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CONSERVATION STATUS OF THE ENDEMIC AND NEAR ENDEMIC PLANT TAXA OF THE KORÇA REGION, ALBANIA

SUMMARY

Endemic and near endemic taxa are good indicators of habitat quality and the evaluation of ecosystem health. Furthermore, they are key indicators for the elaboration of conservation policies and strategies for the protection of biodiversity in national or global scale. Using IUCN categories and criteria, we assessed the national conservation status of 24-endemic and near endemic plant taxa from Korça region in the south-eastern part of Albania. Only 11-taxa have been assessed before referring the National Red List of 2013, whereas all the other taxa are assessed for the first time in this study for the Albanian National Red List. The existing data collected during plant monitoring in the years 2019-2022 allow us to assess the conservation status using criteria B, C and D. One taxon is assessed as CR, nine taxa as EN, four taxa as VU, six taxa as LC and four others as DD. Out of 24-assessed taxa only six of them, *Acantholimon albanicum*, *Centaurea pindicola*, *C. shumkana*, *Dichoropoetalum stridii, Heliosperma pusillum* subsp. *chromodontum*, *Oxytropis dinarica* subsp. *weberi* occur within the current territory of the protected areas of Albania, while three others, *Centaurea candelabrum*, *Dianthus galicicae* and *Odontarrhena albiflora* occurs outside the network of protected areas. The distribution range of 15-other taxa occurs partly within and/or outside of the protected areas of Albania. Eight taxa out of 24 assessed are Albanian endemics and 16-others are near endemics which have a limited distribution range even in the neighbouring territories of Greece and North Macedonia.

Based on the reference list of threats of IUCN, the assessed endemic and near endemic taxa of Korça district are directly or indirectly threatened by climate change, overgrazing and natural biotic and abiotic processes (abiotic natural processes and reduced fecundity).

INTRODUCTION

Plants, due to photosynthesis, are fundamental for our life because we provide our food, medicine and oxygen from them. In the conditions of rapid climate changes and global warming, the loss of biodiversity represent the most important challenge for researchers, policy-makers and conservation CSOs. According to WWF (2020) the number of species at risk is growing all the time and there are already over a million species in danger or at risk of disappearing. The number of documented terrestrial plant extinctions is twice as high as for mammals, birds and amphibians combined (Humphreys *et al.*, 2019) and Mediterranean region is one of the most threatened within Europe in which at least 1,677 species out of 15,060 assessed European species are threatened with extinction, according to IUCN (iucnredlist.org/regions/Europe). The loss of biodiversity due to climate change, human impacts and invasion of alien species makes it even more necessary to take conservative programmes and halt its loss (Shuka *et al*., 2011).

On the other hand, protection of habitat types and ecosystems provide good ecological conditions not only for their species but also fighting climate change (Romerias *et al*., 2016). From this point of view, the assessment and conservation of indicator species of natural habitats and ecosystems is the first step to stop the plant loss. According to Caujapé-Castells *et al*., (2010), assessing the conservation status of endemic plants is a key challenge because of their restricted geographical distribution and high vulnerability to threats, mainly due to the loss or alteration of their habitats. The continuous monitoring of species population trends and processing of their conservation and management plans is also one of the most important actions for the preservation of species and habitats where they occur. *In-situ* preservation of endemic and subendemic species through the protected areas is the best way to provide their conservation (Shuka *et al*., 2021a).

Albanian government is obligated by the low No. 9587, dt. 20.7.2006 (updated) to assess the conservation status of the indicator species and publish every five years the National Red List of protected Flora and Fauna. The first National Red List of Protected Flora and Fauna of Albania came out in 2007 and the second one in 2013. In the red list of 2013 were assessed 411 plant species out of 3629 species that occurs in Albania. From 411 assessed species (Pacifici *et al*., 2018), 328 species have been categorised as threatened of which 79 plant species have been assessed as CR, 121 species as EN and 128 others as VU.

