The world of old oxbowlakes, ancient riverine forests and drained mires in the Tisza river basin

(International excursion to Eastern Hungary and Transcarpathia, Ukraine 31.08. – 04.09.2002)

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Abstract: The vegetation of 16 sites along the Tisza river and its tributaries from western Hungary and adjacent Ukraine are reported. Beside the forest and freshwater types from the river banks and the oxbow lakes, the vegetation of the drainage channels from the Transcarpathian basin is treated in detail. *Quercus hartwissiana*, a species of Transcaucasian origin, is reported from Transcarpathia for the first time.

Zusammenfassung: Die Auenvegetation von 16 Lokalitäten entlang der Theiß und ihrer Nebenflüsse in E-Ungarn und der angrenzenden Ukraine wird beschrieben. Neben der Wald- und Süßwasservegetation der Flußufer und Altarme wird die Wasservegetation der Entwässerungskanäle speziell berücksichtigt. *Quercus hartwissiana*, eine Art aus dem Transkaukasus-Gebiet, wird erstmals für Transkarpatien genannt.

Introduction

Starting in the XIX century, the original wilderness of the floodplains of the Tisza and its tributaries has been deeply transformed through significant changes in landuse policy in Hungary and the adjacent countries. Since that time and especially after the Second World War, no clear benefit to industry was perceived from these wetlands, and the impetus was to replace them with an intensive agriculture landscape. The establishment of several hundred kilometres of flood-control dykes, logging of floodplain forests and drainage of wetlands took place throughout the last two centuries. Now, only a small percentage of the original floodplain forest stands remain, and the habitat has become critically endangered all over Europe. Indeed, these forest types were described as the: "Most diverse, structurally, floristically and faunistically, of all

European ecosystems ..., the great fluvial forests of Europe are reduced to a few highly vulnerable examples" (MOSS et al. 1991).

The aim of our first international excursion was to produce a preliminary inventory of vegetation and make a conservation survey in the study area and adjacent territories defined within the objectives of the Project “Transcarpathian Riverine Forests, Ukraine“, UK006702P, supported by WWF-UK.

Methodological background

The Braun-Blanquet vegetation survey methodology (BRAUN-BLANQUET 1964) was used, and all surveyed sites (see fig. 1) were located using a Global Positioning System (GPS). The indicator species approach of ELLENBERG et al. (1991) for vascular plants was also tested.

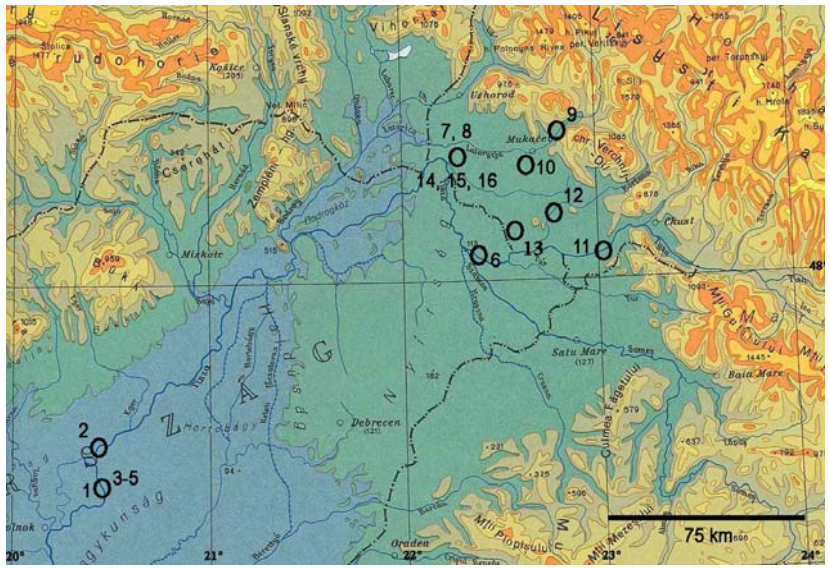

Fig. 1: Northeastern part of the Pannonian Plain and adjacent area with marked visited sites.

The nomenclature is based on TUTIN et al. (1968, 1972, 1976, 1980 and 1993) with the exception of the following species:

Betonica officinalis, Bolboschoenus maritimus, Fallopia dumetorum, Fallopia japonica, Fraxinus angustifolia subsp. *danubialis, Gnaphalium uliginosum, Lamiastrum montanum, Rosa blondeana, Schoenoplectus lacustris,* and *Tragopogon orientalis*.

Itinerary and vegetation observed

Saturday, August 31st 2002

The research group began its itinerary at “Budapest-Keleti” railway station and drove first to Szolnok in eastern Hungary.

SITE 1: HUNGARY, County Jász-Nagykun-Szolnok, "Csatloi" oxbow lake about 4 km directly N of Kötelek, on the orographic right bank of the Tisza river; 47°21.433’N/ 20°24.524’E; at 100 m altitude.

Site type: floodplain inside the outermost dyke, focussing on an oxbow lake that had been cut off from the main Tisza river channel approximately 100 years previously.

Tree layer: *Fraxinus americana, Populus ×canescens, Salix alba × fragilis*

Shrub layer: *Amorpha fruticosa*

a) Flat riverbanks and adjacent shallow water (dominant species in bold letters):

Bidens tripartita
Carex acuta
Echinochloa crus-galli
Hydrocharis morsus-ranae
Leersia oryzoides
Lycopus europaeus
Mentha arvensis
Oenanthe aquatica
Sagittaria sagittifolia
Sium latifolium
Sparganium erectum
Trapa natans
Xanthium strumarium
Bolboschoenus maritimus
Ceratophyllum demersum
Galium rubioides
Iris pseudacorus
Leucojum aestivum
Lythrum salicaria
Nymphaea alba
Rubus caesius
Salvinia natans
Solanum dulcamara
Stachys palustris
Typha latifolia

b) About 1.5 to 2 m above actual water level:

Shrub layer: *Sambucus nigra, Salix fragilis*

Field layer:

Althaea officinalis
Echinocystis lobata
Aristolochia clematitis
Lycopus europaeus

c) Gallery forest along the oxbow lake outside the old river dyke along old Tisza

Relevé area:10×15 m, heights of B1: 18 m, B2: 12 m

Upper tree layer: cover 70%

3 Populus ×canescens
2b Fraxinus pennsylvanica

Lower tree layer: cover 1%

\+ *Morus alba*
\+ *Fraxinus pennsylvanica*

Shrub layer: cover 40%

2b Fraxinus pennsylvanica
2a Amorpha fruticosa

Field layer: cover 15%

2m *Fraxinus pennsylvanica*
\+ *Solanum dulcamara*
\+ *Quercus robur*
\+ *Aristolochia clematitis*
1 *Amorpha fruticosa*
\+ *Rubus caesius*
\+ *Euphorbia lucida*
r *Asparagus officinalis*

Amongst other species present in this woodland were *Populus nigra* (s. str), *Euphorbia esula* (s.str) and *Lysimachia nummularia*.

