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Shift of the western boundary of the distribution area of *Micromeria cristata* (Hampe) Griseb. and *Steptorhamphus tuberosus* (Jacq.) Grossh.

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Abstract – During field investigations of Mt Rumija, two new taxa for the flora of Montenegro were recorded: *Micromeria cristata* (Hampe) Griseb. and *Steptorhamphus tuberosus* (Jacq.) Grossh. From the phytogeographic point of view these data indicate a change in the distribution area of both taxa, which have shifted to the west. A short overview of the taxonomic treatment of both genera is given.

Key words: flora, Montenegro, Mt Rumija, *Micromeria cristata*, *Steptorhamphus tuberosus*

Introduction

Rumija is the southernmost part of the Dinaric Alps, the Adriatic coastal mountain chain, extending in a NW-SE direction, situated between Skadar Lake and the Adriatic Sea. Part of the mountain lies in Albanian territory, and can be considered as both a geographic and a phytogeographic link between the Albanian, Macedonian and Greek mountains. Several taxa reach the limits of their distribution area on Mt Rumija: *Valeriana dioscoridis* Sibth. et Sm. and *Ramondia serbica* Panč. are the easternmost limit (HAYEK 1931, STEVANOVIĆ and BULIĆ 1992), *Cionura erecta* (L.) Griseb. and *Gymnospermium altaicum* ssp. *scipetarum* (E. Mayer et Pulević) Kit Tan et Mullaj are the westernmost (BLEČIĆ and PULEVIĆ 1979, TAN and MULLAJ 2001) and *Centaurea incompta* Vis. is the southwestern (HAYEK 1931). Mt Rumija, accordingly, can be characterised as a kind of a floristic crossroad between the western and eastern Balkans.

On Mt Rumija the following parts are clearly distinguished: a) a longitudinal ridge with its high summits- the summit of Rumija, (1593 m),Vrsuta (1184 m) and Lonac (1179 m); b) numerous cliffs, ravines, defiles, karst valleys, sharp peaks- in this area the hill called Vladimir (486 m) is situated; c) the mountain of Lisinj (1351 m), which rises in the south-west. Southern slopes up to 300–400 m are exposed to the Mediterranean climate,

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while the northern and higher altitude southern slopes are affected by a modified Mediterranean or sub Mediterranean per humid variant of climate. The geological substrate is polymorphic: flysch is dominant on southern and chalk on northern slopes (MILANOVIĆ 1964).

Such specific geographic position, climate and geology are reflected in the development of a very interesting plant-life that has attracted attention of botanists since the second half of the 18th century. Although numerous publications (e.g. EBEL 1844; BALDACCI 1891, 1892, 1894, 1900, 1901; PANČIĆ 1875; ADAMOVIĆ 1913; ROHLENA 1942; ČERNJAVSKI et al. 1949; PULEVIĆ 2005) have provided data about the flora of this area, it is still incompletely known.

A summary of all the literature data (only the most important contributions are listed in the paragraph above) and of our own field investigations, which began in early spring 2000, the checklist of vascular flora of Mt Rumija consists of more than 1500 taxa (excluding the psamophilic and halophilic vegetation of the coastal part of the mountain). During the field investigations several species that are new for the Montenegrin flora were recorded (PETROVIĆ 2005). In this paper we will present *Micromeria cristata* (*Lamiaceae*) and *Steptorhamphus tuberosus* (*Cichoriaceae* the westernmost limits of the distribution area of which are on Mt Rumija. In addition we will give a short overview of the taxonomic treatment of both genera.

Material and methods

Material was collected during field investigations of Mt Rumija, conducted in mid-summer 2006 (*Micromeria cristata* (Hampe) Griseb) and late spring 2007 (*Steptorhamphus tuberosus* (Jacq.) Grossh.). It is preserved in the herbarium collection of the Faculty of Natural Sciences in Podgorica, voucher numbers: 968/06 and 642/07. Identification of *Steptorhamphus* was conducted according to FERÁKOVA (1976, 1977) and DAVIS (1982), while nomenclature follows FERÁKOVA (1977). Identification of *Micromeria* was conducted according to DIKLIĆ (1974), ŠILIĆ (1979), BALL and GETLIFFE (1972) and nomenclature according to BRÄUCHLER et al. (2008). Material is also compared with herbarium specimens preserved in the herbarium collection of the Institute of Plant Sciences in Graz. Due to the diverse taxonomic treatments of *Micromeria* and *Steptorhamphus* genera a short taxonomic overview is given (BALL and GETLIFFE 1972; CHATER and GUINEA 1972; ŠILIĆ 1979; DAVIS 1982; GREUTER et al. 1986; WAGSTAFF et al. 1995; PRATHER et al. 2002; TRUSTY et al. 2004; BRÄUCHLER et al. 2005; KOOPMAN et al. 1998; STEBBINS 1937; TUISL 1968; FERÁKOVA 1977; KILIJAN 2001; LEBEDA et al. 2001, 2004). In order to avoid confusion with similar plants in our flora, some important morphometric features are specified, such as length of the flower and verticillaster peduncle (*Micromeria*) and the presence of an outer minute pappus row (*Steptorhamphus*).

