

Global and Regional IUCN Red List Assessments: 6

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Abstract

In this contribution, the conservation status assessment of four vascular plants according to IUCN categories and criteria are presented. It includes the assessment of *Epipactis maricae* (Croce, Bongiorno, De Vivo & Forti) Presser & S.Hertel at global level, and the regional assessment of *Cerintho retorta* Sm. (Italy), *Platanthera kuenkelei* H.Baumann subsp. *kuenkelei* (Europe) and *Typha elephantina* Roxb. (Egypt).

Keywords

conservation, extinction risk, IUCN protocol, threats

How to contribute

The text of the global and regional assessment should be submitted electronically to Simone Orsenigo (Simone.Orsenigo@unimi.it) or to Giuseppe Fenu (gfenu@unica.it); text up to 8000 characters in length (space included) must include a distribution map and a picture of the assessed species.

Red List assessments

Epipactis maricae (Croce, Bongiorno, De Vivo & Fori) Presser & S.Hertel

Global Assessment

Taxonomy and nomenclature

Order: Asparagales Family: Orchidaceae

Epipactis maricae (Croce, Bongiorno, De Vivo & Fori) Presser & S.Hertel, Ber. Arbeitskreis. Heimische Orchid. 32(2): 108 (2016) = *Epipactis nordeniorum* Robatsch subsp. *maricae* Croce, Bongiorno, De Vivo & Fori, J. Eur. Orch. 43 (4): 837 (2011)

Common name: Elleborina del Savone (It), Marica's Helleborine (En).

Geographic distribution range: *Epipactis maricae* (Fig. 1) is endemic to the Roccamonfina Volcano (Campania, Italy; Croce et al. 2011). This species was observed only in three sites, located along the deep gorge of the “Savone delle Ferriere” stream (Fig. 2). Further explorations of the lower traits of the stream and of other similar sites on the volcano have been unfruitful.

Distribution: Country of occurrence: Italy.

Biology: *Plant growth form:* perennial (geophyte)

Flowering and fruiting time: from July to August.

Reproduction: *Epipactis maricae* is an autogamous (Croce et al. 2011), probably cleistogamous, plant species. Fruits develop quickly after flowering so that, in the same spike, the lower flowers are fruiting while the top ones are still in bud. It is an anemochorous species; no information on seed germination is available.

Habitat and Ecology: *Epipactis maricae* grows in riparian communities, in shady conditions due to the high tree coverage and the steep slopes of the deep and narrow gorge of the “Savone delle Ferriere” stream, always on wet sandy banks, from 290 to 580 m a.s.l. (Croce and Nazzaro 2012).

Population information: Population dynamics have been monitored since the discovery of this species in 1999. In the largest subpopulation at the *locus classicus* (south-west of the village of Furnolo), the number of ramets fluctuates, with no plants emerging in the driest summer and a maximum of 35 ramets in the favourable years. The other two subpopulations have not been observed again in the last five years.

Threats:

- 6.1. *Recreational activities:* fishermen and excursionists trampling on the sandy banks have a negative impact on habitat (soil compaction) and mature individuals.
- 7.3. *Other ecosystem modifications:* severe alteration of the riparian vegetation (tree cutting or falling due to landslides or floods) could affect the environmental conditions (light or soil moisture) of the banks.
- 8.1.2. *Invasive non-native/alien species (named species):* in all sites the quick expansion of *Impatiens balfourii* Hook.f. can pose a serious threat to the habitat of the species.
- 11.4. *Storms & floodings:* landslides, collapse of overhanging cliffs, and floods affect bank morphology by erosion or sediment deposition.



Figure 1. *Epipactis maricae* at the *locus classicus* on the Savone delle Ferriere stream, near the village of Furnolo (Teano, Caserta). Pictures by A. Croce.