SITE 2A: HUNGARY, County Heves, "Kanyari" oxbow lake about 1 km directly SW of Kisköre, on the orographic right bank of the Tisza river; 47°29.539’N/20°28.266’E; at 102 m altitude.

Site type: floodplain inside the oldest Tisza dyke. Closer to the present river course a new dyke has been constructed, which means that no flooding occurs in this area and there is consequently a low sedimentation rate. The oxbow lake has been cut off from flooding by the Tisza for about 120 years.

Shrub layer: *Salix alba × fragilis*

Flat river banks and adjacent oxbow:

Calystegia sepium
Hydrocharis morsus-ranae
Oenanthe aquatica
Polygonum amphibium
Typha cf. *latifolia*
Echinocystis lobata
Lycopus europaeus
Phragmites australis
Rubus caesius

In shallow water:

Ceratophyllum demersum
Myriophyllum spicatum
Lemna trisulca

On the dyke along the road to the adjacent arable fields:

Artemisia vulgaris
Bromus inermis
Chenopodium glaucum
Fallopia dumetorum
Lolium perenne
Rosa canina agg.
Atriplex oblongifolia
Chenopodium album
Cuscuta campestris on *P. aviculare* s.str.
Lactuca viminea
Polygonum aviculare s.str.
Sambucus ebulus

SITE 2B: HUNGARY, County Heves, "Kanyari" oxbow lake (the central part of it is situated 3 km directly SW of Kisköre) on the orographic right bank of the Tisza at 102 m altitude.

Site type: floodplain inside the oldest Tisza dyke. As with Site 2A, a newer dyke separates the oxbow from the present river course, meaning that no flooding usually occurs in this area and that sedimentation rates are very low. The oxbow lake has been cut off from the river for about 120 years.

Inner (deposition) bank of the oxbow lake, together with adjacent arable fields (*Cucurbita pepo*) and an abandoned area with scattered trees (*Salix alba × fragilis*, *Populus alba, Populus ×canescens, Juglans regia* u.a.) as well as *Phragmites australis, Calystegia sepium* and *Lycopus europaeus.*

Shallow water: *Ceratophyllum* cf. *submersum*

Arable fields and adjacent abandoned areas:

Arctium cf. *nemorosum*
Atriplex oblongifolia
Calamagrostis epigejos
Cirsium arvense
Falcaria vulgaris
Lathyrus tuberosus
Pastinaca sativa
Rubus caesius
Setaria viridis
Xanthium strumarium
Artemisia vulgaris
Bromus inermis
Cichorium intybus
Daucus carota
Glycyrrhiza echinata
Lolium perenne
Polygonum aviculare s.str.
Setaria pumila
Tanacetum vulgare

Sunday, September 1st 2002

Driving from our overnight stay at Kisköre, we journeyed to Tiszaroff and from there went along the dyke about 2.5 km in a southerly direction to a point west along a forestry track from the 121.8 km distance marker on the dyke.

SITE 3: HUNGARY, County Jász-Nagykun-Szolnok, about 2 km directly south of Tiszaroff on the orographic left bank of the Tisza river; 47°21.785'N/20°27.113'E; at 105 m above sea level.

Site type: floodplain within the main Tisza dykes.

Relevé area: 20×30 m, vegetation cover: 85%, tree layer height: 25 m

Tree layer: cover 30%

3 *Populus ×canadensis*

Shrub layer: cover 50%

3 *Amorpha fruticosa*
1 *Vitis vinifera* subsp. *vinifera*
\+ *Calystegia sepium*
2b *Fraxinus pennsylvanica*
\+ *Humulus lupulus*

Field layer: cover 20%

2a *Rubus caesius*
2m *Scutellaria galericulata*
1 *Vitis vinifera* subsp. *vinifera*
1 *Stachys palustris*
1 *Lycium europaeum*
1 *Aristolochia clematitis*
\+ *Populus ×canadensis*
\+ *Calystegia sepium*
r *Humulus lupulus*
2a *Fraxinus pennsylvanica*
2m *Amorpha fruticosa*
1 *Urtica dioica*
1 *Lysimachia vulgaris*
1 *Leucojum aestivum*
\+ *Symphytum officinale*
\+ *Galium elongatum*
r *Urtica galeopsifolia*
r *Equisetum arvense*

On the forest edge:

Asclepias syriaca
Buglossoides purpurocaerulea
Inula britannica
Lythrum salicaria
Verbena officinalis
Ballota nigra
Carex riparia
Leucanthemella serotina
Scrophularia nodosa

Degraded wet meadow and track margins:

Althaea officinalis
Ambrosia artemisiifolia
Chenopodium album
Chenopodium polyspermum
Echinochloa crus-galli
Glyceria maxima
Hibiscus trionum
Myosoton aquaticum
Polygonum lapathifolium
Scutellaria galericulata
Sonchus arvensis
Amaranthus retroflexus
Bidens tripartita
Chenopodium hybridum
Conyza canadensis
Echinocystis lobata
Gnaphalium uliginosum
Lycopus europaeus
Oxalis europaea
Portulaca oleracea
Setaria pumila
Xanthium strumarium

SITE 4: HUNGARY, County Jász-Nagykun-Szolnok, "Gói-tó" oxbow lake about 3.5 km directly south of Tiszaroff, on the orographic left bank of the Tisza river; 47°21.610'N/ 20°28.023'E; at 100 m alt. Surveyed site was located west of the 120.7 km distance marker on the dyke.

Site type: outer (eroding) bank of the oxbow lake.

Tree layer: *Fraxinus americana*, *Salix alba* × *fragilis* and poplar plantations along both river banks.

Within the forest stands:

Ambrosia artemisiifolia
Carex brizoides
Carex sylvatica
Echinochloa crus-galli
Lythrum salicaria
Poa annua
Amorpha fruticosa
Carex hirta
Conyza canadensis
Juncus tenuis (on path)
Plantago major
Rubus caesius

Adjacent shallow water:

Relevé area: 2 m^2; total cover 95 %

4 *Hydrocharis morsus-ranae*
1 *Ceratophyllum demersum*
2a *Salvinia natans*
r *Trapa natans*

A very narrow fringe of lakeshore vegetation occurred, comprising the following species locally. In most parts of the oxbow, shade from the *Fraxinus americana* extended over the water.

