

UDC 581.526(497.2) = 20

SOME ANTHROPOGENOUS VEGETATION TYPES OF SOUTHERN BULGARIA

LADISLAV MUCINA and JIŘI KOLBEK

(Dept. of Vegetation Ecology and Nature Conservancy, University of Vienna, Austria
and Botanical Institute, C.S.A.S., Průhonice near Prague, Czechoslovakia)

Received March 28, 1988

Several ruderal communities belonging to the *Eragrostietalia*, *Sisymbrietalia* and *Onopordetalia* in southern Bulgaria (surroundings of Melnik, Bansko and Asenovgrad) are described. Vegetation of walls (*Parietarietea judaicae*), rock fissures (*Asplenieta trichomanis*), shallow-soil habitats (*Sedo-Scleranthetea*) and Black Locust plantations are also tackled in descriptions of some communities. Phytosociologic data on the communities are presented and their syntaxonomy discussed.

Introduction

Ruderal vegetation of the south-European peninsulas is very varied, rich in ruderal species as well as community types. In the Balkan Peninsula most of the research in syntaxonomy of ruderal vegetation was done in Rumania and Yugoslavia (Morariu 1943, 1967, Slavnić 1951, Oberdorfer 1953/1954, Horvatić 1963, Marković-Gospodarić 1965, 1970, Marković 1978 and ample reference cited therein, Pop 1969, Bujorean and Coste 1970, Mititelu and Barabaş 1972, Horeanu 1973, Coste 1975, 1985 just to mention some examples). The other Balkan countries, such as Albania, Greece and Bulgaria, still remain rather sparsely covered by studies in synanthropic vegetation.

The present study is aimed at providing some data and syntaxonomic discussion on ruderal vegetation of selected areas in southern Bulgaria. Wall and rock-fissure vegetation at low altitudes and some other anthropogeneous communities are also characterized.

Materials and Methods

Study Sites and Field Work

The field work was done in the surroundings of Melnik, Bansko, Stara Kresna and Simitli in SW Bulgaria, and Asenovgrad in the central part of S Bulgaria in July and August 1978, May 1980, July 1984 and August 1985 using the classical relevé method of Braun-Blanquet (1964).

Melnik is a small town in south-west Bulgaria. It is a spot heavily attacked by tourists especially in summer. The region is built of thick layers of Tertiary sands and sandstones which are cut and eroded by several brooks and small rivers running from the south-facing flanks of the Pirin Planina Mts. The climate is of a transitional type between Submediterranean and Mediterranean, with a pronounced period of summer drought. The sands are poor in lime.

Stara Kresna and Simitli lie in the Struma River Valley. The prevailing rocks in the surroundings are granodiorites; closer to Kresna, disintegrating, mineral- and lime-rich schists and brecciae also occur. The soils are shallow, but the rocks are deeply eroded, in some places as deep as 3 m.

Bansko is a small town in an extensive basin surrounded by the Pirin Planina Mts., Rila Planina Mts. and Zapadni Rodopi Mts.

Asenovgrad is located at the foot of the central part of the Rodopi Mts., SE of Plovdiv. The town is situated on the Tchepelarska Reka River. The geology of the area is dominated by limestones and marbles in the Dobrostanski Massif which penetrates deep into the Thracian Lowland and near to Asenovgrad reaches 800 m of altitude. The rocks are covered by shallow rendzinas.

Data Treatment and Presentation

Syntaxonomic methods of Braun-Blanquet (1964, see also Westhoff and van der Maarel 1978 for a modern evaluation of the approach) were used.

The nomenclature of higher plant taxa follows *Flora Europaea* (Tutin et coll. 1960—1986) except for *Artemisia campestris* subsp. *lednicensis*, *Ceterach javorkeanum*, and mosses. These are presented with the author citation.

Ruderal Vegetation

MALVO-CHENOPODIETUM VULVARIAE Gutte 1966 nom. inv.

Malvo-Chenopodium vulvariae is a nitrophilous, therophyte ruderal community with the centre of distribution in the submediterranean eastern Europe (Gutte 1966, 1972, Gutte and Pyšek 1976). Typical habitats of the community are edges of walls and fences mainly in villages which are attacked by liquid nitrogen-rich wastes (see also Mucina 1987b). Gutte and Pyšek (l. c.) reported on the community (as the *Chenopodium vulvariae*) from the surroundings of Melnik as well. It is a retreating rustical type of the *Malvion neglectae* (Gutte 1972) Hejný 1978.

Relevé 1: Melnik, in the centre of the town, altitude 390 m, inclination W, slope 15°, area 2 sq. m, cover 80%, along a downtown stone-wall, skeletal soil, slightly trampled; July 28, 1978:

Chenopodium vulvaria 3, *Polygonum arenastrum* 2, *Chenopodium murale* +, *Chamomilla recutita* +, *Plantago major* +, *Urtica dioica* r, *Rumex obtusifolius* r, *Lolium perenne* +, *Veronica spec.* +, *Poa annua* +, *Taraxacum officinale* agg. +, *Cynodon dactylon* r, *Sisymbrium polyceratum* +.

XANTHIETUM SPINOSI Felföldy 1942

The *Xanthium spinosum* community is widely spread over Bulgaria. It is found on abandoned and also frequently disturbed habitats such as village squares, fallow-land on the edge of the settlements, adjacent to dung hills etc. The soils are light, sandy to loamy, rich in nutrients as indicated by the presence of many species characteristic of the *Malvion neglectae*.

Oberdorfer (1953/1954) described an analogous community, the *Amarantho-Atriplicetum tataricae* from Greek Macedonia (surroundings of Thessaloniki), a Mediterranean region situated some 100 km SSW of the location of our relevés (see below). This community belongs to the *Chenopodion muralis* Br.-Bl. et al. 1936, a Mediterranean unit of the *Chenopodietalia muralis* (Br.-Bl. et al. 1936) de Bolós 1962, and differs from the submediterranean-subcontinental *Xanthietum spinosi* (for description see Felföldy 1942, Hejný et coll. 1979) by the presence of numerous mediterranean elements. Oberdorfer (l. c.) also classified some *Xanthietum spinosi* relevés within the *Amarantho-Atriplicetum tataricae*. The latter was also reported from Albania by Ubrizsy and Péntzes (1960). The association *Conyzo-Xanthietum spinosi* of Horvatić (1963) from south Croatia and Montenegro (see also Horvat et coll. 1974: 158) also belongs to the *Chenopodion muralis* and houses many mediterranean elements. The *Xanthietum spinosi* Felföldy 1942 is considered a vicarious unit to the mediterranean associations, and it shows clear syntaxonomic relations with the *Malvion neglectae* (for characteristics see Mucina 1987b).

Relevé 2: Karlanovo, near the bridge over the brook crossing the village, altitude 600 m, area 6 sq. m, cover 85%; July 29, 1978:

Xanthium spinosum 4, *Verbena officinalis* 1, *Chenopodium urbicum* +, *Amaranthus crispus* +, *Chenopodium botrys* +, *Xanthium strumarium* +, *Datura stramonium* +, *Urtica dioica* +, *Malva neglecta* +, *Ballota nigra* +, *Sinapis spec.* +, *Anagallis foemina* +, *Anthemis cotula* +, *Solanum nigrum* +, *Lepidium ruderales* +, *Sambucus ebulus* r, *Rumex crispus* r.

Relevé 3: Rozhen, a small hamlet S of the village, altitude 670 m, inclination S, slope 15°, area 15 sq. m, cover 100%; July 29, 1978:

Xanthium spinosum 5, *Sisymbrium officinale* 1, *Achillea nobilis* subsp. *neilreichii* 1, *Cynodon dactylon* 1, *Datura stramonium* +, *Daucus carota* +, *Descurainia sophia* +, *Polygonum arenastrum* +, *Atriplex tatarica* +, *Hordeum murinum* subsp. *murinum* +, *Elymus repens* +.

