- -	-   -	2	-	x	=	-   -	-   <del>-</del>	×	×	-	×	×	-   -	×	-	-   -		_	-	= =	×	×	_	_   -	-   -	:	×	×	×	=   <del>-</del>		x	×		×
	R. chlorothyrsus Focke		- -		_   _		=   =			=   =		_   _	-   -		-	-   -		: _	-		-	_	_   -	_ _	-   -	-   -		- -	-		-	-		_   -	-   -	=	-	_	_	_   _	-   -		-	_	_	=   :	-   -	-	_	2 2		<u>  -</u>	_	=   =	-	-	×		-   -	-	-	-	-	_   -	-	-	-		_
4	R. pyramidalis Kaltenb.	×	-   ×	× >	x x	-	×   -	-	-   >	×   -	×	×   -	-   -	-	×	×   ×	×   -	×	-	-	-	-	-   -	-   ×	<   -	-   ×	×	-	×	×	-	-	x :	×	-   -	-	-	-		-   -	-   -	×	-	-	-		-   -	-	-	××	( <sup>-</sup>	-	-	-   ×	:   ×	×	×	x   >	×   ×	<   -	-	×	×	-   -	×	x	×		-
5 6	R. macrophyllus Wh. et N R. leucandrus Focke						-   -			-   -		-   -	=   =		×	- -	-   -	:  _	1	-	_	2	-   -	-   -	-   -	=   =	_	-	_	_	_	_	_	_   -	[] [	=	-	-		-   -	[]]	_	-	×	-	=   ?	<u> </u>	-	-	<u>~ </u> _	= =	<u>×</u>	- X	-   -	:   -	-		-   >	×   - -   -	-   <del>-</del>		_	-	=   =	_	-	_		
8	R. silvaticus Wh. et N	×	×   ×	× >	×  ×	-	-   -	×	-   >	×   -	×	××	< X	-	-   3	×   -	-   -	·   ×	-	-	×	×	-   -	-   ×	<   ×	<   -	-	-	×	-	×	-	×	-   >	<   -	-	×	×	-   ·	-   ×	<   ×	-	-	-	-	-   -	-   -	-	-	-   -	-   -	×	×	× -	·	×	-	-   -	-   -	-   ×	-	-	×	-   -	-	-	- '	1	-
29 30	R. amphichlous Sudre		-   -				- -	-		-   -				-		-   -	-   -		-	-	-	-	-   -	- -	-   -	-   -	_	-	×	_	_	_	_	- -		-	-	_	-	-   -	-   -	_	-	2	_	= :	-   -	-		-   -	=   =	-	_		-	-	_		-   -		-	×	_	-   ×	-		_		-
31 32	R. egregius Focke	×	_ _	× >	×   ×		-   ×	×	×	×   ×		= =			_ ] :	-   -	-   ×	:   ×	×	×	<u>×</u>	_	-   -	-   ×	<u> </u>	-   <u>×</u>	×	× _	-	× .	·-	_	×	-   -	:   -	-	×	× _		=   ×	<u> </u>	×	×	_	<u>×</u>		-   -	-		=   =	: -		_	_   _	-		_	-   -	-   -	:   -	-	×	×	_   _	-	×	×		-
33	R. Lindleyanus Lees	-	-   -		-   -	-	×   -	-		-   -	-		-   -	-	× ·	-   -	-   -	·	-	-	-		-   -	-   -	-   -	-   ×	-	-	-	×	-		×	-   -	-   x	×	-	-	-   -	-   -	-   ×	×	-	-	-	-   -	-   ×	-	-	-   ×	×	-	x	×   -	×	×	×	x >	×│-	-   -	-	_	2	×   -	-	-	-		-
34 36	R. Leventii Sudre	×	×   -			×	=   =				<u>×</u>	×   -		[ _ ]	_   .	_   _	-   -	_		-	_		-   -	-   -	-   -	-   <del>*</del>	-			_	_	_	_	- -	-   -	_	-	_		_   _	-   -	- ×	_	_	_					×   - ×   -			_	= =		=	×		-   -	-   ×		_	-		-		<u>×</u>		×
7 9	R. vestitus Wh. et N	<b> </b> -	_   _	_ ;		-	-   -	-	- -	-   -	1-1	-   -	: -	-	×	_ _	-   -	_	-	-	-	-	= :	-   -	-   -	:   -		_	-	_	_	-	-	_   -	-   -	-	=	_	-1:	_   -	-	_	_	-	-	-   -	-   -	-		-   ×	-	-	-	<u>×</u>  -	-	×	×	×   -	-   -	-   -	-	-	-	-   -	-	-	-		-
39	R. Radula Wh.	-	- -	- '	-   -	-	2 =		_   -	-   -	-		-   -	-	_ .	-   -	- -	-   -	-	-	-	-	- -	-   -	-   -	-   -	-	-	_	_	-	-	_	-   -	-   -	-	-	-	-	- -	-   -	-	-	_	-	- :	-   -	-	×	- -	-   -	-	-	- -	-   -		-	_   -	-   -	-   -	-	-	-	- -	_	_	-		-