Bidens tripartita
Carex acuta
Inula britannica
Plantago major
Scutellaria galericulata
Lycopus europaeus
Lysimachia vulgaris

SITE 5: HUNGARY, County Jász-Nagykun-Szolnok, about 3.5 km directly south of Tiszaroff, on the orographic left bank of the Tisza river outside the main dyke and thus no longer flooded; at 47°22.386'N/20°27.883'E and 100 m altitude. The site lay immediately east of the 122.2 km distance marker on the dyke.

Site type: Oak-(Ash) plantation

Relevé area: 10×25 m, vegetation cover: 90%, height: 18 m of B1 layer.

Tree layer: cover 60%

4 *Quercus robur* 2a *Fraxinus angustifolia* subsp. *danubialis*

Shrub layer: cover 30%

2a *Fraxinus angustifolia* subsp. *pannonica* 1 *Ulmus minor*
1 *Ulmus laevis* 1 *Amorpha fruticosa*

Field layer:

2m *Fraxinus pennsylvanica* 2m *Fraxinus angustifolia* subsp. *danubialis*
2m *Calamagrostis epigejos* 1 *Vitis vinifera* subsp. *Vinifera*
1 *Ulmus minor* 1 *Rubus caesius*
1 *Quercus robur* 1 *Festuca rubra*
\+ *Rosa blondaeana* \+ *Prunus spinosa*
\+ *Cephalanthera longifolia* \+ *Epipactis atrorubens*
\+ *Astragalus glycyphyllos* \+ *Arrhenatherum elatius*
r *Vicia cracca* r *Taraxacum* sp.
r *Juglans regia* r *Euphorbia* sp.

The dyke bank separating this oak-ash plantation from the floodplain had some areas of steppic grassland, marked out from the more mesotrophic swards by:

Thalictrum lucidum *Euphorbia esula* s.str.
Galium boreale *Dichanthium ischaemum*
Eryngium planum *Salvia nemorosa*
Scabiosa ocholeuca *Eryngium campestre*
Artemisia pontica

From here, we drove to Nyiregyháza, observing the following alien trees planted on the roadside:

Acer saccharinum *Pinus nigra*
Robinia pseudacacia *Sophora japonica*

The last stage of our itinerary for the day took us via Vásárosnemény to Gulács, where we examined oxbow lakes of the Tisza river WSW of the village.

SITE 6A: HUNGARY, County Szabolcs-Szatmár-Bereg, about 3 km West of Gulács, on the orographic right bank of the Tisza river. Here we examined two oxbow lakes within the highest lying flood dyke at "Holt Tisza" (110 m altitude). The largest oxbow lay closer to the present course of the Tisza, and was separated from the second smaller oxbow by arable fields and a *Juglans regia* plantation. This inner larger lake had a characteristic zonation:

On the steep slopes of the river banks:

Tree layer:

Fraxinus pennsylvanica *Robinia pseudacacia (*with *Viscum album)*
Ulmus laevis

Shrub layer:

Acer negundo *Cornus sanguinea*
Euonymus europaea *Humulus lupulus*
Morus alba *Sambucus nigra*

Field layer:

Arctium tomentosum *Aristolochia clematitis*
Chaerophyllum aureum *Echinochloa crus-galli*
Filipendula ulmaria *Phragmites australis*
Rubus caesius *Sambucus ebulus*
Urtica dioica

Site type: inner (deposition) slope and adjacent shallow water zone.

Relevé area: 10×5 m, vegetation cover: ≤ 90%:

5 *Trapa natans* 1 *Stachys palustris*
1 *Sparganium erectum* 1 *Sagittaria sagittifolia*
\+ *Urtica dioica* \+ *Scutellaria galericulata*
\+ *Polygonum amphibium* \+ *Equisetum fluviatile*
r *Iris pseudacorus*

Relevé area: 1×15 m, vegetation cover: ≤ 85%

5 *Glyceria maxima* 2a *Calystegia sepium*
2m *Lycopus europaeus* 1 *Rubus caesius*
1 *Polygonum hydropiper* 1 *Bidens tripartita*
\+ *Echinocystis lobata* r *Oenanthe aquatica*

Relevé area: 1×6 m, vegetation cover: ≤ 75%

5 *Glyceria maxima* 2b *Schoenoplectus lacustris*
1 *Lycopus europaeus* 1 *Bidens cernua*
\+ *Trapa natans* \+ *Equisetum fluviatile*

Amongst the aquatic and marginal vegetation outside these sample relevés were

Nymphaea candida *Ceratophyllum demersum*
Angelica sylvestris *Sagittaria sagittifolia*
Echinochloa crus-galli

SITE 6B: The small oxbow lake near the dyke.

Tree layer:

Fraxinus angustifolia subsp. *danubialis* *Salix fragilis*
Acer campestre

Shrub layer:

Acer negundo *Calystegia sepium*
Fraxinus angustifolia subsp. *danubialis* *Fraxinus pennsylvanica*
Salix fragilis *Solanum dulcamara*

Field layer:

Bidens cernua
Calystegia sepium
Glyceria maxima
Lycopus europaeus
Mentha arvensis
Ranunculus repens
Rumex cf. *sanguineus*
Typha latifolia
Vitis vinifera
Bidens tripartita
Carex riparia
Iris pseudacorus
Lysimachia vulgaris
Polygonum hydropiper
Rubus caesius
Typha angustifolia
Urtica dioica
Xanthium strumarium

Forest fringe to the dyke: *Chenopodium polyspermum*

We took our overnight stay in the Hotel Tara in Nyíregyháza-Sóstó.

Monday, September 2nd 2002

Starting in Nyíregyháza at 9:30, we drove to Zahony/Chop and crossed the border into Ukraine between 12:00–12:45

SITE 7: UKRAINE, Transcarpathia, Uzhgorod Rayon [county], Chervone: Drainage channel near road bridge; 48°25.206'N/22°17.727'E; 115 m altitude.

The Transcarpathian Plain (a former area of peat-bogs) has been heavily drained with the construction of surface-water channels starting in the XIX century and continuing to the present day. In the last century alone, about 20,000 ha of wetlands (mainly peat-bog) were destroyed and the hydrological system of the plain has been partly damaged as a result of intensive drainage effort. However, within these drainage channels all over the plain, a large number of aquatic plants occur that are included in the Ukrainian Red List. Our first stop near a small bridge across such a channel near the village of Chervone revealed:

Bidens tripartita
Calystegia sepium
Hydrocharis morsus-ranae
Lysimachia vulgaris
Myriophyllum spicatum
Nymphaea alba
Phalaris arundinacea
Salvinia natans
Sparganium erectum
Trapa natans
Typha latifolia
Butomus umbellatus
Glyceria maxima
Iris pseudacorus
Lythrum salicaria
Nuphar lutea
Nymphaea candida
Potamogeton lucens
Schoenoplectus lacustris
Stratiotes aloides
Typha angustifolia

On slopes of the dyke (including damp gullies) occurred:

Agrimonia eupatoria
Carex hirta
Cirsium canum
Eryngium planum
Festuca valesiaca
Inula britannica
Potentilla neglecta
Tragopogon orientalis
Althaea officinalis (gully)
Carex riparia (gully)
Dipsacus laciniatus
Festuca rupicola
Galega officinalis
Juncus effusus (gully)
Tanacetum vulgare

Fig. 2a (left): Drainage channel in the Trancarpathian Plain near the village of Chervone (site no 7). - 2b (right): Trapaetum natantis in the drainage channel near Chervone village.