ERIGERONTO-LACTUCETUM Lohmeyer in Oberdorfer 1957

The *Erigeronto-Lactucetum* is a broadly-distributed ruderal community of the *Atriplici-Sisymbriion* Hejný 1978 (for a synthetic treatment see Mucina 1978). The *Lactuca serriola* dominated type is characteristic of warm and dry climate of eastern Europe (see also Müller

1983) were it occurs on heaps of loam and sandy-loam materials in close vicinity of building sites, or on ruins of old houses. *Aegilops triuncialis*, *Herniaria hirsuta*, *Leptochloa cristata*, *Malva sylvestris* and *Sisymbrium polyceratum* suggest a submediterranean form (race?) wherein our relevé should be classified.

Relevé 4: Melnik, ruins in the centre of the town, altitude 390 m, inclination S, slope 35°, area 20 sq. m, cover 80%; July 28, 1978:

Lactuca serriola 2, *Coryza canadensis* 3, *Trifolium* spec. 1, *Sonchus arvensis* +, *Artemisia absinthium* +, *Medicago lupulina* +, *Cichorium intybus* +, *Leptochloa cristata* +, *Malva sylvestris* 1, *Reseda lutea* +, *Aegilops triuncialis* +, *Herniaria hirsuta* +, *Lactuca saligna* +, *Sisymbrium polyceratum* +, *Capsella bursa-pastoris* +, *Sisymbrium orientale* +, *Polygonum arenastrum* r, *Cuscuta campestris* agg. +.

POLYGONO-AMARANTHETUM CRISPI Vicol et al. 1971

Amaranthus crispus is a neophyte of south-American origin which has rather limited occurrence in east-submediterranean and subcontinental regions of Europe, mainly in the Balkans and the dry Pannonian Basin (Jalas and Suominen 1980). In places it forms a trampled community which was described as the *Polygono-Amaranthetum crispus* by Vicol et coll. (1971), the *Amaranthetum crispus* by Mititelu (1972, see also Krippelová 1981) or the *Amaranthus crispus* consoc. by Timár (1947).

The *Polygono-Amaranthetum crispus* was recorded by one relevé from Melnik. It is a thermophilous trampled community built of psammophytes prone to withstand trampling disturbance, and adapted to this disturbance by prostrate habit (*Amaranthus crispus*, *Portulaca aleracea*, *Eragrostis cilianensis*). Together with the *Polygono-Portulacetum oleracei* Eliáš 1982, *Eragrostio-Polygonetum* Oberdorfer 1953/1954 (e. g. Lohmeyer 1970, Krippelová and Mucina 1988, Mucina 1990) as well as the *Polygonum arenastrum-Cynodon dactylon* community (see below) they belong to a group of trampled communities classified within the *Eragrostietalia* J. Tx. in Poli 1966.

Relevé 5: Melnik, near the Izbata Hotel, altitude 370 m, inclination SW, slope 10°, area 2.5 sq. m, cover 40%; July 28, 1978:

Amaranthus crispus 3, *Portulaca oleracea* +, *Heliotropium europaeum* +, *Chenopodium vulvaria* +, *Eragrostis cilianensis* +, *Solanum nigrum* r, *Anchusa barrelieri* r.

POLYGONUM ARENASTRUM-CYNODON DACTYLON Community (Tab. 1)

The community forms low-grown, patchy lawns with *Cynodon* and *Polygonum arenastrum*. This trampled community populates habitats analogous to those of the *Polygono-Amaranthetum crispus* (trampled patches roads on sandy substrates). Similar communities occur also in the southern regions of central Europe and were described as the *Plantagini-Cynodontetum* (Brun-Hool 1962, Krippelová 1972, Jarolímek 1983, Mucina 1990). However, the strong presence of hemipterophytes in the temperate regions suggests that the *Plantagini-Cynodontetum* Brun-Hool 1962 should rather be classified to the *Lolio-Plantaginion* Sissingh 1969 than to the *Polygonion avicularis* Br.-Bl. ex Aichinger 1933 or a group of trampled communities within the *Eragrostietalia*.

CENTAUREO DIFFUSAE-BERTEROËTUM Oberd. 1957 (Tab. 2)

Mucina and Brandes (1985) classified one relevé of a *Berteroa incana* dominated community from the vicinity of Melnik into the *Berteroetum incanae*. As shown in our table (Tab. 2) the south-Bulgarian community should rather belong to the *Centaureo diffusae-Berteroetum* as both the floristical composition and synecology of the community suggest.

The *Centaureo-Berteroetum* in the surroundings of Melnik and Bansko is found on sandy soils in habitats such as fallow-land and road verges. Several *Eragrostietalia* species and other facultative psammophytes such as *Vulpia myuros*, *Bromus tectorum*, *Cynodon dactylon*, *Chondrilla juncea*, *Chenopodium botrys*, *Plantago arenaria*, *Herniaria hirsuta*, *Erysimum diffusum*, *Jasione montana*, *Centaurea diffusa* and *Carex stenophylla* indicate the belonging to the *Centaureo-Berteroetum* (for other diagnostic species see Mucina and Brandes 1985). Local elements typical of the *Centaureo-Berteroetum* that differentiate the south-Bulgarian material from the central-European relevés include *Achillea coerctata*, *Anchusa barrelieri*, *Silene bupleuroides*, *Cytisus lasiocarpus*, *Petrorhagia illyrica*, *Achillea crithmifolia*, etc.

BALLOTA NIGRA-ARTEMISIA ABSINTHIUM Community (Tab. 3)

The *Ballota-Artemisia absinthium* community occurs on road slopes and along fences and walls in the settlements (Melnik, Asenovgrad). The species composition consists of *Ballota nigra*, *Artemisia absinthium*, *A. vulgaris*, *Bromus sterilis*, *Hordeum murinum* and others. The presence of *Onopordion acanthium*, *Cynoglossum officinale*, *Artemisia lednicensis*, *Vulpia myuros*, *Achillea crithmifolia*, *Saponaria officinalis*, *Caucalis platycarpus*, *Anthemis cotula* and other taxa indicate its similarity to the *Onopordion acanthii* Br.-Bl. et al. 1926 (*Onopordetalia* Br.-Bl. et R. Tx. ex Klika et Hadar 1944). It is syntaxonomically a transitional type between the *Arction lappae* R. Tx. 1937 and the *Onopordion acanthii*, a characteristic phenomenon of areas with warm and dry climate. The habitats of the community are isolated, and the stands prefer south-facing aspects.

The community has so far been described from East Germany (Schubert and Mahn 1959), western Slovakia (Eliáš 1982, Jarolímek 1983, Mucina 1990) and south Moravia (Grüll 1979).

CARDUO ACANTHOIDIS-ONOPORDETUM ACANTHII Soó 1947

The *Carduo-Onopordetum acanthii* is characteristic of dry-climate regions of east Europe (Mucina 1989). In Bulgaria it is found on the edge of its distribution centre. More towards the south, in Greek Macedonia, it is replaced by communities of the vicarious mediterranean *Onopordion illyrici* Oberdorfer 1953/1954, particularly by the *Centaureo solstitialis-Onopordetum illyrici* (Oberdorfer 1953/1954) Brullo in Brullo et Marcenó 1985 (for characteristics of the unit see Oberdorfer 1953/1954, Hruška 1985, Brullo and Marcenó 1985).

The stands of the *Carduo-Onopordetum acanthii* are tallgrown and difficult to penetrate. Like other xerothermophilous ruderal communities of the *Onopordetalia* (Mucina 1981) the community is rich in winter and summer therophytes concentrated in the lower herb layer. *Centaurea solstitialis*, *Coronopus squamatus*, *Carthamus lanatus*, *Anchusa barrelieri*,

Achillea crithmifolia, *Borago officinalis* and *Allium atroviolaceum* suggest a submediterranean influence on the floristic composition. The *Carduo-Onopordetum acanthii* populates abandoned sites along the roads; it is also founds at old building sites and on fallow-land in villages.

Unpublished data on the *Carduo-Onopordeum acanthii* from Bulgaria are also possessed by Krippelová and Gutte (in Mucina 1989).

