

A contribution to the vascular flora of the Pantan territory (central Dalmatia, Croatia)

original scientific paper

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Sažetak

Pregledom dostupne literature i prilikom florističkog istraživanja (2005.-2006. god.) vaskularne flore na području Pantan u blizini grada Trogira (srednja Dalmacija), zabilježeno je sveukupno 269 svojti koje su svrstane u 178 rodova i 61 porodicu. Od toga broja tijekom ovog istraživanja utvrđeno je novih 177 svojti. Od ukupnog broja svojti njih 107 ili 39% pripada skupinama mediteranskog flornog elementa, među kojima su najbrojnije općemediteranske biljke. Dominantnost mediteranskog flornog elementa, velik broj svojti iz porodice *Fabaceae* (40 svojti), te broj terofitskih (121 svojta ili 45%) vrsta govori o mediteranskom karakteru istraživanih područja. Na istraživanom području zabilježena je kritično ugrožena vrsta (CR) *Aeluropus litoralis* (Gouan.) Parl., ugrožene vrste (EN): *Carex extensa* Gooden. i *Glaucium flavum* Crantz, osjetljive vrste (VU): *Desmazeria marina* (L.) Druce, *Hainardia cylindrica* (Willd.) Greuter, *Salsola soda* L. i *Suaeda maritima* (L.) Dumort.

Ključne riječi: vaskularna flora, biljna raznolikost, Pantan, Dalmacija, Hrvatska

Abstract

By checking the available literature data and during the floristic research (2005-2006) of the vascular plants of the Pantan territory in the vicinity of Trogir (central Dalmatia), a total number of 269 taxa were recorded. 177 taxa were recorded for the first time and classified into 178 genera and 60 families. A total number of 107 taxa or 39% of them belong to a group of the Mediterranean floristic elements, of which the most numerous are circum-Mediterranean plants. The dominance of the Mediterranean floristic element, a great number of taxa from the *Fabaceae* family (40 taxa) and a number of Therophytes (121 taxa or 45%) shows the Mediterranean character of the study area. There were also noticed critically endangered species (CR) *Aeluropus litoralis* (Gouan.) Parl., endangered species (EN): *Carex extensa* Gooden. and *Glaucium flavum* Crantz, vulnerable species (VU): *Desmazeria marina* (L.) Druce, *Hainardia cylindrica* (Willd.) Greuter, *Salsola soda* L. and *Suaeda maritima* (L.) Dumort.

Key words: vascular flora, plant diversity, Pantan, Dalmatia, Croatia

Introduction

The territory of Pantan in the vicinity of Trogir in central Dalmatia (UTM grid XJ01 and XJ02) was proclaimed a special ornitho-ichthyological reserve on December 19, 2000 by the Assembly of the Splitsko-Dalmatinska County, in accordance with the Ministry of environmental protection (Gabelica et al. 2011). Pantan reserve is situated in the western part of the Kaštela field (Fig. 1). Besides being a special nature reserve, it is also a cultural and historical monument because of the old renaissance mill which is located there. The surface of the Pantan reserve is approximately 40 hectares (Gabelica et al. 2011). Geologically it is characterized by limestone and sandstone layers that connect joined there, and on the connection line there is a spring of fresh water called Rika (Žanić 2005). According to the historical reports on January 23, 1496 there was a strong earthquake near Trogir and as a consequence the lake was formed at the foot of the hill Krban, out of which the stream Rika flows (Žanić 2005). During the centuries around the area where the Rika enters the sea, swampy tract similar to a small lagoon was formed, which was afterwards shaped by man. Pantan is a typical Mediterranean coastal wetland, which makes habitat for a great number of swamp fish and bird species. As far as we know from the available literature data, botanical researches of this area have never been made systematical and a complete floristic list of this area doesn't exist.

According to the phytogeographical classification of the eastern Adriatic coast, Pantan is situated on the northern border of the central district in the central eumediterranean area (Horvatić 1963a). Information about the flora and vegetation of the Pantan territory can be found in Visiani (1841-1881), Slade-Šilović (1914), Bedalov & Šegulja in Cvitanić (1998), Šegulja (1998), Šakić & Lozančić (1999), Kamenjarin & Pavletić (2002), and in the NHMS Herbarium of Andrija Andrić that is deposited in the Natural History Museum in Split (abbreviation according to Thiers 2015).

Floristic research started in 2005 and lasted one year, and all vegetation seasons were included. Results of our field research, without a floristic list, were presented by Gabelica et al. (2007) on the 2nd Croatian Botanical Congress. Meanwhile, some authors (Ruščić 2010, Ruščić et al. 2010, Jasprica & Kovačić 2011) provided contributions to the flora of the Pantan area but also without a complete floristic list. Therefore, the aim of this research was to contribute a floristic list of the investigated area of Pantan reserve because there was discrepancy in the number of vascular plant taxa in different publications.



Figure 1. Geographical position of the Pantan territory.

