

Provisional IUCN Red List of Iraq's endemic plants

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Tony Miller and Sophie Neale

Centre for Middle Eastern Plants, Royal Botanic Garden Edinburgh

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Introduction

In total 121 plant taxa considered to endemic to Iraq were assessed including five subspecies and five varieties. This list must be considered provisional: the taxonomic status of many of these taxa is uncertain and their distribution poorly known. For instance, 33 taxa are only known from single collections, some made over 150 years ago.

Method

Data for the assessments was gathered from the following sources: species accounts in the *Flora of Iraq* (Ghazanfar 1966-), *Flora Iranica* (Rechinger 1963-) and *Flora of Lowland Iraq* (Rechinger 1964); a brief survey of literature; specimens held in the herbaria of the Royal Botanic Garden Edinburgh and Royal Botanic Gardens Kew and recent field collections and observations. A provisional list of Iraqi endemics was then assembled. This totalled 117 taxa which is considerably lower than had previously been calculated. A review of literature revealed that over 60 species, previously believed to be endemic to Iraq, have now been found to occur in neighbouring countries.

All species were mapped and the patterns of distribution assessed, in particular the degree of fragmentation and the number of locations and sub-populations etc. The Extent of Occurrence (EoO - the total area of distribution) and Area of occupancy (AoO – the area of the habitats occupied within the overall distribution) of each species was calculated using GeoCAT – the Geospatial Conservation Assessment Tool [<http://geocat.kew.org>].

Threats were then assessed. In most cases it was not possible to assess the individual threats to each species. However, it was judged that the two over-arching threats of (1) modification of habitats change brought about by climate change and (2) over-grazing, now impact on all the species under consideration.

1. *Climate*. It is predicted that by the second half of this century there will be a slight increase in precipitation in southern Iraq and a slight increase in northern Iraq but increases in temperature throughout. Large parts of Iraq will experience significant increases in the length of the dry season of ~2 months by late century (Evans 2009, Lelieveld 2012). There is some evidence of that changes are already happening. On Pira Magroon a socio-economic survey carried out by Nature Iraq found that pastoralists repeatedly spoke of springs drying up and reduced flow in streams fed by snow fields.
2. *Changes in Management practices*. The landscapes of Iraq are the result of traditional land management systems developed over the last 10,000 years. These systems are well-adapted to the local conditions, resilient and support a rich biodiversity. Unfortunately, they are gradually falling into disuse. This decline together with uncontrolled and insensitive rural development, urban expansion and a lack of public awareness is having an impact on habitats throughout Iraq – most particularly by increasing grazing pressure and leading to the destruction of vegetation and endangering the survival of many plants.

Summary of the conservation status of Iraqi endemic plants

Category	
Critically Endangered	8
Endangered	25
Vulnerable	58
Near Threatened	4
Data Deficient	10
Least Concern	16
Not Assessed	
Total	121

Notes on the IUCN Red List

The following notes on the Red List are taken from the IUCN website [<http://www.iucnredlist.org/>]

The IUCN Red List of Threatened Species (also known as the IUCN Red List or Red Data List), founded in 1964, is the world's most comprehensive inventory of the global conservation status of biological species.

The IUCN Red List is set upon precise criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. The aim is to convey the urgency of conservation issues to the public and policy makers, as well as help the international community to try to reduce species extinction. The IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species at high risk of global extinction. The general aim of the system is to provide an explicit, objective framework for the classification of the broadest range of species according to their extinction risk.

According to the IUCN (1996), the formally stated goals of the Red List are intended to:

1. provide scientifically based information on the status of species and subspecies at a global level
2. draw attention to the magnitude and importance of threatened biodiversity
3. influence national and international policy and decision-making, and
4. provide information to guide actions to conserve biological diversity.[1]

The Red List Criteria should be applied to a taxon based on the available evidence concerning its numbers, trend and distribution. In cases where there are evident threats to a taxon through, for example, deterioration of its only known habitat, a threatened listing may be justified, even though there may be little direct information on the biological status of the taxon itself. Where data are so uncertain that any category is plausible, the category of 'Data Deficient' should be assigned. However, it is important to recognize that this category indicates that the data are inadequate to determine the degree of threat faced by a taxon, not necessarily that the taxon is poorly known or indeed not threatened. Although

Data Deficient is not a threatened category, it indicates a need to obtain more information on a taxon to determine the appropriate listing; moreover, it requires documentation with whatever available information there is.

The categories

- **Extinct (EX):** A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
- **Extinct in the Wild (EW):** A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
- **Critically Endangered (CR):** A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.
- **Endangered (EN):** A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.
- **Vulnerable (VU):** A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.
- **Near Threatened (NT):** A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
- **Least Concern (LC):** A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
- **DATA DEFICIENT (DD):** A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of

taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

- Not Evaluated (**NE**): A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

References

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Provisional Red List of Iraqi Plants

Apiaceae

***Bunium avromanum* (Boiss. & Hausskn.) Drude**

IUCN category: NT

Notes on assessment: Even though considered "very rare" in Flora Iraq (2013: 165) *Bunium avromanum* is widely distributed across the mountains of Kurdistan. Its altitudinal range suggests it occurs in both the Forest Zone and the Thorn-cushion zone and therefore shows some ecological flexibility in the face of climate change and changes in patterns of land management. *Bunium avromanum* is apparently under no immediate threat but it needs to be monitored and is here categorised as Near Threatened.

Distribution and vegetation type: Widely distributed across the Mountain Forest and Thorn-cushion Zones of Kurdistan.

Habitat: Rocky places on mountains, clearings in *Quercus* woods, on limestone; 1070 - 2750m (Fl. Iraq 2013: 161).

Apiaceae

***Bunium cornigerum* (Boiss. & Hausskn.) Drude**

IUCN category: LC

Notes on assessment: Wide distribution across the mountains of Kurdistan. Its altitudinal range suggests it occurs in both the Forest Zone and the Thorn-cushion zone and therefore shows some ecological flexibility in the face of climate change and changes in patterns of land management.

Distribution and vegetation type: Quite common in the SE sectors of the lower thorn-cushion and upper forest zones of Iraq.

Habitat: Rocky slopes under *Quercus* forest, among serpentine rock. (600-)1000-2000 (-2500)m (Fl. Iraq 2013: 116).

Apiaceae

***Eryngium hainesii* C.C. Towns.**

IUCN category: DD

Notes on assessment: Very rare, only known from one record from the mountains of northern Kurdistan in the upper Forest Zone. Davis (Flora of Turkey 1972, 4: 302) suggests that it is very close to *Eryngium billardieri* and that it requires further study. In common with most herbaceous species in the mountains of Kurdistan its habitat is likely to be impacted by the effects of climate change and over-grazing. It is a poorly known species of uncertain taxonomic status. Further data is required before any meaningful assessment can be made.

Distribution and vegetation type: Mountains of northern Kurdistan in the upper Forest Zone.

Habitat: Dry rocky mountain slopes among *Quercus* scrub; alt 1150 - 1800m (Fl. Iraq 2013: 164)

Apiaceae

***Ferulago abbreviata* C.C. Towns.**

IUCN category: VU D2

Notes on assessment: Very rare, only known from two gatherings on Kapi Qaradagh in the mountains of Kurdistan where it is recorded from the margin of the upper forest/lower thorn-cushion zone of Iraq (Fl. Iraq 2013: 227). Chamberlain (Fl. Iranica 1987, 162: 432) reduces it to a

subspecies of *Ferulago angulata* [subsp. *carduchorum* (Boiss. & Hausskn.) D.F.Chamb.]. Townsend in Flora Iraq (2013: 227) comments that it is very close to *Ferulago carduchorum*. However, he prefers to maintain *F. abbreviata* as a separate species pending population studies in Iraq. He points out that *F. carduchorum* is a rare plant in Iraq "which has not been collected on Qopi Qaradagh". The woodlands and subalpine vegetation on Kopi Qaradagh, the only known locality of *F. abbreviata*, are some of the best protected in Iraq. However, exploration for oil is currently being carried out on the mountain and reduced snow lie (due to climate change) on the upper parts of the mountain are likely to be impacting on the habitat. Even though there is some uncertainty over the taxonomic position of *Ferulago abbreviata* it is clear that it is a distinctive species. It is here assessed as Vulnerable due to its restricted Area of Occupancy (the AoO of the umbelliferous zone on Qara Dagh is estimated to be under 20 km²) and its single location.

Distribution and vegetation type: Upper forest/lower Thorn-cushion Zone

Habitat: Umbelliferous Sub-alpine Zone on limestone mountains; c. 1750m (Fl. Iraq 2013: 227)

Apiaceae

***Ferula shehbaziana* S.A.Ahmad**

IUCN category: CR B1 a biii

Notes on assessment: Known only from Mount Rangin in the Hawraman range, where it is restricted to a small area in the Sub-alpine Zone between rocks and among grasses at 2000 m near the Iraqi-Iranian border. Its habitat is vulnerable to change caused by a reduction in the amount and persistence of snow now being observed in the region (due to climate change). Its single locality, obvious rarity and the threats to the sub-alpine vegetation lead to a Critically Endangered assessment.

Distribution and vegetation type: Sub-alpine grassland.

Habitat: Between rocks and among grasses; 2000m. (Saman A.A. (2013). *Harvard Papers in Botany* 18, 2: 99–100).

Apiaceae

***Leutea rechingeri* (Leute) Pimenov**

IUCN category: EN B1 a biii

Notes on assessment: Known from two localities in the high mountains of Kurdistan. Its Extent of Occurrence is 300 km² and its habitat, on the upper parts of the mountains, is likely to be impacted by reduced snow lie (due to climate change). It is here assessed as Endangered.

Distribution and vegetation type: Local in the Alpine and Thorn-Cushion zone.

