

***HIERACIUM STEVANOVICII* (ASTERACEAE):
A NEW BALKAN STENOENDEMIC OROPHYTE
THREATENED BY GLOBAL WARMING**

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A novel stenoendemic species, *Hieracium stevanovicii* Niketić (Asteraceae), is described from the subalpine and alpine limestone screes of Mt. Durmitor (Montenegro, SE Dinarides). Morphologically distinct from its closest relative, *H. coloriscapum* Rohlena & Zahn, primarily in its more robust growth, as well as by wider glaucous foliage, thickened blackish peduncles, and a denser thicker indumentum of plumose yellowish to reddish-brown trichomes, this taxon is restricted to four glacial cirques (1600–2400 m). Field surveys (1992–2014) and herbarium revisions revealed a syntopic coexistence with *H. coloriscapum*, though the ecological specialization to unstable screes and the morphological divergence support its microspecies status. Chemotaxonomic analyses (flavonoid/phenolic profiles) cluster *H. stevanovicii* closer to the unpublished *H. paratrichum* Niketić (nom. inval.) than to *H. coloriscapum*, indicating distinct hybrid origins: while *H. coloriscapum* arose from *H. gymnocephalum* (sect. *Pannosa*) and *H. naegelianum* (sect. *Naegeliana*), *H. stevanovicii* likely originated from *H. paratrichum* (a *H. gymnocephalum*-affiliated taxon) and *H. naegelianum*. With fewer than 2000 mature individuals across ten localities (two UTM grids) and >90% habitat loss indirectly projected under RCP8.5 by 2080, *H. stevanovicii* meets IUCN Critically Endangered (CR) criteria. Its discovery underscores the role of Mt. Durmitor as a refugium and highlights the need to conserve cryophilous alpine flora threatened by climate-driven niche contraction. Karyological validation of hybrid origins and polyploidy is urged to resolve speciation mechanisms in this taxonomically complex genus.

Key words: Taxonomy, *Hieracium*, hybrid origin, IUCN status, biogeographic significance

INTRODUCTION

The Dinaric Alps, in particular the Durmitor Mountain range in Montenegro, serve as a critical biodiversity hotspot for the genus *Hieracium* L. This region, especially the southeastern Dinarides encompassing Durmitor and the Prokletije Mountains, exhibits exceptional species richness, with more than 60 agamospecies documented historically (Zahn 1930–1935, 1936–1938, Rohlena 1942). A significant concentration of endemic taxa, such as those within the section *Glauciformia* and the *H. gymnocephalum* complex, underscores the area's ecological importance. The remarkable diversity of *Hieracium* and other subalpine genera in Durmitor is attributed to the long-term interplay of alpine and sub-Mediterranean climatic and geological dynamics that have shaped the region's flora over millennia (Stevanović *et al.* 1995).

Hieracium coloriscapum Rohlena & Zahn represents one of the numerous hybridogenous species within this intricate genus. Distributed across the Illyrian-Scardo-Pindic biogeographic region, it thrives in limestone scree slopes and rocky crevices at subalpine to alpine elevations (Niketić *et al.* 2003). When describing it, Rohlena and Zahn suggested that its origin lies in hybridization between *H. gymnocephalum* (section *Pannosa*), a Balkan endemic, and *H. naegelianum* (section *Naegeliana*), a subendemic species predominant in the southeastern Illyrian-Scardo-Pindic region (Zahn 1909). First identified on Mt. Durmitor (Zahn 1909), *H. coloriscapum* has since been recorded in Herzegovina, Albania, Serbia (Kosovo), and North Macedonia. Taxonomic revisions by Zahn (1936) and Behr *et al.* (1939a, 1939b) recognize six subspecies and several varieties, while Sell & West (1976) propose it may constitute a broader species complex. Notably, *H. coloriscapum* retains ecological preferences akin to its progenitor *H. naegelianum*, primarily residing high-elevation habitats above 1800 meters, where it colonizes unstable scree environments.