Material and methods

During the years 2005 and 2006 systematic botanical research of the Pantan territory near Trogir was conducted. It was carried out by the Public institution for managing of protected natural values on the territory of Splitsko-dalmatinska County and by teachers of the 5th Gymnasium "Vladimir Nazor", with the help of students who attended classes of Biology as an optional subject. In this research standard floristic methods were applied according to Nikolić et al. (1998).

Plant parts were collected for determination and the great majority of plants in the stage of inflorescence and fruit were photographed with digital camera. Herbarium specimens were identified by the standard keys (Tutin et al. 1964-1980, Pignatti 1982, Tutin et al. 1993, Domac 1994). The nomenclature follows Flora Croatica Database (Nikolić 2015) and taxa are listed in the context of higher systematic groups in alphabetical order of families. Threatened taxa are defined according to Nikolić & Topić (2005).

After the name of each taxon there is the abbreviation of the author who registered the taxon in this territory for the first time: Visiani (V), Andrić (A), Slade-Šilović (SŠ), Bedalov and Šegulja (BŠ), Šakić and Lozančić (ŠL), Kamenjarin and Pavletić (KP).

Life forms were determined according to Horvat (1949) and Pignatti (1982), while the symbols are given according to Horvat (1949): **Ch**-Chamaephytes, **G**-Geophytes, **T**-Therophytes, **H**-Hemicryptophytes, **P**-Phanerophytes, **I**-Hydrophytes. Floristic elements were determined according to Horvatić (1963b) and Horvatić et al. (1967/68) as follows:

1. Cultivated and adventitious plants
2. Euro-Asian floristic element
3. European floristic element
4. Mediterranean floristic element
 - 4.1. Circum-Mediterranean plants
 - 4.2. Eastern-Mediterranean plants
 - 4.3. European-Mediterranean plants
 - 4.4. Illyrian-Mediterranean plants
 - 4.4.1. Illyrian-Adriatic plants
 - 4.4.1.1. Illyrian-Adriatic endemic plants
 - 4.4.1.2. Illyrian-Appennine plants
 - 4.5. Mediterranean-Atlantic plants
 - 4.6. Mediterranean-Pontic plants
 - 4.7. Western-Mediterranean plants
5. South-European floristic element
 - 5.1. South-European-Atlantic plants
 - 5.2. South-European-Mediterranean plants
 - 5.3. South-European-Pontic plants
6. Widely spread plants

Results and discussion

The vascular flora of the Pantan territory has 269 taxa, and a floristic list is reported here for the first time in totally. Previously reported number of 360 vascular plant taxa by Ruščić (2010), Ruščić et al. (2010) and Nikolić (2015) was not possible to confirm and identify because of lack of the adequate floristic list.

Pteridophyta

Aspleniaceae

Asplenium ceterach L.; **H**; **5.2**.

Spermatophyta

Gymnospermae

Pinaceae

2. *Pinus halepensis* Mill.; (ŠL); **P**; **4.1**.

3. *P. pinea* L.; **P**; **4.1**.

Angiospermae

Anacardiaceae

4. *Pistacia lentiscus* L.; (ŠL); **P**; **4.1**.

Apiaceae

5. *Crithmum maritimum* L.; (ŠL); **Ch**; **4.5**.

6. *Daucus carota* L.; (KP); **H**; **5.2**.

7. *Foeniculum vulgare* Mill.; (ŠL); **H**; **4.1**.

8. *Oenanthe silaifolia* M. Bieb.; (KP); **H**; **5.3**.

9. *Scandix pecten-veneris* L.; **T**; **6**.

Apocynaceae

10. *Nerium oleander* L.; **P**; **4.1.**

Araliaceae

11. *Hedera helix* L.; **P**; **3.**

Aristolochiaceae

12. *Aristolochia clematitis* L.; **G**; **5.3.**

Asteraceae

13. *Anthemis cotula* L.; **T**; **3.**
 14. *Artemisia caerulescens* L.; (BŠ); **Ch**; **4.1.**
 15. *Aster tripolium* L.; (KP); **H**; **2.**
 16. *Bellis perennis* L.; **H**; **3.**
 17. *B. sylvestris* Cirillo; **H**; **4.1.**
 18. *Calendula arvensis* L.; **T**; **5.2.**
 19. *Carduus pycnocephalus* L.; **H**; **4.1.**
 20. *Centaurea solstitialis* L.; **H**; **5.3.**
 21. *Chamomilla recutita* (L.) Rauschert; **T**; **6.**
 22. *Conyza canadensis* (L.) Cronquist; **T**; **1.**
 23. *Dittrichia viscosa* (L.) Greuter; (KP); **H**; **4.1.**
 24. *Filago pyramidata* L.; **T**; **5.2.**
 25. *Helichrysum italicum* (Roth) G. Don; (ŠL); **Ch**; **4.1.**
 26. *Inula crithmoides* L.; (ŠL); **Ch**; **4.5.**
 27. *Onopordum illyricum* L.; **H**; **4.1.**
 28. *Pallenis spinosa* (L.) Cass.; **T**; **4.1.**
 29. *Senecio vulgaris* L.; (ŠL); **T**; **6.**
 30. *Xanthium strumarium* L. ssp. *italicum* (Moretti) D. Löve; (ŠL); **T**; **6.**

