HABITAT TYPES OF EUROPEAN IMPORTANCE IN THE AREA OF WETLANDS GROMIZELJ (BOSNIA AND HERZEGOVINA)

Sladjana PETRONIC, Natasa BRATIC, Tanja JAKISIC, Vesna TUNGUZ

Faculty of Agriculture, University of East Sarajevo, East Sarajevo, Bosnia and Herzegovina

*Corresponding author: sladjanapetronic2504@gmail.com

ABSTRACT

The paper presents the types of wetlands habitat Gromizelj which is of European importance. The review is made on the basis of studies of flora and vegetation and the Guide of the types of habitats according to the European Union (EU) Habitats Directive. Swamp Gromizelj is located in the northeast of Republic of Srpska (RS) and Bosnia and Herzegovina (BiH), in the municipality of Bijeljina. During the research the following habitats have been isolated: 3150 Natural eutrophic lakes with Magnopotamnion-or Hydrocharition-vegetation type, 3270 Muddy river banks with Chenopodionrubri. p. and Bidention p. p. vegetation, 6430 Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels, Reedbeds, tall sedges and vegetation of Phragmito-Magnocaricetea, 91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnionincanae, Salici-onalbae) and 91F0 Riparian mixed forests of Quercus robur, Ulmus laevis and U. minor, Fraxinus excelsior or F. angusti folia, along great rivers (Ulmenion minoris).

Key words: habitat, wetlands, Gromizelj.

INTRODUCTION

Connecting protected areas of RS and BiH in the European network of protected areas Natura 2000 is aimed to prevent the loss of biodiversity, preserve the habitat of endangered species and ensure their long term survival. For BiH, WWF MedPO started a project to support the implementation of the European ecological network Natura 2000 in 2007. Based on the literature data, the research of authors, supported by The EU, made the Habitat Types Guide of BiH according to the EU Habitats Directive.

Potentially protected area Gromizelj is located in the northeast of RS in the municipality of Bijeljina and GMT is between 44°51'12.5" and 44°53'37" north latitude and 19°18'04" and 19°20'24" east longitude. Central coordinates of the point with coordinates are 44°52'19" north latitude and 19°19'15" east longitude. The surface of a natural resource is 831.3 hectares. The map 1 shows the position of the natural resource.
The basic value of the natural resource "Gromizelj" is made of wetlands Gromizelj with Laketic sources and partially channelled stream Prugnjaca. Laketic source extends from southeast to northwest. According to average annual values issued, the length of the source ranges between 50 and 55 meters with a maximum width of 25 m. Laketic source is located in the area of intensive agricultural production under significant anthropogenic pressure. The area is characterized by specific geological and hydrological phenomena and extraordinary biological diversity. This research was first recorded wetland grill (Urticaki oviensis) in BiH. Urticaki oviensis is on the Red List of Europe in the category of vulnerable species (VU).

**MATERIALS AND METHODS**

Floristic and vegetation research on areas are carried out from 2009 to 2011. Taking plant material and making phytocoenological recordings were done at different habitats. Identification of species was based on floristic literature (Javorka and Csapody, 1979; Beck, 1903; Beck, 1927; Josifovic ed. 1970-1977; Domac, 1978; Sumatic et al., 1999). Phytocoenologically recordings were made by the method Braun-Blanquet (1965). During allocations European significant habitats in the wetlands Gromizelj used data research of flora and vegetation and Guide to the types of habitats according to the EU Habitats Directive (Milanovic et al., 2015).
RESULTS AND DISCUSSION

Based on explored flora, vegetation and habitats, according to the Review of the Habitats Directive of the EU, isolated habitats are shown in Table 1.

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of habitats</th>
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<tr>
<td>3150</td>
<td>Natural eutrophic lakes with <em>Magnopotamnion</em>- or <em>Hydrocharition</em>-type vegetation</td>
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<td>3270</td>
<td>Muddy river banks with <em>Chenopodion dionrubri</em> p. and <em>Bidention p. p.</em> vegetation</td>
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<td>6430</td>
<td>Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels</td>
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<td>Reedbeds, tall sedges and vegetation of <em>Phragmito-Magnocaricetea</em></td>
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<td>91E0</td>
<td>Alluvial forests with <em>Alnus glutinosa</em> and <em>Fraxinus excelsior</em> (Alno-Padion, Alnionincanae, Salicionalbae)</td>
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<tr>
<td>91F0</td>
<td>Riparian mixed forests of <em>Quercusrobur</em>, <em>UlmuslaevisandU. minor</em>, <em>Fraxinus excelsior</em> or <em>F. angustifolia</em>, along greatrivers (Ulmenionminoris)</td>
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### 3150 Natural eutrophic lakes with *Magnopotamnion*- or *Hydrocharition*-type vegetation