Habitat: Umbelliferous sub-alpine zone; 2000-3300m. (Fl. Iraq 2013: 229)

Apiaceae

***Pimpinella hadacii* Engstrand**

IUCN category: CR B1 a Biii

Notes on assessment: Apparently very rare; known only from the type collection until found again in 2014, apparently very near to the type locality. The habitat in the area is undergoing rapid change as grazing patterns are being transformed with the abandonment of traditional land management partly driven by the drying of springs in the area - presumably as a result of reduced snow lie on the upper slopes of the mountains. Assessed as Critically Endangered due to its single location, limited Extent of Occurrence (estimated at less than 100 km²) and the threats to its habitat.

Distribution and vegetation type: Forest zone in the mountains of Kurdistan.

Habitat: Degraded *Quercus* woodland on limestone slopes, 1500-1700m.

Apiaceae

***Pimpinella kurdica* Rech.f. & Riedl**

IUCN category: VUD2

Notes on assessment: This species is only known from a single gathering collected close to the Turkish frontier and will possibly occur over the border. It needs further study to confirm its endemic status. However, its small distribution, and single known location makes it vulnerable to stochastic events and it is therefore assessed as VUD2

Distribution and vegetation type: Forest zone of the Kurdistan Mountains. (Fl. Iraq 2013: 197)

Habitat: On a limestone mountain, in rocky fissures; 1200m (Fl. Iraq 2013: 197).

Apiaceae

***Pimpinella nephrophylla* Rech.f. & Riedl**

IUCN category: VUD2

Notes on assessment: Only known from two locations with a small Area of Occupancy estimated at 12 km². However, this is likely an underestimate as the species is certainly under-collected. Its habitat (on cliffs and in gorges) suggests it is less likely to be impacted by the two main threats to habitats in the region: intensification of grazing and drying of the habitat due to climate change (a slight increase in temperature but a significant increase in the duration of the dry season is predicted). However, its small distribution makes it vulnerable to stochastic events.

Distribution and vegetation type: Forest Zone of the northwest Kurdish mountains.

Habitat: Limestone rocks, gorges and cliffs; 1200-1650m (Fl. Iraq 2013: 187).

Apiaceae

***Pimpinella zagrosica* Boiss. & Hausskn.**

IUCN category: NT

Notes on assessment: Known from several locations in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). It is fairly widespread and not under any immediate threat but surveys are needed to assess its status.

Distribution and vegetation type: Upper Forest Zone and just penetrating into the lower Thorn-cushion Zone (Fl. Iraq 2013: 188).

Habitat: In *Quercus* woodland in deep soil; 1100-2000m (Fl. Iraq 2013: 188).

Apiaceae

***Turgenia lisaeoides* C.C. Towns.**

IUCN category: VU D2

Notes on assessment: Known from two localities in the high mountains of Kurdistan. The Area of Occupancy is estimated at 12 km². However, this is likely to be an underestimate as it is an easily overlooked annual species and is certainly under-collected. The degraded *Quercus* woodland which is its habitat is generally impacted by the effects of climate change (lengthening dry season) and over-grazing. Following the precautionary principle it has been assigned as Vulnerable due to the

small Area of Occupancy and only two locations together with the dual threats of increased length of dry season and over-grazing.

Distribution and vegetation type: Forest zone in the SE Kurdish Mountains close to the Iranian border.

Habitat: Lower mountain sides, on stony slopes, on limestone scree among denuded *Quercus*, in cultivated valley; 1150 - 1000m

Araceae

***Arum hainesii* Agnew et Hadac ex Riedl**

IUCN category: En B2 a biii

Notes on assessment: Only known from two gatherings and not seen recently. The two locations where it was last seen are c. 100 km apart and are both in areas of intensive cultivation. *Arum hainesii* is an apparently distinct species which is restricted to date gardens on the central alluvial plains of Iraq. Agriculture has undergone great changes in the central region of Iraq; there has been a decrease in date gardens and an increase in irrigated agriculture. *Arum hainesii* has been assessed as Endangered due to its limited Area of Occupancy (estimated at 8 km²), only two locations and the clear threat to its habitat with changes in agricultural practices.

Distribution and vegetation type: Areas of irrigated cultivation on the alluvial plains of central Iraq.

Habitat: In shade in irrigated date gardens and orange orchards on the alluvial plains; 40m.

Boraginaceae

***Arnebia linearifolia* A. DC. subsp. *desertorum* Riedl**

IUCN category: DD

Notes on assessment: known from two collections in the Sub-desert Zone of central Iraq The Sub-desert Zone of Iraq is heavily over-grazed with consequent degradation of vegetation. *Arnebia linearifolia* is a widespread and variable species. Subsp. *desertorum* is here classified as Data Deficient: its taxonomic status and distribution need to be re-evaluated before it can be assessed.

Distribution and vegetation type: Sub-desert Zone of central Iraq

Habitat: No habitat details; 100m (Fl. Iranica 1967: 163).

Boraginaceae

***Chorianta popoviana* Riedl**

IUCN category: DD

Notes on assessment: Only known from the type gathering. No habitat details are available.

Distribution and vegetation type: Only known from a single collection in the Forest Zone of Kurdistan

Habitat: No habitat details; 1060m (Fl. Iranica 1967: 169).

Boraginaceae

***Heliotropium albo-villosum* Riedl**

IUCN category: VUD2

Notes on assessment: Only known from a single gathering made over 50 years ago on rocks above the town of Duhok in the Moist Steppe Zone or Lower Forest Zone. The location, above the town of Duhok, is likely to be highly altered (over-grazed). *Heliotropium* is a taxonomically difficult genus and the taxonomic status of *Heliotropium albo-villosum* needs to be re-evaluated.

Distribution and vegetation type: Moist Steppe Zone or Lower Forest Zone.

Habitat: On steep rocks above a town; c. 500-700m. (Fl. Iranica 1967: 44)

Boraginaceae

***Heliotropium confertiflorum* Boiss. & Noë**

IUCN category: VUD2

Notes on assessment: Not seen for 50 years and only known from the type gathering. The only location near Diyala is likely to be highly altered (over-grazed). *Heliotropium* is a taxonomically difficult genus and the taxonomic status of *Heliotropium confertiflorum* needs to be re-evaluated.

Distribution and vegetation type: Sub-desert Zone of central Iraq.

Habitat: No habitat details available; c. 50m (Fl. Iranica 1967: 117).

Boraginaceae

***Myosotis kurdica* Riedl**

IUCN category: EN B1 a biii

Notes on assessment: Only known from a single gathering made in the Sub-alpine Thorn-cushion Zone in the Kurdistan Mountains near the Iranian frontier. The Sub-alpine zones habitat is threatened by the impact of climate change which is leading to a reduction in the volume and persistence of snow cover now being observed in the region and the overgrazing brought about by changes in the traditional land management practices. The single location, limited Area of Occupancy and threats to its habitat lead to an Endangered assessment.

Distribution and vegetation type: Sub-alpine Thorn-cushion Zone in the Kurdistan Mountains near the Iranian frontier.

Habitat: 900-1000m (Fl. Iranica 1967: 263).

Boraginaceae

***Onosma albo-roseum* Fisch. & C.A.Mey subsp. *macrocalycinum* Hausskn. & Bornm.**

IUCN category: LC

Notes on assessment: Known from several locations in three localities in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). Most species of *Onosma* are unpalatable to livestock and are not impacted by over-grazing. It is fairly widespread and not under any immediate threat.

Distribution and vegetation type: Mountains of Kurdistan in the Forest Zone.

Habitat: No habitat details known; 2000-2200m (Fl. Iranica 1967: 206).

Boraginaceae

***Onosma angustiloba* Rech. f. & Riedl**

IUCN category: VUD2

Notes on assessment: Known from two nearby sites (about 15 km apart) in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). Most species of *Onosma* are unpalatable to livestock and are not impacted by over-grazing. The small Area of Occupancy (8 km²) and the single location lead to a Vulnerable assessment.

Distribution and vegetation type: Mountains of Kurdistan in the Forest Zone.

Habitat: No habitat details known; 1100-2000m (Fl. Iranica 1967: 177).

Boraginaceae

***Onosma hawramanensis* S.A.Ahmad**

IUCN category: CR B1 a biii

Notes on assessment: Known only the type gathering collected in grassland on Mount Rangin in the Hawraman range, near the Iraqi-Iranian border. This habitat is vulnerable to change caused by a reduction in the amount and persistence of snow now being observed in the region (due to climate change). Its single locality and obvious rarity and the threats to the Sub-alpine lead to a Critically Endangered assessment.

Distribution and vegetation type: Sub-alpine grassland.

Habitat rock grassland; 2000m. (Saman A.A. (2014). *Harvard Papers in Botany* 19, 2: 201-202).

Boraginaceae

***Onosma qandilica* Rech. f. & Riedl**

IUCN category: VUD2

Notes on assessment: Known from only three collections from two locations in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). Most species of *Onosma* are unpalatable to livestock and are not impacted by over-grazing. The small Area of Occupancy (12 km²) and the two locations lead to a Vulnerable assessment.

Distribution and vegetation type: Mountains of Kurdistan in the Forest Zone.

Habitat: Not habitat details known. 1300-2000m (Fl. Iranica 1967: 177).

Boraginaceae

***Onosma striata* Riedl**

IUCN category: VUD2

Notes on assessment: Known from only the type collection in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). Most species of *Onosma* are unpalatable to livestock and are not impacted by over-grazing. The single location leads to a Vulnerable assessment.

Distribution and vegetation type: Mountains of Kurdistan in the Forest Zone.

Habitat: Not habitat details known. 1300m (Fl. Iranica 1967: 192).

Boraginaceae

***Onosma sulaimaniaca* Riedl**

IUCN category: VUD2

Notes on assessment: Known from only the type collection made probably in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry

season is predicted). Most species of *Onosma* are unpalatable to livestock and are not impacted by over-grazing. The single location leads to a Vulnerable assessment.

Distribution and vegetation type: Probably in the Forest Zone.

Habitat: In the mountains (Fl. Iranica 1967: 192).

Boraginaceae

***Onosma wheeler-hainesii* Riedl**

IUCN category: VUD2

Notes on assessment: Known from only the type collection and probably found in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). Most species of *Onosma* are unpalatable to livestock and are not impacted by over-grazing. The single location leads to a Vulnerable assessment.