41 42	R. apiculatus Wh.? R. flexuosus M. et L.		<u> -</u>	$\left \frac{1}{x}\right $	-   - x   x	- x	-   - x   x		-   ·	-   -		-   -		$\left  \frac{1}{x} \right $	$\frac{1}{x}$	- - x x			$\left  \frac{1}{x} \right $			-	- ; x ;	-   -	-   <del>-</del>			 x		_	_	$\overline{\mathbf{x}}$	_	-   -	-   -	_	_			_ _	:  :			_	-	-   ·	-   -		_	= =			_	_ _	_	×	×	<u> </u>	-   -		-		-	_   _	-	- 	÷1		-
43	R. rudis Wh. et N.	-	- 2	22	- -	-	-1-	-		-   -	-	-   -	-   -	-	-   -	- -	-  x	-	-	-	-	-   -	- -	- -	-   -	-   -		-	-	-	-	-	-	-   -	-   -	-	-	-	- -	-   -	-   -	-	-	-	2	2	-   -	-	-	-   -	- -	-	-	-   -	·   -	-	-	- -	- -	- -	2	-		_		2	2		2
44 ' 45	R. derasifolius Sudre	×	- -	_   _	- -		_   _			-   -		-   -	_	=	-   ?	× -	= =	_	=		_	-	-   -	= =	-   -	-   -	-	_	_	_		_	_	-   -	-   -	_				-   -	[] [		_	_	_	_ :	= =			-   -	: =	=	_	= =	: -			2 :	= =	: :		_		-   -	-		_		
46	R. Bellardii Wh	X	× -	× >	×   ×	-	-   -	×	×   -	-   ×	-	- -	-   -	-	-   ·	-   ×	<u> </u>	١. ٣	-		-	-	- >	×   -	-   -	-   -		-	-	-	-	-	-	- -	_	_	-	-	_ ·	_ -	-   -	-	×	-	×	- -	-   -	-	-	-   -	-   -	-	-	-   -	·   -	-	-	-   -	-   ×	( -	-	×	-	-   -	-	×	-		-
<del>1</del> /				<u>^</u>			-   -					<u>^ </u> -					<u> </u>	<u> </u>									[					_							- `	_   -		<u> </u>			_			·   -			<u> </u>	-								-   -			_	_   -		_	_		
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 TABLE I

 Survey of the distribution of 43 Rubus species in 84 stations in the Drenthian District

TABLE II Classification of the Moriferi from 84 stations in the Drenthian District into 4 categories. (The numbers in the columns correspond with those of the list of species and with those of table I)

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	CATEGORIES:	T	TT	III	
		5	Species 3 10 16 21	Species: 4 6 8 9 12	IV
		Species: 19, 20, 20, 31,	Species: 5, 10, 10, 21,	14 99	Remaining species
	STATIONS:	38, 46, 47	24, 42	14, 33	
	<del>`</del>				
. 1	Amer-Bos	19, 20, 28, 31, 38, 46, 47	3, 16, 21, 24, 42	6, 8, 9, 14	11, 15, 34, 45
2	Anderen	28, 46	16 .	_	34
3	Hegebos	19, 28, 47	3, 16, 21, 24, 42	6, 14	·
4	Grolloër-Holt	19, 28, 31, 46, 47	3, 21, 24, 42		30 /
5	Bruntinger Bos	19, 20, 28, 31, 38, 46	3, 16, 21, 24, 42	4	. —-
6	Mantinger Bos	19, 20, 28, 31, 38, 46	3, 21, 24, 42	4, 14	
7	Eursinge	19	16, 42	6, 12, 14	
8	Stuifzand	19, 38	3, 16, 21, 24, 42	4, 14, 33	
9	Kynholt	19, 31	3, 21, 42	14	
10	Asser-Bos.	19, 28, 31, 40	3, 21, 42		
11	Norger-Holt	20, 31, 40	3 91 49	14	_
12	Tomokona Pos	20 31 46	3 21 42	14	: · <u> </u>
13	Aaldan	20, 51, 10	3, 16, 24, 42	12. 14	34
