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MEDICINAL PLANTS IN THE ROPOTAMO RESERVE: BIODIVERSITY AND CONSERVATION SIGNIFICANCE

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Abstract. The paper presents the recent diversity and conservational importance of the medicinal plants in the Ropotamo Reserve (SE Bulgaria): 211 species from 181 genera and 68 families. They comprised significant part of the total plants biodiversity of the reserve, which consisted of 550 species.

The spread of the medicinal plants in different habitats of European significance was shown together with the threatened status of the species and their relative abundance. The distribution of all medicinal species was analyzed according to the frequency or rarity of their occurrence and it was proved that the reserve area hosted some rare for Bulgaria species of medicinal plants.

Key words: Black Sea coast, Bulgaria, rare species, threatened species

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INTRODUCTION

Ropotamo Reserve was created in 1940 to preserve the dense forests (*longozes*) along the banks of the river Ropotamo. In 1975, it was declared as Ramsar site. The reserve is a part of a wetland complex of great national and international significance and recently has been included in a Natura 2000 network protected site (MICHEV & STOYNEVA 2007; VASSILEV ET AL. 2013).

The reserve with its complicated relief is characterized by rich floristic diversity caused mainly by the diversity of habitats (*e.g.* dense forests along the river banks, swamps, rocky shores, dunes, open spaces and oak forests). Although the spread of some medicinal plants has been studied (BONDEV & VELCHEV 1984; GUSSEV ET AL. 2003; SIDJIMOVA 2007), a complex study on the recent distribution and resources of all medicinal plants in Ropotamo Reserve has not been conducted so far (VITKOVA ET AL., in press). Therefore, the present paper represents detailed data on the species composition of the medicinal plants in the area, collected during larger study aimed at the preparation of the new ROPOTAMO RESERVE MANAGEMENT PLAN (2015-2025), abbreviated hereafter as RRMP.

MATERIAL AND METHODS

Ropotamo Reserve is situated between 150 and 0 metres above the sea level along the lowest stream of the Ropotamo River in South-eastern Bulgaria. It occupies an area of 1000.7 ha and falls in the European Continental and Continental-Mediterranean climatic areas characterized by mild winter and warm, dry summer (SUBEV & STANEV 1963).

For the implementation of the task, field trips were organized in the autumn period of 2014 and two methods were applied: Route method and Method for monitoring of higher plants (GUSSEV ET AL. 2008) with the following important features of the populations taken into account: area, horizontal structure, number, project coverage. Species identification was done in the field with some additional camera work, following mainly JORDANOV (1963-1979), VELCHEV (1982, 1989), KOŽUHAROV (1995) and DELIPAVLOV ET AL. (2003). In addition to our own findings, all data concerning medicinal plants in the available literature were analyzed in terms of floristics and nature conservation significance. The list of medicinal plants was prepared after the Application to Art. 1 of the MEDICINAL PLANTS ACT (2000 - MPA). The threatened status of each species was determined according to different international and national documents: BERN CONVENTION (1979), CITES (1973), IUCN (2001), MEDICINAL PLANTS ACT (2000 - MPA), BIOLOGICAL DIVERSITY ACT (2002), ACT ON AMENDING AND SUPPLEMENTING THE BIOLOGICAL DIVERSITY ACT (2007 - BDA), Red List of Bulgarian vascular plants (PETROVA & VLADIMIROV 2009 - RL) and Red Data Book of the Republic of Bulgaria (PEEV 2015 - RDB). The habitats were classified according to EUNIS (2007).

Table 1. Medicinal plants in the Ropotamo Reserve. Abbreviations used: SCS – Species of conservation significance; RS – resources (G – group, Gs - groups, N– numerous, Sp – single plants); Ehb – habitat (indicated by its relevant number); RL - Red List of vascular plants (PETROVA & VLADIMIROV 2009); RDB - Red Data Book of the Republic of Bulgaria (PEEV 2015): EN (Endangered); VU (Vulnerable); LC (Least Concern); BDA - Biological Diversity Act (2002); SRPU - Special Regime of Protection and Use according to Medicinal Plants Act (2000); BC - Bern Convention (1979); CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973); * - Literary data. Families and species are enlisted in alphabetical order.

