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FLORA AND VEGETATION IN FOREST NATURAL HABITATS OF NATURA 2000 PROTECTED AREA *KAMCHIA* (BG0000116) AND *BEACH SHKORPILOVTSI* (BG0000100)

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Abstract. The flora and vegetation in the protected area *Kamchia* were studied, as part of the European ecological network Natura 2000 within the implementation of the project *Mapping and determination of the environmental status of natural habitats and species – phase I*. Contract Nr. 04-014/05.04.2011. The paper presents data on the flora and vegetation in five types of forest natural habitats with codes 91E0, 91F0, 91G0, 91M0 and 92A0. Totally 222 high plant species were recorded in the studied habitats and seven of them were with conservation status. All obtained data confirmed the high conservation value of the flora and vegetation of the protected area and need for strict measures for its protection.

Key words: forest habitats, EUNIS, Directive 92/43/EC, protected species

INTRODUCTION

The present study aimed to assess the current status of the flora and vegetation of the forest natural habitats in the protected area (PA) *Kamchia* (BG0000116),

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which is a part of the European ecological network NATURA 2000. The literature review shows that there is one preceding publication on the flora of the studied area and more data on its vegetation with a stress on riparian forests (PENEV 1984; IVANOV ET AL. 2002; PEEV ET AL. 2003; GEORGIEV 2004, 2008; RUSEV 2004; ZHELEV & YURUKOV 2004). Current status of its five forest and non-forest natural habitats was discussed by TASHEV ET AL. (2018A,B) with special attention on the flora and vegetation of the non-forest habitats (TASHEV ET AL. 2017).

MATERIAL AND METHODS

The studied protected area (PA) *Kamchia* is a part of the European ecological network NATURA 2000, declared as such with a decree of the Council of Ministers of the Republic of Bulgaria Nr. 802/04.12.2007 (STATE GAZETTE Nr.107/2007). The territory of PA *Kamchia* is 129 199.37 dka and includes a nature reserve with the same name. PA *Kamchia* covers the easternmost parts of the Kamchia river valley and the foothills of Stara Planina (Balkan Range) going to the Black Sea. The zone covers the territories on the banks of Kamchia from Grozdyovo village from the West to the mouth of the Kamchia river in the Black Sea at the East. It is announced protected area according to DIRECTIVE 92/43/EEC/ and DIRECTIVE 2009/147/EC with the name Complex Kamchia (BG0002045). The orography of PA *Kamchia* is variable – it is plain along Kamchia river and becomes hilly in the north and south direction. On the entire territory of the area, longer or shorter ravines are deeply jugged into the rock fundament, thus forming steep and very steep slopes. The studied area belongs to the Continental-Mediterranean climatic area, Black Sea climatic sub-area and Northern Black Sea climatic region (VELEV 2002, 2010). The climate is characterized by warm summer and mild winter, relatively small annual temperature amplitude, and autumn-winter precipitation maximum and the absence of annual sustainable snow cover in regions out of the mountains. Annual precipitation amounts are between 500 and 1000 mm and the higher values are related to the ways of the Mediterranean cyclones. The soils are classified as belonging to Carpatho-Danubian soil region, and the East Balkan province (MALINOVA 2010). The predominant soil types are Luvisols, Chromic Luvisols, which form complexes with Rankers and Lithosols in some places. There are also Fluvisols and Alluvial Fluvisols. Soils are mainly IV productivity class, characterized with acid reaction, poor, seasonal surface over-moisturising, erosion processes and shallow.

The field work was conducted during the period July-September 2011. The identification of habitats was done according to KAVRUKOVA ET AL. (2008) and to the Red Data Book of the Republic of Bulgaria (BISERKOV 2015). Each natural habitat was checked also using EUNIS classification. The choice of the places for description was done after visual evaluation of typical sectors within a plant community. The area of description was 256 m² (16x16 m experimental plots – EP). Full floristic inventory was done for each plot and the cover of each taxon was evaluated according to BRAUN-

BLANQUET (1964). In the presence of vertical fragmentation, the description of the floristic composition is done by vertical levels from top to bottom. GPS coordinates, including altitude, were taken for each description plot (**Tables 1, 3, 5, 7, 9**).

Table 1. Geographical coordinates of phytocoenological descriptions of natural habitat 91E0.

Experimental Plot	Geographical coordinates		Altitude [m]	Date
	N	E		
EP 1	43.02129	27.84326	13	3.08.2011
EP 2	43.01991	27.72668	21	5.08.2011
EP 3	42.99890	27.88502	2	6.08.2011
EP 4	43.00119	27.87231	9	7.08.2011
EP 5	43.05241	27.54002	30	8.08.2011
EP 6	43.03054	27.70299	22	10.08.2011
EP 7	43.01904	27.71494	21	10.08.2011

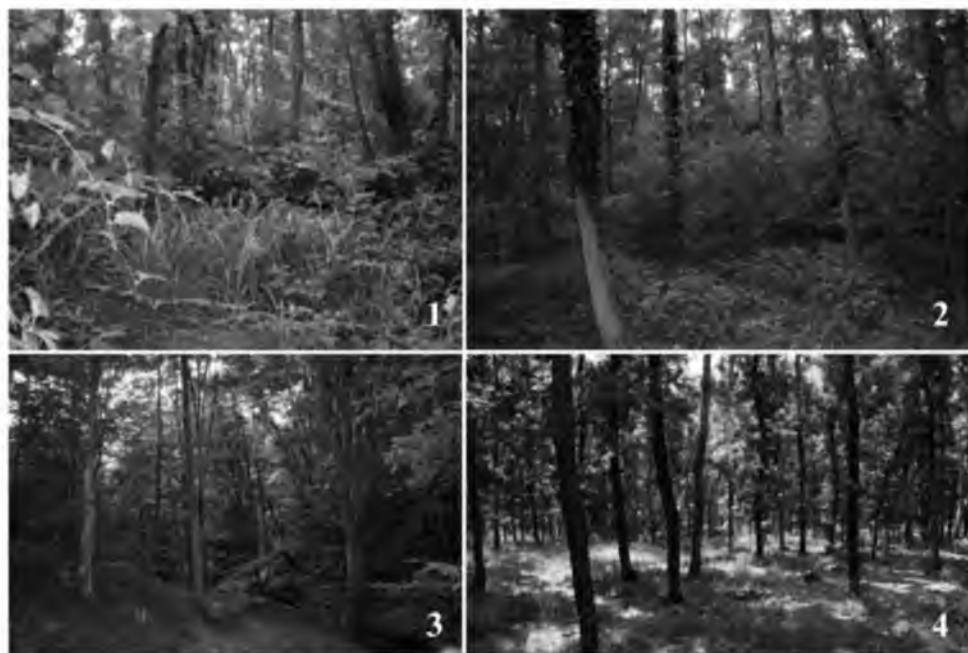
The plant taxa were identified according to JORDANOV ET AL. (1963-1989), VELCHEV (1982, 1989), KOZUHAROV (1995), DELIPAVLOV & CHESHMEDZHIEV (2011) and KOZUHAROV & ANCHEV (2012). The data were analyzed according to the habitat type. Species of conservation status were identified following PETROVA & VLADIMIROV (2009), PEEV (2015), THE BIOLOGICAL DIVERSITY ACT (2007) with Appendices № 3 and 4 (amended in STATE GAZETTE 101/22.12.2015), and according to DIRECTIVE 92/43/EC/21.05.1992 for conservation of natural habitats of the wild flora and fauna. Also, the Convention on the CONSERVATION OF EUROPEAN WILDLIFE AND NATURAL HABITATS Appendix I. (Bern Convention, 1979), EUROPEAN RED LIST OF VASCULAR PLANTS (BILS ET AL. 2011) and 1997 IUCN Red List of Threatened Plants (GILLET & WALTERS 1998) were considered.

