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DISTRIBUTION AND PHYTOSOCIOLOGICAL RELATIONSHIPS OF SNAKE'S-HEAD (*FRITILLARIA MELEAGRIS* L.) IN CROATIA

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The snake's-head (*Fritillaria meleagris* L.) is an endemic European plant. It is more widespread in Croatia than was previously known. Most of its localities lie in the river valleys of northern Croatia, and there are just three localities on Velebit, in southern Croatia (Fig. 1). The phytosociological and ecological amplitude of the snake's-head is much wider in Croatia than in the northern parts of its area. It grows in swamp and moist grasslands (*Magnocaricetalia*, *Molinietalia* and *Arrhenatheretalia*), in moist hedges (*Prunetalia spinosae*) and flood forests of peduncular oak (*Alno-Quercion roboris*, *Fagetalia*) (Tabs. 1, 2). The snake's-head is in Croatia, as well as elsewhere in Europe, an endangered species and thus protected by law.

Key words: *Fritillaria meleagris* L., distribution, plant ecology, vegetation, Croatia

Introduction

The species *Fritillaria meleagris* L. is an endemic European plant (RIX 1989: 31). According to FISCHER (1994: 13), "als natürliches Verbreitungsgebiet gelten Mittel- und Südfrankreich (ohne Pyrenäen) und die Alpenvorländer (Schweiz, Österreich, Ungarn, Jugoslawien) sowie die nordöstlichen Gebiete der Balkan-Halbinsel (Siebenbürgen, Rumänien). In Nord-Kroatien wächst die Art zusam-

men mit *Leucoium aestivum* in wechselnassen *Carex gracilis-Poa palustris*-Überschwemmungswiesen (HORVAT et al. 1974: Tab. 95, ILIJANIĆ 1967)".

HOLLMANN (1972: 78) considers south-eastern Europe to be the homeland of the snake's-head, from where it came to north-western parts of Europe after forest grazing and the destruction of woodland.

Today, the snake's-head is an endangered species in its entire area (compare e.g. NIKLFELD et al. 1986, WRABER and SKOBERNE 1989, FINK et al. 1992, KORNECK et al. 1996), and in many regions can easily become extinct. It is endangered chiefly because of the unfavourable ecological changes in the habitat due to anthropogenic influences, especially changes in the water regime of the habitat by regulation of the water flow, large-scale land reclamation, intensive use of grasslands, turning large areas into arable land.

That is why such attention has been devoted to research into the distribution, phytosociological relationships and ecological features of this plant (comp. e.g. BUSCHMANN 1951, ULARU and PARASCAN 1970, HOLLMANN 1972, TRIST 1981, ZHANG 1983, ZHANG and HYTTERBORN 1985, ACCETTO 1990, LITVAK and LITVAK 1990, FISCHER 1994, HORSTHUIS et al. 1994, KOEHLER 1995, BABIJ 1998).

The snake's-head was noted in Croatia in the previous century (HOST 1827, ALSCHINGER 1832, SCHLOSSER and VUKOTINOVIĆ 1854, 1857, 1869, 1876, SAPETZA 1867, NEILREICH 1868, STUDNICZKA 1890)*, and many authors have noted it to this day. As elsewhere, *Fritillaria meleagris* is endangered in Croatia, and in some localities is even extinct. It was protected by law in 1958, and is listed in the Red Book of Plant Species of the Republic of Croatia (HULINA 1994: 216).

In the last several years we tried to determine its distribution in Croatia as precisely as possible. We also took into account the available vegetation records, so we could deduce the phytosociological relationships and ecological features. The aim was to enable more efficient protection of this endangered species, which is doubtlessly already extinct in some localities.

The nomenclature of plant taxa is given after EHRENDORFER (1973). The records were made using the standard method (BRAUN-BLANQUET 1964).

Results and discussion

Localities of snake's-head in Croatia

All the known localities of the species *Fritillaria meleagris* in Croatia, including those noted in the literature or documented in the herbarium collection of the Botanical Institute of the Faculty of Sciences in Zagreb (ZA), are set forth below. The list of localities is divided into smaller geographical units for ease of orientation: Hrvatsko zagorje (including Varaždin and the Križevci–Bjelovar

* The findings of *Fritillaria meleagris* in South Dalmatia published by STUDNICZKA (1890: 59) the most probably confers to the species *F. tenella* MB (=*F. montana* Hoppe). According to VISIANI (1842: 131) it would also confers to ALSHINGER's note (1832: 79) for Velebit mountain. Therefore, the species *F. meleagris* was noted also later on Velebit mountain (DEGEN 1936: 622, FORENBACHER 1990: 714).

area), the Zagreb area with Turopolje, Pokuplje, Posavina, Požeška kotlina, Podravina (including Baranja) and Velebit mountain (southern Croatia).

Beside the name of each locality there is the date (or at least the year if known) of the finding, and the name of the author in parentheses. If the finding was published previously, the year of publication (cited in the bibliography) follows the author. At the end lies the quadrant code according to the UTM system (Universal Transverse Mercator) as shown on the map in Fig. 1.

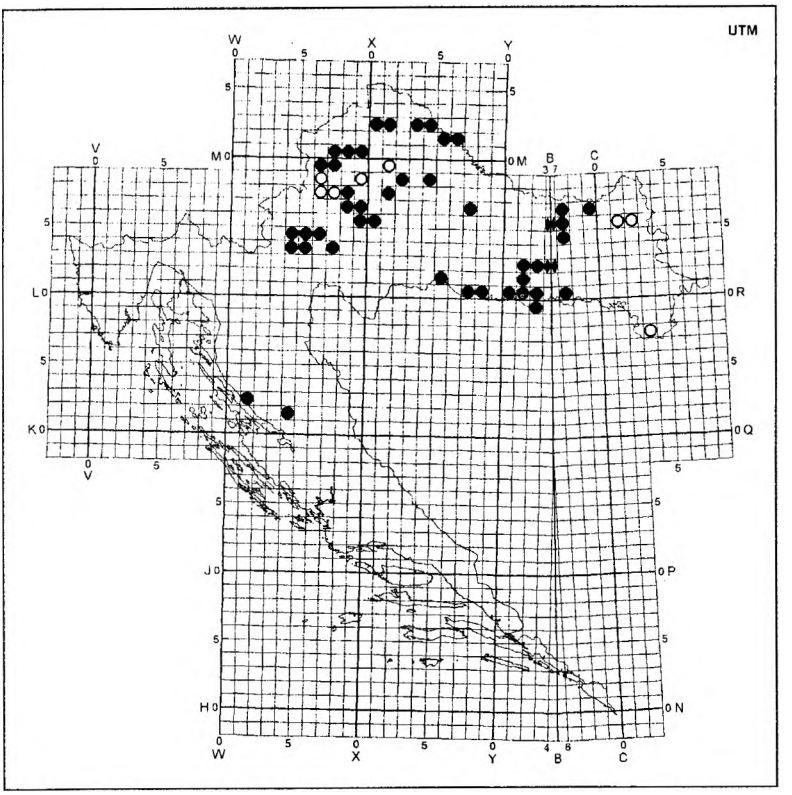

Fig. 1. Distribution of *Fritillaria meleagris* in Croatia (O findings up to 1979, ● findings in 1980 or later)

Hrvatsko zagorje (incl. Varaždin and the Križevci–Bjelovar area)

Novi Dvori at Zaprešić, 23 March 1919 (B. Gušić, Herbarium of Bot. Inst. Fac. of Sci., ZA), a wet forest, 15 and 21 March 1948 (M. and I. Horvat, herbarium ZAHO), UTM WL-67.