Regardless of this, due to the circumstances and the long isolation of the country during 1945-1992, many new species have been discovered recently, some of which are flag species of the priority habitat types according to HD 92/43/EEC and need the specific action plans for conservation.

Hereinafter, we have presenting 24-plant taxa, assessed for the National Red List of Albania from the Korça region, most of which have been discovered in the last 10-years or have been unknown for the country botanists.

MATERIAL AND METHODS

Study area

The endemic and near endemics plants that have been assessed occurs within the Korça region territory and few of them have some subpopulations outside the study area, mostly in the north of the country. The region of Korça cover a territory of 3,711 km^2 that extended from 500 m above sea level to 2,520 m in the highest peak of Gramozi Mt. The average height above sea level is 850 m and in the middle of region extends the Korça field, surrounded by mountain ranges (Kabo, 1991). The mountains cover 58% of the whole territory surface that lied between two biogeographic regions, Mediterranean and Alpine. Valleys are under the influence of Mediterranean climate and at altitudes above 1,200 m dominates the continental climate, particularly in the eastern part of the region. The area is characterised from cold winter and dried and worm summer and low mean annual precipitation, c. 800-1,000 mm per year. The great role in the climate of the region plays three lakes, Ohrid and Makro and Small Prespa lakes that bordering the territory with North Macedonia and Greece (Shuka *et al.*, 2008; 2021b).

The region is distinguished for its diversity of geomorphology of substrate where ultramafic and limestone dominate and diversity of ecosystems too. Three big rivers have their sources in the mountainous part of the region, Drini River from the Dry Mt, Shkumbini River from Valamara Mts range and Osumi from Gramoz and Ostrovica Mts range, whereas the Devolli River, a branch of Shkumbini, go through the whole central part of it. Despite of the high numbers of higher plants, growing in the entire territory, the information regarding current status of endemic and near endemic species still remains incomplete (Shuka *et al*., 2021a).

Sampling methods and analysis

Within a three-year period from 2019 to 2022, we carried out monthly fieldwork during the spring and summer in the Korça region, focusing on the monitoring of endemic and near endemic plant species. The collected plants were identified using the books on Albanian flora (Barina *et al*., 2018; Pils, 2016; Shuka *et al*., 2021a). Additional data were provided from other papers published on the endemic and rare plants of the region (Shuka and Jahollari, 2007; Shuka, 2009; Shuka and Tan, 2013; Mahmutaj *et al*., 2015; Słomka *et al*., 2015; Miszczak *et al*., 2022; Wagenitz *et al*., 2018).

Monitoring of the plant species is realised based on methodology described by Shuka *et al*. (2021b) whereas the habitat types have been evaluated following the Interpretation Manual of European Union Habitats (Natura 2000, 2013). The conservation status and threats of the endemic and near endemic species of Korça region was evaluated following the IUCN Red List Categories and Criteria guidelines (for further details see: http://www.iucnredlist.org/documents/ RedList-Guidelines.pdf; IUCN Standards and Petitions Subcommittee, 2019). Calculation

of extent of occurrence (EOO) and area of occupancy (AOO) was done using the GeoCAT software (Bachman *et al*., 2011).

RESULTS AND DISCUSSION

Distribution and Justification of the Assessed Species

Order: *Aspargales;* Family: *Amaryllidaceae*

Allium albanicum Brullo, C. Brullo, Cambria, Giusso & Salmeri, 2019.

A. albanicum is a recently described species based on the previously known taxon referred as *A. meteoricum.* The species occurs in the serpentine substrate along Devoll River, Renci area and Pashtriku Mt in the Central and NE Albania. The only known locality located in limestone is on the Dry Mountain, not far from the type locality in Devolli River. The EOO of species is estimated 8,026 km^2 and AOO 20 km^2. The localities that occurs in the S and NW of Albania are impacted from the extended drought during the summer and autumn period, which corresponds with the flowering and fruiting phase. Other threats to the species are grazing during the reproductive period and exploring and producing minerals such as Cr and Fe-Ni. The species is part of National Red List and have been assessed as EN A1b in (MoE, 2013) but four localities are out of current net of PA. Based on the species rarity an *ex-situ* conservation has begun in the National Botanical Gardens, and visitor centre of Prespa National Park (NP).

