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Conservation status of eight rare (Apiaceae) taxa from Syria

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Abstract: Habitat fragmentation is one of the main threats to biodiversity. Hence, many species nowadays occur mainly in small and isolated populations (such as endemic species), and will be expected to face extinction. The precise evaluation of the conservation status of a particular species is a necessary condition to prevent its extinction. The correct assessment of conservation status of a species is the most significant tools in biodiversity conservation.

Extensive field studies and a large number of specimens collected from N-W Syria and examining herbarium specimens deposited at some limited Syrian herbaria. Ecological properties were also observed in the field. Threatened categories are proposed according to IUCN Red List Categories Version 3.1. Conservation status of eight species is evaluated for Syria and global level. Threatened categories of the species are determined as

- NT for *Peucedanum mucronatum, Johrenia dichotoma,* and *Eryngium desertorum* locally, and changed for the first two species to LC on globally (the latter is endemic only to the region).
- VU for *Chaerophyllum libanoticum, Ferulago cassia,* and *Johrenia porteri* for local and global levels.
- EN for *Ferula hermonis* for both the local and global levels.
- CR for *Eryngium maritimum* for the local level, but decreased to NT on the global level.

The taxa mainly distributed at coastal areas and Mountains of east Mediterranean. This region is under various threats because of Human disturbance, Agricultural activities and repeated forest fires in recent years. Therefore, *in situ* and *ex situ* conservation measures should be enforced for the species.

Key words: *Apiaceae*, conservation, endemism, IUCN categories, threatened species, Syria.

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Introduction

Natural ecosystems degrade rapidly with the increase of human populations. Due to the rapid increase in the human population in the region within the last few decades, many natural habitats have been fragmented, reduced in size, degraded or destroyed and populations of many species declined due to over-exploitation of the natural resources (Chalabi et al., 2014). Because of the destruction and fragmentation of habitats many species nowadays occur mainly in the small and isolated populations, which for a number of reasons are expected to face a high risk of extinction (Matthies et al., 2004). Numerous studies show that narrow endemic species are more susceptible to extinction for a variety of reasons, one of the most important being the destruction of their habitats (Schemske et al., 1994; Bizoux et al., 2004; Bernardos et al., 2006).

Local endemic taxa are the first to experience the negative effect of habitat degradation or fragmentation on biodiversity components (Breggin et al., 2003) and hence, the level of occurrence of endemic and rare species is among the criteria usually used for defining areas to be preserved and declared as protected areas (Bernardos et al., 2006). The precise assessment of the conservation status of any particular threatened species is a necessity in order to successfully prevent its extinction through conservation work. The International Union for The Conservation of Nature (IUCN) has clearly set the criteria to assess threat level on any taxa in its natural habitat (IUCN, 2003; IUCN, 2012). An important tool for this purpose is defining the cause and degree of threat (or alternatively the expectation of survival) of taxa to which a special significance is attributed. Endemic species as well as rare species seem to be more liable to threats, due to their restricted distribution and limited numbers (Cheikh Ali, 1998), and therefore, the biological features of any rare or endemic taxa have been the subject of preferential attention for biodiversity conservation programmes, in particular when threats to their habitat can be clearly identified (Lovett Doust & Lovett Doust, 1995; Mills & Schwartz, 2005).

Red data lists can play a crucial role by focusing attention on species that need conservation action (Blanca et al., 1998; Broughton & McAdam, 2002; Celep et al., 2010; Marshall et al., 2012). For the purpose of regional conservation assessments, there are significant reasons to assess species

extinction risk and publish red data lists within specific geographically defined areas (IUCN, 2003; Kahraman et al., 2012).

The family Apiaceae (Umbelliferae) is mainly known to have aromatic plants and it is overall comprised of about 430 genera and 3700 species (Stevens, 2001). However, it is considered among the largest ten families in the Syrian flora containing164 species in 74 genus (Mouterde, 1970). Some of these genera have a single species (*Lagoecia*, *Lecoquia*, *Turgenia*, *Conium*, *Crithmum*, …etc.) in the Syrian flora, while others contain good percentage of the family species such as (*Bupleurum*, *Eryngium*, *Ferula*, *Pimpinella*, *Torilis,* …etc.) having more than 9 species each (Mouterde, 1970). This family has a good reputation of having several species that are widely used as medicinal plants and as condiments in cookery (Chevalier, 2005).