Relevé 6: Lyubovishtcha, in the centre of the village, altitude 700 m, inclination SW, slope 35–40°, area 24.5 sq. m, cover 90%, loamy-sandy soil on a slope along a dirt road; July 29, 1978:

Onopordon acanthium 3, *Centaurea solstitialis* +, *Mentha* spec. 3, *Sisymbrium officinale* 1, *Malva sylvestris* 1, *Capsella bursa-pastoris* 1, *Lactuca serriola* +, *Artemisia campestris* subsp. *lednicensis* 1, *Ballota nigra* +, *Plantago lanceolata* +, *Bilderdykia convolvulus* +, *Atriplex oblongifolia* +, *Coronopus squamatus* +, *Setaria viridis* +, *Sisymbrium orientale* 1, *Torilis arvensis* +, *Hypericum* spec. r, *Filago* spec. r, *Bromus sterilis* +, *Sambucus ebulus* r, *Cichorium intybus* +, *Poa angustifolia* +, *Convolvulus arvensis* +, *Carthamus lanatus* +, *Mentha longifolia* var. *mollissima* 3, *Rumex obtusifolius* +, *Veronica* spec. +, *Anchusa barrelieri* +, *Trifolium* spec. +, *Sochus arvensis* r, *Echium vulgare* +, *Achillea crithmifolia* +, *Cuscuta campestris* agg. +, *Euphorbia* spec. r, *Sorghum halepense* +, *Borago officinalis* +, *Allium atroviolaceum* +.

URTICO-SAMBUCETUM EBULI Br.-Bl. et al. 1952

Sambucus ebulus is a dominating species in many ruderal and natural plant communities (Brandes 1985, Mucina 1990). Occurrence of submediterranean elements such as *Malva sylvestris*, *Sisymbrium orientale*, *Xanthium strumarium*, *Aegilops triuncialis*, *Silene trinervis*, *Sisymbrium polyceratum*, *Torilis arvensis*, *Tamus communis* and *Cephalaria transylvanica* are suggestive of the classification of the material within the *Urtico-Sambucetum* (Braun-Blanquet et coll. 1952, Horvatić 1963).

The *Urtico-Sambucetum* is typical of numerous therophytes in the sparse undergrowth overshadowed by a canopy of *Sambucus ebulus*. The community is usually found on abandoned sandy and loamy-sandy tips or on stabilized rubbish heaps on the edges of villages all over south Bulgaria.

Relevé 7: Melnik, at the parking lot, altitude 370 m, inclination W, slope 35°, area 15 sq. m, cover 100%; July 28, 1978:

Sambucus ebulus 5, *Malva sylvestris* 1, *Ballota nigra* 1, *Sisymbrium orientale* 1, *Bromus sterilis* 1, *Plantago arenaria* +, *Xanthium strumarium* +, *Cichorium intybus* +, *Aegilops triuncialis* +, *Silene trinervis* +, *Plantago lanceolata* +, *Artemisia lednicensis* +, *Lactuca serriola* +, *Papaver dubium* +, *Leptochloa cristata* +, *Saponaria officinalis* +, *Tussilago farfara* +, *Urtica dioica* +, *Petrorhagia prolifera* +, *Verbena officinalis* +, *Daucus carota* +, *Dactylis glomerata* +, *Onopordon acanthium* r, *Convolvulus arvensis* r, *Torilis arvensis* r.

Relevé 8: Melnik, at the parking lot, altitude 370 m, inclination W, slope 20°, cover 90%; August 4, 1983:

Sambucus ebulus 5, *Berteroa incana* 1, *Geum urbanum* 1, *Rubus fruticosus* agg. 1, *Brachypodium sylvaticum* 1, *Clematis vitalba* 1, *Artemisia vulgaris* +, *Cynoglossum officinale* +, *Tamus communis* +, *Agrimonia eupatoria* +, *Prunus* spec. +, *Robinia pseudacacia* +, *Rosa* spec. +, *Hypericum perforatum* +, *Cephalaria transylvanica* +, *Elymus repens* +, *Stellaria media* r.

Vegetation of walls, rock fissures and shallow-soil habitats

CYMBALARIETUM MURALIS Görs 1966 (Tab. 4)

The community populates slightly nitrophilous wall habitats found along the Tchepearska Reka River in Asenovgrad as well as on the Asenovata Krepost Fortification. The prevailing species on the walls along the river is *Cymbalaria muralis* joined by *Parietaria officinalis*. At the east-facing walls the habitats of the community are slightly overshadowed by trees of *Robinia pseudacacia*. In all cases the walls are compact and are built of limestone.

The community belongs to the *Centrantho-Parietarium* Rivas-Martínez 1960 nom. inv. (*Parietarietea judaicae* Rivas-Martínez ex Rivas-Goday 1964) which comprises wall nitrophilous vegetation prevailing found in western and southern Europe, thus showing a (sub) atlantic-mediterranean distribution (mild winters). In comparison to the south- or southwest-European *Parietarium muralis* Arènes 1928 corr. Oberd. 1977, the Bulgarian community lacks *Parietaria judaica* s. s., *Cheiranthus cheiri* (both considered character-species of the *Parietarium muralis*); still, the affinity to the *Parietarium muralis* is very high. The classification of the Bulgarian community to the *Cymbalarietum muralis* was motivated by the occurrence and high dominance of *Cymbalaria muralis* (see Oberdorfer 1977b, Kolbek and Kurková 1979, Mucina 1987a).

CETERACH JAVORKEANUM-SEDUM ALBUM Community (Tab. 5)

The communities of rock fissures in limestone (rarely also lime-rich silicate bedrock) with *Ceterach javorkeanum* were found in the surroundings of Asenovgrad, on the walls of the Asenovata Krepost Fortification and in the surroundings of Stara Kresna in the Struma River Valley. *Ceterach javorkeanum*, *Sedum album*, *Achillea clypeolata*, *Verbascum longifolium*, *Silene flavescens* and *Galium album* are the dominant and constant species of the community. The other important elements of the species composition include *Minuartia verna* and *Inula verbascifolia* subsp. *aschersoniana*. The community prefers east- to north-facing aspects and 70—90° slopes. *Ceterach javorkeanum* dwells in narrow fissures overshadowed by tall-grown surrounding vegetation. The species occurs also in stony screes with *Clematis vitalba*, *Campanula trachelium*, *Coronilla varia*, *Vicia pannonica*, *Hieracium bauhinii*, *Sedum maximum*, *Digitalis lanata* etc. Depending on local conditions, several developmental stages of the community can be observed ranging from the well-developed stage to the transitions towards the species-rich grassy communities on steep rocky flanks (analogous to the *Seslerio-Festucion glaucae* Klika 1931 em. Kolbek 1982 or the *Helianthemo cani-Festucion pallentis* Kolbek 1983).

Ceterach javorkeanum is an vicarious east-European taxon (hexaploid) to the west-European, submediterranean and mediterranean *Ceterach officinarum*, which is also limited to rock fissures or wall communities, while *Ceterach javorkeanum* has a rather broad coenologic valency (e. g. Trinajstić 1980). *Ceterach officinarum* was found to occur in the *Saxifraga paniculata-Polypodium vulgare* community (Korneck 1974, the *Asplenietum trichomano-rutae-murariae* Kuhn 1937).

Biscutello-Asplenietum septentrionalis Korneck 1974 and the *Asplenietum septentrionali-adianti-nigri* Oberd. 1938 (see Oberdorfer 1977a). The *Ceterach javorkeanum-Sedum album* community is rather species-poor and it does not house any other fern species which are markedly significant of the *Asplenietea trichomanis* (Br.-Bl. in Meier et Br.-Bl. 1934) Oberd. 1977 wherein the community is classified.

