

RESEARCH OF THE FLORA AND VEGETATION OF THREE PROTECTED NATURAL AREAS OF THE SITOVO MUNICIPALITY, DISTRICT OF SILISTRA (NORTHEASTERN BULGARIA)

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Abstract

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A research has been conducted of the flora and vegetation of three protected natural areas, located in the Sitovo municipality, district of Silistra. As a result of the research, 38 families, 63 genera and 67 species of vascular plants have been established in the “Garvanski mires” protected natural area. In the natural protected area “Gornata koria” 27 families, 46 genera and 46 species of vascular plants have been established and 15 families, 36 genera and 39 species have been established in the protected natural landmark “Ostrata kanara”. Among these established plants, there are several species with conservation statuses – critically endangered (CR) *Verbascum dieckianum* Borbas & Degen, endangered (EN) *Nymphaea alba* L., *Nuphar lutea* (L.) Sibth. & Sm., *Salvinia natans* (L.) All., *Nymphoides peltata* (S. G. Gmel.) Kuntze, *Galanthus elwesii* Hook fil. and vulnerable (VU) *Leucojum aestivum* L. Also, two species included in the Bern Convention were found – *Salvinia natans* (L.) All., and the data deficient (DD) *Typha schuttelworthii* Koch & Sond. Furthermore, several species protected under the law for biodiversity have also been found – *Verbascum dieckianum* Borbas & Degen, *Nuphar lutea* (L.) Sm., *Nymphaea alba* L., *Nymphoides peltata* (S.G.Gmel.) Kuntze, *Galanthus elwesii* Hook fil. and *Salvinia natans* (L.) All. (Petrova and Vladimirov, 2009).

Key words: vascular plants, natural habitats, Natura 2000 areas

Introduction

The flora and vegetation of these three protected natural areas (“Garvanski Mires”, “Gornata koria” and “Ostrata kanara”) had not been researched yet. As a matter of fact, this particular research is a continuation of our previous research work of the flora, vegetation and habitats of other similar areas located in the Republic of Bulgaria: Dimitrov and Vutov (2009, 2011, 2015), Vutov and Dimitrov (2014, 2015), Vutov (2015). Up to this moment, only one palynological study of the Holocene flora and vegetation history of the “Garvanski Mires” has been conducted (Lazarova and Bozilova, 1997). Additional information about the flora of the mires can also be found in the works of Kotchev and Yordanov (1981), Baeva (1991), Peev et al. (2012), Mateva (Kostadinova) and Gramatikov (2007). Only 3 species found in the protected area of “Garvanski mires” have been found and

mentioned in the ongoing developmental plan of the protected area of “Pozharevo – Garvan” (2009), whose plan has not yet been officially accepted (this developmental plan will be an integral part of the overall National Plan for the Conservation of the Most Significant Wet Lands in Bulgaria 2013–2022 by the Bulgarian Foundation of Biodiversity). Currently there aren’t any data about the flora and vegetation of the other two protected natural areas – “Gornata koria” and natural landmark “Ostrata kanara”. The protected area of “Gornata koria” is also a part of the “Ludogorie” Protected Zone, where the 91HO habitat of a Pannonia forest (including mostly *Quercus pubescens*) is found.

Materials and Methods

Over the conduct of the research, we have mainly used the transect method and the method of sampling sites. The collected

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materials were determined according to Kozuharov (1992) and Delipavlov and Cheshmedzhiev (2003). The habitats were determined according to Kavrykova, Dimova, Dimitrov, Tsonev and Belev (2008). The different categories of the plants with conservational statuses were determined by Petrova and Vladimirov (2009).

Results and Discussions

The protected area of the “Garvanski mires” (Leshtava) is located in the dry river valley mouth of Kulak, 2.5 km west from the Popina village and 1 km to the north from the Garvan village. The “Garvanski Mires” are damp and have water from March until June, then around August it dries out and after the summer it slowly gets filled with water again. It was officially announced as a natural protected area by the Ministry of Environment and Water, ordinance № RD- 1205/ 24.09.2003. The overall protected area of „Garvanski Mires“ includes within its boundaries the mires Lyushtova, Momchila and Tonata. We managed to find in the peripheral and middle area of the Tonata mire, an invasion of ruderal and weed species, such as: *Cirsium arvense* (L.) Scop., *Cephalaria transsilvanica* (L.) Roemer & Schultes, *Solanum dulcamara* L., *Dipsacus laciniatus* L., *Erigeron annuus* (L.) Pers., *Sonchus asper* (L.) Hill.ssp. *glaucescens* (Jord.) Ball., *Lactuca serriola* L., *Phytolacca americana* L., *Amorpha fruticosa* L., *Potentilla reptans* L., *Daucus carota* L., *Galium aparine* L., *Chelidonium majus* L. In the vicinity of the Momchila mire there are several farms and agricultural fields. To the west side of the mires there is a man-made plantation consisting of *Tilia platyphyllos* Scop., *Fraxinus excelsior* L., *Morus alba* L., *Crataegus monogyna* Jacq.