№	Family	Taxon	SCS	RS	Ehb
1	Aceraceae	<i>Acer platanoides</i> L.		Sp	G1.76A1
2	Aceraceae	<i>Acer tataricum</i> L.		Gs	G1.2232; G1.76A1
3	Alliaceae	<i>Allium rotundum</i> L.		G	F1.4344
4	Alliaceae	<i>Nectaroscordum siculum</i> ssp. <i>bulgaricum</i> (Janka) Stearn.*		G	G1.2232
5	Alismataceae	<i>Alisma plantago-aquatica</i> L.		N	C3.2
6	Amarillidaceae	<i>Galanthus nivalis</i> L.*	EN, RL, RDB, BDA (Suppl. 3), CITES	Gs	G1.76A1
7	Amarillidaceae	<i>Leucojum aestivum</i> L.*	VU, RL, BDA	N	G1.2232
8	Anacardiaceae	<i>Cotinus coggygria</i> Scop.		N	G1.76A1; B1.4B11; B1.7
9	Apiaceae	<i>Anethum graveolens</i> L.*		G	
10	Apiaceae	<i>Angelica sylvestris</i> L. *		G	
11	Apiaceae	<i>Anthriscus cerefolium</i> (L.) Hoffm.		G	G1.76A1
12	Apiaceae	<i>Chaerophyllum temulentum</i> L.		N	G1.2232
13	Apiaceae	<i>Eryngium campestre</i> L.		N	
14	Apiaceae	<i>Eryngium maritimum</i> L.	EN, RL, RDB, BDA (Suppl.3)	Sp	B1.313
15	Apiaceae	<i>Ferulago sylvatica</i> (Besser) Rchb.*		Gs	
16	Apiaceae	<i>Heracleum sibiricum</i> L.		Gs	
17.	Apiaceae	<i>Opopanax chironium</i> ssp. <i>bulgaricum</i> (Velen.) Andreev*	VU, RL, BDA (Suppl. 4)	Sp	
18	Apiaceae	<i>Pimpinella saxifraga</i> L.		N	G1.76A1
19	Apiaceae	<i>Tordylium maximum</i> L.		Gs	
20	Apocynaceae	<i>Trachomitum venetum</i> (L.)	EN, RL, RDB, BDA (Suppl.3)	N	B1.4B11
21	Araceae	<i>Arum maculatum</i> L.		Gs	G1.76A1
22	Araliaceae	<i>Hedera helix</i> L.		N	G1.2232;G1.76A1; F5.51A4
23	Aristolochiaceae	<i>Aristolochia clematidis</i> L.		Gs	G1.2223
24	Asclepiadaceae	<i>Cionura erecta</i> (L.) Griseb.		N	B1.4B11