Because of difficulties to determine some plant species during the field work, for them herbarium material was taken for identification in the laboratory. Cameral work included processing of data obtained from field work into tables according to types of natural habitats (**Table 2, 4, 6, 8, 10**). Plant species there are divided according to biological type and for each species the experimental plot in which it was found is shown together with its relative abundance. Species with conservation status were also identified according to national and international reference documents (**Table 12**) – Red List of Bulgarian vascular plants (PETROVA & VLADIMIROV 2009) and Red Data Book of the Republic of Bulgaria (PEEV 2015), BIOLOGICAL DIVERSITY ACT (ACT ON AMENDING AND SUPPLEMENTING 2007, Appendices Nr.3 and 4, amended STATE GAZETTE 101/22.12.2015) and DIRECTIVE 92/43/EEC/21.05.1992 for conservation of natural habitats and of wild flora and fauna. Among the international documents CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA

AND FLORA (CITES 1973), CONVENTION ON THE CONSERVATION OF EUROPEAN WILDLIFE AND NATURAL HABITATS Appendix I. (BERN CONVENTION 1979), European Red List of Vascular Plants (BILS ET AL. 2011) and 1997 IUCN Red List of Threatened Plants (GILLET & WALTERS 1998) were taken into account.

RESULTS AND DISCUSSION

A total of 37 phytosociological descriptions were performed for the typical plant communities on the territory of PA *Kamchia*. Below are presented data on the floristic composition and phytocoenological peculiarities of the five forest natural habitats identified in the area (TASHEV ET AL. 2018A): 1) **Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (91E0)**. EUNIS: G1.413 **Southern Helleno-Balkan swamp alder woods (Fig. 1)**. During the current study in this habitat, 7 phytocoenological descriptions were done and totally 76 species were found (Tables 1-2). According to the limited occurrence and plants biodiversity, the habitat is of a high nature conservation value.



Figs. 1-4: 1 - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (91E0) in PA *Kamchia*; 2 - Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmion minoris*) (91F0) in PA *Kamchia*; 3 - Pannonic woods with *Quercus petraea* and *Carpinus betulus* (91G0) in PA *Kamchia*; 4 - Pannonian-Balkan turkey oak-sessile oak forests (91M0) in PA *Kamchia*.

However, during the last decades, as a result from the changed water regime of the River Kamchia because of the building of the reservoirs Kamchia and Tsonevo, the territories of this habitat rapidly decreased. This demands immediate measures for conservation and rehabilitation of the habitat; **2) Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmion minoris*) (91F0). EUNIS: G1.2232 Helleno-Balkan ash-oak-alder forests (Fig. 2).** The forests in this habitat are riparian mixed deciduous forests, which are periodically flooded and are known with the term *longoz* (DIMITROVA ET AL. 2007). It has to be boldly underlined that the proclamation of the reserve had the aim to preserve exactly this habitat type. During the study, seven phytocoenological investigations were done and 123 higher plants were recorded (Tables 3-4). The conservation priority of longozes is due both to their rare type and taxonomic richness. However, due to the anthropogenic impact on the habitat in the region of investigation, the occurrence of numerous dangerous and strongly competitive invasive species was observed (TASHEV ET AL. 2018A). The rapid decrease of the area of this habitat noted during the last years (BISERKOV 2015) could be explained with the influence of the reservoirs Kamchia



Fig. 5. *Salix alba* and *Populus alba* galleries (92A0) in PA Kamchia.

and Tsonevo, which were built in the watershed of the Kamchia River and changed its water regime (TASHEV ET AL. 2018A). Undesirable succession, expressed by replacement of hygrophytes in phytocoenoses by more drought-resistant plant species, was observed in the communities and showed the need of urgent measures for the conservation and restoration of this natural habitat; **3) Pannonic woods with *Quercus petraea* and *Carpinus betulus* (91G0).**

EUNIS: G1.A1C31 Moesian mesophile oak-hornbeam forests (Fig. 3). In the investigated area for this habitat, two phytocoenological descriptions were made and 52 species were determined (Tables 5-6). Due to the difficultly accessible terrains there was no negative anthropogenic impact on this habitat; **4) Pannonian-Balkan turkey oak-sessile oak forests (91M0). EUNIS: G1.768 Moesio-Danubian thermophilous oak forests (Fig. 4).** In this habitat four phytocoenological descriptions were done and 79 species were recorded (Tables 7-8). The habitat is anthropogenically impacted and invasion of *Robinia pseudoacacia* has been observed; **5) *Salix alba* and *Populus alba* galleries (92A0). EUNIS: G1.3155 Rhodpine Mediterranean poplar galleries (Fig. 5).** This type of habitat was

reported for the first time in the PA *Kamchia* (TASHEV ET AL. 2018A). Six phytocoenological descriptions were made and 84 species were recorded (**Tables 9-10**). A degradation was established in this habitat as a result from the anthropogenic activity due to the recreation to large groups of people and fishing (TASHEV ET AL. 2018A).

The conservation value of the investigated types of natural habitats and plant species on the territory of PA *Kamchia* is presented on **Tables 11-12**.

Table 2. Floristic and phytocoenological characterization of natural habitat 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in PA *Kamchia*.

№	Species	Abundance (after BRAUN-BLANQUET 1964)						
		EP1	EP2	EP3	EP4	EP5	EP6	EP7
Trees								
1.	<i>Acer campestre</i> L.	-	+	-	1 - 2	-	-	+
2.	<i>Alnus glutinosa</i> (L.) Gaertn.	2 - 3	4	4	2	-	-	2
3.	<i>Carpinus betulus</i> L.	-	1	-	-	-	1 - 2	1 - 2
4.	<i>Fraxinus excelsior</i> L.	3 - 4	-	-	-	-	-	-
5.	<i>Fraxinus oxycarpa</i> M. Bieb. ex Willd.	-	3	2	4	2	2	2
6.	<i>Populus alba</i> L.	-	-	3	-	2 - 3	-	3
7.	<i>Pyrus pyraeaster</i> Burgsd.	-	-	+	-	-	-	-
8.	<i>Quecus robur</i> L.	-	-	+ - 1	-	-	1 - 2	-
9.	<i>Salix alba</i> L.	-	1	-	-	2	2	3
10.	<i>Salix fragilis</i> L.	-	-	-	-	2	2	-
11.	<i>Salix triandra</i> L.	-	-	-	-	-	1 - 2	-
12.	<i>Tilia platyphyllos</i> Scop.	-	+	-	-	-	-	-
13.	<i>Ulmus leavis</i> Pall.	-	-	-	2	2	1 - 2	1
14.	<i>Ulmus minor</i> Mill.	+	1	1	2	2	1 - 2	1
Shrubs and lianas								
15.	<i>Cornus sanguinea</i> L.	+	1	-	-	-	1 - 2	+
16.	<i>Corylus avellana</i> L.	-	+	-	-	-	-	-
17.	<i>Crataegus monogyna</i> Jacq.	+	+	+	1 - 2	-	1	-
18.	<i>Evonymus europaeus</i> L.	-	1	-	1	-	-	+
19.	<i>Hedera helix</i> L.	-	1	r	1 - 2	-	-	1 - 2
20.	<i>Periploca graeca</i> L.	+	+ - 1	2	+	-	-	+
21.	<i>Rosa canina</i> L.	-	-	-	-	-	-	+