Distribution and vegetation type: Probably in the Forest Zone.

Habitat: Not habitat details known (Fl. Iranica 1967: 189).

Brassicaceae

***Alyssum aff inflatum* Nyar [Fl. Iraq 1980: 983]**

IUCN category: DD

Notes on assessment: Known from several collections in two widely separated localities in the Forest Zone of Kurdistan. Townsend in his account in the Flora of Iraq (1980: 983) comments on the uncertainty surrounding the identity and status of this taxon. More research is required before it can be assessed.

Distribution and vegetation type: Mountains of Kurdistan in the Forest Zone.

Habitat: Stony mountainside in *Quercus* forest on clay; alt (800) 1350 - 1550 (Fl. Iraq 1980: 983).

Brassicaceae

***Alyssum penjwinense* Dudley**

IUCN category: LC

Notes on assessment: Widespread in the mountains and known from many collections.

Distribution and vegetation type: Mountains of Kurdistan in the Thorn-cushion and upper Forest Zones.

Habitat: Steep rocky slopes in *Quercus* forest on igneous or metamorphic rock (serpentine); 1600-2100m (Fl. Iraq 1980: 983).

Brassicaceae

***Camelinopsis kurdica* (A.G.Mill.) Al-Shehbaz & A.G.Mill.**

IUCN category: EN B1 a biii, iv

Notes on assessment: Three locations in the Forest Zone of the mountains of southern Kurdistan. The forested mountain slopes in the region are generally impacted by the effects of climate change (lengthening dry season) and over-grazing. One of the three known locations near Zewiya on Pirmagroon mountain has been extensively surveyed over the last five years and this highly distinctive species was not located which strongly indicates a reduction in the number of sub-populations. The habitat in this area is undergoing changes as grazing patterns change. The three

locations, fragmented distribution and limited Extent of Occurrence (estimated at 3250 km²) lead to an Endangered assessment.

Distribution and vegetation type: Mountains of SE Kurdistan in the upper Forest Zone.

Habitat: Dry scree slopes on Serpentine and limestone; alt 1400 - 1800m (Fl. Iraq 1980: 1016).

Brassicaceae

***Erysimum filifolium* Boiss. & Hausskn.**

IUCN category: LC

Notes on assessment: Common and widely distributed in the mountains of Kurdistan.

Distribution and vegetation type: Mountains of Kurdistan in the Forest Zone.

Habitat: Stony mountain slopes, open and coppiced *Quercus* woodland; 700-1450m (Fl. Iraq 1980: 1060).

Brassicaceae

***Erysimum strophades* Boiss.**

IUCN category: LC

Notes on assessment: Fairly common and widely distributed in the Dry Steppe and Sub-desert Zone of northern Iraq.

Distribution and vegetation type: Dry-steppe and Sub-desert Zones of Kurdistan.

Habitat: Desert hills and plains, sometimes gypsaceous, on sandy gravel; 150-250. (Fl. Iraq 1980: 1062).

Brassicaceae

***Hesperis blakelockii* F.Dvořák**

IUCN category: VUD2

Notes on assessment: Only known from the type gathering on a mountain near the Turkish frontier. Its habitat, on a mountain summit is vulnerable to change caused by a reduction in the amount and persistence of snow now being observed in the region (due to climate change) and lead to a Vulnerable assessment.

Distribution and vegetation type: Mountains of Kurdistan in the Thorn-cushion Zone.

Habitat: Mountain summit; 2000m (Fl. Iraq 1980: 1041).

Brassicaceae

***Hesperis kurdica* F. Dvořák & Hadač var. *unguiculata* Dvořák**

IUCN category: DD

Notes on assessment: Only known from a single gathering in Forest Zone of the Kurdistan Mountains. The endemic variety of this widespread species is only known from the type gathering. Its taxonomic status needs to be confirmed by further collecting.

Distribution and vegetation type: Forest Zone of the Kurdistan Mountains. (Fl. Iraq 2013: 1042).

Habitat: Rocky mountain slope alt 1550 – 1650m (Fl. Iraq 1980: 1042).

Brassicaceae

***Hesperis novakii* F.Dvořák var. *mirabilis* Dvorak**

IUCN category: CR B1 a biii

Notes on assessment: Known only from Jebal Sinjar. The vegetation on Jebal Sinjar has been heavily degraded by over-grazing and forest clearance. Several endemic taxa are known from the mountain and all are under extreme threat. The single location, limited Extent of Occurrence (estimated at 32 km²) and severe threats to the habitat lead to a Critically Endangered assessment

Distribution and vegetation type: Degraded forest?

Habitat: On a limestone mountain with relics of *Quercus* forest and terraced fig gardens; 800m (Fl. Iraq 1980: 1044).

Caryophyllaceae

***Paronychia mesopotamica* Chaudhri**

IUCN category: VUD2

Notes on assessment: Only known from the type gathering. It is a small and easily overlooked plant. There is little data on this species but its single locality and small Area of Occupancy lead to a Vulnerable assessment.

Distribution and vegetation type: Forest Zone of northern Kurdistan.

Habitat: Among rocks; 1300m.

Caryophyllaceae

***Petrorhagia sarbaghia* S.A.Ahmad**

IUCN category: VUD2

Notes on assessment: known only from Mount Darlane and above Ahmad Awa in the Hawraman region of Kurdistan close to the Iranian frontier. The two small populations are less than 5km apart but separated by 1400m of altitude and thus show a wide degree of ecological flexibility being found (presumably) in both the Forest and the Sub-alpine Zones. However, both of these vegetation zones are threatened by the impact of climate change which is leading to a reduction in the volume and persistence of snow cover now being observed in the region and the overgrazing brought about by changes in the traditional land management practices. The two locations, limited Area of Occupancy and threats to both habitats lead to a Vulnerable assessment.

Distribution and vegetation type: Forest and the Sub-alpine Zones.

Habitat: in cracks in limestone and on cliffs; 1100-2500m. (Saman A.A. (2014). *Willdenowia* 44: 35–38).

Compositae

***Achillea aleppica* DC. subsp. *densa* (Blakelock) Hub.-Mor.**

IUCN category: EN B1 a biii

Notes on assessment: Known from two sites in the Forest Zone. The *Quercus* woodlands of Kurdistan are already or likely to become threatened by the effects of climate change (slight increase in temperature and a lengthening of the dry season) and over-grazing due to changes in traditional land management. The two sites and Extent of Occurrence estimated at well under 5,000km² lead to an Endangered assessment.

Distribution and vegetation type: Forest Zone of Kurdistan.

Habitat: Habitat not recorded.

Compositae

***Anthemis hamrinensis* Iranshahr**

IUCN category: EN B1 a biii

Notes on assessment: Not seen for 50 years and only known from a small area near Tikrit. This area is likely to be highly altered (over-grazed) and extensive areas are now under irrigated cultivation. The single location and limited Extent of Occurrence (1270km²) lead to an Endangered assessment.

Distribution and vegetation type: Sub-desert Zone of central Iraq.

Habitat: Habitat not recorded; 50-100m.

Compositae

***Anthemis micrantha* Boiss. & Hausskn.**

IUCN category: VUD2

Notes on assessment: Known from a single gathering at Mergapan on Piramagroon mountain made over 100 years ago. This area has been extensively surveyed over the last five years but *Anthemis micrantha* was not located. The forested mountain slopes in Kurdistan are generally impacted by the effects of climate change (lengthening dry season) and over-grazing. It is a small and insignificant species, easily confused with other species of *Anthemis*. This little known but interesting species has been assessed as Vulnerable, following the precautionary principle, until its status can be more fully assessed. If the woodland comes under threat in the future its category will have to be increased to Critically Endangered.

Distribution and vegetation type: Known only from the Piramagroon range in the Kurdish mountains, probably in the Forest Zone.

Habitat: Habitat not recorded.

Compositae

***Anthemis microlepis* Eig**

IUCN category: LC

Notes on assessment: Widely distributed in the Moist steppe Zone and lower Forest Zone.

Distribution and vegetation type: Moist Steppe and lower Forest Zones of the northern Kurdish mountains.

Habitat: Habitat not known; 450-1500.

Compositae

***Anthemis plebeia* Boiss. & Noe**

IUCN category: VUD2

Notes on assessment: Collected twice in a small area in the Moist Steppe Zone near Kirkuk. This area has suffered from over-grazing. The single location, limited Extent of Occurrence and threats lead to a Vulnerable assessment.

Distribution and vegetation type: Moist Steppe Zone of northern Iraq.

Habitat: Habitat not known; 300-600m.

Compositae

***Centaurea alveicola* Rech.f.**

IUCN category: EN B1 a biii

Notes on assessment: Only known from the Sub-desert Zone. This region of sub-desert near the Iranian border is likely to be highly altered by over-grazing. Its small distribution (Extent of Occurrence 1685 km²), single location and the potential threats lead to an Endangered assessment.

Distribution and vegetation type: Sub-desert Zone.

Habitat: Habitat no known; 100-350m.

Compositae

***Centaurea elegantissima* Bornm.**

IUCN category: VUD2

Notes on assessment: Only collected once in the Forest Zone on Sakri Sakran. The single location suggests a threatened assessment is appropriate following the precautionary principle.

Distribution and vegetation type: Forest Zone of the Kurdish mountains.

Habitat: Habitat not known; 1500m.

Compositae

***Centaurea foveolata* Blakelock**

IUCN category: VUD2

Notes on assessment: Known only from two sites c. 30 km apart in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). The limited Extent of Occurrence (estimated at less than 500km²) and two locations lead to a Vulnerable assessment.

Distribution and vegetation type: Moist-steppe and lower Forest Zones of the Kurdish mountains.

Habitat: limestone gully; 1000-1500m

Compositae

***Centaurea fusiformis* Blakelock**

IUCN category: VUD2

Notes on assessment: Known only from two sites c. 10 km apart in the Forest Zone. The Forests and Moist-steppe Zones of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). The limited Extent of Occurrence (estimated at less than 300km²) and two locations lead to a Vulnerable assessment.