Boraginaceae

31. *Anchusa arvensis* (L.) M. Bieb.; **T**; **6.**
 32. *Cynoglossum creticum* Mill.; (V); **H**; **4.1.**
 33. *C. officinale* L.; (A); **H**; **3.**
 34. *Echium plantagineum* L.; **H**; **4.5.**
 35. *Heliotropium europaeum* L.; **T**; **4.6.**

Brassicaceae

36. *Aurinia sinuata* (L.) Griseb.; **Ch**; **4.4.1.2.**
 37. *Bunias erucago* L.; **T**; **5.2.**
 38. *Cakile maritima* Scop.; (BŠ); **T**; **6.**
 39. *Capsella bursa-pastoris* (L.) Medik.; **T**; **6.**
 40. *C. rubella* Reut.; (ŠL); **T**; **4.1.**
 41. *Cardamine hirsuta* L.; **T**; **6.**
 42. *Cardaria draba* (L.) Desv.; (ŠL); **G**; **6.**
 43. *Diplotaxis tenuifolia* (L.) DC. **H** **6.**
 44. *Erophila verna* (L.) Chevall. ssp. *praecox* (Steven) Walters; **T**; **6.**
 45. *Lepidium graminifolium* L.; **H**; **5.3.**
 46. *Raphanus raphanistrum* L. ssp. *raphanistrum*; (ŠL); **T**; **4.1.**
 47. *Sisymbrium officinale* (L.) Scop.; **T**; **6.**
 48. *Thlaspi perfoliatum* L.; **T**; **2.**

Callitricheae

49. *Callitriche palustris* L.; (V); **G**; **6.**

Campanulaceae

50. *Legousia hybrida* (L.) Delarbre; **T**; **5.1.**
 51. *L. speculum-veneris* (L.) Chaix; **T**; **5.2.**

Caprifoliaceae

52. *Viburnum tinus* L.; **P**; **4.1.**

Caryophyllaceae

53. *Agrostemma githago* L.; (A); **T**; **6.**
 54. *Arenaria leptoclados* (Reichenb.) Guss.; **T**; **2.**
 55. *A. serpyllifolia* L.; **T**; **6.**
 56. *Cerastium glomeratum* Thuill.; **T**; **6.**
 57. *Petrorhagia prolifera* (L.) P.W.Ball et Heywood; **T**; **2.**
 58. *P. saxifraga* (L.) Link; **H**; **5.2.**
 59. *Silene latifolia* Poiret; **H**; **5.2.**
 60. *S. nocturna* L.; (A); **T**; **4.2.**
 61. *S. viridiflora* L.; (A); **H**; **5.3.**
 62. *S. vulgaris* (Moench) Garcke ssp. *angustifolia* Hayek; **H**; **5.2.**
 63. *Spergularia salina* J. Presl et C. Presl; **Ch**; **6.**
 64. *Stellaria media* (L.) Vill; (ŠL); **T**; **6.**

Chenopodiaceae

65. *Arthrocnemum fruticosum* (L.) Moq.; (BŠ); **Ch**; **6.**
 66. *Atriplex prostrata* Boucher ex DC in Lam. et DC.; (KP); **T**; **6.**
 67. *Beta vulgaris* L. ssp. *maritima* (L.) Arcangeli; (KP); **H**; **4.5.**
 68. *Chenopodium album* L.; **T**; **6.**
 69. *Ch. bonus-henricus* L.; **H**; **6.**
 70. *Ch. vulvaria* L.; **T**; **5.2.**
 71. *Halimione portulacoides* (L.) Aellen; (ŠL); **Ch**; **6.**
 72. *Salsola soda* L.; (BŠ, KP); **T**; **5.3.**
 73. *Suaeda maritima* (L.) Dumort.; (KP); **T**; **6.**

Cichoriaceae

74. *Cichorium intybus* L.; **H**; **6.**
 75. *Crepis rubra* L.; **T**; **4.2.**
 76. *C. sancta* (L.) Babç.; **T**; **4.2.**
 77. *C. setosa* Haller f.; **T**; **5.2.**
 78. *Lactuca serriola* L.; (KP); **H**; **6.**
 79. *Picris echioides* L.; **T**; **4.1.**
 80. *P. hieracoides* L.; **H**; **2.**
 81. *Pulicaria dysenterica* (L.) Bernh.; (KP); **H**; **5.2.**
 82. *Reichardia picroides* (L.) Roth; (ŠL); **H**; **4.1.**
 83. *Scorzonera humilis* L.; (BŠ); **H**; **3.**
 84. *S. laciniata* L.; **H**; **6.**
 85. *Sonchus asper* (L.) Hill ssp. *glaucescens* (Jord.) Ball; **T**; **4.1.**
 86. *S. maritimus* Lam.; (KP); **H**; **4.1.**
 87. *S. oleraceus* L.; **T**; **6.**
 88. *Tragopogon hybridus* L.; **T**; **4.1.**
 89. *T. dubius* Scop.; **H**; **5.3.**
 90. *T. porrifolius* L. ssp. *porrifolius*; **H**; **4.1.**