№	Species	Abundance (after BRAUN-BLANQUET 1964)						
		EP1	EP2	EP3	EP4	EP5	EP6	EP7
22.	<i>Rubus caesius</i> L.	-	-	-	3	5	-	+
23.	<i>Rubus hirtus</i> Waldst. & Kit.	1	-	+	-	-	-	-
24.	<i>Salix purpurea</i> L.	-	-	-	-	+ - 1	-	-
25.	<i>Sambucus nigra</i> L.	-	+	-	-	-	-	-
26.	<i>Vitis sylvestris</i> C. C. Gmel.	-	-	+	-	-	-	-
Herbaceous plants								
27.	<i>Aegopodium podagraria</i> L.	-	1 - 2	-	-	-	+	-
28.	<i>Alliaria petiolata</i> (M. Bieb.) Cavara & Grande	-	-	-	-	-	+ - 1	-
29.	<i>Angelica sylvestris</i> L.	-	1	-	-	-	2	-
30.	<i>Arctium tomentosum</i> Mill.	-	-	-	-	+	-	-
31.	<i>Asparagus tenuifolius</i> Lam.	-	-	r	-	-	-	-
32.	<i>Brachypodium sylvaticum</i> (Huds.) P. Beauv.	-	-	+	-	+	-	-
33.	<i>Calamagrostis pseudo-phragmites</i> (Haller f.) Koeler	+	-	-	-	-	-	-
34.	<i>Calystegia sepium</i> (L.) R. Br.	-	+	+	-	-	+	+ - 1
35.	<i>Carex remota</i> L.	-	-	+	2 - 3	-	+	+
36.	<i>Carex</i> sp.	+	-	-	-	-	-	-
37.	<i>Chaerophyllum</i> sp.	-	-	-	-	+	-	-
38.	<i>Circaea luteciana</i> L.	+	-	-	-	-	-	-
39.	<i>Cucubalus baccifer</i> L.	-	-	-	-	+	-	-
40.	<i>Dactylis glomerata</i> L.	-	-	-	-	-	-	+
41.	<i>Equisetum arvense</i> L.	+	-	-	-	-	-	-
42.	<i>Equisetum telmateia</i> Ehrh.	-	2 - 3	-	-	-	1	1
43.	<i>Euphorbia palustris</i> L.	-	-	-	-	r	-	-
44.	<i>Galium aparine</i> L.	-	-	-	1	1 - 2	+ - 1	-
45.	<i>Galium palustre</i> L.	1 - 2	-	-	1	+	+	-
46.	<i>Geum urbanum</i> L.	-	-	-	-	-	+	+
47.	<i>Humulus lupulus</i> L.	-	-	-	-	2 - 3	-	1 - 2
48.	<i>Iris pseudacorus</i> L.	+	+	-	1	-	-	-
49.	<i>Lapsana communis</i> L.	-	-	-	-	+	-	-
50.	<i>Leucojum aestivum</i> L.	+	+	-	3	-	+ - 1	1
51.	<i>Lycopus europaeus</i> L.	+	+	+	+	+	+	+

№	Species	Abundance (after BRAUN-BLANQUET 1964)						
		EP1	EP2	EP3	EP4	EP5	EP6	EP7
52.	<i>Lysimachia nummularia</i> L.	+	+	-	+	-	-	-
53.	<i>Lysimachia punctata</i> L.	+	-	-	-	-	-	-
54.	<i>Lythrum salicaria</i> L.	-	-	+	-	-	+	1
55.	<i>Lythrum</i> sp.	-	-	-	-	-	-	2
56.	<i>Mentha aquatica</i> L.	-	-	-	-	-	+	-
57.	<i>Oenanthe aquatica</i> (L.) Poir.	-	1	-	-	-	+	-
58.	<i>Persicaria hydropiper</i> (L.) Opiz (Syn. <i>Polygonum hydropiper</i> (L.) Delabre)	-	+	-	-	-	-	-
59.	<i>Phytolacca americana</i> L. (Syn. <i>Phytolacca decandra</i> L.)	-	-	-	-	+	-	-
60.	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	-	-	-	-	-	-	+ - 1
61.	<i>Potentilla reptans</i> L.	-	-	+	-	-	-	-
62.	<i>Ranunculus lanuginosus</i> L. var. <i>constantinopolitanus</i> DC. (Syn. <i>Ranunculus con-</i> <i>stantinopolitanus</i> (DC.) D'Urv.)	+	-	-	-	-	-	-
63.	<i>Ranunculus repens</i> L.	+	-	-	-	-	-	-
64.	<i>Rumex sanguineus</i> L.	+	-	-	-	-	-	-
65.	<i>Ruscus aculeatus</i> L.	-	-	r	-	-	-	-
66.	<i>Scirpus lacustris</i> L. (Syn. <i>Schoenoplectus lacustris</i> (L.) Palla)	-	4	-	-	-	1 - 2	1 - 2
67.	<i>Scirpus sylvaticus</i> L.	4	-	-	+	-	-	-
68.	<i>Scirpus triqueter</i> L. (Syn. <i>Schoe-</i> <i>noplectus triqueter</i> (L.) Palla)	-	-	-	-	-	-	1 - 2
69.	<i>Smilax excelsa</i> L.	+	3	+	+	-	2	+
70.	<i>Solanum dulcamara</i> L.	1 - 2	+	+	-	-	+	+
71.	<i>Stachys palustris</i> L.	+	-	-	-	-	-	-
72.	<i>Stellaria nemorum</i> L.	-	-	-	-	-	+	-
73.	<i>Symphytum officinale</i> L.	1	-	-	-	-	-	-
74.	<i>Tamus communis</i> L.	-	-	+	-	-	-	-
75.	<i>Urtica dioica</i> L.	+	-	-	-	1	1	-
76.	<i>Viola odorata</i> L.	-	-	+	-	-	-	-
77.	Bryophyta	-	-	-	1 - 2	-	-	-

Table 3. Floristic and phytocenological characterization of natural habitat 91F0 Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmunion minoris*) in PA Kamchia.

[illegible]

№	Species	Abundance (after Braun-Blanquet)																	
		EP 1	EP 2	EP 3	EP 4	EP 5	EP 6	EP 7	EP 8	EP 9	EP 10	EP 11	EP 12	EP 13	EP 14	EP 15	EP 16	EP 17	EP 18
15.	<i>Pyrus pyraaster</i> Burgsd.	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-
16.	<i>Quercus cerris</i> L.	-	-	+	-	2	-	-	-	-	-	-	-	+	-	-	-	-	-
17.	<i>Quercus frainetto</i> Ten.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
18.	<i>Quercus petraea</i> (Mattuschka) Liebl.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
19.	<i>Quercus robur</i> L.	2 - 3	2	+	2	-	3	3	2 - 3	3	-	-	-	2	+	-	-	-	+
20.	<i>Sorbus torminalis</i> (L.) Crantz	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
21.	<i>Tilia platyphyllos</i> Scop.	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
22.	<i>Ulmus laevis</i> Pall.	2	1	+	+	-	-	2	1 - 2	2	2	2	+	1	1	1 - 2	2	2	-
23.	<i>Ulmus minor</i> Mill.	1	2	+	+	-	-	2	1 - 2	2	2	-	+	1	1	1 - 2	2	-	2
Shrubs and lianas																			
24.	<i>Amorpha fruticosa</i> L.	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
25.	<i>Clematis vitalba</i> L.	+	-	-	1	-	-	-	-	+	+	+	-	-	+	-	1 - 2	-	-
26.	<i>Cornus mas</i> L.	-	-	-	-	-	-	-	1 - 2	-	-	-	-	-	-	-	-	-	+
27.	<i>Cornus sanguinea</i> L.	+	+	-	-	-	+	-	-	-	-	-	+	1	1	+	+	-	+
28.	<i>Crataegus monogyna</i> Jacq.	+	+	2	+	+	+	3	1	3	1	+	+	1 - 2	2	+	+	-	+
			- 1													- 1			- 1

