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The genus *Carex* (Cyperaceae) in Kosovo

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Running title: CAREX OF KOSOVO

Abstract – This study presents the first verified checklist of *Carex* taxa in Kosovo, based on field surveys (2022–2024), herbarium revisions and literature analyses. We recorded 52 species, including 19 subspecies and 1 variety, as well as 2 hybrids. Among them are 15 taxa newly reported for the flora of Kosovo. Most of the records come from the Sharri Mountains and the Albanian Alps of Kosovo, both national parks, although significant populations occur throughout the country. Several taxa are restricted to single localities, emphasising the urgent need for conservation efforts. These results refine the taxonomy and distribution of *Carex* in Kosovo and provide an important basis for future molecular and conservation studies in the Balkans.

Keywords: Balkans, *Carex*, checklist, conservation, endangered flora, Kosovo, taxonomy

Introduction

The Balkan Peninsula is a biodiversity hotspot and one of the richest floristic regions in Europe, characterised by exceptional species diversity (Hewitt 2011, Nieto Feliner 2014, Španiel and Rešetnik 2022). Its unique geographical location and historical role as a refuge during climatic fluctuations have significantly shaped biodiversity patterns in the region (Mittermeier et al. 2011). In addition, the Balkans harbour refugia that serve as reservoirs of genetic diversity and evolutionary potential due to the long-term persistence of species (Médail and Quézel 1999, Médail and Diadema 2009). This combination of high endemism and ecological importance makes the region a priority area for nature conservation (Griffiths et al. 2004).

Among the diverse plant taxa of the Balkans, the genus *Carex* L. (Cyperaceae) is of particular interest due to its ecological importance and taxonomic complexity. However, the floristic richness of Kosovo, a central part of the Balkans, is still relatively understudied compared to neighbouring countries, partly due to historical challenges and a lack of comprehensive botanical surveys (Berisha et al. 2020). Preliminary results indicate a high diversity of *Carex* species in Kosovo, but inconsistencies in records and reliance on outdated data hinder accurate assessment. In addition,

many *Carex* specimens in the Kosovo herbarium have remained unidentified or misclassified so far, emphasising the need for taxonomic revision.

The genus *Carex* is one of the largest and most diverse genera of vascular plants, with around 2,000 species distributed worldwide, covering a wide range of ecological habitats (Jiménez-Mejías and Larridon 2021; POWO 2024). Recent phylogenetic studies have significantly reshaped the classification of *Carex*, recognising six major subgeneric lineages: *Siderostictae* Franch. ex Ohwi, *Carex*, *Euthyceras* Peterm., *Psyllophora* (Degland) Peterm., *Uncinia* (Pers.) Peterm., *Vignea* (P.Beauv. ex T.Lestib.) Heer (Villaverde et al. 2020). These subgenera are supported by molecular data, refining the previously used infrageneric classifications that often did not reflect monophyletic groups (Roalson et al. 2021). Despite its high species diversity, many subgenera and sections within *Carex* have been shown to be polyphyletic, necessitating a revised classification framework that incorporates both molecular and morphological traits to provide a more accurate systematic organisation (Villaverde et al. 2020, Roalson et al. 2021). This refined classification does not only aid taxonomic clarity but also enhances our understanding of evolutionary relationships and species identification within this complex genus.

Several *Carex* species are known for their important role in wetland ecosystems, contributing to soil stabilisation, water filtration and biodiversity conservation. Their wide distribution in temperate and boreal regions underlines their ecological adaptability and evolutionary success (Martín-Bravo et al. 2019). Taxonomically, *Carex* is one of the most difficult genera to study due to its highly morphological variability (e.g. Więclaw et al. 2021, Więclaw et al. 2022), complex hybridisation patterns (Więclaw and Wilhelm 2014) and cryptic diversity (Chater 1980, Maguilla and Escudero 2016). Despite these challenges, the genus is of great importance for ecological research, habitat restoration and climate change studies as it occurs in sensitive ecosystems such as alpine, subalpine and boreal wetlands (Bernard 1990). In Europe, *Carex* is an important genus within plant diversity, comprising 235 species, some of which are endemic or highly protected (Kukkonen 1998; Martín-Bravo et al. 2019, Koopman 2022). The genus is particularly well represented in mountainous regions and wetlands, where it plays a central role in the formation of vegetation communities and the maintenance of ecosystem functions. Several European countries have made considerable efforts to document the diversity of *Carex*, but there are still gaps, especially in less studied regions of the continent, such as the Balkans (Martín-Bravo et al. 2019).

The genus *Carex* is an example of the diversity on the Balkan Peninsula, where 108 native *Carex* species have been documented (Koopman 2022, Govaerts et al. 2021). Nevertheless, there are still many uncertainties, especially in areas such as Kosovo, where data on *Carex* remain sparse and fragmented. The lack of detailed studies, compounded by historical taxonomic ambiguities, leaves many question marks regarding the exact number of *Carex* taxa present, their distribution and ecological role. This issue highlights the urgent need for targeted floristic and taxonomic studies in Kosovo to clarify the status of *Carex* taxa and contribute to broader regional biodiversity assessments.

This study aims to provide a comprehensive and updated account of the genus *Carex* in Kosovo, filling significant knowledge gaps and resolving taxonomic ambiguities. The main objectives are to document the diversity of *Carex* taxa through detailed floristic inventories and herbarium revisions, to clarify taxonomic ambiguities by resolving misidentifications and discrepancies in existing records of *Carex* taxa in different habitats, especially in wetlands and in subalpine and alpine ecosystems. In addition, the study aims to identify rare, endemic and potentially threatened *Carex* taxa, assess their conservation status and propose measures for their protection. By placing these results in a broader Balkanic and European context, this research aims to improve the regional understanding of *Carex* diversity and fill floristic gaps in this region.

Ultimately, this work will support long-term monitoring, management and conservation of sensitive ecosystems in Kosovo.

Material and methods

Sampling

During 2022–2024, extensive field expeditions were carried out in various habitats throughout Kosovo (Fig. 1) during three consecutive vegetative periods. The main objective of these expeditions was to document and collect as many *Carex* taxa as possible. All collected specimens were carefully processed and deposited in the Herbarium of the Faculty of Mathematics and Natural Sciences (UPH) at the University of Prishtina. In addition to this recently collected material, existing *Carex* herbarium vouchers were thoroughly examined. Many of these specimens had previously been either unidentified or misidentified, so a systematic taxonomic revision was required to ensure the accuracy and reliability of the documentation of *Carex* diversity.

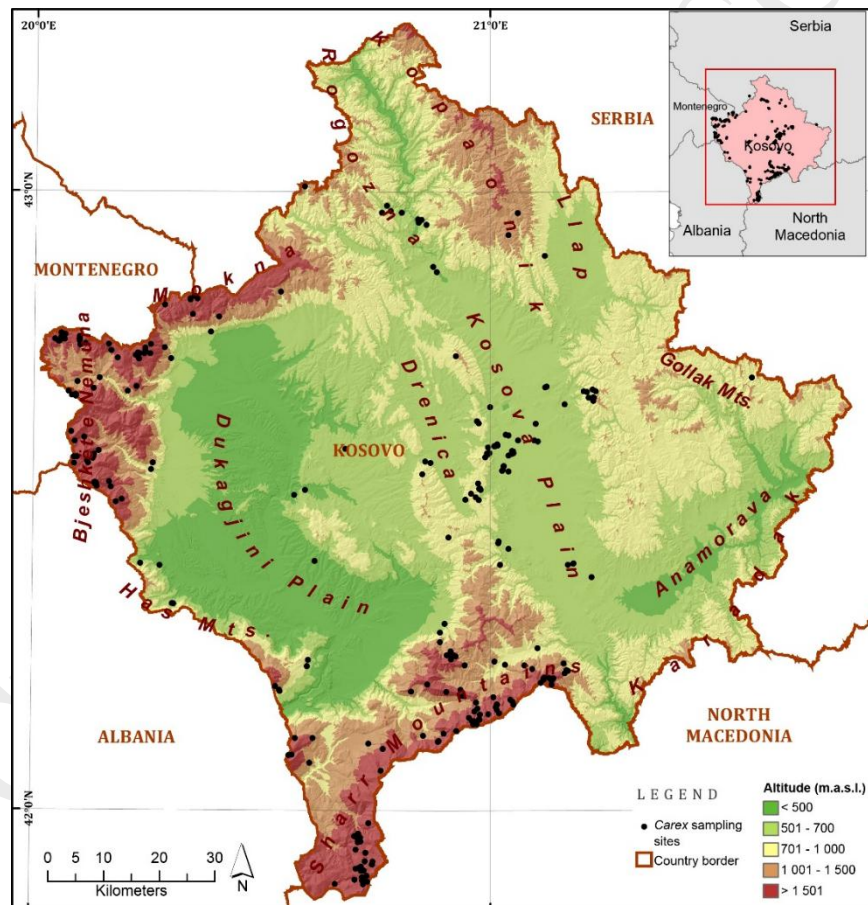


Fig. 1. Map of Kosovo showing sampling sites of *Carex* taxa.

This work is part of a broader research initiative focusing on the genus *Carex* (Cyperaceae) in the Balkans, aiming to comprehensively document and analyse its diversity in the region. Kosovo is involved in this large-scale project and is making a valuable contribution to ongoing efforts to refine the taxonomy, distribution and conservation status of *Carex* taxa in the Balkans.

Taxonomic study

Species identification was primarily based on an upgraded key of *Carex* (Koopman et al. 2025), as well as on established taxonomic keys, including those from the Flora of Albania (Pils 2016), Field guide of Spanish and Portuguese sedges (Luceño et al. 2023), the Excursion Flora of Germany (Jäger et al. 2017) and the Sedges of the British Isles (Jermy et al. 2007), along with other relevant literature sources. Morphological analyses of the plant material were performed under a stereozoom microscope (KERN OZM-5) to ensure accurate identification. All specimens were deposited in the Herbarium of the University of Prishtina (UPH), Kosovo. In certain cases, which required detailed morphological comparison, scanned herbarium specimens from the Herbarium of Vienna (JACQ, <https://www.jacq.org/>) were used. In addition, herbarium material from the Macedonian National Herbarium (MKNH), at the Faculty of Natural Sciences, Institute of Biology Skopje, North Macedonia, Herbarium Stetinense (SZUB) at University of Szczecin, Poland, and specimens from the private herbarium of Jac. Koopman were used to resolve taxonomic uncertainties. In addition, selected vouchers from the Herbarium of the Natural History Museum in Belgrade, Serbia, were examined on request in order to support species identification and confirm the occurrence of certain *Carex* taxa in the flora of Kosovo. The nomenclature of *Carex* taxa in this study follows *Carex Europaea* (Koopman 2022).

Literature sources

A wide range of literature sources mentioning *Carex* taxa from Kosovo were consulted for this study. They included both floristic and phytosociological publications mentioning *Carex* taxa. From these sources we were able to extract valuable information such as the reported locations, habitat types and ecological relationships of the taxa. Using this information, we were able to visit the reported sites, collect specimens and verify their identity in the field. Our approach was to include in the final checklist only those *Carex* taxa for which we have had the opportunity to observe specimens and identify them confidently to species, subspecies or variety level. Taxa that are mentioned in the literature but for which no plant material was available, or cases where the collected specimens did not match the taxa given in the literature, are discussed separately in this article to eliminate inconsistencies and clarify the entries.