Based on the present data such as the total population size observed less than 2,500 mature individuals, a continuous decline in the EOO and AOO, the number of localities less than 10 (Tab. 1) as well as habitat quality and other threats, it is listed as EN B1ab(i,iii) + 2b(ii,iv,v).

Order: *Apiales*; Family: *Apiaceae*

Dichoropoetalum stridii (Hartvig) Pimenov & Kljuykov, 2007.

This is a near endemic species with distribution range in the serpentine substrates of Valamara, Albania and Smolika Mts, North Pindos Greece. It was found in bare rubbly slopes and serpentine pastures and scree at altitudes above 2,000 m near the peak of Valamara Mt. The locality in Valamara Mt is characterised by the presence of shallow soils. Habitat Types: 62B0 * Serpentinophilous grasslands and scree of the western Balkans (Meço, 2019). The EOO and AOO calculated with GeoCAT software (Bachman *et al*., 2011) is 12 km^2. The mature individuals that occur in the eastern scree of the Valamara Mt, monitored in 2007, 2015 and 2022 show an extreme fluctuation, respectively 1,850, 1,500 and 2,100 (L. Shuka pers. comm.) and its growing habitat is reduced by the impact of climate change, habitat quality and low reproduction fertility. Drought and the temperatures in the flowering period are extremely high. The species is part of a new PA category IV, announced at the end of 2022 from the Albanian government.

Considering the population size less than 2,100 mature individuals, a decline observation in EOO and AOO and fluctuation of the number of mature individuals, and habitat quality it is assessed as EN B1ab(iii) + 2b(iv).

Siler zernyi* subsp. *ochridanum (Micevski) Niketić, F. Conti, D. Lakušić & Bartolucci, 2021. (=*Laserpitium ochridanum* Micevski).
Siler zernyi subsp. *ochridanum* is stenoendemic species of Galićica and Prespa National Parks. In Albania, the species was recorded in two localities, on subalpine and alpine pastures above tree line of calcareous grasslands of Dry and Ivani Mountains (Shuka *et al*., 2021a). According to Shuka *et al*., 2013, the species inhabit the rocky pastures, densely covered by herbaceous species, especially *Graminaceae* at altitudes from 1,600 m up to 1,850 m. In Dry Mt it was found in eastern slopes above Gorica e Madhe village, closed to the border line with N Macedonia and in Ivani Mt around its peak. The EOO is 19.712 km² and AOO is 20 km². The population size of the species in Albanian territory is less than 1,000 mature individuals, and expected to decrease from the grazing, particularly in the Ivani Mt. Since the plant is edible from animals, it is threated from grazing in Ivani Mt. The global climate change has been identified as another threat to the species. Based on restricted area of distribution, population size and threats, it is assessed as EN B1ab(i,v) + 2ab(iii,v).

Order: *Asterales*; Family: *Asteraceae*
Centaurea galicicae Micevski, 1985.
Centaurea galicicae is stenoendemic species, restricted in the limestone cliffs of Prespa Lakes, between Albanian, Greece and North Macedonian (Micevski, 1985; Wagenitz *et al*., 2018). In N Macedonia it was found in the rocky slopes of Lake shore between villages Stenje and Konjsko on altitudes 850-880 m a.s.l. In Albania the species occur on the rocky cliffs above lake shore of Gollomboçi peninsula. It was recorded for the first time in July 2013, in a subpopulation with less than 50 mature individuals (Shuka and Tan, 2013). During the species monitoring in June 2021 in that locality the species was not observed. A fire in 2017 is thought to be the cause of the burning of this subpopulation. However, more observations should be carried out in the area to see if the species is extinct for Albania or not, so it is assessed as DD.