Near **Ivanec** village, on the meadow on the eastern side of the Zagreb-Krapina road, 18 April 1967 (Lj. Ilijanić), UTM WL-67.

Pojatno, below Vel. Vrh, 15 March 1934 (M. and I. Horvat, herbarium ZAHO), UTM WL-68.

Dubrovčan, the wet meadow along the Gubaševo–Tuheljske Toplice road, 10 April 1996 (Lj. Ilijanić), UTM WL-69.

Zabok, the meadow along the road near the crossroads for Tuheljske Toplice (near to "Đalski Castle "), 15 May 1967 (Lj. Ilijanić), UTM WL-69.

Zabok, abundant on the wet meadows at the northern exit from the town, near the crossroads for Sv. Križ Začretje, 20 April 1996 (Lj. Ilijanić and Z. Stančić), 6 April 1999 (Lj. Ilijanić and J. Topić), UTM WL-69.

Bedekovčina, the wet meadows on the southern side of the railway station, March 1997 (Z. Stančić), UTM WL-79.

Štrucljevo, the meadows in Krapinica valley between the road and the railroad, 20 April 1996 (Lj. Ilijanić and Z. Stančić), UTM WM-70.

Pustodol, the meadow in Krapinica valley, 20 April 1996 (Lj. Ilijanić and Z. Stančić), UTM WM-70.

Sveti Križ Začretje, on the wet meadow at the exit to the Zagreb–Krapina highway, 20 April 1996 (Lj. Ilijanić and Z. Stančić), UTM WM-70.

Poznanovec, wet meadows, south of the Zabok–Varaždin railroad, 20 April 1996 (Lj. Ilijanić and Z. Stančić), UTM WM-70.

Lovrečan, the wet meadows on the southern and northern side of the railroad toward Poznanovec, 1997 (Z. Stančić), UTM WM-80.

Zlatar Bistrica, the woods and the meadow on the northern and southern side of the railroad, 1 May 1994 (STANČIĆ 1996: Tab. 28), UTM WM-80.

Tugonica, a wet meadow, 6 April 1999 (Lj. Ilijanić and J. Topić), UTM WM-80.

Donji Lipovec, a wet meadow and woods, 29 April 1994 (Z. Stančić), UTM WM-80.

Turnišće, west from the Batina stream, 5 June 1993 (STANČIĆ 1996: Tab. 25), 6 April 1999 (Lj. Ilijanić and J. Topić), UTM WM-80.

Bočaki, a wet meadow, 9 May 1992 (STANČIĆ 1996: Tab. 21), UTM WM-80.

Konjščina, wet meadows, 19 May 1993 (STANČIĆ 1996: Tab. 21), 29 May 1993 (STANČIĆ 1996: Tab. 21), UTM WM-80.

Kosovečko, the wet meadows near the Selnica stream, 18 June 1993 (STANČIĆ 1996: Tab. 21), UTM WM-90.

Husinec, the wet meadows along the Krapina River, 27 May 1993 (STANČIĆ 1996: Tab. 23), UTM WM-90.

Crkveno at Konjščina, wet meadows, 21 April 1996 (Z. Stančić), UTM WM-90.

Turčin, the wet meadow about one kilometre west from the railway station, 21 April 1996 (Z. Stančić), April 1999 (B. Getoš), UTM XM-02.

Jalkovec–Poljana Biškupečka, a forest, April 1999 (B. Getoš), UTM XM-02.

Kneginec, a meadow, April 1999 (B. Getoš), UTM XM-02.

Donji Kućan, a meadow, April 1999 (B. Getoš), UTM XM-02.

Gornji Kućan, the meadows along the Plitvica River, April 1999 (B. Getoš), UTM XM-02.

Trnovec, a meadow, April 1999 (B. Getoš), UTM XM-02.

Zbelava, a meadow and the Merišće forest, April 1999 (B. Getoš), UTM XM-02.

Šemovec, toward Jalžabet, a meadow, April 1999 (B. Getoš), UTM XM-12.

Zamlaka, a meadow, April 1999 (B. Getoš), UTM XM-12.

Dubravski Markovac (between Bjelovar and Vrbovec), a wet meadow, April 1996 (S. Ozimec), UTM XL-17.

Križevci, (SCHLOSSER and VUKOTINOVIĆ 1854: 123), UTM XL-19.

Lovrečina, wet forests and meadows (SCHLOSSER and VUKOTINOVIĆ 1869: 1116), UTM XL-19.

Sv. Helena at Paukovac, (SCHLOSSER and VUKOTINOVIĆ 1869: 1116), UTM WL-98.

Bolč, on the margin of the Bolčanski lug forest, April 1996 (S. Ozimec), UTM XL-28.

Kokinac (south of Bjelovar), wet meadows, 1997 (R. Kranjčev), UTM XL-48.

Grubišno Polje, the meadows in Ilova river valley, 1998 (S. Gottstein), UTM XL-76.

The Zagreb area with Turopolje

Kraljevec at Zagreb, (H. Klinggräff, herbarium ZA), UTM WL-77.

Velika Gorica, (S. Wormastiny, herbarium ZA), UTM WL-86.

Petrovina at Velika Gorica, (HULINA 1989: 155), UTM WL-86.

Mičevec at Velika Gorica, (HULINA 1989: 155), UTM WL-86.

Selnica at Sesvete, a wet meadow (ILIJANIĆ 1988: Tab. 1), UTM WL-87.

Peščenica (Turopolje), between Buševec and Lekenik villages (HULINA 1989: 155), UTM WL-95.

Lekenik (Turopolje), (S. Wormastiny, herbarium ZA), the Turopoljski lug forest, 23 April 1993 (N. Matočec), UTM WL-95.

Selce (Turopolje), wet meadows, 7 April 1986 (Lj. Ilijanić and Lj. Marković), UTM WL-95.

Drnek (Turopolje), between Novo Čiče and Vrbovo, wet meadows, 21 April 1986 (Lj. Ilijanić and Lj. Marković), UTM WL-96.

Suša (Turopolje), southeast of Veleševec, wet meadows and shrub, 21 April 1984 (Lj. Ilijanić and Lj. Marković), UTM XL-05.