. 15	Weerdinger Bos	28, 47	3, 10, 16, 21, 24, 42	· ·	34
16	Roelage Bos	19, 20, 28	3, 10, 16, 42	4	
17	Angelsloo	28	3, 42	· · · · · · · · · · · · · · · · · · ·	l —
18	Frederiksoord.	19, 31	10, 16, 21, 42	4	
19	Wijster	19	10, 16, 21, 24, 42	4, 6, 12, 14, 33	26, 37
20	De Klencke, N	28	3, 10, 16, 24, 42		44
21	De Klencke, S	19, 31, 46	3, 10, 16, 21, 24, 42		
22	Spaarbank-Bos	19, 31, 46	10, 10, 21, 42	4, 0, 12	34
23	Huize Echten	19, 28, 31, 46, 47	3, 10, 10, 21, 24, 42 10, 16, 91, 49	4 6 19 14	11
24	Hollandse Veld, 1	19	10, 10, 21, <del>1</del> 2	, , , , 12, 1T	l ii
25	Oldongo and	10 28	16 21	12. 14	· · ·
20	Westerborker Ros	19, 20, 28	3, 10, 16, 21	4, 12, 14	11
27	Hollandse Veld III		3, 16, 21, 42	4, 6, 14	- · ·
29	Hamveld	38, 46	10, 16, 42	6, 12	_
30	Westervelde	19, 28	3, 10, 16, 21, 24	9, 12, 14	—
31		20, 28	3, 16, 42	6, 12, 14	-
32	De Eeze	19, 31	3, 16, 21, 24, 42	4, 0, 33	
33	Huis ter Heide	19, 20, 31, 46	3, 10, 10, 21, 24, 42	4 6 9 12 14	23
34	Lieveren	20, 31	3 16 21 24 42	6 9 12 14	30
30	Forwolde	31	16. 21. 24	9, 12, 14	34
37	De Leek	19. 28	10, 16, 21	9	— ·
38	Zuidlaren		10, 16, 21, 42		-
39	Midlaren	28, 31	16, 21, 24	4, 14, 33	
40	Noordlaren.		3, 10, 24		
41	Anderse Diepje	28	16	12 33	34
42	Roden-Peize	20 —	16	14, 33	
44	Drijber	19. 28. 31	3	4	_
45	Lheebroek	19, 28, 31	10, 16, 21	4, 6, 12, 14	45
46	Ruinen, N	19	10, 16	4, 6, 12, 14	
47	Anser Plas		3, 10, 16	4, 6, 12, 14	
· 48	Rhebruggen	19, 28, 31	3, 10	4, 6, 12, 14	1, 15
49	Doldersum	28, 31	3, 10, 10, 21	0, 12, 14, 33	
50	Haviksnorst	19, 31	10 16 21 42	6 12	J
52	Zuidwolde	19	10, 16, 11, 12	6, 12, 14	11, 18, 26, 29
53	Dickninge	19. 31. 46	3, 10, 16, 21, 42	4	
54	Bos v. Eleveld	19	10, 16, 21, 42	• 14	· · ·
55	Westerholt	19, 20	3, 42	6, 12, 14	25
56	Kraloo	19	3, 10, 16, 21	12, 14, 33	
57	Spannen.	-	16, 21	0, 12, 14	13
58	Dalisen, N		3, 10 10 16 94	6 12	25 33 36
59			24	6, 33	37
61	Springendaal	· · ·	3, 10, 16, 42	6, 8, 12, 33	I — '
62	Geesteren	· ·	3, 16, 42	4, 6, 12, 14	25
63	Tubbergen	— —	3, 10, 16	12, 33	25
64	Vasse	28	10. 16	6, 33	37
65	Denekamp, N		10, 24	12, 14	
66	Illigte-Denekamp		10, 21, 24	<b>4</b> , 0, 12, 33 6 12 14 22	<sub>37</sub> —
67	brekienkamp	10	3 10 16 94	4 6 14 22	22 34 37 41
60 60	Rheeze	<sup>13</sup>	16. 24. 42	14, 33	37, 41
70	Holthone		3, 10, 16, 24, 42	6, 12, 33	25, 37
71	De Grote Schere	19, 28, 46	10, 16, 24, 42		· -
72	Oud-Avereest.		3, 10, 16	12	26, 34
73	Beetsterzwaag, O	19	3, 16, 21, 42		
74	Beetsterzwaag-Oltert	31, 46	16, 21, 24	12, 14	30
75	Heidhuizen	28, 31	10, 16, 21, 24	0, 12, 14 6 10 14 99	32
76	Koningsdiep	·	10	0, 12, 14, 33	29
77	De Driehoek	10	3 16 99	6	