The flora of the “Garvanski mires” includes 38 families, 63 genera and 67 species of vascular plants. The families which have the biggest number of species are: *Asteraceae* (8 species),



Fig. 1. *Nymphaea alba* L. and *Alisma plantago aquatica*



Fig. 2. *Nymphoides peltata* (S.G. Gmel.) Kuntze



Fig. 3. *Hydrocharis morsus-ranae* L.

5 species from *Poaceae*, *Fabaceae* и *Lamiaceae*, *Rosaceae* (4 species), *Cyperaceae* (3 species), 2 species from *Apiaceae*, *Dipsacaceae*, *Nymphaeaceae*, *Ranunculaceae*, *Rubiaceae* and *Typhaceae*, and finally 1 species from *Amaryllidaceae*, *Butomaceae*, *Boraginaceae*, *Convolvulaceae*, *Equisetaceae*, *Iridaceae*, *Juglandaceae*, *Juncaceae*, *Hydrocharitaceae*, *Lemnaceae*, *Lythraceae*, *Malvaceae*, *Menyanthaceae*, *Onagraceae*, *Primulaceae*, *Salicaceae*, *Sparganiaceae*, *Polygonaceae*, *Potamogetonaceae*, *Ulmaceae* and *Verbenaceae*.

Among the habitats of the “Garvanski mires”, there are 3150 – Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* vegetation, 3130 – Oligotrophic and mesotrophic stale waters with *Littorelletea uniflorae* and/or *Isoeto-Nanojunceteta* vegetation, and 3260 – Plane or mountainous rivers with *Ranunculus fluitans* and *Callitriche-Batrachion* vegetation.

The natural protected area of “Garvanski mires” is an inte-

gral part of the Natura 2000 zone “Pozharevo – Garvan” BG 0000530. The area also often shelters many waterfowl birds, residents of the nearby natural reserve “Srebarna”. In the past here there was a governmental cooperative which used to produce lots of mats, baskets and other objects from the cane which grows in huge amounts in the area. At the moment this cooperative is no longer in existence and operation. However, it is recommended that the cane formation is periodically mowed, so that this material could be utilized and also to prevent the total swamping of the area which could destroy most of the habitats here.

The natural protected area of “Gornata koria” (Kitka) is located to the south-east from the Dobrotitsa village, Sitovo municipality. The area was officially declared with a protected status in 1981 with ordinance № 1141 of the Committee for Preservation of the Environment and again under ordinance № RD – 1203 by the Ministry of Environment and Water on 24.09.2003. The total area is 40 064 decares. It represents an actual remnant of deciduous forest, populated with *Quercus cerris* L., *Carpinus orientalis* Mill. and *Ulmus laevis* Pall. Within this forest there is also a population of *Paeonia peregrina* Miller. The natural protected area of “Gornata koria” is a part of the 91HO habitat with Pannonia forest of *Quercus pubescens*.

“Gornata koria” is included in the Natura 2000 Zone, under the Directive for preservation of habitats 92/43/ EIO and included in the “Ludogorie” Protected Zone. The flora of the area includes 27 families, 46 genera and 46 species of vascular plants.

The families which have the biggest number of species are: *Rosaceae* (7 species), *Lamiaceae* and *Poaceae* with 5 species, *Asteraceae* (4 species), *Brassicaceae* and *Liliaceae* (2 species) and the families with 1 species – *Amaranthaceae*, *Chenopodiaceae*, *Boraginaceae*, *Cannabaceae*, *Caryophyllaceae*, *Fagaceae*, *Hypericaceae*, *Iridaceae*, *Malvaceae*, *Plantaginaceae*, *Paeoniaceae*, *Rutaceae*, *Scrophulariaceae*, *Ulmaceae* and *Verbenaceae*.

