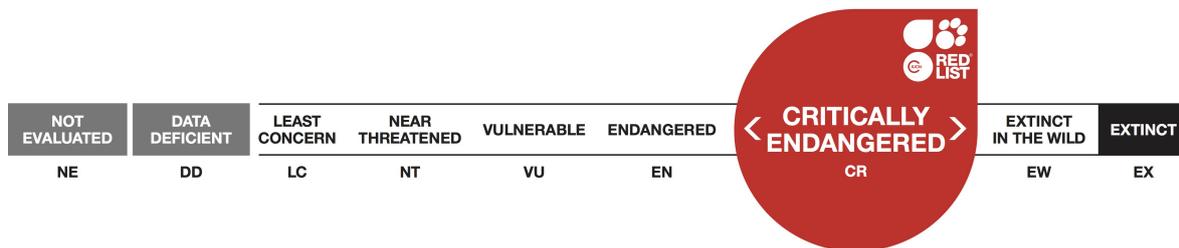




Zelkova sicula

Assessment by: Garfi, G., Pasta, S., Fazan, L. & Kozłowski, G.



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Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Urticales	Ulmaceae

Taxon Name: *Zelkova sicula* Di Pasq., Garfi & Quézel

Taxonomic Source(s):

The Plant List. 2016. The Plant List. Version 1.1. RBG Kew. Available at: <http://www.theplantlist.org/>.

Taxonomic Notes:

The genus *Zelkova* includes only six species, three of which grow in eastern Asia, one in Transcaucasia, and two in the Mediterranean basin (this species in Sicily and another, *Z. abelicea*, which is a threatened species endemic to the mountains of Crete (Greece) (Kozłowski and Gratzfeld 2013).

Assessment Information

Red List Category & Criteria: Critically Endangered B1ab(iii)+2ab(iii) [ver 3.1](#)

Year Published: 2017

Date Assessed: September 13, 2017

Justification:

The species is currently known from only two localized natural subpopulations, each occupying a very small area (about 0.18 and 0.50 hectares, respectively) (Garfi *et al.* 2011). Both the extent of occurrence (EOO) and the area of occupancy (AOO), estimated using a 2x2 km grid, are very much less than 8 km², and there is a continuing decline in the quality of habitat as a result of a range of threats, including grazing, fire, and climate change. No successful pollination has been observed so far in the few flowering plants (Garfi 1997, Garfi and Buord 2012), which fluctuate from year to year from about 20 to 70 in total for the two subpopulations. All the examined seeds proved to be sterile, and the species only reproduces through root suckers, whilst re-sprouting allows prompt recovery from damage caused by disturbance and drought stress (Garfi *et al.* 2002). Unable to perform sexual reproduction and due to its extreme genetic impoverishment, the number of individuals are potentially subject to decline owing to diseases and/or global warming (Gratzfeld *et al.* 2015), the latter also affecting the habitat. Though the recent finding (2009) of a second subpopulation (Garfi *et al.* 2011) increased the number of known plants, the probability of extinction remains very high. The species is assessed as Critically Endangered B1ab(iii)+2ab(iii).

A range of conservation actions are in place for this species, including the establishment in 2016 of additional sub-populations outside the natural range of the species, and the species should be reassessed in 2021.

Previously Published Red List Assessments

1998 – Endangered (E)

Geographic Range

Range Description:

The species is known from two localities some 17 km apart on the volcanic outcrops of the Iblei Mountains, Siracusa Province, in southeastern Sicily (Garfi *et al.* 2011). One subpopulation is located in Bosco Pisano (Municipality of Buccheri) and consists of scattered individuals covering a 130 m long strip along a slope, between 495 and 526 m asl; the second subpopulation is located in Contrada Ciranna (Municipality of Melilli), and is mostly concentrated within a 240 m long gully, between 318 and 357 m asl. Both the EOO and the AOO, estimated using a 2x2 km grid, are very much less than 8 km².

Four new subpopulations were created in 2016 comprising 25-26 plants at each locality (Garfi *et al.* 2016), within the activities of the LIFE Project Zelkov@zione (www.zelkovazione.eu). They are located respectively in the Regional Park of the Nebrodi Mts., the Regional Park of the Madonie Mts., the Regional Park of Sicani Mts. and in the SCI ITA090022 Bosco Pisano, the latter a few hundred meters from one of the existing subpopulations. These new subpopulations are not included in the assessment since fewer than five years have passed since they were established.

Country Occurrence:

Native: Italy (Sicilia)

Distribution Map

Zelkova sicula



Range

Extant (resident)

Compiled by:

IUCN (International Union for Conservation of Nature)



Population

The species is known from only two subpopulations, the first one consisting of about 260 individuals, the second of some 1,600 individuals. Recent genetic investigations revealed strong genetic differences between the two subpopulations but no differences at all within each of them (Christe *et al.* 2014). That means that each subpopulation is clonal, hence they should be both considered as issuing from probably centuries-long sprouting of two single surviving genetic individuals (Garfi and Buord 2012, Gratzfeld *et al.* 2015).

Number of mature individuals (=population size): since the population is clonal, the number of mature individuals has been estimated at about 1,860, corresponding to the number of reproducing units.