№	Family	Taxon	SCS	RS	EHb
25	Asclepiadaceae	<i>Periploca graeca</i> L.		N	G1.2232
26	Asclepiadaceae	<i>Vincetoxicum hirundinaria</i> Medic.		Gs	G1.76A1
27	Aspleniaceae	<i>Asplenium adiantum-nigrum</i> L.*		Gs	
28	Aspleniaceae	<i>Asplenium ruta-muraria</i> L.*		Gs	
29	Aspleniaceae	<i>Asplenium trichomanes</i> L.	SRPU	Gs	G1.76A1
30	Asteraceae	<i>Achillea collina</i> J. Becker ex Reichenb.		N	E1.4344; B1.7
31	Asteraceae	<i>Anthemis cotula</i> L.		Gs	
32	Asteraceae	<i>Anthemis tinctoria</i> L.		Gs	G1.76A1; B1.4B11
33	Asteraceae	<i>Arctium lappa</i> L.		Gs	
34	Asteraceae	<i>Artemisia absinthium</i> L.		N	B1.4B11
35	Asteraceae	<i>Artemisia campestris</i> L.		N	B1.4B11; B1.7
36	Asteraceae	<i>Artemisia santonica</i> L.	SRPU	N	B1.4B11
37	Asteraceae	<i>Artemisia vulgaris</i> L.		N	
38	Asteraceae	<i>Bellis perennis</i> L.		N	
39	Asteraceae	<i>Carduus acanthoides</i> L.		Gs	
40	Asteraceae	<i>Carlina vulgaris</i> L.		Gs	E1.4344; B1.7
41	Asteraceae	<i>Centaurea cyanus</i> L.		Gs	B1.4B11; G1.76A1; B1.7
42	Asteraceae	<i>Cichorium intybus</i> L.		Gs	
43	Asteraceae	<i>Cnicus benedictus</i> L.*	SRPU	G	
44	Asteraceae	<i>Filago vulgaris</i> Lam.		Gs	
45	Asteraceae	<i>Inula ensifolia</i> L.		N	
46	Asteraceae	<i>Matricaria chamomilla</i> L.		N	
47	Asteraceae	<i>Scorzonera hispanica</i> L.		Gs	
48	Asteraceae	<i>Senecio vulgaris</i> L.		Gs	
49	Asteraceae	<i>Taraxacum officinale</i> Web.		N	
50	Asteraceae	<i>Tanacetum vulgare</i> L.		N	G1.76A1
51	Asteraceae	<i>Tragopogon pratensis</i> L.		Gs	
52	Asteraceae	<i>Xanthium strumarium</i> L.		Gs	B1.4B11
53	Asteraceae	<i>Xeranthemum annuum</i> L.		Gs	E1.4344
54	Betulaceae	<i>Alnus glutinosa</i> (L.) Gaertner		N	G1.2232
55	Betulaceae	<i>Carpinus betulus</i> L.		N	G1.2232
56	Betulaceae	<i>Corylus avellana</i> L.			G1.76A1
57	Boraginaceae	<i>Anchusa officinalis</i> L.		N	
58	Boraginaceae	<i>Buglossoides purpureo-caerulea</i> (L.) I. M. Johnst.		Gs	G1.76A1
59	Boraginaceae	<i>Cynoglossum officinale</i> L.		Gs	
60	Boraginaceae	<i>Echium vulgare</i> L.		Gs	

№	Family	Taxon	SCS	RS	Ehb
61	Boraginaceae	<i>Lithospermum officinale</i> L.		Gs	G1.76A1
62	Brassicaceae	<i>Alyssum alyssoides</i> L.		N	
63	Brassicaceae	<i>Capsella bursa-pastoris</i> (L.) Medic		N	
64	Brassicaceae	<i>Cardamine bulbifera</i> L.		N	G1.76A1
65	Brassicaceae	<i>Lepidium ruderales</i> L.		N	
66	Brassicaceae	<i>Nasturtium officinale</i> R. Br.		N	G1.2223
67	Brassicaceae	<i>Thlaspi arvense</i> L.		Gs	
68	Butomaceae	<i>Butomus umbellatus</i> L.		Gs	G 3.2
69	Campanulaceae	<i>Campanula persicifolia</i> L.		G	G1.76A1; B1.7
70	Caprifoliaceae	<i>Sambucus ebulus</i> L.		Gs	
71	Caprifoliaceae	<i>Sambucus nigra</i> L.		Gs	G1.76A1; G1.2232
72	Caryophyllaceae	<i>Herniaria hirsuta</i> L.		Gs	
73	Caryophyllaceae	<i>Lychnis flos-cuculi</i> L.		Gs	E1.4344
74.	Caryophyllaceae	<i>Stellaria media</i> (L.) Vill.		N	G1.2232
75	Caryophyllaceae	<i>Viscaria vulgaris</i> ssp. <i>atropurpurea</i> (Griseb.) Stoj.		Gs	
76	Celastraceae	<i>Euonymus europaeus</i> L.		Gs	G1.76A1
77	Celastraceae	<i>Euonymus verrucosus</i> Scop.		Gs	G1.76A1
78	Chenopodiaceae	<i>Chenopodium album</i> L.		Gs	
79	Convolvulaceae	<i>Calystegia sepium</i> (L.) R. Br.		Gs	G1.2232
80	Convolvulaceae	<i>Convolvulus arvensis</i> L.		N	
81	Cornaceae	<i>Cornus mas</i> L.		Gs	G1.76A1; B1.7
82	Crassulaceae	<i>Sedum maximum</i> (L.) Suter		G	
83	Cucurbitaceae	<i>Echallium elaterium</i> (L.) A. Richard		Gs	B1.313
84	Dioscoreaceae	<i>Tamus communis</i> L.		Gs	G1.2232
85	Dipsacaceae	<i>Knautia arvensis</i> (L.) Coult.		Gs	
86	Ephedraceae	<i>Ephedra distachya</i> L.*	VU, RL, BDA (Suppl. 3)	G	B1.4B11
87	Equisetaceae	<i>Equisetum sylvaticum</i> L.		Gs	G1.2232
88	Equisetaceae	<i>Equisetum telmateia</i> Ehrh		Gs	G1.2232
89	Euphorbiaceae	<i>Euphorbia amygdaloides</i> L.		Gs	G1.76A1
90	Euphorbiaceae	<i>Euphorbia cyparissias</i> L.		Gs	E1.4344; B1.7
91	Euphorbiaceae	<i>Euphorbia peplis</i> L.	VU, RL, BDA (Suppl. 3)	Sp	B1.313
92	Euphorbiaceae	<i>Mercurialis perennis</i> L.		N	
93	Fabaceae	<i>Bituminaria bituminosa</i> (L.) Stirt.		G	G1.76A1
94.	Fabaceae	<i>Chamaecytisus hirsutus</i> (L.) Link.		Gs	G1.76A1
95	Fabaceae	<i>Coronilla varia</i> L.		Gs	E1.4344