70 70	Oldeberkoon II	19 31 46	3, 16, 21, 24, 42	Ă ·	_
80	Oldeberkoop-Makkinga	19.31	3. 21. 24. 42		34
81	Bekhofschans	19	21, 42	· _ ·	34
82	Linde-vallei	19	3, 16, 21	6	-
83	Bos a. Linde	19, 28, 38	3, 21, 24, 42	4, 6, 12, 14	L
84	Road to Hemrik	19, 28, 31	3,42	ı —	ı —
				-	3

 TABLE III

 Vegetation records of 28 Rubus stations in the Drenthian District

 (An asterisk means that the species is present, but that its frequency has not been determined)

	(1)		CHISK	mean	5 tha		speer	0.5 10	preser	,			negu		11045 11				neu)				0					
STATIONS: PLANT SPECIES:	- Amer-Bos en omgeving	Anderen (bosrest)	u Hegebos bij Exloo	Grolloër-Holt (Ozijde)	Crolloër-Holt (Wzijde)	o Bruntinger-Bos	ص Mantinger-Bos	L Eursinge, gem. Ruinen	<ul> <li>Oude Diepje (Stuifzand)</li> </ul>	6 Kynholt	5 Asser-Bos	Norger-Holt (Zzijde)	Norger-Holt (Nzijde)	Tonckens Bos bij Norg	Aalden (bosrest)	G Weerdinger Meerbos	Boelage Bos bij Ter Apel	C Oeverse Bosje bij Angelsloo	Sterbos bij Frederiksoord	G Dennenbos t. W. v. Wijster	De Kleucke (Nzijde)	De Kleucke (Zzijde)	25 Huize Echten	Holl. Veld (Kerkkavel)	5 Holl. Veld (Rechtuit)	2 Westerbork (Gem. Bos)	86 Holl. Veld (ten Z.)	E Dickinge bij de Wijk
I. Trees:         Pseudotsuga taxifolia Britt.         Picea Abies Karsten         Larix leptolepis Murray         Pinus silvestris L.         Betula pubescens Ehrh.         Alnus glutinosa Gaertn.         Carpinus Betulus L.         Fagus silvatica L.         Q. borealis f. maxima (Marsk.) Ashe         Populus tremula L.         Populus hybr. cult.         Ulmus carpinifolia Gled.         Sorbus Aucuparia L.         Malus hybr. cult.         Ilex Aquifolium L.         Fraxinus excelsior L.	- - - 3.2 +.1 +.1 +.1 +.1 - 2.2 - 1.2 -							- - - 4.2 - - - 1.2 - 1.2	- - - 3.1 - 1.1 1.3 - 1.2 - - - -	- - 1.1 - 1.2 4.1 - - 1.1 - - 1.1 - - 4.3 -	-+.1   * 4.1   2.1  3.3 -	- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -	- 2.1 1.1 4.1 2.2 - - 1.2 - 1.2 - 1.2 - 1.2 - - - - - - - - - - - - - - - - - - -		- - - 2.1 4.1 - - 3.2 - 4.3 -	  +.1  5.1 +.2  4.2 * *	- - - 3.1 - - - 2.2 - 1.1 4.2 -	4.1 	- - - - - +.1 +.2 - - - +.1 +.2 - - - - - - - - - - - - - - - - - - -	- - - - 1.1 4.1 - - - 2.2 - - - - - -	- +.1 - - +.1 5.1 - - - 2.2 - +.1 -	- 1.1 - * 1.1 4.1 * - +.1 1.2 - * +.2 -	- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -	$\begin{array}{c} - \\ - \\ 2.1 \\ 1.1 \\ - \\ 1.1 \\ 3.1 \\ 1.1 \\ - \\ + .1 \\ + .2 \\ - \end{array}$	- - 3.1 2.2 - - 2.1 - - - 2.2 - - - - - - - - - - - - - - -	
