

ADDITION TO THE VASCULAR FLORA OF THE ISLAND OF KRAPANJ (ŠIBENIK ARCHIPELAGO, CROATIA)

MILENKO MILOVIĆ

Medical and Chemical School, Ante Šupuka Street, HR-22000 Šibenik, Croatia
(mmilovic@inet.hr)

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The paper provides a list of 160 vascular plant taxa new for the flora of the island of Krapanj (Šibenik archipelago), the outcome of research carried out in the period 2000 to 2004. These new taxa refer mainly to indigenous and naturalised (133 taxa) and less to cultivated plants (27 taxa). Together with the 270 taxa that have been published previously this makes a total of 430 taxa of vascular flora recorded for the island of Krapanj so far.

The great richness of the flora of this small island (0,36 km²) is explicable by the proximity of the mainland and diversity of habitats as well as the good population density.

Key words: new taxa, vascular flora, island of Krapanj, Šibenik archipelago, Croatia

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U radu se navodi popis od 160 svojiti vaskularnih biljaka novih za floru otoka Krapnja (šibenski arhipelag) zabilježenih tijekom istraživanja provedenog u razdoblju od 2000. do 2004. Od novoza-bilježenih svojiti, većina su autohtone i naturalizirane biljke (133 svojiti) a manji dio biljke koje dolaze u uzgoju (27 svojiti). Zajedno s 270 prethodno zabilježenih svojiti, dosad poznata vaskularna flora otoka Krapnja obuhvaća ukupno 430 svojiti.

Veliko bogatstvo flore ovog malog otoka (0,36 km²) može se objasniti njegovim malom udaljenošću od kopna, velikom raznolikošću staništa te brojnošću stanovnika.

Ključne riječi: analiza flore, otok Krapanj, šibenski arhipelag, Hrvatska

INTRODUCTION

Krapanj (43°40'16"N, 15°55'18"E) is a small island (0,36 km²) of the Šibenik archipelago situated in the south-eastern part of the Šibenik Channel (Fig. 1). It is only about 400 m from the mainland at the settlement of Brodarica. It is low (the