The natural landmark “Ostrata kanara” is located 2 km east from the Dobrotitsa village, Sitovo municipality. It was declared a natural protected area with ordinance № 1141 on 15.12.1981 by the Committee for Preservation of the Environment – with total area of 1 ha. Later the total area was increased with decree № RD-711 on 29.07.2010, published in the official Government Newspaper № 78, 2010, so that the area became 26 454 decares.

„Ostrata kanara“ is a rocky formation comprised of shell-bearing limestone (muschelkalk) dating back to the The Cretaceous Period. The surface of the rocks is covered with deep recesses and furrows caused by continuous weathering. The tallest part of the landmark is about 10 m and its length is 150 – the whole formation looks like a stronghold. There are agrophytocenoses in the nearby area – corn and sunflower fields.

The vegetation of the rocky formation is steppe, comprised of typical steppe and pontic species, such as: *Salvia nutans* L., *Festuca valesiaca* Schleich. ex Gaudin, *Koeleria nitidula* Velen. Up on the vertical slopes of the rocks there is a typical calcicolous vegetation, represented by: *Alyssum murale* Waldst. & Kit., *Asperula tenella* Heuff. ex Deg. f. *tenella*, *Minuartia glomerata* (M.Bieb.) Degen f. *glomerata*, *Galium lucidum* All., *Thymus striatus* Vahl. “Ostrata kanara” is referred to the 6110 Open calcicolous and basophilic grass communities of *Alyssosession albi*.

The flora of this natural landmark includes 15 families, 36 genera and 39 species of vascular plants. The *Lamiaceae* family has the biggest number of species – 7, *Asteraceae* and *Poaceae* (6 species), *Caryophyllaceae*, *Rosaceae* and *Scrophulariaceae* (3 species), *Ranunculaceae* and *Rubiaceae* (2 species).

Conclusion

All of the three researched protected territories have their own ecological problems and issues. The “Garvanski mires” area is currently in danger of being contaminated by the dumping of garbage and waste from the nearby Garvan village. Also, during springtime when the river Danube is full with water, a lot of times the area and the agricultural fields around are flooded. Since artificial and natural fertilizers are used on the agricultural fields, the flooding water gets contaminated with them. Afterwards, this water flows away to the “Garvanski mires”. Consequently, this leads to eutrophication with phosphorous and nitrogen compounds, which poses a negative influence on the whole local flora and fauna in the mires. For this reason, certain preventive measures and maintenance have to be taken with the local irrigation facilities, which control the inflow and outflow of water in the area – dams, sluices and canals. These facilities also connect the otherwise separate Tonata, Momchila and Lyushtova mires. Another big problem for the “Garvanski mires” area is the invasive plants species, which have been introduced here. As a result, the native species’ existence is in danger.

It has to be noted, however, that the Local Inspectorate of the Environment and Water – Ruse has accepted already in 2014 an investment project for the repair and reconstruction of the existing drainage facilities in the area of the “Garvanski mires”.

Regarding the natural protected area of “Gornata koria”, the general threat of man-made fire and wood-cutting constantly exist. A threat that has the capacity to destroy this wonderful site, a mere remnant today of the previously existing plane forests in Northeastern Bulgaria.

The natural landmark “Ostrata kanara” is surrounded by agrophytocenoses. The specific geological structure of this rocky

formation is comprised of Cretaceous limestone, which makes it really vulnerable to acid rain. Also, the formation is located right beneath a plane filled with agricultural fields. As a result, "Ostrata kanara" is vulnerable to the impact of the soluble mineral fertilizers in the fields' soil, which because of rainfall and irrigation flow and get to the foundation of the rocks. During our visit of the site, we manage to actually witness fallen rocky devris from the landmark. Unless proper measures are taken, in order for this problem to be solved, this beautiful and rich in rare plant species natural landmark could crumble and disappear in time.

Appendices

A list of the flora of the natural protected area "Garvanski mires":

Amaryllidaceae

1. *Leucojum aestivum* L.– VU, Appendix 4 LBD

Apiaceae

2. *Daucus carota* L.
3. *Oenanthe aquatica* (L.) Poir.

Asteraceae

4. *Cirsium arvense* (L.) Scop.
5. *Erigeron annuus* (L.) Pers.
6. *Lactuca serriola* L.
7. *Lapsana communis* L.
8. *Picris hieracioides* L. subsp. *hieracioides*
9. *Pulicaria dysenterica* (L.) Bernh.
10. *Sonchus asper* (L.) Hill. subsp. *glaucescens* (Jord.)

Ball.

11. *Tragopogon pratensis* L.