The habitat is characterized by significant biomass production, reduced mineralization and reduced amount of oxygen in the deeper layer of sludge. Natural well is located in the area of intensive agricultural production. In the water of lakes ammonia and nitrate nitrogen, are indicating that manufacturers perform intensive fertilizing arable land with NPK fertilizer. Saprobity index "S" was measured (Pant-Buck, 1955) which shows that the water source Laketic belong to class III and has a "moderate" ecological status. The concentration of dissolved oxygen in water ofLaketic source shows the requirements for class V indicating very poor status of water quality. The value of the saturation of water with oxygen is very bad. The water is rich in dissolved bases with a pH above 7 (Water Institute, doo Bijeljina, 2010). Habitat is populated with vegetation of submerged to class Potametea and order Potametalia which is articulated on alliance Magnopotamionautc (submerged plant communities that are not connected to the bottom); Nymphaealbae (community of plants with floating leaves) and Hydrocharition. From community of alliance Magnopotamionautc. there is *Ceratophylletum demersi* belonging tosubmerged, aquatic vegetation not connected to the bottom and withoptimal development achieved during the summer. Species that participate in building of communities are: *Nuphar luteum*, *Myriophyllum spicatum*, *Hottonia-palustris*, *Potamogetonnatans* and *Lemna minor*. 
Alliance *Nymphaeionalabae* includes community *Hottonietumpalustris* and *Myriophyro-Numpharetum*. Association *Myriophyro-Numpharetum* develops in the deepest zone of the source where the water is moderately enriched with organic and mineral substances. The main feature of the floristic community gives a dominant species *Nuphar luteum* and *Myriophyllum umvercalatum*. There are also: *Potamogetonnatans*, *Myriophyllum spicatum*, and *Certophyllum demersum*.

Monodominant community *Hottonietumpalustris* occurs in Laketic source fragmentary. In the second half of the year, waters receded within forests of alder and ash, on the muddy and wet surfaces with a high level of ground water. After the withdrawal of water *Hottoniapalustris* takes emergent character growing together with species *Nuphar luteum*, *Caltha palustris*, and *Sium latifolium*.

Vegetation of hydrophytanot connected with bottom belongs to class *Lemnetea*, order *Lemnetalia* and alliance *Lemnion minoris* with community *Lemnetum minoris*, *Lemnetum trisulcae* and *Hydrocharidietum morsus-ranae*. This type of vegetation rarely develops in the coastal zone of Laketic source, but it is more frequent in small depressions of swamps Gromizelj and in the part Prunjace where water reserves in the first half of the year. At this habitat, intensive processes of decomposition of organic matter occur under the separation of methane, hydrogen sulfide, with a pH value above 7.

Community *Lemnetum minoris* belongs to submerged vegetation not connected to the bottom stands. It mainly develops sporadically along the coast of Laketic source in shallow irrigation canals and in parts Prunjace. In that habitat, water is warm and moderately rich in organic matter and water flow is weak or absent. The water depth does not exceed 1 m, the bottom is muddy. Stands of the community are poor of species. In small depressions near Laketic source and the source of the coast stands of communities *Lemnetum trisulcae* were recorded. There are species: *Lemna minor* and *Utricularia vulgaris*. Community of *Hydrocharidetum morsus-ranae* belongs to the type of floating not connected to the bottom aquatic vegetation observed in small depressions of Gromizelj near Laketic source, where the water is calm, standing, shallow, warm and eutrophic. Besides the dominant species *Hydrocharismorsus-healing*, there are also *Ceratophyllum demersum*, *Lemna minor*, *Lemnatisulca* and *Utricularia vulgaris*.

This type of habitat is the most representative in the upper part of the Pliva lakes, coastal zone of Spreca, at Bardaca, Svilaj, Vojskovi, Loncar, Sanicani, Prnjavor, but along the river Savait is largely absent (Redzic and Brudanovic, 2008-2009). This type of habitat is recorded in a number of permanent water surfaces of BiH, ponds, canals and artificial lakes. (Milanovic et al., 2015).