ACHILLEA CLYPEOLATA-VERBASCUM LONGIFOLIUM Community (Tab. 6)

Dry and shallow soils covering south-facing slopes on lime-rich substrates in the surroundings of Asenovgrad house a typical community composed of *Achillea clypeolata*, *Verbascum longifolium*, *Silene flavescens*, on steeper slopes also *Sedum album*, *Thymus longicaulis* and *Seseli rhodopense*. Various successional stages can be recognized ranging from low-cover stands (Tab. 6, rel. 1) towards species-rich and high-cover stands. The latter occurs on deeper soil horizons. Homogeneous stands (Tab. 6, rels. 4 and 5) occur along road verges, at the foot of slopes and broad rocky terraces. Small-sized and species-poorer stands are limited to wall crowns (e. g. the Asenovata Krepost Fortification) and to rocky terraces with shallow soils. The community is characterized by small cover of grasses.

Syntaxonomically the community fits to the *Alyso-Sedion albi* Oberd. et Müller in Müller 1961 (*Sedo-Scleranthetalia* Br.-Bl. 1955, *Sedo-Scleranthetea* Br.-Bl. 1955), which generally comprises therophyte-rich pioneer communities on lime-rich rubble, dominated by species of submediterranean provenience (Korneck 1974, 1978).

Black Locust (*Robinia pseudacacia*) Coppices

GERANIUM LUCIDUM-ROBINIA PSEUDACACIA Community (Tab. 7)

The sands and sandstones in the surroundings of Lyubovishtcha and Rozhen (E and NE of Melnik) are covered by patches of *Robinia pseudacacia* coppices. *Robinia pseudacacia* is rather aggressive especially in deep gorges eroded by water rills. It is one of the pioneer woody species populating erosion dells. The typical ground-layer species include *Rubus rhombifolius*, *Bromus sterilis* (dominating), *Geranium lucidum* and *Brachypodium sylvaticum*. The black locust wood-lots are secondary plantations in locations formerly covered by xerothermophilous oak woods.

The community is classifiable within the *Balloto nigrae-Robinion* Hadač et Sofron 1980 (*Chelidonio-Robinieta* Jurko ex Hadač et Sofron 1980, *Robinieta* Jurko ex Hadač et Sofron 1980). The floristic composition shows a close relation to the *Bromo sterilis-Robinieta* described by Jurko (1963) from southern Slovakia. *Geranium lucidum* also occurs in some places in south Slovakia in fringes of *Robinia* wood-lots (Mucina unpubl.)

Syntaxonomy of the *Robinieta* is rather dubious. From the structural point of view this unit should be separated into a different class (see also Rejmánek 1977). However, the floristic composition indicates closest relations of the black locust communities to the *Glechometalia hederaceae* R. Tx. et Brun-Hool 1975 (nitrophilous fringe communities) to the *Galio-Alliarion* Lohm. et Oberd. in Oberd. et al. 1967. This implies that the units such as the *Balloto-Robinion*, *Chelidonio-Robinion* Hadač et Sofron 1980, *Chelidonio-Robinieta*, *Robinieta* should be abandoned.

Zusammenfassung

Einige Ruderalgesellschaften der *Eragrostietalia*, *Sisymbrietalia* und *Onopordetalia* wurden in Südbulgarien (Umgebung von Melnik, Kresna, Bansko und Asenovgrad) analysiert und nach Zürich-Montpellier-Methode klassifiziert. Auch die nitrophilen Mauergesellschaften (*Parietarietea judaicae*), Felsspaltengesellschaften (*Asplenietea trichomanis*), Pioniergesellschaften der primitiven flachgründigen Böden und festliegenden Silikat-sandböden (*Sedo-Scleranthetea*) und sekundäre Akazienwälder wurden festgelegt. Jede Pflanzengesellschaft ist mit Vegetationsaufnahmen belegt und ihre charakteristischen Artenzusammensetzung und Artenkombination werden beschrieben und ein Vergleich mit der Literatur ist durchgeführt. Vom phytozöologischen Gesichtspunkt aus handelt es sich um die Gesellschaften mit submediterraneum Charakter und den Übergangsformen zwischen Ruderalvegetation Europas und Mediterran.



Acknowledgements: Some of the voucher specimens were determined or revised by J. Dvořák, Kuřim in Brno, J. Holub and P. Tomšovic, both Průhonice near Prague. The junior author thanks the Czechoslovak Academy of Sciences and the Bulgarian Academy of Sciences for financial support during the field work. W. Holzner, Wien, kindly corrected the German summary and Mrs. Susi Nemenz retyped the text.

References

- Brandes, D.*, 1985: Das *Sambucetum ebuli* Felf. 1942 im südlichen Mitteleuropa und seine geographische Gliederung. *Tuexenia* 2, 47—60.
- Braun-Blanquet, J.* 1964: Pflanzensozioologie. Grundzüge der Vegetationskunde. 3. Aufl. Springer, Wien, New York.
- Braun-Blanquet, J., N. Roussine, R. Nègre*, 1952: Les groupements végétaux de la France Méditerranéenne. C. N. R. S., Montpellier.
- Brullo, S., C. Marcenó*, 1985: Contributo alla conoscenza della vegetazione nitrofila della Sicilia. *Coll. Phytosociol., Camerino* 12, 23—148.
- Brun-Hool, J.* 1962: Pflanzengesellschaften der Wege. *Mitt. Naturforsch. Ges. Luzern* 19, 67—151.
- Bujorean, G., I. Coste*, 1970: Beiträge zum Studium der anthropogenen Assoziationen aus der Beregsäu-Aue (Temesch-Ebene). *Rev. Roum. Biol., Ser. Bot.* 15, 385—397.
- Coste, I.* 1975: Contribution á l'étude de la végétation anthropogene dans les Monts de Locva (sud-ouest de la Roumanie). — I. *Doc. Phytosociol. Lille*, 9—14, 63—72.
- Coste, I.*, 1985: Contribution á l'étude de la classe *Agropyretea intermedii-repentis* Oberd., Th. Müll. et Görs 1967 dans le sud ouest de la Roumanie. *Coll. Phytosociol., (Bailleul)* 12, 577—589.
- Eliáš, P.* 1982: Ku klasifikácii teplomilnej ruderalnej vegetácie strednej Európy. *Preslia (Praha)* 54, 55—65.
- Felföldy, L.*, 1942: Szociológiai vizsgálatok a pannóniai flóráterület gyomvegetációján. *Acta Geobot. Hung. (Kolozsvár)* 5, 87—138.
- Grüll, F.*, 1979: *Arctio-Ballotetum nigrae* ve vývojové fázi s *Artemisia absinthium* v ruderalní vegetaci města Brna. *Preslia (Praha)* 51, 271—277.
- Gutte, P.*, 1966: Die Verbreitung einiger Ruderalpflanzengesellschaften in der weiteren Umgebung von Leipzig. *Wiss. Z. Univ. Halle, Ser. Math.-Nat.* 15, 937—1010.