№	Family	Taxon	SCS	RS	EHb
96	Fabaceae	<i>Lathyrus niger</i> (L.) Bernh.		Gs	G1.76A1; B1.7
97	Fabaceae	<i>Lathyrus sylvestris</i> L.		Gs	G1.76A1
98	Fabaceae	<i>Lathyrus vernus</i> (L.) Bernh.		Gs	G1.76A1
99	Fabaceae	<i>Lotus corniculatus</i> L.		N	
100	Fabaceae	<i>Melilotus officinalis</i> (L.) Palla.		N	
101	Fabaceae	<i>Ononis spinosa</i> L.		N	E1.4344
102	Fabaceae	<i>Trifolium pratense</i> L.		N	
103	Fabaceae	<i>Vicia cracca</i> L.		N	
104	Fagaceae	<i>Fagus orientalis</i> Lipsky		N	G1.76A1
105	Fagaceae	<i>Quercus frainetto</i> Ten.		N	G1.76A1; B1.7
106	Geraniaceae	<i>Geranium robertianum</i> L.		N	G1.76A1
107	Geraniaceae	<i>Geranium sanguineum</i> L.		Gs	G1.76A1; B1.7
108	Hypericaceae	<i>Hypericum androsaemum</i> L.*	EN, RL, RDB, BDA (Suppl. 3)	Sp	G1.76A1
109	Hypericaceae	<i>Hypericum perforatum</i> L.		N	E1.4344; G1.76A1
110	Hypolepidiaceae	<i>Pteridium aquilinum</i> (L.) Kuhn		N	G1.76A1; B1.7
111.	Iridaceae	<i>Iris pseudacorus</i> L.		N	G1.2232
112.	Lamiaceae	<i>Acinos arvensis</i> (Lam.) Dandy		N	
113.	Lamiaceae	<i>Ajuga laxmannii</i> (L.) Benth.		Gs	G1.76A1
114	Lamiaceae	<i>Ballota nigra</i> L.		Gs	
115	Lamiaceae	<i>Clinopodium vulgare</i> L.		Gs	G1.76A1
116	Lamiaceae	<i>Glechoma hederacea</i> L.		N	G1.76A1
117.	Lamiaceae	<i>Lamium purpureum</i> L.		Gs	
118	Lamiaceae	<i>Lycopus europaeus</i> L.		Gs	C3.2
119	Lamiaceae	<i>Marrubium peregrinum</i> L.		Gs	B1.4B11; B1.7
120	Lamiaceae	<i>Melissa officinalis</i> L.		Gs	G1.76A1
121	Lamiaceae	<i>Mentha arvensis</i> L.		Gs	
122	Lamiaceae	<i>Mentha spicata</i> L.		Gs	
123	Lamiaceae	<i>Origanum vulgare</i> ssp. <i>vulgare</i> L.		N	E1.4344
124	Lamiaceae	<i>Prunella vulgaris</i> L.		N	
125	Lamiaceae	<i>Salvia verticillata</i> L.		N	E1.4344
126	Lamiaceae	<i>Sideritis montana</i> L.		N	
127	Lamiaceae	<i>Stachys recta</i> L.		G	
128	Lamiaceae	<i>Teucrium chamaedrys</i> L.		N	B1.4B11; G1.76A1; B1.7
129	Lamiaceae	<i>Teucrium polium</i> L.		N	B1.4B11; B1.7
130	Lamiaceae	<i>Thymus longidentatus</i> (Deg. et Urum.) Ronn.		N	E1.4344; G1.76A1
131	Lamiaceae	<i>Thymus sibthorpii</i> Benth.		N	E1.4344