SITE 8: UKRAINE, Transcarpathia, Uzhgorod Rayon [county]: Chomonyn forest; 48°25.182'N/ 22°25.430'E; about 115 m a.s.l.

The fragmented areas of surviving wetland (about 15,000 ha), mainly comprise oak-ash flooded/damp forests, but also include wet meadows, swamps, small lakes and ponds. These are located within the limits of the Tysa (Tisza), Latorytsya, Borzhava and other river basins (close to the Hungarian, Romanian and Slovakian borders) and are the main biodiversity centres in the area.

One example of damp forest (outside the dyke and thus now never flooded) consisted of Fraxino-pannonicae-Ulmetum Soó 1960 with the composition listed below:

Relevé area: 20×30 m, vegetation cover: ≤ 70%.

Upper tree layer: height 28 m, cover: 50%

3 *Quercus robur*
1 *Fraxinus angustifolia* subsp. *danubialis*

Lower tree layer: height: 15 m, cover: 25%

2b *Fraxinus angustifolia* subsp. *pannonica*
1 *Carpinus betulus*
\+ *Acer negundo*
1 *Quercus robur*
1 *Acer campestre*

Shrub layer: height: 1-8 m, cover: 25 %

2b *Cornus sanguinea*
1 *Crataegus laevigata*
1 *Acer campestre*
\+ *Humulus lupulus*
\+ *Frangula alnus*
r *Sambucus nigra*
1 *Ulmus laevis*
1 *Acer negundo*
\+ *Ligustrum vulgare*
\+ *Fraxinus angustifolia* subsp. *pannonica*
\+ *Euonymus europaea*

Field layer: up to 1 m height, cover: 25%

2a *Rubus caesius*
2m *Viola reichenbachiana*
2m *Galium odoratum*
2m *Fraxinus angustifolia* subsp. *pannonica*
2m *Brachypodium sylvaticum*
1 *Ulmus laevis*
1 *Stellaria nemorum*
1 *Prunus avium*
1 *Lysimachia nummularia*
1 *Galium elongatum*
1 *Euonymus europaea*
1 *Asarum europaeum*
1 *Acer campestre*
\+ *Veronica chamaedrys*
\+ *Polygonatum multiflorum*
\+ *Geum urbanum*
\+ *Dryopteris filix-mas*
\+ *Crataegus laevigata*
r *Ranunculus auricomus* s.l.
2a *Cornus sanguinea*
2m *Quercus robur*
2m *Galium aparine*
2m *Circaea lutetiana*
1 *Urtica dioica*
1 *Torilis japonica*
1 *Prunus spinosa*
1 *Moehringia trinervia*
1 *Geranium robertianum*
1 *Galeopsis speciosa*
1 *Carex brizoides*
1 *Ajuga reptans*
\+ *Viburnum opulus*
\+ *Pulmonaria officinalis*
\+ *Ligustrum vulgare*
\+ *Fallopia dumetorum*
\+ *Deschampsia cespitosa*
\+ *Alliaria petiolata*
r *Pyrus pyraster*

Other species noted in the forest, but outside the sample relevé were

Acer tataricum
Corylus avellana
Oenanthe aquatica
Salix cinerea
Tilia cordata
Bidens tripartita
Lycopus europaeus
Polygonum hydropiper
Betonica officinalis

One of the most important findings of our excursion was *Quercus hartwissiana* Stev., which was observed just outside the relevé described above. We believe that this oak was probably planted using Transcaucasian seeds following the Second World War, and became successfully naturalised. The size of the present population (or populations) in Transcarpathia needs to be assessed.

Information note:

Quercus hartwissiana Stev. 1857, Bull.Soc.Nat.Mosc. 30:387. - *Q. armeniaca* Kotschy, 1862, Die Eichen: tab.25. - *Q. stranjensis* Turrill, 1928, Mitt. Bulg. Bot. Gesellsch. 2: 62. Locus classicus: [Western Georgia] “Sylvae Mingreliae et Imeretiae” (MENITSKIY, 1984). Spread in Europe: Bulgaria, European Turkey. Distributed in Asia: Anatolia, Kolkhida, north-western Caucasus. It occurs as a component of floodplain and hilly forest types. Mesophilic, it needs a long growing season for normal development, and prefers extreme wetness (*i.e*. standing, flooding water, even bogs). *Q. hartwissiana* has a fast growing character: 1.2–1.3 times faster than *Q. robur* and 1.5-1.8 times faster than *Q. petraea*; (MENITSKIY 1984). This attribute of *Q. hartwissiana* was one of the reasons for the introduction of this species and could also be an advantage in its continuing spread.

SITE 9: UKRAINE, Transcarpathia, Svalyava Rayon [county], Suskovo: Gravel river bed of Latorytsya river; 48°32.550’N/22°55.810’E; 172 m a.s.l.

The south-western slopes of the Ukrainian Carpathians are drained by many rivers, most of which have a high degree of naturalness. However, signs of human impact are seen often, such as rubbish dumping or agricultural patches near the river, which although officially illegal are often tolerated by local authorities. For example, where the Latorytsya passes close to Mukachevo city, the banks and much adjacent disturbed ground are infested with the neophyte *Reynoutia* ×*bohemica* (hybrid of *R. japonica* and *R. sachalinensis*). Away from this pervading urban influence, in the Carpathian foothills, *Salix* shrub communities are extensive on riverine gravels and play an important role in holding back the water during the flash floods within the river.