### Muddy river banks with *Chenopodion rubri*. *p.* and *Bidention* *p.* *p.* vegetation

Nitrophilic community of wetland Gromizelj belongs to alliance *Bidention tripartite* *p.* order *Bidentetalia tripartite* and class *Bidentetea tripartite*. It develops on wet and nitrated anthropogenic fluvisol and eugley. The soils have mainly base reactions. This type of vegetation is typical for autumn.
At the sites Sljunkara and Prugnjaca nitrophilous vegetation of muddy and wet habitats alliance *Bidentition tripartitae* and communities *Polygonohydropiperis-Bidentetum tripartitae* and *Polygonetum lapatifoliae* were recorded. Short belt of flat and slightly inclined coast Sljunkara is covered with association *Polygonohydro-piperis-Bidentetum tripartitae*. This association is well developed in the Prugnjaca in the second half of the year, when water is withdrawn, which takes up significant area. In a community, the dominant species are *Polygonum hydropiper* and *Bidenta tripartita*. There are also: *Mentha aquatica*, *Alisma plantago-aquatica*, *Veronica becabunga*, *Juncus atriculatus*, *Lycopus europaeus*, *Lythrumsalicaria*, *Lycopusexaltatus*, *Agrostis stolonifera*, *Salix alba*, *Eupatorium cannabinum* and others.

Association of *Polygonum lapathifolium* occurs more frequently in the study area by building monodominant stands that take up less surface area. This vegetation is distributed in the flood zone of the Sava River on lands rich with nitrates. They are very developed along the river backwater. Its dominance increases going upstream towards Bosanska Raca (at the mouth of the Drina River). Nitrated stagnant water is in the wider area of Plivsko jezero, Modrac, Spreca, Gradiska, Sanicani, Prnjavor, Svilaj, Bosanski Samac, Odzak, Orašje, Ukrina, Zabar, Loncari, Raca (Redzic and Brudanovic, 2009).

**6430 Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels**

The vegetation of tall herbs was developed in the hydrophile forests of alder, willow and poplar, and in the forests of oak and elm. Optimal location is on the wet nitrified soils and the openings of hygrophile land. Depending on the degree of ecological conditions of humidity, shade and nitrified land vegetation of high green two alliance can be differentiated: *Senecion fluviatilis* and *Petasition officinalis*. Alliance *Seneciofluviatilis* includes typical Posavina hydrophilic-nitrophilic community. This vegetation, in ecological terms, continues to vegetation and alliance Magnocaricion and Phragmition. Some of the species that participate in the construction of high green vegetation are: *Angelica sylvestris*, *Barbarea vulgaris*, *Rorippa austriaca*, *Althea officinalis*, *Potentillareptans*, *Mentha longifolia*, *Glycierhiza echinata* and other.

Vegetation of alliance *Petasition officinalis* is recorded in the vicinity of roads, dykes and settlements, in places rich in nitrates. It often occurs in degraded forests of alder, willow, ash and oak. As characteristic, the species of these habitats are: *Aegopodium podagraria*, *Eupatorium cannabinum*, *Parietaria officinalis*, *Galium parine*, *Artemisia vulgaris*, *Urtica dioica*, *Sambucus ebulus*. Those species are involved in building of communities: *Urtico-Aegopodietum*, *Urtico-Sambuctetum buli*, *Eupatorietum cannabini* and *Urtico-Parietietum*. An important area of habitat is occupied by invasive species *Polygonum cuspidatum* and *Echinocystis lobata*. 
Reedbeds, tall sedges and vegetation of Phragmito-Magnocaricetea

The belt of aquatic vegetation community builds on floodplains is dominated by emersal hydro-heliophytes of class Phragmitetalia, order Phragmitetalia covered with alliance Phragmition and Sparganio-Glycerion. Alliance Phragmition belongs to the community Scirpo-Phragmidium, Typhaetumangustifolia, Typhaetumlatifolia, Phragmitetumaustralis and Sparganieterum. Community of reeds and sedges has an important role in preserving the overall plant and animal diversity of wetland habitats.

Community of Scirpo-Phragmitetum inhabits continuously or periodically flooded areas of Laketic source and Sljunkara. The basic characteristic of floristic community types comes from the following species: Phragmitescommunis and Scirpuslacustris. The narrow coastal strip of Sljunkara is covered with species Scirpuslacustris which builds less facies. It was noted that the facies with Scirpuslacustris alternately change the community stands of Typhaetumangustifoliae and Typhaetumlatifoliae. Differences were observed in the floristic composition of communities between Laketic source and Sljunkara. In the community stands Scirpo-Phragmitetumof Sljunkara, besides dominant species, there are also: Lycopuseuropaea, Menthaaquatica, Iris pseudacorus, Lythrumsalicaria, Polygonumlapathifolium, Bidensfrondosa. In the community of Laketic source, in a significant number, there are species: Siumlatifoliumand Sparganiumerectum. Ass. Phragmitetumaustralis is present at the sites Prugnjaca, Sljunkara and Cilinuk where it occupies significant space, a slightly larger area under this community can be foundin Bule. The floristic composition is dominated by Phragmitesaustralis, which survives in conditions after the withdrawal of water where there is a high level of groundwater. Community of reeds is mainly developed in the forest belt of alder, willow, poplar and ash.