- Gutte, P., 1972: Ruderalpflanzengesellschaften West- und Mittelsachsens. Feddes Repert. (Berlin) 83, 11—122.
- Gutte, P., A. Pyšek, 1976: Das *Chenopodietum vulvariae* — eine neue Ruderalpflanzengesellschaft. Feddes Repert. (Berlin) 87, 521—526.
- Hejny, S., K. Kopecký, V. Jehlík, T. Krippelová, 1979: Přehled ruderálních rostlinných společenstev Československa. Rozpr. Čs. Akad. Ved., Ser. Math.-Nat. (Praha) 89 (2), 1—100.
- Horeanu, C., 1973: Contribuție la cunoașterea vegetației antropofile din po-dișul Casimcea. Peuce (Tulcea) 3, 103—122.
- Horvat, I., V. Glavač, H. Ellenberg, 1974: Vegetation Südosteuropas. Gustav Fischer Verlag, Stuttgart.
- Horvatić, S., 1963: Vegetacijska karta Otoka Paga s općim pregledom vegetacijskih jedinica hrvatskog primorja. Prirodoslov. istraživ. knj. 33, Acta biol. 4, 1—187, Zagreb.
- Hruška, K., 1985: Ruderal xerothermic vegetation in the Marche (central Italy). Coll. Phytosociol. (Bailleul) 12, 149—154.
- Jalas, J., J. Suominen, 1980: Atlas Florae Europaeae. 5. *Chenopodiaceae* to *Basellaceae*. Helsingin Liikekirjapaino Oy, Helsinki.
- Jarolimek, I., 1983: Ruderálne společenstvá Bratislavy. Dissertation, Bratislava.
- Jurko, A., 1963: Zmena pôvodných lesných fytoocenóz introdukciov agáta. Čs. Ochr. Prír. (Bratislava) 1, 56—75.
- Kolbek, J., J. Kurková, 1979: *Cymbalaria muralis* Görs 1966 v průhonickém parku. Zpr. Čs. Bot. Společn. (Praha) 14, 23—25.
- Korneck, D., 1974: Xerothermvegetation in Rheinland-Pfalz und Nachbargebieten. Schriftenrh. Vegetkde. (Bonn-Bad Godesberg) 7, 1—196.
- Korneck, D., 1978: Klasse: *Sedo-Scleranthetea*. In: E. Oberdorfer (ed.): Süddeutsche Pflanzengesellschaften. Teil II. 2. Aufl. Pflanzensoziologie (Jena) 10, 13—85.
- Krippelová, T., 1972: Ruderálne spoločenstvá mesta Malaciek. Biol. Práce (Bratislava) 18 (1), 1—116.
- Krippelová, T., 1981: Synanthrope Vegetation des Beckens Košická kotlina. Vegetácia ČSSR, Ser. B (Bratislava) 4, 1—216.
- Krippelová, T., L. Mucina, 1988: Charakteristika vyšších syntaxónov triedy *Stellarietea mediae* na Slovensku. Preslia (Praha) 60, 41—58.
- Lohmeyer, W., 1970: Zur Kenntnis einiger nitro- und thermophiler Unkrautgesellschaften im Gebiet des Mittel- und Niederrheins. Schriftenrh. Vegetkde. (Bonn-Bad Godesberg) 5, 29—43.
- Marković, Lj., 1978: Übersicht der Ruderalpflanzengesellschaften in Jugoslawien. Acta Bot. Slov. Acad. Sci. Slovacae, Ser. A, (Bratislava) 3, 305—309.
- Marković-Gospodarić, Lj., 1965: Prilog poznavanju ruderalne vegetacije kontinentalnih dijelova Hrvatske. Acta Bot. Croat. (Zagreb) 24, 91—136.
- Marković-Gospodarić, Lj. 1970: Beitrag zur Kenntnis der Ruderalvegetation von Gusinje und seiner Umgebung. Mitt. Ostalp.-Din. Ges. Vegetkde. 11, 101—108.
- Mititelu, D., 1972: Asociații noi de buruieni din Moldova. Anal. Știin. Univ. A. I. Cuza, Ser. Biol. (Iași) 18, 119—126.
- Mititelu, D., N. Barabaș, 1972: Vegetația ruderală și segetală din interiorul și împrejurimile municipiului Bacău. Stud. Comunic. (Bacău) 1972, 127—148.
- Morariu, D., 1943: Asociații de plante antropofile din jurul Burureștilor cu observații asupra răspîndirii lor în țară și mai ales în Transilvania. Bul. Grăd. Bot. Muz. Bot. Univ. (Cluj) 23, 131—212.
- Morariu, I., 1967: Clasificarea vegetației nitrofile din România. Contrib. Bot. (Cluj) 1967, 233—246.
- Mucina, L., 1978: Ruderal communities with dominant species *Lactuca serriola*. Biológia (Bratislava) 33, 809—819.
- Mucina, L., 1981: Die Ruderalvegetation des nördlichen Teils der Donau-Tiefebene. 1. *Onopordion acanthii*-Verband. Föl. Geobot. Phytotax. (Praha) 16, 225—263.
- Mucina, L., 1987a: *Cymbalaria muralis* v Piešťanoch. Zpr. Čs. Bot. Společn. (Praha) 22, 53—55.

- Mucina, L.*, 1987b: The ruderal vegetation of the northwestern part of the Podunajská nížina Lowland. 5. *Malvion neglectae*. Fol. Geobot. Phytotax. (Praha) 22, 1—23.
- Mucina, L.*, 1989: Syntaxonomy of the *Onopordum acanthium* communities in temperate and continental Europe. Vegetatio (Dordrecht) 81, 107—115.
- Mucina, L.* 1990: Syntaxonomie und Ökologie der Ruderalvegetation der westlichen Donau-Tiefebene in der Slowakei. Braun-Blanquetia (Camerino) (submitted).
- Mucina, L., D. Brandes*, 1985: Communities of *Berteroa incana* in Europe and their geographical differentiation. Vegetatio 59, 125—136.
- Müller, T.*, 1983: Klasse: *Chenopodietea*. In: Oberdorfer (ed.): Süddeutsche Pflanzengesellschaften. Teil III. 2. Aufl. Pflanzensoziologie (Jena) 10, 48—114.
- Oberdorfer, E.*, 1953/1954: Über Unkrautgesellschaften der Balkanhalbinsel. Vegetatio 4, 379—411.
- Oberdorfer, E.*, 1977a: Klasse: *Asplenietea rupestris*. In: E. Oberdorfer (ed.): Süddeutsche Pflanzengesellschaften. Teil I. 2. Aufl. Pflanzensoziologie (Jena) 10, 23—38.
- Oberdorfer, E.*, 1977b: Klasse: *Parietarietea judaicae*. In: E. Oberdorfer (ed.): Süddeutsche Pflanzengesellschaften. Teil I. 2. Aufl. Pflanzensoziologie (Jena) 10, 39—41.
- Pop, I.*, 1969: Vegetația nitrofilă din lunca Someșului-Mic, Cluj. Contrib. Bot. (Cluj) 1969, 157—167.
- Rejmánek, M.*, 1977: The concept of structure in phytosociology with references to classification of plant communities. Vegetatio 35, 55—61.
- Schubert, R., E.-G. Mahn*, 1959: Vegetationskundliche Untersuchungen in der mitteldeutschen Ackerlandschaft. I. Die Pflanzengesellschaften der Gemarkung Friedeburg (Saale). Wiss. Z. Martin-Luther-Univ., Ser. Math.-Nat. (Halle) 8, 865—1012.
- Slavnić, Z.*, 1951: Pregled nitrofilne vegetacije Vojvodine. Nauč. Zbor. Matice Srpske (Novi Sad) 1, 84—169.
- Timár, L.*, 1947: Egyéves növénytársulások a Szeged környéki szikesek iszapján. I. Ann. Biol. Univ. Hung. (Budapest) 2, 311—321.
- Trinajstić, I.*, 1980: Aperçu syntaxonomique de la végétation des rochers de l'espace Adriatique. Stud. Geobot. (Trieste) 1, 203—212.
- Tutin, T. G. et coll. (eds.)*, 1964—1986: Flora Europaea. Vols. 1—6. Cambridge Univ. Press, Cambridge.
- Ubrizsy, G., A. Péntzes*, 1960: Beiträge zur Kenntnis der Flora und der Vegetation Albaniens. Acta Bot. Acad. Sci. Hung. (Budapest) 6, 155—170.
- Vicol, E. C., E. Schneider-Binder, F. Täuber*, 1971: *Polygono (avicularis)-Amaranthum crispum* nova ass. Stud. Comunic. Muz. Bruckenthal (Sibiu) 16, 173—182.
- Westhoff, V., E. van der Maarel*, 1978: The Braun-Blanquet approach. In: R. H. Whittaker (ed.). Classification of plant communities. Handb. Veget. Sci. 5, 619—726. Dr. W. Junk Publ., The Hague.