Centaurea shumkana Kit Tan, Shuka & Wagenitz, 2018.
Centaurea shumkana is an endemic species of Albania with very narrow distribution range in calcareous rocky cliffs above both Prespes Lakes (Wagenitz *et al*., 2018). In Albania it was found in two small scattered populations; in the Gollomboçi peninsula, Makro Prespa Lake and in the rocky cliffs above Small Prespa shore. The extent of occurrence is 8 km², whereas the area of occupancy in both localities is also 8 km². *C. shumkana* is extremely rare species found only in two

localities so far. It has a very small population size of fewer than 120 mature individuals, monitored during June of 2021 from c. 150 mature individuals observed in 2016 (L. Shuka pers. com.).

During monitoring of this species at the summer of 2021 in the type locality Gollomboçi peninsula, the dried stems of the plants are observed too. The extended drought and high temperatures during the flowering and fruiting period is the main threats to the species due to premature drying of the capitules and non-ripening of the seeds.

Centaurea soskae Hayek, 1926.

Centaurea soskae is endemic to the Western Balkan Peninsula, with restricted distribution range in Trapezica (N Macedonia), Mali i Thatë (Dry Mountain), the rocky cliffs of Prespa Lakes in Albania and NW Greece (Košanin, 1926; Shuka and Tan, 2013; Wagenitz *et al*., 2018). In Albania, it was found in three localities between 850 m and 1,200 m, on calcareous rocky slopes of western side of Dry Mt, above Shëngjergji village and on calcareous rocky cliffs of the Gollomboçi peninsula in the Makro and Small Prespa Lakes.

The Albanian population of *C. soskae* in three localities of its occurrence is calculated c. 500 mature individuals. It is apparently stable in the rocky cliffs of Small Prespa, but severely fragmented along rocky cliffs of Makro Prespa Lake and western rocky slopes of Dry Mt. The EOO is 124.753 km^2 and AOO is 20 km^2. The major threat of the species is the climate change or the extreme higher temperatures during the summer and the fires. Since the population of the species in Albania is decline, the low number of localities and fragmentation, it is assessed as EN B1ab(iii,v) + 2ab(ii,iv).

Centaurea drenovensis Pils, 2016.

C. drenovensis is an Albanian endemic described recently from the serpentine substrates of Morava Mt on the E of Korça city (Pils, 2016). During filed trips it was observed further more in the S of type locality, toward Sheleguri area. The population size in three localities of its distribution range was calculated less than 4,000 mature individuals.

The extent of occurrence of the species is 191 km^2 and AOO of 24 km^2. The southernmost locality of this species in Shelegur, occur within a Protected Area (PA), while two others occurs outside PA. The expansion of the oak and black pine forest in Qarri Pass and Shelegur are occupying the growing habitat of *C. drenovensis* and reduction of its EOO and AOO is expected. Taking in consideration the number of localities, the population size, habitat quality as well as the EOO and AOO reduction, the species is assessed as Endangered (EN B1ab(i,iv) + 2b(ii,iii,v)).

Order: *Brassicales*; Family: *Brassicaceae*

Odontarrhena albiflora (Meyer) Španiel, Al-Shehbaz, D. A. German & Marhold, 2018.

O. albiflora is an Albanian endemic species, obligate to the western limestone cliffs of Dry Mountain, above Shëngjergji village. According to Cecchi *et al*., (2018), this species is an extremely rare endemic only known from the type locality, on altitudes from 900 to 1,300 m. Due to the difficult terrain to explore, during our field trips we cannot monitor the species population size and threats and so it was assessed as DD.

Odontarrhena moravensis (Meyer) L. Cecchi & Selvi, 2018.

Odontarrhena moravensis is endemic to the serpentine massifs on the Korça region. The species was observed on ultramafic rocky ground and gravels in three localities: Morava Mt, serpentine areas between Voskopojë and Gjergjevicë villages and Devolli River near the Strelca village, at altitudes 800 to 1,550 m (Shuka and Jahollari, 2007; Meyer, 2011; Cecchi *et al*., 2018). The population size was monitored only in Morava Mt and Voskopojë-Gjergjevicë localities, respectively with c. 300 and 1,200 mature individuals. The calculated EOO is 142.4 km^2 and AOO is 16 km^2. Based on habitat quality, number of localities, only three, and population size, the species was assessed as EN B1ab(i,v) + 2ab(i,ii,iv).