II. Shrubs:         Juniperus communis L	$\begin{array}{c} - \\ 4.2 \\ 1.2 \\ 1.2 \\ +.2 \\ 1.2 \\ 1.2 \\ +.3 \\ - \\ 1.3 \\ - \\ + \\ 1.3 \\ - \\ + \\ 1.3 \\ - \\ - \\ 1.2 \\ 2.3 \\ 1.2 \\ - \\ - \\ 1.2 \\ - \\ 1.2 \\ - \\ 2.2 \\ 2.3 \\ - \\ - \\ - \\ 1.2 \\ - \\ 2.2 \\ 2.3 \\ - \\ - \\ - \\ 2.2 \\ - \\ 2.2 \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\ 2.2 \\ - \\ - \\ 2.2 \\ - \\$	$ \begin{array}{c} - 4.2 \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ -$	$ \begin{array}{c} -1.1\\ -\\ -1.2\\ 1.3\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\$	-4.2 		$ \begin{array}{c} -3.2\\ -\\ 1.2\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\$		$\begin{array}{c} -2.2\\ 1.2\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\$	$ \begin{array}{c} - \\ 1.3 \\ - \\ 1.2 \\ * \\ 1.2 \\ * \\ 1.2 \\ - \\ - \\ 2.2 \\ * \\ - \\ - \\ 2.3 \\ - \\ - \\ 1.2 \\ - \\ - \\ - \\ - \\ 1.2 \\ - \\ - \\ - \\ - \\ 1.2 \\ - \\ - \\ - \\ - \\ 1.2 \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ -$	-1.2 -1.2 -1.3 -1.3 -1.3 -1.2	-1.2 -1.2 1.2 1.3 -1.2 1.3 -1.2 3.4 +1.3 -1.2 3.4 +1.2 -1.2 3.4 +1.2 -1		$ \begin{array}{c}     - \\     - $	$ \begin{array}{c} - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\$		- 		- - - - - - - - - - - - - - - - - - -		+.2   	$ \begin{array}{c} - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\$	$ \begin{array}{c} - +.2 \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ -$	-2.2 -1.2 2.2 +.2 +.2 +.2 +.2 +.2 +.2 +.2 +.2 +.2 +.2 +.2  +.2 +.2  +.2  +.2  +.2  +.2  +.2  +.2  +.2  +.2  +.2  +.2  +.2  +.2  +.2  +.2  +.2   +.2   +.2     +.2   	- - - - + 2 + 2 - + 2 - - + 2 - - - + 2 - - - - - - - -	$ \begin{array}{c} - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\$	$\begin{array}{c} - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - $	$\begin{array}{c} - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - $	-+.2 
III. Dicotyledonous herbs         Humulus Lupulus L		2.3						+.2 2.4 - 1.2	1.2 3.3 •					-	 + 		·		- - +.3 -	- - +.1	_  +.3   _ _		1.2 +.2 - -		- - +.2 -			

TABLE III. Continued

STATIONS: PLANT SPECIES:	Amer-Bos en omgeving	a Anderen (bosrest)	<ul> <li>Hegebos bij Exloo</li> </ul>	Grolloër-Holt (Ozijde)	Grolloër-Holt (Wzijde)	Bruntinger-Bos	Mantinger-Bos	<sup>4</sup> Eursinge, gem. Ruinen	<ul> <li>Oude Diepje (Stuifzand)</li> </ul>	e Kynholt	Asser-Bos	Norger-Holt (Zzijde)	Norger-Holt (Nzijde)	Tonckens Bos bij Norg	Aalden (bosrest)	Weerdinger Meerbos	Roelage Bos bij Ter Apel	Ceverse Bosje bij Angelsloo	E Sterbos bij Frederiksoord	Dennenbos t. W. v. Wijster	De Kleucke (Nzijde)	De Kleucke (Zzijde)	8 Huize Echten	Holl. Veld (Kerkkavel)	Holl. Veld (Rechtuit)	Westerbork (Gem. Bos)	Holl. Veld (ten Z.)	Dickninge bij de Wijk