This study presents the latest scientific information of the species where possible. This to include; the taxonomy, geographical distribution and localities locally and regionally (Bouloumoy, 1930; Mouterde, 1970; Davis, 1972), as well as a discussion about conservation status for determining the threatened categories of eight rare and endemic species from the family Apiaceae: *Eryngium desertorum* Zohary*, Eryngium maritimum* L., *Chaerophyllum libanoticum* Boiss. et Ky., *Peucedanum mucronatum* Thiébaut, *Johrenia dichotoma* D.C. *Johrenia porteri* Post (Boiss.), *Ferulago cassia* Boiss. and lastly *Ferula hermonis* Boiss. These were discussed in this paper according to available data and references (Mouterde, 1970; Chalabi, 1980; Nahal, 1989; Ghazal Asswad, 1998).

Materials and methods

Extensive field studies have been carried out in various parts of Syria since 1990s as a part of several projects about national vegetal Biodiversity. A large number of specimens were collected from fieldwork and many herbarium specimens deposited at the limited Syrian herbaria mainly at the Forestry and Ecology Department Herbarium at Aleppo University, Syria (FRE) were also examined in addition to other limited data gathered through revising the Herbarium Collection Data of the General Commission for Scientific Agricultural Research, Damascus, Syria (GCSAR). Population sizes as well as the phenological and ecological properties were reported

from observations in the field and from reviewing earlier studies and floras (Post, 1896; Bouloumoy, 1930; Mouterde, 1970; Davies, 1972). Assessing the threats and the risk of extinction of species was carried out according to IUCN Red List Categories Version 3.1 of the threatened species (IUCN, 2001). Details of threats were determined for each species and comments were made according to Broughton and McAdam (2002).

Results and discussion

1- *Eryngium desertorum* Zohary (*Pal. Journ. of Bot.*, **II**, 1941, p. 167).

Synonym: Without synonym.

Distribution: Endemic to the dry areas from the region of the Levant: Jordan, Palestine, Lebanon and Syria. It was reported in the flora from the following sites in Syria: Menbij, Jabal Al-Hass, Dmeir, Qaryatein, ʻAïn-et-Tine, Qasyoun, Anti-Lebanon Mountains.

Species national distribution: It was reported from the following sites in Syria: Menbij, Jabal Al-Hass, Dmeir, Qaryatein, ʻAïn-et-Tine, Qasyoun, Anti-Lebanon Mountains.

Ecology and Habitat: Flowering from July to October. Growing at deserted areas and Arid sites in the region.

Conservation Status: Threatened category of the taxon was not determined previously. This study is the first attempt to categorize and assess the threatening category of the species. Population of the species are narrowly scattered in this range, but it occurs in low densities and in small batches at open areas with low level of disturbance where it was encountered from few locations. It is estimated to have limited number of individuals. Hence, based on the distribution of the species in the region, where it is considered as endemic to, the threatened category of the taxon can be described as Near Threatened (NT) for the national Syrian level as well as the regional and the global level.

2- *Eryngium maritimum* L., (*Sp. Pl. 233:* 1753; *Flora Orientalis,Vol. 2: 820).*

Synonym: Without synonym.

Distribution: Wide geographical distribution on the coastal areas of

the Atlantic and the Mediterranean as well as the Black sea.

Species national distribution: Coastal plains: Tartous, Lattakia, and Ras Chamra.

Ecology and Habitat: Flowering from June to September, at coastal areas with low disturbance.

Conservation Status: Threatened category of the species was previously described as Endangered (Nahal, 1989). However, looking at the population size from field observations and data gathered during the past period, it has a dramatic decline to the brink of extinction. Now it is only reported from Ras Chamra (North of Lattakia) where it is estimated to a number fewer than 25 individuals in clusters at that confined area which has not been largely subject to human disturbance being in the vicinity of a historical site of old ruins that are preserved from uncontrolled human activities. Hence, the above findings can justify proposing a more sever status to be Critical Endangered (CR) on the national level. However, based on observation and reports from neighbouring countries (Bulgaria and Ukraine) proposing its status (Dyatlov and Vasilieva, 2012) as well as other reports from other parts from the world of its distribution (Turkey and West Europe), this proposal can be in line with the suggestion of giving it the status of being Endangered (EN) on the regional level and stuck with the only Near Threatened (NT) for the world level.

3- *Chaerophyllum libanoticum* Boiss. et Kotschy. (*Diagn. Pl. Orient.* ***II****,* ***6****: 89 1859).*

Synonym: Without synonym.