IUCN characterization is in accordance with the most recent Guidelines for Using the IUCN Red List Categories and Criteria (ANONYMOUS 2010), while the regional justification of categories follows the Guidelines for Application of IUCN Criteria at Regional Levels (ANONYMOUS 2003). Sources of threats and recommendation measures are defined due to the Authority Files, prepared by IUCN, Major Threats Authority File and Conservation Actions Authority File (http://www.iucn.org). From the time of the first record, the species was monitored up to September 2010 at a frequency of several times a year. Only mature individuals were counted.

Results

During the field investigations of Mt Rumija two new taxa for the flora of Montenegro were recorded: *Micromeria cristata* (Hampe) Griseb. subsp. *cristata* and *Steptorhamphus tuberosus* (Jacq.) Grossh. The first taxon was collected in Seoca village, northern slopes, N 42° 13' 83" E 19° 08' 27", altitude ca 250 m, in rock crevices in the *Stipo-Salvietum officinalis* H-ić (1956) 1958 association, developed as a degradation stage of white hornbeam shrubland (*Rusco-Carpinetum orientalis* Blečić et Lakušić 1966.) and representing the most common type of rocky pastures in the southern part of the country. The population has fewer than 50 individuals. They share a habitat with the related *Micromeria juliana* (L.) Bentham. Although very similar in habitus and ecology, these species can be clearly distinguished by the length of the flower and verticillaster peduncle (Fig 1). *Micromeria cristata* flowers are distinctly pedicellate and verticillasters are pedunculate, in distinction to *M. juliana,* which has sessile flowers and subsessile verticillaster. However, we suspected there was a possibility of confusion as result of which in previous surveys *M. cristata* might have been overlooked in rich populations of *M. juliana*. After the first record in 2006, no new populations of this species have been found in similar habitat types in the sub-Mediterranean part of Montenegro.

The first records of *Steptorhamphus tuberosus* (Fig. 2) date from 2007. The species was collected in the vicinity of the village of Godinje (northern slopes of Rumija mountain, N 42° 13' 52", E 19° 06' 32", altitude 86 m), in the plant community *Carpinetum orientalis punicosum* O. Greb 1949., one of the degradation stages of white hornbeam forests and

Fig 1. *Micromeria cristata*, verticillasters (photo by D. Petrović)

Fig. 2. *Steptorhamphus tuberosus,* a) inflorescens, b) root, and c) pappus (photo by D. Petrović)

shrublands. The population consisted of approximately 30 individuals and it has remained stable. Another population of *S. tuberosus* has been found on the southern slopes of Rumija mountain (Spilica, N 42° 05' 50", E 19° 08' 37", altitude 195 m). It inhabits a site similar to that of the previous population- a fringe of *Rusco-Carpinetum orientalis* Blečić et Lakušić 1966., a degradation stage of white hornbeam shrubland. Population size is much smaller (fewer than 10 individuals) and has remained stable.

Discussion

Taxonomic position of *Micromeria cristata* (Hampe) Griseb.

According to some taxonomists, the genus *Micromeria* Benth. is considered a part of the »*Satureja* complex«, which is, due to morphological diversity, divided into several genera: *Satureja* L., *Calamintha* Mill., *Clinopodium* L., *Acinos* Mill., *Micromeria* Benth. (BALL et GETLIFFE 1972, DAVIS 1982, ŠILIĆ 1979). According to others, it is included in the genus *Satureja* L. (GREUTER et al. 1986). Recently conducted studies of the phylogeny and generic status of *Satureja* s.l. (WAGSTAFF et al. 1995, PRATHER et al. 2002, TRUSTY et al. 2004, BRÄUCHLER et al. 2005) clearly show that the genus is not monophyletic.