During our several years of field research in the mountains encompassing the broadly defined range of *H. coloriscapum*, extensive herbarium material was collected and deposited at the Natural History Museum in Belgrade (BEO). Morphological analysis of the collected specimens revealed significant variability within this agamospecies complex. Notably, some previously described subspecies (such as *H. c.* subsp. *leucoseriophyllum* O. Behr, E. Behr & Zahn) could be reclassified under other species, while the taxonomic status of others (e.g., *H. c.* subsp. *parunicum* B. Schütt & Zahn) may warrant demotion to lower taxonomic ranks.

Two distinct morphotypes were observed on Mt. Durmitor. Despite co-occurring in identical habitats and sites, these morphotypes are unlikely to be conspecific. Furthermore, the type subspecies (*H. c.* subsp. *coloriscapum*), originally described from Mt. Durmitor (Zahn 1909), remains poorly represented in European herbaria, including institutions in Germany and the Czech Republic. The absence of original type material complicates definitive identification, raising questions about which morphotype corresponds to Rohlena's and Zhan's initial description.

Based on the protologue and the localized distribution of one morphotype (restricted to Mt. Durmitor), it is reasonable to infer that this rarer form was not part of the original type material. However, the possibility that the original description inadvertently included both morphotypes cannot be ruled out. Designating the rarer morphotype as the type specimen would conflict with the current distribution of *H. c.* subsp. *coloriscapum*, which aligns with the widespread morphotype found across the south-eastern Dinarides.

Karyological analyses in Niketić *et al.* (2003, 2006), conducted under the designation "*H. coloriscapum* sensu lato", did not refer to the type morphotype. Subsequent studies of both morphotypes support the hypothesis that the rarer form represents a stenoendemic microspecies, distinct from the widely distributed subspecies.

MATERIALS AND METHODS

Field investigations spanning over two decades (1992–2014) encompassed the collection of specimens attributed to the new species. Quantitative morphological traits (stem dimensions, leaf architecture, involucre structure, and indumentum features) were analyzed using *Digimizer Image Analysis Software* (v. 5.7, MedCalc Software, Belgium). Plant height was measured in situ with a standard ruler calibrated to 0.1 cm precision.

Comparative morphology was assessed using reference specimens of *Hieracium coloriscapum* deposited in the BEO herbarium. Voucher specimens of *H. stevanovicii* were deposited at BEO, with duplicates designated for distribution to herbaria B and BEOU (acronyms follow Thiers 2024). Karyological data were sourced from prior studies (Niketić *et al.* 2003, 2006). The IUCN Red List status was assessed using the criteria-based tool (Niketić 1999).

RESULTS

Taxonomic treatment

Hieracium stevanovicii Niketić, **sp. nov.** (Figs. 1–8).

[*H. pyricephalum* Niketić in Milutinović *et al.*, *Phytochem. Anal.* 29: 31 (2018), nom. inval. (nom. nud.)]

Type: Montenegro, Mt. Durmitor, Minin Bogaz (peak), 2000 *m*, MGRS 34T CN47, 19.038035° E, 43.126367° N, limestone, screes, coll. M. Niketić, 13-Aug-1994 [holotype: BEO 101487 (Fig. 7), isotype: *s.n.* B, *s.n.* BEOU].