Boraginaceae

12. *Symphytum officinale* L.

Butomaceae

13. *Butomus umbellatus* L.

Caprifoliaceae

14. *Sambucus ebulus* L.

Convolvulaceae

15. *Calystegia sepium* (L.) R.Br.

Cyperaceae

16. *Bolboschoenus maritimus* (L.) Palla
17. *Carex hirta* L.
18. *Schoenoplectus lacustris* (L.) Palla

Dipsacaceae

19. *Cephalaria transsilvanica* (L.) Roem. & Schult.
20. *Dipsacus laciniatus* L.

Equisetaceae

21. *Equisetum telmateia* Ehrh.

Fabaceae

22. *Amorpha fruticosa* L.

23. *Gleditschia triacanthos* L.

24. *Glycyrrhiza echinata* L.

25. *Lotus corniculatus* L.

26. *Trifolium pratense* L.

Hydrocharitaceae

27. *Hydrocharis morsus-ranae* L.

Iridaceae

28. *Iris pseudacorus* L.

Juglandaceae

29. *Juglans regia* L.

Juncaceae

30. *Juncus inflexus* L.

Lamiaceae

31. *Ballota nigra* L.

32. *Lycopus exaltatus* L.

33. *Mentha aquatica* L.

34. *Mentha spicata* L.

35. *Stachys palustris* L.

Lemnaceae

36. *Lemna minor* L.

Lythraceae

37. *Lythrum salicaria* L.

Malvaceae

38. *Althaea officinalis* L.

Menyanthaceae

39. *Nymphoides peltata* (S.G.Gmel.) Kuntze – EN,

Appendix 2 LBD

Nymphaeaceae

40. *Nuphar lutea* (L.) Sm.-EN, Appendix 2 LBD

41. *Nymphaea alba* L.-EN, Appendix 2 LBD

Onagraceae

42. *Epilobium adnatum* Griseb.

Phytolaccaceae

43. *Phytolacca americana* L.

Poaceae

44. *Agrostis stolonifera* L.

45. *Calamagrostis epigeios* (L.) Roth

46. *Elymus hispidus* (Opiz) Meld. subsp. *hispidus*

47. *Phalaris arundinacea* L.

48. *Phragmites australis* (Cav.) Trin.ex Steud.

Polygonaceae

49. *Rumex conglomeratus* Murr.

Potamogetonaceae

50. *Potamogeton natans* L.

Primulaceae

51. *Lysimachia nummularia* L.

Ranunculaceae

52. *Ranunculus aquatilis* L.

53. *Ranunculus repens* L.