Shrub layer: (dominants in bold)

Alnus glutinosa
Humulus lupulus
Salix purpurea
Crataegus monogyna
Salix fragilis

Field layer:

Cynodon dactylon
Euphorbia cyparissias
Galinsoga ciliata
Impatiens parviflora
Myosoton aquaticum
Salvia verticillata
Verbena officinalis
Equisetum telmateia
Galeopsis tetrahit
Heracleum sosnowski
Mentha longifolia
Salvia glutinosa
Verbascum nigrum

In moist hollows:

Alisma plantago-aquatica
Cyperus fuscus
Equisetum palustre
Juncus inflexus
Odontites vernus
Polygonum mite
Rorippa palustris
Xanthium strumarium
Bidens cernua
Eleocharis palustris
Glyceria spec.
Lythrum hyssopifolia
Polygonum hydropiper
Pulicaria vulgaris
Senecio aquaticus subsp. *barbareifolius*

On gravel banks by the river:

Acer negundo
Amaranthus cruentus
Callistephus chinensis (garden escape)
Echinochloa crus-galli
Epilobium hirsutum
Galeopsis pubescens
Veronica opaca
Polygonum hydropiper
Polygonum mite
Salix purpurea
Agrostis stolonifera
Bidens tripartita
Chenopodium polyspermum
Elsholtzia ciliata
Eupatorium cannabinum
Galium album subsp. *pycnotrichum*
Pentstemon sp. (garden escape)
Polygonum lapathifolium
Salix fragilis

Fig. 3: Gravelly river bed of the upper Latorytsya north of Mukachevo near Suskovo. Driftwood has been sedimented during the flood.

Across the road on stony dry/wet surface by the roadside:

Ambrosia artemisifolia
Clematis vitalba
Conyza canadensis
Equisetum palustre
Linaria vulgaris
Lycopus europaeus
Odontites serotinus
Hieracium pilosella
Quercus robur
Thymus pannonicus
Athyrium filix-femina
Clinopodium vulgare
Daucus carota
Galium verum
Lotus corniculatus
Mentha longifolia
Pastinaca sativa
Potentilla anserina
Sanguisorba minor

We stayed for two nights in Mukachevo whilst we explored Transcarpathian Ukraine, with a view directly over a canalised portion of the Latorytsya, where the course of the river was confined by retaining concrete walls.

Tuesday, September 3rd 2002

SITE 10: UKRAINE, Transcarpathia, Mukachevo Rayon [county], S of Mukachevo: "Ostrosh" forest; 48°23.788'N/22°40.605'E; 155 m a.s.l.

Oak-hornbeam forest, coppice with standards, about 160 years old, with a very small addition of planted *Platanus.* Vegetation cover 80%. Typical dimensions for the dominant tree species are: *Quercus robur*: 36 m high, BHD (diameter at breast height): 60 cm; *Carpinus betulus*: 25 m, BHD: 60. The rising human impact and decreasing water level encourage the growth of hornbeam.

An example of Querco robori-Carpinetum at this location comprised:

Upper tree layer: height: 28-32 m, cover: 65%

3 *Carpinus betulus*
3 *Quercus robur*

Lower tree layer: height: 18-22 m, cover: 25-30%

3 *Carpinus betulus*
1 *Quercus robur*

Shrub layer: shrub height: 1-12 m, cover: 10-15 %

2a *Carpinus betulus*
1 *Cornus sanguinea*

Field layer: height: up to 1 m, cover: 5-10%

2m *Viola odorata*
2m *Lamiastrum montanum*
2m *Carpinus betulus*
1 *Stellaria holostea*
1 *Pulmonaria obscura*
1 *Milium effusum*
1 *Euonymus europaea*
1 *Cornus sanguinea*
1 *Carex sylvatica*
1 *Asarum europaeum*
\+ *Geranium robertianum*
\+ *Brachypodium sylvaticum*
\+ *Anemone nemorosa*
\+ *Melampyrum nemorosum*
r *Prunus avium*
2m *Rubus caesius*
2m *Galium odoratum*
2m *Aegopodium podagraria*
1 *Quercus robur*
1 *Polygonatum multiflorum*
1 *Geum urbanum*
1 *Dactylis glomerata*
1 *Circaea lutetiana*
1 *Carex brizoides*
1 *Ajuga reptans*
\+ *Galeopsis speciosa*
\+ *Alliaria petiolata*
\+ *Cerastium sylvaticum*
r *Sambucus nigra*

Forest use: recreation for the inhabitants of Mukachevo; selected cutting of single trees for furniture. Planting of *Q. robur* seeds of local provenance.

Lower-lying parts of the forest are occupied by *Alnus glutinosa*, together with a little *Quercus robur* and *Frangula alnus (*Alnetum glutinosae Mejer-Drees 1936). Typical nettles of this ground flora are *Urtica galeopsifolia*, *U. kiovensis* (rare in Transcarpathia) and *U. dioica*, as well as other wetland herbs:

Lythrum hyssopifolia
Carex elongata
Carex vesicaria
Caltha palustris
Glyceria maxima
Oenanthe aquatica
Hottonia palustris
Callitriche stagnalis
Carex riparia
Lysimachia vulgaris
Galium elongatum
Myosoton aquaticum
Selinum carvifolia

Fig. 4: Old growth oak-hornbeam forests on gley soils at the 'Ostrosh' forest massif (site no 10) south of Mukachevo. Oak standards and hornbeam coppice.

In contrast, those parts of the forest that stand 1-1.5 m above the floodwater are occupied by *Fagus sylvatica* (Fagetalia silvaticae (Pawl.1928) Tx. et Diem. 1936).

Relevé area: 20×30 m, vegetation cover 70%

Upper tree layer: height: 28-32 (35) m, cover: 40%

2b *Quercus robur* 2a *Fagus sylvatica*
2a *Carpinus betulus*

Lower tree layer: height: 20-22 (25) m, cover: 50%

3 *Carpinus betulus*

Shrub layer: height: 1-8 m, cover: 10 %

2a *Carpinus betulus* 1 *Corylus avellana*
\+ *Tilia cordata* + *Fagus sylvatica*
\+ *Acer campestre*

Fig. 5a (left): *Alnus glutinosa* and *Quercus robur* in depressions of the 'Ostrosh' forest massif south of Mukacevo (site no 10). - 5b (right): *Hottonia palustris* in the depressions with standing water.

Field layer: height: up to 1 m, cover: 10-15%

2a *Lamiastrum montanum* 2m *Rubus caesius*
2m *Hedera helix* 2m *Galium odoratum*
2m *Fagus sylvatica* 2m *Aegopodium podagraria*
2m *Carpinus betulus* 1 *Viola odorata*
1 *Viburnum opulus* 1 *Tilia cordata*
1 *Stellaria holostea* 1 *Quercus robur*
1 *Milium effusum* 1 *Maianthemum bifolium*
1 *Corylus avellana* 1 *Carex brizoides*
1 *Asarum europaeum* 1 *Ajuga reptans*
\+ *Polygonatum multiflorum* + *Galeopsis speciosa*
\+ *Euphorbia amygdaloides* + *Euonymus europaea*
\+ *Dactylis glomerata* + *Acer campestre*
r *Rosa canina* r *Epipactis atrorubens*

The next goal on our journey lay near Vinogradiv, where we passed the Chorna Hora (Black Hill) Local Nature Reserve, where the basaltic rock supports a xerothermic flora (dominated by *Q. petraea*).