Order: *Caryophyllales*, Family: *Caryophyllaceae*

Dianthus galicicae Micevski, 1987.

Dianthus galicicae is a restricted endemic species of Galićica-Dry Mts range with limited range of distribution in both sides of the Albanian-North Macedonian border, respectively above villages Peshkëpi and Ljubanishta. The extent of occurrence and area of occupancy is 8 km². Our survey, carried out during July of 2020 in Albania has counted c. 1,200 mature individuals.

The population size is decreased with c. 200 mature individuals since the first monitoring of 2014 (Shuka *et al*., 2013), from the reduction and fragmentation of the habitat due to the expansion of the woody Hornbeam and *Quercus* spp. species towards the open stripped grasslands. Considering the decline trend of the area of occupancy and population size, mainly due to reduction and fragmentation of the habitat, it is therefore assessed as Endangered (EN C1C2a(i,ii)).

Heliosperma pusillum **subsp.** ***chromodontum*** (Boissier & Reuter) Niketić & Stevanović, 2007.

H. pusillum subsp. *chromodontum* is a near endemic taxon with restricted distribution range in Olympus Mt (Greece), Prespa Lakes shore in N Macedonia and Albania as well as in Llënga Canyon, Sopoti Mt, Shkalla e Drenit and near Biza also in Albania (Niketić and Stevanović, 2007; Shuka *et al*., 2020, Miszczak *et al*., 2022). The favourite habitats of this taxon are limestone rock crevices in semi shadow caves or deep canyons. The extent of occurrence in Albania is 1,151.34 km^2 and AOO is 20

km². Despite of the area of occupancy, 20 km², the cover surface in each of the five localities of its occurrence in Albania is less than 100 m² and the number of mature individuals is less than 700. A reduction of the population size with 15% from last monitoring in 2014, is observed during 2021. In its distribution range the taxon is endangered from the climate change and construction of hydropower dams or deviation of the water flow in rivers and canyons for the same reason (Shumka *et al.*, 2010). Based on extent of occurrence in Albania is 1,151.34 km², the quality of habitat, small area of occupancy and small population size, it is assessed as Vulnerable C1C2a.

Order: *Fabales*; Family: *Fabaceae*

Chamaecytisus pseudojankae Pifkó & Barina, 2016.

C. pseudojankae has been considered as Albanian endemic with very narrow distribution range in calcareous rocky pastures of Dry Mountain (Pifkó and Barina, 2016) and Ivani Mountain (Shuka *et al*., 2021a). Recently, the species is recorded also in the adjacent parts of Prespa NP in Greece around the Vrontero village, closed to Ivani Mt (Bergmeier *et al*., 2020).

In Albania the species is restricted along the ridge of Dry Mt and rocky pastures of E and W slopes of it. In Ivani Mt and Greece the species occur at the edges of Oak or Oriental Hornbeam woods. Since the species is recently described, it is not assessed for the red lists in both countries. The extent of occurrence is 58.637 km² and area of occupancy is 40 km² in both localities of Dry and Ivani mountains. The current population size of *C. pseudojankae* in its distribution range is calculated c. 1,500 mature individuals. The species is threatened by the fires and climate change. During species monitoring at the end of July 2020, mature plants of the western slopes of Dry and Ivani Mts were with dried legumes and dried unmatured seeds. Based on the population size, severe fragmentation of its habitat and the impact of fires in the western slopes of Dry Mt as well as the low rate of reproductivity due to global warming, the species is assessed as EN B1 2ab(i,iii,v) + 2ab(ii,iv).

Oxytropis dinarica (Murb.) Wettst. **subsp.** ***weberi*** Chrtek & Chrtková, 1983.