№	Species	Abundance (after Braun-Blanquet)																	
		EP 1	EP 2	EP 3	EP 4	EP 5	EP 6	EP 7	EP 8	EP 9	EP 10	EP 11	EP 12	EP 13	EP 14	EP 15	EP 16	EP 17	EP 18
43.	<i>Angelica sylvestris</i> L.	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	-
44.	<i>Anthriscus sylvestris</i> (L.) Hoffm.	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
45.	<i>Arctium lappa</i> L.	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
46.	<i>Arctium tomentosum</i> Mill.	+	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-
47.	<i>Aristolochia clematitis</i> L.	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
48.	<i>Artemisia absinthium</i> L.	-	-	-	-	-	-	-	-	-	1 - 2	-	-	-	-	-	-	-	-
49.	<i>Artemisia annua</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
50.	<i>Artemisia vulgaris</i> L.	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-
51.	<i>Arum orientale</i> M. Bieb.	-	-	-	-	-	-	-	+	r	-	-	-	r	-	-	-	-	-
52.	<i>Ballota nigra</i> L.	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
53.	<i>Brachypodium sylvaticum</i> (Huds.) P. Beauv.	+	1	3	+	+	+	1	1	+	3	+	1 - 2	3	1	+	4	-	+
54.	<i>Bromus</i> sp.	-	-	+	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
55.	<i>Bromus sterilis</i> L.	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-	-	-	-
56.	<i>Calamintha sylvatica</i> Bromf.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
57.	<i>Calystegia sepium</i> (L.) R. Br.	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+
58.	<i>Campanula trachelium</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
59.	<i>Cardamine pratensis</i> L.	-	-	+- 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60.	<i>Carex divulsa</i> Stokes	-	1	+	-	-	+	-	-	-	-	1	-	+	-	-	+	-	+

[illegible]

№	Species	Abundance (after Braun-Blanquet)																	
		EP 1	EP 2	EP 3	EP 4	EP 5	EP 6	EP 7	EP 8	EP 9	EP 10	EP 11	EP 12	EP 13	EP 14	EP 15	EP 16	EP 17	EP 18
79.	<i>Festuca gigantea</i> (L.) Vill.	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
80.	<i>Galium aparine</i> L.	+	+	1	-	1	-	1 - 2	1	1 - 2	2 - 3	2	2 - 3	+	1 - 2	-	+	+	-
81.	<i>Galium rotundifolium</i> L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
82.	<i>Geum urbanum</i> L.	+	+	+	+	+	+	+	+	1	-	+	+	+	1	2	1	+	+
83.	<i>Glechoma hederacea</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
84.	<i>Heracleum sibiricum</i> L.	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-
85.	<i>Hordeum</i> sp.	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
86.	<i>Humulus lupulus</i> L.	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	1	-
87.	<i>Iris pseudacorus</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3 - 4	-
88.	<i>Lamiastrum galeobdolon</i> (L.) L. (Syn. <i>Lamium galeobdolon</i>)	-	-	-	-	+- 1	-	-	-	-	-	-	-	-	-	-	-	-	-
89.	<i>Lapsana communis</i> L.	-	-	+- 1	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+
90.	<i>Lathyrus laxiflorus</i> (Desf.) Kuntze	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
91.	<i>Leucojum aestivum</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	-	2 - 3	-	-	2 - 3	-
92.	<i>Lycopus europaeus</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
93.	<i>Lysimachia nummularia</i> L.	+	-	+	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-
94.	<i>Lysimachia punctata</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-

[illegible]

№	Species	Abundance (after Braun-Blanquet)																	
		EP 1	EP 2	EP 3	EP 4	EP 5	EP 6	EP 7	EP 8	EP 9	EP 10	EP 11	EP 12	EP 13	EP 14	EP 15	EP 16	EP 17	EP 18
109.	<i>Rumex sanguineus</i> L.	-	+	+	-	+	-	+	+	+	+	-	+	+	+	-	+	+	+
110.	<i>Ruscus aculeatus</i> L.	-	-	-	-	+	2	-	2	-	-	-	-	-	-	-	-	-	+ - 1
111.	<i>Sambucus ebulus</i> L.	-	-	-	-	-	-	-	-	-	-	1 - 2	2 - 3	-	-	-	-	-	-
112.	<i>Scirpus lacustris</i> L.(Syn. <i>Schoenoplectus lacustris</i> (L.) Palla)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
113.	<i>Scirpus sylvaticus</i> L.	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
114.	<i>Smilax excelsa</i> L.	-	-	-	+	-	2	-	+	-	-	-	-	-	+	-	-	-	-
115.	<i>Solanum dulcamara</i> L.	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
116.	<i>Sonchus palustris</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	r	+	-
117.	<i>Stachys sylvatica</i> L.	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-
118.	<i>Stellaria nemorum</i> L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		- 1																	
119.	<i>Symphytum tauricum</i> Willd.	-	-	-	-	+	-	-	-	-	-	-	-	r	-	-	-	-	-
120.	<i>Tamus communis</i> L.	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
121.	<i>Urtica dioica</i> L.	+	+	2	1	+	-	-	-	+	+	2	-	+	+	-	1	+	+
											- 1								
122.	<i>Viola hirta</i> L.	-	-	-	-	-	-	-	-	-	+	-	+	1 - 2	-	3	-	-	+
123.	<i>Viola odorata</i> L.	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+

Table 4. Geographical coordinates of phytocoenological descriptions of natural habitat 91F0.

Test areas	Geographical coordinates		Altitude [m]	Date
	N	E		
EP 1	43.02267	27.82036	14	2.08.2011
EP 2	43.01213	27.84977	21	3.08.2011
EP 3	43.01335	27.81955	5	4.08.2011
EP 4	43.01575	27.80878	20	4.08.2011
EP 5	43.01950	27.72357	24	5.08.2011
EP 6	42.99141	27.88591	6	6.08.2011
EP 7	43.01695	27.86377	12	7.08.2011
EP 8	43.00076	27.87090	5	7.08.2011
EP 9	43.04485	27.54675	31	8.08.2011
EP 10	43.03987	27.56107	28	8.08.2011
EP 11	43.04646	27.60319	20	9.08.2011
EP 12	43.04103	27.62228	18	9.08.2011
EP 13	43.04356	27.64681	23	10.08.2011
EP 14	43.02443	27.69195	17	11.08.2011
EP 15	43.03098	27.66532	23	11.08.2011
EP 16	43.00809	27.72123	5	12.08.2011
EP 17	43.02178	27.88754	1	12.08.2011
EP 18	42.98320	27.88395	5	12.08.2011

Table 5. Geographical coordinates of phytocoenological descriptions of natural habitat 91G0.

Experimental Plot	Geographical coordinates		Altitude [m]	Data
	N	E		
EP 1	43.03707	27.72630	85	5.08.2011
EP 2	43.04326	27.64681	25	10.08.2011

Table 6. Floristic and phytocoenological characterization of natural habitat 91G0 Pannonic woods with *Quercus petraea* and *Carpinus betulus* in PA Kamchia.

№	Species	Abundance (after BRAUN-BLANQUET 1964)	
		EP1K	EP2K
Trees			
1.	<i>Acer campestre</i> L.	1	2
2.	<i>Acer tataricum</i> L.	-	+

№	Species	Abundance (after BRAUN-BLANQUET 1964)	
		EP1K	EP2K
3.	<i>Carpinus betulus</i> L.	3	3
4.	<i>Carpinus orientalis</i> Mill.	+	-
5.	<i>Fraxinus oxycarpa</i> M. Bieb. ex Willd.	2	+
6.	<i>Prunus cerasifera</i> Ehrh.	-	+
7.	<i>Quercus cerris</i> L.	2	2 - 3
8.	<i>Quercus frainetto</i> Ten.	2	-
9.	<i>Quercus robur</i> L.	-	4
10.	<i>Tilia platyphyllos</i> Scop.	2	-
11.	<i>Ulmus laevis</i> Pall.	-	+
12.	<i>Ulmus minor</i> Mill.	-	+
Shrubs and lianas			
13.	<i>Clematis vitalba</i> L.	-	1 - 2
14.	<i>Cornus mas</i> L.	-	+
15.	<i>Cornus sanguinea</i> L.	+	-
16.	<i>Crataegus monogyna</i> Jacq.	+	1
17.	<i>Evonymus europaeus</i> L.	-	+
18.	<i>Hedera helix</i> L.	4	+ - 1
19.	<i>Ligustrum vulgare</i> L.	-	+
20.	<i>Rubus hirtus</i> Waldst. & Kit.	+	-
21.	<i>Sambucus nigra</i> L.	-	+
Herbaceous plants			
22.	<i>Alliaria petiolata</i> (M. Bieb.) Cavara & Grande	+	-
23.	<i>Bilderdykia convolvulus</i> (L.) Dumort. (Syn. <i>Fallopia convolvulus</i> (L.) A. Love)	+	-
24.	<i>Brachypodium sylvaticum</i> (Huds.) P. Beauv.	-	2
25.	<i>Buglossoides purpureocaerulea</i> (L.) I. M. Johnst.	1	-
26.	<i>Calamintha sylvatica</i> Bromf.	+	-
27.	<i>Campanula rapunculoides</i> L.	+	-
28.	<i>Campanula</i> sp.	+	-
29.	<i>Campanula trachelium</i> L.	+	-
30.	<i>Carex divulsa</i> Stokes	-	+ - 1