S A Ž E T A K

O NEKIM ANTROPOGENIM ZAJEDNICAMA JUŽNE BUGARSKE

Ladislav Mucina i Jiří Kolbek

(Zavod za ekologiju bilja i zaštitu prirode, Sveučilište u Beču i Botanički institut
C.S.A.S., Průhonice kraj Praga)

Na području južne Bugarske (okolica mjesta Melnika, Banskog i Asenovgrada) opisano je nekoliko ruderalnih zajednica iz redova *Eragrostietalia*, *Sisymbrietalia* i *Onopordietalia*. Prikazuje se i vegetacija zidova (*Parietarietea judaicae*), pukotina stijena (*Asplenietea trichomanis*), vegetacija razreda *Sedo-Scleranthetea*, a obrađena je i vegetacija bagremovih šikara. Za svaku zajednicu iznose se fitocenološki podaci i raspravlja se o njihovoj sintaksonomiji.

Dr. Ladislav Mucina
Dept. of Vegetation Ecology
and Nature Conservancy
Institute of Plant Physiology
University of Vienna
Althanstraße 14
A-1091 Wien (Austria)

Dr. Jiří Kolbek
Dept. of Geobotany
Botanical Institute
C.S.A.S.
CS-252 43 Průhonice u Prahy
(Czechoslovakia)

Tab. 1. *POLYGONUM ARENASTRUM-CYNODON DACTYLON* Community

Relevé No.	1	2	3	4	
Inclination	E	—	SW	—	
Slope (°)	15	—	10	—	
Sampled area (m ²)	12	6	2	6	
Cover (%)	30	75	90	100	
<hr/>					
E ₁					C
<i>Polygonum arenastrum</i>	2	3	1	1	100
<i>Cynodon dactylon</i>	.	2	1	5	75
<i>Hordeum murinum</i>	+	+	+	+	100
<i>Plantago major</i>	+	+	.	.	50
<i>Bromus squarrosus</i>	+	.	3	.	50
<i>Aegilops triuncialis</i>	+	.	+	.	50
<i>Cichorium intybus</i>	r	.	.	+	50
<i>Artemisia campestris</i> subsp. <i>ledmicensis</i> (Rochel) Lemke et Rothm.	r	.	.	r	50
<i>Portulaca oleracea</i>	.	+	+	.	50
<i>Taraxacum officinale</i> agg.	.	+	.	1	50
<i>Poa annua</i>	+	.	.	.	25
<i>Plantago arenaria</i>	.	.	1	.	25
<i>Amaranthus crispus</i>	.	.	+	.	25
<i>Vulpia myuros</i>	.	.	+	.	25
<i>Chenopodium vulvaria</i>	.	.	+	.	25
<i>Plantago argentea</i>	.	.	+	.	25
<i>Malva neglecta</i>	.	.	+	.	25
<i>Marrubium vulgare</i>	.	.	+	.	25
<i>Setaria viridis</i>	.	.	+	.	25
<i>Convolvulus arvensis</i>	.	.	.	1	25
<i>Artemisia vulgaris</i>	.	.	.	1	25
<i>Plantago anaeolata</i>	.	.	.	+	25
<i>Artemisia absinthium</i>	.	.	.	+	25
<i>Apera spica-venti</i>	.	.	.	+	25
<i>Medicago lupulina</i>	.	.	.	+	25
<i>Conyza canadensis</i>	.	.	.	r	25
<i>Arctium spec.</i>	.	.	.	r	25

Localities of relevés:

1. Between Karlanovo and Rozhen, on a dust road, July 29, 1978.
2. Melnik, direction Vinograd, a road edge, August 8, 1983.
3. Melnik, at the Izbata Hotel, edge of pavement, July 28, 1978.
4. see rel. 2.

Tab. 2. *CENTAUREO DIFFUSAE-BERTEROETUM* Oberd. 1957

Relevé No.	1	2	3	4	5	6	7	
Inclination	WSW	—	W	—	N	—	—	
Slope (°)	5	—	25	—	10	—	—	
Sampled area (m ²)	20	9	6	12	12	12	12	
Cover — herb layer (%)	90	90	90	80	75	85	90	
Cover — moss layer (%)	—	—	—	<5	5	—	10	

E ₁	1	2	3	4	5	6	7	C
<i>Berteroa incana</i>	4	5	4	3	3	4	4	100
<i>Cynodon dactylon</i>	2	1	+	2	.	.	.	57
<i>Achillea coarctata</i>	+	+	+	2	.	.	.	57
<i>Vulpia myuros</i>	1	.	.	.	+	.	.	29
<i>Silene bupleuroides</i>	+	.	+	.	.	.	.	29
<i>Plantago arenaria</i>	.	2	.	1	.	.	.	29
<i>Chenopodium botrys</i>	.	1	r	.	.	.	.	29
<i>Erysimum diffusum</i>	.	+	.	1	.	.	.	29
<i>Herniaria glabra</i>	.	.	.	.	2	.	+	29
<i>Trifolium arvense</i>	+	.	.	.	.	.	.	14
<i>Herniaria hirsuta</i>	.	1	.	.	.	.	.	14
<i>Jasione montana</i>	.	.	+	.	.	.	.	14
<i>Centaurea diffusa</i>	.	.	+	.	.	.	.	14
<i>Carex stenophylla</i>	.	.	.	3	.	.	.	14
<i>Petrorhagia illyrica</i>	.	.	.	+	.	.	.	14
<i>Equisetum ramosissimum</i>	.	.	.	.	.	1	.	14
<i>Cichorium intybus</i>	.	1	1	+	2	1	2	86
<i>Plantago lanceolata</i>	.	+	+	+	1	+	1	86
<i>Ballota nigra</i>	+	2	+	.	1	+	.	71
<i>Anchusa barrelieri</i>	+	2	1	+	.	.	.	57
<i>Artemisia vulgaris</i>	+	1	1	.	.	1	.	57
<i>Echium vulgare</i>	.	+	.	1	+	.	2	57
<i>Centaurea rhenana</i>	.	.	+	+	.	2	2	57
<i>Hypericum perforatum</i>	+	+	+	.	.	.	.	43
<i>Artemisia campestris</i> subsp. <i>lednicensis</i>	+	.	1	2	.	.	.	43
<i>Arenaria serpyllifolia</i>	+	.	.	.	+	.	+	43
<i>Chondrilla juncea</i>	.	2	.	.	.	+	2	43
<i>Trifolium repens</i>	.	1	+	.	1	.	.	43
<i>Melilotus alba</i>	.	1	+	.	.	.	+	43
<i>Convolvulus arvensis</i>	.	1	.	.	.	+	+	43
<i>Conyza canadensis</i>	.	+	2	+	.	.	.	43
<i>Taraxacum officinale</i> agg.	.	+	+	.	.	.	+	43
<i>Daucus carota</i>	.	+	+	.	.	.	+	43
<i>Hordeum murinum</i>	.	+	.	2	2	.	.	43
<i>Polygonum arenastrum</i>	.	+	.	.	3	2	.	43
<i>Achillea crithmifolia</i>	.	.	.	+	.	2	1	43
<i>Trifolium dubium</i>	.	.	.	.	+	+	+	43
<i>Saponaria officinalis</i>	2	2	.	.	.	.	.	29
<i>Bromus tectorum</i>	1	.	.	1	.	.	.	29
<i>Malva sylvestris</i>	+	+	.	.	.	.	.	29
<i>Artemisia absinthium</i>	+	+	.	.	.	.	.	29
<i>Dactylis glomerata</i>	+	.	2	.	.	.	.	29
<i>Sisymbrium orientale</i>	+	.	.	+	.	.	.	29
<i>Elymus repens</i>	.	+	+	.	.	.	.	29
<i>Cardaria draba</i>	.	+	+	.	.	.	.	29
<i>Malva pusilla</i>	.	+	.	.	1	.	.	29
<i>Chenopodium album</i> subsp. <i>striatum</i>	.	+	.	.	+	.	.	29
<i>Verbescum densiflorum</i>	.	+	.	.	.	.	+	29