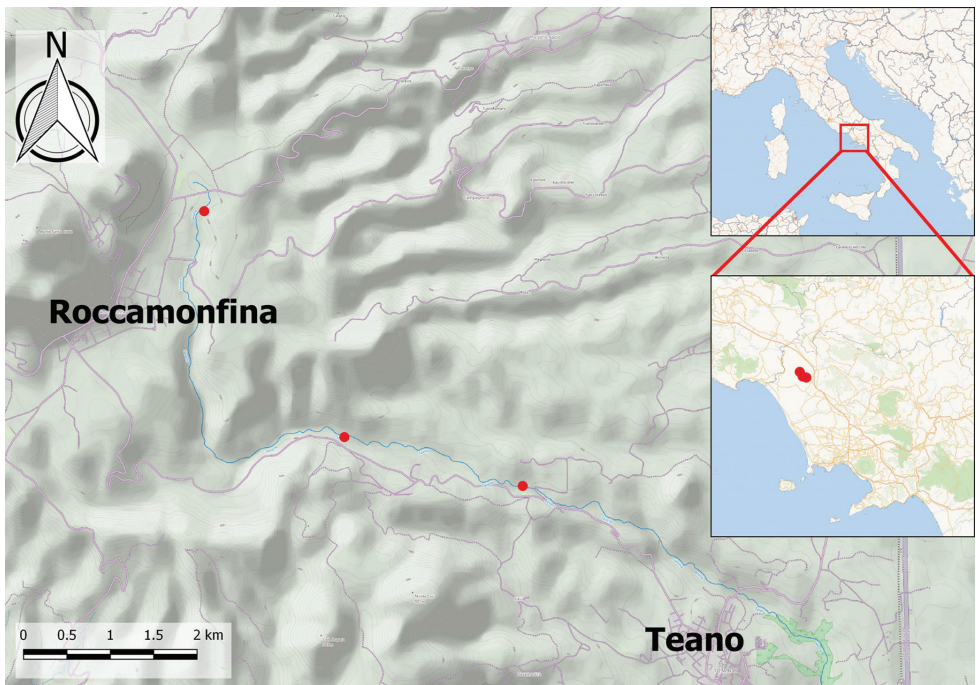


Figure 2. Geographic range and distribution map of *Epipactis maricae*.

CRITERIA APPLIED:

Criterion B: **EOO:** 4 km² calculated with a minimum convex hull polygon in QGIS Desktop 2.18.15

a) Number of locations: one, according to threat 11.4

b) Documented decline in quality of the habitat (iii) and number of mature individuals (v)

Criterion D: Number of mature individuals < 50

Red List category and Criteria (Global Assessment)

CR	Critically Endangered	B1ab(iii,v) + D
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Rationale for the assessment: *Epipactis maricae* is an Italian endemic species threatened by alteration of its habitat: it has an EOO of 4 km². The known populations are made up of few individuals (less than 50), growing in a very narrow and short belt along the stream. It is, therefore, assessed as Critically Endangered (CR) at a global level.

Previous assessment: Critically Endangered (CR B1ab(v)+2ab(v)+D) at global level (Orsenigo et al. 2018).

Conservation actions: All orchids are protected at the Regional level (LR 40/1996). All populations fall within the Roccamonfina-foce Garigliano natural Park.

Conservation actions needed: Further monitoring and research activities are recommended to assess the presence of the species in similar habitats in other gorges on the volcano or along the Savone stream at lower altitudes. *Ex situ* conservation actions are also recommended.

Antonio Croce, Luciano Bongiorno

Cerinthe retorta Sm.

Regional assessment (Italy)

Taxonomy and nomenclature

Order: Boraginales *Family:* Boraginaceae

Cerinthe retorta Sm., Fl. Graec. Prodr. 1(1): 120 (1806) = *Cerinthe purpurea* Vis., Flora 12(1, Ergänzungsbl.): 8 (1829) = *Cerinthe atropurpurea* Vis. ex A.DC., Prodr. 8: 4 (1844).

Common name: Violet honeywort (En).

Geographic distribution range: *Cerinthe retorta* (Fig. 3) grows in Turkey, SE-Europe, and Italy (Selvi et al. 2009, Valdés 2011, Wagensommer et al. 2014). In Italy, it occurs only in Puglia, with a single population on the Gargano Promontory, Valle dell'Inferno, in the municipality of San Giovanni Rotondo (Fig. 4).



Figure 3. *Cerinthe retorta* in Valle dell’Inferno (San Giovanni Rotondo, Italy). Picture by R.P. Wagenommer.



Figure 4. Geographic range and distribution map of *Cerinthe retorta* in Italy.

Distribution: Countries of occurrence: Turkey, Greece, Macedonia, Albania, Italy, and doubtfully Croatia.