Current Population Trend: Stable

Habitat and Ecology (see Appendix for additional information)

The plants of the Bosco Pisano subpopulation and some of those of the Contrada Ciranna subpopulation grow within a mosaic-like open landscape dominated by thorny shrubland and open *Quercus suber* (cork oak) woodland. Most parts of the Contrada Ciranna subpopulation forms an almost pure stand. Both stands are located on bare soils with outcropping volcanic rocks; they are restricted to the bottom of gullies and along narrow streams, suggesting that this peculiar microtopographic position plays a key role in improving water supply, and helping the species withstand seasonal water stress.

The species grows as a shrub or small tree in its current habitat, but has the potential to grow into a larger tree in less constraining conditions.

Systems: Terrestrial

Use and Trade

No part (leaves, wood, etc.) of the species is known to have any direct local uses. However the species is probably one of the most palatable plants within local pastures, so presumably it could contribute value to local livestock grazing.

Threats (see Appendix for additional information)

Although a second subpopulation was found in 2009, both known subpopulations contain a very low number of individuals. Being unable to perform sexual reproduction and due to its extreme genetic impoverishment, the probability of extinction of this species is very high. At present its survival relies solely on vegetative propagation through root suckering mechanisms.

Moreover, the plant communities hosting this species are very degraded due to past land uses such as logging, in addition to current cork harvesting, wildfires and (over)grazing. Ongoing investigations into the water physiology of the species suggest that it requires moist conditions and highlight the negative effects of temperature extremes and droughts; such factors periodically cause severe damage to the plants, and have significantly increased in frequency and intensity in recent years presumably as a consequence of climate changes. Moreover, they may intensify the occurrence of wildfires and the impact of pests and diseases. Fires represent a very real threat to this species; whilst the long-term

impact in terms of mortality requires ongoing monitoring, a large wildfire in August 2017 over an area of more than 7 km² impacted the Contrada Ciranna subpopulation, causing more or less severe damage to 60% of plants there (G. Garfi pers. comm. 2017).

Conservation Actions (see Appendix for additional information)

The species was assessed as CR globally in 2006 (Garfi 2006, Montmollin and Strahm 2005) and in 1998 (Garfi, in Walter and Gillett 1998).

Actions in Place

Since 2013 the species has been officially protected by the Presidential Decree of the Sicilian Region 27/05/2013.

In situ: Both subpopulations are fenced to prevent grazing, and fall within two SCIs (Sites of Community Importance) of the European Natura 2000 Network. Several actions of an ongoing EU LIFE Project, e.g. the implementation of a grazing management plan and the afforestation activities to restore local habitat functions and speed up vegetation dynamics, aim at improving the conservation status of the species. In June and November 2016, 25-26 plantlets per site were introduced in small pilot areas at Bosco Tassita (Nature Regional Park of Nebrodi Mts.), Bosco Pomieri (Nature Regional Park of Madonie Mts.), Bosco Ficuzza (Nature Regional Park of Sicani Mts.) and in the SCI ITA09002 Bosco Pisano (Garfi *et al.* 2016) following the IUCN Re-introduction Guidelines.

Ex situ: Currently the species is cultivated at the Botanical Garden of the University of Catania, at the National Botanical Conservatory of Brest (France), at the Regional Forest Nursery of Spinagallo (Siracusa) of the Sicilian Forest Department, at the Parc Saint-Mitre of Aix-en-Provence (France), in a private garden in the town of Buccheri, and at a private estate at Fasano di Puglia. Moreover, in the framework of the above-mentioned LIFE project *Zelkov@zione*, new plants have been obtained through root cuttings (by the Conservatoire National Botanique de Brest) and through *in vitro* techniques (by the Institute of Biosciences and BioResources of Palermo with the support of the University of Fribourg, Switzerland). Some of this material is being used to create new subpopulations in other Sicilian sites, some of them selected outside its current range as they are suggested to be more suitable for the survival of the species in case of global warming. Four new subpopulations have been created in 2016, including 25-26 plants each, within the LIFE Project *Zelkov@zione*. They are located respectively in the Regional Park of the Nebrodi Mts., the Regional Park of the Madonie Mts., the Regional Park of Sicani Mts., and in the SCI Bosco Pisano, the latter a few hundred meters from one of the existing subpopulations.

Actions Needed

Field exploration throughout the Iblei Mountains and the Sicilian territory, supported by modern GIS and remote sensing tools, has been carried out in Autumn 2016 in order to find new subpopulations which may contain precious genetic heritage to be conserved. 99 potential locations classified by both automatic and manual procedures were selected and 72 sites explored. Though no new site was found yet, the model proved to work well, so new campaigns are planned in the near future with more refined methods.

Better information on the reproduction biology, ecological requirements (soil and water) and on ecosystem-level relationships (competition, facilitation, parasites and predators) should improve

conservation measures.

Credits

Assessor(s): Garfi, G., Pasta, S., Fazan, L. & Kozlowski, G.

Reviewer(s): Perez Graber, A. & Allen, D.J.