Perennial herbaceous plant, lacking floccose hairs, with a pseudorosette above the stem base (hypophyllopod). Stem 30–40 *cm* tall, 2–3 *mm* thick at the base, sparsely hairy between the leaf nodes, bearing 1–2(–3, rarely up to 6) capitula. Basal leaves glaucous, 6–10 × (1–)2–3 *cm*, densely clustered in the lower part of the stem, lanceolate to obovate-ovate-lanceolate, often falcate, lingulate (tongue-shaped), slightly fleshy, sessile, gradually narrowing at the base; margins predominantly entire, sinuate to undulate; apex acute. Indumentum dense, comprising curly, yellowish to reddish-brown, plumose hairs (forming a 2–3.5 *mm* thick indumentum layer), intermixed with long, barbate (bearded) hairs along the midrib on the abaxial surface; adaxial surface partially glabrous. Upper cauline leaves (1–4) abruptly reduced, linear-lanceolate to linear. Synflorescence monocephalous or lax and deeply furcate with several capitula. Acladium (and peduncles) markedly thickened and blackish in the upper part at maturity, typically bearing blackish, minute bracts near the capitulum. Involucre pyriform pre-anthesis, later elongating to 12–13(–15) *mm* long, blackish in the lower portion, covered with wavy to curly, yellowish to reddish-brown, dark-based plumose hairs [(0.1–)0.12–0.13(–0.15) *mm* thick at the base] and sparse, minute glandular hairs distally. Phyllaries imbricate, outer ovate, ± obtuse, moderately to densely hairy (rarely sparse) on the lower and middle parts, weakly bearded at apex; inner phyllaries lanceolate, acute, glabrous. Ligules and stigmas yellow. Achenes light brown, 4–5 × 0.8–1 *mm*; pappus greyish.

Closely related to *H. coloriscapum* Rohlena & Zahn (Figs. 3–5, 8–10) but differs in its intensely glaucous foliage, larger stature, thicker stems and peduncles, indumentum of thicker yellowish to reddish-brown plumose curly hairs (vs. whitish to yellowish wavy subplumose), broader and slightly fleshy leaves, consistently glabrous peduncles, and larger involucre with broader and less acute phyllaries (Tab. 1).

Tab. 1. – Morphological differences between *H. stevanovicii* and *H. coloriscapum* subsp. *coloriscapum*¹.

Morphological characters	<i>H. stevanovicii</i>	<i>H. coloriscapum</i> subsp. <i>coloriscapum</i>
Stem (height)	30–40 cm	20–30 cm
Stem (max. width)	2–3 mm	1–2 mm
Leaves (shape)	lanceolate to (obovate-) ovate-lanceolate	lanceolate to linear-lanceolate
Leaves (surface)	lingulate	plain or lingulate
Leaves (width)	(1–)2–3 cm	1–2 cm
Leaves (colour)	glaucous	light to dark green and glaucescens
Leaves (succulence)	somewhat fleshy	not fleshy
Involucre (length)	12–13(15) mm	10–12(13) mm (rarely 15 mm)
Peduncle (hairiness)	glabrous (very rarely with single hairs)	usually hairy, less often glabrous
Involucral hairs (max. width)	(0.1–)0.12–0.13(–0.15) mm	0.07–0.1(–0.11) mm
Involucral hairs (curvature)	curly to villous	villous, subsericeous
Involucral hairs (colour)	yellowish to reddish-brown	whitish to yellowish
Involucral hairs (branching)	plumose	subplumose
Middle phyllaries (shape)	ovate to lanceolate	lanceolate to linear-lanceolate
Middle phyllaries (apex)	acute to obtuse	acute to acuminate

Etymology

The species is named in honour of Academician Vladimir Stevanović, a professor at the Faculty of Biology, University of Belgrade, who dedicated decades to studying the flora of Mt. Durmitor and mentoring generations of Balkan botanists.

Phenology

Flowering and fruiting occur in August, occasionally extending into September.

¹ Certain morphological characteristics exhibit considerable variability in both taxa, and partial overlap may occur in some of traits. However, such overlap does not encompass the entire set of characters when evaluated collectively.



Fig. 1. – *Hieracium stevanovicii* in situ on alpine limestone screes, Mt. Durmitor, Veliki Međed peak (photo M. Niketić).

Distribution and ecology

Hieracium stevanovicii is restricted to a dozen microlocalities (spanning two 10×10 km UTM squares) in the subalpine and alpine belts of Mt. Durmitor, southeastern Dinarides (Montenegro). Its distribution is confined to the slopes of four large glacial cirques: Škrka, Valoviti Do, Lokvice, and

Velika Kalica, at elevations of 1,600–2,400 *m*, in the dwarf mountain pine (*Pinus mugo* Turra) zone or above it.