Biology: *Plant growth form:* Annual (therophyte). Chromosome number: $2n = 18$ (material from Greece; Selvi et al. 2009).

Flowering and fruiting time: Flowering from late March to early May, fruiting in May.

Reproduction: Pollination by bees; no information is available on seed germination.

Habitat and Ecology: In Italy, *C. retorta* grows on calcareous rocky slopes, directly on the rocks or among the rocks, at an altitude of 380–400 m a.s.l. Nevertheless, in the Aegean region this species occurs also in secondary sites, such as fields, ruderal sites, road margins, and olive groves (Selvi et al. 2009).

Population information: In Italy, *C. retorta* was first recorded in 2013. In 2013 and 2015, about 240 flowering plants were counted, while in 2014 and 2016 only about 50 flowering plants were present. These fluctuations are natural, given that *C. retorta* is an annual species.

Threats:

2.3.1 *Nomadic grazing:* The area in which the species grows is, sometimes, affected by goat grazing. However, during the monitoring period (2013–2016), grazing did not concern the population of *C. retorta*.

5.2.1 *Gathering terrestrial plants (intentional use):* The species could be affected by collection for its beauty during the flowering period and for scientific purposes by botanists. However, the growing site is far from roads and, therefore, it is visited by a small number of people spending time in nature.

CRITERIA APPLIED:

Criterion D: number of mature individuals: < 250.

Red List category and Criteria (Regional Assessment)

EN	Endangered	D
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Rationale for the assessment: In Italy, *Cerintho retorta* occurs in a single locality, in an area of approximately 10.000 m². The monitoring programme demonstrated that the identified threats are only hypothetical and no continuing decline is expected. In addition, fluctuations in the number of mature individuals are natural. Therefore, criteria B and C cannot be used. Given the number of mature individuals, constantly less than 250 during the four years of monitoring, the species is attributed to the category Endangered (EN), according to criterion D.

Previous assessment: The species was recently recorded in Italy, and assigned to the category Critically Endangered (CR) (Wagensommer et al. 2014). To date, the species was not evaluated (NE) both at global and European levels (Bilz et al. 2011, IUCN 2018).

Conservation actions: *Cerintho retorta* is not protected by international, national or regional laws. No seed collection from the Italian population exists in germplasm

banks. The Italian growing site is included in the National Park of Gargano and in two Natura 2000 sites: “Valloni e steppe pedegarganiche” (SCI IT9110008) and “Promontorio del Gargano” (SPA IT9110039).

Conservation actions needed: Research activities and a monitoring programme are recommended in order to better understand the reproductive biology and the population trend of the species. *Ex situ* genome resource banking is also recommended within plant translocation programmes aimed at increasing the very low number of individuals of the unique Italian population.

Robert Philipp Wagensommer, Enrico Vito Perrino

Platanthera kuenkelei H.Baumann subsp. *kuenkelei*

Regional assessment (Europe)

Taxonomy and nomenclature

Order: Asparagales *Family:* Orchidaceae

Platanthera kuenkelei H.Baumann, Mitt. Arbeitskreis Heimische Orchid. Baden-Württemberg. 13: 120 (1981) = *Platanthera bifolia* var. *kuenkelei* (H.Baumann) P.Delforge, Naturalistes Belges. 81: 398 (2000) = *Platanthera bifolia* subsp. *kuenkelei* (H.Baumann) Kreutz, Kompend. Eur. Orchid.: 133 (2004).

Common name: Platantera di Künkele (It), Butterfly orchid of Künkele (En).

Geographic distribution range: The current distribution of *Platanthera kuenkelei* H.Baumann subsp. *kuenkelei* (Fig. 5) in Europe consists of a single population located in central-western Sardinia; the nearest populations are reported for Tunisia and Algeria (Fig. 6).

Distribution: Countries of occurrence: Italy (Sardinia), Algeria, Tunisia.

Biology: *Plant growth form:* perennial (geophyte).

Flowering and fruiting time: Flowering from late May to June and fruiting from June to July.

Reproduction: No information on pollination, dispersal strategy and seed germination is available.