№	Species	Abundance (after BRAUN-BLANQUET 1964)	
		EP1K	EP2K
31.	<i>Carex</i> sp.	1	-
32.	<i>Chaerophyllum</i> sp.	-	+
33.	<i>Circaea luteociana</i> L.	+	+ - 1
34.	<i>Clinopodium vulgare</i> L.	+	-
35.	<i>Dactylis glomerata</i> L.	1	-
36.	<i>Doronicum orientale</i> Hoffm.	+	-
37.	<i>Festuca drymeja</i> Mert & Koch	1 - 2	-
38.	<i>Galium aparine</i> L.	-	+ - 1
39.	<i>Galium pseudoaristatum</i> Schur	+	-
40.	<i>Geum urbanum</i> L.	+	1
41.	<i>Lapsana communis</i> L.	+	-
42.	<i>Lathyrus niger</i> (L.) Bernh.	+	-
43.	<i>Leonurus cardiaca</i> L.	-	+
44.	<i>Mycelis muralis</i> (L.) Dumort.	1 - 2	-
45.	<i>Parietaria lusitanica</i> L.	+	-
46.	<i>Poa nemoralis</i> L.	+	-
47.	<i>Polygonatum latifolium</i> (Jacq.) Desf.	+	+
48.*	<i>Symphytum tauricum</i> Willd.	-	+
49.	<i>Tamus communis</i> L.	+	+
50.	<i>Urtica dioica</i> L.	+	1 - 2
51.	<i>Viola alba</i> Besser	+	-
52.	<i>Viola hirta</i> L.	+	1 - 2
53.	Bryophyta	+ - 1	-

Table 7. Geographical coordinates of phytocoenological descriptions of natural habitat 91M0.

Experimental Plot	Geographical coordinates		Altitude [m]	Date
	N	E		
EP 1	43.02726	27.82842	30	3.08.2011
EP 2	43.04940	27.81825	72	4.08.2011
EP 3	43.03731	27.72665	122	5.08.2011
EP 4	43.05579	27.64328	72	10.08.2011

Table 8. Floristic and phytocoenological characterization of natural habitat 91M0 Pannonian-Balkan oak-sessile oak forests (91M0) in PA *Kamchia*.

№	Species	Abundance (after BRAUN-BLANQUET 1964)			
		EP1	EP2	EP3	EP4
Trees					
1.	<i>Acer campestre</i> L.	+	-	+	+ - 1
2.	<i>Carpinus orientalis</i> Mill.	-	-	3	+
3.	<i>Fraxinus ornus</i> L.	+	-	2	-
4.	<i>Prunus cerasifera</i> Ehrh.	+ - 1	-	+	+
5.	<i>Pyrus pyraeaster</i> Burgsd.	+	-	-	-
6.	<i>Quercus cerris</i> L.	4	2	2	3
7.	<i>Quercus frainetto</i> Ten.	3	4	3	2
8.	<i>Quercus petraea</i> (Mattuschka) Liebl.	-	1	-	-
9.	<i>Sorbus domestica</i> L.	-	-	+	-
10.	<i>Sorbus torminalis</i> (L.) Crantz	-	2	+	-
11.	<i>Ulmus minor</i> Mill.	+ - 1	-	-	-
Shrubs and lianas					
12.	<i>Clematis vitalba</i> L.	-	-	+	-
13.	<i>Cornus mas</i> L.	1	+	-	2
14.	<i>Crataegus monogyna</i> Jacq.	1	+	+	1
15.	<i>Evonymus europaeus</i> L.	+	-	-	+
16.	<i>Genista tinctoria</i> L.	-	-	+	-
17.	<i>Hedera helix</i> L.	-	-	+ - 1	-
18.	<i>Ligustrum vulgare</i> L.	-	-	-	+ - 1
19.	<i>Prunus spinosa</i> L.	+ - 1	-	-	+
20.	<i>Rosa canina</i> L.	+	+	-	+ - 1
Herbaceous plants					
21.	<i>Agrimonia eupatoria</i> L.	-	+	-	-
22.	<i>Allium flavum</i> L.	-	+	-	-
23.	<i>Arabis glabra</i> (L.) Bernh.(Syn. <i>Turritis glabra</i> L.)	-	-	-	+
24.	<i>Arctium tomentosum</i> Mill.	-	+	-	-
25.	<i>Aremonia agrimonoides</i> (L.) DC.	-	+	-	-
26.*	<i>Asparagus tenuifolius</i> Lam.	+	-	r	-
27.	<i>Brachypodium sylvaticum</i> (Huds.) P. Beauv.	2 - 3	-	+	2 - 3

№	Species	Abundance (after BRAUN-BLANQUET 1964)			
		EP1	EP2	EP3	EP4
28.	<i>Bromus squarrosus</i> L.	-	+	-	-
29.	<i>Calamintha sylvatica</i> Bromf.	-	-	+	-
30.	<i>Campanula bononiensis</i> L.	-	-	-	+
31.	<i>Campanula persicifolia</i> L.	-	-	+	-
32.	<i>Carex</i> sp.	-	-	+	1
33.	<i>Chaerophyllum byzantinum</i> Boiss.	-	+	-	-
34.	<i>Cirsium arvense</i> (L.) Scop.	+	-	-	-
35.	<i>Cirsium</i> sp.	-	+	-	-
36.	<i>Clinopodium vulgare</i> L.	-	-	+	-
37.	<i>Cynanchum acutum</i> L.	+	-	-	-
38.	<i>Dactylis glomerata</i> L.	+	2	2	+
39.	<i>Daucus carota</i> L.	-	+	-	-
40.	<i>Deschampsia caespitosa</i> (L.) P. Beauv.	-	-	+	-
41.	<i>Dorycnium herbaceum</i> Vill.	-	+	-	-
42.	<i>Eryngium campestre</i> L.	-	+	-	-
43.	<i>Euphorbia amygdaloides</i> L.	-	-	+	-
44.	<i>Festuca heterophylla</i> Lam.	1 - 2	1	2	+
45.	<i>Festuca pratensis</i> L.	-	-	-	+
46.	<i>Festuca valesiaca</i> Schleich. ex Gaudin	+	+	-	+
47.	<i>Filipendula vulgaris</i> Moench	+	-	-	-
48.	<i>Fragaria vesca</i> L.	+	-	-	+
49.	<i>Galium pseudoaristatum</i> Schur	-	-	1	-
50.	<i>Geum urbanum</i> L.	+	+	-	-
51.	<i>Hypericum perforatum</i> L.	-	+	+	-
52.	<i>Lapsana communis</i> L.	+ - 1	+	+	+ - 1
53.	<i>Lathyrus laxiflorus</i> (Desf.) Kuntze	+	+	-	+
54.	<i>Lathyrus niger</i> (L.) Bernh.	1	1 - 2	1 - 2	-
55.	<i>Lithospermum officinale</i> L.	+	-	-	-
56.	<i>Luzula forsteri</i> (Sm.) DC.	-	-	-	+
57.	<i>Lychnis coronaria</i> (L.) Desr.	-	+	+	-
58.	<i>Lysimachia vulgaris</i> L.	+	-	-	-
59.	<i>Muscari comosum</i> (L.) Mill.	+	+	-	+