Convolvulaceae

91. *Calystegia sepium* (L.) R. Br.; (KP); **H; 3**.
 92. *Convolvulus althaeoides* L. ssp. *tenuissimus* (Sibth. et Sm.) Stace; **H; 4.2**.
 93. *C. arvensis* L.; **G; 6**.
 94. *C. cantabrica* L.; **H; 5.2**.

Crassulaceae

95. *Sedum acre* L.; **Ch; 2**.
 96. *Umbilicus horizontalis* (Guss.) DC.; **G; 4.1**.

Cucurbitaceae

97. *Ecballium elaterium* (L.) A. Rich.; (KP); **G; 4.1**.

Dipsacaceae

98. *Sixalix atropurpurea* (Forssk.) Greuter et Burdet; **H; 5.2**.

Euphorbiaceae

99. *Euphorbia characias* L. ssp. *wulfenii* (Hoppe ex Koch) A.M. Sm.; **P; 4.4.1.1**.
 100. *E. helioscopia* L.; (ŠL); **T; 6**.
 101. *E. maculata* L.; **T; 1**.
 102. *E. peplus* L.; **T; 6**.
 103. *Mercurialis annua* L.; (ŠL); **T; 6**.

Fabaceae

104. *Astragalus hamosus* L.; **T; 4.1**.
 105. *Bituminaria bituminosa* (L.) Stirton; **Ch; 4.1**.
 106. *Colutea arborescens* L.; **P; 4.1**.
 107. *Coronilla emerus* L. ssp. *emeroides* Boiss. et Spruner; **P; 4.2**.
 108. *Hippocrepis biflora* Spreng.; **T; 4.1**.
 109. *Lathyrus cicera* L.; **T; 4.1**.
 110. *L. setifolius* L.; **T; 4.1**.
 111. *Lotus cytisoides* L.; (ŠL); **Ch; 4.1**.
 112. *Medicago disciformis* DC.; (ŠL); **T; 4.1**.
 113. *M. doliata* Carmign.; **T; 4.1**.
 114. *M. falcata* L.; **H; 2**.
 115. *M. hispida* Gaertner; **T; 5.2**.
 116. *M. lupulina* L.; **T; 6**.
 117. *M. minima* (L.) Bartal.; **T; 6**.
 118. *M. orbicularis* (L.) Bartal.; **T; 4.1**.
 119. *M. rigidula* (L.) All.; **T; 4.6**.
 120. *M. sativa* L.; **H; 6**.
 121. *M. truncatula* Gaertner; **T; 4.1**.
 122. *Melilotus albus* Medik.; **T; 2**.
 123. *M. altissimus* Thuill.; **G; 2**.
 124. *M. indicus* (L.) All.; **T; 4.1**.
 125. *M. officinalis* (L.) Lam.; **T; 2**.
 126. *M. sulcatus* Desf.; **T; 4.1**.
 127. *Onobrychis caput-galli* Lam.; **T; 4.1**.
 128. *Securigera cretica* (L.) Lassen; **T; 4.2**.
 129. *S. securidaca* (L.) Degen et Dörf.; **T; 4.1**.
 130. *Sophora japonica* L.; **P; 1**.
 131. *Spartium junceum* L.; (ŠL); **P; 4.1**.
 132. *Trifolium angustifolium* L.; **T; 4.1**.
 133. *T. campestre* Schreber; **T; 6**.

134. *T. pratense* L.; **H; 2**.

135. *T. repens* L.; **H; 6**.

136. *T. scabrum* L.; **T; 4.1**.

137. *Trigonella esculenta* Willd.; **T; 4.6**.

138. *Vicia cracca* L.; **H; 2**.

139. *V. dumetorum* L.; **H; 2**.

140. *V. lutea* L.; **T; 5.2**.

141. *V. narbonensis* L.; **T; 4.1**.

142. *V. serratifolia* Jacq.; **T; 4.1**.

143. *V. sativa* L. ssp. *sativa*; **T; 2**.

Fumariaceae

144. *Fumaria capreolata* L.; **T; 4.5**.

145. *F. officinalis* L. ssp. *officinalis*; (ŠL); **T; 6**.

Geraniaceae

146. *Erodium ciconium* (L.) L'Hér.; **T; 4,6**.

147. *E. cicutarium* (L.) L'Hér.; **T; 6**.

148. *E. malacoides* (L.) L'Hér.; **T; 4.1**.

149. *Geranium dissectum* L.; (A); **T; 6**.

150. *G. molle* L.; (ŠL); **T; 6**.