Habitat and Ecology: This species shows a relatively narrow ecological range. The unique Sardinian population grows on basaltic substrate near Monte Sant’Antonio (Borore municipality), at about 700 m a.s.l. It is a member of plant communities characterised by *Quercus ichmusae* Mossa, Bacch. & Brullo, *Quercus ilex* L., *Quercus suber* L., and *Ilex aquifolium* L. Its habitat is dominated by *Smilax aspera* L., *Hedera helix* L., *Clematis vitalba* L., *Rubus ulmifolius* Schott, *Rosa sempervirens* L., and *Crataegus monogyna* Jacq.

Population information: There is no detailed information available on population dynamics.



Figure 5. Inflorescence of *Platanthera kuenkelei* H.Baumann subsp. *kuenkelei*. Photograph by V. Rodi.

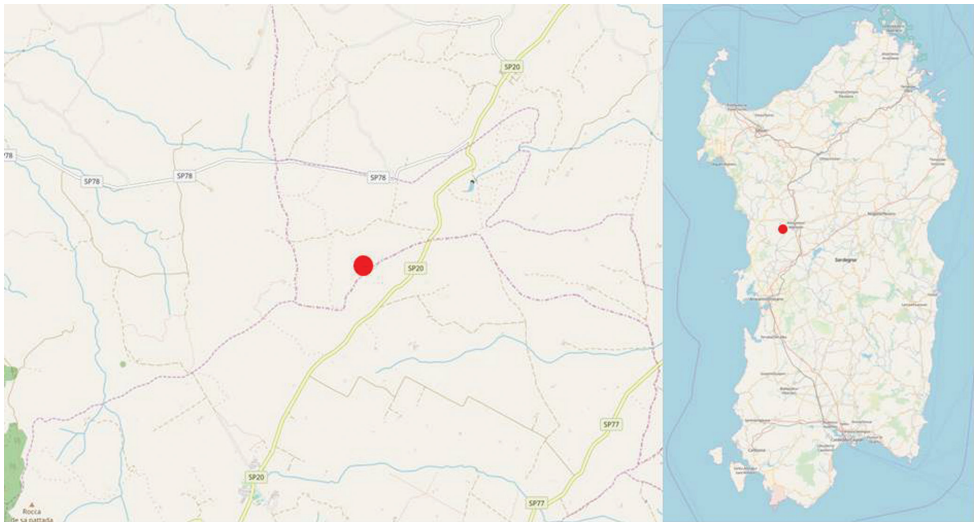


Figure 6. Geographic range and distribution map of *Platanthera kuenkelei* H.Baumann subsp. *kuenkelei* in Sardinia.

Threats:

- 2.3.1 *Nomadic grazing*: The high number of wild boars (*Sus scrofa*) during the reproductive stage could limit the fitness of this unit.
- 2.2 *Wood plantations*: silvicultural activities could cause damage to the population.
- 5.2 *Gathering terrestrial plants*: the only known European population is subject to the attendance of photographers and orchid lovers that might harm plants.

CRITERIA APPLIED:

- Criterion B*: **AOO**: 4 km² calculated with a 2×2 km cell fixed grid
- Decline*: observed decline in number of mature plants (v).
- Criterion C*: Population estimated in less than 250 mature plants. Continuous decline observed in the number of mature individuals. Population structure with no subpopulations consisting of more than 50 mature individuals.
- Criterion D*: Population estimated in less than 50 mature individuals; in the last monitoring (June 2018) only 40 mature individuals were observed.

Red List category and Criteria (Regional Assessment)

CR	Critically Endangered	B2ab(v)+C2a(i)+D
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Rationale for the assessment: The Sardinian population of *Plantanthera kuenkelei* subsp. *kuenkelei* is the only population occurring in Europe. Public actions to clean up the underwood in order to prevent fires might seriously damage the population. Moreover, the small size of the population (less than 50 individuals), the observed grazing impact and the frequent visit of orchid photographers caused a decline. For this reason, this plant is assessed as Critically Endangered.

Previous assessment: The taxon was not evaluated previously (NE) (IUCN 2018).

Conservation actions: *Plantanthera kuenkelei* H.Baumann subsp. *kuenkelei* is not protected by international, national and regional laws. A fence was built to protect the population from the destructive action of animals and humans.

Conservation actions needed: Research activities and especially monitoring programs are encouraged in order to better understand the reproductive biology of this species; *ex situ* conservation and germination could prevent the risk of extinction.

