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VEGETATION PROCESSES AS SUBJECT
OF GEOBOTANICAL MAP
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VEGETATION SERIES: ITS USE FOR SMALL SCALE GEOBOTANICAL MAPPING

Summary: Some considerations about the concept of vegetation series and its relations to those of sigmetum and potential natural vegetation are made. Its use for geobotanical mapping and the experience in the Iberian Peninsula is also explained and a concrete example of one vegetation series is used to illustrate the possibilities of dividing it into smaller units.

Key words: Vegetation series; Sigmeta; Geobotanical mapping.

In some of the countries where classic phytosociology in the sense of BRAUN-BLANQUET has traditionally been well développed, the concept of sigmetum (also called sinassociation or vegetation series) has become general as a geobotanical tool to interprete the vegetal landscape, developing the original concept of Gesellschaftsring (KRAUSE 1952, SCHWICKERATH 1954) in which a complex of communities were relatated by dinamic links which led, in succession, to a concrete potential natural vegetation (DEIL 1990, GÉHU 1986, RIVAS-MARTINEZ 1976, 1982a, 1987, R. TÜXEN 1973, 1977, 1979). This dynamic component in the concept of sigmetum led to the use of the name "vegetation series" for the same thing in order to make it easier a wider publicum to understand.

One of the most inmediate consequence of the stablishment of these ideas was the use of the sigmeta or vegetation series for geobotanical mapping. The units of the maps made according to this criterion should represent the different vegetation series of a given area: a different colour for each sigmetum. The maps which "a priori" could be done should be very similar to those of potential natural vegetation (R. TÜXEN 1956, KALKHOVEN & VAN DER WERF 1988) or even to those ellaborated using synthetical criteria which established complex cartographical units constituted by groups of plant communities which had some kind of ecological, structural or successional affinity among them. The natural potential vegetation maps made on a phytosociological basis reach a high degree of similitude with those of vegetation series, because in both cases identical philosophy underlies them.