151. *G. purpureum* Vill.; (ŠL); **T; 5.2**.

152. *G. pusillum* Burm. f.; **T; 3**.

Lamiaceae

153. *Ballota nigra* L.; **H; 4.1**.

154. *Calamintha nepetoides* Jord.; **H; 5.3**.

155. *Lamium amplexicaule* L.; (ŠL); **T; 2**.

156. *Rosmarinus officinalis* L.; **P; 4.1**.

157. *Salvia officinalis* L.; **Ch; 4.3**.

158. *S. verbenaca* L.; **H; 4.5**.

159. *Stachys salviifolia* Ten.; **H; 4.4.1.2**.

Lauraceae

160. *Laurus nobilis* L.; **P; 4.1**.

Linaceae

161. *Linum tenuifolium* L.; **Ch; 5.3**.

Malvaceae

162. *Malva neglecta* Wallr.; **T; 6**.

163. *M. sylvestris* L.; (ŠL); **H; 6**.

Moraceae

164. *Ficus carica* L.; **P; 4.1**.

Oleaceae

165. *Olea europaea* L.; (ŠL); **P; 4.1**.

Onagraceae

166. *Epilobium tetragonum* L. ssp. *tetragonum*; (V); **H; 6**.

Papaveraceae

167. *Glaucium flavum* Crantz; (BŠ); **H; 4.5**.

168. *Papaver rhoeas* L.; **T; 6**.

Pittosporaceae

169. *Pittosporum tobira* (Thunb.) Aiton f.; **P; 1.**

Plantaginaceae

170. *Plantago lanceolata* L.; (ŠL); **H; 6.**

Plumbaginaceae

171. *Limonium narbonense* Mill.; (KP); **H; 4.1.**

172. *Plumbago europaea* L.; (A); **Ch; 4.1.**

Polygonaceae

173. *Polygonum aviculare* L.; **T; 6.**

174. *P. maritimum* L.; (KP); **H; 4.6.**

175. *Rumex crispus* L.; (KP); **H; 6.**

176. *R. pulcher* L.; **H; 5.2.**

Portulacaceae

177. *Portulaca oleracea* L.; **T; 6.**

Primulaceae

178. *Anagallis arvensis* L.; (A); **T; 6.**

179. *A. coerulea* Schreb.; **T; 6.**

Ranunculaceae

180. *Consolida regalis* S.F. Gray; **T; 5.2.**

181. *Nigella damascena* L.; **T; 4.1.**

182. *Ranunculus acris* L.; (A); **H; 6.**

183. *R. bulbosus* L.; **H; 2.**

184. *R. muricatus* L.; (ŠL); **T; 4.1.**

185. *R. scleratus* L.; (A); **T; 6.**

Resedaceae

186. *Reseda alba* L.; **T; 5.2.**

187. *R. lutea* L.; **H; 6.**

188. *R. phyteuma* L.; **T; 5.2.**

Rhamnaceae

189. *Paliurus spina-christi* Mill.; **P; 4.4.1.2.**

Rosaceae

190. *Agrimonia eupatoria* L.; **H; 6.**

191. *Potentilla hirta* L.; **H; 5.2.**

192. *Rosa canina* L.; **P; 6.**

193. *Rubus heteromorphus* Ripart ex Genev; **P; 4.4.1.2**

194. *Sanguisorba minor* Scop. ssp. *muricata* Briq.; (ŠL); **H; 5.2.**

Rubiaceae

195. *Galium aparine* L.; (ŠL); **T; 6.**

196. *G. maritimum* L.; (KP); **H; 4.1.** (Probably wrong determination)