ANTHROPOGENOUS VEGETATION OF SOUTHERN BULGARIA

<i>Robinia pseudacacia</i>	.	r	r	.	.	.	.	29
<i>Sonchus asper</i>	.	.	r	.	.	r	.	29
<i>Bromus hordeaceus</i>	.	.	.	+	2	.	.	29
<i>Poa annua</i>	.	.	.	.	2	.	2	29
<i>Poa bulbosa</i>	.	.	.	.	2	.	2	29
<i>Erodium cicutarium</i>	.	.	.	.	+	.	+	29
<i>Cynoglossum officinale</i>	.	.	.	.	r	+	.	29
<i>Lactuca viminea</i>	.	.	.	.	r	.	+	29
<i>Euphorbia cyparissias</i>	.	.	.	.	.	+	+	29
E ₀								
<i>Bryum caespiticium</i> Hedw.	.	.	.	2	.	.	1	29
<i>Bryum argenteum</i> Hedw.	.	.	.	.	2	.	.	14
<i>Ceratodon purpureus</i> (Hedw.) Brid.	.	.	.	.	.	.	2	14

In one relevé only:

Relevé 1: *Trifolium campestre* +, *Coronilla varia* r;

Relevé 2: *Setaria viridis* 1, *Lactuca serriola* +, *Medicago lupulina* +, *Amaranthus retroflexus* +, *Plantago major* +, *Lotus tenuis* +, *Chenopodium opulifolium* +, *Clematis vitalba* +, *Salvia* spec. +, *Geranium* spec. r, *Armoracia rusticana* r;

Relevé 3: *Picris hieracioides* 1, *Anthemis tinctoria* 1, *Tussilago farfara* 1, *Rumex acetosella* 1, *Cytisus eriocarpus* +, *Brachypodium sylvaticum* +, *Salix* spec. +, *Chenopodium album* r, *Linaria genistifolia* r, *Sonchus oleraceus* r;

Relevé 4: *Petrorhagia prolifera* 1, *Crepis foetida* subsp. *rheadifolia* 1;

Relevé 5: *Chamomilla recutita* 2, *Spergula* spec. 1, *Chenopodium vulvaria* 1, *Silene alba* +, *Capsella bursa-pastoris* +, *Polycnemum* spec. +, *Lepidium* spec. +, *Carduus* spec. +, *Taraxacum* sec. *Erythrosperma* +, *Sclerochloa dura* +, *Sisymbrium officinale* r, *Tanacetum vulgare* r;

Relevé 6: *Linaria vulgaris* 2, *Tragopogon dubius* r, *Eryngium campestre*;

Relevé 7: *Ononis spinosa* 2, *Origanum vulgare* 1, *Scrophularia heterophylla* subsp. *laciniata* +, *Mentha* cf. *rotundifolia* +, *Euphorbia seguierana* +, *Hypericum* spec. +, *Sanguisorba minor* +, *Carex hirta* +, *Festuca pseudovina* +, *Bromus squarrosus* +, *Digitaria sanguinalis* +, *Asperula cynanchica* +, *Carduus* spec. r, *Filago* spec. r.

Localities of relevés:

1. Melnik, direction Karlanovo, near the Melnishka Reka River, abandoned site, July 29, 1978.
2. Melnik, near a monument at the road to Vinograd, August 8, 1983.
3. Melnik, parking lot, August 8, 1983.
4. Simitli, direction Bansko, near bridge over the Struma River, August 8, 1984.
5. Bansko, bus terminal, August 8, 1984.
6. Bansko, railway station, August 8, 1984.
7. Bansko, near bridge over the small river near the railway station, river alluvium, August 8, 1984.

Tab. 3. *BALLOTA NIGRA-ARTEMISIA ABSINTHIUM* Community.

Relevé No.	1	2	3	4	5	
Inclination	SW	W	W	—	S	
Slope (°)	10	30	10	—	20	
Sampled area (m ²)	12	16	18	9	8	
Cover (%)	60	85	65	80	80	
E₁						C
<i>Ballota nigra</i>	2	2	3	2	2	100
<i>Achillea crithmifolia</i>	+	1	1	+	1	100
<i>Artemisia absinthium</i>	2	2	.	1—2	1	80
<i>Anthemis cotula</i>	1	.	1	+	+	80
<i>Rumex crispus</i>	+	r	1	+	.	80
<i>Artemisia campestris</i> subsp. <i>lednicensis</i> (Rochel) Lemke et Rothm.	+	r	+	+	.	80
<i>Bromus sterilis</i>	.	2	+	2	2	80
<i>Onopordon acanthium</i>	.	+	+	r	1	80
<i>Taraxacum officinale</i> agg.	2	+	.	r	.	60
<i>Vulpia myuros</i>	2	.	1	1	.	60
<i>Artemisia vulgaris</i>	1	.	1	2	.	60
<i>Urtica dioica</i>	.	1	1	+	.	60
<i>Galium aparine</i>	.	1	1	+	.	60
<i>Papaver rhoeas</i>	.	1	.	1	+	60
<i>Hordeum murinum</i>	.	+	.	2	2—3	60
<i>Malva sylvestris</i>	.	+	.	+	+	60
<i>Saponaria officinalis</i>	1	.	1—2	.	.	40
<i>Caucalis platycarpus</i>	1	.	.	1	.	40
<i>Poa annua</i>	+	.	1	.	.	40
<i>Capsella bursa-pastoris</i>	+	.	.	+	.	40
<i>Clematis vitalba</i>	+	.	.	.	2	40
<i>Hypericum perforatum</i>	r	.	+	.	.	40
<i>Potentilla recta</i> agg.	r	.	.	r	.	40
<i>Sambucus ebulus</i>	.	2	.	1	.	40
<i>Verbena officinalis</i>	.	1	+	.	.	40
<i>Euphorbia esula</i>	.	+	r	.	.	40
<i>Fumaria officinalis</i>	.	+	.	.	+	40
<i>Descurainia sophia</i>	.	+	.	.	+	40
<i>Senecio</i> cf. <i>vernalis</i>	.	r	+	.	.	40
<i>Clematis recta</i>	.	.	+	+	.	40
<i>Lolium perenne</i>	.	.	+	r	.	40
<i>Erodium cicutarium</i>	.	.	.	r	+	40

In one relevé only:

Relevé 1: *Filago* spec. +, *Plantago lanceolata* 1, *Papaver albiflorum* +, *Arabidopsis thaliana* r, *Malva neglecta* r, *Nonea pulla* r;

Relevé 2: *Cynoglossum officinale* r, *Lactuca serriola* r;

Relevé 3: *Plantago major* +, *Medicago minima* r;

Relevé 4: *Arctium lappa* 1, *Reseda lutea* +, *Lamium amplexicaule* +, *Dactylis glomerata* r, *Potentilla reptans* +, *Veronica arvensis* +, *Vicia cracca* +, *Carduus acanthoides* +, *Valeriana locusta* +, *Poa bulbosa* r;

Relevé 5: *Convolvulus arvensis* 2, *Chaerophyllum* spec. 2, *Cannabis sativa* +—1, *Sisymbrium officinale* +.

Tab. 4. *CYMBALARIETUM MURALIS* Görs 1966

Relevé No.	1	2	3
Inclination	E	N	E
Slope (°)	90	90	90
Sampled area (m ²)	7	5	4
Cover (%)	10	10	5
<hr/>			
E ₁			
<i>Cymbalaria muralis</i>	2	2	+
<i>Parietaria officinalis</i>	+	.	+
<i>Lamium amplexicaule</i>	+	+	.
<i>Reseda lutea</i>	1	.	.
<i>Moehringia trinervia</i>	+	.	.
<i>Hypericum perforatum</i>	r	.	.
<i>Lactuca serriola</i>	r	.	.
<i>Ficus carica</i>	.	1	.
<i>Platanus orientalis</i>	.	1	.
<i>Lamium purpureum</i>	.	1	.
<i>Taraxacum officinale</i> agg.	.	+	.
<i>Clematis vitalba</i>	.	+	.
<i>Bromus sterilis</i>	.	r	.
<i>Sedum album</i>	.	.	+ - 1
<i>Centaurea affinis</i> subsp. <i>balcanica</i>	.	.	+
<i>Lamium garganicum</i>	.	.	+

Localities of relevés:

1. Asenovgrad, direction Asenovata Krepost Fortification, wall near the Tchepearska Reka River, May 7, 1983.
2. Asenovgrad, right bank of the Tchepearska Reka River, May 7, 1983.
3. Asenovgrad, walls of the Asenovata Krepost, May 7, 1983.