Oxytropis dinarica subsp. *weberi* is a near endemic taxa with very restricted distribution range in SE Albania and NW of N Macedonia (Chrtek and Chrtkova, 1983; Shuka and Tan, 2013). The monitoring of the species in Dry and Valamara Mt was carried out during July of 2020 and 2022. It was observed and monitored in the rocky pastures of the alpine region of Valamara, Dry Mt and Korab Mt, between 1,800 and 2,400 m. The extent of occurrence of Albanian subpopulations is 1,820.5 km², the area of occupancy is 28 km² and the population size was calculated c. 4,000 mature individuals. During observations of the taxon in both mountains have been recorded massive damage from grazing by the ships have been recorded. Taking in consideration the small AOO, 20 km², the fact that three subpopulations of this taxon are far from each other and the projection of taxon declines with more than 10% in the future from grazing, it is assessed as VU C1C2a.

Oxytropis purpurea (Baldacci) Markgraf, 1927.
Oxytropis purpurea is subendemic species with restricted distribution range in Albania and Greece (Shuka and Malo, 2010). In Albania it was found only on limestone rocky grasslands on altitudes 1,700–1,900 m, in two localities Dry Mt and Sinuer (Çermenikë). The extent of occurrence of the species is 38.6 km^2 and area of occupancy is 12 km^2. The observed population size in Dry Mt was between 1,200 and 1,500 mature individuals, whereas half of it occurs outside of the border of Prespa NP. No information exists on the second subpopulation of Sinuer Mt, but its population size should be smaller than in Dry Mt, calculated from the habitat quality. The species has been assessed as EN A1b in the National Red list of 2013. During species monitoring on June, 2022 on Prespa NP (Dry Mt) about 25 % of mature individuals have been eaten by animals. Based on the small EOO, AOO, number of localities and threats the species is assessed as Endangered (EN B1ab(i,iii) + 2ab(ii,iv,v).

Order: *Malpighiales*; Family: *Hypericacea*
Hypericum haplophylloides Halácsy & Bald. **subsp.** ***devollense*** F.K. Meyer, 1978.
H. haplophylloides subsp. *devollense* is one of two subspecies of *H. haplophylloides*, endemic to the south of Albania (Shuka and Jahollari, 2007; Malo and Shuka, 2009; Meyer, 2011; Meço, 2019). It is a serpentine obligate taxon with distribution range in the middle part of Devolli River (Kokol and Gjergjevica valley) and Qarrishta branch of Shkumbini River. The EOO of the taxon is 370 km^2 and its EOO is12 km^2. In its distribution range the taxon is endangered from construction of hydropower dams in rivers Devolli and Shkumbini or their tributaries (Shumka *et al.*, 2010). Population size is monitored only in Gjergjevica valley, c. 60 mature individuals and unknown for two other locations, so the taxon is listed as DD.

Order: *Liliales*, Family: *Iridaceae*
Crocus cvijicii Košanin, 1926.
Cvijici's Saffron is a stenoendemic of Dry and Galićica Mts range, located respectively in SE Albania and SW parts of N Macedonia. It was found in dry subalpine and alpine calcareous pastures of Dry Mt in Albania, and several localities in Galićica Mt in N Macedonia (Shuka *et al*., 2009). The extent of occurrence in Albania is 18.1 km^2 and area of occupancy is 32 km^2. Other records from NE Greece and mountains of Gramoz, Ostrovicë and Valamara in Albania (Shuka *et al*., 2018) belongs to a different species (L. Shuka pers. comm. 2022). Based on the previous known distribution (Ranđelovic *et al*., 2007), the species have been assessed for the Red List of IUCN as LC.

In Albania, the population size in 2015 was estimated c. 11,000 mature individuals in the population of Dry Mt (Shuka *et al*., 2018). The monitoring of species in Dry Mt during the end of May, 2022 turns out to be less than 10,000 mature

individuals. Population of *C. cvijicii* in Albania have been observed to be decline at lower altitudes but stable at altitudes above 1,850 m as result of global warming and reduction of the snow. The population of *C. cvijicii* in Albania is fragmented in the upper part of Dry Mt, on altitudes between 1,700 m and 2,100 m. Considering the restricted distribution range and small EOO and AOO, the population size less 10,000 mature individuals and its habitat reduction as result of climate change, the species is assessed as Vulnerable (VU C1C2a).