№	Species	Abundance (after BRAUN-BLANQUET 1964)			
		EP1	EP2	EP3	EP4
60.	<i>Myosotis sylvatica</i> Ehrh. ex Hoffm.	-	-	-	+
61.	<i>Poa nemoralis</i> L.	+	+	+ - 1	+
62.	<i>Poa pratensis</i> L.	+ - 1	+ - 1	-	+ - 1
63.	<i>Polygonatum latifolium</i> (Jacq.) Desf.	-	-	+	+
64.	<i>Prunella vulgaris</i> L.	+	-	-	+
65.	<i>Rumex sanguineus</i> L.	-	+	-	-
66.	<i>Silene viridiflora</i> L.	-	+	+	+
67.	<i>Tanacetum corymbosum</i> (L.) Sch. Bip.	-	-	r	+
68.	<i>Teucrium chamaedrys</i> L.	-	-	-	+
69.	<i>Trifolium alpestre</i> L.	-	+	-	+
70.	<i>Trifolium montanum</i> L.	-	-	-	+
71.	<i>Trifolium pannonicum</i> Jacq.	-	-	-	+
72.	<i>Trifolium</i> sp.	-	+	-	-
73.	<i>Verbascum phoeniceum</i> L.	-	-	-	+
74.	<i>Veronica chamaedrys</i> L.	+	-	+	-
75.	<i>Veronica officinalis</i> L.	-	-	+	-
76.	<i>Veronica orchidea</i> Crantz (Syn. <i>Pseudolysimachium orchideum</i> (L.) Rauschert)	+	+	-	-
77.	<i>Viola odorata</i> L.	-	-	+	-
78.	<i>Viola reichenbachiana</i> Jord. ex Boreau	+	-	-	-
79.	<i>Xeranthemum annuum</i> L.	-	+	-	-
80.	Bryophyta	-	-	+ - 1	-

Table 9. Geographical coordinates of phytocoenological descriptions of natural habitat 92A0.

Experimental Plot	Geographical coordinates		Altitude [m]	Date
	N	E		
EP 1	43.01232	27.85741	12	7.08.2011
EP 2	43.04052	27.55403	27	8.08.2011
EP 3	43.04996	27.59413	22	9.08.2011
EP 4	43.04149	27.63415	21	9.08.2011
EP 5	43.02883	27.67261	5	11.08.2011
EP 6	43.01656	27.72096	18	12.08.2011

Table 10. Floristic and phytocoenological characterization of natural habitat 92A0 *Salix alba* and *Populus alba* galleries in PA Kamchia.

№	Species	Abundance (after BRAUN-BLANQUET 1964)					
		EP1	EP2	EP3	EP4	EP5	EP6
Trees							
1.	<i>Acer campestre</i> L.	+	-	-	-	-	+
2.	<i>Acer negundo</i> L.	-	1	-	1	-	+
3.	<i>Fraxinus oxycarpa</i> M. Bieb. ex Willd.	3	-	+ - 1	+	-	+
4.	<i>Juglans regia</i> L.	-	-	-	+ - 1	-	-
5.	<i>Morus alba</i> L.	-	+	1	+	-	+
6.	<i>Populus alba</i> L.	2 - 3	2 - 3	4	3	2 - 3	3
7.	<i>Prunus cerasifera</i> Ehrh.	+	+	+	-	-	+
8.	<i>Quecus robur</i> L.	+	-	+	-	-	-
9.	<i>Salix alba</i> L.	4	3	2	2 - 3	3	3 - 4
10.	<i>Salix fragilis</i> L.	-	-	2	-	3	2
11.	<i>Ulmus laevis</i> Pall.	-	1	1	+ - 1	+	+
12.	<i>Ulmus minor</i> Mill.	1 - 2	1 - 2	-	+ - 1	-	+
Shrubs and lianas							
13.	<i>Amorpha fruticosa</i> L.	+ - 1	+	1 - 2	+	+ - 1	2
14.	<i>Clematis vitalba</i> L.	+	+	-	-	-	1
15.	<i>Crataegus monogyna</i> Jacq.	-	1	-	-	-	-
16.	<i>Hedera helix</i> L.	+ - 1	-	-	-	-	-
17.	<i>Ligustrum vulgare</i> L.	-	+	-	-	-	-
18.	<i>Periploca graeca</i> L.	2	-	-	+	-	-
19.	<i>Prunus spinosa</i> L.	-	+	-	-	-	-
20.	<i>Rubus hirtus</i> Waldst. & Kit.	2	2	3 - 4	2	2	2 - 3

№	Species	Abundance (after BRAUN-BLANQUET 1964)					
		EP1K	EP2K	EP3K	EP4S	EP5S	EP6
21.	<i>Sambucus nigra</i> L.	-	-	-	-	-	+
Herbaceous plants							
22.	<i>Agrostis capillaris</i> L.	-	-	1	1 - 2	-	-
23.	<i>Agrostis stolonifera</i> L.	-	-	-	-	+	-
24.	<i>Agrostis verticillata</i> Vill. (Syn. <i>Polypogon viridis</i> (Gouan) Breistr.)	-	3	-	-	-	-
25.	<i>Angelica sylvestris</i> L.	-	-	+	+	-	-
26.	<i>Anthriscus sylvestris</i> (L.) Hoffm.	+	-	-	-	-	-
27.	<i>Arctium lappa</i> L.	-	+	-	-	-	-
28.	<i>Arctium tomentosum</i> Mill.	+	-	-	-	+	-
29.	<i>Aristolochia clematitis</i> L.	+	-	-	-	-	-
30.	<i>Artemisia absinthium</i> L.	-	+	-	-	-	-
31.	<i>Artemisia annua</i> L.	-	+	-	-	-	-
32.	<i>Artemisia vulgaris</i> L.	+	+	+	+	1	-
33.	<i>Aster amellus</i> L.	+	-	-	-	-	-
34.	<i>Ballota nigra</i> L.	-	+	-	-	-	-
35.	<i>Bidens tripartita</i> L.	-	-	-	-	+	-
36.	<i>Brachypodium sylvaticum</i> (Huds.) P. Beauv.	2	+	+	+	+	-
37.	<i>Bromus</i> sp.	-	1 - 2	-	-	-	-
38.	<i>Bromus sterilis</i> L.	2 - 3	-	-	1 - 2	-	-
39.	<i>Calamagrostis pseudophragmites</i> (Haller f.) Koeler	-	+	-	-	-	-
40.	<i>Calystegia sepium</i> (L.) R. Br.	-	-	+	-	+	-
41.	<i>Campanula trachelium</i> L.	+	-	-	-	-	-
42.	<i>Carex</i> sp.	+	-	-	-	-	-
43.	<i>Chaerophyllum</i> sp.	-	-	-	+	+	+
44.	<i>Chelidonium majus</i> L.	-	-	-	+	-	+
45.	<i>Chenopodium album</i> L.	-	-	-	-	+	-
46.	<i>Cichorium intybus</i> L.	+	-	-	-	+	+
47.	<i>Cirsium alatum</i> (S. G. Gmel.) Bobr.	-	-	+	1	+	-
48.	<i>Cirsium arvense</i> (L.) Scop.	-	+	-	-	-	-
49.	<i>Conium maculatum</i> L.	-	-	-	-	+ - 1	-
50.	<i>Conyza canadensis</i> (L.) Cronquist	-	1	+	-	+	-
51.	<i>Cucubalus baccifer</i> L.	+	-	+	+	-	+
52.	<i>Epilobium hirsutum</i> L.	-	-	-	+	-	-
53.	<i>Equisetum arvense</i> L.	-	+	-	-	+	-
54.	<i>Erigeron annuus</i> (L.) Pers.	-	1	+	+	+	-