197. *Sherardia arvensis* L.; **T; 6.**

198. *Valantia muralis* L.; (ŠL); **T; 4.1.**

Scrophulariaceae

199. *Linaria vulgaris* Mill.; **H; 2.**

200. *Misopates orontinum* (L.) Raf.; **T; 2.**

201. *Scrophularia peregrina* L.; **T; 4.1.**

202. *Verbascum blattaria* L.; **H; 6.**

203. *V. sinuatum* L.; **H; 4.1.**

204. *Veronica agrestis* L.; **T; 2.**

205. *V. anagallis-aquatica* L.; (ŠL); **H; 5.2.**

206. *V. arvensis* L.; **T; 2.**

207. *V. cymbalaria* Bodard.; **T; 5.2.**

208. *V. hederifolia* L.; **T; 6.**

209. *V. persica* Poir.; (ŠL); **T; 6.**

210. *V. polita* Fri.; (ŠL); **T; 2.**

Solanaceae

211. *Datura innoxia* Mill.; **T; 1.**

212. *D. stramonium* L.; (KP); **T; 1.**

213. *Solanum nigrum* L.; **T; 6.**

Tamaricaceae

214. *Tamarix dalmatica* Baum; (KP); **P; 4.2.**

Ulmaceae

215. *Celtis australis* L.; **P; 5.2.**

Urticaceae

216. *Parietaria judaica* L.; (KP); **H; 5.2.**

Verbenaceae

217. *Verbena officinalis* L.; **H; 6.**

218. *Vitex agnus-castus* L.; (KP); **P; 4.1.**

Vitaceae

219. *Parthenocissus quinquefolia* (L.) Planchon; **P; 1.**

Angiospermae

Agavaceae

220. *Agave americana* L.; **P; 1.**

Amaryllidaceae

221. *Allium ampeloprasum* L.; **G; 4.4.1.2.**

222. *A. neapolitanum* Cirillo; (A); **G; 4.1.**

223. *A. nigrum* L.; (A); **G; 4.1.**

224. *A. paniculatum* L.; (A); **G; 5.2.**

225. *A. roseum* L.; (A); **G; 4.1.**

226. *A. subhirsutum* L.; **G; 4.1.**

227. *Narcissus tazetta* L. ssp. *tazetta*; **G; 4.7.**

228. *Sternbergia lutea* (L.) Ker Gawl. ex Spreng.; (A); **G; 4.1.**

Asparagaceae

229. *Asparagus acutifolius* L.; **G; 4.1.**

230. *Muscari comosum* (L.) Mill.; **G; 5.2.**

231. *M. neglectum* Guss. ex Ten.; **G; 4.3.**

232. *Ornithogalum exscapum* Ten.; **G; 5.2.**

Cyperaceae

233. *Carex divulsa* Stokes; **H; 6.**

234. *C. extensa* Gooden.; (KP); **H; 4.5.**

235. *Scirpus maritimus* L. ssp. *maritimus*; (A); **G**; **6**.
- Juncaceae
 236. *Juncus acutus* L.; (ŠL); **H**; **4.5**.
 237. *J. compressus* Jacq.; **G**; **2**.
 238. *J. maritimus* Lam.; (BŠ); **G**; **6**.
- Liliaceae
 239. *Fritillaria orientalis* Adams; (A); **G**; **5.2**.
 (Probably wrong determination)
- Poaceae
 240. *Aegilops geniculata* Roth; **T**; **4.1**.
 241. *A. triuncialis* L.; **T**; **4.1**.
 242. *Aeluropus litoralis* (Gouan.) Parl.; (BŠ); **G**; **4.1**.
 243. *Avena barbata* Pott ex Link; **T**; **6**.
 244. *A. fatua* L.; **T**; **5.2**.
 245. *A. sterilis* L.; **T**; **5.3**.
 246. *Bromus hordaceus* L. ssp. *hordaceus*; **T**; **5.2**.
 247. *B. rigidus* Roth; (ŠL); **T**; **5.1**.
 248. *Cynodon dactylon* (L.) Pers.; **G**; **6**.
 249. *Dactylis glomerata* L.; **H**; **4.1**.
 250. *Desmazeria marina* (L.) Druce; **T**; **4.5**.
 251. *D. rigida* (L.) Tutin; **T**; **4.5**.
 252. *Elymus caninus* (L.) L.; **H**; **6**.
 253. *E. elongatus* (Host) Runemark; (BŠ); **H**; **4.1**.
254. *E. pycnanthus* (Godr.) Melderis; (KP); **G**; **4.1**.
 255. *Hainardia cylindrica* (Willd.) Greuter; **T**; **4.1**.
 256. *Holcus lanatus* L.; **H**; **2**.
 257. *Hordeum bulbosum* L.; **H**; **6**.
 258. *Lolium perenne* L.; **H**; **3**.
 259. *Lophochloa cristata* (L.) Hyl.; (KP); **T**; **6**.
 260. *Melica ciliata* L.; **H**; **2**.
 261. *Phleum subulatum* (Savi) Asch. et Graebn.; **T**; **4.1**.
 262. *Phragmites australis* (Cav.) Trin. ex Steud.; (A); **G**; **6**.
 263. *Poa annua* L.; **T**; **6**.
 264. *Puccinellia festuciformis* (Host) Parl. ssp. *festuciformis*; (KP); **H**; **4.1**.
- Potamogetonaceae
 265. *Potamogeton gramineus* L.; (A); **I**; **6**.
 266. *P. pectinatus* L.; (V); **I**; **6**.
- Ruppiaceae
 267. *Ruppia maritima* L.; (KP); **I**; **6**.
- Typhaceae
 268. *Typha latifolia* L.; (A); **G**; **6**.
- Xanthorrhoeaceae
 269. *Asphodelus aestivus* Brot.; **G**; **4.1**.

Taxonomic analysis

In this work 177 new plant taxa were recorded in the Pantan territory and the total number of registered taxa is now 269. There are altogether 61 families of vascular plants, and most of them belong to the group *Dicotyledones* (216 taxa). Then follows the group *Monocotyledones* with 10 families (50 taxa), *Coniferopsida* with one family (two taxa), and the group *Pteridophytes* with one family (one taxon). The family represented by the highest number of taxa is *Fabaceae* with 40 taxa and then follow the families *Poaceae* (25 taxa), *Asteraceae* (18 taxa) and *Cichoriaceae* (17 taxa).