SITE 11: UKRAINE, Transcarpathia, Vinogradiv Rayon [county], 2 km due east of Vinogradiv on the gravel bed of the Tisza; 48°13'N/23°07'E; 140 m a.s.l.

Here were heavily grazed stands with scattered trees of *Populus nigra* (Black Poplar), in an area that is ideal for bats, which use the habitat to live and hunt in. These old trees may need to be protected as a genetic reserve for black poplar, taking into consideration the recent rapid hybridisation processes within this genus. Black poplar

plays an essential role as a anti-erosion tree along gravel river banks, and its elimination could stimulate renewed erosion:

Upper tree layer:

Alnus glutinosa
Populus alba,
Salix alba × *fragilis*
Populus ×*canescens*
Populus nigra

Lower tree layer:

Fraxinus pennsylvanica
Fraxinus excelsior × *angustifolia* subsp*. danubialis*
Pyrus pyraster

Shrub layer:

Acer negundo
Cornus sanguinea
Fraxinus pennsylvanica
Prunus spinosa
Salix triandra (rare)
Alnus incana
Crataegus monogyna
Juglans regia
Salix purpurea

Field layer:

Achillea millefolium agg.
Anchusa officinalis
Aristolochia clematitis
Centaurea arenaria subsp. *borysthenica*
Centaurea jacea agg.
Chenopodium album
Chenopodium schraderanum
Clematis vitalba
Daucus carota
Dipascus fullonum
Elsholtzia ciliata
Erodium cicutarium
Eupatorium cannabinum
Helianthus tuberosus
Lepidium ruderale
Medicago sativa agg.
Odontites vernus
Plantago lanceolata
Prunella vulgaris
Rosa canina agg.
Sambucus ebulus
Solidago gigantea
Tussilago farfara
Verbascum phlomoides
Ambrosia artemisifolia
Arctium cf. *lappa*
Artemisia absinthium
Xanthium strumarium
Chaenarrhinum minus
Chenopodium botrys
Cirsium arvense
Cynoglossum officinale
Digitaria ischaemum
Echinochloa crus-galli
Erigeron annuus
Eryngium planum
Euphorbia cyparissias
Leontodon hispidus
Lythrum salicaria
Mentha longifolia
Ononis spinosa
*Populus nigra (*seedlings*)*
Fallopia japonica
Rubus caesius
Setaria pumila
Tanacetum vulgare
Urtica dioica
Verbena officinalis

Fig. 6: Heavily grazed *Populus nigra* stands in the floodplain of Tisza river near the town of Vinogradiv (site no 11).

SITE 12: UKRAINE, Transcarpathia, Beregovo Rayon [county], 3 km directly E of Velyki Berehy, “Atak” Local Nature Reserve; [48°14.062’N/22°48.078 outside the forest]; 132 m a.s.l.

Vegetation type: Riverine forest along Borshava river. This is probably one of the oldest remnants of ancient riverine forests in Central Europe. Here was observed another example of the Fraxino pannonicae-Ulmetum Soó. However the community here is of a drier variant than the s.str. type, and was located on a high river bank with sandy sedimentation in the upper layers of the soil, with only a short period of a standing water during floods.

Relevé area: 20×30 m, vegetation cover ≤ 85%, ash and oak with BHD: 40-65 cm.

Upper tree layer: height: 35-40 m, cover: 35%

2b *Fraxinus angustifolia* subsp*. danubialis*
2m *Hedera helix*
2b *Quercus robur*

Lower tree layer: height: 20-25 m, cover: 60%

3 Carpinus betulus
2a *Fraxinus angustifolia* subsp*. danubialis*
1 *Quercus robur*
2b *Acer campestre*
2m *Hedera helix*

Fig. 7: Riverine forest dominated by *Fraxinus angustifolia* and *Quercus robur* along Borshava river near the village of Kvasovo.

Shrub layer: height: 1-10 (12) m, cover: 20 %

2a *Carpinus betulus*
2m *Cornus sanguinea*
1 *Ulmus minor*
1 *Crataegus laevigata*
2m Hedera helix
2m *Acer campestre*
1 *Sambucus nigra*

Field layer: height: up to 1 m, cover: 50-55%

2m *Acer campestre*
r *Ajuga reptans*
\+ *Carex remota*
\+ *Circaea lutetiana*
1 *Cornus sanguinea*
2m *Euonymus europaea*
\+ *Geum urbanum*
2m *Lamiastrum montanum*
\+ *Polygonatum multiflorum*
1 *Rubus caesius*
\+ *Ulmus minor*
\+ *Viburnum opulus*
3 *Aegopodium podagraria*
1 *Brachypodium sylvaticum*
1 *Carex sylvatica*
1 *Convallaria majalis*
\+ *Crataegus laevigata*
1 *Fraxinus angustifolia* subsp*. danubialis*
3 *Hedera helix*
1 *Milium effusum*
\+ *Pulmonaria officinalis*
1 *Sambucus nigra*
1 *Urtica galeopsifolia*
\+ *Viola reichenbachiana*

The forest flora here was especially rich, and other species found outside the sample relevé were:

Acer tataricum
Athyrium filix-femina
Cerastium sylvaticum
Dryopteris filix-mas
Galium odoratum
Lathyrus vernus
Maianthemeum bifolium
Neottia nidus-avis
Platanthera bifolia
Scrophularia nodosa
Tilia cordata
Asarum europaeum
Bromus benekenii
Dactylis glomerata
Epipactis albensis
Glechoma hederacea
Lysimachia nummularia
Mercurialis perennis
Paris quadrifolia
Prunella vulgaris
Stellaria nemorum
Vincetoxicum hirundaria

The age of the forest stands is more than 170 years old. Flood frequency is usually with up to six floods in a year, though our visit was at the end of an exceptionally dry summer. A full relevé was not conducted but the following species were noted.

Species of the ancient riverine forest – including frequently and rarely flooded areas

Acer campestre
Allium ursinum
Cardamine amara
Carex remota
Carex sylvatica
Cerastium sylvaticum
Convallaria majalis
Festuca gigantea
Galium odoratum
Hedera helix
Lysimachia vulgaris
Malus sylvestris
Milium effusum
Polygonum hydropiper
Ranunculus auricomus
Stellaria nemorum
Viola reichenbachiana
Aegopodium podagraria
Bidens tripartita
Cardamine impatiens
Carex strigosa
Cephalanthera longifolia
Circaea lutetiana
Fagus sylvatica
Fraxinus angustifolia subsp*. danubialis*
Glechoma hederacea
Lathyrus vernus
Maianthemum bifolium
Matteuccia struthiopteris
Polygonatum multiflorum
Populus ×canescens
Rubus caesius
Urtica galeopsifolia

Species of the forest margins – especially more disturbed and wet areas

Althaea officinalis
Bidens pilosa
Echinocystis lobata
Galinsoga ciliata
Phalaris arundinacea
Salix triandra
Ambrosia artemisiifolia
Cuscuta europaea
Epilobium hirsutum
Lythrum virgatum
Rorippa sylvestris
Scrophularia nodosa

Fig. 8: The old growth forest of the 'Atak' Local Forest Reserve near the village of Velyki Berehy (site no 12). The authors together with local forester and volunteer.

