

## THE CLASS ADIANTETEA IN THE MEDITERRANEAN AREA - A STATE OF KNOWLEDGE REPORT

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ABSTRACT - This is a summarizing report about the contribution presented during the 6<sup>th</sup> workshop for the European Vegetation Survey in Rome. The results have recently been published in detail elsewhere (Deil 1996).

After a description of some ecological and floristic peculiarities of the *Adiantetea*, a report is given about the actual knowledge of the vegetation in halvcaves with dripping water and a syntaxonomical scheme is presented for the class.

KEY WORDS - *Adiantetea*, syntaxonomy, synevolution, vegetation history

### INTRODUCTION

Permanently shaded halvcaves („Balmen“) with dripping water, natural cliffs and man-made terraces overflowed by fresh water and the sprinkling zone beside waterfalls shelter a very special vegetation type, dominated by *Adiantum capillus-veneris* and chalk incrusting bryophytes like *Eucladium verticillatum*. They are unified in the *Adiantetea capilli-veneris*, a class separated floristically and ecologically clearly from other mediterranean vegetation units. Because this class was recently revised by the author, just a brief report together with a syntaxonomical scheme is given here. The whole data set and a survey of the available literature are presented in Deil (1996), the scales of spatial homogeneity in the *Adiantetea* environment and evolutionary aspects are discussed in detail by Deil (1995).

The balme habitat offers some peculiarities:

1. Very constant climatic conditions (stenothermic; permanent water supply). This makes the vegetation there quite independent from the precipitation regime of the climatic zone and from the climatic changes in the past.

2. The stands cover small areas and are highly fragmented and disperse (island character).

3. The *Adiantetea*-communities shelter paleoendemic, vicarious species from the genera *Pinguicula*, *Primula* and *Hypericum* and relictic outposts of tropical ferns (*Woodwardia radicans*, *Pteris vittata*).

The underlying principle of a classification, based upon floristic similarity (like in the Zürich-Montpellier-approach), is the paradigm, that species with similar ecological valence are associated. A „good“ classification system is reflecting the ecological (dis)similarity of the environment. If the ecological valence of the associated species is ranked and has different levels of environmental homogeneity, the result of the classification will be a hierarchical system and at the same time a reflection of the prevailing ecological factors. This is the case in most of the large data sets, studied within the European Vegetation Survey. But what are the effects of the peculiarities mentioned above for the classification of the *Adiantetea*? We may suppose, that the actual pattern of species composition is more the result of evolutionary processes and of dispersal effects than of the recent ecological differentiation in the study area.

### THE AVAILABLE DATA SET

The Mediterranean is one centre of distribution and diversity of the *Adiantetea*-vegetation type. For a better understanding, the review was not restricted to Europe, but comprised the entire Mediterranean region including the North African side and the adjacent countries. For the constancy table (tab. 2 in Deil, 1996), 513 relevés from 74 publications and own data have been used. The localities of the observations and the number of relevés can be seen from fig. 2 in Deil (1996). In Europe, the data base is quite good for Ireland, Spain, France, the Atlantic Islands, Sicily, the southern fringe of the Alps and the Northern Adriatic coast. A very few publications were at my disposal from Central Italy, the Balcan peninsula and Crete. No data are available from Portugal, England and Wales.

Most associations have been described by a very few relevés (see fig. 3 in Deil, 1995) and in many cases the bryophyte layer was sampled incompletely or even neglected. Furthermore, the authors use different scales of ecological homogeneity. Botanists, trained for cryptogams, use smaller sampling areas and have a higher demand for homogeneity than „vascular plant botanists“ (see fig. 1 in Deil, 1995). This is a severe handicap for an European wide comparison and makes a statistical treatment of the data impossible.

### RESULTS

The classification proposed here (see the syntaxonomical scheme at the end of the contribution) is based upon the combination of the vascular plant species. The sampling area is homogenous in the microclimatic conditions. More subtle processes in the bryophyte layer (water velocity, oxygen saturation, intensity and frequency of dessication of the upper bryophyte layer in summer) are typified at the subassociation level. Cyclic regeneration processes happen in the moss stratum by peeling tuff-layers from the wall. Those differences are treated as succession phases with *Didymodon tophaceus* respectively *Southbya scillicidiorum* (chronocoenoses of the classical associations).

There are only three species with high constancy: *Adiantum capillus-veneris*

and *Samolus valerandi* in the vascular plant layer, *Eucladium verticillatum* in the moss layer. Of medium constancy are *Pellia endiviifolia*, *Conocephalum conicum* and various *Gymnostomum*-species.