Rosaceae

54. *Agrimonia eupatoria* L.
 55. *Potentilla reptans* L.
 56. *Prunus cerasifera* Ehrh.
 57. *Rubus caesius* L.
- Rubiaceae*
 58. *Galium aparine* L.
 59. *Galium humifusum* Bieb.
- Salicaceae*
 60. *Salix alba* L.
- Salviniaceae*
 61. *Salvinia natans* (L.) All. – EN, LBD
- Solanaceae*
 62. *Solanum dulcamara* L.
- Sparganiaceae*
 63. *Sparganium erectum* L.
- Typhaceae*
 64. *Typha latifolia* L.
 65. *Typha schuttelworthii* Koch & Sond.-DD, Bern convention
- Ulmaceae*
 66. *Celtis australis* L.
- Verbenaceae*
 67. *Verbena officinalis* Voss.
 A list of the flora of natural protected area “Gornata koria”:
- Amaranthaceae*
 1. *Amaranthus retroflexus* L.
- Amaryllidaceae*
 2. *Galanthus elwesii* Hook f.-EN, Appendix 2 LBD
- Apiaceae*
 3. *Eryngium campestre* L.
- Asteraceae*
 4. *Arctium lappa* L.
 5. *Cichorium inthybus* L.
 6. *Inula hirta* L.
 7. *Xeranthemum cylindraceum* Sibth. & Sm.
- Betulaceae*
 8. *Carpinus orientalis* Mill.
- Boraginaceae*
 9. *Cynoglossum hungaricum* Simonk.
- Brassicaceae*
 10. *Alliaria petiolata* (M.Bieb.) Cavara & Grande
 11. *Cardaria draba* (L.) Desv.
- Cannabaceae*
 12. *Cannabis sativa* L.
- Caryophyllaceae*
 13. *Silene noctiflora* L.
- Chenopodiaceae*
 14. *Chenopodium glaucum* L.
- Cornaceae*
 15. *Cornus mas* L.
- Fagaceae*
 16. *Quercus cerris* L.
- Hypericaceae*
 17. *Hypericum perforatum* L.
- Iridaceae*
 18. *Crocus flavus* Waston – Appendix 4 LBD
- Lamiaceae*
 19. *Betonica officinalis* L.
 20. *Clinopodium vulgare* L.
 21. *Leonurus cardiaca* L.
 22. *Prunella vulgaris* L.
 23. *Stachys germanica* L.
- Liliaceae*
 24. *Allium paniculatum* L.
 25. *Asparagus officinalis* L. – Appendix 4 LBD
- Malvaceae*
 26. *Alcea pallida* (Waldst. & Kit. ex Willd.) Waldst. & Kit.
- Oleaceae*
 27. *Syringa vulgaris* L.
- Poaceae*
 28. *Brachypodium sylvaticum* (Huds.) P.Beauv.
 29. *Dactylis glomerata* L.
 30. *Echinochloa crus-galli* (L.) Beauv.
 31. *Poa compressa* L.
 32. *Setaria viridis* (L.) P. Beauv.
- Paeoniaceae*
 33. *Paeonia peregrina* Miller – Appendix 4 LBD
- Plantaginaceae*
 34. *Plantago major* L.
- Polygonaceae*
 35. *Rumex sanguineus* L.
- Rosaceae*
 36. *Agrimonia eupatoria* L.
 37. *Crataegus monogyna* Jacq.
 38. *Geum urbanum* L.
 39. *Potentilla neglecta* Baumg.
 40. *Prunus spinosa* L.
 41. *Pyrus pyraster* Burgsd.
 42. *Rosa dumalis* Bechst.
- Rutaceae*
 43. *Dictamnus albus* L.
- Scrophulariaceae*
 44. *Verbascum phoeniceum* L.
- Ulmaceae*
 45. *Ulmus laevis* Pall.
- Verbenaceae*
 46. *Verbena officinalis* Voss.
 A list of the flora of the natural landmark “Ostrata kanara”:
- Asteraceae*

1. *Centaurea rutifolia* Sm.
 2. *Chondrilla juncea* L.
 3. *Cota tinctoria* (L.) Gay.
 4. *Jacobaea erucifolia* (L.) Gaertn. & Al.
 5. *Picris hieracioides* L. subsp. *hieracioides*
 6. *Tragopogon dubius* Scop.
- Boraginaceae*
7. *Echium vulgare* L.
- Brassicaceae*
8. *Alyssum murale* Waldst. & Kit.
- Campanulaceae*
9. *Campanula sibirica* L.
- Caryophyllaceae*
10. *Arenaria serpyllifolia* L.
 11. *Minuartia glomerata* (M.Bieb.) Degen f. *glomerata*
 12. *Petrorhagia prolifera* (L.) P.W.Ball & Heywood
- Chenopodiaceae*
13. *Chenopodium glaucum* L.
- Dipsacaceae*
14. *Scabiosa triniifolia* Friv. – Bal. endemic
- Lamiaceae*
15. *Ajuga chia* Schreb.
 16. *Calamintha sylvatica* Bromf.
 17. *Salvia nutans* L.
 18. *Sideritis montana* L.
 19. *Stachys recta* L.
 20. *Teucrium polium* L.
 21. *Thymus striatus* Vahl.
- Liliaceae*
22. *Allium rotundum* L.
- Malvaceae*
23. *Althaea cannabina* L.
- Poaceae*
24. *Dichanthium ischaemum* (L.) Roberty
 25. *Festuca valesiaca* Schleich. ex Gaudin
 26. *Koeleria nitidula* Velen.
 27. *Melica ciliata* L.
 28. *Poa bulbosa* L.
 29. *Poa compressa* L.
- Ranunculaceae*
30. *Consolida regalis* Gray
 31. *Nigella arvensis* L.
- Rosaceae*
32. *Potentilla pedata* Willd.
 33. *Prunus mahaleb* L.
 34. *Sanguisorba minor* Scop.
- Rubiaceae*

35. *Asperula tenella* Heuff. ex Degen f. *tenella*
 36. *Galium lucidum* All.
- Scrophulariaceae*
37. *Linaria genistifolia* (L.) Mill.
 38. *Verbascum dieckianum* Borbas & Degen-CR, Appendix 2 LBD, Bal. endemic
 39. *Verbascum banaticum* Schrad.

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