◀ Localities of relevés:

1. Melnik, edge of road, direction to Karlanovo, sandy heap, May 2, 1983.
2. Melnik, edge of the town, direction to Karlanovo, between the road and gardens, May 2, 1983.
3. Melnik, between road and a small park in the town, May 2, 1983.
4. Melnik, between the small park and river, May 2, 1983.
5. Asenovgrad, direction Asenovata Krepost Fortification, edge of the town, May 7, 1983.

Tab. 5. *CETERACH JAVORKEANUM-SEDUM ALBUM* Community

Relevé No.	1	2	3	4	5	6	
Inclination	SE	N	W	E	E	E	
Slope (°)	70	90	90	90	90	75	
Sampled area (m ²)	5	1	6	6	4	28	
Cover — herb layer (%)	10	10	10	12	7	25	
Cover — shrub layer (%)	—	—	—	—	—	4	

							C
E₂							
<i>Pistacia terebinthus</i>	.	.	.	.	.	.	17
<i>Fraxinus ornus</i>	.	.	.	.	.	.	17
E₁							
<i>Ceterach javorkeanum</i> (Vida) Soó	1	1	+	+—1	1—2	+	100
<i>Sedum album</i>	1—2	1	+	.	+	2	83
<i>Silene flavescens</i>	.	1—2	1—2	+	1	+	83
<i>Galium album</i>	.	r	.	1—2	r	+	67
<i>Achillea clypeolata</i>	.	.	1	1	+	1	67
<i>Verbascum longifolium</i>	.	.	r	1—2	1	r	67
<i>Parietaria officinalis</i>	.	1	.	.	+—1	.	33
<i>Lamium purpureum</i>	.	.	+	+	.	.	33
<i>Verbascum spec.</i>	.	.	.	+	r	.	33
<i>Inula verbascifolia</i> subsp. <i>aschersoniana</i>	.	.	.	r	.	2	33
<i>Cerastium arvense</i>	.	.	.	.	+	1	33
<i>Sempervivum spec.</i>	1	.	.	.	.	.	17
<i>Paliurus spina-christi</i>	.	.	+	.	.	.	17
<i>Geranium molle</i>	.	.	+	.	.	.	17
<i>Erysimum diffusum</i>	.	.	.	+	.	.	17
<i>Arenaria serpyllifolia</i>	.	.	.	+	.	.	17
<i>Mimuartia verna</i>	.	.	.	+	.	.	17
<i>Achillea crithmifolia</i>	.	.	.	r	.	.	17
<i>Taraxacum officinale</i> agg.	.	.	.	r	.	.	17
<i>Sedum telephium</i> subsp. <i>maximum</i>	.	.	.	r	.	.	17
<i>Seseli rhodopeum</i>	.	.	.	(r)	.	.	17
<i>Symphytum spec.</i>	.	.	.	.	r	.	17
<i>Jurinea mollis</i>	.	.	.	.	.	+	17
<i>Festuca pseudovina</i>	.	.	.	.	.	+	17
<i>Melica ciliata</i> agg.	.	.	.	.	.	+	17
<i>Allium spec.</i>	.	.	.	.	.	+	17
<i>Alyssoides graeca</i>	.	.	.	.	.	+	17
<i>Koeleria macrantha</i>	.	.	.	.	.	+	17
<i>Stachys recta</i>	.	.	.	.	.	r	17
<i>Erysimum cheiranthoides</i>	.	.	.	.	.	r	17
<i>Pistacia terebinthus</i>	.	.	.	.	.	r	17

Localities of relevés:

1. Stara Kresna, right bank of the Struma River above the village, May 7, 1983.
- 2.—5. Asenovgrad, walls of the Asenovata Krepost, direction to the town, May 7, 1983.
6. Asenovgrad, rocks near the Asenovata Krepost, May 7, 1983.

Tab. 6. *ACHILLEA CLYPEOLATA-VERBASCUM LONGIFOLIUM* Community

Relevé No.	1	2	3	4	5	
Inclination	SW	S	S	S	S	
Slope (°)	5	20	15	30	40	
Sampled area (m ²)	6	8	12	12	9	
Cover (%)	5	20	35	70	70	
<hr/>						
E ₁						C
<i>Achillea clypeolata</i>	+ - 1	1	r	1	+	100
<i>Sedum album</i>	.	.	.	3-4	4	50
<i>Verbascum longifolium</i>	1	1-2	2	+	.	80
<i>Silene flavescens</i>	1	2	2	.	.	60
<i>Centaurea affinis</i> subsp. <i>balcanica</i>	r	.	.	+	+	60
<i>Erysimum diffusum</i>	.	+	+	+	.	60
<i>Lamium purpureum</i>	r	.	+	.	.	40
<i>Thymus longicaulis</i>	.	.	.	1-2	1	40
<i>Seseli rhodopeum</i>	.	.	.	1	r	40
<i>Koeleria macrantha</i>	.	.	.	r	r	40
<i>Coronilla varia</i>	r	.	.	.	.	20
<i>Galium album</i>	.	1-2	.	.	.	20
<i>Alyssoides graeca</i>	.	+	.	.	.	20
<i>Stellaria media</i>	.	+	.	.	.	20
<i>Veronica hederifolia</i> s. s.	.	.	+ - 1	.	.	20
<i>Parietaria officinalis</i>	.	.	1	.	.	20
<i>Achillea crithmifolia</i>	.	.	r	.	.	20
<i>Chondrilla juncea</i>	.	.	.	1	.	20
<i>Euphorbia cyparissias</i>	.	.	.	+	.	20
<i>Malva sylvestris</i>	.	.	.	+	.	20
<i>Marrubium peregrinum</i>	.	.	.	+	.	20
<i>Lactuca viminea</i>	.	.	.	.	1	20
<i>Teucrium polium</i>	.	.	.	.	r	20
<i>Chrysopogon gryllus</i>	.	.	.	.	(r)	20

Localities of relevés:

1.—3. Asenovgrad, inside the Asenovata Krepost, May 7, 1983.

4.—5. Asenovgrad, limestone rocky escarpments at the Asenovata Krepost, May 7, 1983.

Tab. 7. *GERANIUM LUCIDUM-ROBINIA PSEUDACACIA* Community

Relevé No.	1	2
Exposition	SW	S
Slope (°)	30	30
Sampled area (m ²)	300	200
Cover — tree layer (%)	80	70
Cover — shrub layer (%)	20	20
Cover — herb layer (%)	80	80
<hr/>		
E ₃		
<i>Robinia pseudacacia</i>	5	4
E ₂		
<i>Robinia pseudacacia</i>	2	2
E ₁		
<i>Bromus sterilis</i>	4	4
<i>Rubus cf. canescens</i>	1	+
<i>Geranium lucidum</i>	+	+
<i>Brachypodium sylvaticum</i>	+	+
<i>Galium aparine</i>	1	.
<i>Dactylis glomerata</i> subsp. <i>aschersoniana</i>	1	.
<i>Valeriana locusta</i>	+	.
<i>Silene alba</i>	+	.
<i>Veronica chamaedrys</i>	+	.
<i>Geum urbanum</i>	+	.
<i>Linaria genistifolia</i>	+	.
<i>Verbascum spec.</i>	+	.
<i>Taraxacum officinale</i> agg.	.	1
<i>Sonchus arvensis</i>	.	1
<i>Carduus acanthoides</i>	.	1
<i>Crepis spec.</i>	.	1
<i>Poa nemoralis</i>	.	+
<i>Lactuca viminea</i>	.	+
<i>Teucrium chamaedrys</i>	.	+
<i>Erysimum diffusum</i>	.	r
<i>Digitalis lanata</i>	.	r
<i>Senecio cf. vernalis</i>	.	r

Localities of relevés:

- 1.—2. Between Lybovishtcha and Rozhen, slopes above the road connecting the villages, May 2, 1983.