SITE 13: UKRAINE, Transcarpathia, Beregovo Rayon [county], 2 km linear distance W of Dyida; 48°12.941'N/22°32.559; 128 m a.s.l.

Vegetation type: The mire that formerly occurred here has been drained and changed into a large pond. In 2001 a local nature reserve was established here to prevent any further ecosystem transformation. Ten types of aquatic and marginal vegetation (A-J) present here are summarised below. The lagoon was prone to drawdown, exposing large areas of wet mud.

A. Hydrochari-Stratiotetum Westhoff 1942 (two relevés):

Relevé area: 4×15 m, vegetation cover 95%

5 *Stratiotes aloides*
2m *Utricularia australis*
1 *Lemna trisulca*
1 *Hydrocharis morsus-ranae*
2b *Ceratophyllum demersum*
2m *Salvinia natans*
1 *Lemna minor*

Relevé area: 2×3 m, vegetation cover 70%

3 *Hydrocharis morsus-ranae*
2a *Stratiotes aloides*
2a *Polygonum amphibium*
\+ *Lemna trisulca*
r *Glyceria maxima*
3 *Ceratophyllum demersum*
2a *Salvinia natans*
2m *Utricularia australis*
\+ *Lemna minor*

B. Potamogeton pectinatus-Myriophyllum spicatum community with a substantial proportion of Najas marina:

Relevé area: 2×2.5 m, vegetation cover 80%

4 *Najas marina*
1 *Potamogeton pectinatus*
\+ *Potamogeton crispus*
2a *Myriophyllum spicatum*
1 *Ceratophyllum demersum*

C. An example of Ceratophylletum demersi (Soó) Hild 1956:

Relevé area: 1×2 m, vegetation cover 60%

3 *Ceratophyllum demersum*
1 *Potamogeton pectinatus*
\+ *Hydrocharis morsus-ranae*
2b *Myriophyllum spicatum*
1 *Potamogeton crispus*
\+ *Glyceria maxima*

D. The edge of the water supported a wide variety of habitat types, including a community with *Carex bohemica* in its single known locality in Transcarpathia:

Relevé area: 2×10 m, vegetation cover 50%, stones 30%

2b *Oenanthe aquatica*
2a *Bidens cernua*
2m *Echinochloa crus-galli*
1 *Stachys palustris*
1 *Lycopus europaeus*
\+ *Polygonum persicaria*
\+ *Lythrum salicaria*
2a *Carex bohemica*
2a *Alisma plantago-aquatica*
2m *Bidens tripartita*
1 *Rorippa amphibia*
1 *Butomus umbellatus*
\+ *Phalaris arundinacea*
\+ *Lysimachia nummularia*

E. Phragmitetum vulgaris Soó 1927:

Relevé area: 4×5 m, vegetation cover 90%

5 *Phragmites australis*
1 *Salix purpurea*
1 *Myriophyllum spicatum*
\+ *Lythrum salicaria*
2a *Ceratophyllum demersum*
1 *Polygonum amphibium*
\+ *Rorippa amphibia*

F. A community referable to the Potamion, probably a particular association.

Relevé area: 2×3 m, vegetation cover 70%

3 *Potamogeton crispus*
2b *Ceratophyllum demersum*
1 *Lythrum salicaria*
2b *Myriophyllum spicatum*
1 *Najas marina*
r *Alisma plantago-aquatica*

G. An example of Glycerietum maximae Hueck 1931

Relevé area: 4×4 m, vegetation cover 90%, the stand is situated in 25-30 cm water

5 *Glyceria maxima*
2m *Najas minor*
1 *Lemna trisulca*
1 *Ceratophyllum demersum*
\+ *Lythrum salicaria*
\+ *Hydrocharis morsus-ranae*
r *Alisma plantago-aquatica*
2a *Polygonum amphibium*
1 *Oenanthe aquatica*
1 *Lemna minor*
\+ *Salix cinerea*
\+ *Lycopus europaeus*
r *Rorippa palustris*

H. A community of the Phragmitetea was dominated by *Butomus umbellatus*

Relevé area: 4×4 m, vegetation cover: 60-70%, the stand is situated in 25-30 cm water

4	*Butomus umbellatus*	2a	*Salvinia natans*
2m	*Utricularia australis*	1	*Phragmites australis*
1	*Lemna minor*	+	*Salix purpurea*
+	*Lythrum salicaria*		

I. The weedy grass *Echinochloa crus-galli* was especially prominent along the edge of the water, where it is well adapted to a highly variable water regime with floods and drawdown.

Relevé area: 5×10 m, vegetation cover: 90%

5	*Echinochloa crus-galli*	2m	*Polygonum amphibium*
2m	*Bidens tripartita*	1	*Salix triandra*
1	*Salix purpurea*	1	*Oenanthe aquatica*
1	*Alisma plantago-aquatica*	+	*Lythrum salicaria*
+	*Inula britannica*		

K. Agrostion stoloniferae Soó (1933) 1971 with *Carex bohemica*

Relevé area: 2×8 m, vegetation cover: 70%

3	*Agrostis stolonifera*	2m	*Rorippa brachycarpa*
2m	*Plantago major*	2m	*Oenanthe aquatica*
2m	*Echinochloa crus-galli*	2m	*Alopecurus geniculatus*
1	*Salix purpurea*	1	*Rorippa palustris*
1	*Polygonum persicaria*	1	*Polygonum amphibium*
1	*Mentha arvensis*	1	*Lythrum salicaria*
1	*Gnaphalium uliginosum*	1	*Carex bohemica*
1	*Bidens tripartita*	1	*Alisma plantago-aquatica*
+	*Salix triandra*	+	*Salix fragilis*
+	*Lycopus europaeus*	+	*Iris pseudacorus*
+	*Inula britannica*	+	*Glyceria maxima*
+	*Eleocharis ovata*	r	*Rumex maritimus*
R	*Juncus effusus*	r	*Butomus umbellatus*

Fig. 9a (left): *Carex bohemica* in the pond near the village of Dyida (site no 13). - 9b (right): *Utricularia australis* in the pond near Dyida

Wednesday, September 4th 2002

We started at 6.00 in the direction of Chop and the border with Hungary, making stops on the way between Mukachevo and the Tisza.