Results

Confirmed *Carex* taxa

Our study has identified a total of 52 *Carex* species in the flora of Kosovo, including 19 subspecies and 1 variety, as well as 2 hybrids. There are 15 new taxa for the flora of Kosovo (Tab. 1).

Tab. 1. Newly recorded *Carex* taxa in Kosovo.

No.	Taxon
1.	<i>Carex acutiformis</i> Ehrh.
2.	<i>Carex brizoides</i> L.
3.	<i>Carex castroviejoi</i> Luceño & Jim.-Mejías
4.	<i>Carex depressa</i> subsp. <i>transsilvanica</i> (Schur) K.Richt.
5.	<i>Carex distachya</i> Desf. subsp. <i>distachya</i>
6.	<i>Carex ferruginea</i> Scop.
7.	<i>Carex flacca</i> subsp. <i>erythrostachys</i> (Hoppe) Holub
8.	<i>Carex macrolepis</i> Bertol.
9.	<i>Carex muricata</i> L. subsp. <i>muricata</i>
10.	<i>Carex pairae</i> F.W.Schultz
11.	<i>Carex sempervirens</i> subsp. <i>pseudotristis</i> (Domin) Pawł.
12.	<i>Carex umbrosa</i> Host subsp. <i>umbrosa</i>
13.	<i>Carex vesicaria</i> L.
14.	<i>Carex</i> × <i>ruedtii</i> Kneuck. [<i>C. flava</i> × <i>C. lepidocarpa</i>]
15.	<i>Carex</i> × <i>subviridula</i> Fernald [<i>C. flava</i> × <i>C. oederi</i>]

An alphabetical summary of all the recorded *Carex* taxa, along with their distribution in Kosovo, is provided in the Supplementary material (On-line Suppl. Tab. 1). In the following, we present taxonomic and detailed distributional notes for all documented taxa, including those recorded during field surveys as well as those verified from herbarium specimens.

1. *Carex acuta* L., Sp. Pl.: 978 (1753).

A widespread species found mainly in wetlands of Europe, including floodplains, riverbanks and marshes (Müller et al. 2021). In Kosovo it thrives in riparian zones and wet meadows at low to medium altitudes.

Specimens: – Albanian Alps of Kosovo: Liqenat (Kuqishtë), at the vicinity of Lumbardhi i Pejës - 42° 41.488'N, 20° 5.707'E, 939 m, 29 May 2022, *Leg. Berisha, N.*; – Central Kosovo: Llapçevë (Rajoni i Mirushës), 42° 30.600'N, 20° 34.237'E, 461 m, 22 Jun 2023, *Leg. Krasniqi, E.*; – Lumi Drenicë (Bardh i Vogël), Fushë Kosovë, 42° 36.424'N, 21° 2.382'E, 533 m, 19 Jun 2024, *Leg. Krasniqi, E.*

2. *Carex acutiformis* Ehrh., Beitr. Naturk. 4: 43 (1789).

A widespread species that occurs mainly in wetlands in Europe, specifically in nutrient-rich marshes, fens, river valleys, and along watercourses (Müller et al. 2021). In Kosovo, it grows in riparian habitats at low altitudes. This is a new species for the flora of Kosovo.

Specimens: – Ligatina e Hencit (Fushë Kosovë), 42° 34.869'N, 21° 2.926'E, 537 m, 12 May 2024, *Leg. Berisha, N* [UPH - 00002035].

3. *Carex aterrima* Hoppe, Caricolog. Germ.: 51 (1826).

3.1. - *Carex aterrima* subsp. *aterrima*

A mountainous taxon that occurs mainly in the montane, subalpine to alpine regions of Europe, often in association with moist habitats such as wooded slopes and alpine meadows (Konrad et al. 2018). In Kosovo it grows in high-altitude areas where it thrives in moist microhabitats.

Specimens: – Albanian Alps of Kosovo: Hajlë, 42° 45.195'N, 20° 6.697'E, 1779 m, 15 Jul 1987, *Leg. Krivošej, Z.*; – Bogičë, 42° 34.175'N, 20° 5.687'E, 1946 m, 29 Jun 1988, *Leg. Millaku, F.*; – Hajlë, 42° 45.422'N, 20° 5.897'E, 1709 m, 01 Jul 1988, *Leg. Millaku, F.*; – Sharri Mts.: Bresanë – Opojë, 42° 6.020'N, 20° 45.964'E, 1634 m, 18 Jun 2018, *Leg. Mala, Xh.*; – Rrasa e Zogut, 42° 30.124'N, 20° 11.623'E, 1821 m, 29 Jun 2021, *Leg. Berisha, N.*; – Sharri Mts.: Vracë, 41° 54.456'N, 20° 42.829'E, 1961 m, 27 Jul 2023, *Leg. Millaku, F.*; – Marjash, 42° 35.745'N, 20° 5.417'E, 1968 m, 20 May 2024, *Leg. Berisha, N.*

4. *Carex atrata* L., Sp. Pl.: 976 (1753).

4.1. *Carex atrata* subsp. *atrata*

A widespread species that occurs throughout Europe in montane, subalpine and alpine habitats and is specifically found in wet meadows, fens, and rocky slopes with sufficient moisture (Konrad et al. 2018). In the high mountains of southern Europe, this taxon behaves as a chionophile, preferring habitats with prolonged snow cover. Similarly, in Kosovo, it is found in high-altitude grasslands, alpine meadows, and damp rocky crevices.

Specimens: – Albanian Alps of Kosovo: Gjeravicë, 42° 31.708'N, 20° 8.182'E, 2307 m, 22 Jun 2011, *Leg. Millaku, F.*; – Gjeravicë, 42° 31.747'N, 20° 8.035'E, 2310 m, 23 Jul 2023, *Leg. Berisha, N.*; – Sharri Mts.: Gryka e Jezercës, 42° 9.506'N, 21° 1.125'E, 2303 m, 29 Jun 2002, *Leg. Millaku, F.*; – Vracë, 41° 54.193'N, 20° 43.186'E, 2009 m, 27 Jul 2023, *Leg. Millaku, F.*; – Bistër, 42° 8.890'N, 20° 58.510'E, 2088 m, 09 Aug 2023, *Leg. Krasniqi, E.*

5. *Carex brizoides* L., Cent. Pl. 1: 31 (1755).

A rhizomatous species native to central, south-western and eastern Europe, usually found in mesic to moist habitats, including grasslands, forest clearings and roadsides (Müller et al. 2021; Luceño et al. 2023). In Kosovo, it thrives in open forest clearings, meadows and disturbed sites with moderate moisture. This is a new species for the flora of Kosovo.

Specimens: – Albanian Alps of Kosovo: Hajlë, 42° 45.870'N, 20° 5.958'E, 1859 m, 15 Jul 1987, *Leg. Krivošej, Z.* [UPH – 00002049]; – Hajlë, 42° 45.055'N, 20° 6.010'E, 1522 m, 03 Jul 1998 [UPH – 00002050], *Leg. Millaku, F.*; – Bjeshka e Rusolisë, 42° 44.563'N, 20° 14.566'E, 2201 m, 07 Aug 1987, *Leg. Millaku, F.* [UPH – 00002051]; – Bjeshka e Rusolisë, 42° 44.270'N, 20° 13.817'E, 1969 m, 02 Jul 2014, *Leg. Berisha, N.* [UPH – 00002052]; – Sharri Mts.: Bistër, 42° 8.842'N, 20° 58.590'E, 2088 m, 24 Jul 2021, *Leg. Berisha, N.* [UPH – 00002053]; – Brod, 41° 57.141'N, 20° 42.742'E, 1791 m, 20 Aug 2023, *Leg. Krasniqi, E.* [UPH – 00002054]; – Central Kosovo: Mali Drenicë (Llapçevë), 42° 31.104'N, 20° 35.702'E, 497 m, 30 Apr 2024, *Leg. Krasniqi, E.* [UPH – 00002055]; – Northern Kosovo: Banjskë (Zveçan), 42° 58.698'N, 20° 46.338'E, 641 m, 14 Jun 1986, *Leg. Krivošej, Z.* [UPH – 00002056].

6. *Carex canescens* L., Sp. Pl.: 974 (1753).

6.1. *Carex canescens* subsp. *canescens*

This species is widespread across boreal, temperate, and montane regions of Europe, while it is absent or extremely rare in Mediterranean areas. It specifically grows in moist, acidic habitats such as bogs, fens, peatlands and on the edges of lakes and streams (Müller et al. 2021). In Kosovo, it is found in high-montane wetlands, nutrient-poor bogs and on the edges of water bodies, often in association with peat mosses and other moisture-dependent vegetation.

Specimens: – Sharri Mts.: Bistër, 42° 8.919'N, 20° 58.531'E, 2087 m, 24 Jul 2021, *Leg. Berisha, N.*; – Brod, 41° 55.949'N, 20° 43.747'E, 1942 m, 01 Aug 2020, *Leg. Mala, Xh.*

7. *Carex caryophylla* Latourr., Chlor. Lugd.: 27 (1785).

A widespread species found in dry to mesic grasslands, open woodlands and meadows throughout Europe. It thrives in well-drained, nutrient-poor soils in calcareous and sandy habitats

(Müller et al. 2021). In Kosovo, it is found in dry grasslands, on forest edges and in sparse forests, especially in sunny or semi-shady locations.

Specimens: – Albanian Alps of Kosovo: Bjeshka e Rusolisë, 42° 44.315'N, 20° 13.587'E, 1889 m, 19 Jun 1988, *Leg. Millaku, F.*; – Bjeshka e Rusolisë, 42° 44.298'N, 20° 13.608'E, 1901 m, 23 Jun 2012, *Leg. Millaku, F.*; – Peklen, 42° 41.051'N, 20° 13.469'E, 1754 m, 29 Jun 2022, *Leg. Berisha, N.*; – Central Kosovo: Blinajë, 42° 30.416'N, 20° 58.068'E, 701 m, 13 May 2024, *Leg. Berisha, N.*; – Golesh Mt., 42° 34.303'N, 20° 59.314'E, 906 m, 01 Jun 2024, *Leg. Berisha, N.*; – Llapushnik, 42° 32.647'N, 20° 51.083'E, 951 m, 30 Apr 2024, *Leg. Berisha, N.*; – Sharri Mts.: Vracë, 41° 54.242'N, 20° 43.522'E, 2190 m, 19 Jun 2023, *Leg. Millaku, F.*; – Luboten Mt., 42° 12.679'N, 21° 8.000'E, 1799 m, 23 Jun 2018, *Leg. Berisha, N.*; – Konjushë Mt., 42° 8.714'N, 20° 57.845'E, 2198 m, 23 Jun 2024, *Leg. Berisha, N.*; – Shtërpçë, 42° 14.193'N, 21° 1.890'E, 954 m, 01 Jul 2020, *Leg. Mala, Xh.*; – South-Western Kosovo: Pashtrik Mt., 42° 11.600'N, 20° 32.500'E, 949 m, 16 Jun 2012, *Leg. Berisha, N.*; – North Kosovo: Sërboc – Zveçan, 42° 57.350'N, 20° 50.932'E, 732 m, 03 Jul 1989, *Leg. Krivošej, Z.*

8. *Carex castroviejoi* Luceño & Jim.Mejías, Acta Bot. Malac. 34: 231 (2008).