№	Family	Taxon	SCS	RS	EHB
132	Lemnaceae	<i>Lemna minor</i> L.		N	C3.2
133	Liliaceae	<i>Colchicum autumnale</i> L.		N	
134	Liliaceae	<i>Polygonatum odoratum</i> (Millr) Druce	BDA (Suppl. 4)	Gs	G1.76A1; B1.7
135	Liliaceae	<i>Ruscus aculeatus</i> L.	BDA (Suppl. 4) SRPU	N	G1.76A1; G1.2232; F5.51A4
136	Liliaceae	<i>Scilla bifolia</i> L.	BDA (Suppl. 4)	N	G1.76A1
137	Lorantaceae	<i>Viscum album</i> L.		G	
138	Lythraceae	<i>Lythrum salicaria</i> L.		N	G1.2232
139	Lythraceae	<i>Lythrum virgatum</i> L.		Gs	C3.2
140	Malvaceae	<i>Malva sylvestris</i> L.		Gs	
141	Nymphaeaceae	<i>Nuphar lutea</i> (L.) Sibth. et Sm.	EN, RL, RDB, BDA (Suppl. 3)	N	C3.2
142	Nymphaeaceae	<i>Nymphaea alba</i> L.	EN, RL, RDB, BDA (Suppl. 3)	N	C3.2
143	Oleaceae	<i>Fraxinus ornus</i> L.		N	G1.76A1; F5.51A4; B1.7
144	Oleaceae	<i>Fraxinus oxycarpa</i> Willd.		N	B1.7
145	Oleaceae	<i>Ligustrum vulgare</i> L.		Gs	G1.76A1
146.	Oleaceae	<i>Phyllirea latifolia</i> L.		N	F5.51A4
147.	Orchidaceae	<i>Anacamptis pyramidalis</i> (L.) L. C. M. Reichard*	VU, RL, BDA (Suppl. 3), CITES	Sp	E1.4344
148.	Orchidaceae	<i>Orchis papilionaceae</i> L.*	VU, RL, BDA (Suppl. 3), CITES	Sp	E1.4344
149.	Papaveraceae	<i>Chelidonium majus</i> L.		Gs	
150.	Papaveraceae	<i>Glaucium flavum</i> Grantz.	SRPU	G	B1.313
151.	Papaveraceae	<i>Papaver rhoeas</i> L.		Gs	E1.4344
152.	Plantaginaceae	<i>Plantago lanceolata</i> L.		Gs	
153.	Plantaginaceae	<i>Plantago media</i> L.		Gs	
154.	Polygonaceae	<i>Persicaria hydropiper</i> (L.) Opiz		N	G 3.2
155.	Polygonaceae	<i>Polygonum aviculare</i> L.		N	
156	Polygonaceae	<i>Rumex acetosella</i> L.		N	E1.4344
157	Polypodiaceae	<i>Polypodium vulgare</i> L.		Gs	G1.76A1
158	Portulacaceae	<i>Portulaca oleracea</i> L.		Gs	
159	Primulaceae	<i>Anagallis arvensis</i> L.		Gs	
160	Primulaceae	<i>Cyclamen coum</i> Mill.	LC, RL, BC, BDA (Suppl. 3), CITES	N	G1.76A1
161	Primulaceae	<i>Lysimachia nummularia</i> L.		N	G1.2232
162	Primulaceae	<i>Primula acaulis</i> ssp. <i>rubra</i> (Sm.) Greuter & Burdet	VU, RL	Gs	G1.76A1
163	Primulaceae	<i>Primula veris</i> L.	SRPU	Gs	G1.76A1