№	Species	Abundance (after BRAUN-BLANQUET 1964)					
		EP1K	EP2K	EP3K	EP4S	EP5S	EP6
55.	<i>Eupatorium cannabinum</i> L.	-	+	+	-	-	-
56.	<i>Galium aparine</i> L.	1 - 2	1	2	1	-	2 - 3
57.	<i>Geum urbanum</i> L.	+	-	+	-	-	-
58.	<i>Heracleum ternatum</i> Velen.	1 - 2	-	-	+	+	-
59.	<i>Humulus lupulus</i> L.	+	-	+ - 1	-	+ - 1	2
60.	<i>Inula</i> sp.	-	+	-	-	-	-
61.	<i>Linaria vulgaris</i> Mill.	-	-	-	-	+	-
62.	<i>Lycopus europaeus</i> L.	-	+	+	-	+	-
63.	<i>Lythrum salicaria</i> L.	-	+	+	+	+	+
64.	<i>Mentha aquatica</i> L.	-	+	-	-	-	-
65.	<i>Panicum</i> sp.	-	-	-	-	-	+
66.	<i>Parietaria officinalis</i> L. (Syn. <i>Parietaria erecta</i> Mert. & Koch)	-	+	+	+ - 1	-	+
67.	<i>Persicaria hydropiper</i> (L.) Opiz (Syn. <i>Polygonum hyaropiper</i>)	-	+	-	-	1 - 2	-
68.	<i>Phalaris arundinacea</i> L.	-	-	-	+	-	-
69.	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	+	-	+	+	+ - 1	+
70.	<i>Phytolacca americana</i> L.	-	-	+	-	-	-
71.	<i>Plantago media</i> L.	-	-	-	-	-	+
72.	<i>Rumex sanguineus</i> L.	-	-	+	-	+	-
73.	<i>Sambucus ebulus</i> L.	-	1	-	1	+	-
74.	<i>Saponaria officinalis</i> L.	+ - 1	+	-	-	-	-
75.	<i>Solanum dulcamara</i> L.	-	+	+	-	-	+
76.	<i>Stellaria media</i> (L.) Vill.	-	1	+	+	+	-
77.	<i>Stellaria palustris</i> Retz.	-	-	-	-	2	-
78.	<i>Tanacetum corymbosum</i> (L.) Sch. Bip.	-	-	-	+	-	-
79.	<i>Taraxacum officinale</i> L.	+	-	-	-	-	-
80.	<i>Taraxacum</i> sp.	-	+	-	-	-	+
81.	<i>Urtica dioica</i> L.	1	+	1 - 2	2	+ - 1	1 - 2
82.	<i>Urtica urens</i> L.	-	-	-	-	+	-
83.	<i>Verbascum</i> sp.	-	+	-	-	-	-
84.	<i>Xanthium italicum</i> Moretti	-	-	-	-	-	+

Table 11. Conservation significance of natural habitats in the protected area *Kamchia*; code NATURA 2000 is the four-figure code pointed out in the standard form of NATURA 2000; the sign „+” means that the relevant type of natural habitat is included in appendix 1 of the Law for amendment of the Law for Biological Diversity (2007), appendix 1 of the Bern Convention (1979) and Directive 92/43/EEC (1992); the sign „-” means that the relevant type of natural habitat is presented in the relevant list; categories after The Red Book of the Republic of Bulgaria on Natural habitats (BISERKOV 2015): EN – Endangered, CR – Critically Endangered, VU – Vulnerable, NT – Nearly Threatened.

№	Natural habitats	Code Natura 2000	Bdv. Act (2007)	BernConv. (1979)	Direct. 92/43/EEC	BG Red Book (2015)
1	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)	91E0	+	+	+	EN
2	Riparian mixed forests of <i>Quercus robur</i> , <i>Ulmus laevis</i> and <i>Ulmus minor</i> , <i>Fraxinus excelsior</i> or <i>Fraxinus angustifolia</i> , along the great rivers (<i>Ulmenion minoris</i>)	91F0	+	+	+	CR
3	Pannonic woods with <i>Quercus petraea</i> and <i>Carpinus betulus</i>	91G0	+	+	+	NT
4	Pannonian-Balkan turkey oak-sessile oak forests	91M0	+	+	+	EN
5	<i>Salix alba</i> and <i>Populus alba</i> galleries	92A0	+	-	+	VU
Total			5	4	5	5

CONCLUSION

During the field work in the PA *Kamchia*, rich plant species composition (222 vascular plants in total) was recorded in the registered five types of forest natural habitats. However, we registered changes in the flora and vegetation which could be linked with their xerophytisation and were expressed also in the occurrence of invasive and ruderal species. Despite of this, seven of the species found are of high conservation significance and together with the high conservational value of all five habitat types proves the need to keep favourable nature-conservation level there as proposed in TASHEV ET AL. (2018A).

Table 12. Conservation status of the species of higher plants established on the territory of the protected area *Kamchia*. Legend: Bulgarian Red Data Book of Plants and Fungi (PEEV 2015) with the following category: EN – *Endangered*; the sign „+” means that the relevant taxon is included un appendix 2 of the Biodiversity Law (2002) or appendix 3 and 4 of the Law for amendment of the Law for Biological Diversity (2007), and those ones with the sign „*” are included in appendix 4; the sign „-” means that the relevant taxon does not appear in the relevant list.

№	Species	Conservation significance	Conservation measures taken	
		Red Data Book of the Republic of Bulgaria (2015)	Biodiversity Act (2002)	Biodiversity Act (2007)
1.	<i>Asparagus</i> sp. div.*	-	-	+
2.	<i>Cardamine penzesii</i> Ancev & Marhold (Syn. <i>Cardamine pratensis</i> L.)	-	+	+
3.	<i>Primula acaulis</i> (L.) L. (Syn. <i>Primula vulgaris</i> Hudson)*	-	-	+
4.	<i>Leucojum aestivum</i> L.*	-	-	+
5.	<i>Ruscus aculeatus</i> L.*	-	-	+
6.	<i>Sonchus palustris</i> L.	EN	-	+
7.	<i>Symphytum tauricum</i> Willd.	EN	-	-
Total		2	1	6

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this article.

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References

- BILS M., KELL S., MAXTED N. & LANSDON R. 2011. European Red List of Vascular Plants. <http://data.iucn.org/dbtw-wpd/edocs/RL-4-016.pdf> (Last assessed 15.05.2017)
- BIOLOGICAL DIVERSITY ACT (ACT ON AMENDING AND SUPPLEMENTING) 2007. Decree № 354 accepted by the 40th National Assembly on 1st November 2007. - State Gazette № 94/16.11.2007, 2-44 (In Bulgarian).
- BISERKOV V. (Ed.-in-Chief) 2015. Red Data Book of the Republic of Bulgaria. Vol. 3. Natural habitats. BAS & MoEW, Sofia, 422 pp.
- BRAUN-BLANQUET J. 1964. Pflanzen soziologie. Grundzüge der Vegetationskunde. Springer-Verlag, Wien and New York, 865 pp.
- CONVENTION ON THE CONSERVATION OF EUROPEAN WILDLIFE AND NATURAL HABITATS. Appendix I. 1979. http://www.lkp.org.pl/prawo_html/know_bemenska_zl.html (Retrieved on 2.04.2017).
- CITES 1973. Convention on International Trade in Endangered Species of Wild Fauna and Flora. <https://www.cites.org/eng/disc/text.php> (last assessed 24.10.2017)
- DELIPAVLOV D. & CHESHMEDZHIEV I. (Eds) 2011. Key to the Plants of Bulgaria. Academic Press, Agrarian University, Plovdiv, 591 pp. (In Bulgarian)
- DIMITROVA S., GROZANOVA L., STOYNEVA M. P. & MICHEV T. M. 2007. Bulgarian hydronyms. - In: MICHEV T. M. & STOYNEVA M. P. (Eds), Inventory of Bulgarian Wetlands and their Biodiversity. Part 1: Non-Lotic Wetlands. Publ. House Elsi-M, Sofia, 68-88.
- DIRECTIVE 92/43/EEC. 1992. Council Directive 92/43/EEC on 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043> (Retrieved on 2.04.2017).
- DIRECTIVE 2009/147/EC. 2009. Council Directive 2009/147/EC on the conservation of wild birds. <https://www.npws.ie/directive-2009147ec-conservation-wild-birds-codified-version> (Retrieved on 12.04.2017).
- GILLET H., K. WALTERS (Eds.) 1998. 1997 IUCN Red List of Threatened Plants. Compiled by the World Conservation Monitoring Centre. IUCN – The World Conservation Union. Gland, Switzerland and Cambridge, UK. Lxiv + 862 p.
- GEORGIEV D. 2004. Conservation significance and guidelines for conservation and sustainable management of the dense forests along the Kamchia River. - In: Reports from the National Conference *Environmentally friendly and sustainable management of the dense forests*, MAF, Sofia, 35-39.
- GEORGIEV D. 2008. Guidelines for sustainable management and development of Kamchia dense forests. - Governance and Sustainable Development 1 (19): 107-113.
- IVANOV D., FILIPOVA-MARINOVA M. & DIMITROV D. 2002. The flora and vegetation of Kamchia Nature Complex. - Annual of Sofia University “St. Kliment