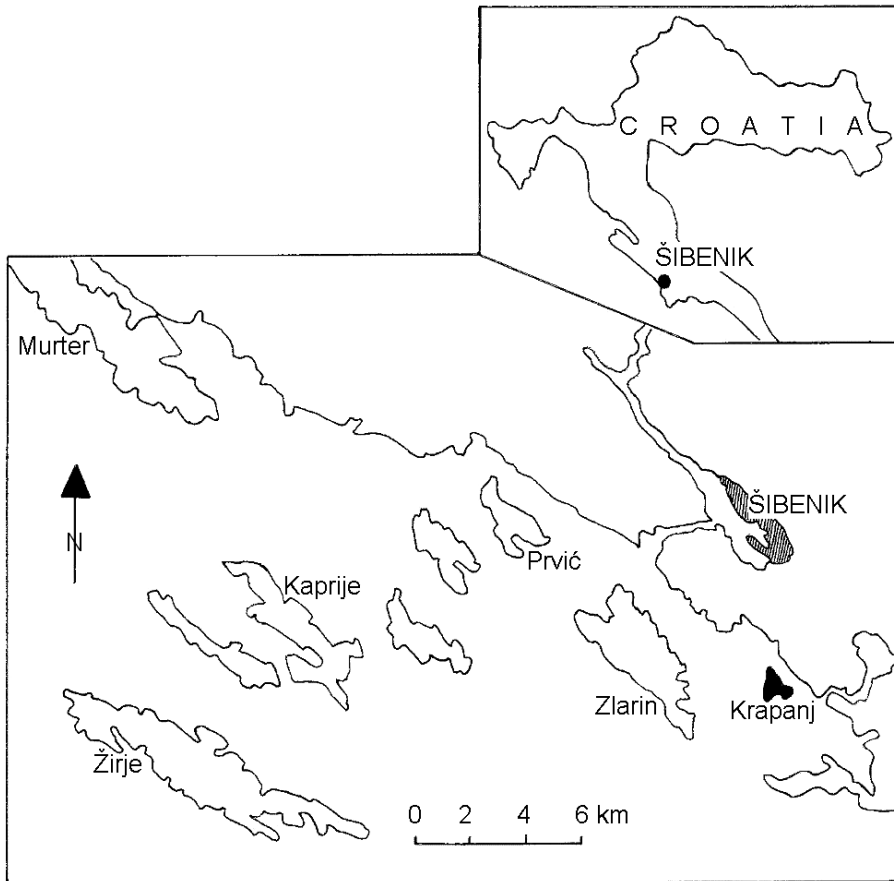


Fig. 1. Geographic position of the island of Krapanj

average altitude is about 2 m and the highest spot is 7 m above sea level), is built of Senonian limestones and lies in the Dinaric direction, from north-west to south-east (MAMUŽIĆ *et al.*, 1966). The island of Krapanj was for a long time densely populated but the trend towards depopulation has been very rapid especially in the last two decades: it had a population of 1767 in 1981, but of only 237 in 2001 (BERTIĆ (ed.), 1987; FELDBAUER, 2004).

The island belongs in quadrant WJ73 of the UTM grid (10x10 km), and quadrant 2361 of the MTB grid (10° x 6°).

The island of Krapanj is situated in the central part of the Croatian littoral and is characterized by a warm, dry Mediterranean climate. According to data from the nearest weather station, in Šibenik, for the period from 1986 to 1996 the average annual temperature was 15.5°C and the average annual precipitation 711.7 mm. The island belongs to the Mediterranean proper vegetation zone characterized by poten-

tial vegetation from *Quercion ilicis* alliance. The primary holm oak forest vegetation was destroyed by long-term human activities and now secondary types of habitats and vegetation are dominant. There is very little cultivated land, mostly vegetable gardens, olive groves and vineyards. Neglected crops are gradually turning into dry grasslands and undergrowth (garrigue and maquis). The north-western part of the island is overgrown by small Aleppo pine forest while typical halophilic vegetation occurs along the sandy and pebbly coast.

The first reliable floristic data for the island of Krapanj comes from VISIANI (1826, 1842–1852) who recorded 15 plant taxa, but the greatest number of taxa were registered in the last 10 years. Firstly, PAVLETIĆ & PANDŽA (1994) found the west Mediterranean plant *Diplotaxis erucooides* (L.) DC., after that PANDŽA (1998c) registered 252 new taxa, and finally two adventitious species, *Galinsoga parviflora* Cav. and *Conyza sumatrensis* (Retz.) E. Walker, were found on Krapanj by MILOVIĆ (2001, 2004).

According to these literature data 270 taxa in all have previously been registered for the island of Krapanj. Although the island of Krapanj is very small, it could be supposed that the total number of 270 taxa was not definitive. This research is a contribution to a more complete knowledge about the vascular flora of the island of Krapanj.

METHODS

Research in the flora of the island of Krapanj was carried out in the period from 2000 to 2004. During this period the island was visited several times each season.

The taxa were determined by standard flora keys (TUTIN *et al.* (eds.), 1968–1980, 1993; PIGNATTI, 1982).

The list that follows comprises 160 taxa, new for the island of Krapanj. The nomenclature is arranged according to *Flora Europaea* (TUTIN *et al.* (eds.), 1968–1980, 1993) with the exception of the American neophyte *Conyza sumatrensis* (Retz.) E. Walker. The families with their appertaining species and subspecies are sorted alphabetically within the higher systematic taxa. Detailed designations of finding sites have not been given because of the small surface of the island. Cultivated taxa are marked with an asterisk (*).