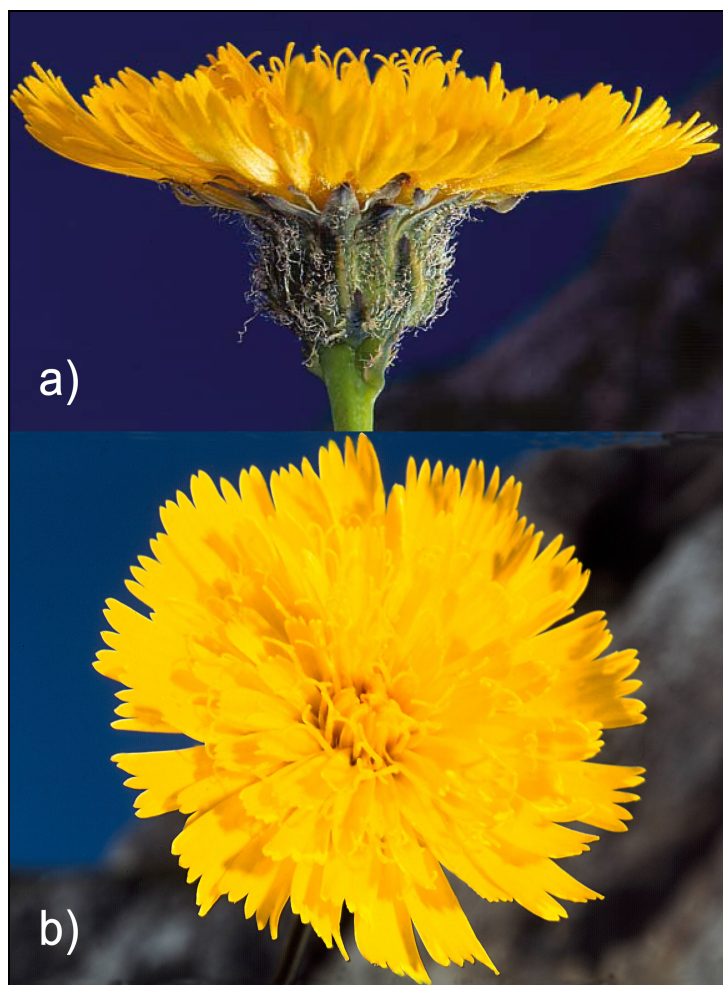


Fig. 2. – Capitulum of *Hieracium stevanovicii* (individual from Fig. 1): a) lateral view; b) apical view (photo M. Niketić).

The species inhabits moderately mobile, wet limestone screes within the alliance *Saxifragion prenjae* Lakušić 1966 (association *Linario-Valerianetum bertisceae* Horvatić 1936), predominantly on south-facing slopes. It grows in scattered populations alongside characteristic scree flora, including *Biscutella laevigata* L. subsp. *laevigata*, *Cardamine glauca* Spreng., *Cerinth glabra* Mill., *Dryopteris villarii* (Bellardi) Woy. ex Schinz & Thell., *Galium anisophyllum* Vill., *Heracleum pyrenaicum* subsp. *orsinii* (Guss.) F. Pedrotti & Pignatti, *Hieracium pseudoschenkii* (Rohlena & Zahn) Niketić, *H. scheppigianum* Freyn, *Linaria alpina* (L.) Mill., *Poa*

alpina L., *Poa cenisia* All., *Rumex scutatus* L., *Sedum ochroleucum* Vill., *Silene glareosa* subsp. *prostrata* (Gaudin) Guarino & Pignatti, *Valeriana bertiscea* Pančić, etc.



Fig. 3. – Basal leaf of: a) *Hieracium stevanovicii* (BEO), b) *H. coloriscapum* subsp. *coloriscapum* (BEO).
Scale bar 1 cm.