Tab. 1- The assessed taxa of the Korça region, previous protection status and proposed protection status, number of locations, their habitat code and EOO and AOO.

Family	Name of species	Alb Red List 2013	Proposed current status	Nr of locations	Habitat Code	AOO km^2	EOO km^2
Amaryllidaceae	*Allium albanicum* Brullo, C. Brullo, Cambria, Giusso & Salmeri	EN A1b	VU C1C2a	5	62B0, 6170	20	8,026
Apiaceae	*Dichoropoetalum stridii* (Hartvig) Pimenov & Kljuykov	NE	EN B1ab(iii) + 2b(iv)	1	62B0, 8140	12	12
Apiaceae	*Siler zernyi* subsp. *ochridanum* (Micevski) Niketić, F. Conti, D. Lakušić & Bartolucci	NE	EN B1ab(i,v) + 2ab(iii,v)	2	6170, 6520	20	19.712
Asteraceae	*Centaurea candelabrum* Hayek & Košanin	EN A1b	LC	12	62B0	80	3,682.86
Asteraceae	*Centaurea drenovensis* Pils.	NE	EN B1ab(i,iv) + 2b(ii,iii,v)	6	62B0	24	191
Asteraceae	*Centaurea galicicae* Micevski	NE	DD	1	8210	0	0
Asteraceae	*Centaurea pindicola* Griseb.	EN A1b	LC	8	62B0, 6520	32	57
Asteraceae	*Centaurea shumkana* Kit Tan, Shuka & Wagenitz	NE	CR B1ab(i,iii,iv) +2b(ii,iii,v)	2	8210	8	8
Asteraceae	*Centaurea soskae* Hayek	VU A1b	EN B1ab(iii,v) + 2ab(ii,iv)	5	8210	20	124.753
Asteraceae	*Centaurea vlachorum* Hartvig	CR B1	LC	9	62B0, 6520	36	1,494
Brassicaceae	*Odontarrhena albiflora* (Meyer) Španiel, Al-Shehbaz, D. A. German & Marhold	NE	DD	1	8210	4	4
Brassicaceae	*Odontarrhena moravensis* (Meyer) L. Cecchi & Selvi	NE	EN B1ab(i,v) + 2ab(i,ii,iv)	3	8140	16	142.4
Campanulaceae	*Campanula hawkinsiana* Haussk. & Heldr.	EN A1b	LC	9	8140	36	5,462
Caryophyllaceae	*Cerastium smolikanum* Hartvig.	CR B1	LC	6	8140	24	1,601.00
Caryophyllaceae	*Dianthus galicicae* Micevski	NE	EN C1C2a(i,ii)	1	91M0, 6220	8	8
Caryophyllaceae	*Heliosperma pusillum* subsp. *chromodontum* (Boissier & Reuter) Niketić & Stevanović	NE	VU C1C2a	5	8210	20	1,151.34
Cistaceae	*Cistus albanicus* E. F. Warb.ex Heywood.	EN B2c	DD	5	62B0, 6220	20	517
Crassulaceae	*Sempervivum ciliosum* Craib.	EN A1b	LC	4	6110, 6170	64	367
Fabaceae	*Chamaecytisus pseudojankae* Pifkó & Barina	NE	EN B1 2ab(i,iii,v) + 2ab(ii,iv)	2	6110, 6170	40	58.637
Fabaceae	*Oxytropis dinarica* (Murb.) Wettst. subsp. *weberi* Chrtek & Chrtková	NE	VU C1C2a	3	6170	20	1,820.50
Fabaceae	*Oxytropis purpurea* (Baldacci) Markgraf	EN A1b	EN B1ab(i,iii) + 2ab(ii,iv,v)	2	6170	12	38.625
Hypericacea	*Hypericum haplophylloides* Halácsy & Bald. subsp. *devollense* F.K. Mey.	NE	DD	3	8140	12	370
Iridaceae	*Crocus cvijicii* Kosanin	LC (IUCN	VU C1C2a	1	6170, 6520	32	18.1
Plumbaginaceae	*Acantholimon albanicum* Schawarz & F.K. Mey.	EN A1b	EN B1ab(i,iii) + 2ab(ii,iv,v)	2	8140	8	8

Order: *Caryophyllales*, Family: *Plumbaginaceae*

Acantholimon albanicum Schawarz & F.K. Meyer, 1987.