After the name of each species and subspecies types of habitats are given, marked by letters in this way:

- | | |
|--|---|
| a = garrigue and maquis | g = along roads and paths |
| b = Aleppo pine forests | h = walls |
| c = rocky ground | i = the bottom of the house and yard walls |
| d = hedges | j = rocky and gravelly spots by the sea |
| e = gardens, olive groves and vineyards | k = muddy and sandy shores |
| f = flower beds | l = salt marsh spots by the sea |

THE LIST OF NEWLY REGISTERED TAXA

P T E R I D O P H Y T A

FILICOPSIDA

*A s p l e n i a c e a e**Asplenium ruta-muraria* L.; h*Asplenium trichomanes* L.; h

S P E R M A T O P H Y T A

ANGIOSPERMAE : DICOTYLEDONES

*A i z o a c e a e***Carpobrotus edulis* (L.) N.E.Br.; f*A m a r a n t h a c e a e**Amaranthus paniculatus* L.; g*A p o c y n a c e a e***Nerium oleander* L.; f*A r a l i a c e a e**Hedera helix* L.; b*B o r a g i n a c e a e**Echium plantagineum* L.; g,i*Myosotis ramossisima* Rochel; c,e*C a c t a c e a e***Opuntia ficus indica* (L.) Miller; f*C a m p a n u l a c e a e**Campanula erinus* L.; h,c*C a r y o p h y l l a c e a e**Cerastium brachypetalum* Desp. subsp. *roeseri* (Boiss. & Heldr.) Nyman; e,g,c*Myosoton aquaticum* (L.) Moench; e,f*C h e n o p o d i a c e a e**Atriplex littoralis* L.; g,l**Bassia scoparia* (L.) A.J.Scott; f,g*Chenopodium opulifolium* Schrader ex Koch & Ziz; e,g*Salicornia europaea* L.; k*C i s t a c e a e**Cistus incanus* L. subsp. *creticus* (L.) Haywood; a,c*C o m p o s i t a e**Subfam. Asteroideae (=Asteraceae)**Bellis sylvestris* Cyr.; a,c,e

**Calendula officinalis* L.; f

Carthamus lanatus L. subsp. *lanatus*; g

Cirsium vulgare (Savi) Ten.; e,g

Filago pyramidata L.; c,a

**Helianthus tuberosus* L.; f

**Senecio cineraria* DC.; f

**Tanacetum parthenium* (L.) Shultz Bip.; f

Tyrimnus leucographus (L.) Cass.; g,e

Subfam. Cichorideae (=Cichoriaceae)

Cichorium endivia L. subsp. *endivia*; e,g

Crepis foetida L. subsp. *foetida*; g,e

Crepis vesicaria L. subsp. *haenseleri* (Boiss ex DC.) P. D. Sell (= *C. vesicaria* L. subsp. *taraxacifolia* (Thuill.) Thell.; g,e,b

Hieracium praealtum Vill. ex Gochnat subsp. *bauhinii* (Besser) Petunnikov; c,e,a

Leontodon tuberosus L.; a,e,c

Scorzonera villosa Scop. subsp. *villosa*; c,a

Sonchus tenerrimus L.; g,i,

Taraxacum megalorhizon (Forsskal) Hand.-Mazz.; g,c

Taraxacum officinale agg.; g,i,e

C o n v o l v u l a c e a e

**Ipomoea purpurea* Roth.; g

C r a s s u l a c e a e

Sedum acre L.; c,g

Sedum hispanicum L.; c

Sedum telephium L. subsp. *maximum* (L.) Krockner; g,d

C r u c i f e r a e (=Brassicaceae)