Distribution and vegetation type: Forest Zone of the Kurdish mountains.

Habitat: 400-1170m.

Compositae

***Centaurea gudrunensis* Boiss. & Hausskn. ex Boiss.**

IUCN category: VUD2

Notes on assessment: Only known from the Pirmagroon range where it is locally common in the oak woodlands. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in

duration of the dry season is predicted). *Centaurea gudrenensis* is locally common on Piramagroon particularly on limestone outcrops. Its small distribution leads to a Vulnerable assessment.

Distribution and vegetation type: Forest Zone on the Piramagroon range in Kurdistan.

Habitat: limestone cliffs and gulleys; 1100-1500m.

Compositae

***Centaurea longipedunculata* Sch.Bip. ex Boiss.**

IUCN category: VUD2

Notes on assessment: Known from two sites c. 10km apart in *Quercus* forest. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). Not recently collected and status unknown. Small Area of Occupancy, single location and threats lead to a Vulnerable assessment.

Distribution and vegetation type: Forest Zone of the northern Kurdish mountains.

Habitat: 1200-1350M.

Compositae

***Cousinia acanthophysa* Rech.f.**

IUCN category: EN B1 a biii

Notes on assessment: The *Quercus* woodlands of Kurdistan are already or likely to become threatened by the effects of climate change (slight increase in temperature and a lengthening of the dry season) and over-grazing due to changes in traditional land management. A poorly known species whose status is uncertain. The less than five localities, limited Extent of Occurrence (estimated at 2,375km²) and potential threats lead to an Endangered assessment.

Distribution and vegetation type: Forest Zone of the northern Kurdish mountains.

Habitat: Rocky slopes; 200-1500m (Fl. Iranica 1972: 227).

Compositae

***Cousinia algurdina* Rech.f.**

IUCN category: EN B1 a biii

Notes on assessment: Known from the highest mountains. The Alpine habitat is threatened by change caused by a reduction in the amount and persistence of snow now being observed in the region (due to climate change) and by overgrazing. The five locations, limited Extent of Occurrence (estimated at 2000 km²) and threats lead to an Endangered assessment.

Distribution and vegetation type: Sub-alpine and Alpine Thorn-cushion Zone on the highest mountains in Kurdistan near the Iranian frontier.

Habitat: Rocky slopes; 2400-3340m (Fl. Iranica 1972: 222).

Compositae

***Cousinia carduchorum* C.Winkl. & Bornm.**

IUCN category: EN B1 a biii

Notes on assessment: The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). The less than five localities, the limited Extent of Occurrence (estimated at 589km²) and potential threats lead to an Endangered assessment.

Distribution and vegetation type: Forest zone in the mountains of Kurdistan.

Habitat: Rocky slopes; 1000-2600m (Fl. Iranica 1972: 220).

Compositae

***Cousinia gigantosphaera* Rech.f.**

IUCN category: NT

Notes on assessment: Only known from the PIRAMAGROON range. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted).

Widespread and locally common throughout the woodlands on PIRAMAGROON. It is found in both the coppiced *Quercus* woodlands, which on PIRAMAGROON are in places in remarkably good condition and areas of open grassland/degraded woodland. Its limited Extent of Occurrence lead to a Near Threatened assessment.

Distribution and vegetation type: Known only from the PIRAMAGROON range in the Forest Zone.

Habitat: In coppiced *Quercus* and woodland on limestone; 1100-1500m (Fl. Iranica 1972: 225).

Compositae

***Cousinia inflata* Boiss. & Hausskn. ex Boiss.**

IUCN category: EN B1 a biii

Notes on assessment: The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). The less than five localities, limited Extent of Occurrence (estimated at 600km²) and potential threats give grounds for an Endangered assessment.

Distribution and vegetation type: Forest zone in the mountains of Kurdistan near the Iranian frontier.

Habitat: Rocky slopes; 1300-2100m (Fl. Iranica 1972: 248).

Compositae

***Cousinia kurdica* C.Winkl. & Bornm.**

IUCN category: DD

Notes on assessment: Only known from the type gathering collected over one hundred years ago. Its taxonomic status needs to be confirmed by further collecting.

Distribution and vegetation type: Forest Zone in the mountains of Kurdistan.

Habitat: Rocky slopes; 1300-1700m (Fl. Iranica 1972: 221).

Compositae

***Cousinia macrolepis* Boiss. & Hausskn. ex Boiss.**

IUCN category: NT

Notes on assessment: Only known from the PIRAMAGROON range. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted).

Widespread and locally common throughout the woodlands on PIRAMAGROON. It is found in both the coppiced *Quercus* woodlands, which on PIRAMAGROON are in places in remarkably good condition and areas of open grassland/degraded woodland. Its limited Extent of Occurrence lead to a Near Threatened assessment.

Distribution and vegetation type: Known only from the PIRAMAGROON range where it is found in the Forest Zone.

Habitat: In coppiced *Quercus* and woodland on limestone; 1100-1500m (Fl. Iranica 1972: 223).

Compositae

***Cousinia mazu-shirinensis* Rech.f.**

IUCN category: VU B1 a biii

Notes on assessment: The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). The less than five localities, limited Extent of Occurrence (estimated at 1500km²) and potential threats lead to a Vulnerable assessment.

Distribution and vegetation type: Forest Zone of northern Kurdish Mountains

Habitat: Rocky slopes in *Quercus* woodland; 1100-2200m (Fl. Iranica 1972: 226).

Compositae

***Cousinia odontolepis* Sch.Bip. ex DC.**

IUCN category: VU B1 a biii

Notes on assessment: Occurs in two distinct areas: north of Mosul, apparently in the Moist Steppe Zone (700-1000m); and a single collection in the mountains near the Iranian border at 1800m. Both the Moist Steppe Zones and Forest zones are threatened by over-grazing and gradual drying. The fragmented distribution and Extent of Occurrence of over 5,000km² lead to a Vulnerable assessment but an investigation of the taxonomic status of the two sub-populations is needed.

Distribution and vegetation type: Moist Steppe? and Forest Zones of northern Kurdish mountains.

Habitat: Rocky slopes in *Quercus* woodland, limestone; 700-1800m (Fl. Iranica 1972: 226).

Compositae

***Cousinia qandilica* Rech.f.**

IUCN category: CR B1 a biii

Notes on assessment: Very rare and only known from a single location. The *Quercus* woodlands are generally impacted by the effects of climate change (lengthening of the dry season) and over-grazing. The limited Area of Occupancy, single location and threats from over-grazing lead to a Critically threatened assessment. Field surveys are needed to confirm this category.

Distribution and vegetation type: Forest Zone of Kurdistan close to the Iranian frontier.

Habitat: rocky *Quercus* woodland; 1200m (Fl. Iranica 1972: 223).

Compositae

***Cousinia wheeler-hainesii* Rech.f.**

IUCN category: DD

Notes on assessment: Only known from two gatherings from Penjwin in Kurdistan. No habitat details available but it possibly grows on serpentine which is common in the area near Penjwin and a rock type renowned for its endemics.

Distribution and vegetation type: SE Kurdistan.

Habitat: Habitat not known (Fl. Iranica 1972: 223).

Compositae

***Crepis kurdica* Rech.f.**

IUCN category: EN B1 a biii

Notes on assessment: Only known from the Qandil range close to the Iranian border. The Alpine and Sub-alpine zones habitats are threatened by the impact of climate change which is leading to reduction in the volume of snow and persistence of snow cover now being observed in the region and the overgrazing brought about by changes in the traditional land management practices. *Crepis kurdica* is only known from two collections in a single or two locations and clearly has a restricted range. The Extent of Occurrence could not be estimated from the available information but it is clearly below 5,000 km² which together with the threats and single location lead to an Endangered assessment

Distribution and vegetation type: Sub-alpine Thorn-cushion and Alpine Zones.

Habitat: On calcareous rocks; 1800-3200m (Fl. Iranica 1977: 305)

Compositae

***Echinops amoenus* Rech.f.**

IUCN category: VUD2

Notes on assessment: Only known from a single collection made 50 years ago on limestone near Zakho in the northern Kurdish mountains. *Echinops* is a difficult genus with poor species delimitation. The species are all very spiny and avoided by livestock. The habitat of this species is not known but is either in the lower Forest Zone or upper Moist-steppe Zone. *Echinops amoenus* is only known from a single location which leads to a Vulnerable assessment.

Distribution and vegetation type: Forest Zone.

Habitat: Limestone rocks.

Compositae

***Echinops armatus* Boiss. & Hausskn. var. *armatus* Rech.f.**

IUCN category: VUD2

Notes on assessment: *Echinops* is a difficult genus with poor species delimitation. The species are all very spiny and avoided by livestock. *Echinops armatus* has only been collected three times on dry hills in the Moist Steppe Zone between Erbil and Kirkuk. This area is heavily grazed. The Extent of Occurrence is small (1800km²) which leads to a threatened assessment following the precautionary principle.

Distribution and vegetation type: Moist-steppe between Kirkuk and Erbil in northern Iraq

Habitat: Dry hills; c.600m.

Compositae

***Echinops candelabrum* Rech.f.**

IUCN category: VUD2

Notes on assessment: Known only from two collections in the upper Moist-steppe or lower Forest Zone of Kurdistan. *Echinops* is a difficult genus with poor species delimitation. The species are all very spiny and avoided by livestock. *Echinops amoenus* is only known from a two sites about 15 km apart. The limited Extent of Occurrence and two localities lead to a Vulnerable assessment following the precautionary principle.

Distribution and vegetation type: Upper Moist-steppe or lower Forest Zone of Kurdistan.

Habitat: Denuded rocky slopes; 900m.

Compositae

***Echinops faucicola* Rech.f.**

IUCN category: VUD2

Notes on assessment: Known only from the type in the upper Moist-steppe or lower Forest Zone of Kurdistan. *Echinops* is a difficult genus with poor species delimitation. The species are all very spiny and avoided by livestock. *Echinops faucicolus* is apparently only known from a single location. The limited Extent of Occurrence and two localities lead to a Vulnerable assessment following the precautionary principle.