Distribution: the East of the Mediterranean, Lebanon, Syria, Turkey. In forest areas at medium and high mountains from the region.

Species national distribution: forest areas of the coastal mountains in Slenfe, Fronllok

Ecology and Habitat: Flowering in the summer (May-August). Growing at high areas of 650–1300m, in Deciduous forests of Oak (*Quercus cerris* subsp. *pseudocerris*) on northern and western slopes. It is a characteristic species for a climax plant community *Chaerophyllo (libanoticum)-Quercetum pseudocerridis* which dominates at stable and

balanced forest areas in deciduous oak woodlands (Chalabi, 1980)

Conservation Status: Threatened category of the taxon was provisionally proposed as Endangered (EN) without clear justification for the country (Chalabi, 1980; Nahal, 1989; Ghazal Asswad, 1998). It is reported mainly from only two sites in Syria with an Area of Occupancy that does not exceed 500 km^2 and composing the herbal cortege of deciduous oak woodlands. Population size from these two sites can be estimated with relatively low numbers to a figure that exceeds 500-1000 individuals. The threatened category hence of the species should be proposed to be Vulnerable (VU) for Syria and similarly for the global level (Turkey and Lebanon) because of this rarity.

4- *Peucedanum mucronatum* Thiébaut, (*Bull. Soc. Bot. de Fr*., 96, 1949).

Synonym: *Siler cordifolium* Boiss., *Laser cordifolium* (Boiss.) Thell., *Glaucosciadium cordifolium* (Boiss.) B.L. Burtt & P.H. Davis.

Distribution: the Mediterranean, central and southern Europe, and western Asia.

Species national distribution: the Syrian Coastal Mountains: north of Lattakia, to the south of Kizl Dagh, and the forest areas along the valley of Al-Kbeer Al-Shemali River, woodlands and streams between Aleppo and Lattakia.

Ecology and Habitat: Flowering from July to September, in woodlands at the coastal areas at medium altitude mountains 200–600 m and along seasonal watercourses and streams.

Taxonomic Notes: The taxon was an older name which was recently replaced by some taxonomical authorities to be *Glaucosciadium cordifolium* when a revision for this taxon was achieved in the Global Plant and Biodiversity DataBase (GBIF, 2011).

Conservation Status: Threatened category of the taxon was not determined previously. This study is the first attempt to categorize and assess the threatening category of the species in Syria. *It* was encountered from only few locations in the coastal area, but it occurs in low densities and in small batches. Population size is not easily estimated to assess the

rough number of individuals: Therefore, Hence, based on the distribution of the species in the region and its abundance in Turkey, the threatened category of the taxon can be described as Near Threatened (NT) for the national Syrian level, but should be reduced to Least Concern (LC) for the regional and global levels.

5- *Johrenia dichotoma* D.C. (*Coll. Mém.* ***5****: 54 1829).*

Synonym: Without synonym.

Distribution: East Mediterranean element, distributed in Turkey, Lebanon, Palestine and Syria.

Species national distribution: on the Syrian Coastal Mountains and Cassius and Amanus, Haffeh and Slenfeh, on the eastern slopes of the Coastal Mountains in Salma and the hills of Harem, Sarmada, to the North of Lattakia towards Mount Cassius, Frounllok, Kassab.

Ecology and Habitat: Flowering from April to June. Growing 200–900 m, in various forms of *Pinus brutia* forest and to lesser extent in Deciduous Oak woodlands *Quercus cerris* subsp. *psuedocerris* on sunny and rocky slopes.

Taxonomic Notes: The taxon is considered as unresolved taxon regarding its taxonomy and credit (The Plant List, 2013).

Conservation Status: Threatened category of the taxon was not determined previously. This study is the first attempt to categorize and assess the threatening category of this species in Syria. It was encountered from only few restricted locations in the coastal area (Post 1896; Mouterde, 1970; Ghazal Asswad, 1998), occurring in low densities in small batches. Therefore, based on the distribution of the species in the region the threatened category of the taxon can be described as Near Threatened (NT) for the national Syrian level as well as the regional level. However, this should be changed to Least Concern (LC) for the global level due to availability from other regions.

6- *Johrenia porteri* Post ex Boiss. (*Supplementum ad Fl. Or.*, p. 266 1888)

Synonym: Without synonym.

Distribution: East Mediterranean element reported only from Syria

(Endemic to North west Syria and its neighbouring areas and southwest Turkey).

Species national distribution: in the areas between Antakya and Maraash and forest areas to the North of Lattakia, Frounllok, Rabiaa.