Erophila verna (L.) Chevall. subsp. *praecox* (Steven) Walters; c,e,a

**Lobularia maritima* (L.) Desv.; f

Raphanus sativus L.; e

C u s c u t a c e a e

Cuscuta campestris Yuncker; e

E u p h o r b i a c e a e

Euphorbia falcata L.; g,e

Euphorbia paralias L.; j

F a g a c e a e

Quercus pubescens Willd.; d

G e n t i a n a c e a e

Blackstonia perfoliata (L.) Hudson subsp. *perfoliata*; a,c,e

Centaureum tenuiflorum (Hoffmanns. et Link) Fritsch; e,l,g

*Geraniaceae**Erodium cicutarium* (L.) L'Hér.; g,e*Geranium dissectum* L.; e*Geranium tuberosum* L.; e*Labiate (=Lamiaceae)**Lamium purpureum* L.; e,d**Lavandula angustifolia* Miller; f*Micromeria juliana* (L.) Benth. ex Reichenb.; c,a,h**Rosmarinus officinalis* L.; f,d*Salvia sclarea* L.; g*Satureja montana* L. subsp. *variegata* (Host.) P. W. Ball; a,b*Stachys cretica* L. subsp. *salviifolia* (Ten.) Rech. fil.; c,g*Lauraceae***Laurus nobilis* L.; e*Leguminosae (=Fabaceae)**Astragalus hamosus* L.; g,e**Cercis siliquastrum* L.; f**Cicer arietinum* L.; e*Hippocrepis ciliata* Willd.; c,e*Hippocrepis unisiliquosa* L.; g,e*Lathyrus latifolius* L. (= *L. megalanthus* Steudel); e,d*Lathyrus ochrus* (L.) DC.; e,d*Lathyrus sativus* L.; e*Lathyrus setifolius* L.; c,a,g*Lotus ornithopodioides* L.; c,e*Lotus tenuis* Waldst. & Kit. ex Willd.; l,g,e*Medicago arabica* (L.) Hudson; g*Medicago coronata* (L.) Bartal.; c,a,b,g*Medicago lupulina* L.; c,e*Medicago rigidula* (L.) All.; g,c*Medicago sativa* L. subsp. *falcata* (L.) Arcangeli; g*Medicago sativa* L. subsp. *sativa*; g,e*Medicago truncatula* Gaertner (= *M. tribuloides* Desr.); c,g,j*Melilotus indica* (L.) All. (= *M. parviflorus* Desf.); c,g*Melilotus italica* (L.) Lam.; g*Melilotus officinalis* (L.) Pallas; g,e*Melilotus sulcata* Desf.; c,a,g*Pisum sativum* L. subsp. *elatius* (M. Bieb.) Ach. et Graebn.; e,d**Poinciana gilliesii* Hook.; f*Scorpiurus muricatus* L.; c,e,a