Along the **Odra river** (Turopolje), upstream from the Patka hunting lodge, 21 April 1986 (Lj. Ilijanić and Lj. Marković), UTM XL-05.

Pokuplje

Gornje Mekušje (Karlovac), on a wet meadow near a pedunculate oak forest, April 1961, 1998 (V. Peršin), UTM WL-43.

Turanj (Karlovac), 17. April 1896 (ROSSI 1924: 38, herbarium ZA), UTM WL-43.

Turanjski lug, *Quercus robur* wood near Karlovac, April 1998 (V. Peršin), UTM WL-43.

Brodarci near Karlovac, a wet meadow along the Kupa River, April 1959, 1960, 1998 (V. Peršin), UTM WL-44.

Ilovac (Karlovac), a wet meadow, April 1959, 1962, 1998 (V. Peršin), UTM WL-44.

Orlovac (Karlovac), 29 March 1908 (var. *albiflora*) (Lj. Rossi, herbarium ZA, ROSSI 1924: 38, 1932: 70), a wet meadow near the forest margin, April 1962, 1998 (V. Peršin), UTM WL-44.

Pojatno (Karlovac), a wet meadow, April 1962, 1998 (V. Peršin), UTM WL-44.

Selce (Karlovac), meadows, 30 April 1922 (Lj. Rossi, herbarium ZA, ROSSI 1924: 38, 1932: 70), UTM WL-44.

Vodostaj (Karlovac), meadows (SAPETZA 1867: 17), UTM WL-44.

Kobilić, a wet meadow, April 1997, 1998 (V. Peršin), UTM WL-53.

Rečica, a wet meadow near the railway station, April 1965, 1998 (V. Peršin), UTM WL-53.

Vukmanić, a wet meadow near the Trebinja stream, April 1961, 1998 (V. Peršin), UTM WL-53.

Banska Selnica, in the Jelančinka pedunculate oak forest along the Selnica stream, April 1998 (V. Peršin), UTM WL-54.

Blatnica, (ROSSI 1932: 70), UTM WL-54.

Banski Kovačevac, a wet meadow, April 1996 (V. Peršin), UTM WL-64.

Jamnička Kiselica, (SCHLOSSER and VUKOTINOVIĆ 1869: 1116, ROSSI 1924: 38), UTM WL-64.

Auguštanovac at Pokupsko, 1982 (N. Šegulja), UTM WL-73.

Pokupsko, the meadow south of the village (ŠEGULJA 1974: 204), UTM WL-73.

Posavina

Jasenovac, wet meadows, 1981 (N. Šegulja), UTM XL-51.

Bročice at Jasenovac, a wet meadow, 1981 (N. Šegulja), UTM XL-51.

Mokro Polje (east of Jasenovac), a wet meadow, 1981 (N. Šegulja), UTM XL-51.

Gornji Varoš, a wet meadow, 1981 (N. Šegulja), UTM XL-70.

Novi Varoš, a meadow west of the village, 1981 (N. Šegulja), UTM XL-70.

Stara Gradiška, a wet meadow, 1981 (N. Šegulja), UTM XL-70.

Visoka Greda at Mačkovac, a meadow, 1981 (N. Šegulja), UTM XL-80.

Batrina, the meadows along the Orljava River, 27 March 1994 (M. Tomašević), UTM YL-00.

Lužani, Rogača *Quercus robur* wood, 1996 (N. Šegulja and J. Topić), UTM YL-10.

Stupnički Kuti, *Quercus robur* wood, 1996 (N. Šegulja and J. Topić), UTM YL-20.

Bebrina, the Gaj forest, 1996 (N. Šegulja and J. Topić), UTM YK-29.

Donja Vrba, the Baltara forest, 1996 (N. Šegulja and J. Topić), UTM BR-70.

Sapci, in the Ugori, Topolik and Selište woods, 1996 (N. Šegulja and J. Topić), UTM BR-70.

Ođinjača, a meadow, 1996 (N. Šegulja and J. Topić), UTM BR-70.

Soljani (southeast of Spačva), wood, 17 April 1907 (D. Hirc, herbarium ZA), UTM CQ-37.

Požeška kotlina

Dragovci, the meadow near the Orljava River, 5 April 1992 (Tomašević 1998: 128), UTM YL-11.

Pleternica, the meadow near the Londža River, 1997 (M. Valenta – information by M. Tomašević), UTM YL-11.

Bresnica (south of Pleternica), a meadow, 1997 (M. Tomašević), UTM YL-11.

Gradac Požeški, 1997 (M. Valenta – information by M. Tomašević), UTM YL-12.

Grabarje, wet meadows (Tomašević 1998: 128), UTM YL-22.

Zagrađe, wet meadows (Tomašević 1998: 128), UTM YL-22.

Mali Bilač, 1997 (M. Valenta – information by M. Tomašević), UTM YL-22.

Veliki Bilač, 1997 (M. Valenta – information by M. Tomašević), UTM YL-22.

Knežci, wet meadows, (Tomašević 1998: 128), UTM YL-22.

Mihaljevci, 1997 (M. Valenta – information by M. Tomašević), UTM YL-22.

Čaglin, wet meadows, (Tomašević 1998: 128), UTM YL-32.

Latinovac, the woods along the Londža River, 1994 (I. Samardžić – information by M. Tomašević), UTM YL-32.

Migalovci, woods, 1994 (I. Samardžić – information by M. Tomašević), UTM YL-32.

Ruševo, a wet meadow, 1997 (M. Tomašević), UTM BR-62.

Sovski Dol, a wet meadow, 1997 (M. Tomašević), UTM BR-62.

Podravina (incl. Baranja)

Kutnjak, woods, (KRANJČEV 1995: 35), UTM XM-32.

Zablatje, woods, (KRANJČEV 1995: 35), UTM XM-42.

Hlebine, a wet meadow, south-east of the village, 1997 (R. Kranjčev), UTM XM-51.

Čambina, woods, (KRANJČEV 1995: 32), UTM XM-61.

Grudnjak, *Quercus robur* wood, north-west of the fishpond, 25 April 1996 (V. Tikas), UTM YL-35.

Grudnjak, *Quercus robur* wood, north of the fishpond, 25 April 1996 (V. Tikas), UTM BR-65.

Našice, (SCHLOSSER and VUKOTINOVIĆ 1869: 1116), UTM BR-74.

Klokočevac, April 1997 (J. Topić), UTM BR-74.

Beničanci, April 1997 (J. Topić), UTM BR-75.

Torjanci (Baranja), the woods along the Drava River, 1982 (J. Topić), UTM BR-76.

Židopustara (Baranja), (PANJKOVIĆ 1989: 20), UTM BR-96.

Osijek, (SCHLOSSER and VUKOTINOVIĆ 1869: 1116), UTM CR-15.

Mece (Baranja), the meadows near Stara Drava (ILIJANIĆ 1968: 169), UTM CR-25.