A species endemic to the Balkans, occurring in montane, marshy soils over ophiolitic rocks (Jiménez-Mejías and Luceño 2009). It has recently been reported from Albania (Martín-Bravo et al. 2022). In Kosovo it has been found on serpentine and silicate substrates in mountain and high mountain regions. This is a newly reported species for the flora of Kosovo.

Specimens: – North Kosovo: Rogozna Mt., 43° 0.565'N, 20° 35.489'E, 1060 m, 10 Jun 1994, *Leg. Rexhepi, F.* [UPH – 00002037]; – Sharri Mts.: "Vahuf loc.", no coord., 09 Jul 1979, *Leg. Pichler, A.* [UPH – 00002038]; – Maja e Zezë, 42° 7.517'N, 20° 53.897'E, 1527 m, 30 May 1998, *Leg. Rexhepi, F.* [UPH – 00002039]; – Albanian Alps of Kosovo: Bogiçë, 42° 33.559'N, 20° 5.359'E, 2097 m, 19 Jul 1979, *Leg. Lindtner, V.* [UPH – 00002040].

9. *Carex curvula* All., Fl. Pedem. 2: 264 (1785).

9.1. *Carex curvula* subsp. *curvula*

A species widespread in the high mountains of Europe. It is specifically found in alpine grasslands, rocky slopes and windswept ridges and thrives on acidic, nutrient-poor soils (Konrad et al. 2018). In Kosovo, it is found in the alpine zones of the Sharri Mountains.

Specimens: – Sharri Mts.: Pribreg Mt., 42° 10.626'N, 21° 2.860'E, 2121 m, 10 Aug 2023, *Leg. Millaku, F.*; – Shutman – Brod, 41° 55.074'N, 20° 44.692'E, 2166m, 31 Jul 2023, *Leg. Krasniqi, E.*; – Konjushë Mt., 42° 8.736'N, 20° 57.627'E, 2127 m, 23 Jun 2024, *Leg. Berisha, N.*

10. *Carex davalliana* Sm. in Trans. Linn. Soc. London 5: 266 (1800).

A dioecious species native to continental Europe, specifically found in calcareous fens and wet meadows (Müller et al. 2021). It thrives on alkaline, carbonate-rich soils, often in small spring bogs. In Kosovo, it has been found in similar habitats, in nutrient-rich, subalpine calcareous fens.

Specimens: – Sharri Mts.: Konjushë Mt., 42° 8.664'N, 20° 57.750'E, 2155m, 23 Jun 2024, *Leg. Berisha, N.*; – Vracë, 41° 54.598'N, 20° 43.155'E, 2049 m, 19 Jun 2023, *Leg. Millaku, F.*

11. *Carex depauperata* Curtis ex Woodw. in W. Withering., Bot. Arr. Brit. Pl., ed. 2, 2: 1049 (1787).

A sedge native to Europe. It thrives on semi-shady, dry, well-drained soils of calcareous as well as silicate substrates, on forest edges (Müller et al. 2021). In Kosovo, it has been found in similar habitats in the edges of *Quercus pubescens* Willd. forest.

Specimens: – Central Kosovo: Golesh Mt., 42° 34.708'N, 20° 59.886'E, 736 m, 12 May 2024, *Leg. Berisha, N.*

12. *Carex depressa* Link in J. Bot. (Schrader) 1799(2): 309 (1800).

12.1. *Carex depressa* subsp. *transsilvanica* (Schur) T.V.Egorova, Novosti Sist. Vysš. Rast. 9: 80 (1972).

A densely tufted subspecies with short rhizomes that grows in forests and dry grasslands. It is widespread in south-east Europe and the Carpathians (Koopman 2022). The species grows on well-drained soils, often in open or semi-shaded habitats (Konrad et al. 2018). In Kosovo, it has been found in the vicinity of forest vegetation. It is a newly recorded taxon for Kosovo.

Specimens: – Sharri Mts.: Pashallore Mt., 42° 14.716'N, 20° 54.839'E, 1709 m, 27 Jul 2023, *Leg. Berisha, N.* [UPH - 00002041].

13. *Carex digitata* L., Sp. Pl.: 975 (1753).

A widespread Eurasian species that occurs in dry to mesic forests, on forest edges and rocky slopes (Nikolić, 2020). In Kosovo it has been found in montane and subalpine regions, where it grows on calcareous substrates.

Specimens: – Sharri Mts.: Gllloboqicë, 42° 10.671'N, 21° 9.534'E, 1170 m, 02 Jul 2009, *Leg. Mala, Xh.*; – Gërm (Prishtinë), 42° 40.087'N, 21° 12.937'E, 819 m, 14 Jun 2023, *Leg. Berisha, N.*

14. *Carex distachya* Desf., Fl. Atlant. 2: 336 (1799).

14.1. *Carex distachya* subsp. *distachya*

Primarily a Mediterranean species, often found in dry woodland, scrub and on rocky slopes, on calcareous and siliceous soils (Nikolić 2020; Koopman et al. 2024). In Kosovo, it thrives in *Quercus pubescens* forests as well as in their clearings. This is a new (sub)species for Kosovo.

Specimens: – Gërm (Prishtinë), 42° 40.068'N, 21° 13.616'E, 822 m, 24 May 2024, *Leg. Berisha, N.* [UPH - 00002042]; – Llapashticë (Podujevë), 42° 53.827'N, 21° 7.179'E, 708 m, 30 May 2022, *Leg. Berisha, N.* [UPH - 00002043].

15. *Carex distans* L., Syst. Nat., ed. 10, 2: 1263 (1759).

A widespread Eurasian species found in wet meadows, marshes and along riverbanks, often on saline or nutrient-rich soils (Müller et al. 2021). In Kosovo, it has been found in lowland and mountainous regions, specifically in wet meadows and near water bodies.

Specimens: – Central Kosovo: Golesh Mt., 42° 34.670'N, 20° 59.542'E, 731 m, 13 May 2023, *Leg. Berisha, N.*; – Miradi e Epërme (Fushë Kosovë), 42° 35.940'N, 21° 5.775'E, 533 m, 20 May 2024, *Leg. Berisha, N.*; – Gazimestan, 42° 41.167'N, 21° 7.395'E, 584 m, 02 Jul 2022, *Leg. Berisha, N.*; – Harilaç (Fushë Kosovë), 42° 35.449'N, 21° 0.946'E, 551 m, 05 May 2024, *Leg. Berisha, N.*; – Ligatina e Hencit (Fushë Kosovë), 42° 34.702'N, 21° 3.041'E, 531 m, 12 May 2024, *Leg. Berisha, N.*; – Dobrajë (Lipjan), 42° 32.935'N, 21° 2.398'E, 555 m, 12 May 2024, *Leg. Berisha, N.*; – Shtime, 42° 25.424'N, 21° 2.379'E, 604 m, 10 Jun 2019, *Leg. Mala, Xh.*; – Sojevë (Ferizaj), 42° 22.658'N, 21° 13.252'E, 549 m, 02 Jul 2024, *Leg. Berisha, N.*; – Blinajë, 42° 30.165'N, 20° 58.510'E, 651 m, 13 May 2024, *Leg. Krasniqi, E.*; – Sharri Mts.: Shutman, 41° 54.832'N, 20° 44.606'E, 2161m, 31 Jul 2023, *Leg. Millaku, F.*; – Albanian Alps of Kosovo: Zalli i Rupës, 42° 34.072'N, 20° 7.789'E, 1504 m, 19 May 2024, *Leg. Berisha, N.*; – Bjeshka e Rusolisë, 42° 43.815'N, 20° 17.982'E, 882 m, 30 Jun 1987, *Leg. Millaku, F.*; – Mokna, 42° 46.399'N, 20° 23.214'E, 641 m, 19 Jul 1989, *Leg. Krivošej, Z.*; – Northern Kosovo: Banjskë (Zveçan), 42° 58.184'N, 20° 46.868'E, 644 m, 14 Jun 1986, *Leg. Krivošej, Z.*; – Sërboc (Zveçan), 42° 57.061'N, 20° 50.551'E, 539 m, 16 May 1986, *Leg. Krivošej, Z.*; – Zhazhë (Zveçan), 42° 56.856'N, 20° 51.561'E, 725 m, 16 May 1986, *Leg. Krivošej, Z.*; – Jashevik (Zveçan), 42° 58.011'N, 20° 48.316'E, 540 m, 14 May 1986, *Leg. Krivošej, Z.*; – South-Western Kosovo: Malësi e Gjakovës, 42° 20.030'N, 20° 18.534'E, 551 m, 29 Jun 2024, *Leg. Berisha, N.*; – Potaqan (Rahovec), 42° 24.227'N, 20° 36.964'E, 409 m, 20 Jun 1979, *Leg. Hundozi, B.*

16. *Carex divisa* Huds., Fl. Angl.: 348 (1762).

A species native to Europe, Asia and North Africa. It specifically inhabits seasonally moist meadows, marshes and riverbanks; in much of Europe it behaves as a soil indifferent, from siliceous to saline soils (Jermy et al. 2007). In Kosovo, it has been found in moist meadows at low altitudes.

Specimens: – Central Kosovo: Miradi i Poshtme (Fushë Kosovë), 42° 35.944'N, 21° 3.626'E, 519 m, 14 May 2024, *Leg. Berisha, N.*; – Dobrajë (Lipjan), 42° 32.987'N, 21° 1.547'E, 553 m, 12 May 2024, *Leg. Berisha, N.*

17. *Carex divulsa* Stokes in W. Withering, Bot. Arr. Brit. Pl., ed. 2, 2: 1035 (1787).

A widespread species native to Europe and Asia, specifically found in grasslands, forest edges and roadsides, often on nutrient-rich soils (Nikolić 2020). In Kosovo, it has been found in moist grassland and forest clearings from the montane to the high mountain zone.

Specimens: – Central Kosovo: Blinajë, 42° 31.750'N, 20° 58.411'E, 704 m, 13 May 2024, *Leg. Berisha, N.*; – Albanian Alps of Kosovo: Gjeravicë, 42° 31.296'N, 20° 10.204'E, 1701 m, 10 Jul 2022, *Leg. Berisha, N.*; – Zalli i Rupës: 42° 34.244'N, 20° 7.872'E, 1398 m, 19 May 2024, *Leg. Berisha, N.*; – Marjash: 42° 36.122'N, 20° 6.639'E, 1680 m, 30 Jun 2024, *Leg. Berisha, N.*; – Sharri Mts.: Luboten Mt., 42° 14.337'N, 21° 9.571'E, 1096 m, 24 Jun 2017, *Leg. Berisha, N.*; – Northern Kosovo: Iberane (Zveçan), No coord., 650 m, 15 May 1986, *Leg. Krivošej, Z.*

18. *Carex echinata* Murray, Prodr. Stirp. Gott.: 76 (1770).

18.1. *Carex echinata* subsp. *echinata*

A widespread species native to Europe, Asia and North America, specifically found in wet meadows, bogs and acidic swamps (Jermy et al. 2007). In Kosovo it has been found in montane and subalpine regions, where it grows on moist grasslands, fens and nutrient-poor soils.