Trifolium arvense L.; e,c

Trifolium lappaceum L.; c,e,g

Vicia benghalensis L. (= *V. atropurpurea* Desf.); l,e

**Vicia faba* L.; e

Vicia lutea L. subsp. *vestita* (Boiss) Rouy; e,d

Vicia peregrina L.; e,c

Vicia sativa L. subsp. *nigra* (L.) Ehrh.; a,g,e,c

Vicia villosa Roth subsp. *varia* (Host) Corb.; e,g,a

L i n a c e a e

Linum strictum L. subsp. *corymbulosum* (Reichenb.) Rouy; c,a,e

Linum strictum L. subsp. *strictum*; c,e,

Linum tenuifolium L.; a,c

M o r a c e a e

**Morus alba* L.; e

O l e a c e a e

**Ligustrum vulgare* L.; d

O n a g r a c e a e

Epilobium tetragonum L. subsp. *lamyi* (F.W. Schultz) Nyman; e

O r o b a n c h a c e a e

Orobanche minor Sm.; a,c

O x a l i d a c e a e

Oxalis corniculata L.; i,g,h

P a p a v e r a c e a e

Fumaria capreolata L.; g,d

P l a n t a g i n a c e a e

Plantago coronopus L. subsp. *commutata* (Guss.) Pilger; g,k

P o l y g o n a c e a e

**Fallopia aubertii* (Louis Henry) J. Holub (= *Bilderdykia aubertii* (Louis Henry) Moldenke; h,f

Polygonum bellardii All.; g,b

Rumex conglomeratus Murray; g,l

Rumex crispus L.; g,l

P r i m u l a c e a e

Anagallis foemina Miller (= *A. caerulea* Schreber, non L.); e,g

P u n i c a c e a e

**Punica granatum* L.; d,f

R a n u n c u l a c e a e

Clematis vitalba L.; d

Delphinium peregrinum L.; c,g,e

Ranunculus arvensis L.; e

R e s e d a c e a e*Reseda lutea* L.; g,e**R h a m n a c e a e***Frangula rupestris* (Scop.) Schur; a,d*Rhamnus alaternus* L.; b,a**R o s a c e a e***Agrimonia eupatoria* L.; e,g,l**Prunus dulcis* (Miller) D.A. Webb (= *Amygdalus communis* L.); e**Prunus cerasifera* Ehrh.; e,g*Prunus mahaleb* L.; a,b,d**Prunus persica* (L.) Batsch.; e,g*Rosa canina* L.; d**R u b i a c e a e***Asperula arvensis* L.; e*Galium tricornutum* Dandy; e**R u t a c e a e***Ruta chalepensis* L. (= *R. bracteosa* DC.); g,c**S a x i f r a g a c e a e***Saxifraga tridactylites* L.; c,h,a**S c r o p h u l a r i a c e a e***Chaenorrhinum minus* (L.) Lange subsp. *litorale* (Willd.) Hayek; g,j,e*Linaria angustissima* (Loisel.) Borbás (= *L. italica* Trev.); g,e*Linaria chalepensis* (L.) Miller; e*Veronica hederifolia* L. subsp. *triloba* (Opiz) Čelak.; e**S o l a n a c e a e***Datura innoxia* Miller; f*Solanum luteum* Miller subsp. *alatum* (Moench) Dostál; g**U m b e l l i f e r a e (=Apiaceae)***Chaerophyllum coloratum* L.; a,b*Torilis nodosa* (L.) Gaertner; e,g,d**V a l e r i a n a c e a e****Centranthus ruber* (L.) DC.; f**V e r b e n a c e a e***Verbena officinalis* L.; g,l,e**V i o l a c e a e***Viola adriatica* Freyn; d*Viola arvensis* Murray; e,g,c**V i t a c e a e****Parthenocissus quinquefolia* (L.) Planchon; h

ANGIOSPERMAE : MONOCOTYLEDONES

*Cyperaceae**Carex divisa* Hudson; c,e*Gramineae (=Poaceae)**Aegilops geniculata* Roth; c,g,e*Agrostis stolonifera* L. (incl. *A. maritima* Lam.); e,l*Avena sterilis* L.; g*Bromus erectus* Hudson subsp. *condensatus* (Hackel) Ascherson & Graebner; a,b*Bromus rigidus* Roth; g*Digitaria sanguinalis* (L.) Scop.; e,g,f*Elymus elongatus* (Host) Runemark; l,g*Festuca arundinacea* Schreber; g,l*Festuca pratensis* Hudson; g,l*Lolium multiflorum* Lam.; g,l*Lolium rigidum* Gaudin. subsp. *lepturoides* (Boiss.) Sennen & Mauricio; c,g*Phleum subulatum* (Savi) Acherson & Graebner; g,e,b,i*Poa annua* L.; g,f*Poa trivialis* L. subsp. *sylvicola* (Guss.) H. Lindb. fil.; b*Polypogon monspeliensis* (L.) Desf.; l,k*Setaria ambigua* (Guss.) Guss., non Schrader (= *S. verticillata* x *viridis*); g,e*Liliaceae**Allium ampeloprasum* L.; a,b*Allium paniculatum* L. subsp. *fuscum* (Waldst. & Kit.) Arcangeli; c,g*Allium scorodoprasum* L. subsp. *rotundum* (L.) Stearn; g,e**Lilium candidum* L.; f*Ornithogalum pyramidale* L.; e,d*Ornithogalum refractum* Kit. ex Schlecht; e

DISCUSSION

The vascular flora of the islands of Šibenik archipelago has been thoroughly investigated during the last decade. According to literature data published so far, the flora lists of the inhabited islands of Šibenik archipelago comprise in total from 268 to 734 vascular plant taxa (Tab. 1).

With the exception of the flora of the islands of Murter and Zlarin, the plants that grow in cultivated conditions are not included in the total vascular flora of the islands of the Šibenik archipelago (Tab 1.). The justification of the inclusion of all cultivated plants surviving in the open air during the unfavorable vegetation period in the flora of some area was elaborated by TRINAJSTIĆ & PAVLETIĆ (1999).