Velebit mountain (southern Croatia)

Mali Stolac, (southern Velebit), wet mountain meadows, (FORENBACHER 1990: 714), UTM WK-12.

Bunjevačka poljana above Raduč (southern Velebit), about 1200 m a. s. l., a wet habitat (DEGEN 1936: 622), UTM WK-41.

Bunovac (southern Velebit), wet mountain meadows (FORENBACHER 1990: 714), UTM WK-41.

As this list clearly shows, the snake's-head was noted in about 110 localities. In some of those, this plant has already been destroyed, or is extinct, especially in the older ones in the vicinity of fast-growing towns (such as Zagreb, Karlovac and others), as well as in those which have undergone significant changes in their water regimes and, consequently, the spread of arable land over river valleys. A good example is the Krapina river valley, where the snake's head used to be rather widespread between Zaprešić and Zabok (comp. HIRC 1917: 94), whereas today it is quite rare. More complete data on the earlier distribution of the snake's-head in Croatia are not available, and therefore accurate comparison between the current state and that of fifty or a hundred years ago is not possible.

It can be assumed that the localities recorded in 1980 or later are mostly still "active". According to our list, there are over 90 such localities, mainly in river valleys of north-western and eastern Croatia. Thus, it can be concluded that this

endangered plant species, the snake's-head, still grows in a number of localities in Croatia, although sometimes the stands are very restricted, with a small number of individuals. That there still are undiscovered localities can be postulated with certainty. Therefore some attention should be paid to the snake's-head in future research, too. New localities should be identified, and the state of the populations of known localities monitored. That way a complete depiction of the distribution and population dynamics of the species can be made, leading to more efficient conservation measures for this plant, which is protected by law.

The phytosociological relationships of snake's-head in Croatia

There are plenty of data on the phytosociological relationships of the species *Fritillaria meleagris* in European phytosociological literature. In a comprehensive monograph based on numerous vegetation records, HOLLMANN (1972: 78) concludes that this plant can be considered:

"a) als Klassencharakterart der *Molinio-Arrhenatheretea* mit einem Optimum im Übergang der *Molinietalia* zu den *Arrhenatheretalia*,

b) in NW-Europa als Differenzialart des *Arrhenatheretum elatoris alopecuretosum*,

c) in SO-Europa auch als Vertreter der *Querco-Fagetea*, sofern sich um den Übergangsbereich von *Alno-Padion* zum *Carpinion* (bzw. deren im SO vikarirenden Verbände) handelt und es dort (infolge Waldweide etc.) genügend Licht gibt".

According to extensive research at the Kungsängen Nature Reserve near Uppsala (eastern Sweden), "Five main community types were distinguished. *Fritillaria meleagris* occurs optimally in the *Arrhenatherum pubescens-Alopecurus pratensis* community" (ZHANG 1983: 80).

HORSTHUIS et al. (1994: 637) classify all Dutch stands with *Fritillaria meleagris* in the association *Fritillario-Alopecuretum pratensis* Westhoff et Den Held ex Corporaal, Horsthuis et Schaminée within the *Arrhenatherion* alliance (cf. also WESTHOFF and DEN HELD 1969: 189).

OBERDORFER (1957: 182) considers snake's-head a characteristic species of the *Calthion* alliance, distributed "auch im *Filipendulion* u. feucht. *Arrhenatheretalia*-Ges." (1979: 125). ELLENBERG (1982: 911) also considers it a characteristic *Calthion* species. In the seventh edition of his flora OBERDORFER (1994: 131) specified *Fritillaria meleagris* as "... *Molinietalia*-Ordn. char., bis in feucht. *Arrhenatheretalia*-Ges". About the phytosociological relationships of *F. meleagris*, see also WULF (1998: 117-118).

It is evident from the cited literature that the snake's-head, in the northern parts of its area, has a relatively narrow phytosociological and ecological amplitude on the moist grasslands of the class *Molinio-Arrhenatheretea*. In south-eastern Europe its amplitude is wider, as it is found in moist forests, too (cf. HOLLMANN 1972, including the bibliography).

Available vegetational records make it evident that this is also true for Croatia. In Croatia, snake's-head has greater amplitude, and grows on swamp

and moist grasslands and forests (cf. Tab. 1 and 2). The same also holds for the neighboring Slovenia (comp. SELIŠKAR 1986, ACCETTO 1990).

The snake's-head in grassland vegetation in Croatia. The grassland vegetation in which the species *Fritillaria meleagris* grows is shown in the phytosociological table (Tab. 1). The records were made in the following localities:

Rec. 1. Gornji Varoš, west of the village, 20 June 1981 (N. Šegulja), UTM XL-70, (*Ranunculus flammula* L., *Teucrium scordium* L., *Veronica scutellata* L. (1)).

Rec. 2. Near Stara Drava, in the vicinity of Mece (Baranja), (ILIJANIĆ 1968: 169), UTM CR-25, (*Eleocharis uniglumis* (Link) Schultes).

Rec. 3. Near Stara Drava, in the vicinity of Rec. 2, (ILIJANIĆ 1968: 169), UTM CR-25, (*Alisma gramineum* Lej.).

Rec. 4. Near Stara Drava, in the vicinity of Rec. 3, (ILIJANIĆ 1968: 169), UTM CR-25, (*Iris sibirica* L., *Poa angustifolia* L. (1)).

Rec. 5. Konjščina, south of the railroad, 29 May 1993 (STANČIĆ 1996: Tab. 21), UTM WM-80.

Rec. 6. South of Bočaki village in the vicinity of Konjščina, 9 May 1992 (STANČIĆ 1996: Tab. 21), UTM WM-80.

Rec. 7. Konjščina, near the road to Sušobreg, 19 May 1993 (STANČIĆ 1996: Tab. 21), UTM WM-80, (*Angelica sylvestris* L.).

Rec. 8. Kosovečko, to the east, near the Selnica stream, 18 June 1993 (STANČIĆ 1996: Tab. 21), UTM WM-90, (*Rumex acetosella* L.).

Rec. 9. Turnišće, near the Batina stream, 5 June 1993 (STANČIĆ 1996: Tab. 25), UTM WM-80.

Rec. 10. Near Jasenovac, 19 June 1981 (N. Šegulja), UTM XL-51, (*Bromus hordeaceus* L., *Juncus sp.*).

Rec. 11. Gornji Varoš, 20 June 1981 (N. Šegulja), UTM XL-70, (*Poa compressa* L., *Senecio jacobaea* L.).

Rec. 12. Selnica, near Sesvete (ILIJANIĆ 1968: Tab. 1), UTM WL-87, (*Ranunculus auricomus* L., *Succisa pratensis* Moench (1), *Symphytum officinale* L., *Juncus conglomeratus* L., *Carex brizoides* L. (2), *Cuscuta* sp.).

Rec. 13. Mokro polje, near Jasenovac, 19 June 1981 (N. Šegulja), UTM XL-51, (*Juncus* sp.).