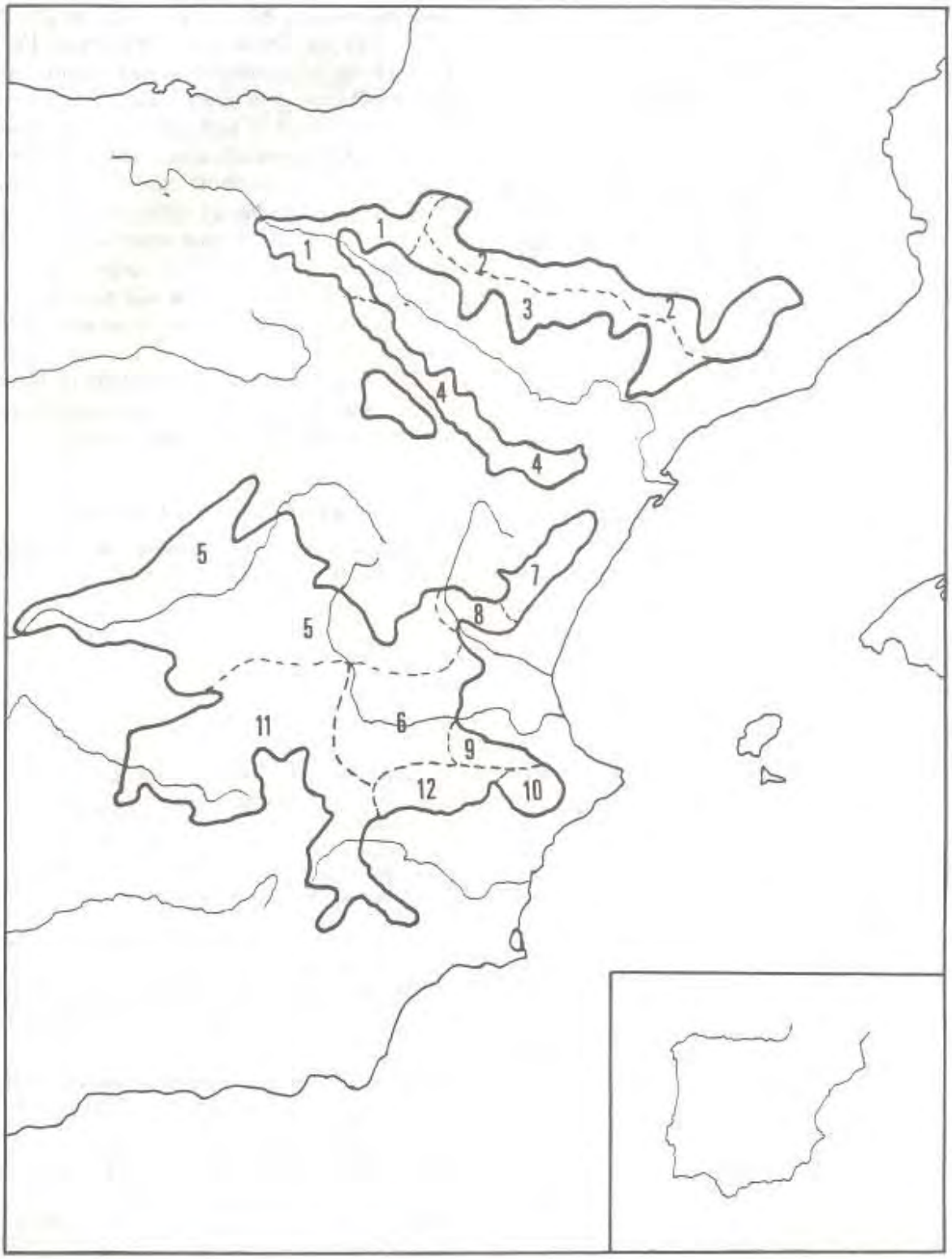
The basic problem, in order to define and to map a vegetation series, or sigmetum, is to recognise the ecologically homogeneous area (R. TÜXEN 1973, 1977) which occupies it. This area has been termed "Fliese" in German and "physiotope" in French (DEIL 1990). In Spanish geobotanical literature it has been called "tesela"; from Latin tessella: a cubic piece of stone or marble used for mosaic works (BOLOS 1963, RIVAS-MARTINEZ 1976). In the experience carried out until today, which consists basically of the maps of RIVAS-MARTINEZ (1982, 1987), one vegetation series usually occupies a single tesella although sometimes it also occupies nearby pluritessellar spaces formed by different proximate tesella. So, in the last case, this pluritessellar space contains a certain ecological variability. Nevertheless the frontiers which separate one vegetation series from another one nearby, have been drawn following the main ecotone that have been detected. They are caused by changes in some ecological factors of importance for the vegetation: changes in the soil and bedrock composition (e.g. base-rich of base-poor), in the soil hydromorphy, in the regime and amount of rainfall, in the bioclimatic stage (OZENDA 1975, QUEZEL 1979, RIVAS-MARTINEZ 1981, 1982b) or big phytogeographical differences which provoke changes in the floristic composition of the vegetation series mature stages (i.e. forests or woodlands

SCRUB ASSOCIATION	MANTLE	FOREST
1. **Salvio lavandulifoliae-Ononidetum fruticosae** Fernández-González, Loidi & Molina 1986 2. **Teucro aragonensis-Thymetum fontquerii** O. Bolòs (1961)1967 corr. 1976 3. **Rosmarino officinalis-Linetum suffruticosi** Br.-Bl. & O. Bolòs 1957 4. **Sideritido spinulosae-Lavanduletum latifoliae** Loidi, Fernández-González & Molina 1990 5. **Lino differentis-Salvietum lavandulifoliae** Rivas Goday & Rivas-Martínez 1969 6. **Salvio lavandulifoliae-Genistetum mugronensis** Costa, Peris, Izco & Molina in Costa & Peris 1985 7. **Genisto hispanicae-Erinaceetum anthyllidis** Rivas Goday & Borja 1961 8. **Sideritido linearifoliae-Teucrietum expansi** Rivas Goday & Borja 1961 9. **Helianthemo cinerei-Thymetum piperellae** Rivas Goday 1958 corr. Costa & Peris 1985 10. **Teucrio homotrichi-Ulicetum dianii** Alcaraz & de la Torre 1988 11. **Paronichio aretioidis-Astragaletum tumidi** Rivas Goday & Rivas-Martínez 1969 12. **Thymo funkii-Anthyllidetum onobrychioidis** Rivas Goday & Rivas-Martínez 1969 --- 13. **Cisto clusii-Rosmarinetum** Rivas-Martínez & Izco in Izco 1969 14. **Genisto scorpii-Ononidetum fruticosae** Izco 1979 --- 15. **Helianthemo thibaudii-Gypsophiletum hispanicae** Rivas Goday 1957 corr. Loidi, Fernández-González & Molina 1990 16. **Gypsophilo struthii-Centaureetum hyssopifoliae** (Bellot 1952) Rivas Goday 1956 17. **Herniario fruticosae-Teucrietum pumili** Rivas-Martínez & Costa 1970 18. **Herniario fruticosae-Teucrietum floccosi** Rivas-Martínez & Costa 1970 19. **Jurineo-Centaureetum hyssopifoliae** Rivas Goday 1956 20. **Gypsophilo struthii-Ononidetum edentulae** Costa, Peris & Figuerola in Costa & Peris 1985	**RHAMNO LYCIOIDIS-QUERCETUM COCCIFERAE** Br.-Bl. & O. Bolòs 1957	**QUERCETUM ROTUNDIFOLIAE** Br.-Bl. & O. Bolòs 1957