Notes: Morphometric investigations confirm the close relationship with the populations from North Africa. Genetic analyses support the morphometric analyses and show that European and African populations can be both ascribed to the same subspecies. *Plantanthera kuenkelei* differs from *P. algeriensis* for its ecology (it prefers sunny and wet meadows) and for its greenish flowers. In comparison with *P. bifolia*, *P. kuenkelei* is generally taller (50-80 cm) and shows a higher number of flowers (30-60 per inflorescence; Pavarese et al. 2011).

Michele Lussu, Annalena Cogoni, Pierluigi Cortis

Typha elephantina Roxb.

Regional Assessment (Egypt)

Taxonomy and nomenclature*Order:* Poales *Family:* Typhaceae

Typha elephantina Roxb. Fl. Ind. 3: 566 (1832) = *T. maresii* Batt., Bull. Soc. Bot. France 34: 389 (1887), *T. schimperii* Rohrb., Verh. Bot. Vereins Prov. Brandenburg 11: 95 (1869)

Common name: Dees, Burdi Elhor (Arabic); Hogla, Indian Reedmace (En).

Geographic distribution range: *Typha elephantina* (Fig. 7) is widespread across Africa, Middle East and southern Asia (Burkill 2000, Boulos 2005). In Egypt, it was recorded in Wadi Natrun by Boulos (2005) and, in particular, on the banks of Al-Gaar, El-Baida, El Khadra, El Fasda, and El-Hamra lakes (Abd El-Ghani et al. 2014) and in Sinai, in the oasis of Ein umm Ahmed, by Danin et al. (1985). However, the Sinai population was no longer confirmed (Boulos 1995, El-Amier 2013). Currently, its distribution in Egypt is restricted to the Wadi Natrun (Fig. 8) only, along the edges of three lakes: Al-Gaar, El-Baida and El-Hamra (unpublished data).

Distribution: Countries of occurrence: Algeria, Chad, China, Egypt, Eritrea, Ethiopia, India, Iran, Israel, Jordan, Libya, Morocco, Myanmar, Nepal, Niger, Pakistan, Palestine, Saudi Arabia, Senegal, Tajikistan, Turkmenistan, Uzbekistan, and Yemen.

Biology: *Plant growth form:* perennial (geophyte).

Flowering and fruiting time: Flowering from June to July, fruiting from September to November.

Reproduction: By seed and vegetative propagation. Wind-pollinated. Seed dispersal anemochorous.

Habitat and Ecology: *Typha elephantina* grows on swamps and sandy terraces bordering permanent lakes of fresh or brackish waters (Boulos 2005, Zahran and Willis 2009). This species typically occurs on muddy soils, rich in organic matter (Zahran and Willis 2009) and in fresh water where the total soluble salts not exceeds 2000 ppm (Abd El-Ghani et al. 2014).

Population information: There is no available detailed information on population dynamics. According to Abdelaal (2013), *T. elephantina* population surface-area was ca. 0.25 km²; however, the authors observed a decrease to ca. 0.01 km² during the last years (unpublished data). Accordingly, also the number of mature individuals can be considered in decline.

Threats:

- 1.1 *Housing & urban areas:* There is an increase in the urban areas along banks of the lakes.
- 2.1 *Annual & perennial non-timber crops (2.1.2 Small-holder farming):* Agriculture and newly-reclaimed lands have replaced most of the native habitats.



Figure 7. *Typha elephantina* Roxb. in El-Baida Lake, Wadi Natrun (Egypt). Plants living in their natural habitat and spikes. Pictures by M. Abdelaal.