Specimens: – Albanian Alps of Kosovo: Ishtedim, 42° 44.089'N, 20° 13.325'E, 1820 m, 10 Jul 1987, *Leg. Krivošej, Z.*; – Hajlë, 42° 45.688'N, 20° 5.901'E, 1784 m, 15 Jul 1987, *Leg. Millaku, F.*; – Mokna, 42° 49.623'N, 20° 20.457'E, 1869 m, 21 Jun 2012, *Leg. Millaku, F.*; – Gjeravicë, 42° 31.580'N, 20° 8.286'E, 2148 m, 23 Jul 2023, *Leg. Berisha, N.*; – Marjash, 42° 36.634'N, 20° 4.925'E, 2021 m, 10 Jul 2024, *Leg. Berisha, N.*; – Sharri Mts.: Përrojet e Durlës, 42° 10.376'N, 21° 0.860'E, 1631 m, 30 Jul 2022, *Leg. Berisha, N.*; – Luboten Mt., 42° 12.818'N, 21° 6.899'E, 1935 m, 26 Jun 2018, *Leg. Berisha, N.*; – Vracë, 41° 53.587'N, 20° 43.295'E, 2027 m, 09 Jul 2023, *Leg. Millaku, F.*; – Ujërat e Qeta, 42° 6.792'N, 20° 53.256'E, 1762 m, 30 Jun 2014, *Leg. Mala, Xh.*; – Pashallore Mt., 42° 14.718'N, 20° 54.856'E, 1774 m, 27 Jul 2023, *Leg. Berisha, N.*

19. *Carex ferruginea* Scop., Fl. Carniol., ed. 2, 2: 225 (1772).

A montane to alpine species native to central and southern Europe, specifically found in subalpine and alpine grasslands, on rocky slopes and in open coniferous forests (Müller et al. 2021). In Kosovo it has been found in high mountain regions of Sharri Mts., where it grows on calcareous substrates. Given its previously unverified occurrence, this record represents a species new to Kosovo.

Specimens: – Sharri Mts.: Brod, 41° 58.831'N, 20° 44.095'E, 2009 m, 20 Aug 2023, *Leg. Berisha, N.* [UPH - 00002044]; – Pashallore Mt., 42° 15.037'N, 20° 55.467'E, 1540 m, 27 Jul 2023, *Leg. Berisha, N.* [UPH - 00002045]; – Përrojet e Durlës, 42° 10.093'N, 21° 0.695'E, 1774 m, 30 Jul 2022, *Leg. Berisha, N.* [UPH - 00002046]; – Vracë, 41° 53.267'N, 20° 43.309'E, 2087 m, 09 Jul 2023, *Leg. Millaku, F.* [UPH - 00002047]; – Maja e Zezë, 42° 7.071'N, 20° 55.415'E, 2104 m, 17 Jun 2021, *Leg. Krasniqi, E.* [UPH - 00002048].

20. *Carex flacca* Schreb., Spic. Fl. Lips.: App. 178 (1771).

A widespread Eurasian species, often found in wet meadows, fens, and calcareous grasslands. In Kosovo it has been found in montane to high montane regions, where it specifically grows on moist, calcareous soils. It is represented in Kosovo by the following two subspecies:

20.1. *Carex flacca* subsp. *flacca*

Specimens: – Albanian Alps of Kosovo: Shtupeç i Vogël, 42° 40.614'N, 20° 12.291'E, 1204 m, 30 Jun 2022, *Leg. Berisha, N.*; – Bogë, 42° 45.416'N, 20° 3.114'E, 1521 m, 08 Jun 2024, *Leg. Berisha, N.*; – Rekë e Allagës, 42° 44.541'N, 20° 10.105'E, 1637 m, 19 Jun 2024, *Leg. Berisha, N.*; – Kuqishtë, 42° 40.251'N, 20° 5.449'E, 1858 m, 14 Jun 2024, *Leg. Berisha, N.*; – Northern Kosovo: Banjskë (Zveçan), 42° 58.022'N, 20° 45.671'E, 852 m, 14 Jun 1986, *Leg. Krivošej, Z.*

20.2. *Carex flacca* subsp. *erythrostachys* (Hoppe) Holub, Folia Geobot. Phytotax. 23: 413 (1988).

This subspecies is a newly reported taxon for Kosovo.

Specimens: – Central Kosovo: Golesh Mt., 42° 34.584'N, 20° 59.656'E, 752 m, 12 May 2024, *Leg. Berisha, N.* [UPH – 00002036].

21. *Carex flava* L., Sp. Pl.: 975 (1753).

A widespread species native to Europe, Asia and North America. It occurs in wet meadows, fens, and marshes, often on calcareous and nutrient-rich soils (Jermy et al. 2007). In Kosovo it has been found in high montane regions, where it thrives in moist grasslands and fens.

Specimens: – Sharri Mts.: Brod, 41° 57.761'N, 20° 42.837'E, 1570 m, 20 Aug 2023, *Leg. Millaku, F.*; – Përrojet e Durlës: 42° 9.811'N, 21° 0.840'E, 2016 m, 03 Jul 2017, *Leg. Berisha, N.*; – Vracë, 41° 53.347'N, 20° 42.358'E, 1916 m, 27 Jul 2023, *Leg. Krasniqi, E.*; – Luboten Mt., 42° 12.965'N, 21° 7.028'E, 1887 m, 09 Jul 2018, *Leg. Berisha, N.*; – Lumi i Murzhicës (Shtërpçë), 42° 14.514'N, 21° 0.525'E, 945 m, 29 May 1973, *Leg. Kirković, D.*; – Maja e Zezë, 42° 7.804'N, 20° 55.534'E, 2351 m, 06 Jul 2011, *Leg. Millaku, F.*; – Albanian Alps of Kosovo: Mokna, 42° 50.310'N, 20° 32.404'E, 1176 m, 27 Jun 1996, *Leg. Krivošej, Z.*; – Bogë, 42° 45.539'N, 20° 3.464'E, 1551 m, 08 Jun 2024, *Leg. Berisha, N.*; – Rekë e Allagës, 42° 45.171', 20° 9.795'E, 1874 m, 19 Jun 2024, *Leg. Berisha, N.*

22. *Carex halleriana* Asso, Syn. Stirp. Aragon.: 133 (1779).

A species native to southern and central Europe, North Africa and Western Asia. It specifically inhabits rocky and grassy slopes, often on calcareous soils (Müller et al. 2021). In Kosovo, it has been found in dry grasslands and open forests, especially in mountainous regions.

Specimens: – Koritnik Mt.: Breznë, 42° 7.068'N, 20° 36.810'E, 1526 m, 11 Jul 2012, *Leg. Krasniqi, E.*; – Kërsteç, 42° 4.671'N, 20° 36.401'E, 1187 m, 29 Apr 2024, *Leg. Berisha, N.*; – Shalë e Bajgorës: Vesekovc, 42° 55.863'N, 21° 2.388'E, 1243 m, 27 Jun 2009, *Leg. Berisha, N.*; – Iberane (Zveçan), No coord., 671 m, 15 May 1986, *Leg. Krivošej, Z.*; – Mazrek (Has), 42° 14.028'N, 20° 36.024'E, 623 m, 10 Sep 2023, *Leg. Berisha, N.*; – Llapushnik, 42° 14.657'N, 20° 36.163'E, 790 m, 30 Apr 2024, *Leg. Berisha, N.*; – Gërmi (Prishtinë), 42° 40.633'N, 21° 12.718'E, 788m, 24 May 2024, *Leg. Berisha, N.*

23. *Carex hirta* L., Sp. Pl.: 975 (1753).

A widespread Eurasian species, often found in grasslands, riverbanks, ditches and disturbed habitats, preferably on nutrient-rich soils (Müller et al. 2021). In Kosovo, it is one of the most widespread *Carex* species, occurring from lowlands to mountainous regions in a variety of moist and mesic environments.

Specimens: – Albanian Alps of Kosovo: Bogë, 42° 45.745'N, 20° 3.483'E, 1584 m, 19 Jun 2024, *Leg. Berisha, N.*; – Gjeravicë, 42° 31.813'N, 20° 9.950'E, 1901 m, 23 Jul 2023, *Leg. Berisha, N.*; – Mali Drenicë, 42° 30.167'N, 20° 56.729'E, 669 m, 01 Jul 2008, *Leg. Krasniqi, E.*; – Blinajë, 42° 31.152'N, 20° 58.706'E, 648 m, 13 May 2024, *Leg. Krasniqi, E.*; – Vasilevë, 42° 37.793'N, 20° 58.240'E, 719 m, 17 Jun 2024, *Leg.*

Berisha, N.; – Prishtinë, 42° 39.426'N, 21° 9.787'E, 584 m, 16 May 2024, *Leg. Berisha, N.*; – Mushtisht, 42° 17.333'N, 20° 53.401'E, 698 m, 21 Jun 2005, *Leg. Mala, Xh.*; – Harilaç (Fushë Kosovë), 42° 35.479'N, 21° 0.950'E, 551 m, 05 May 2024, *Leg. Berisha, N.*; – Çiçavicë, 42° 44.107'N, 20° 55.460'E, 931 m, 04 Jun 1987, *Leg. Rexhepi, F.*; – Sharri Mts.: Prevallë, 42° 10.546'N, 20° 58.118'E, 1450 m, 22 Jul 2011, *Leg. Berisha, N.*

24. *Carex hordeistichos* Vill., Hist. Pl. Dauphiné 2: 221 (1787).

A species native to Europe and western Asia, specifically found in wet meadows, marshes and seasonally flooded grasslands (Müller et al. 2021). In Kosovo it was found in lowland meadows and also thrived in temporarily wet habitats near an artificial lake.

Specimens: – Ligatina e Hencit (Fushë Kosovë), 42° 34.889'N, 21° 2.966'E, 537 m, 12 May 2024, *Leg. Berisha, N.*

25. *Carex humilis* Leyss., Fl. Halens.: 175 (1761).

A species native to Europe, specifically found in dry grasslands, rocky slopes and open forests, preferably on calcareous soils (Konrad et al. 2018). In Kosovo it occurs in montane regions and thrives in dry, well-drained habitats.

Specimens: – Albanian Alps of Kosovo: Bjeshka e Rusolisë, 42° 44.254'N, 20° 15.219'E, 2053 m, 21 Jul 2010, *Leg. Millaku, F.*; – Pashtrik Mt., 42° 11.756'N, 20° 32.419'E, 1066 m, 16 Jun 2012, *Leg. Berisha, N.*; – Gllarevë, 42° 35.110'N, 20° 40.946'E, 608 m, 03 Apr 2023, *Leg. Berisha, N.*; – Mushtisht, 42° 18.173'N, 20° 54.036'E, 708 m, 19 May 2020, *Leg. Mala, Xh.*

26. *Carex kitaibeliana* Bech. in Ber. Schweiz. Bot. Ges. 70: 178 (1960).

26.1. *Carex kitaibeliana* var. *kitaibeliana*

A species native to south-eastern and south-central Europe, as well as western Asia (Türkiye), specifically inhabiting dry, rocky slopes, high mountain grasslands and open forests, often on calcareous soils (Pignatti et al. 2018). In Kosovo, it has been found in high montane, subalpine regions where it thrives in rocky grasslands. Further research should reveal whether the variety *capillata*, known from the Balkans in Bulgaria and Greece, occurs in Kosovo, too.