№	Family	Taxon	SCS	RS	EHb
164	Ranunculaceae	<i>Adonis aestivalis</i> L.		Gs	
165	Ranunculaceae	<i>Clematis vitalba</i> L.		N	G1.2232
166	Ranunculaceae	<i>Consolida hispanica</i> (Costa) Greuter & Burdet		Gs	B1.7
167	Ranunculaceae	<i>Helleborus odorus</i> Waldst. & Kit.		Gs	E1.4344
168	Ranunculaceae	<i>Ranunculus ficaria</i> L.		N	G1.2232
169	Ranunculaceae	<i>Ranunculus repens</i> L.		N	
170	Rhamnaceae	<i>Paliurus spina-christi</i> Mill.		N	B1.4B11; G1.76A1; F5.51A4; B1.7
171	Rhamnaceae	<i>Rhamnus catharticus</i> L.		Sp	G1.76A1; B1.7
172	Rosaceae	<i>Agrimonia eupatoria</i> L.		N	E1.4344
173	Rosaceae	<i>Crataegus monogyna</i> Jacq.		Gs	G1.76A1; B1.7
174	Rosaceae	<i>Crataegus pentagyna</i> W.etK. ex Willd.		G	G1.76A1
175	Rosaceae	<i>Filipendula vulgaris</i> Moench.		N	E1.4344
176	Rosaceae	<i>Fragaria vesca</i> L.		N	G1.76A1; B1.7
177	Rosaceae	<i>Geum urbanum</i> L.		N	G1.2232
178	Rosaceae	<i>Malus sylvestris</i> Mill.		Sp	G1.76A1
179	Rosaceae	<i>Potentilla reptans</i> L.		N	G1.2232
180	Rosaceae	<i>Prunus spinosa</i> L.		Gs	G1.76A1
181	Rosaceae	<i>Rosa gallica</i> L.		Gs	G1.76A1
182	Rosaceae	<i>Rubus caesius</i> L.		Gs	G1.76A1
183	Rosaceae	<i>Sanguisorba minor</i> Scop.		Gs	E1.4344
184	Rosaceae	<i>Sorbus aucuparia</i> L.		Sp	G1.76A1
185	Rosaceae	<i>Sorbus domestica</i> L.		Sp	
186	Rosaceae	<i>Sorbus torminalis</i> (L.) Crantz.		Sp	G1.76A1
187	Rubiaceae	<i>Cruciata laevipes</i> Opiz.		N	G1.76A1
188	Rubiaceae	<i>Galium aparine</i> L.		N	G1.2232
189	Rubiaceae	<i>Galium verum</i> L.		N	E1.4344
190	Salicaceae	<i>Salix alba</i> L.		N	
191	Scrophulariaceae	<i>Digitalis lanata</i> Ehrh.		Gs	E1.4344
192	Scrophulariaceae	<i>Scrophularia nodosa</i> L.		Gs	
193	Scrophulariaceae	<i>Verbascum densiflorum</i> Bertol.		Gs	
194.	Scrophulariaceae	<i>Verbascum phlomoides</i> L.		Gs	G1.76A1
195	Scrophulariaceae	<i>Verbascum phoeniceum</i> L.		Gs	G1.76A1
196	Scrophulariaceae	<i>Veronica officinalis</i> L.		Gs	G1.76A1
197	Smilacaceae	<i>Smilax excelsa</i> L.		N	G1.2232
198	Solanaceae	<i>Datura stramonium</i> L.		Gs	