According to Damo and Icka (2020) and Meyer (2011) *A. albanicum* is a serpentine obligate species, endemic to the Korça region. In its type locality, Morava Mt, between Village Boboshticë and Bigëll, it was found on ultramafic rocky ground and gravels in a very restricted surface. In this locality, it was companied with few other species and the ground surface was much eroded. No data have been given for the population size and distribution of the species in the previous assessment of the year 2013 as endangered (EN A1b). However, during our monitoring at the end of July 2022, the population size was less than 100 mature individuals. The extent

of occurrence and area of occupancy of the species is 8 km^2. Since we haven't data on population size and ecology for the second locality and considering the small EOO, AOO, number of localities and habitat quality, it is assessed as Endangered (EN B1ab(i,iii) + 2ab(ii,iv,v)).

The monitoring and observation of the population size, distribution and ecology of the following species; *Centaurea candelabrum* Hayek & Kosanin, *C. drenovensis* Pils, *C. pindicola* Griseb., *C. vlachorum* Hartvig, *Campanula hawkinsiana* Hausskn. & Heldr., *Cerastium smolikanum* Hartvig and *Sempervivum ciliosum* Craib. (Shuka and Jahollari, 2007; Shuka and Malo, 2010; Shuka and Tan 2009, 2013; Mahmutaj *et al*., 2015), show that they have larger EOO, AOO, population size and more than five localities (Tab. 1). Four of them, *Centaurea candelabrum*, *C. vlachorum*, *Campanula hawkinsiana* and *Cerastium smolikanum* can be found also outside of Korça region and their distribution range extended towards the serpentine massifs of the N of Albania. These species have been listed as Least Concern (LC) as they are more widespread and have larger populations, of 4,000 mature individuals in Albania, and could be much larger, considering the distribution range also in Greece, Kosova and N Macedonia.

The inclusion in the National Red List of 2013 by MoE and assessment as threatened of the following species; *C. candelabrum* assessed as EN A1b, *C. pindicola* as EN A1b, *C. vlachorum* as CR B1, *C. hawkinsiana* as EN A1b, *C. smolikanum* as CR B1 and *S. ciliosum* as EN A1b, does not correspond to the reality of their distribution range and population size. There is no data for these species on the population size, EOO, AOO, number of localities and habitat types as well as on threats against them that can justify their status given in the National Red List (MoE, 2013).

CONCLUSIONS

In this study, 24 plant taxa have been assessed for the National Red List of Albanian Flora and 14 of them are assessed as threatened (VU, EN and CR). Six taxa, *Acantholimon albanicum*, *Centaurea pindicola*, *C. shumkana*, *Dichoropoetalum stridii, Heliosperma pusillum* subsp. *chromodontum* and *Oxytropis dinarica* subsp. *weberi* can be considered as protected because they are located within the protected areas of Albania.

Three other taxa, *Centaurea candelabrum*, *Dianthus galicicae* and *Odontarrhena albiflora* occurs outside the current net of protected areas and can be considered as completely unprotected and for this reason the conservation plans are necessary. The distribution range of 15-other taxa occurs partly within and outside of the protected areas of Albania, so their population dynamics should be taken under continuous monitoring.

The major threats to all assessed species are the low quality of growing habitat because they grow in serpentines substrate which are under the stress of the

heavy metals; climate change particularly the high temperatures and fires during the summer and autumn period as well as construction of hydropower (HP) dams or deviation of the water flow in rivers and canyons for HP construction.

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