Rec. 14. Visoka Greda, near Mačkovac, 19 June 1981 (N. Šegulja), UTM XL-80.

Rec. 15. Near Đalski Castle at Zabok, 15 May 1967 (Lj. Ilijanić), UTM WL-69.

Rec. 16. Near Stara Gradiška, 20 June 1981 (N. Šegulja), UTM XL-70, (*Inula salicina* L. (1), *Rumex conglomeratus* Murray, *Vicia* sp.).

Rec. 17. Near Ivanec village, in the Krapina river valley, western foothills of Medvednica (ILIJANIĆ 1988: Tab. 1), UTM WL-67, (*Veronica serpylli-*

folia L. (1), *Anemone nemorosa* L., *Sedum sexangulare* L. emend. Grimm).

Rec. 18. Dubrovčan, near the road Gubaševo–Tuheljske Toplice, 20 June 1985 (Lj. Ilijanić), UTM WL-69, (*Valeriana officinalis* L. (1), *Equisetum palustre* L. (1), *Carex nigra* (L.) Reichard, *Juncus compressus* Jacq.).

Rec. 19. Novi Varoš, west of the village, 22 June 1981 (N. Šegulja), UTM XL-70.

Rec. 20. Near Đalski Castle at Zabok, beside the road for Tuheljske Toplice, 25 April 1968 (Lj. Ilijanić), UTM WL-69.

Rec. 21. Bročice, near Jasenovac, 19 June 1981 (N. Šegulja), UTM XL-51, (*Vicia sativa* L.).

Rec. 22. Auguštanovac, near Pokupsko, 22 September 1982 (N. Šegulja), UTM WL-73, (*Cynodon dactylon* (L.) Pers.).

Rec. 23. Husinec, in the Krapina river valley, 27 May 1993 (STANČIĆ 1996: Tab. 23), UTM WM-90, (*Colchicum autumnale* L. (2), *Knautia arvensis* (L.) Coulter (1), *Tragopogon pratensis* L. (1), *Crepis biennis* L. (1), *Clinopodium vulgare* L. (1), *Luzula campestris* (L.) DC., *Polygala* sp.).

Rec. 24. Ođinjača, north of Sapci village, 18 June 1993 (N. Šegulja and J. Topič), UTM BR-70, (*Viola elatior* Fries (1), *Campanula patula* L., *Pastinaca sativa* L., *Carex* sp., *Crocus napolitanus* Mord. et Loisel., *Fragaria moschata* Duchesne (1), *Galanthus nivalis* L., *Prunus spinosa* L., *Quercus robur* L. juv. (1)).

Rec. 25. Auguštanovac, near Pokupsko, 22 September 1982 (N. Šegulja), UTM WL-73, (*Achillea millefolium* L. (1), *Polygala vulgaris* L.).

As is evident from Table 1, the species *Fritillaria meleagris* grows in Croatia in a vegetation of high sedges of the order *Magnocaricetalia* (*Magnocaricion*), swamp grasslands of the order *Molinietalia* and moist grasslands of the order *Arrhenatheretalia*. In some localities the species *Hordeum secalinum, Trifolium pallidum* and *Clematis integrifolia* are present (cf. Table 1) in the transitional stands toward the communities of the *Trifolion pallidi* Ilijanić 1969 alliance, i.e. the order *Trifolio-Hordeetalia* H-ić 1963 (*Molinio-Arrhenatheretea*). This leads to the conclusion that the phytosociological amplitude of the snake's-head in the non-forest vegetation in Croatia ranges from the class *Phragmitetea* (*Magnocaricion*) to the swamp and moist communities of the class *Molinio-Arrhenatheretea*. The optimum is, apparently, between *Molinietalia* and *Arrhenatheretalia*.

Snake's-head blooms early in the spring (March and April). Consequently, it is not found in many of the vegetation records in literature where its existence could be expected from its distribution and habitat, because the vegetation records are made later, in the full vegetation season before the mowing of the grasslands, when the aboveground parts are no longer visible.

Tab. 1. *Fritillaria meleagris* in grassland vegetation

No. of records	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Fritillaria meleagris **L.**	+	+	+	+	+	1	1	1	+	+	+	+	+	+	+	+	1	1	+	+	+	+	+	2	1
Magnocaricetalia **Pign. et *Phragmitetea* Tx. et Preising**																									
Galium palustre L.	1	1	1	1	1	1	+		1	3	1	1	1		1	3	1	+	2			1			
Poa palustris L.		2	2	1						3	1		3	2		1			2		1				
Carex otrubae Podp.	5										+	1	1	+				1	1	+	+			+	
Carex gracilis Curtis	4	2	3	2	1	3																			
Carex vulpina L.					4	3	4	3	1			+													
Iris pseudacorus L.	1		+	+								+	+												
Oenanthe fistulosa L.					2	1	+		2	2															
Carex riparia Curtis		2	1	1																					
Phalaris arundinacea L.		1	1	1																					
Senecio paludosus L.		+	1	1																					
Mentha aquatica L.						1	+										+								
Rorippa amphibia (L.) Besser	+																								
Molinietalia **W. Koch**																									
Lychnis flos-cuculi L.		+	1	1	+	+	1	1	1		+	2		1	1	+	1	1	+	1			+	1	+
Gratiola officinalis L.	+	+	1	1	2	2	1		1	2	2	1	1	+	1	2	+					1			
Lythrum salicaria L.	1	+	+	+	+		+	1		+	+	1	+	+	+		+								
Leucojum aestivum L.		1	1	1	+	1	1	1				+	+	+	3		1			1			+		
Cardamine pratensis L.	1	+	1		1	1	1					2	1				1				+				
Taraxacum palustre (Lyons) Symons					1	1	1	1	+			1			2	+	1	1							
Lotus tenuis Waldst. et Kit. ex Willd.							1	2	+	1	1	2	2		2		1	1							
Oenanthe silaifolia MB.											1	1	3	+	1	1		+	+	+	+				
Trifolium hybridum L.					3		1	1	1	1	+						2		+						
Carex tomentosa L.										1	2	1	+		1	1	1	+							
Senecio aquaticus Hill.	+					+	+	1							1		1						+		