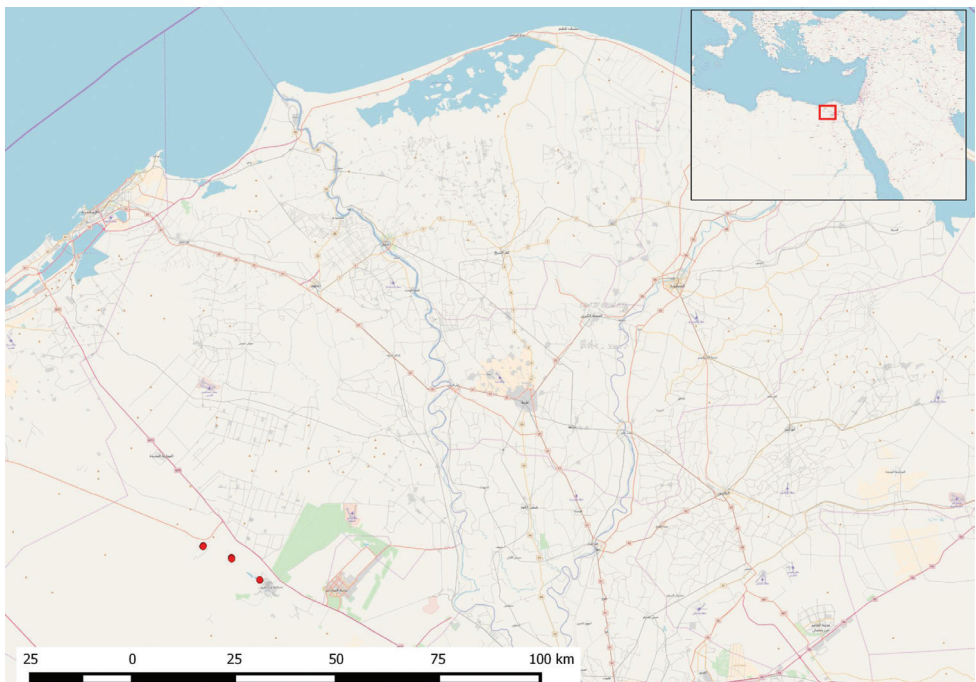


Figure 8. Geographic range and distribution map of *Typha elephantina* in Egypt.

- 2.3 *Livestock farming & ranching (2.3.1 Nomadic grazing)*: All populations are influenced by cattle and sheep trampling.
- 5.2.1 *Intentional use (species being assessed is the target)*: the plant is used by local inhabitants as a source of fuel during cooking in the absence of alternative combustibles, for making fences, mats, huts, mattresses and paper manufactures.
- 7.2 *Dams & Water Management/Use*: *Typha elephantina* vegetation has been replaced in some areas by *Phragmites australis* (Cav.) Trin. ex Steud. and *T. domingensis* (Pers.) Steud., due to changes in water flow patterns from their natural range and due to an increase in salinity levels.
- 11.4 *Storms and flooding*: Al-Gaar Lake locality is subjected to occasional heavy rainstorms, causing exceptional flash flooding that may affect the environmental conditions needed by this species.

CRITERIA APPLIED:

Criterion B: **AOO**: 12 km² calculated with a 2×2 km cell fixed grid

EOO: 12 km² calculated with minimum convex hull in ArcGIS 9.1

- a) Number of locations: three locations (Al-Gaar, El-Baida and El-Hamra) have been identified according to the main threats 1.1. and 2.1.2.
- b) Decline: continuing decline was observed in EOO (i), quality and extent of the habitat (iii) and number of mature individuals (v).

Red List category and Criteria (Regional Assessment)

EN	Endangered	B1ab(i,iii,v) + 2ab(i,iii,v)
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Rationale for the assessment: *Typha elephantina* is widespread across Africa, Middle East and southern Asia, but it is restricted to only three localities in Egypt. It has an area of occurrence (AOO) of 12 km² and a decline in terms of extent of occurrence, population size and habitat quality, was estimated during the last years. Such regional population behaves as an endemic, according to the IUCN guidelines for regional assessments (IUCN 2012), due to the impossibility of any propagules coming from neighbouring regions to recolonize current growing sites in case of extinctions. According to the number of locations (three), it has been regionally assessed as Endangered according to the formula B1ab(i,iii,v)+2ab(i,iii,v).

Previous assessment: Least Concern (LC) in Zhuang (2011) at global level and Least Concern (LC) in García et al. (2015) at regional level for the Arabian Peninsula.

Conservation actions: To our knowledge, *T. elephantina* is not protected by either international, national or regional laws.

Conservation actions needed: Monitoring and research activities are recommended in order to better understand the effective distribution, population size and trend; *ex situ* and *in situ* conservation programs (e.g. enclosures, protected area or seed and vegetative collections) are encouraged.