Occasionally, it colonizes sheltered areas at the foot of cliffs. While *H. stevanovicii* is ecologically specialized, occurring exclusively on screes, its close relative *H. coloriscapum* – also a hybridogenous and more widespread taxon derived from *H. sect. Pannosa* – exhibits broader habitat tolerance, frequently occupying both screes and rock crevices.

Chromosome number

$2n = 4x = 36$, including 2–3 submetacentric chromosomes with spherical satellites (Niketić *et al.* 2003, 2006; cited under *H. coloriscapum* sensu lato).

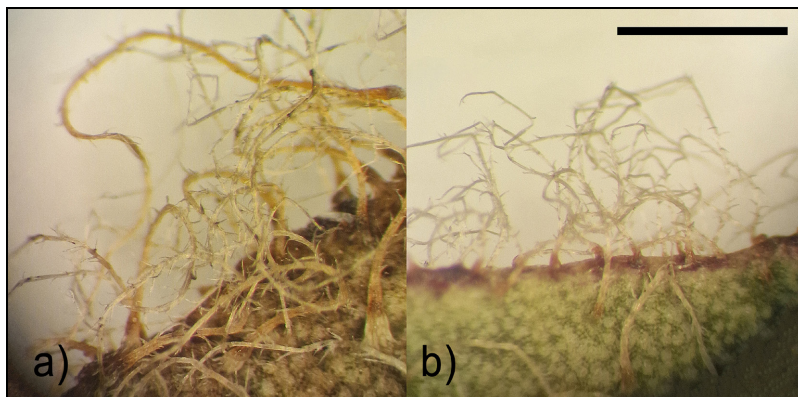


Fig. 4. – Basal leaf trichomes of: a) *Hieracium stevanovicii* (BEO), b) *H. coloriscapum* subsp. *coloriscapum* (BEO). Scale bar 1 mm.

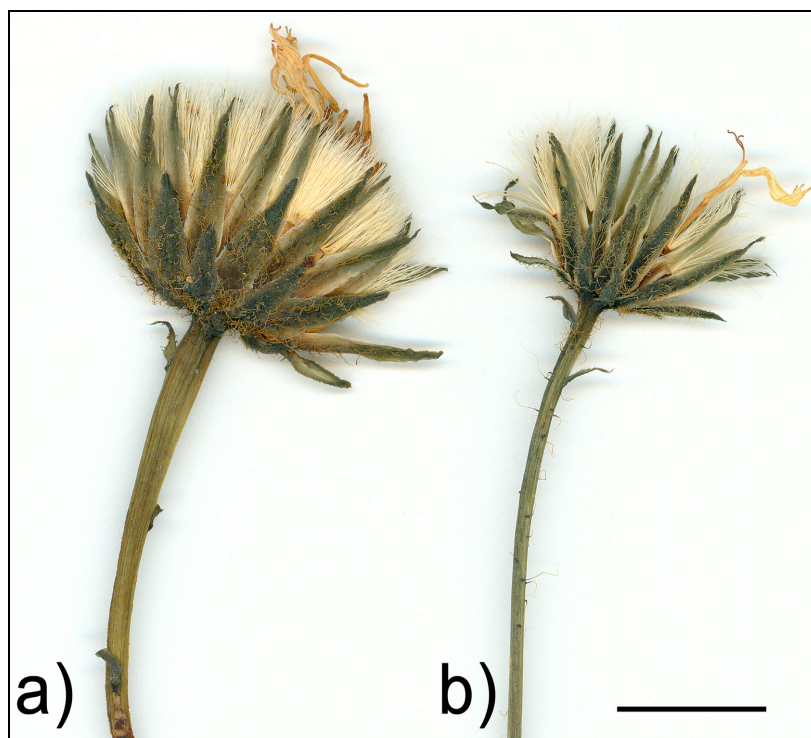


Fig. 5. – Peduncle and capitulum in: a) *Hieracium stevanovicii* (BEO), b) *H. coloriscapum* subsp. *coloriscapum* (BEO). Scale bar 1 cm.