Specimens: – Sharri Mts.: Vracë, 41° 54.405'N, 20° 42.479'E, 1970 m, 27 Jul 2023, *Leg. Millaku, F.*; – Luboten Mt., 42° 12.281'N, 21° 7.999'E, 1879 m, 02 Jul 2017, *Leg. Berisha, N.*; – Konjushë Mt., 42° 8.713'N, 20° 57.868'E, 2171 m, 23 Jun 2024, *Leg. Berisha, N.*; – Shutman, 41° 55.116'N, 20° 43.671'E, 2164 m, 30 Jun 2011, *Leg. Millaku, F.*; – Oshlak, 42° 11.562'N, 20° 54.249'E, 1956 m, 24 Jun 2019, *Leg. Berisha, N.*; – Albanian Alps of Kosovo: Mokna, 42° 49.505'N, 20° 20.461'E, 1888 m, 21 Jun 2012, *Leg. Millaku, F.*; – Bjeshka e Rusolisë, 42° 44.805'N, 20° 14.578'E, 2263 m, 21 Jun 2011, *Leg. Millaku, F.*; – Ishtedim, 42° 43.753'N, 20° 13.737'E, 1931 m, 28 Jun 2011, *Leg. Millaku, F.*; – Rrasa e Zogut, 42° 29.877'N, 20° 10.842'E, 2060 m, 27 Jun 2021, *Leg. Berisha, N.*; – Pashtrik Mt., 42° 12.082'N, 20° 31.875'E, 1426 m, 20 Jun 2019, *Leg. Berisha, N.*; – Shalë e Bajgorës: Kaçandoll, 42° 58.000'N, 21° 3.605'E, 1321 m, 03 Jul 2010, *Leg. Berisha, N.*

27. *Carex lazarei* Jac. Koopman, Niketić, Więclaw & Govaerts, Phytotaxa 422: 296 (2019).

A species endemic to the Balkan Mountains, specifically found on acidic grasslands and rocky slopes (Koopman et al. 2019). In Kosovo it has been found in high-montane and subalpine regions, where it grows on siliceous substrates in dry, open habitats.

Specimens: – Sharri Mts.: Konjushë Mt., 42°09'07"N, 20°57'23"E, 1846 m, 23 Jun 2024, *Leg. Berisha, N.*; – Vracë, 41°53'13"N, 20°44'01"E, 2168 m, 29 Jun 2011, *Leg. Berisha, N.*; – Bistër, 42°08'44"N, 20°58'24"E, 2082 m, 24 Jul 2021, *Leg. Berisha, N.*; – Brezovicë, 42°10'33"N, 21°03'01"E, 2048 m, 03 Jul 2007, *Leg. Krasniqi, E.*; – Albanian Alps of Kosovo: Bjeshka e Rusolisë, 42°44'27"N, 20°14'44"E, 2229 m,

24 Jun 2010, *Leg. Millaku, F.*; – Gjeravicë, 42°31'36"N, 20°08'34"E, 2085 m, 22 Jun 2011, *Leg. Rexhepi, F.*

28. *Carex lepidocarpa* Tausch, Flora 17: 179 (1834).

28.1. *Carex lepidocarpa* subsp. *lepidocarpa*

A species native to Europe and eastern Canada, specifically found in base-rich fens, calcareous swamps and lakeshores (Nikolić 2020). In Kosovo it was found in moist, calcareous habitats in the montane regions.

Specimens: – Malësi e Gjakovës, 42°23'45"N, 20°16'40"E, 561 m, 29 Jun 2024, *Leg. Berisha, N.*; – Bjeshka e Morinës, 42°23'56"N, 20°14'07"E, 512 m, 02 Jul 2021, *Leg. Millaku, F.*; – Sharri Mts.: Brod, 41°56'15"N, 20°42'28"E, 1901 m, 20 Aug 2023, *Leg. Berisha, N.*

29. *Carex leporina* L., Sp. Pl.: 973 (1753).

A species native to Eurasia, North Africa and parts of North America, specifically found in seasonally moist to wet habitats such as meadows, fields and open areas (Konrad et al. 2018). In Kosovo, it has been found in lowland to mountainous regions where it thrives in moist grasslands and open woodlands.

Specimens: – Sharri Mts.: Luboten Mt., 42°13'23"N, 21°09'43"E, 1378 m, 23 Jun 2016, *Leg. Berisha, N.*; – Firajë, 42°13'48"N, 21°05'27"E, 1368 m, 02 Jul 2020, *Leg. Berisha, N.*; – Brod, 41°57'26"N, 20°43'03"E, 1735 m, 14 Jul 2016, *Leg. Berisha, N.*; – Vracë, 41°53'43"N, 20°43'54"E, 2096 m, 09 Jul 2023, *Leg. Millaku, F.*; – Bistër, 42°09'23"N, 20°58'37"E, 1815 m, 24 Jul 2021, *Leg. Berisha, N.*; – Konjushë Mt., 42°09'40"N, 20°57'53"E, 1592 m, 23 Jun 2024, *Leg. Berisha, N.*; – Përrojet e Durlës, 42°11'04"N, 21°00'23"E, 1432 m, 03 Jul 2017, *Leg. Berisha, N.*; – Pashallore Mt., 42°15'08"N, 20°54'19"E, 1652 m, 27 Jul 2023, *Leg. Millaku, F.*; – Mushtisht, 42°16'24"N, 20°53'26"E, 1115 m, 21 Jun 2005, *Leg. Mala, Xh.*; – Bresanë (Opojë), 42°06'32"N, 20°44'04"E, 1240 m, 21 Jun 2007, *Leg. Mala, Xh.*; – Albanian Alps of Kosovo: Bogë, 42°45'37"N, 20°02'42"E, 1590 m, 09 Jun 2024, *Leg. Berisha, N.*; – Mokna, 42°48'07"N, 20°20'48"E, 1556 m, 21 Jun 2012, *Leg. Millaku, F.*; – Central Kosovo: Blinajë, 42°30'47"N, 20°57'27"E, 788 m, 13 May 2024, *Leg. Berisha, N.*; – Vasilevë, 42°37'35"N, 20°58'29"E, 726 m, 17 Jun 2024, *Leg. Berisha, N.*; – North Kosovo: Sërboc – Zveçan, 42°57'21"N, 20°50'26"E, 596 m, 03 Jul 1989, *Leg. Krivošej, Z.*

30. *Carex macrolepis* DC., Cat. Pl. Horti Monsp.: 89 (1813).

A sedge species native to parts of southern Europe, including Italy, Albania, Greece and Turkey. This species thrives in moist meadows, grasslands and near forests (Pignatti et al. 2018). In Kosovo, it was found in a white oak forest (*Quercus pubescens*) in a moist habitat on a serpentine substrate. This is a new species for Kosovo.

Specimens: – Malësi e Gjakovës, 42°20'02"N, 20°18'21"E, 528 m, 29 Jun 2024, *Leg. Berisha, N.* [UPH – 00002057].

31. *Carex melanostachya* Willd., Sp. Pl. 4: 299 (1805).

A species native to Central and Eastern Europe and Western Asia, specifically found in wet grasslands, marshes and riverbanks, often on slightly saline or calcareous soils (Konrad et al. 2018). In Kosovo, it has been recorded in lowland regions and thrives in moist, open habitats.

Specimens: – Ligatina e Hencit (Fushë Kosovë), 42°34'39"N, 21°02'52"E, 536 m, 12 May 2024, *Leg. Berisha, N.*; – Harilaç (Fushë Kosovë), 42°35'34"N, 21°00'55"E, 560 m, 05 May 2024, *Leg. Berisha, N.*; – Talinoc (Ferizaj), 42°23'52"N, 21°10'10"E, 569 m, 09 May 2024, *Leg. Berisha, N.*

32. *Carex michelii* Host, Syn. Pl.: 507 (1797).

A species native to Central, Southern and Eastern Europe, extending as far as Turkey, the Caucasus and Iran. It specifically inhabits semi-arid grasslands, often on calcareous soils. In Kosovo, it has been found in forest clearings in montane regions.

Specimens: – Gërmi (Prishtinë), 42°40'52"N, 21°13'28"E, 826 m, 29 May 1962, *Leg. Nimolić, V.*

33. *Carex muricata* L., Sp. Pl.: 974 (1753).

33.1. *Carex muricata* subsp. *muricata*

A species native to Europe and western Asia, specifically found in calcareous grasslands and forests (Müller et al. 2021). In Kosovo it has been found in similar habitats and thrives on well-drained soils in montane to high montane regions. This is a new taxon for Kosovo.

Specimens: – Albanian Alps of Kosovo: Bjeshka e Deçanit, 42°33'40"N, 20°15'42"E, 873 m, 04 Jul 2023, *Leg. Berisha, N.* [UPH – 00002058]; – Liqenat, 42°40'33"N, 20°04'32"E, 1633 m, 28 Jun 2020, *Leg. Berisha, N.* [UPH – 00002059]; – Zalli i Rupës, 42°34'50"N, 20°08'34"E, 1301 m, 25 Jun 2024, *Leg. Berisha, N.* [UPH – 00002060]; – Mokna, 42°47'53"N, 20°24'17"E, 1415 m, 06 Jul 2012, *Leg. Millaku, F.* [UPH – 00002061]; – Bjeshka e Rusolisë, 42°44'51"N, 20°17'07"E, 1361 m, 29 Jun 1987, *Leg. Millaku, F.* [UPH – 00002062]; – Bogë, 42°45'35"N, 20°03'58"E, 1620 m, 08 Jun 2024, *Leg. Berisha, N.* [UPH – 00002063]; – Sharri Mts.: Brod, 41° 56.981'N, 20° 42.744'E, 1842 m, 01 Aug 2023, *Leg. Berisha, N.* [UPH – 00002064]; – Central Kosovo: Blinajë, 42° 31.259'N, 20° 58.525'E, 682 m, 13 May 2024, *Leg. Berisha, N.* [UPH – 00002065]; – Gërmi (Prishtinë), 42° 39.759'N, 21° 13.553'E, 931 m, 24 May 2024, *Leg. Berisha, N.* [UPH – 00002066]

34. *Carex nigra* (L.) Reichard, Fl. Moeno-francof. 2: 96 (1778).

34.1. *Carex nigra* subsp. *nigra*

A species native to Europe, western Asia and North America, occurring in a variety of habitats, in wetlands, marshes, near water sources, in *Sphagnum*-dominated springs and along river banks, often on calcareous or acidic soils (Konrad et al. 2018). In Kosovo, it has been found in high montane to subalpine regions, where it thrives in fens and near high-mountain lakes. *Carex nigra* subsp. *nigra* is epistomatic (sometimes with a few stomata on the abaxial surface of the leaves), whereas the subspecies *intricata* (Tineo ex Guss.) Rivas Mart. (mainly distributed in the western Mediterranean region) and *transcaucasica* (T.V.Egorova) Jim.Mejías, G.E.Rodr.-Pal., Amini Rad & Martin-Bravo (from the Balkans to Iran) are both amphistomatic. Further research should reveal whether subsp. *transcaucasica* occurs also in Kosovo, as genomic studies suggest that at least some of the Balkan *C. nigra* material should be assigned to the subsp. *transcaucasica* (Valdés-Florido et al. 2024).