- Ohridski", Faculty of Biology, Book 2-Botany 92: 39-67 (In Bulgarian).
- JORDANOV D. (Ed.) 1963. Flora Republicae Popularis Bulgaricae. Vol. 1. Aedibus Acad. Sci. Bulgaricae, Serdica, 509 pp. (In Bulgarian)
- JORDANOV D. (Ed.) 1964. Flora Republicae Popularis Bulgaricae. Vol. 2. Aedibus Acad. Sci. Bulgaricae, Serdica, 426 pp. (In Bulgarian)
- JORDANOV D. (Ed.) 1966. Flora Republicae Popularis Bulgaricae. Vol. 3. Aedibus Acad. Sci. Bulgaricae, Serdica, 638 pp. (In Bulgarian)
- JORDANOV D. (Ed.) 1970. Flora Republicae Popularis Bulgaricae. Vol. 4. Aedibus Acad. Sci. Bulgaricae, Serdica, 748 pp. (In Bulgarian)
- JORDANOV D. (Ed.) 1973. Flora Republicae Popularis Bulgaricae. Vol. 5. Aedibus Acad. Sci. Bulgaricae, Serdica, 444 pp. (In Bulgarian)
- JORDANOV D. (Ed.) 1976. Flora Republicae Popularis Bulgaricae. Vol. 6. Aedibus Acad. Sci. Bulgaricae, Serdica, 592 pp. (In Bulgarian)
- KAVRAKOVA, V., DIMOVA D., DIMITROV M., TZONEV R., BELEV T. & RAKOVSKA K. (Eds) 2009. Handbook for identification of habitats of European significance in Bulgaria. 2nd edn. WWF Danube-Carpathian Programme and Green Balkans Federation, Sofia, 131 pp. (In Bulgarian)
- KOŽUHAROV S. (Ed.) 1995. Flora Republicae Popularis Bulgaricae. Vol. 10. Aedibus Acad. Sci. Bulgaricae, Serdica, 428 pp. (In Bulgarian)
- KOŽUHAROV S. & ANCHEV M. (Eds) 2012. Flora Republicae Bulgaricae. Vol. 11. Serdica, Aedibus Acad. Sci. Bulgaricae, Serdica, 527 pp. (In Bulgarian)
- KUZMANOV B. (Ed.) 1979. Flora Republicae Popularis Bulgaricae. Vol. 7. Aedibus Acad. Sci. Bulgaricae, Serdica, 530 pp. (In Bulgarian)
- LUCAS G. 1983. List of rare, threatened and endemic plants in Europe. Strasburg, Council of Europe, Publications Section, 358 pp.
- MALINOVA L. 2010. Soil science and soil pollution. University of Forestry, Sofia, 236 pp. (in Bulgarian)
- PEEV D. (Ed.-in-Chief) 2015. Red Data Book of the Republic of Bulgaria. Vol. 1. Plants and Fungi. Sofia, BAS & MoEW, 881 pp.
- PEEV D., TZONEVA S. & VALYOVSKA N. 2003. Evaluation of conservation value and importance of plant biodiversity on the dune complexes of the Northern Black Sea coast. Sofia. Report to BSBCP (manuscript, in Bulgarian).
- PEEV D., PETROVA A., APOSTOLOVA I. & DELCHEVA M. 2009. Bulgaria. - In: RADFORD E. A. & B. ODE (Eds), Conserving important plant areas: Investing in the Green Gold of South Europe. Plantlife International, Salisbury, UK, 27-36.
- PENEV I. 1984. The dense forests on the Bulgarian Black Sea Coast. - Godishnik na Sofiyskiya Universitet, Kniga 2 -Botanika 74: 113-120.
- PETROVA A. & VLADIMIROV V. (Eds) 2009. Red List of Bulgarian vascular plants. - Phytologia Balcanica 15 (1): 63-94.
- RUSEV Y. 2004. Management of the dense forests in the region of RFM Varna. - In: Reports from the National Conference *Environmentally sound and sustainable management of the dense forests*, MAF, Sofia, 9-22.

- STOYANOV N., STEFANOV B. & KITANOV B. 1966. Flora of Bulgaria, Vol. 1. Fourth updated edition, Nauka i Izkustvo, Sofia, 564 pp. (In Bulgarian)
- STOYANOV N., STEFANOV B. & KITANOV B. 1967. Flora of Bulgaria, Vol. 2. Fourth updated edition. Nauka i Izkustvo, Sofia, 1326 pp. (In Bulgarian)
- TASHEV A. N., VITKOVA A. A. & ALEKSANDROVA A. V. 2017. Vascular plant biodiversity of the natural non-forest habitats in the Natura 2000 protected sites Kamchia (BG0000116) and Shkorpilovtsi Beach (BG0000100). – Annual of Sofia University “St. Kliment Ohridski”, Faculty of Biology, Book 2- Botany 101: 54-65.
- TASHEV A. N., VITKOVA A. A. & ALEXANDROVA A. V. 2018A. Floristic composition and current state of forest natural habitats in Natura 2000 protected site *Kamchia* (BG0000116). - Acta Zoologica Bulgarica, Supplement 11: 69-74.
- TASHEV A. N., Vitkova A. A. & Aleksandrova A. V. 2018B. Floristic composition and current state of non-forest natural habitats in Natura 2000 protected sites *Kamchia* (BG0000116) and *Shkorpilovtsi Beach* (BG0000100). - Acta Zoologica Bulgarica, Supplement 11: 75-80.
- TZONEV R., DIMITROV M. & ROUSSAKOVA V. 2005. Dune vegetation of the Bulgarian Black Sea coast. - Hacquetia 4 (1): 7-32.
- VELEV S. 2002. Climatic regionalisation. - In: KOPRALEV I. (Ed.), Geography of Bulgaria. Physical Geography. Socio-Economic Geography. ForKom 2000, Sofia, 155-156. (In Bulgarian).
- VELEV S. 2010. Climate of Bulgaria. 2nd edn. Heron Press. Sofia, 189 pp. (In Bulgarian).
- VELCHEV V. (Ed.) 1982. Flora Reipublicae Popularis Bulgaricae. Vol. 8. Aedibus Acad. Sci. Bulgaricae, Serdica, 518 pp. (In Bulgarian).
- VELCHEV V. (Ed.) 1989. Flora Reipublicae Popularis Bulgaricae. Vol. 9. Aedibus Acad. Sci. Bulgaricae, Serdica, 541 pp. (In Bulgarian).
- ZELEV P. & YURUKOV S. 2004. Timber species in Kamchia dense forests. - In: Reports from the National Conference *Environmentally sound and sustainable management of the dense forests*, MAF, Sofia, 25-33.

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