in most of the cases). In many cases, due to the particular geographical circumstances of the Iberian Peninsula, the historical factor also has been considered because there are many vegetational relics. All these criteria have always been supported by a phytosociological study which has ensured sufficient floristical homogeneity in the mature stage of the vegetation series so as to maintain it as one association over its whole extent.

The geographical amplitude which some of the series can reach can be so vast, that whithin its territory several phytogeographical influences can be detected. The degree of homogeneity of the area occupied by each vegetation series is determinated, as I said before, by the existence of one type of potential natural vegetation which can be grouped into one association. This, at least in the Iberian Peninsula, corresponds, in most of the cases, to a type of forest or woodland which usually belongs to the classes *Querco-Fagetea, Quercetea ilicis, Pino-Juniperetea, Nerio-Tamaricetea* or to *Elyno-Seslerietea* or *Juncetea trifidi* in the cases of high mountains (alpine and crioromediterranean stages).

Occasionally, the territory of these forest associations which play the role of mature stage of a vegetation series, occupies a lot of ground and so, as I said above, areas with different climate and flora are comprised in this territory. In the Mediterranean Region of the Iberian Peninsula, this effect is very marked and it influences specially the floristical composition of some substitution communities, specially scrubs. These, in spite of representing a degradated vegetation, contain a high proportion of the endemic taxa of the iberian flora; it is a vegetation type which has a strong phytogeo-



Numbers show the geographical distribution of the first 12 associations represented in the diagram within the area of *Querceto rotundifoliae-Sigmetum* in the Iberian Peninsula.

graphical meaning. The unavoidable result has been the description of many regional associations, mostly belonging to classes like *Ononido-Rosmarinetea, Cisto-Lavanduletea* or *Calluno-Ulicetea*, strongly characterized by its many times endemic-rich peculiar flora.This situation, usually supported by sufficient floristic arguments, has reached after an intensive development of reasarching activity in the seventies and eighties.

As a result of all this, the vegetation series maps are virtually obliged to express, in some way, this important manifestation of vegetal biodiversity which has to do with phytogeography. So there has been introducted a phytogeographically differentiation criterion which permits to separate a vegetation series into several subseries or faciations, if this division is susceptible or convenient to. This criterion coexistes with the normal criterion which

characterizes ecological subseries (nearby but different tessella within the same vegetation series).

One of the best examples of this is found in the mesomediterranean base-rich soils and dry ombroclimate castilianaragonese holm-oak series (*Querceto rotundifoliae-S.*). This vegetation series occupies a great extent of the central eastern part of the Iberian Peninsula and so it is capable of breaking easily, using phytosociological arguments, in several faciations of different phytogeographical meaning. The diagram shows the example in which the degradation of *Quercetum rotundifoliae* can lead to no less than 20 different possibilities of scrub vegetation types, depending, in 12 of them, on the territory in which that degradation takes place.