Conservation status

This stenoendemic species is currently documented in a single population spanning ten localities in two 2×2 km grid squares, with less than 2,000 mature individuals recorded. Notably, the rare Dinaric endemic *Cerastium dinaricum* Beck & Szyszyl. has been observed in the vicinity of *H. stevanovicii*, though restricted to north-facing sites. Potential habitat suitability for this chionophilous alpine species in high elevation niches, under the RCP 8.5 climate scenario was modeled by Đurović *et al.* (2021), projecting a severe reduction (>90%) of suitable habitats by 2080. This climatic vulnerability, combined with its extremely limited distribution and population size, informed the IUCN Red List assessment. Applying criteria B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v) *H. stevanovicii* qualifies as Critically Endangered (CR).



Fig. 6. – *Hieracium stevanovicii* – achenes (BEO).
Scale bar 5 mm.

Additional specimens examined (paratypes)

Montenegro, Mt. Durmitor:

Veliki Meded (peak), above Velika Kalica (cirque), 2000–2100 m, exp. SW, MGRS 34T CN47, limestone, screes, coll. M. Niketić, 14-Aug-1992 (BEO 101488).

Velika Rbatina (peak), 2000–2100 m, exp. S, MGRS 34T CN47, limestone, screes below the peak, coll. M. Niketić, 19-Aug-1992 (BEO 101492).

Planinica (peak) – Škrka Lakes, 2100 m, MGRS 34T CN37, limestone, rocky pastures and screes, coll. M. Niketić, 17-Aug-1993 (BEO 101498).



Fig. 7. – *Hieracium stevanovicii* – holotype (BEO 101487).

Biljegov Do, below Ledena Pećina (cave) and Čvorov Bogaz (peak), 2000 m, MGRS 34T CN47, limestone, screes, coll. M. Niketić, 21-Aug-1993 (BEO 101491).

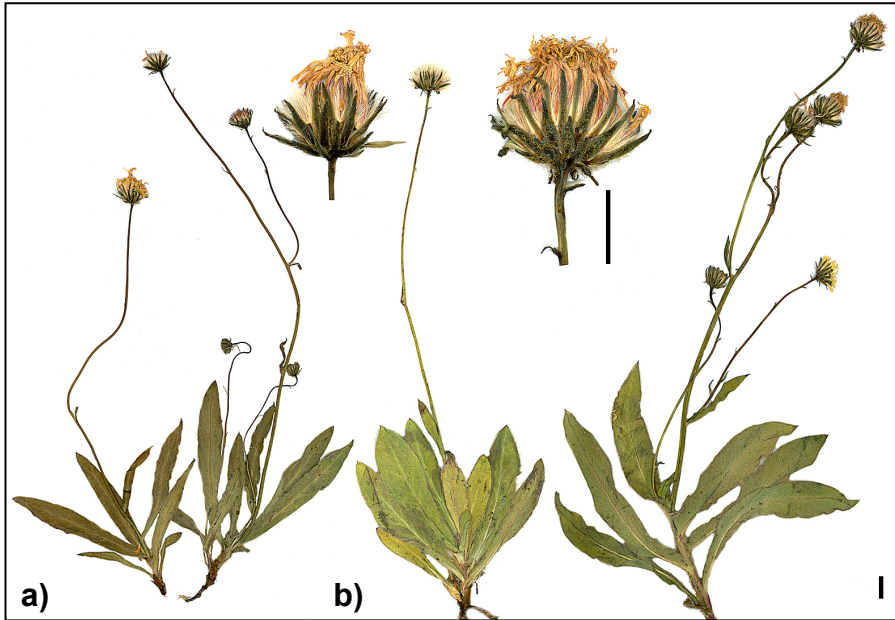


Fig. 8. – Plant habit and capitulum of a) *Hieracium coloriscopum* subsp. *coloriscopum* (BEO) and b) *H. stevanovicii* (BEO). Scale bar 1 cm.