Hygrophilous community Typhetumangustifoliae is recorded at the site Sljunkara. It inhabits shallow water along the coastal part.

Ass. Sparganio-Glycerietumfluitans belongs to alliance Spargаниюglycerion and it is particularly developed in some parts of Prugnjaca. There is a wide ecological valence compared to hydric regime. Significant surface of Prugnjaca is covered with community Sparganieterum which joins with species Urticakioviensis and builds a specific community. It is necessary to monitor this "community" with the aim of describing and determining the appropriate status. For the territory of Bosnia and Herzegovina, Urticakioviensis was firstly recorded in Laketic source, on december 2008.

Alliance of Salicioncinerea includes a community Salicetumcinerea. It is present on the coast of Laketić source with permanent flooding during the first half of the year. The community is dominated by wading willow bushes which reaches a height of 2-3 m, and there are species: Telypterispalustris, Urticakioviensis, Carexremota, Sparganiumerectum, Menthaaquatica and others. Particularly important species Telypterispalustris, Urticakioviensisare rare species for the area of BiH. The only, so far known, habitat of Urticakioviensisin Bosnia and Herzegovina is wetland of Gromizelj and Laketic source, as well asfor Telypterispalustris in RS.
The habitat of these species is not defined in "Interpretation manual of European Union habitats" but it is necessary to specify it as a literary data. Community of reeds and rushes are distributed along the flood areas of the Sava River and lower parts of its tributaries. Among them, the most important habitats are in the area of fishpond Sanicani, fishpond Bardaca, fishpond Prnjavor, hinterland of lake Modrac, the western part of the large Pliva lakes, backwaters zone in the area Odzak, Svilaj, Velikaand Mala Tisina, Loncar. In other places, this vegetation is sporadically developed in the form of small fragments (Redzic and Brudanovic, 2009).

**91E0 Alluvial forests with Alnusglutinosasaand Fraxinusexcelsior (Alno-Padion, Alnionincanae, Salicionalbae)**

Hygrophilous forests with *Alnus glutinosa* (*Alnetum glutinosae*) syntaxonomic belong to the Central European alliance Alnionglutinosae, order Alnetaliaglutinosae and class Alneteaglutinosae. They are relocated in places where is a high level of ground water throughout the year, mainly on deep fluvisol soils, gleys and pseudogley. Surface water is retained until May when it withdraws. In the area of swamps Gromizelj this community occupies about 10 hectares of the study area. In the floor of the trees there is species with the largest cover value *Alnus glutinosa*. Trees reach a height over 20 meters. From shrubs there are: *Cornus sanguinea*, *Sambucus nigra*, *Ligustrum vulgare*, *Corylus avellana*, *Acer tataricum*, *Viburnum opulus*, *Euonymus europaeus* and other species. In the floor of the herbaceous plants there are: *Stachys palustris*, *Carex elongata*, *Carex remota*, *Lysimachia vulgaris*, *Solanum dulcamara*, *Thelypteris palustris*. Forests of *Alnus glutinosa* have an important role in maintaining ecological balance, hydric regime, preservation of groundwater and the existing biodiversity. It should be noted that the communities in this area are well preserved, but there is always a danger of logging and the spread of invasive species *Echinocytis lobata*, *Asclepias siliqua* and *Amorpha fruticosa*. The high importance of the forest ecosystem has resulted in putting habitat in priority in conservation (Annex 1 of the Habitat Directive). Community of *Alnus glutinosa*, alliance Alnionglutinosaeis widespread in Posavina, and in the coastal zone of large rivers, particularly in their lower courses (Una, Vrbas, Bosna, Drina). The forests of *Alnus glutinosa*, have been developed as azonal vegetation along other waterways in the continental part of BiH (Redzic and Brudanovic, 2009).

Community Frangulo-Alnetumglutinosae is on the smaller areas that have the mosaic distribution. Significant cover value in the floor of bushes has species *Frangula alnus*, and there are other species such as: *Viburnum opulus*, *Rhhamnus cathartica*, *Thelypteris palustris*, *Glechoma hederacea*, *Salix cinerea*. In the floor of the herbaceous plants there are species: *Solanum dulcamara*, *Symphytum tuberosum*, *Polygonum lapathifolium*, *Stachys palustris*, *Lythrum salicaria*, *Iris pseudacorus*, *Sium latifolium* and other.