The other 8 associations are linked to special ecological conditions such gypsum-rich substrata (nrs. 15 to 20) and for that case we could separate ecologically defined faciations. These scrub associations, which belong to the class *Ononido-Rosmarinetea*, have a very rich specific flora with a high proportion of endemic plants. For this reason it has been considered desirable to consider the possibility to express this circumstance in faciations at least in some of the cases, specially when the forest mantle community (in this case always a kermes-oak shrub named *Rhamno lycioidis-Quercetum cocciferae*) shows some variability, more or less parallel to that observed in the scrub communities. Of course that, depending on the scale we want to work in, it will be more or less suitable to divide the vegetation series in more or less faciations.

The map shows the distribution of these 12 scrub associations which approximately share the territory of the *Querceto rotundifoliae-S.*

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REFERENCES

BOLOS O., 1963. Botánica y Geografía.— Mem. R. Acad. Ci. Artes Barcelona 34: 443-480.

DEIL U., 1990. Approches géobotaniques pour l'analyse des structures végétales anthropiques à travers des exemples marocains. In Le Maroc: espace et société (A. Bencherifa & H. Popp, eds.,).— Passauer Mittelmeerstudien 1. Passau.

GÉHU J.M., 1986. Des complexes des groupements végétaux à la phytosociologie paysagère contemporaine.— Inform. Bot. Ital. 18: 53-83.

KALKHOVEN J.T. R. & VAN DER WERF S., 1988. Mapping potential natural vegetation. In: A.W. Küchler, I.S. Zonneveld. eds., Vegetation Mapping: 375-386.— Kluwer Acad. Publ. Dordrecht.

KRAUSE W., 1952. Das Mosaik der Pflanzengesellschaften und seine Bedeutung für die Vegetationskunde.— Planta 41: 240-289.

OZENDA P., 1975. Sur les étages de végétation dans les montagnes du Bassin Méditerranéen.— Docum, Cart. Ecologique 16: 1-32,.

QUEZEL P., 1979. La Région Méditerranéenne francaise et ses essences forestières. Signification écologique dans le contexte circum-méditerranéen.— Forêt Méditerranéenne 1(1): 7-18.

SCHWICKERATH M., 1954. Die Landschaft und ihre Wandlung.— Georgi Verlag, Aachen.

RIVAS-MARTINEZ S., 1976. Sinfitosociologia, una nueva metodologia para el estudio del paisaje vegetal.— Anales Inst., Bot. Cavanilles 33: 179-188.

RIVAS-MARTINEZ S., 1978. Sobre las sinasociaciones de la Sierra de Guadarrama.— Assoziazionskomplexen (Sigmeten).— Ber. Intern. Symposion 1977 in Rinteln: 189-212.

RIVAS-MARTINEZ S., 1981. Les étages bioclimatiques de la végétation de la Peninsule Iberique.— Anales Jard. Bot. Madrid 37(2): 251-268.

RIVAS-MARTINEZ S., 1982a. Memoria del mapa de series de vegetación de la provincia de Madrid.— Diputación de Madrid, 47 pp.

RIVAS-MARTINEZ S., 1982b. Etages bioclimatiques, secteurs chorologiques et series de végétation de l'Espagne méditerranéenne.— Ecologia Mediterranea 8(1-2): 257-288.

RIVAS-MARTINEZ S., 1987. Memoria del mapa de series de vegetación de Espana a escala 1:400000.— ICONA, Madrid.

TÜXEN R., 1956. Die heutige potentielle natürliche Vegetation als Gegenstand für Vegetationskartierung.— Angew. Pflanzensoziologie 13.

TÜXEN R., 1973. Vorschläge zur Aufnahme von Gesellschaftskomplexen in potentiell natürlichen Vegetationsgebieten.— Acta Bot. Sci. Hungar. 19(1-4): 379-348.

TÜXEN R., 1977. II. Zur Homogenität von Sigmassoziazionen, ihrer syntaxonomischen Ordnung und ihrer Verwendung in der Vegetationskartierung.— Docum. Phytosociologiques N.S. 1: 321-327.

TÜXEN R., 1979. Sigmeten und Geosigmeten, ihre Ordnung und ihre Bedeutung für Wissenschaft, Naturschutz und Plannung.— Biogeographica 16: 79-91.

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