Fig. 9. – *H. coloriscopum* subsp. *coloriscopum* in situ on alpine limestone screes, Mt. Komovi, Kom Vasojevički peak (photo M. Niketić).



Fig. 10. – Plant habit of *H. coloriscapum* subsp. *coloriscapum* (BEO).

Pasovi (rocks) – Sagorele Ploče (rocks), 2100–2200 *m*, MGRS 34T CN47, limestone, screes and rocky places, coll. M. Niketić, 13-Aug-1994 (BEO 101495).

Velika Rbatina (peak), 2000–2400 *m*, MGRS 34T CN47, limestone, screes, coll. M. Niketić, 14-Aug-1994 (BEO 101489).

Veliki Meded (peak), above Velika Kalica (cirque), 1800 *m*, MGRS 34T CN47, limestone, screes, coll. M. Niketić, 20-Aug-1995 (BEO 101490).

Velika Rbatina (peak), 2000–2400 *m*, MGRS 34T CN47, limestone, screes, coll. M. Niketić, 22-Aug-1996 (BEO 101493).

Veliki Meded (peak), above Velika Kalica (cirque), 1800–2200 *m*, MGRS 34T CN47, limestone, screes, coll. M. Niketić, 03-Aug-2002 (BEO 101488).

Veliki Meded (peak), above Velika Kalica (cirque), 2000 m, MGRS 34T CN47, limestone, screes, coll. M. Niketić, 24-Aug-2011 (BEO 101497).

Zeleni Vir (Lake) – Danilova Ploča (memorial plaque), 1600–2200 m, MGRS 34T CN47, limestone, screes, coll. M. Niketić, 26-Aug-2014 (BEO 101464).

DISCUSSION

The Balkan subendemic *Hieracium* sect. *Pannosa*, distinguished by its long plume-like trichomes, exhibits exceptional taxonomic richness in the orosubmediterranean bioclimate. This is particularly evident on Mt. Durmitor, where numerous taxa have evolved from the Western Balkan orophyte *H. gymnocephalum* Griseb. ex Pant. Similarly, the subendemic *H.* sect. *Naegeliana* thrives in subalpine and alpine orosubmediterranean screes, with its type species, *H. naegelianum*, also occurring on Mt. Durmitor. Notably, these sections frequently exhibit syntopic coexistence within shared habitats, as observed in the closely related *H. coloriscapum* and *H. stevanovicii*.

The hybrid origin of *H. coloriscapum* – traditionally attributed to *H. gymnocephalum* (sect. *Pannosa*) and *H. naegelianum* (sect. *Naegeliana*) (Zahn 1921) – has been debated since its description. Zahn (1909) referred ambiguously to *H. orientii* Kern. (a member of the *H. gymnocephalum* complex) as a potential progenitor, despite *H. orientii*'s absence from Mt. Durmitor and is restricted to the southern Montenegrin mountains. Chemotaxonomic analyses (Milutinović *et al.* 2018) revealed clustering of *H. coloriscapum* and *H. stevanovicii* based on shared flavonoid and phenolic acid profiles². However, *H. stevanovicii* exhibited stronger chemical affinity to *H. paratrichum* Niketić (nom. inval., nom. nud.), an unpublished taxon within the *H. gymnocephalum* complex (Niketić *et al.* 2003, 2006, Milutinović *et al.* 2018), than to *H. coloriscapum*.

This divergence suggests a different hybrid origin of the two species. Morphological evidence supports this hypothesis: *H. paratrichum* shares key traits with *H. stevanovicii*, including broader, lingulate leaves and thicker, more plumose trichomes – features absent in other members of the *H. gymnocephalum* complex. Additionally, both *H. stevanovicii* and *H. paratrichum* occupy similar scree habitats, further reinforcing their proposed phylogenetic relationship. Collectively, these findings substantiate the recognition of *H. stevanovicii* as a distinct microspecies. Definitive confirmation is anticipated from forthcoming karyological studies of *H. coloriscapum*, which may clarify the role of polyploidy and hybridization dynamics in this complex.