No. of records	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Lysimachia vulgaris L.	1	1		1										1	1								+		
Carex panicea L.												+	1	+	2		1								
Ophioglossum vulgatum L.								+			+			1		+	1								
Myosotis scorpioides L.					+	1	1								1		+								
Serratula tinctoria L.			+	1								+												+	
Carex distans L.												+			1					+	+				
Filipendula ulmaria (L.) Maxim.					+												2	3		+					
Deschampsia cespitosa (L.) P.B.									+	+		3						+							
Euphorbia palustris L.		+	+	+										+											
Euphorbia lucida Waldst. et Kit.		+	+	+																					
Plantago altissima L.		+	+	1																					
Juncus effusus L.												2					+		+						
Gentiana pneumonanthe L.			+	1																					
Veronica longifolia L.			+	+																					
Cirsium canum (L.) All.							2					2													
Scutellana hastifolia L.											1		1												
Lotus uliginosus Schkuhr														1		1									
Stachys palustris L.										1				+											
Succisella inflexa (Kluk) G. Beck												1			+										
Thalictrum flavum L.													+	+											
***Arrhenatheretalia* Pawl.**																									
Centaurea jacea L. s. l.							+	1	2	+		+			+	1	3	+	+	1	1	1	2	2	2
Bromus racemosus L.					1	1	1		2		2	1			1	+	1	1	+	2	2		+		
Cynosurus cristatus L.								+	1		3	+					1			+	2		1		
Daucus carota L.							1		+			+					1			1			1	1	+
Poa trivialis L.					1						1			+			1	1	2	1					
Rumex acetosa L.								1				+					1			1			+	+	+
Taraxacum officinale Weber						1			+			+					2		1			+	1		
Trifolium patens Schreber								1			1					1	3	1			1				

Tab.1. – continued

No. of records	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Galium mollugo L.							1	+									+		+				1	+	
Gaudinia fragilis (L.) P.B.												+					1			1					
Ononis arvensis L.																				+	1		1		
Arrhenatherum elatius (L.) J. et K. Presl																							4	1	
Dactylis glomerata L.																							1	1	
Bellis perennis L.																	1						1		
Trisetum flavescens (L.) PB.																	+						1		
Carum carvi L.									+											+					
Moenchia mantica (L.) Bartl.									+															+	
***Molinio Arrhenatheretea* Tx.**																									
Alopecurus pratensis L.		1	1	2	5	3	1	1	3	+	2	1	2	2	1	2	1	1	3	+	3		+	1	1
Festuca pratensis Hudson					1		2	+	+	1	2	1	+	1	1	1	2	1	1	1	1		1	1	
Plantago lanceolata L.							1	2	+	1	1	1	1	+	1	1	2	+			+	+	1	1	1
Trifolium pratense L.						2	+	1	2		1	3			1		3	+	+	1	1	2	1	1	1
Ranunculus acris L.					1	1	2	3	3			2			1		3	1		1	1	2	+	1	2
Poa pratensis L.					+	1		1	2		1	1	+	1	1	1	1		+	1			+	1	
Prunella vulgaris L.							2	5		1	1	1	+	1	2	1	1				+	1	2		1
Rhinanthus minor L.							+	1	2	+	1	1				1	1		+		2		1		
Trifolium repens L.						+	2		1			1			2		1	1	3	1		1			+
Vicia cracca L.							2	+		1	+		3	+	+	1		+	1		+				
Carex hirta L.								+	+		+	1	1		1		+	1	1	+					
Holcus lanatus L.								1				2					2		+	1	2	1	+	2	1
Leontodon autumnalis L.							+	+	2		1	1		1	+		1		1			+			
Leucanthemum vulgare Lam.							+	+	+			1		+			2	+		1		+		+	+
Lathyrus pratensis L.												+					1			+	+	1	+	1	+
Betonica officinalis L.												2			1		1			1		2	+	1	1
Lotus corniculatus L.					1												1			+		1		1	1
Leontodon hispidus L.								+	1								2			+		1	1		
Phleum pratense L.										1	+		+		+			+			+				

No. of records	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Cerastium holosteoides Fries emend. Hyl.							+					+					1	+					1		
Trifolium dubium Sibth.												1					1						+		
Festuca rubra L.												+					1						1		
Agrostis stolonifera L.																	+	+			1				
Trifolium fragiferum L.							1						1												
Leontodon saxatilis Lam.												+					1								
Rhinanthus alectorolophus (Scop.) Pollich																		+		1					
Veronica chamaedrys L.																							1	+	
Other species																									
Potentilla reptans L.		1	1	1		+	+			1	1	1	2	1	1	2	1	1	1	1		+	+	+	+
Ranunculus repens L.	+	1	2	1	3	2	2	4	3	3		2	3	1	2		2	1		1	1	1			
Rumex crispus L.					+	+	+	+	1		+	1	+	+	+		1	+	1	+	2				
Galium verum L.									+			+			1	1	2	+		1	1	2	2	2	2
Lysimachia nummularia L.					2	1	2		+			1		+	1	1	+					1			
Ranunculus sardous Crantz.						+			+	+	+		1				+		1			+			+
Agrostis canina L.	+									1	3		2	4		4			2			2			
Cichorium intybus L.					+			+			+	+				+	2			+			+		
Anthoxanthum odoratum L.												2					1			1	2		+	1	
Ajuga reptans L.												1					1			1			+	+	+
Juncus articulatus L.		+	1	+								+					+								
Carex spicata Hudson							+						+						+	1	+				
Alopecurus utriculatus (L.) Sol.									3	+	2										1				
Filipendula vulgaris Moench														1		+	+								1
Carex pallescens L.												2		+			1				+				
Briza media L.												1					+			1			1		
Medicago lupulina L.									1								+						1	+	
Rorippa sylvestris (L) Besser		+		+															+						
Agropyron repens (L.) PB.													+			+								+	
Genista elata Wenderoth													+			+									+

Tab. 1. – continued

No. of records	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Inula hirta L.											1			2		+									
Calystegia sepium (L.) R. Br.														+					+					+	
Stellaria graminea L.												+					1				1				
Lolium perenne L.									1								+						1		
Agrimonia eupatoria L.																			+					+	+
Trifolium pallidum Waldst. et Kit.													1											+	+
Clematis integrifolia L.																								3	1
Eleocharis palustris (L.) Roem. et Schult.													1		1										
Mentha arvensis L.													+	+											
Potentilla erecta (L.) Räuschel														1								+			
Mentha pulegium L.														+		1									
Viola sp.														+		1									
Convolvulus arvensis L.																+								+	
Glechoma hederacea L.												+					+								
Picris hieracioides L.												+												+	
Equisetum arvense L.								+															2		
Erigeron annuus (L.) Pers.									+										+						
Ranunculus bulbosus L.									+														+		
Trifolium campestre Schreber																			+		1				
Carex flacca Schreber																						+			+
Inula britannica L.		+																						1	
Hordeum secalinum Schreber											+								+						

Shrubs and forests. Shrub and forest vegetation where *Fritillaria meleagris* was recorded is shown in Table 2, which consists of twelve phytosociological records. The records were made in following localities:

Rec. 1. Suša (Turopolje), 21 April 1986 (Lj. Ilijanić and Lj. Marković), UTM XL-05, (*Leucojum aestivum* L. (1), *Carex gracilis* Curtis).

Rec. 2. Along Odra river in Turopolje, about 200 m upstream of the Patka hunting lodge, 21 April 1986 (Lj. Ilijanić and Lj. Marković), UTM XL-05, (*Salix purpurea* L., *Carex hirta* L., *Angelica sylvestris* L., *Inula* sp., *Althaea officinalis* L., *Asclepias syriaca* L., *Fragaria vesca* L., *Heracleum sphondylium* L., *Solidago gigantea* Aiton (1), *Ulmus* sp.).