SITE 14: UKRAINE: we stopped 2 km west from the village of Bakosh, between Bakosh and Solovka, near the bridge over the canalised Charonda river. Here we examined the aquatic vegetation (four relevés), which comprised floating-leaved and emergent associations, as well as some areas of forest outside the floodbank.

Associations referable to the Nymphaeion Oberd. 1956 emend. Neuhäusl 1959 are common here:

Relevé area: 5×10 m, vegetation cover: 85%

3	*Nymphaea candida*	3	*Nuphar lutea*
2a	*Hydrocharis morsus-ranae*	2m	*Salvinia natans*
2m	*Lemna trisulca*	1	*Stratiotes aloides*
1	*Sparganium erectum*	1	*Glyceria maxima*
1	*Ceratophyllum demersum*	+	*Potamogeton lucens*

The Glycerietum maximae Hueck 1931 is well represented here, with the full floristic structure of the described community, rather than the monocultural variant so prevalent generally

Relevé area: 3×10 m, vegetation cover: 100%

4	*Glyceria maxima*	2b	*Typha latifolia*
2m	*Lemna trisulca*	1	*Typha angustifolia*
1	*Salvinia natans*	1	*Hydrocharis morsus-ranae*
1	*Calystegia sepium*	+	*Stratiotes aloides*
+	*Sparganium erectum*	+	*Rumex hydrolapathum*
+	*Potamogeton lucens*	r	*Butomus umbellatus*

Other emergent vegetation included Schoenoplectetum lacustris Eggler 1933 near the edge of the channel:

Relevé area: 3×5 m, vegetation cover: 90%

4 *Schoenoplectus lacustris*
2a *Lycopus europaeus*
1 *Scutellaria galericulata*
\+ *Typha latifolia*
2b *Glyceria maxima*
2a *Calystegia sepium*
1 *Lysimachia vulgaris*
\+ *Lysimachia nummularia*

Stands of Hydrochari-Stratiotetum Westhoff 1942 are very common and occupy a large area:

Relevé area: 5×5 m, vegetation cover: 90%

5 *Stratiotes aloides*
2b *Hydrocharis morsus-ranae*
1 *Lemna minor*
3 *Ceratophyllum submersum*
2m *Salvinia natans*

The ash-oak stand outside of the dyke is an another example of Fraxino-pannonicae-Ulmetum Soó 1960

Relevé area: 20×20 m, vegetation cover 60-70%

Upper tree layer: height: 16-20 (25) m, cover: 35-40%

3 *Quercus robur*
2a *Fraxinus angustifolia* subsp*. danubialis*

Lower tree layer: height: 8-10 m, cover: 30%

2a *Fraxinus angustifolia* subsp*. danubialis*
\+ *Pyrus pyraster*
2a *Quercus robur*

Shrub layer: height: 1-5 m, cover: 65%

2b *Acer tataricum*
2a *Fraxinus angustifolia* subsp*. danubialis*
1 *Prunus padus*
1 *Cornus sanguinea*
\+ *Prunus spinosa*
r *Rosa canina*
2b *Acer campestre*
1 *Quercus robur*
1 *Crataegus laevigata*
1 *Acer negundo*
\+ *Carpinus betulus*

Field layer: up to 1 m high, vegetation cover: 40%

2a *Lysimachia nummularia*
2m *Prunus spinosa*
2m *Fraxinus angustifolia* subsp*. danubialis*
2m *Acer tataricum*
1 *Prunella vulgaris*
1 *Geum urbanum*
1 *Crataegus laevigata*
1 *Carpinus betulus*
1 *Brachypodium sylvaticum*
\+ *Moehringia trinervia*
\+ *Filipendula vulgaris*
\+ *Carex brizoides*
r *Ribes uva-crispa* subsp*. grossularia*
2m *Quercus robur*
2m *Maianthemum bifolium*
2m *Cornus sanguinea*
1 *Prunus padus*
1 *Ligustrum vulgare*
1 *Galium elongatum*
1 *Circaea lutetiana*
1 *Carex spicata*
1 *Agrostis stolonifera*
\+ *Fragaria vesca*
\+ *Daucus carota*
\+ *Acer negundo*

SITE 15: UKRAINE: 0.5 km south from the village of Chomonyn, on the road to the village of Serne. Here again we focussed on the aquatic vegetation within the drainage channel (4 relevés). The associations of Hydrocharition Rübel 1933, Lemnion minoris W. Koch et Tx. ex Oberd. 1957 and Glycerio-Sparganion Br.-Bl. et Sissing ex Boer 1942 represent this site:

Relevé area: 3x4 m, vegetation cover: 95%

5 *Hydrocharis morsus-ranae*
2a *Salvinia natans*
2m *Lemna minor*
1 *Elodea canadensis*
2a *Spirodela polyrhiza*
2m *Lemna trisulca*
1 *Glyceria maxima*

Relevé area: 2×2 m, vegetation cover: 80%

4 *Spirodela polyrhiza*
2a *Hydrocharis morsus-ranae*
2a *Lemna minor*
2m *Lemna trisulca*

Relevé area: 1.5×1.5 m, vegetation cover: 95%

4 *Sparganium erectum*
2b *Lemna minor*
1 *Lemna trisulca*
3 *Spirodela polyrhiza*
1 *Lycopus europaeus*
1 *Bidens frondosa*

Relevé area: 2×5 m, vegetation cover: 95%

4 *Lemna minor*
2a *Lemna trisulca*
1 *Elodea canadensis*
\+ *Hydrocharis morsus-ranae*
2b *Spirodela polyrhiza*
1 *Salvinia natans*
1 *Ceratophyllum demersum*

SITE 16: UKRAINE. Our final site stop was along the road between the villages of Serne and Batevo, where the emergent vegetation in the drainage channel comprised two associations, separated mainly by the relative dominance of two *Typha* species:

Typhetum angustifoliae (All. 1922) Pign.

Relevé area: 2.5×20 m, vegetation cover: 95%

5 *Typha angustifolia*
1 *Lycopus europaeus*
\+ *Galium palustre*
1 *Typha latifolia*
\+ *Lysimachia nummularia*

Typhetum latifoliae Soó 1927.

Relevé area:: 2.5×20 m, vegetation cover: 90%

5 *Typha latifolia*
2m *Lycopus europaeus*
1 *Carex riparia*
2m *Lysimachia vulgaris*
1 *Galium palustre*

Our excursion finished at Chop where the group dispersed at 12-12.30 p.m., some remaining in Ukraine, some travelling on to Austria, and others driving back to the UK via România and intervening countries.

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