Specimens: – Albanian Alps of Kosovo: Gjeravicë, 42° 31.733'N, 20° 8.163'E, 2288 m, 23 Jul 2023, *Leg. Berisha, N.*; – Bogë, 42° 46.217'N, 20° 3.512'E, 1618 m, 08 Jun 2024, *Leg. Berisha, N.*; – Hajlë, 42° 45.782'N, 20° 5.927'E, 1811 m, 09 Jul 2007, *Leg. Millaku, F.*; – Bjeshka e Rusolisë, 42° 45.148'N, 20° 15.287'E, 2051 m, 21 Jul 2010, *Leg. Millaku, F.*; – Bjeshka e Dobroshit, 42° 34.168'N, 20° 5.310'E, 2041 m, 25 Jun 2024, *Leg. Berisha, N.*; – Sharri Mts.: Luboten Mt., 42° 12.448'N, 21° 6.551'E, 2072 m, 24 Jun 2017, *Leg. Berisha, N.*; – Konjushë Mt., 42° 8.423'N, 20° 57.756'E, 2248 m, 23 Jun 2024, *Leg. Berisha, N.*; – Shutman, 41° 54.818'N, 20° 44.629'E, 2161 m, 31 Jul 2023, *Leg. Millaku, F.*; – Brod, 41° 57.553'N, 20° 42.281'E, 1769 m, 01 Aug 2020, *Leg. Krasniqi, E.*; – Bresanë (Opojë), 42° 3.892'N, 20° 45.696'E, 1982 m, 21 Jun 2007, *Leg. Mala, Xh.*; – Ujërat e Qeta, 42° 6.711'N, 20° 53.147'E, 1756 m, 30 Jun 2014, *Leg. Mala, Xh.*

35. *Carex ornithopoda* Willd., Sp. Pl. 4: 255 (1805).

35.1. *Carex ornithopoda* subsp. *ornithopoda*

A taxon native to Europe spreading as far as Anatolia. It is specifically found on dry grasslands, in open woodlands, on calcareous as well as siliceous grasslands and on rocky slopes (Jermy et al. 2007). In Kosovo, it has been found in high montane regions and thrives in well-drained, and well insolate habitats.

Specimens: – Sharri Mts.: Oshlak, 42° 11.147'N, 20° 56.389'E, 1491 m, 30 May 2018, *Leg. Krasniqi, E.*; – Albanian Alps of Kosovo: Ujerat e Kuqe, spruce meadows forest clearings, no. coord., 1791 m, 03 Jul 1952, *Leg. Rudski, J.*; – Bogiqevicë, calc. grassland, no. coord., 1350 m, 08 Jul 1979, *Leg. Rexhepi, F.*; – Sejnovë, 42° 48.995'N, 20° 17.123'E, 1708 m, 28 Jul 1969, *Leg. Anonymous*; – Zalli i Rupës, 42° 33.835'N, 20° 7.047'E, 1721 m, 19 May 2024, *Leg. Berisha, N.*; – Koritnik Mt., no coord., 14 Jul 1936, *Leg. Oelizm, H.*; Koritnik Mt., 42° 7.076'N, 20° 34.500'E, 1497 m, 29 May 2012, *Leg. Millaku, F.*

36. *Carex otomana* Molina & Llamas, Bot. J. Linn. Soc. 156: 404 (2008).

A species native to Europe spreading as far as Central Asia. It is specifically found in anthropogenically managed pastures, meadows and tall herbaceous meadows on fertile, deep soils (Molina et al. 2008). In Kosovo, it has been found in montane regions, where it thrives in damp meadows and open forests. In Kosovo, this species was previously erroneously known as *Carex leersii* F.W.Schultz.

Specimens: – Sharri Mts.: Brod, 41° 57.043'N, 20° 43.133'E, 1644 m, 20 Aug 2023, *Leg. Berisha, N.*; – Albanian Alps of Kosovo: Gryka e Rugovës, 42° 41.906'N, 20° 8.618'E, 1019 m, 09 Jun 2008, *Leg. Rexhepi, F.*; – Lumbardhi i Deçanit, 42° 33.015'N, 20° 15.457'E, 682 m, 19 Aug 2023, *Leg. Berisha, N.*; – Zalli i Rupës, 42° 34.485'N, 20° 7.978'E, 1472 m, 19 May 2024, *Leg. Berisha, N.*

37. *Carex otrubae* Podp. in Spisy Prír. Fak. Masarykovy Univ. 12: 15 (1922).

A species native to Europe, parts of Asia and North Africa, specifically found in moist habitats such as marshes, ditches, riverbanks and wet meadows (Müller et al. 2021). In Kosovo, it has been found in lowland to mountainous regions and thrives in moist, nutrient-rich soils.

Specimens: – Central Kosovo: Ligatina e Hencit (Fushë Kosovë), 42° 34.681'N, 21° 2.921'E, 536 m, 12 May 2024, *Leg. Berisha, N.*; – Lumi Drenicë (Bardh i Vogël), 42° 36.510'N, 21° 2.026'E, 533 m, 09 Jun 2024, *Leg. Krasniqi, E.*; – Golesh Mt., 42° 35.244'N, 20° 59.691'E, 681 m, 12 Jun 2015, *Leg. Krasniqi, E.*; – Vasilevë, 42° 37.797'N, 20° 58.257'E, 723 m, 17 Jun 2024, *Leg. Berisha, N.*; – Harilaç (Fushë Kosovë), 42° 35.348'N, 21° 0.569'E, 566 m, 05 May 2024, *Leg. Berisha, N.*; – Shtime, 42° 25.981'N, 21° 1.056'E, 591 m, 24 Jun 2017, *Leg. Mala, Xh.*; – Talinoc (Ferizaj), 42° 23.973'N, 21° 10.836'E, 566 m, 28 May 2023, *Leg. Mala, Xh.*; – Gazimestan, 42° 41.100'N, 21° 7.228'E, 582 m, 02 Jul 2022, *Leg. Berisha, N.*; – North Kosovo: Mitrovicë, 42° 52.766'N, 20° 52.458'E, 508 m, 17 May 2022, *Leg. Berisha, N.*

38. *Carex pairae* F.W.Schultz, Flora 51: 303 (1868).

A species native to Europe and north-west Africa, specifically found in forest borders, meadows and disturbed areas (Jermy et al. 2007). In Kosovo, it has been recorded in a montane region, thriving in thermophilous forest borders. This is a new species for Kosovo.

Specimens: – Gërmi (Prishtinë), 42° 40.686'N, 21° 12.268'E, 760 m, 01 Jun 2024, *Leg. Berisha, N.* [UPH - 00002067].

39. *Carex pallescens* L., Sp. Pl.: 977 (1753).

A species native to the northern hemisphere, including Europe, Asia and North America. It specifically inhabits moist meadows, open woodlands and grassy clearings and often favours acidic to neutral soils (Müller et al. 2021) though present also on calcareous soils (Luceño et al. 2023). In

Kosovo, it has been found in high mountain regions where it thrives in semi-shaded, damp environments.

Specimens: – Sharri Mts.: Përrojet e Durlës, 42° 10.339'N, 21° 0.877'E, 1649 m, 30 Jul 2022, *Leg. Berisha, N.*; – Luboten Mt., 42° 13.691'N, 21° 9.927'E, 1209 m, 24 Jun 2017, *Leg. Berisha, N.*; – Oshlak, 42° 11.786'N, 20° 56.119'E, 1409 m, 02 Jun 2017, *Leg. Berisha, N.*; – Pashallore Mt., 42° 15.032'N, 20° 54.897'E, 1659 m, 27 Jul 2023, *Leg. Berisha, N.*; – Bistër, 42° 9.971'N, 20° 58.320'E, 1504 m, 24 Jul 2021, *Leg. Berisha, N.*; – Albanian Alps of Kosovo: Hajlë, 42° 45.548'N, 20° 5.973'E, 1769 m, 09 Jul 2007, *Leg. Millaku, F.*; – Mokna, 42° 49.850'N, 20° 21.008'E, 2019 m, 21 Jun 2012, *Leg. Millaku, F.*; – Bogë, 42° 45.683'N, 20° 3.577'E, 1609 m, 08 Jun 2024, *Leg. Berisha, N.*; – Rekë e Allagës, 42° 43.817'N, 20° 10.947'E, 1741 m, 17 Jun 2023, *Leg. Berisha, N.*

40. *Carex paniculata* L., Cent. Pl. 1: 31 (1755).

40.1. *Carex paniculata* subsp. *paniculata*

A species native to Europe, western Asia, and parts of North America. It specifically inhabits wet, often more or less shady areas such as peaty swamps, marshes, and the edges of lakes, canals, and streams (Jermy et al. 2007). In Kosovo, it has been recorded in similar habitats, thriving in moist, nutrient-rich soils of high-mountain regions.

Specimens: – Sharri Mts.: Pashallore Mt., 42° 15.065'N, 20° 54.845'E, 1679 m, 27 Jul 2023, *Leg. Berisha, N.*; – Brezovicë, 42° 10.814'N, 21° 2.608'E, 1900 m, 17 Jul 2020, *Leg. Krasniqi, E.*; – Vracë, 41° 52.924'N, 20° 39.789'E, 1722 m, 19 Jun 2023, *Leg. Millaku, F.*; – Oshlak, 42° 12.278'N, 20° 51.780'E, 1752 m, 24 Jun 2019, *Leg. Krasniqi, E.*; – Luboten Mt., 42° 12.902'N, 21° 8.248'E, 1715 m, 24 Jun 2017, *Leg. Berisha, N.*; – Brod, 41° 57.441'N, 20° 42.928'E, 1601 m, 14 Jul 2016, *Leg. Mala, Xh.*; – Përrojet e Durlës, 42° 10.344'N, 21° 0.868'E, 1630 m, 03 Jul 2017, *Leg. Berisha, N.*; – Albanian Alps of Kosovo: Bogë, 42° 46.077'N, 20° 4.033'E, 1656 m, 08 Jun 2024, *Leg. Berisha, N.*

41. *Carex pendula* Huds., Fl. Angl.: 352 (1762).

A species native to western, central and southern Europe and extending to north-west Africa and parts of the Middle East. It specifically inhabits moist, shady environments such as woodlands, stream banks and hedgerows and often favours heavy clay soils (Müller et al. 2021). In Kosovo, it has been recorded in similar habitats and thrives on moist, nutrient-rich soils from the lowlands to the mountainous regions.

Specimens: – Zalli i Rupës, 42° 34.188'N, 20° 7.868'E, 1488 m, 25 Jun 2024, *Leg. Berisha, N.*; – Gërmi (Prishtinë), 42° 40.681'N, 21° 13.875'E, 931 m, 25 May 1989, *Leg. Anonymus*; – Sharri Mts.: Gotovushë, 42° 14.153'N, 21° 4.428'E, 1071 m, 10 Aug 2023, *Leg. Millaku, F.*

42. *Carex pyrenaica* Wahlenb. in Kongl. Vetensk. Acad. Nya Handl., nov. Ser. 24: 139 (1803).

42.1. *Carex pyrenaica* subsp. *pyrenaica*

A species native to the mountainous regions of Europe. It specifically inhabits moist meadows and stream banks, often at higher altitudes (Davis, 1985). In Kosovo it has been found in subalpine zones and thrives on moist, well-drained soils, also near snow-bed vegetation.

Specimens: – Sharri Mts.: Liqeni i Jazhincës, 42° 9.408'N, 20° 59.738'E, 2070 m, 10 Jul 2013, *Leg. Berisha, N.*; – Bistër, 42° 8.714'N, 20° 57.745'E, 2268 m, 24 Jul 2021, *Leg. Berisha, N.*

43. *Carex remota* L., Fl. Angl.: 24 (1754).

A species native to Europe, West Asia and parts of North Africa, specifically found in moist forests, riparian forests, and shady stream banks (Müller et al. 2021). In Kosovo, it has been found in mountainous regions where it thrives in moist gallery forests and well-drained soils.