The genus *Micromeria* includes about 54 accepted species with 32 subspecies and 13 varieties BRÄUCHLER et al. (2008). Following this taxonomic approach and revising ROHLENA (1942), ŠILIĆ (1979) and PULEVIĆ (2005) we found that in the Montenegrin flora *Micromeria* is represented by 5 species: *Micromeria graeca* (L.) Benth. ex Rchnb., *Micromeria croatica* (Pers.) Schott., *M. juliana* (L.) Benth. ex Rchnb., *M. longipedunculata* Bräuchler *and M. kerneri* Murb. During field investigations of Mt Rumija an additional *Micromeria* species was recorded – *M. cristata*, which is according to BRÄUCHLER et al. (2008) subdivided into 6 subspecies: *M. cristata* subsp. *carminea* (P. H. Davis) P. H. Davis, *M. cristata* (Hampe) Griseb. subsp. *cristata, M. cristata* subsp. *kosaninii* (Šilić) Bräuchler et Govaerts, *M. cristata* subsp. *orientalis* P. H. Davis, *M. cristata* subsp. *phrygia* P. H. Davis, *M. cristata* subsp. *xylorrhiza* (Boiss. et Heldr. ex Benth.) P. H. Davis. Data on general distribution (GREUTER et al. 1986, DAVIS 1982, HAND 2006 and JAMZAD 2009) show that four subspecies are endemic to Anatolia, while the type species and *M. cristata* subsp. *kosaninii* are distributed in the Balkan Peninsula. In the flora of Montenegro only the subspecies *cristata* exists.

Geographic distribution of *Micromeria cristata*

The main part of the distribution area occurs on the Balkan peninsula, in Albania, Bulgaria, Greece, Serbia, Kosovo, Macedonia (ŠILIĆ 1979) (Fig. 3), but the species is also reported for Anatolia (DAVIS 1982) and Iran (JAMZAD 2009). Thus the new finding of *Micromeria cristata* on Mt Rumija means a shift of the limit of its distribution area towards the west.

Endangered status and protection

During the field survey we estimated that the population of *Micromeria cristata* in Montenegro consists of fewer than 50 mature individuals. Due to this fact, and according to criterion D1, the IUCN threat category is CR (Critically endangered) (ANONYMOUS 2010). But, taking into account the possibility of immigration from the neighbouring area (Albania in the first place), the regional Red List Category (ANONYMOUS 2003) should be

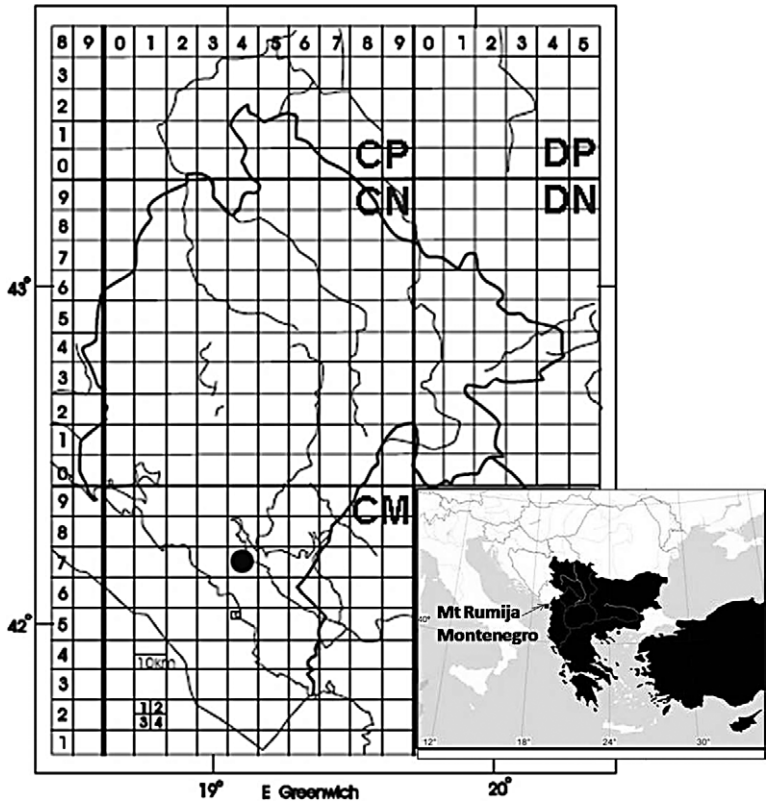

Fig. 3. UTM map of Montenegro (source: Geokarta's UTM basemap) with the record of *Micormeria cristata* on Mt Rumija, and general distribution map of *M. cristata* (with permission from Atlas Florae Europaeae).

changed to EN (Endangered). Monitoring conducted in the period 2006–2010 showed that the population is stable. However, even a small environmental change could seriously endanger this species.

Taxonomic position of *Steptorhamphus tuberosus* (Jacq.) Grossh.