Ecology and Habitat: Flowering in July. Growing in forest areas of deciduous woodlands at 350–800m, on rocky slopes on a Green Rock substratum.

Conservation Status: as the distribution of this species is limited to small batches in Syria and neighbouring areas in Turkey at the east of the Mediterranean, the threatened category of the taxon was not determined previously and can be described as Vulnerable (VU) for the national level. Population size is estimated to be in very few individuals and the Area of Occupancy does not exceed 500 km^2. The threatened category of the taxa should also be proposed to be VU also on the global level because of this rarity and restriction in distribution and because of this narrow endemism.

7- *Ferulago cassia* Boiss.

Synonym: Without synonym.

Distribution: East Medierranean, in the Syrian Coastal Mountains, to the north of Lattakia and northwards towards Amanus: Endemic to North west of Syria and South west Turkey.

Species national distribution: Slenfeh, Nahr Al-Kebir Al-Shemali, North Lattakia, Ain Haramiye, Fronllok, South of Kessab, cassius, Qara Duran.

Ecology and Habitat: Flowering from May to June. Growing in forests and woody areas of mixed vegetation, on various slopes, but more frequent near wet and humid slopes.

Conservation Status: Threatened category of this taxon was not previously assessed. The presence of this species was reported from several studies in the region (Chalabi, 1980; Ghazal Asswad, 1998) but without a precise assessment to its status. However, population size can be roughly estimated to few scattered individuals concentrated in batches within the woodland areas. The Area of Occupancy is estimated not to exceed 700 km^2. Therefore, the threatened category of the taxa should be proposed to

be as Vulnerable (VU) for the national level but can be reduced due to its abundance in Turkey to be as Near Threatened (NT) for the global level because of this regional narrow distribution in deciduous oak woodlands.

8- *Ferula hermonis* Boiss.

Synonym: Without synonym.

Distribution: Endemic to the Levant: South west Syria and South east of Lebanon.

Species national distribution: Mout Hermon, Anti Lebanon Mountains: Jabal Chekif, in abundance above Bloudan area and Abo Zad areas to the west of Damascus

Ecology and Habitat: Flowering from May to June. Growing in High mountain areas which are subject to some degradation factors on rocky slopes.

Conservation Status: Threatened category of the taxon was previously described as Endangered for Syria (Nahal, 1989). Population size used to be in abundance but has declined sharply in the last decades due to habitat destruction and over-exploitation of this species in an unsustainable way for medicinal usages as an aphrodisiac. However, this has provoked some dialogue about some official channels to protect the species and restricted its collection to a specially designated authority for this species in order to let its numbers recover in situ. Number of batches is fewer than 20 batches that contain good numbers of individuals. However, this abundance with the extensive collecting of the plant would justify proposing the Endangered status (EN) for both the national and the global levels.

Results and discussion

Threatened categories of *Eryngium desertorum*, *Eryngium maritimum*, *Chaerophyllum libanoticum*, *Peucedanum mucronatum*, *Johrenia dichotoma*, *Johrenia porteri*, *Ferulago cassia*, and lastly *Ferula hermonis* are correctly evaluated according to IUCN ver. 3.1 for Syria for the first time and consequently was proposed for the global level.

Distribution of each of the taxa as well as endemism status were discussed. In addition to all the above-mentioned information current

suggestions are based on fieldwork, observations and literature review. *Eryngium desertorum* is endemic species that is only found at arid and semi-arid areas of the Syrian steppe and similar parts of Jordan and Palestine. *Eryngium maritimum* is confined to the coastal plains, while *Chaerophyllum libanoticum*, *Peucedanum mucronatum*, *Ferulago cassia*, *Johrenia dichotoma* and *Johrenia porteri* are confined to the coastal mountain areas in Syria and neighbouring countries. *Ferula hermonis* is restricted to Mount Hermon and the Anti Lebanon range, but it has a very limited distribution outside this area. All these areas are under serious threats because of the habitat destruction and over usage of natural resources by human activities, and to some extent the repeated forest fires in recent years. The protection of these species whether in situ or ex situ are imperative given the threat of habitat destruction climate change, and over exploitation (Whiting et al. 2004). In light of the above information in situ and ex situ conservation measures should be put into practice for these species where possible. Propagation studies of these species should be conducted and completed where possible similar to other studies and trials on endangered species from other countries on another endangered Syrian species *Centurea arifolia* (Bona & Ghazal Asswad, 2014).

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