Specimens: – Sharri Mts.: Firajë: 42° 15.822'N, 21° 6.160'E, 731 m, 23 Aug 2022, *Leg. Mala, Xh.*; – Lubinjë e Poshtme, 42° 7.305'N, 20° 51.226'E, 1294 m, 01 Aug 2023, *Leg. Krasniqi, E.*; – Malet e Jezercës, Petrovë: 42° 23.884'N, 21° 1.288'E, 770 m, 20 May 2020, *Leg. Berisha, N.*; – Central Kosovo: Blinajë, 42° 31.278'N, 20° 58.646'E, 690 m, 13 May 2024, *Leg. Berisha, N.*

44. *Carex riparia* Curtis, Fl. Londin. 2(4): t. 60 (1783).

A robust, rhizomatous species native to Europe and parts of Asia and North Africa. It is specifically found in moist habitats such as marshes, swamps, riverbanks and the edges of lakes (Jermy et al. 2007). In Kosovo, it has been found in lowland regions where it thrives in nutrient-rich, waterlogged soils in swamps and on riverbanks.

Specimens: – Ligatina e Hencit (Fushë Kosovë), 42° 34.917'N, 21° 2.835'E, 536 m, 12 May 2024, *Leg. Berisha, N.*; – Dobrajë (Lipjan), 42° 33.049'N, 21° 1.636'E, 551 m, 12 May 2024, *Leg. Berisha, N.*; – Graboc i Epërm (Obiliç), 42° 39.166'N, 20° 59.964'E, 551 m, 13 May 2024, *Leg. Krasniqi, E.*; – Miradi e Epërme (Fushë Kosovë), 42° 35.825'N, 21° 6.224'E, 548 m, 10 May 2024, *Leg. Berisha, N.*; – Medvec (Lipjan), 42° 33.441'N, 21° 1.738'E, 548 m, 12 May 2024, *Leg. Berisha, N.*; – Jezercë (Ferizaj), 42° 26.507'N, 20° 54.508'E, 794 m, 10 Jul 2023, *Leg. Berisha, N.*; – Talinoc (Ferizaj), 42° 24.009'N, 21° 10.903'E, 566 m, 09 May 2024, *Leg. Berisha, N.*; – Harilaç (Fushë Kosovë), 42° 35.416'N, 21° 0.929'E, 550 m, 05 May 2024, *Leg. Berisha, N.*; Mitrovicë, 42° 52.268'N, 20° 52.951'E, 503 m, 11 May 2024, *Leg. Berisha, N.*; – Shtime, 42° 26.148'N, 21° 1.083'E, 594 m, 09 May 2024, *Leg. Berisha, N.*

45. *Carex rostrata* Stokes in W. Withering, Bot. Arr. Brit. Pl., ed. 2, 2: 1059 (1787) nom. cons.

A rhizomatous taxon native to the Holarctic of Europe, Asia and North America. It specifically inhabits wetlands such as marshes, bogs, fens and the margins of lakes and rivers (Müller et al. 2021). In Kosovo, it has been recorded in similar habitats and thrives in nutrient-rich, waterlogged soils in high montane regions.

Specimens: – Sharri Mts.: Bistër, 42° 8.572'N, 20° 57.818'E, 2198 m, 09 Jul 2018, *Leg. Berisha, N.*; – Ujërat e Qeta, no coord., 1977 m, 29 Jun 1980, *Leg. Rexhepi, F.*; – Vracë, 41° 53.367'N, 20° 43.405'E, 2084 m, 29 Jun 2011, *Leg. Millaku, F.*; – Koritnik Mt., 42° 5.461'N, 20° 34.098'E, 1981 m, 29 May 2012, *Leg. Krasniqi, E.*; – Albanian Alps of Kosovo: Mokna, 42° 49.605'N, 20° 21.409'E, 1969 m, 21 Jun 2012, *Leg. Millaku, F.*; – Liqenat (Kuqishtë), 42° 40.173'N, 20° 5.526'E, 1869 m, 28 Jun 2020, *Leg. Berisha, N.*

46. *Carex rupestris* All., Fl. Pedem. 2: 264 (1785).

A rhizomatous species native to the subarctic and temperate regions of the northern hemisphere of Europe, Asia, and North America. It specifically inhabits dry to mesic heaths, meadows, and rocky outcrops (Müller et al. 2021). In Kosovo, it has been recorded in alpine and subalpine zones, thriving in well-drained, rocky soils and wind-exposed short base-rich grasslands.

Specimens: – Albanian Alps of Kosovo: Liqenat (Kuqishtë), 42° 40.187'N, 20° 4.945'E, 2011 m, 28 Jun 2020, *Leg. Berisha, N.*; – Koritnik Mt., 42° 5.419'N, 20° 33.705'E, 2109 m, 28 Jul 2013, *Leg. Krasniqi, E.*

47. *Carex sempervirens* Vill., Hist. Pl. Dauphiné 2: 214 (1787).

47.1. *Carex sempervirens* subsp. *pseudotristsis* (Domni) Pawł., Publ. Inst. Bot. Univ. Jagell. Cracov. 1937: 5 (1937).

A tussock-forming species native to the mountainous regions of Europe, specifically found in nutrient-poor grasslands, rocky slopes and alpine meadows at high altitudes (Luceño 2008). In Kosovo, it has been found in subalpine and alpine zones, where it thrives in well-drained, silicate grasslands. This is a newly recorded species for Kosovo.

Specimens: – Sharri Mts.: Luboten Mt., 42° 12.949'N, 21° 7.611'E, 1989 m, 27 Jun 2019, *Leg. Berisha, N.* [UPH - 00002068]; – Vracë, 41° 52.884'N, 20° 43.448'E, 2151 m, 29 Jun 2011, *Leg. Millaku, F.* [UPH -

00002069]; – Bjeshka e Lumbardhit të Prizrenit, 42° 11.576'N, 20° 49.640'E, 1284 m, 12 Aug 2023, *Leg. Berisha, N.* [UPH - 00002070]; – Albanian Alps of Kosovo: Gjeravicë, 42° 31.596'N, 20° 8.054'E, 2210 m, 23 Jul 2023, *Leg. Berisha, N.* [UPH - 00002071].

48. *Carex spicata* Huds., Fl. Angl.: 349 (1762).

48.1. *Carex spicata* subsp. *spicata*

A caespitose species native to Europe, parts of Western Asia and North Africa. It usually grows in grasslands, meadows, roadsides and disturbed areas and often favours heavy, slightly alkaline soils (Jermy et al. 2007). In Kosovo it has been recorded in similar habitats. It thrives on well-drained, nutrient-rich soils from the lowlands to the mountain regions.

Specimens: – Ligatina e Hencit (Fushë Kosovë), 42° 34.457'N, 21° 2.364'E, 538 m, 12 May 2024, *Leg. Berisha, N.*; – Dobrajë (Lipjan), 42° 33.455'N, 21° 1.776'E, 547 m, 12 May 2024, *Leg. Berisha, N.*; – Koretin (Kamenicë), no coord., 808 m, 11 Jul 1990, *Leg. Pajazitaj, Q.*

49. *Carex sylvatica* Huds., Fl. Angl.: 353 (1762).

49.1. *Carex sylvatica* subsp. *sylvatica*

A densely tufted species native to deciduous forests throughout Europe and parts of Asia as far as north Iran. It specifically inhabits moist, shady environments and thrives in heavy, humus-rich soils (Jermy et al. 2007). In Kosovo, it has been recorded in similar habitats, favouring moist, shady forest soils.

Specimens: – Albanian Alps of Kosovo: Bogë, 42° 45.413'N, 20° 3.320'E, 1501 m, 09 Jun 2024, *Leg. Berisha, N.*; – Zalli i Rupës (Deçan), 42° 33.619'N, 20° 7.201'E, 1553 m, 19 May 2024, *Leg. Berisha, N.*; – Drelaj, 42° 40.855'N, 20° 7.825'E, 1660 m, 10 Jun 2024, *Leg. Berisha, N.*; – Sharri Mts.: Pashallore, 42° 15.520'N, 20° 54.825'E, 1570 m, 27 Jul 2023, *Leg. Berisha, N.*; – Luboten Mt., 42° 13.601'N, 21° 10.102'E, 1249 m, 20 Jun 2019, *Leg. Berisha, N.*; – Vërbeshiticë (Shtërpçë), 42° 14.124'N, 20° 56.649'E, 1289 m, 11 Jul 2023, *Leg. Mala, Xh.*

50. *Carex tomentosa* L., Mant. Pl. 1: 123 (1767).

A species native to Europe and parts of Asia, specifically found in seasonally moist meadows, ditch margins and light, slightly moist deciduous forests (Müller et al. 2021). In Kosovo, it has been recorded in similar habitats and thrives on calcareous, nutrient-poor soils in partially shaded areas.

Specimens: – Gërmi (Prishtinë), 42° 40.120'N, 21° 13.518'E, 830 m, 24 May 2024, *Leg. Berisha, N.*; – Llapushnik, 42° 33.897'N, 20° 51.418'E, 711 m, 30 Apr 2024, *Leg. Berisha, N.*; – Harilaç (Fushë Kosovë), 42° 35.394'N, 21° 0.523'E, 568 m, 05 May 2024, *Leg. Berisha, N.*; – Bresje (Fushë Kosovë), 42° 37.557'N, 21° 5.939'E, 529 m, 06 May 2024, *Leg. Berisha, N.*

51. *Carex umbrosa* Host, Icon. Descr. Gram. Austriac. 1: 52 (1801).

51.1. *Carex umbrosa* subsp. *umbrosa*

A caespitose taxon native to Europe and parts of Asia, specifically found in grassy areas of deciduous forests, where it thrives in moist, shady environments (Konrad et al. 2018). In Kosovo it has been recorded in similar habitats, favouring well-drained, calcareous soils of the montane zone. This species is newly recorded for Kosovo.

Specimens: – Svirçë (Kamenicë), 42° 41.947'N, 21° 34.421'E, 819 m, 07 May 2023, *Leg. Berisha, N.* [UPH - 00002072]; – Llapushnik, 42° 33.761'N, 20° 52.128'E, 733 m, 30 Apr 2024, *Leg. Berisha, N.* [UPH - 00002073]; – Sharri Mts.: Pashallore, 42° 15.119'N, 20° 55.150'E, 1589 m, 27 Jul 202, *Leg. Berisha, N.* [UPH - 00002074]; – Albanian Alps of Kosovo: Bogë, 42° 45.525'N, 20° 3.409'E, 1550 m, 08 Jun 2024, *Leg. Berisha, N.* [UPH - 00002075].

52. *Carex vesicaria* L., Sp. Pl.: 979 (1753).

A species native to temperate regions of the northern hemisphere of Europe, Asia and North America. It is specifically found in wetlands such as marshes, swamps, lake and pond shores and wet meadows, in areas that are seasonally flooded in spring but can dry out later in the year (Müller et al. 2021). In Kosovo, it has been recorded in a similar habitat, thriving in moist, nutrient-rich soil nearby a lake in the high mountainous region. This species is newly recorded for Kosovo.

Specimens: – Albanian Alps of Kosovo: Liqenat (Kuqishtë), 42° 40.097'N, 20° 5.483'E, 1861 m, 28 Jun 2020, *Leg. Berisha, N.* [UPH - 00002086].