Rec. 3. Lužani, Rogača forest, 1996 (N. Šegulja and J. Topić), UTM YL-10, (*Milium effusum* L., *Primula vulgaris* Hudson, *Carex spicata* Hudson, *Helleborus* sp.).

Rec. 4. Sapci, Topolik forest, 1996 (N. Šegulja and J. Topić), UTM BR-70, (*Populus nigra* L. (4), *Campanula trachelium* L., *Serratula tinctoria* L., *Equisetum palustre* L., *Calystegia sepium* (L.) R. Br., *Carex otrubae* Podp., *Erigeron annuus* (L.) Pers. (1), *Eupatorium cannabinum* L., *Lapsana communis* L., *Ranunculus repens* L., *Iris pseudacorus* L.).

Rec. 5. Sapci, Ugori forest, 1996 (N. Šegulja and J. Topić), UTM BR-70, (*Ranunculus acris* L., *Dactylis glomerata* L., *Galeopsis* sp., *Salix caprea* L. (1)).

Rec. 6. Sapci, Selište forest, 1996 (N. Šegulja and J. Topić), UTM BR-70, (*Vitis vinifera* L. subsp. *sylvestris* (C. C. Gmelin) Hegi).

Rec. 7. Donja Vrba, Baltara forest, 1996 (N. Šegulja and J. Topić), UTM BR-70, (*Cruciata glabra* (L.) Ehrend., *Alliaria petiolata* (M. B.) Cav. et Gr.).

Rec. 8. Bebrina, Gaj forest, 1996 (N. Šegulja and J. Topić), UTM YK-29, (*Viola hirta* L.).

Rec. 9. Stupnički Kuti, Ciganija forest, 1996 (N. Šegulja and J. Topić), UTM YL-20, (*Dryopteris filix-mas* (L.) Schott, *Neottia nidus-avis* (L.) Rich., *Sanicula europaea* L., *Agrimonia eupatoria* L., *Geranium robertianum* L., *Lysimachia nummularia* L.).

Rec. 10. Zlatar Bistrica, towards Donji Lipovac, 1 May 1994 (Stančić 1996: Tab. 28), UTM WM-80, (*Athyrium filix-femina* (L.) Roth, *Doronicum austriacum* Jacq. (2), *Quercus petraea* (Matt.) Liebl., *Dentaria bulbifera* L.).

Rec. 11. Zlatar Bistrica, in the vicinity of Rec. 10, 1. May 1994 (Stančić 1996: Tab. 28), UTM WM-80, (*Fragaria moschata* Duchesne, *Myosotis scorpioides* L.).

Rec. 12. Zlatar Bistrica, in the vicinity of Rec. 11, 1. May 1994 (Stančić 1996: Tab. 28), UTM WM-80, (*Valeriana dioica* L.).

It can be seen from Table 2 that in Croatia the snake's-head grows also in moist forests and shrubs of the class *Querco-Fagetea*. The first two stands (Rec.1 and Rec. 2, Tab. 2) are moist shrubs of the *Berberidion* alliance (order *Prunetalia spinosae*). The presence of hygrophylous species such as *Fraxinus angustifolia*, *Rubus caesius* and others indicates those stands to be closest to the community *Corno-Ligustretum rubetosum caesii*, described by HORVAT (1962: 118) under the name *Corno-Ligustretum "caesietosum"* as found in Kukuljanovo doline, near Škrljevo, in the vicinity of Rijeka.

Other stands belong to flood forests of the *Alno-Quercion roboris* Horv. (1937) 1938 alliance within the order *Fagetalia sylvaticae* Pawlowski 1928 (HORVAT et al. 1974: 378). In part, those are moist, periodically flooded forests of pedunculate oak of the *Genisto elatae-Quercetum roboris* Horv. 1938 association. The rest are less moist, sporadically flooded pedunculate oak forests with hornbeam of the *Carpino betuli-Quercetum roboris* (Anić 1959) Rauš 1969 association. In eastern Croatia, both of these communities include Tatarian maple (*Acer tataricum*).

The snake's-head is more common in the forest vegetation, too, than the many vegetation records in the literature suggest. The reasons for this are the same as with the grassland vegetation. Thus, e.g., in the cited book HORVAT et al. (1974) found no vegetation tables of forest communities that contain *Fritillaria meleagris* among those where its existence would be expected according to these results, and among the grassland communities just one (1. c. p. 402). For this reason, future research into vegetation should pay more attention to all spring plants (therophytes and geophytes) whose aboveground parts disappear earlier in the year than vegetation records are customarily made. Vegetation records should therefore be made several times during the vegetation season on the same surfaces, so as to take into consideration all the species present there. Because of this problem, in continental as well as coastal sub-Mediterranean and eu-Mediterranean areas many spring plants, in reality very common, are regularly absent from most vegetation records – a discrepancy which is often very significant for the phytosociological and ecological interpretation of the vegetation in question.

Conclusion

Fritillaria meleagris is an endangered species of the Croatian flora primarily because of anthropogenic changes in the habitat water regime, the spread of urban areas and the expansion of arable land. In many places it is already either extinct or has significantly dwindled, so its protection is well justified.

Despite its being endangered, the snake's-head is still more widespread than was previously known or noted in the literature. Currently known localities are mostly concentrated in the lowlands of north-western and eastern Croatia, and there is a small exclave in the wet meadows on the Velebit mountain in southern Croatia.

The phytosociological and ecological amplitude of the snake's-head is considerably greater in Croatia than in the northern parts of its area in Europe. It