№	Family	Taxon	SCS	RS	Ehb
199	Solanaceae	<i>Solanum dulcamara</i> L.		Gs	G1.2232
200	Solanaceae	<i>Solanum nigrum</i> L.		Gs	B1.7
201	Tiliaceae	<i>Tilia tomentosa</i> Moench		Gs	G1.76A1
202	Typhaceae	<i>Typha angustifolia</i> L.		N	C3.2
203	Ulmaceae	<i>Celtis australis</i> L.		Sp	B1.7
204	Ulmaceae	<i>Ulmus minor</i> Mill.		Gs	G1.2232
205	Urticaceae	<i>Parietaria officinalis</i> L.		Gs	G1.2232
206	Urticaceae	<i>Urtica dioica</i> L.		N	G1.2232
207	Valerianaceae	<i>Valeriana officinalis</i> L.	SRPU	G	G1.76A1
208	Verbenaceae	<i>Verbena officinalis</i> L.		Gs	
209	Violaceae	<i>Viola odorata</i> L.		N	G1.76A1
210	Vitaceae	<i>Vitis sylvestris</i> C.C.Gmelin		Sp	G1.2232
211	Zygophyllaceae	<i>Tribulus terrestris</i> L.		N	B1.4B11

RESULTS

All documented medicinal plants of the Ropotamo Reserve are enlisted in **Table 1**. The list contains 197 species found by us during the present study, together with 14 other species which have been recorded at least once in the area and published in the relevant literature (indicated by asterisk - *). The total list of medicinal plants reported from the reserve comprised 211 species belonging to 181 genera and 68 families. This number represents 38% of all 550 species of vascular plants known from the reserve territory (for details see VITKOVA ET AL., in press) and 28% of all medicinal plants in Bulgaria (MPA).

Twenty-three species of the medicinal plants, or 11%, were threatened according to different documents (**Table 1**): seven were *Endangered* in the Bulgarian Red Data Book (PEEV 2015), fifteen were from the Red List of Bulgarian vascular plants (PETROVA & VLADIMIROV 2009), eighteen species were from the BIOLOGICAL DIVERSITY ACT (2002), four species were from the species protected under CITES and seven species were protected by the MPA with Special Regime of Protection and Use (2000).

Many medicinal plants were found to grow in habitats of European significance according to EUNIS (2007) – **Table 1**. The mixed oak forests, which represent the habitat EUNIS G1.76A1 *Euxino-Thracian [Quercus frainetto]–[Quercus cerris] forests* (**Fig. 1**), cover large areas in the reserve reaching the coastal area north of the megalith Begliktash, the shores above the Black Sea bay St. Paraskeva (**Fig. 2**) and the slopes of the Vulchanovoto Kale area as well. Totally 68 medicinal plants were found there, ten of them were of conservation significance (**Table 1**). Three species were protected: *Cyclamen coum*, *Galanthus nivalis* and *Hypericum androsaemum*.

C. coum and *Ruscus aculeatus* were abundant (VITKOVA ET AL., in press).

Both banks of the Ropotamo River are covered with dense forests (**Fig. 3**). The periodically flooded mixed deciduous forests along the banks of the river represent the habitat EUNIS G1.2232 *Helleno-Balkanica ash-oak-alder forest* (**Fig. 4**). Thirty-one medicinal plants were found there, and two of them were of conservation significance - *Leucojum aestivum* and *Ruscus aculeatus* (**Table 1**).

The habitat EUNIS C3.2 *Water-fringing reedbeds and tall heliophytes other than cans* (**Fig. 5**) is represented by the vegetation of the Arkutino marsh, where we found nine medicinal plants. Two of them were with conservation status - *Nymphaea alba* and *Nuphar lutea* (**Table 1**).

The secondary grasslands at the sides of destroyed forests represent the



Figs. 1-4: **1** - Habitat G1.76A1 *Euxino-Thracian [Quercusfrainetto]-[Quercuscerris] forests*: Over the bay of St. Paraskeva; **2** - The bay of St. Paraskeva; **3** - Ropotamo River; **4** - Habitat G1.2232 *Helleno-Balkanica ash-oak-alder forest*: Ropotamo River bank.

habitat EUNIS E1.4344 *Helleno-Balkanic andropogonoid grass steppe*. Twenty-two medicinal plants were found there, among which two were of conservation significance - *Anacamptis pyramidalis* and *Orchis papilionaceae* (**Table 1**).