Distribution and vegetation type: Upper Moist-steppe or lower Forest Zone of Kurdistan.

Habitat: Fissures in limestone in a gully; 700m.

Compositae

***Echinops nitens* Bornm.**

IUCN category: VUD2

Notes on assessment: Known only from a small area in the upper Moist-steppe or lower Forest Zone of Kurdistan. *Echinops* is a difficult genus with poor species delimitation. The species are all very spiny and avoided by livestock. This species has been collected several times in the Rawanduz Gorge which cuts through the Kurdistan mountains. The gorge has sheer cliff walls and there are extensive cliff habitats. It is an important refugial site with good examples of *Quercus* forest and riverine forest. It is the only site in Iraq for the chasmophyte *Dionysia bornmuelleri*, a plant of damp cliffs. This site is heavily impacted by tourists and picnickers who come from all over Iraq. The cliff vegetation in the Rawanduz Gorge is to some extent protected from the two main threats to habitats in the region: intensification of grazing and drying of habitat due to climate change. Chasmophytes are less threatened by grazing and cliffs often act as refugia at times of climate change. The limited Extent of Occurrence and two localities lead to a Vulnerable assessment following the precautionary principle.

http://www.natureiraq.org/uploads/9/2/7/0/9270858/rawanduz_gorge-iq015-oct-21-final.pdf.

Distribution and vegetation type: Upper Moist-steppe or lower Forest Zone of Kurdistan.

Habitat: Fissures in limestone in a gully; 700-800m.

Compositae

***Echinops rectangularis* Rech.f.**

IUCN category: VUD2

Notes on assessment: Known only from a single collection At Hajji Omri in the Kurdish mountains *Echinops* is a difficult genus with poor species delimitation. The species are all very spiny and avoided by livestock. The limited Extent of Occurrence and two localities lead to a Vulnerable assessment following the precautionary principle.

Distribution and vegetation type: Forest Zone? in the Kurdish mountains

Habitat: Habitat not known; 1100-1400m.

Compositae

***Staehelina kurdica* Merxm. & Rech.f.**

IUCN category: EN B1 a biii

Notes on assessment: Recorded from several sites in the Forest Zone NE of Mosul. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). The three localities, limited Extent of Occurrence (estimated at 1900 km²) and potential threats lead to an Endangered assessment.

Distribution and vegetation type: limited Forest Zone of northern Kurdistan.

Habitat: In rock fissures, calcareous rocks; 1200m.

Dipsacaceae

***Pterocephalus laxus* I.K. Ferguson**

IUCN category: VU B1 a biii

Notes on assessment: "Locally common" (Fl. Iraq 2013: 309) in the upper Forest Zone of northern Kurdistan. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). The less than five localities, an Extent of Occurrence estimated at 1500km² and potential threats lead to a Vulnerable assessment.

Distribution and vegetation type: Upper Forest Zone of northern Kurdistan (Fl. Iraq 2013: 309).

Habitat: Mountain slopes, near water; alt 1200 -1500m (Fl. Iraq 2013: 309).

Gramineae

***Eragrostis boriانا* Launert**

IUCN category: VUD2

Notes on assessment: It has been difficult to assess the status of this species. It is only found twice in two locations on muddy river banks and has not been recorded for over 50 years. Riverine habitats along stream sides are amongst the most threatened habitats in Iraq. The riparian woodlands and vegetation along rivers is being cleared for agriculture and cut for fuel. The hydrology of the streams, which effects the vegetation, is being altered by the construction of dams, shingle extraction and extraction of water for irrigation. The limited Area of Occupancy (20 km²) and the threats to its habitat discussed above lead to a Vulnerable assessment.

Distribution and vegetation type: Sub-desert Zone along in degraded riverine forest?

Habitat: Muddy riverbank, below flood level; 35- 40m (Fl. Iraq 1968: 440).

Labiatae

***Marrubium eriocephalum* Seybold**

IUCN category: EN B1 a biii

Notes on assessment: Only known from a single locality on the highest mountains of Kurdistan. The Alpine and Sub-alpine zones habitats are threatened by the impact of climate change which is leading to reduction in the volume of snow and persistence of snow cover now being observed in the region and overgrazing brought about by changes in the traditional land management practices. The single locality, limited Area of Occupancy and limited Extent of Occurrence (estimated at well under than 5,000 km²) lead to an Endangered assessment.

Distribution and vegetation type: Sub-alpine Thorn-cushion and Alpine Zones on a single mountain range in Northern Iraq.

Habitat: 2600-3340m.

Labiatae

***Nepeta autraniana* Bornm.**

IUCN category: VUD2

Notes on assessment: Known from a single locality in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). A poorly known species whose status is uncertain but the single locality, limited Area of Occupancy and potential threats give grounds for a Vulnerable assessment.

Distribution and vegetation type: Forest Zone of Kurdistan.

Habitat: No habitat details: 1300m.

Labiatae

***Satureja metastasiantha* Rech.f.**

IUCN category: LC

Notes on assessment: Widespread with a broad altitudinal zone and range of habitats

Distribution and vegetation type: Widespread in the mountains of Kurdistan with a wide altitudinal range covering the Upper Forest Zone, Sub-alpine Thorn-cushion Zone and Alpine Zone.

Habitat: Mountains, siliceous rocks; 1200-3200.

Labiatae

***Scutellaria porphyrantha* Rech.f.**

IUCN category: VUD2

Notes on assessment: Known from three sites in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). A poorly known species whose status is uncertain but the small number of localities, limited Area of Occupancy and potential threats give grounds for a Vulnerable assessment.

Distribution and vegetation type: Forest Zone of Kurdistan.

Habitat: Rocky ground in *Quercus* woodland; 900-1400m.

Labiatae

***Stachys fragillima* Bornm.**

IUCN category: VU B1 a biii

Notes on assessment: Recorded from two sites c. 60km apart in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). A poorly known species whose status is uncertain. The two localities, limited Extent of Occurrence (estimated at well under 20,000 km²) and potential threats lead give grounds for a Vulnerable assessment.

Distribution and vegetation type: Lower Forest Zone; Kurdistan mountains

Habitat: Fissures in calcareous rocks; 600-1200m.

Labiatae

***Stachys graveolens* Nábelek**

IUCN category: VU B1 a biii

Notes on assessment: Recorded from two sites 15km apart in the Forest Zone. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). A poorly known species whose status is uncertain. The two localities, an Extent of Occurrence estimated at well under 20,000 km² and potential threats give grounds for a Vulnerable assessment.

Distribution and vegetation type: Forest Zone in the mountains of northern Kurdistan.

Habitat: Fissures in calcareous rocks; 900m.

Labiatae

***Stachys iraqensis* Bhattacharjee**

IUCN category: DD

Notes on assessment: Known only from a single collection gathered along a river in the Forest Zone of Iraq. It is difficult to assess the status of this species; it has only been found once in irrigated fields and waste ground by a river.

Distribution and vegetation type: Forest Zone of Iraq.

Habitat: Waste ground near river and in irrigated cultivation; c.1000m.

Labiatae

***Stachys nephrophylla* Rech.f.**

IUCN category: VUD2

Notes on assessment: Only known from a single collection in the Rawanduz Gorge which cuts through the Kurdistan mountains. The gorge has sheer cliff walls and there are extensive cliff habitats. It is an important refugial site with good examples of *Quercus* forest and riverine forest. It is the only site in Iraq for the chasmophyte *Dionysia bornmuelleri*, a plant of damp cliffs. The site is heavily impacted by tourists and picnickers who come from all over Iraq. The cliff vegetation in the Rawanduz Gorge is to some extent protected from the two main threats to habitats in the region: intensification of grazing and drying of habitat due to climate change. Chasmophytes are less threatened by grazing and cliffs often act as refugia at times of climate change. However, its small distribution makes it vulnerable to stochastic events and therefore has been assessed as Vulnerable. Ref. http://www.natureiraq.org/uploads/9/2/7/0/9270858/rawanduz_gorge-iq015-oct-21-final.pdf.

Distribution and vegetation type: Only collected once in the Lower Forest Zone.

Habitat: Rock fissures in a limestone gorge; 700m.

Labiatae

***Thymus neurophyllus* (Rech.f.) R.Morales.**

IUCN category: VUD2

Notes on assessment: Only known from a single collection in Moist Steppe Zone of Kurdistan. It is difficult to assess the status of this species. It has only been collected once at a single location on dry hills in the Moist Steppe Zone near Kirkuk. This area is heavily grazed. The single location leads to a Vulnerable assessment following the precautionary principle.

Distribution and vegetation type: Moist Steppe Zone of Kurdistan.

Habitat: Dry hills; 600m.

Liliaceae

***Allium calocephalum* Wedelbo**

IUCN category: VUD2

Notes on assessment: A very distinctive species and of possible horticultural interest. It is found in *Quercus* woodland a habitat which is generally already or likely to be threatened by the effects of climate change (slight increase in temperature and a lengthening of the dry season) and over-grazing. The limited Area of Occupancy leads to a Vulnerable assessment but Its category could rapidly increase to Endangered if a market for horticulturally attractive species develops in Iraq.

Distribution and vegetation type: Forest Zone in the mountains of northern Kurdistan.

Habitat: *Quercus* woodland; 1200-1400 (3000?)m (Fl. Iraq 1985: 173).

Lilliaceae

***Allium notabile* Feinbrun**

IUCN category: VUD2

Notes on assessment: Known from a single location. The *Quercus* woodlands of Kurdistan are already or likely to become threatened by the effects of climate change (slight increase in temperature and a lengthening of the dry season) and over-grazing due to changes in traditional land management. It has been given a Vulnerable assessment due to its limited Area of Occupancy (12 km²), single location and the threat to its habitat.

Distribution and vegetation type: Forest Zone in the mountains of northern Kurdistan.