A significant feature of alluvial forests vegetation of *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Fraxinetum angustifoliae*) has a high ecosystem importance which is resulting in separation of the community into the category of priority habitat conservation. In the trees floors, the dominant species is *Fraxinus angustifolia* and
there are also: *Populus nigra*, *Populus alba* and *Alnus glutinosa*, and on the higher ground there is *Quercus robur*. In the floor of shrubs there are species: *Ulmus laevis*, *Rhamnus catartica*, *Frangula alnus*, *Acer campestre*, *Salix fragilis*, and in the floor of herbaceous plants there are: *Leucojum aestivum*, *Ficaria verna*, *Crocus vernus*, *Arum maculatum*, *Lysimachia nummularia*, *Mentha aquatica*, *Lycopus europaeus* and others. From community of alliance *Salicionalbaet* here are: *Salicetum albae-fragilis*, *Populetum nigro-albae*, *Salici-Populetum nigrae*, *Salicetum albae* and *Salicetum fragilis*. Community of *Salicetum albae* is developed on the site Pristalovac and coasts of Prugnjaca. The dominant species in community is *Salix alba* and there are also species: *Salix fragilis*, *Populus alba*, *Populus nigra*, *Ulmus effusa*, in shrubs there are: *Amorpha fruticosa*, *Cornus mas*, *Crataegus monogyna*. In the floor of herbaceous plants there are: *Mentha aquatica*, *Solanum dulcamara* and others.

*Populus alba* and *Populus nigra* build special community in smaller areas. Association *Populetum albae* is recorded near Prugnjaca and wider area Pristalovca.

91FO Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *U. minor*, *Fraxinus excelsior* or *F. angustifolia*, along greater rivers (Ulmenion minoris)

Alliance of *Alno-Quercion roboris* includes wet swamp lowland forest regions developed over periodically flooded fields or beyond, but a significant role in the maintenance of these forests has the presence of high levels of groundwater. Riparian forests of *Fraxinus angustifolia* are present on some dry habitats but with a high level of ground water. In riparian forests of *Fraxinus angustifolia* community *Leucojo-Fraxinetum angustifoliae* is developed which is registered on the site Ranisavljeva basca, on the surface of about 1 hectare in the depression which is strongly influenced by the flood and groundwater. In the floor of trees the dominated species is *Fraxinus angustifolia*, in the floor of herbaceous plants there are: *Leucojum aestivum*, *Galium palustre*, *Lycopus europaeus*, *Solanum dulcamara*, *Carex elongata* and others.

On the elevated grounds with short-term flooding or no flooding communities of *Quercus robur* and *Genista elata* (*Genisto elatae-Quercetum roboris*) were developed. Community belongs to alliance *Alno-Quercion roboris*, order *Alnetalia glutinosae* and class *Alneteaglutinosae*. Due to excessive logging of *Quercus robur* community has significantly changed the original appearance. Ground floor of community abounds with offspring of *Quercus robur*. This community has a very important role in the preservation of biodiversity of Posavina landscape and deserves special priority in protection.

Mixed forests of *Fraxinus angustifolia* and *Alnus glutinosa* with *Quercus* occupy about 14 hectares of the study area. They occupy most hydrographic positions (beams) where flooding is short and affordable level of groundwater is located at a considerable depth. These forests are the first transition of hydrophilic alluvial vegetation according to climatogenic forests. Only *Quercus robur* forests in the wide alluvial valleys belong to this type of habitat (Milanovic et al., 2015).
CONCLUSION

Connecting protected areas of RS and BiH in the European network of protected areas Natura 2000 aims to prevent the loss of biodiversity, preserve habitats of endangered species and ensure their long-term survival. For BiH, WWF MedPO started a project to support the implementation of the European ecological network Natura 2000 in 2007.

The paper presents the habitat areas of Gromizelj which is of European importance. During the research and according to Guide to the types of habitats of BiH the following habitats were isolated: 3150 Natural eutrophic lakes with Magnopo-tamnion Hydrocharition-type vegetation, 3270 Muddy river banks with Che-nopodionrubrip. p. and Bidention p. p. vegetation, 6430 Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels, Reedbeds, tall sedges and vegetation of Phragmito-Magnocaricetea, 91E0 Alluvial forests with Alnusglutinosaaand Fraxinusexcelsior (Alno-Padion, Alnionincanae, Salicionalbae) and 91F0 Riparian mixed forests of Quercusrobur, Ulmuslaevis and U. minor, Fraxinus excelsior or F. angustifolia, along large rivers (Ulmenionminoris).

REFERENCES