Beside the widespread basal community *Eucladio-Adiantetum* and the west-mediterranean *Trachelio-Adiantetum*, one can recognize a large series of associations with local distribution (from the *Eucladio-Phyllitidetum* to the *Conocephalo-Woodwardietum*). They are characterized by stenoic and stenochore species. No character species exist between the rank of the associations and the class.

## DISCUSSION

The halve-cave environment is very constant in time and space. The plants there have neither been much affected by the climatic changes in geological times nor by the actual climatic differentiation within the Mediterranean area. At the phanerogamic level, the actual pattern of species composition is more the result of evolutionary processes within relictic taxa, of dispersal effects and reproductive effort of the species involved and of the age and permanence of the locality than of the recent ecological differentiation in the study area.

The communities are relictic in a double sense: They are impoverished remnants of the Tertiary vegetation, reduced to small areas by the climatic change in the Quarternary and Holocene periods and they shelter ancient forms within large genera, who are linked to the *Adiantetea* since a long period and underwent their evolution and speciation process in this sociological and ecological context. All the *Pinguicula* species in the *Adiantetea* communities (*P. longifolia* s.str., *P. l.* ssp. *caussensis*, *P. l.* ssp. *reichenbachiana*, *P. vallisneriifolia*, *P. grandiflora* and *P. coenocantabrica*) belong to the Series *Longifoliae* which comprises the primitive members of the subgenus *Pinguicula*. Most of the *Adiantetea*-character species from *Primula* (*P. verticillata* s.str., *P. v.* ssp. *simensis*, *P. boveana*) belong to the Subgenus *Sphondylia*, which is close to the *Archaeprimulae*. The stenoic character species from genus *Hypericum* (*H. coadunatum*, *H. naudinianum*, *H. sinaicum*, *H. tomentosum*, *H. pubescens* and *H. caprifolium*) belong to section *Adenosepalum*, which is next to the basal section *Campylosporus*). A classification at the level of the sections and subgenera, the so-called coeno-syntaxon-concept (Deil, 1994) outline the distribution of the ancestor communities in tertiary time.

## ZUSAMMENFASSUNG

Dies ist ein Kurzbericht des Beitrages beim 6. Arbeitstreffen zum European Vegetation Survey in Rom, da die Ergebnisse an anderer Stelle vor kurzem ausführlich publiziert wurden (Deil, 1996).

Nach der Beschreibung einigen ökologischer und floristischer Besonderheiten der *Adiantetea* wird ein kurzer Bericht über den aktuellen Kenntnisstand der Vegetation von Sickerwasserhalbhöhlen gegeben und eine syntaxonomischen Gliederung vorgeschlagen.

## SYNTAXONOMICAL SCHEME AND DISTRIBUTION OF THE *ADIANTE-TEA*-COMMUNITIES

**ADIANTEA CAPILLI-VENERIS Br.-Bl. 1952****Adiantetalia capilli-veneris Br.-Bl. ex Horvatič 1939****Adiantion capilli-veneris Br.-Bl. ex Horvatič 1939**the widespread basal community:

- Eucladio-Adiantetum Br.-Bl. ex Horvatič 1934  
 eucladietosum  
 <widespread Subassociation>  
 pteridietosum vittatae em. Deil 1996 (= Adianto-Pteridetum vittatae  
 Brullo  
 et al. 1989)  
 <Sicily, Southern Spain, Morocco, Canary Islands, Yemen, Peru>  
 amblystegietosum tenax Brullo et al. 1990  
 <Sicily>  
 cratoneuretosum filicini em. Deil 1996 (= Adianto-Cratoneuretum filicini  
 Brullo et al. 1989)  
 <widespread>  
 cratoneuretosum commutati em. Deil 1996 (= Adianto-Cratoneuretum  
 commutati Pritivera & Lo Guidice 1986)  
 <widespread>  
 osmundetosum regalis em. Deil 1996 (= Adianto-Osmundetum regalis  
 Brullo 1989)  
 <Sicily>  
 hypericetosum androsaemi Br.-Bl. 1967 (= Hyperico-Adiantetum (Br.-  
 Bl.  
 1967) R.-M. et al. 1991)  
 <Ireland, Nordwestern Spain, Liguria>  
 asplenietosum marini ex Ivimey & Proctor 1966 em. Deil 1996  
 <from Asturia/Spain to Ireland>  
 crithmetosum maritimi (Gehu et al. 1988) em. Deil 1996 (= Crithmo-  
 Adiantetum Gehu et al. 1988)  
 <Sardinia>

the Eucladio-Adiantetum eucladietosum is including the following variants, phases and bryophyte synusia:

- variant with *Hypericum hircinum majus*  
 variant with *Hypericum undulatum*  
 variant with *Sagina maritima*  
*Didymodon tophaceus*-phase (= *Eucladio-Adiantetum didymodetosum*  
 Raimondo et al. 1981 = *Eucladio-Didymodonetum* Hebrard 1973 =  
*Eucladio-Barbuletum* Couderc 1977)  
*Southbya stillicidiorum*-phase (= *Eucladio-Adiantetum southbyetosum*  
 stillicidiorum Giacomini 1951)

Associations with local or regional character species:

- Eucladio-Phyllitetum* Horvatič 1938 (syn.: *Adianto-Phyllitidetum* Horvatič 1939)  
 <Northern Adria>  
*Adianto-Saxifragetum bericae* Lausi 1967  
 <Monti Berici/Italy>

- Primuletum allionii Rioux & Quezel 1949  
 <Southwestern Alps/France>
- Trachelio-Adiantetum O. Bolós 1957 (incl. Trachelio-Adiantetum sensu Gehu et al. 1992)  
 <Western Mediterranean area, Canary Islands>  
 trachelietosum  
 hypericetosum metroi Deil 1996  
 <Jebel Tazekka = Northern Middle Atlas/Morocco>  
 variant with Pteris vittata (Crespo et al. 1989)  
 <Valenciano/Spain>
- Carici tenuis-Pinguiculetum longifoliae ssp. caussensis (Br.-Bl. in Br.-Bl. et al. 1952) corr. Deil 1989  
 <Causses/Southern France>
- Adianto-Pinguiculetum reichenbachianae ined. (Pignatti in litt.)  
 <Apuanian Alps and Apennin/Italy>
- Pinguiculo longifoliae-Adiantetum capilli-veneris R.-M. et al. 1991  
 <Central Pyrenees>
- Adianto-Pinguiculetum grandiflorae var. dertosensis (O. Bolós 1967) Deil 1989  
 <Spanish Levante>
- Hyperico nummulariae-Pinguiculetum coenocantabricae Diaz Gonzales et al. (1982) em. R.-M. et al. 1984  
 <Cantabrian Mountains>
- Eucladio-Pinguiculetum vallisneriifoliae Diaz Gonzales et al. 1982  
 <Eastern Betic Mountains>
- Adianto-Pinguiculetum hirtiflorae sensu Krause et al. 1963 nom. corr. Deil 1989  
 <Euböa/Greece and Central Italy>
- Adianto-Hypericetum pubescentis Varo Alcala & Fernandez Casas 1970  
 <Betic Mountains/Spain and Middle Atlas/Morocco>  
 hypericetosum pubescentis  
 cratoneuretosum filicini Deil 1996
- Adianto-Hypericetum naudiniani Deil 1996  
 <Rif and High Atlas/Morocco>  
 hypericetosum naudiniani  
 philonotidetosum fontanae Deil 1996
- Adianto-Hypericetum coadunati ex Sunding 1972 em. Deil 1996  
 <Canary Islands>
- Lyperietum canariensis Sunding 1972  
 <Western Canary Islands>
- Cardaminetum caldeirari Lüpnitz 1975  
 <Acores>
- Adianto-Primuletum verticillatae Deil 1989  
 <Southwestern Arabia>
- Adianto-Primuletum simensis ined.  
 <Highlands of Eritrea and Ethiopia>
- Adianto-Primuletum boveanae ined.  
 <Sinai/Egypt>
- Adianto-Epipactidetum veratrifoliae Deil 1989  
 <Musandam-Halbinsel/U.A.E., Southern Jordania and Eastern Turkey>

Arabis bucharica-Minuartia aucheriana-community (= Adiantetum capilliveneris s.l. sensu Gilli 1971)

<Afghanistan>

Conocephalo-Woodwardietum radicans Brullo 1989

conocephaletosum

<Sicily/Italy>

dicranetosum scottiani Lüpnitz 1975 ex Deil 1996

<Acores>

\_\_\_\_\_ Local species combination without own character species are:

\_\_\_\_\_ Thamnobryo-Phyllitidetum scolopendrium Brullo et al. 1992

<Sicily>

Dumortiera-Adiantum capillus-veneris-community sensu Lohmeyer & Trautmann 1970

<La Palma, probably also Basque country>

Acrocladio-Adiantetum Gradstein & Smittenberg 1977

<Crete>

Conocephalo conici-Adiantetum Caneva et al. 1995

<Central Italy>

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