Habitat: Pine and *Quercus* woodland; 900-1100m (Fl. Iraq 1985: 155).

Lilliaceae

***Bellevalia parva* Wendelbo**

IUCN category: VUD2

Notes on assessment: Only known from a single location in. The Thorn-cushion Zone of the mountains of Kurdistan is vulnerable to change caused by a reduction in the amount and persistence of snow now being observed in the region (due to climate change). It has been given a Vulnerable assessment due to its limited Area of Occupancy (12 km²), single location and the threat to its habitat.

Distribution and vegetation type: Thorn-cushion Zone of the mountains of Kurdistan.

Habitat: Limestone mountain; 2030m (Fl. Iraq 1985: 155).

Lilliaceae

***Eremurus rechingeri* Wendelbo**

IUCN category: VUD2

Notes on assessment: Only known from the type gathering in the Dry-steppe Zone of Iraq close to the Iranian frontier. A distinctive species which Wendelbo in Flora of Iraq (1985: 65) notes is closely related to a species from NE Iran and Turkmenia, and needs further investigation. The Dry-steppe Zone is under extreme grazing pressure which together with its restricted distribution lead to a Vulnerable assessment. Further fieldwork is urgently needed to assess the status of this noteworthy species.

Distribution and vegetation type: Dry-steppe Zone of Iraq close to the Iranian frontier.

Habitat: Dry sandstone and conglomerate foothills on sandy soil; 50m (Fl. Iraq 1985: 65).

Liliaceae

***Fritillaria crassifolia* Boiss. & A. Huet subsp. *poluninii* Rix**

IUCN category: VUD2

Notes on assessment: Known from Píramagroon where it is fairly common and widespread and on a mountain near the Iranian border where its status is not known. The status at its second location on the Iranian frontier is not known. Found in *Quercus* woodland a habitat which is generally already or likely to be threatened by the effects of climate change (slight increase in temperature and a lengthening of the dry season) and over-grazing. Variation in the plants on Píramagroon suggests that more than one species is represented. The genus *Fritillaria* is of great horticultural interest. The relatively limited Area of Occupancy leads to a Vulnerable assessment but this category could rapidly increase to Endangered if a market for horticulturally attractive species develops in Iraq.

Distribution and vegetation type: Forest Zone of northern Kurdistan.

Habitat: *Quercus* woodland on limestone; 1100-2000m.

Liliaceae

***Ornithogalum iraqense* Feinbrun**

IUCN category: LC

Notes on assessment: Widespread and fairly common in the mountains and steppes of northern Iraq.

Distribution and vegetation type: Dry and Moist Steppe Zones and lower Forest Zone of northern Iraq.

Habitat: stony and gravelly hills and mountain slopes; 200-900(-1600)m (Fl. Iraq 1985: 95).

Liliaceae

***Ornithogalum kurdicum* Bornm.**

IUCN category: LC

Notes on assessment: Widespread and fairly common in the lower forest zone of the mountains of northern Iraq.

Distribution and vegetation type: Lower Forest Zone of the mountains of Kurdistan.

Habitat: Cultivated ground, waste ground and mountain slopes; 500-1400m (Fl. Iraq 1985: 91).

Liliaceae

***Scilla kurdistanica* Speta**

IUCN category: LC

Notes on assessment: Wendelbo notes in Flora Iraq (1985: 107) that he has only accepted this species with "considerable misgivings". It appears to be fairly common with an Extent of Occurrence of 23,000 km².

Distribution and vegetation type: Occasional in lower forest zone of Kurdistan

Habitat: Limestone cliffs, in sheltered places by snow melt and by springs; 650-1200m (Fl. Iraq 1985: 107).

Liliaceae

***Tulipa kurdica* Wendelbo**

IUCN category: CR B1 a biii

Notes on assessment: Found on the highest mountains of Kurdistan. This species is sometimes considered conspecific with *Tulipa pulchella* (which is also found in Turkey and Iran) or as a variety of *Tulipa humilis* (var. *kurdica* (Wendelbo) Christenh.) which is endemic to northern Iraq. *T. kurdica* is known from a single location with a limited Area of Occupancy (8 km²). The Alpine and Thorn-cushion zones of northern Iraq are vulnerable to change caused by a reduction in the amount and persistence of snow now being observed in the region (due to climate change). The limited AoO, single location and threats to its habitat lead to a Critically Endangered assessment.

Distribution and vegetation type: In the Alpine and Thorn-cushion Zones of the highest mountain in northern Iraq.

Habitat: High mountain slopes near melting snow on igneous rocks and limestone; 2400-3000m (Fl. Iraq 1985: 86).

Linaceae

***Linum velutinum* Steud. Ex Planch.**

IUCN category: VUD2

Notes on assessment: Only known from a single location with the Area of Occupancy estimated at 4 km². The habitat of *L. velutinum* on limestone cliff suggests it is less likely to be impacted by the two main threats to habitats in the region: intensification of grazing and drying of habitat due to climate change. Chasmophytes are less threatened by grazing and cliffs often act as refugium at times of climate change. However, its small AoO and possible threats to the habitat lead to a Vulnerable assessment.

Distribution and vegetation type: Forest Zone of Kurdistan.

Habitat: Clefts and fissures in a limestone cliff with northern aspect; 1200 - 1400m (Fl. Iraq 1980: 281)

Linaceae

***Linum mucronatum* Bertol. subsp. *pubifolium* (P.H.Davis) P.H.Davis**

IUCN category: LC

Notes on assessment: Only known from three locations with an Extent of Occurrence estimated at 240 km². It seems fairly common in a variety of habitats (Limestone gorge, limestone plateau, red marl stream banks) to which it could have a degree of ecological flexibility in the face of climate change and changes in patterns of land management.

Distribution and vegetation type: Forest Zone of Kurdistan.

Habitat: On rocky limestone plateau, in a limestone gorge in pine forest, on red marl banks by stream in valley; 750-1500m (Fl. Iraq 1980: 286).

Orchidaceae

***Himantoglossum hircinum* (L.) Spreng. var. *pseudocaprinum* J.J. Wood**

IUCN category: CR B1 a biii

Notes on assessment: Very rare and only known from a single location in woodland. It is found in woodland which is generally impacted by the effects of climate change (lengthening the dry season)

and over-grazing. The limited Area of Occupancy, single location and threats from over-grazing lead to a Critically Endangered assessment.

Distribution and vegetation type: Forest Zone of Kurdistan.

Habitat: Shady places under trees on organic soils; 800m (Fl. Iraq 1985: 295).

Papaveraceae

***Glaucium cuneatum* Cullen**

IUCN category: DD

Notes on assessment: Only known from the type specimen collected in the Moist Steppe Zone of northern Iraq. A poorly known species. Further collections are needed so that its taxonomic and conservation status can be assessed

Distribution and vegetation type: Moist Steppe Zone of northern Iraq.

Habitat: Dry steppic hills; c. 300m. (Fl. Iraq 1980: 790).

Papilionaceae

***Astragalus baijensis* Townsend**

IUCN category: VUD2

Notes on assessment: Only known from the type found 40 years ago in the Dry-steppe Zone. The status of this species is completely unknown. Its only known habitat in the central Dry-steppe Zone has been heavily impacted by over-grazing in most areas. It is clearly a distinct species with a very restricted distribution. Some authors have considered *A. baijensis* to be a synonym of *A. phlomoides* Boiss., a species restricted to central Iran. However, Ranjbar et al. (Willdenowia 32 – 2002) make a good case for considering *A. baijensis* to be a good species endemic to Iraq. The single locality and threats to the habitat lead to a Vulnerable assessment.

Distribution and vegetation type: Dry-steppe Zone.

Habitat: Habitat not known; c. 120m; (Fl. Iraq 1980: 394).

Papilionaceae

***Astragalus caryolobus* Bunge**

IUCN category: LC

Notes on assessment: Widespread and common

Distribution and vegetation type: Lower Forest Zone and Steppe region of central and northern Iraq.

Habitat: Rocky mountain slopes, in *Quercus* scrub, on limestone, steppic rolling plains; 250 - 1000m (Fl. Iraq 1974: 295).

Papilionaceae

***Astragalus chionobiiiformis* C.C. Towns.**

IUCN category: EN B1 a biii

Notes on assessment: Only known from a single location in the Qandil range close to the Iranian border. The sub-alpine Thorn-cushion habitat is threatened by change caused by a reduction in the amount and persistence of snow now being observed in the region (due to climate change) and by overgrazing. The single location, small Area of Occupancy and threats lead to an Endangered assessment.

Distribution and vegetation type: Sub-alpine Thorn-cushion Zone.

Habitat: Mountain slopes; 1800 - 2600 (Fl. Iraq 1980: 321).

Papilionaceae

***Astragalus dendroproselius* Rech.f.**

IUCN category: EN B1 a biii

Notes on assessment: Known only from three locations in the Forest Zone. The *Quercus* woodlands of Kurdistan are already or likely to become threatened by the effects of climate change (slight increase in temperature and a lengthening of the dry season) and over-grazing due to changes in traditional land management. The three locations, limited Extent of Occurrence (estimated at 215 km²) and threats lead to an Endangered assessment.

Distribution and vegetation type: Forest Zone of Kurdistan.

Habitat: Mountain slopes, in *Quercus* forests and scrub on limestone 1150 - 1500 (Fl. Iraq 1980: 438).

Papilionaceae

***Astragalus dolius* Boiss. & Hausskn.**

IUCN category: DD

Notes on assessment: There are various problems with assessing this species. Flora Iraq questions its status as a distinct species. It was found over a century ago (and not found since) on the frontier between Iraq and Iran and it is not clear in which country it was collected. Needs further investigation.

Distribution and vegetation type: habitat not known but probably in the Sub-alpine Thorn-cushion Zone.

Habitat: Mountains; 2300m (Fl. Iraq 1980: 349).

Papilionaceae

***Astragalus gillettii* C.C. Towns.**

IUCN category: VUD2

Notes on assessment: Not collected recently. Known only from a single location which is known to be heavily over-grazed. Its single location, threatened habitat and limited AoO lead to a Vulnerable assessment.