Previously reported taxa *Galium maritimum* and *Fritillaria orientalis* were probably incorrectly determined and in our field research we did not find any of them.

Analyses of floral elements and life forms

According to the floristic elements (Fig. 2), the best represented floristic elements are given below: Mediterranean (107 taxa), South-European (45 taxa), Eurasiatic (24 taxa), European (eight taxa), widely spread plants (77 taxa), cultivated and adventitious plants (eight taxa). In the context of the Mediterranean floristic element the best represented are the circum-Mediterranean plant taxa (75 taxa), and in the context of the South-European floristic element the best represented are the South-European-Mediterranean plant taxa (33 taxa).

The plant taxa that have IUCN threat categories according to Nikolić & Topić (2005) that occur on the Pantan territory is critically endangered species (CR) *Aeluropus litoralis* (Gouan.) Parl., endangered species (EN) are *Carex extensa* Gooden. and *Glaucium flavum* Crantz, vulnerable species (VU) are *Desmazeria marina* (L.) Druce, *Hainardia cylindrica* (Willd.) Greuter, *Salsola soda* L. and *Suaeda maritima* (L.) Dumort.

The analyses of life forms (Fig. 3) show the the most represented are *Therophytes* (121 taxa), followed by *Hemicryptophytes* (78 taxa), *Geophytes* (29 taxa), *Phanerophytes* (24 taxa), *Chamaephytes* (14 taxa) and *Hydrophytes* (three taxa).

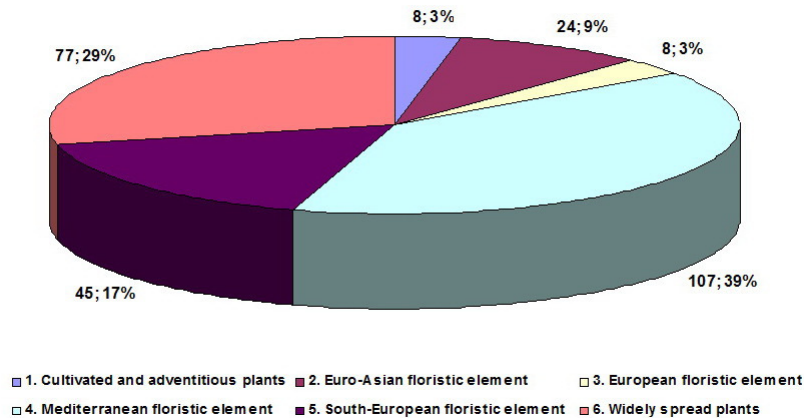


Figure 2. Phytogeographical analysis of the territory of Pantan.

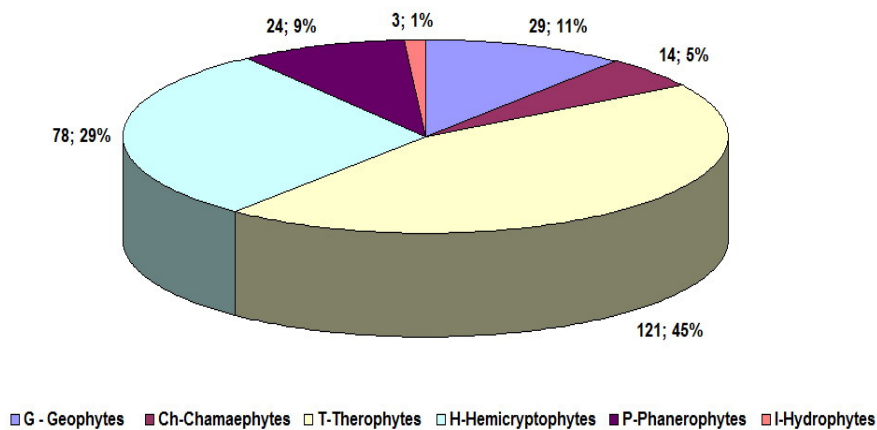


Figure 3. Spectrum of life forms of the vascular plants from the Pantan

Conclusion

During the years 2005 and 2006 a systematic botanical research of the Pantan territory near Trogir was carried out. The result is a floristic list that currently consists of 269 vascular plant taxa classified into 178 genera and 59 families. 177 new taxa were recorded for the first time. The dominance of Mediterranean floristic elements, many taxa from the *Fabaceae* family (40 taxa), and high number of therophytes (121 taxa) documents the Mediterranean character of the research territory.