References

- Abd El-Ghani M, Hamdy RS, Hamed A (2014) Aspects of vegetation and soil relationships around athalassohaline lakes of Wadi El-Natron, Western Desert, Egypt. *Journal of Biology and Earth Sciences* 4: 21–35.
- Abdelaal M (2013) Plant life in the different habitats in El-Behira Governorate, Egypt: ecology and economic potentialities. PhD Thesis, Mansoura University, Egypt.
- Bilz M, Kell SP, Maxted N, Lansdown RV (2011) European Red List of Vascular Plants. Publications Office of the European Union, Luxembourg.
- Boulos L (1995) Flora of Egypt: Checklist. Al-Hadara Publishing, Cairo.
- Boulos L (2005) Flora of Egypt (vol. 4). Al-Hadara Publishing, Cairo.
- Burkill HM (2000) The useful plants of West Tropical Africa (2nd edn) – Volume 5, Families S–Z, Addenda. Royal Botanic Gardens, Kew, Richmond.
- Croce A, Bongiorno L, De Vivo R, Fori S (2011) *Epipactis nordeniorum* subsp. *maricae*, una nuova sottospecie dal Vulcano di Roccamonfina (Campania, Sud Italia). *Journal Europäischer Orchideen* 43(4): 833–846
- Croce A, Nazzaro R (2012) The Orchid Flora of Roccamonfina-Foce Garigliano Regional Park (Campania, Italy). *Journal Europäischer Orchideen* 44 (3): 509–583.
- Danin A, Shmida A, Liston A (1985) Contributions to the flora of Sinai, III. Checklist of the species collected and recorded by the Jerusalem team 1967–1982. *Willdenowia* 15: 255–322.
- El-Ameir YA (2013) Spatial distribution and nutritive value of two *Typha* species in Egypt. *Egyptian Journal of Botany* 53: 91–113.
- García N, Harrison I, Cox N, Tognelli MF (2015) The status and distribution of freshwater biodiversity in the Arabian Peninsula. IUCN, Gland, Cambridge, and Arlington. <https://doi.org/10.2305/IUCN.CH.2015.MRA.4.en>
- IUCN (2012) Guidelines for Application of IUCN Red List Criteria at Regional and National Levels: Version 4.0. IUCN, Gland and Cambridge. [accessed on 2018/10/01]
- IUCN (2018) The IUCN Red List of Threatened Species (Version 2018–1). <http://www.iucnredlist.org> [accessed on 2018/08/23]
- Orsenigo S, Montagnani C, Fenu G, Gargano D, Peruzzi L, Abeli T, Alessandrini A, Bacchetta G, Bartolucci F, Bovio M, Brullo C, Brullo S, Carta A, Castello M, Cogoni D, Conti F, Domina G, Foggi B, Gennai M, Gigante D, Iberite M, Lasen C, Magrini S, Perrino EV, Prosser F, Santangelo A, Selvaggi A, Stinca A, Vagge I, Villani MC, Wagensommer RP, Wilhelm T, Tartaglini N, Duprè E, Blasi C, Rossi G (2018) Red Listing plants under full national responsibility: extinction risks and threats in the vascular flora endemic to Italy. *Biological Conservation* 224: 213–222.
- Pavarese G, Tranchida-Lombardo V, Cogoni A, Cristaudo A, Cozzolino S (2011): Where do Sardinian orchids come from: a putative African origin for the insular population of *Platanthera bifolia* var. *kuenkelei*? *Botanical Journal of the Linnean Society* 167: 466–475. <https://doi.org/10.1111/j.1095-8339.2011.01190.x>
- Selvi F, Cecchi L, Coppi A (2009) Phylogeny, karyotype evolution and taxonomy of *Cerintho* L. (Boraginaceae). *Taxon* 58(4): 1307–1325.

- Valdés B (2011) Boraginaceae. Euro +Med Plantbase – The information resource for Euro-Mediterranean plant diversity. <http://ww2.bgbm.org/euroPlusMed/query.asp> [accessed on 2018/08/23]
- Wagensommer RP, Fröhlich T, Fröhlich M (2014) First record of the southeast European species *Cerintho retorta* Sibth. & Sm. (Boraginaceae) in Italy and considerations on its distribution and conservation status. *Acta Botanica Gallica: Botany Letters* 161(2): 111–115. <https://doi.org/10.1080/12538078.2014.892438>
- Zahran MA, Willis AJ (2009) *The vegetation of Egypt* (2nd edn). Springer, Netherlands.
- Zhuang X (2011) *Typha elephantina*. The IUCN red list of threatened species. <https://doi.org/10.2305/IUCN.UK.2011-1.RLTS.T164162A5757751.en>