Similar to that of *Micromeria,* the taxonomic position of the genus *Lactuca* s. l. is not simple. There are 3 basic concept of the genus given by Stebbins, Tuisl and Feráková (KOOPMAN et al., 1998). According to STEBBINS (1937), the genus *Lactuca* s. l. also includes the following genera *Mulgedium* Cass., *Lactucopsis* Schultz-Bip. ex Vis. Et Panc., *Phaenixopus* Cass, *Mycelis* Cass. and part of *Cicerbita*. TUISL (1968) gave a stricter concept of the genus and singled out *Mulgedium, Scariola* FW. Schmidt (= *Phaenixopus*), *Cicerbita, Cephalorrhynchus* Boiss. and *Steptorhamphus*. Clasification by FERÁKOVA (1976, 1977) is intermediate so the genera *Mulgedium, Lactucopsis* and *Phaenixopus/Scariola* are included in genus *Lactuca*, while *Mycelis, Cicerbita, Cephalorrhynchus* and *Steptorhamphus* are not. The presence of an outer minute pappus row (Fig. 2) was the main feature used by Ferákova to keep this genus separate from *Lactuca*.

Flora Europaea follows Ferakova's concept where *Lactuca cretica* Desf. contains two unequal rows of hairs, and is transferred to the genus *Steptorhamphus* (*S. tuberosus* (Jacq.) Grossh.). Molecular analysis based on ITS-1 DNA sequences (KOOPMAN et al. 1998), has not supported a distinction between *Lactuca* and *Steptorhamphus*. Nevertheless, these investigations were not sufficient for a revised delimitation of *Lactuca* and related genera (KILIJAN 2001). Despite this, GREUTER et al. (2008) included the genus *Steptorhamphus* into *Lactuca*. In the recent publications on the distribution and ecology of *Lactuca* species in Europe (LEBEDA et al. 2001, LEBEDA et al., 2004), the taxon *L. tuberosa* Jacq. is not treated within this genera.

In our paper we decided to follow the concept of the monographer (FERAKOVA 1977), arguing that molecular analysis still has not resolved the »*Lacuca- Steptorhamphus*« taxonomical problem.

Geographic distribution of *Steptorhamphus tuberosus*

Only a part of the *Steptorhamphus tuberosus* distribution area occurs in the southern and eastern part of the Balkan peninsula (Fig. 4). An interesting detail is that in spite of a

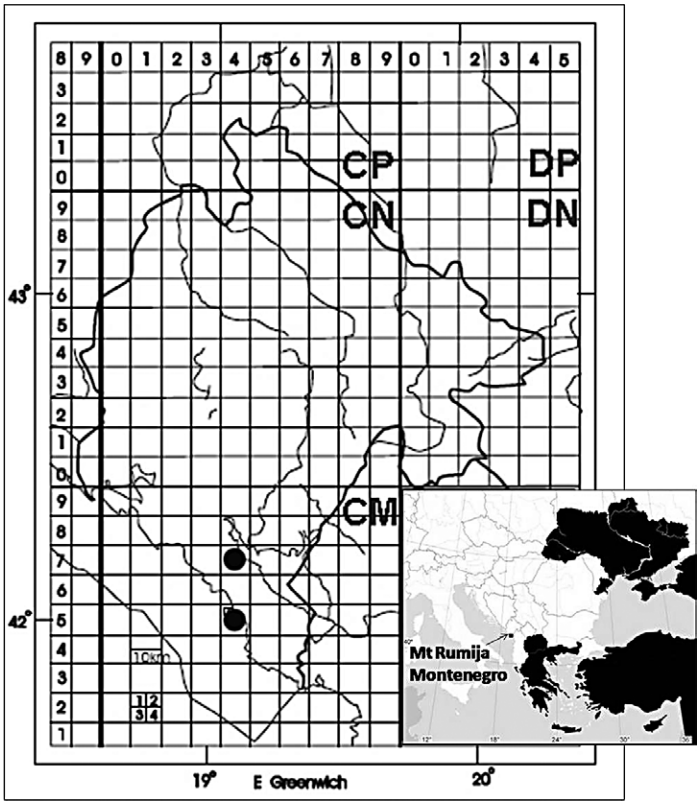

Fig. 4. UTM map of Montenegro (orig., map, source: Geokarta's UTM basemap) with the record of *Streptorhaphus tuberosus* on Mt Rumija, and general distribution map of *S. tuberosus* (with permission from Atlas Florae Europaeae).

previous record of this taxon in Macedonia (SOŠKA 1939, BORNMÜLLER 1926), Flora Europaea did not include ex-Yugoslavia in its geographic distribution. Just as in the case of *Micromeria cristata,* a new record of the species on Mt Rumija (Montenegro) means a moving of the limit of its distribution area towards the west.

Endangered status and protection

During the field survey we estimated that the population of *Steptorhamphus tuberosus* in the village of Godinje consists of approximately 30 mature individuals, while on the southern slopes only a few (less than 10) have been counted. Due to this fact, and according to criteria D1, the IUCN category of threat is CR (Critically endangered) (ANONYMOUS 2010). Since the species is not recorded in neighbouring countries, the regional Red List Category need not to be changed. Monitoring of *Steptorhamphus tuberosus* population during the period 2007–2010 showed that the population is stable.

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