53. *Carex* × *ruedtii* Kneuck., in M.A.Seubert, Excurs.-Fl. Baden, ed. 5: 67 (1891).

[*C. flava* × *C. lepidocarpa*]

Carex × *ruedtii* is a rather rare hybrid, documented in various parts of Europe. It prefers mineral-rich bogs where there is a regular through-flow of water (Koopman 2010, 2022). In Kosovo it was recorded in a wet meadow. It is a newly recorded hybrid for Kosovo.

Specimens: – Sharri Mts.: Brod, 41° 57.800'N, 20° 42.806'E, 1526 m, 20 Aug 2023, *Leg. Berisha, N.* [UPH - 00002087].

54. *Carex* × *subviridula* Fernald, Rhodora 35: 231 (1933).

[*C. flava* × *C. oederi*]

Carex × *subviridula* is a rather rare hybrid, specifically found in habitats similar to its parent species, such as wetlands, fens, and moist meadows, often in areas with calcareous or slightly acidic soils (Więclaw 2014; Koopman 2022). In Kosovo, *C. × subviridula* has been observed in the subalpine region, where it thrives in fen vegetation of slightly acidic fens. It is a newly recorded hybrid for Kosovo. However, despite the presence of its hybrid, we have not recorded the parental species *Carex oederi* Retz. in this area. Nevertheless, we expect that additional field surveys will confirm its presence.

Specimens: – Sharri Mts.: Luboten Mt., 42° 12.773'N, 21° 6.938'E, 1969 m, 08 Jul 2018, *Leg. Berisha, N.* [UPH - 00002088].

Discussion

This study has resulted in the most comprehensive and taxonomically verified checklist of *Carex* taxa in Kosovo to date. The recorded 52 species, 19 subspecies, 1 variety and 2 hybrids constitute a considerable increase in the known *Carex* diversity in the region. The confirmation of 15 taxa newly recorded for the flora of Kosovo underlines the floristic gaps that still exist in this Balkan country.

The high representation of *Carex* taxa in subalpine and alpine ecosystems, especially in the Sharri Mountains and the Albanian Alps, confirms the ecological importance and habitat specificity of this genus. Many taxa, such as *C. castroviejoi*, *C. sempervirens* subsp. *pseudotristis* and *C. lazareii*, are restricted to serpentine or silicate substrates, emphasizing their importance as habitat specialists and potential indicators of habitat integrity.

Compared to neighbouring countries such as Albania (Martín-Bravo et al. 2022), Croatia (Nikolić 2020) and Serbia (Niketić and Tomović 2018), the diversity of the genus *Carex* in Kosovo is now well documented and more accurately represented due to this comprehensive study. While the country has reached a comparable level of knowledge regarding the richness of *Carex*, further field research in underexplored regions could reveal additional taxa. In particular, some species

already reported (e.g. *Carex arenaria*, *C. tricolor*) have not yet been confirmed, underlining the need for more targeted surveys.

The taxonomic challenges within the genus, such as hybridisation (e.g. *C. × ruedtii* and *C. × subviridula*) and morphological plasticity, have been addressed by using modern identification keys and comparative herbarium studies. This approach has not only corrected numerous misidentifications but also improved our understanding of infraspecific variation in the region. *Carex* hybrids can usually be recognised by empty utricles and anthers that do not dehisce, hidden under the male glumes (Jermy et al. 2007). Moreover, hybrids like *C. × ruedtii* and *C. × subviridula* are generally morphologically intermediate compared to their parental taxa or they show a mosaic of parental, intermediate and unique characters (Więclaw and Wilhelm 2014).

The discovery of narrowly distributed and habitat-specific taxa also has conservation implications. Many of these sites are located in national parks but are not actively monitored.

This updated checklist and distribution assessment contributes significantly to the understanding of *Carex* diversity in the Balkans. It provides a taxonomic basis for future ecological, biogeographical and conservation research. It also emphasizes the need for systematic botanical inventories, especially in areas such as Kosovo that are rich in biodiversity but have historically been unexplored.

Non-confirmed records of *Carex* taxa

Drawing on several key sources for the genus in our region (Josifović 1976, Sarić and Diklić 1986, Niketić and Tomović 2018), we have not been able to confirm the presence of the 16 *Carex* taxa previously reported for Kosovo in Tab. 2.

Tab. 2. Non-confirmed *Carex* taxa in Kosovo.

No.	Taxon
1.	<i>Carex appropinquata</i> Schumach.
2.	<i>Carex brevicollis</i> DC.
3.	<i>Carex elongata</i> L.
4.	<i>Carex foetida</i> All.
5.	<i>Carex fuliginosa</i> Schkuhr
6.	<i>Carex leersii</i> F.W.Schultz
7.	<i>Carex limosa</i> L.
8.	<i>Carex montana</i> L.
9.	<i>Carex myosuroides</i> Vill.
10.	<i>Carex oederi</i> Retz.
11.	<i>Carex ornithopoda</i> subsp. <i>ornithopodioides</i> (Hausm.) Nyman
12.	<i>Carex panicea</i> L.
13.	<i>Carex pilosa</i> Scop.
14.	<i>Carex praecox</i> Schreb.
15.	<i>Carex strigosa</i> Huds.
16.	<i>Carex vulpina</i> L.

Our review of all available herbarium specimens and field observations revealed that these records were either misidentifications (*C. appropinquata*, *C. leersii*, *C. montana*, *C. pilosa*, *C. praecox* and *C. vulpina*), the specimens being assigned erroneously to other *Carex* taxa, or were entirely absent from their reported habitats in Kosovo.

Accurate taxonomic identification is essential for understanding regional species diversity. In the case of *Carex*, a genus known for its morphological complexity, misidentifications are not uncommon (Clerc-Blain et al. 2009). The results of this study emphasise the need to regularly review historical records and herbarium specimens with taxonomic expertise (Więclaw et al. 2021). Although future field expeditions and broader surveys may reveal some of these *Carex* taxa in Kosovo, our current evidence indicates that, to date, they remain unverified.

Diversity, distribution, and rarity of *Carex* taxa in Kosovo

Carex taxa play a central role in maintaining wetland ecosystem functions. Their dense, fibrous root systems stabilise soil by reducing erosion and promoting sediment retention along riparian zones. Moreover, these taxa enhance water infiltration and retention, moderate runoff patterns, and thereby promote nutrient cycling and overall water quality. Given their sensitivity to hydrological changes and pollutant inputs, *Carex* taxa are frequently used as bioindicators in wetland monitoring programmes, offering valuable insights into ecosystem health (Yuan et al. 2019).

The *Carex* flora of Kosovo exhibits notable diversity, with currently 52 species within 4 different subgenera. Geographically, the documentation of these taxa spans various regions of Kosovo. The Sharri Mountains and the Albanian Alps, both national parks, are particularly significant, with 36 taxa and 90 records, and 25 taxa and 62 records, respectively. These figures underscore their roles as major reservoirs for *Carex* diversity, although the high record counts may include multiple observations from the same localities. Additionally, substantial records originate from other areas, such as Pashallore Mt., low meadows of Kosovo plain and Malësia e Gjakovës, demonstrating that *Carex* diversity is widespread and not confined solely to the two major mountain ranges. Within these broader regions, several hotspots emerge: Vracë and Brod each host 13 taxa, followed by Luboten Mt. with 12, Bogë with 10, and Bistër with 9 taxa. Other localities, including Bjeshka e Rusolisë, Pashallore Mt., Gërmi, Mokna, Ligatina e Hencit, Gjeravicë Mt., Blinajë, Zalli i Rupës, and Përrojet e Durlës, each record 7 or 8 taxa, indicating a clustered pattern of species richness.

Another important result of this study is the establishment of the rarity of some taxa. An analysis of locality data shows that several *Carex* taxa are known only from a single locality. For example, *C. depressa*, *C. digitata*, *C. distachya*, *C. macrolepis*, *C. michelii*, *C. pairae*, and *C. vesicaria* have all been recorded from single sites. These restricted occurrences may indicate true rarity - due to specific habitat requirements or historical isolation - or could reflect gaps in sampling. Nevertheless, taxa with such a narrow distribution are of particular conservation interest, as they are more vulnerable to environmental disturbance.

In view of these findings, targeted conservation measures are urgently needed. For instance, *C. vesicaria* is only known from Liqenat, where it thrives along the lake shore, a popular destination for tourists and mountain hikers - potentially increasing habitat disturbance. Similarly, *C. pairae* and *C. michelii*, recorded in the bushy vegetation and forest clearings of Gërmia, underscore the importance of designating Gërmia a regional park with unique conservation value. *Carex macrolepis*, found in Malësia e Gjakovës on serpentine soils near *Quercus* forests, is confined to a limited natural habitat that is subject to military exercises and is expected to become a strict military zone, further jeopardising its survival. Additionally, *C. depressa* from Pashallore Mt. and *C. flacca* subsp. *erythrostachys*, documented only in Golesh Mt. of central Kosovo, highlight the vulnerability of species with a very narrow distribution. Monitoring population trends and implementing targeted conservation measures in these areas are crucial for preserving these taxa,

their habitats, and the overall ecological integrity of Kosovo's landscapes (van Diggelen et al. 2006).

Finally, the patterns observed in Kosovo reflect broader trends in the Balkan region, where complex topography and diverse microhabitats have fostered high levels of endemism and floristic turnover (Martín-Bravo et al. 2022, Więclaw et al. 2019). Continued field research, particularly in understudied areas, is essential to refine our understanding of the distributional limits and conservation status of these taxa. Such efforts, coupled with molecular studies to resolve taxonomic ambiguities, will provide deeper insights into the evolutionary and ecological processes shaping sedge diversity in Kosovo and the Balkans.

Conclusions

This study provides the first verified checklist of *Carex* taxa for Kosovo. It confirms the occurrence of 52 species, including 19 subspecies and one variety, and two hybrids. There are 15 taxa newly reported for the flora of Kosovo; earlier reports of another 10 taxa remaining are refuted as so far unconfirmed. Although our extensive field surveys and herbarium reviews have provided an important basis for regional *Carex* diversity, further fieldwork is needed to update these results and ensure that all details are accurately documented. In addition, molecular studies would be invaluable for clarifying the phylogenetic relationships among these taxa, clarifying taxonomic uncertainties and prioritising conservation efforts. It is essential that government agencies conduct systematic assessments of the conservation status of these taxa, especially those with restricted distributions, in order to develop effective management and conservation strategies.

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Author contribution statement

N.B. designed the research, obtained the research grant, conducted and organised the field surveys and sample collections, performed taxonomic work, prepared the first draft of the manuscript and the final version; F.M. conducted the field surveys and sample collections, worked on the taxonomy of taxa, examined and prepared herbarium specimens, and wrote/edited parts of the manuscript; E.K. conducted the field surveys and sample collections, performed taxonomic work, and wrote parts of the manuscript; R.C. examined and prepared herbarium specimens at different stages of the work, performed taxonomic work, and wrote/edited parts of the manuscript; X.M. conducted the field surveys and sample collections, performed taxonomic work, and assisted in herbarium specimen collections; H.W. performed taxonomic work, verified the final taxa identifications, and contributed to the manuscript structure and writing; J.K. performed taxonomic work, verified the final taxa identifications, and contributed to the manuscript structure and writing.

All authors contributed to the concept and implementation of the study and took part in the final revision, discussion, and approval of the manuscript.

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