² In this study, *H. stevanovicii* was provisionally labeled as “*H. pyricephalum*” (nom. nud.)

CONCLUSIONS

The discovery of *Hieracium stevanovicii* highlights the unresolved taxonomic complexity within the Balkan *Hieracium* sect. *Pannosa*. This stenoendemic microspecies, restricted to the Mt. Durmitor's alpine screes, is morphologically defined by its more robust growth, glaucous foliage, thickened peduncles, and thicker densely plumose indumentum. Chemo-taxonomic and morphological evidence suggests a hybrid origin diverging from *H. coloriscapum*, implicating *H. paratrichum* (a *H. gymnocephalum* affiliate) as a progenitor. With < 2000 mature individuals across two UTM grids and > 90% habitat loss projected under RCP8.5 by 2080, *H. stevanovicii* qualifies as Critically Endangered (CR). Its recognition underscores Durmitor's role as a glacial refugium and prioritizes conservation of its cryophilous flora. Karyological analyses are urged to resolve polyploid speciation dynamics.

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***HIERACIUM STEVANOVICII* (ASTERACEAE):**

НОВА БАЛКАНСКА СТЕНОЕНДЕМИЧНА ОРОФИТА УГРОЖЕНА ГЛОБАЛНИМ ЗАГРЕВАЊЕМ

МАРЈАН НИКЕТИЋ

РЕЗИМЕ

Нова стеноендемична врста, *Hieracium stevanovicii* Niketić (Asteraceae), описана је са субалпијских и алпијских кречњачких сипара Дурмитора у Црној Гори. Морфолошки се јасно разликује од најближе сродне врсте, *H. coloriscapum* Rohlena & Zahn, пре свега по робуснијем расту, као и по ширим плавичасто сивим (глаукозним) делимично

меснатим листовима, јако задебљалим дршкама главица и густом индументуму од дебљих жућкастих до црвенкастосмеђих перастих длака. Ова врста ограничена је на четири глацијална цирка (Шкрка, Валовити до, Локвице и Велика калица) на надморској висини 1600–2400 m. Теренска истраживања (1992–2014) и ревизија хербарског материјала (ВЕО) показала су да *H. stevanovicii* синтопијски коегзистира са *H. coloriscapum* на истим стаништима, али њена еколошка специјализација на мобилне сипаре и морфолошке разлике потврђују њен статус засебне микроврсте.

Хемотаксономске анализе (флавоноида и фенолних киселина) (Milutinović *et al.* 2018) групишу *H. stevanovicii* ближе непубликованој врсти *H. paratrichum* Niketić (nom. inval.) него *H. coloriscapum*, указујући на различито хибридно порекло: док је *H. coloriscapum* вероватно настао укрштањем *H. gymnocephalum* Griseb. ex Pant. (sect. *Pannosa*) и *H. naegelianum* (sect. *Naegeliana*), *H. stevanovicii* је вероватно резултат хибридизације *H. paratrichum* (таксона сродног *H. gymnocephalum*) и *H. naegelianum*. Морфолошке сличности са *H. paratrichum* (шири листови, дебље перасте длаке) и заједничко станиште поткрепљују ову хипотезу.

Врста је забележена на само 10 локалитета у два УТМ квадрата (10×10 km), са мање од 2000 зрелих јединки. Пројекције станишта под RCP8.5 климатским сценаријом (Ђуговић *et al.* 2021) посредно предвиђају губитке преко 90% погодних еколошких ниша до 2080. године, што је такође допринело процени IUCN статуса – критично угрожена врста [CR B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v)]. Откриће *H. stevanovicii* наглашава улогу Дурмитора као рефугијума криофилне алпске флоре, истичући хитну потребу за њеном заштитом. Предстојећа истраживања укључиће кариолошке анализе *H. stevanovicii* и *H. coloriscapum* за потврду њиховог хибридног порекла праћеног полиплоидизацијом.