Habitat B1.7. *Coastal dune woods* occupies the eastern steep and the western sloping slopes of the dune at the Cape Kaya (**Fig. 6**). This is the largest dune along the Bulgarian Black sea coast covered with woods. The forest communities on the dune have typical xerothermic features, the trees are low and branched. These coenoses are dominated by *Carpinus orientalis* Mill., *Fraxinus ornus*, *Quercus cerris* Morariu, *Q. frainetto*, *Q. pubescens* Schwarz and *Celtis australis* is also characteristic. Twenty-four medicinal plants were found in this habitat (**Table 1**).

The habitat EUNIS B1.4B11 *Southwestern Pontic fixed dunes* (**Fig. 7**) is widely presented in the reserve by fixed grey dunes. We found 15 medicinal plants



Figs. 5-8: 5 - Habitat C3.2 *Water-fringing reedbeds and tall heleophytes other than cans*: Arkutino marsh; 6 - Coastal dune woods: Cape Kaya; 7 - Habitat B1.4B11 *Southwestern Pontic fixed dunes*; 8 - Habitat B1.313 *Pontic embryonic dunes*.

there, two of which were of conservation significance – *Trachomitum venetum* and *Ephedra distachia* (**Table 1**).

The habitat EUNIS B1.313 *Pontic embryonic dunes* represents the first stages of the dune formation (**Fig. 8**). Four medicinal plants, mostly obligate psammophytes, were found there. Two species were of conservation significance: *Eryngium maritimum* and *Euphorbia peplis* (**Table 1**). During the study, we

proved that the localities of the threatened medicinal plants *Eryngium maritimum*, *Euphorbia peplis* and *Glaucium flavum* often fall into the beach area actively used for recreation.

The next habitat of European significance in the reserve is EUNIS F5.51A4 *Eastern [Phillyrea] thickets* which occupies the exposed dry slopes in the locality Luvska Glava. There, besides the main species *Phillyrea latifolia*, four other medicinal plant species were found: *Fraxinus ornus*, *Paliurus spina-christi*, *Hedera helix*, *Ruscus aculeatus* (**Table 1**).

The largest number of medicinal plants was found in the habitats G1.76A1 *Euxino-Thracian [Quercus frainetto]–[Quercus cerris] forests* (68 species) followed by G1.2232 *Helleno-Balkan ash-oak-alder forest* (31) B1.7. *Coastal dune woods* (24), E1.4344 *Helleno-Balkan andropogonoid grass steppe* (22) and B1.4B11 *Southwestern Pontic fixed dunes* (15). The largest number (10) of conservationally significant species was found in the habitat G1.76A1.

Some of the recorded medicinal plants are of medium to high rarity in Bulgaria. Moreover, some of them are distributed only along the Black Sea coast and Strandzha Mountain (e.g. *Artemisia santonicum*, *Eryngium maritimum*, *Euphorbia peplis*, *Glaucim flavum*, *Hypericum androsaemum*, *Trachomitum venetum*). Worthy to note is that 58% of the medicinal species were found as single plants, in a group or in groups (14, 14 and 95 species, respectfully), and only 42% (88 species) were more abundant (**Table 1**).

DISCUSSION

The high number of medicinal plants recorded in the reserve territory (211), which represents 38% of its flora and the finding of 23 threatened species (six of which with the IUCN category *Endangered*) proves the nature conservation significance of the flora of the Ropotamo Reserve. Noteworthy, some of the threatened species occur only as single specimens in the reserve area. In addition, 140 medicinal plants in eight reserve habitats of European significance were reported. Moreover, some of the medicinal species were rare for the country and this, combined with the well-known strong recent anthropogenic pressure on the Black Sea coast, increases their vulnerability and threat of extinction.

CONFLICT OF INTERESTS

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

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