References

- **Carev, I. (2009):** Id 4496-4498. U: Nikolić, T. (ur.): Flora Croatica Database. University of Zagreb, Faculty of Science, Department of Botany and Botanical Garden, Zagreb. <http://hirc.botanic.hr/fcd> (accessed November 2015).
- **Cvitanić, A. (1998):** Specifičnosti mediteranske močvare Pantan. Radovan, časopis društva za zaštitu kulturnih dobara Trogira 2(2): 81-86.
- **Domac, R. (1994):** Flora Hrvatske. Školska knjiga, Zagreb.
- **Gabelica, I., Piasevoli, G., Vladović, D., Parmać, T., Matković, D., Županović, G. (2007):** Vascular flora of the Pantan territory. In: Britvec, M., Škvorc, Ž. (eds.): Book of abstracts 2nd Croatian Botanical Congress, 20th-22nd September 2007., Zagreb. 22.
- **Gabelica, I., Piasevoli, G., Jurić, M., Mekinić, S., Kažimir, Z., Pešić, N., Perković, A. (2011):** Zaštićene prirodne vrijednosti Splitsko-dalmatinske županije. Javna ustanova za

- upravljanje zaštićenim prirodnim vrijednostima na području Splitsko-dalmatinske županije, Tisak "Franjo Kluz" d.d. Omiš.
- **Horvatić, S. (1963a):** Biljnogeografski položaj i rasčlanjenje našeg primorja u svjetlu suvremenih fitocenoloških istraživanja. *Acta Botanica Croatica* 22: 27-81.
 - **Horvatić, S. (1963b):** Vegetacijska karta otoka Paga s općim pregledom vegetacijskih jedinica hrvatskog primorja. *Acta biologica IV, Prirodoslovna istraživanja JAZU, knjiga 33*, Zagreb.
 - **Horvatić, S., Ilijanić, L.J., Marković-Gospodarić, L.J. (1967/68):** Biljni pokrov okolice Senja. *Senjski zbornik* 3: 298-322.
 - **Jasprica, N., Kovačić, S. (2011):** Raznolikost vegetacije na Pelješcu. *Zbornik u čast Ivici Žili, Matica Hrvatska, ogranak Dubrovnik*, 263-282.
 - **Kamenjarin, J., Pavletić, Z. (2002):** Vegetation of the Pantana area at Kaštela bay and its protections problem. *Hacquetia* 1(2): 185-192.
 - **Nikolić, T. (ur.) (2015):** Flora Croatica Database. University of Zagreb, Faculty of Science, Department of Botany and Botanical Garden, Zagreb. <http://hirc.botanic.hr/fcd> (accessed November 2015).
 - **Nikolić, T., Topić, J. (ur.) (2005):** Crvena knjiga vaskularne flore Republike Hrvatske. Kategorije EX, RE, CR, EN, VU. Ministarstvo kulture, Državni zavod za zaštitu prirode, Zagreb.
 - **Nikolić, T., Bukovec, D., Šopf, J., Jelaska, S. D. (1998):** Kartiranje flore Hrvatske: Mogućnosti i standardi. *Natura Croatica* 7(Suppl. 1): 1-62.
 - **Pignatti, S. (1982):** Flora d'Italia, vol. 1-3. Edizioni Agricole, Bologna.
 - **Ruščić, M. (2010):** Pantan. In: Nikolić, T., Topić, J., Vuković, N., (eds.): *Botanički važna područja Hrvatske*. Školska knjiga, Zagreb, 321-324.
 - **Ruščić, M., Carev, I., Zerdun, M. (2010):** Flora i vegetacija prirodnog rezervata „Pantan“. In: Jasprica N. i sur. (eds.): *Knjiga sažetaka 3. hrvatskog botaničkog kongresa*, 24.-26. rujna 2010., otok Murter, 173-174.
 - **Slade-Šilović, R. (1914):** Herbar Andrije Andrića trogirana sa životopisom istoga. Leonova tiskara, Spljet.
 - **Šakić, A., Lozančić, T. (1999):** Slanjače područja Pantan-Blata kod Trogira. o. š. "Bol". Znanstveni rad za susret i natjecanje mladih biologa Hrvatske.
 - **Šegulja, N. (1998):** Biljni svijet pjeskovito-šumovite i muljevite obale našeg Jadrana. *Ekološki glasnik* 6(8): 21-27.
 - **Thiers, B. (2015):** Index Herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. <http://sweetgum.nybg.org/ih/> (accessed October 21, 2015).
 - **Tutin, T. G., Heywood, V. H., Burges, N. A., Moore, D. M., Valentine, D. H., Walters, S. M., Webb, D. A. (eds.) (1964-1980):** *Flora Europaea*, 1-5. University press, Cambridge.
 - **Tutin, T.G., Burges, N.A., Chater, A.O., Edmondson, J.R., Heywood, V. H., Moore, D.M., Valentine, D.H., Walters, S. M., Webb, D. A. (eds.) (1993):** *Flora Europaea* 1, 2nd ed. University press, Cambridge.
 - **Visiani, R. (1841-1881):** *Flora Dalmatica*, vol. I-III + Supplementum I-II/2. Lipsiae et Venetiis.
 - **Žanić, M. (2005):** Pantan - poseban rezervat. *Radovan, časopis društva za zaštitu kulturnih dobara Trogira* 3(2): 140-141.