Bibliography

Christe, C., Kozłowski, G., Frey, D., Bétrisey, S., Maharramova, E., Garfi, G., Pirintsos, S. and Naciri, Y. 2014. Footprints of past intensive diversification and structuring in the genus *Zelkova* (Ulmaceae) in south-western Eurasia. *Journal of Biogeography* 41(6): 1081-1093: DOI: 10.1111/jbi.12276.

Garfi, G. 1997. On the flowering of *Zelkova sicula* (Ulmaceae): additional description and comments. *Plant Biosystems* 131(2): 137-142.

Garfi, G. 2006. *Zelkova sicula*. The IUCN Red List of Threatened Species 2006: e.T61678A12522379. <http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T61678A12522379.en>. IUCN: Cambridge (Accessed: 31 August 2017).

Garfi, G. and Buord S. 2012. Relict species and the challenges for conservation: the emblematic case of *Zelkova sicula* Di Pasquale, Garfi et Quézel and the efforts to save it from extinction. *Biodiversity Journal* 3(4): 281-296.

Garfi, G., Barbero, M. and Tessier, L. 2002. Architecture and growth patterns of *Zelkova sicula* (Ulmaceae) in South-East Sicily as a response to environmental conditions. *Journal of Mediterranean Ecology* 3(2-3): 65-76.

Garfi, G., Carimi, F., Pasta, S., Rühl, J. and Trigila, S. 2011. Additional insights on the ecology of the relict tree *Zelkova sicula* Di Pasquale, Garfi et Quézel (Ulmaceae) after the finding of a new population. *Flora* 206: 407-417.

Gratzfeld, J., Kozłowski, G., Fazan, L., Buord, S., Garfi, G., Pasta, S., Gotsiou, P., Fournaraki, Ch., and Dimitriou, D. 2015. Whither rare relict trees in a climate of rapid change? Conservation challenges of *Zelkova sicula* and *Z. abelicea* – two Mediterranean narrow endemics. *BGjournal* 12.2: 21-25.

IUCN. 2017. The IUCN Red List of Threatened Species. Version 2017-3. Available at: www.iucnredlist.org. (Accessed: 7 December 2017).

Kozłowski, G. and Gratzfeld, J. 2013. *Zelkova* – an ancient tree. Global status and conservation action. Natural History Museum, Fribourg.

Montmollin, B. de and Strahm, W. (eds). 2005. *The Top 50 Mediterranean Island Plants: Wild plants at the brink of extinction, and what is needed to save them*. IUCN SSC Mediterranean Islands Plant Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Oldfield, S., Lusty, C. and MacKinven, A. (compilers). 1998. *The World List of Threatened Trees*. World Conservation Press, Cambridge, UK.

Walter, K.S. and Gillett, H.J. (eds). 1998. *1997 IUCN Red List of Threatened Plants*. Compiled by the World Conservation Monitoring Centre. IUCN – The World Conservation Union, Gland, Switzerland and Cambridge, UK.

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External Resources

For [Images and External Links to Additional Information](#), please see the Red List website.

Appendix

Habitats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Habitat	Season	Suitability	Major Importance?
3. Shrubland -> 3.8. Shrubland - Mediterranean-type Shrubby Vegetation	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.2. Wetlands (inland) - Seasonal/Intermittent/Irregular Rivers/Streams/Creeks	Resident	Suitable	Yes

Threats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Threat	Timing	Scope	Severity	Impact Score
11. Climate change & severe weather -> 11.2. Droughts	Future	Whole (>90%)	Very rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.2. Small-holder grazing, ranching or farming	Ongoing	Majority (50-90%)	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.5. Motivation Unknown/Unrecorded	Ongoing	Whole (>90%)	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality		
8. Invasive and other problematic species, genes & diseases -> 8.2. Problematic native species/diseases -> 8.2.1. Unspecified species	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	2. Species Stresses -> 2.1. Species mortality		

Conservation Actions in Place

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Actions in Place
In-Place Research, Monitoring and Planning
Action Recovery plan: Yes

Conservation Actions in Place
Systematic monitoring scheme: Yes
In-Place Land/Water Protection and Management
Occur in at least one PA: Yes
Percentage of population protected by PAs (0-100): 100
Invasive species control or prevention: Not Applicable
In-Place Species Management
Successfully reintroduced or introduced benignly: Yes
Subject to ex-situ conservation: Yes
In-Place Education
Subject to recent education and awareness programmes: Yes

Conservation Actions Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
1. Land/water protection -> 1.2. Resource & habitat protection
3. Species management -> 3.2. Species recovery

Research Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
1. Research -> 1.5. Threats
2. Conservation Planning -> 2.1. Species Action/Recovery Plan
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km ²): 8

Distribution
Continuing decline in area of occupancy (AOO): No
Estimated extent of occurrence (EOO) (km ²): 8
Continuing decline in extent of occurrence (EOO): No
Number of Locations: 2
Lower elevation limit (m): 318
Upper elevation limit (m): 526
Population
Continuing decline of mature individuals: No
Extreme fluctuations: No
Population severely fragmented: Yes
Continuing decline in subpopulations: No
Extreme fluctuations in subpopulations: No
All individuals in one subpopulation: No
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes

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