Tab. 2. *Fritillaria meleagris* in wood vegetation

No. of records	1	2	3	4	5	6	7	8	9	10	11	12
Fritillaria meleagris L.	+	+	+	3	3	1	1	+	+	1	1	2
***Alno-Quercion roboris* Horv.**												
Ulmus minor Miller	+		+	1	1	+	1	+	+	3	+	3
Quercus robur L.			1		1	3	2	1	+	3	2	2
Fraxinus angustifolia Vahl.	1	+	3	+	1	3	2	2	1			
Viburnum opulus L.	+		+			+			+	+	1	+
Rubus caesius L.	1	3	1	1		+		+				
Ranunculus auricomus L.						+			+	1	2	3
Carex brizoides L.								1	1	1	+	
Listera ovata (L.) R. Br.			+		+			+	1			
Carex remota L.			+	+		+	+					
Circaea lutetiana L.					+		+	+	+			
Frangula alnus Miller				1			+					
Genista elata Wenderoth	+											
Malus domestica Borkh.	+											
***Fagetalia* Pawl. et *Querco-Fagetea* Br.-Bl. et Vlieger**												
Acer campestre L.			2	+	1	2	2	2	1	2	1	2
Corylus avellana L.			+	+	1	1	+	1	2	4		+
Acer tataricum L.			**3**	**1**	**1**	**1**	**1**	**1**	**3**			
Arum maculatum L.			+		+	+	+	+	+	+		
Geum urbanum L.			+	+	+	+		+	+			1
Carpinus betulus L.							**1**	**2**	**4**	**2**	**5**	**4**
Viola reichenbachiana Jordan ex Boreaú					+		1	1	1		2	+
Polygonatum multiflorum (L.) All.			+			1	+	+	1		+	
Brachypodium sylvaticum (Hudson) PB.			+		1	+	+	+	+			
Ranunculus ficaria L.	2	+								5	4	5
Aegopodium podagraria L.			1			1				1	2	1
Pulmonaria officinalis L.			2		1	+	1				+	
Carex sylvatica Hudson					+			+	+		+	+
Rosa arvensis Hudson					+		+	+	+			
Anemone nemorosa L.										3	2	1
Galanthus nivalis L.		1			1	1						
Adoxa moschatellina L.			1		+		+					
Lamiastrum galeobdolon (L.) Ehrend. et Polatschek			+							+		+
Mercurialis perennis L.					+					+		+
Symphytum tuberosum L.											3	2
Stellaria holostea L.			2		2							
Lonicera xylosteum L.					1		3					
Isopyrum thalictroides L.										+		3
Convallaria majalis L.								2	+			
Asarum europaeum L.			1		1							
Leucojum vernum L.										1		+
Hedera helix L.		+							+			
Tamus communis L.				+				+				
Paris quadrifolia L.										+		+
Ranunculus lanunginosus L.											+	+

Tab. 2. – continued

No. of records	1	2	3	4	5	6	7	8	9	10	11	12
Aposeris foetida (L.) Less.											+	+
Allium ursinum L.					4							
Asperula taurina L.					2							
Scrophularia nodosa L.								+				
Cardamine impatiens L.									+			
Daphne mezereum L.											+	
Prunus avium L.												+
Tilia cordata Miller												+
Lamium orvala L.												+
Prunetalia Tx.												
Ligustrum vulgare L.		1	1		1	1	+	1	1	1	+	+
Cornus sanguinea L.	3	3	+	1	1		1		1			
Crataegus laevigata (Poiret) DC						2	1	+	1	+	1	+
Euonymus europaea L.	+	1	+			+	+	+	+			
Crataegus monogyna Jacq.	2	+	+	+				+	+			
Prunus spinosa L.	2	2		+								
Rosa sp.		1									+	
Rosa canina L.	+										+	
Rhamnus catharticus L.		+										
Other species												
Ajuga reptans L.			+	1		+			+	+	+	
Glechoma hirsuta Waldst. et Kit.			1	2	1			1	+			
Galium aparine L.							+	1	1	+	+	
Geranium phaeum L.			+		+					+	+	+
Filipendula ulmaria (L.) Maxim.	3									+	+	1
Urtica dioica L.	+	+	1						+			
Sambucus nigra L.			1						1	+		
Rumex sp.			+		+	+						
Galeopsis speciosa Miller										+	+	+
Caltha palustris L.	+		+									
Cardamine pratensis L.			+	+								
Veronica chamaedrys L.				+								+
Rubus hirtus Waldst. et Kit.						+	+					
Platanthera bifolia (L.) Rich.								+	+			
Robinia pseudacacia L.								+	+			
Glechoma hederacea L.										+		+

grows in swamp communities of high sedges of the order *Magnocaricetalia* (*Phragmitetea*), swamp grasslands of the order *Molinietalia*, and moist grasslands of the order *Arrhenatheretalia* (*Molinio-Arrhenatheretea*). It also grows in moist shrubs (*Prunetalia spinosae*) and flood forests of the *Alno-Quercion roboris* (*Fagetalia*) alliance.

The results so far show that new localities where the snake's-head still grows can well be expected. Therefore this line of research should be further pursued, and in the known localities, the dynamics of its population further examined, so

that in time efficient measures of protection could be prescribed according to the specificities of the ecological conditions of the localities or regions in question.

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Sažetak

Rasprostranjenost i fitocenološki odnosi kockavice (*Fritillaria meleagris* L.) u Hrvatskoj

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Kockavica (*Fritillaria meleagris* L.) je u Hrvatskoj nađena na oko 110 lokaliteta. Preko polovice od tih su nova, dosad neobjavljena nalazišta. Na nekim je lokalitetima iz ranijih razdoblja kockavica uništena ili znatno prorijeđena. S velikom se sigurnošću može pretpostaviti da na novijim nalazištima (od 1980. do danas) ta biljka još uvijek raste. Takvih nalazišta je na popisu više od 90.

Može se zaključiti da je kockavica, ugrožena biljka navedena u Crvenoj knjizi biljnih vrsta Republike Hrvatske i zaštićena zakonom 1958, u Hrvatskoj rasprostranjena znatno više nego što je dosad bilo poznato, a pretpostavljamo da našim istraživanjima zasigurno nisu utvrđeni svi lokaliteti na kojima kockavica danas raste. Većina nalazišta leži u riječnim nizinama sjeverne Hrvatske, osobito u sjeverozapadnoj i istočnoj Hrvatskoj. U južnoj Hrvatskoj kao eksklava poznata su samo dva novija i jedno starije nalazište s južnog Velebita (v. popis nalazišta i kartu, sl. 1). Nalazišta navedena u literaturi za Dalmaciju odnose se vjerojatno na vrstu *F. tenella* MB.

Značajno je da u Hrvatskoj, kao i u drugim područjima jugoistočne Europe, kockavica ima znatno širu fitocenološko-ekološku amplitudu nego u sjevernim područjima njezina areala u Europi. U nas raste u močvarnim zajednicama visokih šaševa reda *Magnocaricetalia* (*Phragmitetea*), u močvarnim travnjacima reda *Molinietalia* i vlažnim travnjacima reda *Arrhenatheretalia* (*Molinio-Arrhenatheretea*). Njezina su staništa također vlažne živice reda *Prunetalia spinosae*, poplavne lužnjakove i lužnjakovo-grabove šume sveze *Alno-Quercion roboris* (*Fagetalia*) (tab. 1 i 2).

Budući da *Fritillaria meleagris* rano cvjeta (ožujak-travanj), a nakon razvitka plodova (travanj-svibanj) obamiru nadzemni dijelovi biljke, kockavica dosad gotovo da nije bila zastupljena u fitocenološkim snimkama iz Hrvatske. To vrijedi i za mnoge druge proljetnice u kopnenim, a osobito u primorskim područjima. Stoga takvim vrstama u floristićkim i fitocenološkim istraživanjima valja posvetiti veću pozornost, osobito u zajednicama u kojima bi se mogle očekivati.

Na poznatim pak nalazištima kockavice valjalo bi kontinuirano pratiti stanje njenih populacija, kako bi se pravodobno moglo odrediti efikasne mjere njezine zaštite u slučaju nepovoljnih promjena na staništu.

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