Distribution and vegetation type: Lower Forest Zone of Kurdistan. Between chemchamal and Darbandikan Basian.

Habitat: Broken country with limestone ridges. 750m (Fl. Iraq 1980: 432).

Papilionaceae

***Astragalus helgurdensis* C.C. Towns.**

IUCN category: EN B1 a biii

Notes on assessment: Known from the Alpine Zone on the highest mountain in Iraq. The Alpine habitat is threatened by change caused by a reduction in the amount and persistence of snow now being observed in the region (due to climate change) and by overgrazing. Two locations with a limited Extent of Occurrence (estimated at 120 km²) and threats lead to an Endangered assessment.

Distribution and vegetation type: Alpine Thorn-cushion Zone on the highest mountains in Kurdistan.

Habitat: High rocky mountain slopes; (2600-)2800-3000m (Fl. Iraq 1980: 319).

Papilionaceae

***Astragalus leiophyllus* Freyn & Bornm. var. *nigropedunculatus* C.C. Towns**

IUCN category: EN B1 a biii

Notes on assessment: Only known from two collections in Sub-alpine and Alpine Thorn-cushion Zone on the highest mountains in Kurdistan near the Iranian frontier. The Alpine habitat is threatened by change caused by a reduction in the amount and persistence of snow now being observed in the region (due to climate change) and by overgrazing. Two locations, a limited Extent of Occurrence (estimated at 120 km²) and threats lead to an Endangered assessment.

Distribution and vegetation type: Sub-alpine and Alpine Thorn-cushion Zone on the highest mountains in Kurdistan

Habitat: Rocky alpine summit, sub alpine slope; 2650-3500m (Fl. Iraq 1980: 319).

Papilionaceae

***Astragalus lobophorus* Boiss. var. *pilosus* (Bornm.) C.C. Towns.**

IUCN category: NT

Notes on assessment: Known from the Forest Zone. The *Quercus* woodlands of Kurdistan are already or likely to become threatened by the effects of climate change (slight increase in temperature and a lengthening of the dry season) and over-grazing due to changes in traditional land management. This taxon is relatively common in the upper *Quercus* woodlands of Piramagroon which are still in good condition. Its status over the northern part of its range needs to be assessed.

Distribution and vegetation type: Forest zone of Kurdistan.

Habitat: *Quercus* forest or coppiced *Quercus* on limestone; 1000-1200m; (Fl. Iraq 1980: 300).

Papilionaceae

***Astragalus porphyrodon* C.C. Towns.**

IUCN category: NT

Notes on assessment: Occasional and locally abundant in the Sub-alpine and Alpine Thorn-cushion Zone on the highest mountains in Kurdistan near the Iranian frontier. The Alpine and Sub-alpine zones habitats are threatened by the impact of climate change which is leading to reduction in the volume of snow and persistence of snow cover now being observed in the region and the overgrazing brought about by changes in the traditional land management practices. The limited Extent of Occurrence (estimated at 109 km²) and potential threats would indicate a threatened category but the description of the species as locally abundant (Fl. Iraq 1980: 373), have led to it being assessed as Near Threatened.

Distribution and vegetation type: Sub-alpine and Alpine Thorn-cushion Zone on the highest mountains in Kurdistan near the Iranian frontier.

Habitat: Rocky summits and mountainsides, on metamorphic or igneous rock; 2800-3350m (Fl. Iraq 1980: 373).

Papilionaceae

***Astragalus pseudofragrans* C.C. Towns.**

IUCN category: EN B1 a biii

Notes on assessment: Only collected once in the Alpine Thorn-cushion Zone on one of the highest mountains in Kurdistan near the Iranian frontier. The Alpine and Sub-alpine zones habitats are threatened by the impact of climate change which is leading to reduction in the volume of snow and

persistence of snow cover now being observed in the region and the overgrazing brought about by changes in traditional land management practices. The single gathering, with limited Area of Occupancy and clear threats lead to an Endangered Assessment.

Distribution and vegetation type: Alpine Thorn-cushion Zone on one of the highest mountains in Kurdistan near the Iranian frontier.

Habitat: Rocky mountain summit; 3000m (Fl. Iraq 1980: 287).

Papilionaceae

***Astragalus pushtashanicus* C.C. Towns.**

IUCN category: EN B1 a biii

Notes on assessment: Only collected once over 60 years ago in the Thorn-cushion vegetation in the lower Sub-alpine Zone. The Sub-alpine zones habitat is threatened by the impact of climate change which is leading to a reduction in the volume of snow and persistence of snow cover now being observed in the region and the overgrazing brought about by changes in the traditional land management practices. The single gathering, with limited Area of Occupancy and clear threats lead to an Endangered Assessment.

Distribution and vegetation type: Thorn-cushion vegetation in the lower Sub-alpine Zone.

Habitat: Mountain slope; 1800-2200m. (Fl. Iraq 1980: 342).

Papilionaceae

***Astragalus sarae* Eig**

IUCN category: VU B1 a biii, iv

Notes on assessment: The *Quercus* woodlands of Kurdistan are already or likely to become threatened by the effects of climate change (slight increase in temperature and a lengthening of the dry season) and over-grazing due to changes in traditional land management. The vegetation on the isolated Jebal Sinjar, at the most north westerly site of its distribution, has been reported to be devastated by over-grazing and forest clearance. Several endemic taxa are known from the mountain and all are under extreme threat. The limited Extent of Occurrence, fragmented distribution, decline in habitat and the possible extinction of one of its sub-populations lead to its Vulnerable assessment.

Distribution and vegetation type: Forest Zone of Kurdistan.

Habitat: Rocky mountain slopes, in coppiced *Quercus*, on limestone; 1000 - 1400m (Fl. Iraq 1980: 319).

Papilionaceae

***Astragalus zoharyi* Eig**

IUCN category: VUD2

Notes on assessment: Known from single gathering at Mergapan on Pirmagroon mountain made over 50 years ago. This area has been extensively surveyed over the last five years but *Astragalus zoharyi* was not located. The forested mountain slopes in Kurdistan are generally impacted by the effects of climate change (lengthening dry season) and over-grazing. However, the *Quercus* woodland at Mergapan on Pirmagroon mountain is in remarkably good condition. The base of the mountain at is being developed for up-market and weekend residences but at the moment this development is not affecting the woodlands. In Flora Iraq (Fl. Iraq 1980: 341) *Astragalus zoharyi* is described as "being distinct from all other Iraqi Tragacanth in the small size of all its parts" so it has

perhaps been overlooked. This little known but interesting species is assessed as Vulnerable, following the precautionary principle, until its status can be more fully assessed. If the woodland comes under threat in the future its assessment will have to increase to Critically Endangered.

Distribution and vegetation type: Upper Forest Zone of Pira Magroon mountain.

Habitat: *Quercus* woodland on rocky mountainside on limestone; 1000-1100m (Fl. Iraq 1980: 340).

Papilionaceae

***Vavilovia formosa* (Stev.) Al. Fed.**

IUCN category: VUD2.

Notes on assessment: This taxon is described as locally common in one district of the central sector of the alpine zone of Iraq where it is reported to grow on serpentine scree, a rock type often associated with endemism in the region. (Fl. Iraq 1980: 578). In general the Alpine habitat in Iraq is threatened by the impact of climate change which is leading to reductions in the volume of snow and persistence of snow cover now being observed in the region and the overgrazing brought about by changes in the traditional land management practices. However, the taxonomic and endemic status of this variety are not clear; similar plants are recorded from SE Turkey. Further research is needed to sort out these issues but it is clear that the taxon is under potentially threatened and therefore, due to its limited distribution and following the precautionary principle, it has been assessed as Vulnerable.

Distribution and vegetation type: Alpine zone.

Habitat: Rocky alpine slopes on a serpentine scree; 2900-3500m (Fl. Iraq 1980: 578).

Papilionaceae

***Vicia singarensis* Boiss. & Hausskn. in Boiss.**

IUCN category: CR B1 a biii

Notes on assessment: Only known from Jebal Sinjar where it was collected once over 150 years ago. The vegetation on Jebal Sinjar has been reported to be devastated by over-grazing and forest clearance. Several endemic taxa are known from the mountain and all are under extreme threat. *Vicia singarensis* has apparently not been seen for 150 years and is likely to be extinct. Field work is needed to assess the status of this and other endemics on the mountain. Its very limited Extent of Occurrence, single locality and obvious threats lead to a Critically Endangered status. Surveys are urgently needed to see if this species is still extant.

Distribution and vegetation type: Forest zone.

Habitat: Limestone mountains; 600m (Fl. Iraq 1980: 523).

Plumbaginaceae

***Acantholimon astragalinum* Mobayen**

IUCN category: VUD2

Notes on assessment: Only collected three times in two places near the Iranian border 16 km apart and not seen for 50 years. The location near Diyala is likely to be highly altered (over-grazed). More collections are needed before the species can be fully assessed but its small distribution, single location and the potential threats warrant a Vulnerable assessment.

Distribution and vegetation type: Sub-desert Zone.

Habitat: Foothills in dry steppe zone; 100-350m (Fl. Iraq 2013: 650).

Polygonaceae

***Pteropyrum noeanum* Boiss. ex Meisn.**

IUCN category: VUD2

Notes on assessment: Not seen for 50 years and only known from the type gathering. The exact location of the only collection near Diyala is not known but the area is highly altered by over-grazing and irrigated agriculture. More collections are needed before the species can be fully assessed but its small distribution, single location and the potential threats warrant a Vulnerable category.

Distribution and vegetation type: Sub-desert Zone.

Habitat: Habitat no known; 100-350m.

Ranunculaceae

***Delphinium micranthum* Boiss. & Hohen.**

IUCN category: VU B1 a biii

Notes on assessment: Known from three localities in the high mountains of Kurdistan. The Alpine and Sub-alpine zones habitats are threatened by the impact of climate change which is leading to reduction in the volume of snow and persistence of snow cover now being observed in the region and the overgrazing brought about by changes in the traditional land management practices. The Extent of Occurrence (estimated at 8,760 km²), fragmented distribution and threats to its habitat lead to a Vulnerable assessment.