Rumex Hydrolapathum Huds							- - 4.4 - +.2 - - - - - - - - - - - - - - - - - - -	$\begin{array}{c} - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - $	1.1 - - - - - - - - - - - - -	$ \begin{array}{c} - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\$	- - - - - - - - - - - - - - - - - - -	- 1.2 2.4 3.4 - 1.3 - 1.2 - 1.2 - 1.3 - - - - - - - - - - - - -		I.2 I.2 I.1 I.2 I.2 I.2 I.2 I.2 I.2 I.2 I.2	11111111 + 1 + 1 + 1 + 1 + 1 + 1 + 1 +	$ \begin{array}{c} - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\$				- +.1 - - - 1.2 - - - - - - - - - - - - - - - - - - -		$\begin{array}{c} - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - $			3.2			$\begin{array}{c} - \\ +.2\\ 2.3\\ - \\ - \\ - \\ - \\ +.2\\ - \\ +.2\\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ -$
IV. Monocotyledonous herbs:         Maianthemum bifolium F. W. Schmidt         Polygonatum multiflorum Alb.         Convallaria majalis L.         Iris Pseudacorus L.         Iris Pseudacorus L.         Carex Pseudocyperus L.         Carex Pseudocyperus L.         Carex remota Grfb.         Festuca ovina L.         Poa pratensis L.         Poa pratensis L.         Holcus lanatus L.         Holcus mollis L.         Deschampsia caespitosa P.B.         Deschampsia flexuosa Trin.         Calamagrostis epigeios Roth.         Milium effusum L.         Anthoxanthum odoratum L.         Phalaris arundinacea L.			1.3 - - - - - - - - - - - - -	3.3 +.2 - - - - 4.4 - - - - - - - - - - - - - -		- - - - - - - - - - - - - - - - - - -	1.2 - 1.2 - +.3 - +.3 - - - -	- - - - - - - - - - - - - - - - - - -	* - +.2 - - 1.3 2.3 - 1.3 - 1.3 - - 1.3	3.4 1.2 • - 2.3 - 1.3 - - 2.3 - - 2.3 - - - 2.3 - - - - - - - - - - - - - - - - - - -	1.4 1.2 - - +.3 - - +.3 - - - - - - - - - - - - - - - - - - -	1.3 1.2 2.3 - - - - - - - - - - - - - - - - - - -	2.4 1.2 1.4 - +.3 - -	1.3 		2.3 - +.3 - +.3 - 1.3 - 1.3 - - - - - - - - - - - - - - - - - - -	1.3 +.2 3.4 - - +.1 +.1 +.3 - 1.3 - -	1.3 1.2 - 1.3 - +.3 - 1.2 - 1.3 - 1.2 - 1.3 - - - - - - - - - - - - -	• + - 3 +		* 	1.3 +.2 +.3 - - - 1.3 - - - - - - - - - - - - - - - - - - -	2.3 +.2 +.3 - - - - - - - - - - - - - - - - - - -	- - - - 3.3 - +.2 - - 4.3 - - - - -				* 1.3 * - - 1.3 - - 2.3 - -
V. Pteridophytes: Equisetum palustre L	- - - * *		- - - +.1 -	- - - 2.3 -	+ + + + + + + + + + + + + + + + + + + +	- - 3.3 -	- - - 1.2 -		+.2 - - - - -	- - - 1.2 1.2	- +.1 - - - -	 - - 2.3 -	- - +.1 2.3 -	- - * 1.2 -		- - +.3 -	<b> </b>	  3.3 	- - 2.2 -	- - +.2 2.2 - -		- +.2 - 1.2 •	- 1.2 * - 1.2 - -	- - 2.2 - -	- - +.1 -	- - 1.1 1.3	- - 1.2 - -	- - - +.3