Tab. 1. Survey of the number of plant taxa from the inhabited islands of Šibenik archipelago

Island	Surface	Total no. of taxa	No. of cult. taxa	Source
Krapanj	0,36 km ²	268	0	Pandža, 1998c
Prvić	2,37 km ²	272	0	Pandža, 1998c
Kaprije	6,97 km ²	278	0	Franjić & Pandža, 1995
Zlarin	8,19 km ²	444	75	Pandža, 1998b; Trinajstić & Pavletić, 1999
Žirje	15,78 km ²	469	0	Pandža, 2003
Murter	17,90 km ²	734	134	Pandža, 1998a

It was to be expected that on more detailed floristic research and with the inclusion of cultivated plants the total number of plant taxa on each of the islands of the Šibenik archipelago will be significantly increased.

This was proved to be true by the most recent research into the vascular flora of some other small islands on the Adriatic coast (TRINAJSTIĆ & PAVLETIĆ, 1999) as well as the most recent research into vascular flora of the island of Krapanj presented in this paper. According to research by PANDŽA (1998c) a total of 268 taxa were registered on the island of Krapanj, but it could be expected that it was not a full inventory of this flora, in spite of the small surface of the island (0.36 km²).

With the addition of two neophytic taxa, *Galinsoga parviflora* and *Conyza sumatrensis* (MILOVIĆ, 2001; 2004), the total number of taxa on the island increased to 270 taxa. In this paper a list of 160 plant taxa of *Pteridophyta* and *Spermatophyta* newly recorded for the island is given, so the entire known flora of the island of Krapanj has risen to 430 taxa. The great richness of the vascular flora of this small island (0.36 km²) is explicable by its proximity to the mainland, diversity of habitats and the good population density.

The total of 160 newly registered taxa contains the total of the previously known flora of this island (270 taxa) by 59%. These new taxa are mostly indigenous and naturalised plants (133 taxa) and to a lesser extent cultivated plants (27 taxa).

According to the list of vascular flora of the island of Krapanj by PANDŽA (1998c) and the flora list that is given in this paper, the *Leguminosae* family with 61 plant taxa (14.19% of total flora), the *Compositae* family with 57 taxa (13.26%) and the *Gramineae* family with 49 plant taxa (11.40%) are featured in the greatest number of plant taxa. The great share of plants from these three families (167 taxa, 38.84% of total flora) indicates the anthropochorus character of the flora of the island of Krapanj and reveals the long-lasting and strong anthropogenic influence.

CONCLUSION

This paper provides a list of 160 vascular plant taxa new for the flora of the island of Krapanj (Šibenik archipelago). These new taxa mostly consist of indigenous and naturalised plants (133 taxa) and less to cultivated plants (27 taxa). Together

with the 270 taxa that have been published previously this makes a total of 430 taxa for the vascular flora recorded for the island of Krapanj.

In spite of numerous data published previously, the vascular flora of the islands of the Šibenik archipelago is still not completely known. Accordingly, more thorough floristic research will be continued with a special accent on the hibernal aspect of the flora and full inventory of the cultivated plants.

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SAŽETAK

Dodatak flori otoka Krapnja (Šibenski arhipelag, Hrvatska)

M. Milović

U razdoblju od 2000. do 2004. obavljena su dodatna istraživanja vaskularne flore otoka Krapnja pri čemu je zabilježeno ukupno 160 novih svojti što je 59% od dotad poznate flore (270 svojti). Od novozabilježenih svojti, 133 su domaće i naturalizirane dok 27 svojti dolazi u uzgoju. Ukupna do danas poznata vaskularna flora Krapnja broji ukupno 430 svojti.

Veliko bogatstvo flore ovog malog otoka (0,36 km²) može se objasniti njegovim malom udaljenošću od kopna, velikom raznolikošću staništa te brojnošću stanovnika.

Na primjeru rezultata dodatnih istraživanja vaskularne flore Krapnja može se sa sigurnošću pretpostaviti da flora otoka šibenskog arhipelaga još uvijek nije u potpunosti poznata i da će se ukupni broj svojti tijekom slijedećih istraživanja znatno povećati.