Distribution and vegetation type: Sub-alpine Thorn-cushion Zone of Iraq.

Habitat: Rocky mountain slopes on igneous and / or metamorphic rocks, by a stream; 1650 - 2800m (Fl. Iraq 1980: 691).

Rosaceae

***Alchemilla kurdica* Rothm.**

IUCN category: EN B1 a biii

Notes on assessment: Known from a single locality in the high mountains of Kurdistan. The Alpine and Sub-alpine zones habitats are threatened by the impact of climate change which is leading to reduction in the volume of snow and persistence of snow cover now being observed in the region and the overgrazing brought about by changes in the traditional land management practices. The single locality, small Area of Occupancy and threats lead to an Endangered assessment.

Distribution and vegetation type: Sub-alpine Thorn-cushion Zone on the highest mountains of Kurdistan.

Habitat: By water on metamorphic rock; 2000-2700m - 3100m (Fl. Iraq 1966: 134).

Rubiaceae

***Asperula asterocephala* Bornm.**

IUCN category: LC

Notes on assessment: Reported as locally abundant in the Forest Zone. The forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). However, the habitat of *A. asterocephala*, on limestone cliffs, suggests may be is less prone to these sort of threats. Chasmophytes are less threatened by grazing and cliffs often act as refugium at times of climate change.

Distribution and vegetation type: Forest Zone of Kurdistan.

Habitat: Limestone crags and cliffs in *Quercus* and pine forest; 500-1500(-2500)(Fl. Iraq 1980: 582).

Rubiaceae

***Asperula comosa* Schoenb.-Tem.**

IUCN category: VUD2

Notes on assessment: Only known from one small area in the Forest Zone of the north Kurdish mountains near the Turkish frontier. The Forests of Kurdistan are threatened by an intensification of grazing and drying of habitats due to changes in climate (a slight increase in temperature but significant increase in duration of the dry season is predicted). However, the habitat of *A. comosa*, on limestone cliffs, suggests may be less prone to these sort of threats. Chasmophytes are less threatened by grazing and cliffs often act as refugia at times of climate change. The single locality limited Area of Occupancy (estimated at 16 km²) and threats lead to a Vulnerable assessment.

Distribution and vegetation type: Forest Zone.

Habitat: On rock crevices and on walls; 1100 - 1400m (Fl. Iraq 1980: 583).

Rubiaceae

***Asperula friabilis* Schoenb.-Tem.**

IUCN category: VUD2 or DD

Notes on assessment: Only found once, over 50 years ago on Kapi Qaradagh. The woodlands on Qaradagh, the only known locality of *A. friabilis*, are some of the best protected in Iraq. However, exploration for oil is currently being carried out on the mountain and reduced snow lie (due to climate change) on the upper parts of the mountain are likely to be impacting on the habitat of this species. However, the habitat of *A. friabilis* on limestone cliffs, suggests may be less prone to these sort of threats. Chasmophytes are less threatened by grazing and cliffs often act as refugia at times of climate change. There is little data on this species but its single locality, limited Area of Occupancy and threats lead to a Vulnerable assessment.

Distribution and vegetation type: Upper Forest Zone of Qaradagh in SW Kurdistan.

Habitat: In cracks on limestone cliffs; 1500m? (Fl. Iraq 1980: 582)

Rubiaceae

***Galium hainesii* Schonb.-Tem.**

IUCN category: VUD2 or DD

Notes on assessment: *Galium hainesii* is known only from the type collection made on a rocky roadside over 50 years ago. The woodlands on Kapi Qaradagh, are some of the best protected in Iraq. However, exploration for oil is currently being carried out on the mountain and reduced snow lie (due to climate change) on the upper parts of the mountain are likely to be impacting on the habitat of this species. There is little data on this species but because of its single locality and small Area of Occupancy it has been assessed as Vulnerable.

Distribution and vegetation type: Upper Forest Zone of Qaradagh in SW Kurdistan.

Habitat: Disturbed rocky roadside on limestone; c.1400m (Fl. Iraq 1980: 603)

Rubiaceae

***Galium qaradaghense* Schonb.-Temb.**

IUCN category: EN B1 a biii

Notes on assessment: *Galium qaradaghense* is known only from the type collection made on a rocky roadside over 50 years ago. The woodlands on Kapi Qaradagh, are some of the best protected in Iraq. However, exploration for oil is currently being carried out on the mountain and reduced snow lie (due to climate change) on the upper parts of the mountain are likely to be impacting on the habitat of this species. This species has been collected in the same locality on a number of occasions but because of its small Area of Occupancy, single location and the threats discussed above it has been assessed as Endangered.

Distribution and vegetation type: Occasional in a single locality in the Upper Forest Zone of Qaradagh in SW Kurdistan.

Habitat: *Quercus* woodland and on a mountain summit and slopes on limestone; c.1400m (Fl. Iraq 1980: 601).

Scrophulariaceae

***Rhynchocorys elephas* (L.) Griseb. subsp. *carduchorum* Burbidge & Richardson**

IUCN category: EN B1 a biii

Notes on assessment: Only known from a single location in the mountains of Kurdistan. The Alpine and Sub-alpine zones habitats are threatened by the impact of climate change which is leading to reduction in the volume of snow and persistence of snow cover now being observed in the region and the overgrazing brought about by changes in the traditional land management practices. Known from one location, with a limited Extent of Occurrence (it was not possible to calculate but estimated to be well below 5,000 km²) and potential threats lead to its assessment as Endangered.

Distribution and vegetation type: Sub-alpine Thorn-cushion zone of the highest mountain in Iraq.

Habitat: Mountain slopes on igneous rocks; 2300-3000m (Fl. Iranica 1981: 210).

Scrophulariaceae

***Scrophularia atroglandulosa* Grau**

IUCN category: EN B1 a biii

Notes on assessment: Known from a few location in the high mountains of Kurdistan. The Alpine and Sub-alpine zones habitats are threatened by the impact of climate change which is leading to reduction in the volume of snow and persistence of snow cover now being observed in the region and the overgrazing brought about by changes in the traditional land management practices. Known from under five locations, with a limited Extent of Occurrence (estimated at 150 km²) and potential threats lead to an assessment of Endangered

Distribution and vegetation type: Sub-alpine Thorn-cushion zone of the Kurdish mountains.

Habitat: Mountain slopes; 2200-3100m (Fl. Iranica 1981: 244).

Scrophulariaceae

***Verbascum arbelense* Bornm.**

IUCN category: EN B1 a biii

Notes on assessment: Only known from two collections about about 15km apart and made over 50 years ago. One of the sites on the outskirts of Erbil, a rapidly expanding city, is likely to have been destroyed by development. The present status of this species is completely unknown. Moist-steppe

Zone has been heavily impacted by over-grazing in most areas. It should be searched for near Erbil. Its small Area of Occupancy, single location and threats lead to it being assessed as Endangered.

Distribution and vegetation type: Moist-Steppe Zone

Habitat: Moist steppe; 500m (Fl. Iranica 1981: 33).

Scrophulariaceae

***Scrophularia sulaimanica* S.A.Ahmad**

IUCN category: VUD2

Notes on assessment: known only from two localities (between Darashesh and Hawar, and Lase Marf) in the Hawraman region of Kurdistan close to the Iranian frontier. The two small populations are less than 18 km apart but separated by almost 900m of altitude and thus show a wide degree of ecological flexibility being found (presumably) in both the Forest and the lower Sub-alpine Zones. However, both of these vegetation zones are threatened by the impact of climate change which is leading to a reduction in the volume and persistence of snow cover now being observed in the region and the overgrazing brought about by changes in the traditional land management practices. The two locations, limited Area of Occupancy and threats to both habitats lead to a Vulnerable assessment.

Distribution and vegetation type: Forest and the Sub-alpine Zones.

Habitat: Between rocks on and on cliffs or eroded places; 1060-1900m. (Saman A.A. (2014) Kew Bull. 69: 9509).

Urticaceae

***Parietaria rechingeri* Chrtek**

IUCN category: VUD2

Notes on assessment: Only known from a single locality in the forests of Kurdistan; but a small and easily overlooked plant. It seems to be closely related to the widespread *P. judaica*. The habitat of *P. rechingeri* in rock crevices, suggests that it may be less prone to the dual threats of climate induced drying and overgrazing which impact on most of the forests of Kurdistan. Chasmophytes are less threatened by grazing and cliffs often act as refugia at times of climate change. There is little data on this species but because of its single locality and small Area of Occupancy it has been assessed as Vulnerable.

Distribution and vegetation type: Only known from a single locality in the mountains in northern Kurdistan; in the Forest Zone.

Habitat: Crevices in calcareous rock crevices; 1200m (Fl. Iraq 1980: 447).

Valerianaceae

***Valerianella deserticola* Hadac**

IUCN category: LC

Notes on assessment: Widespread.

Distribution and vegetation type: Apparently very widespread throughout the deserts of Iraq.

Habitat: Deserts and semi-deserts on sand; 50-300m (Fl. Iraq 2013: 292).

Vitaceae

***Vitis hissarica* subsp. *rechingeri* Vassilcz.**

IUCN category: VU B1 a biii, iv

Notes on assessment: The habitat of this species in riparian thickets along stream sides is one of the most threatened in Iraq. The riparian woodlands are being cleared for agriculture, cut for fuel and the hydrology of the streams along which they grow is being affected by the construction of dams, shingle extraction and extraction of water for irrigation. Its fragmented distribution (4 widely separated sub-populations), the EOO of 15,000 km², limited Area of Occupancy (20 km²) and the threats to its habitat discussed above place lead to Vulnerable assessment.

Distribution and vegetation type: Middle Forest Zone of the Kurdish mountains

Habitat: In the mountains, near streams in *Quercus* forest, climbing over shrubs in riparian thickets; alt 1000-1400m (Fl. Iraq 1980: 447)