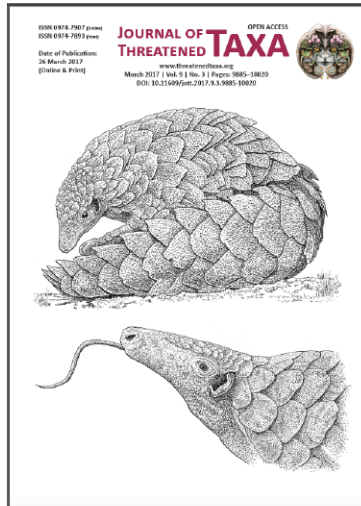


OPEN ACCESS



The Journal of Threatened Taxa is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at www.threatenedtaxa.org. All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use of articles in any medium, reproduction, and distribution by providing adequate credit to the authors and the source of publication.



Journal of Threatened Taxa

Building evidence for conservation globally

www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

ARTICLE

AN UPDATED REPORT ON THE DISTRIBUTION AND CONSERVATION STATUS OF THE ENDANGERED CAT'S HEAD ROCKROSE *HELIANTHEMUM CAPUT-FELIS* (MAGNOLIOPSIDA: VIOLALES: CISTACEAE) IN ALGERIA

Jonás C. Agulló, Ana Juan, Manuel B. Crespo, María Ángeles Alonso & Alejandro Terrones

26 March 2017 | Vol. 9 | No. 3 | Pp. 9885–9891

10.11609/jott.2592.9.3.9885-9891



For Focus, Scope, Aims, Policies and Guidelines visit http://threatenedtaxa.org/About_JoTT.asp

For Article Submission Guidelines visit http://threatenedtaxa.org/Submission_Guidelines.asp

For Policies against Scientific Misconduct visit http://threatenedtaxa.org/JoTT_Policy_against_Scientific_Misconduct.asp

For reprints contact info@threatenedtaxa.org

Partner



Publisher/Host





ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

AN UPDATED REPORT ON THE DISTRIBUTION AND CONSERVATION STATUS OF THE ENDANGERED CAT'S HEAD ROCKROSE *HELIANthemum CAPUT-FELIS* (MAGNOLIOPSIDA: VIOLALES: CISTACEAE) IN ALGERIA

Jonás C. Agulló¹, Ana Juan², Manuel B. Crespo³, María Ángeles Alonso⁴ & Alejandro Terrones⁵

^{1,2,3,4,5} Departamento de Ciencias Ambientales y Recursos Naturales (dCARN) & Instituto de la Biodiversidad-CIBIO, University of Alicante, PO Box 99, ES-03080 Alicante, Spain

¹jonas@ua.es (corresponding author), ²ana.juan@ua.es, ³crespo@ua.es, ⁴ma.alonso@ua.es,

⁵alejandro.terrones@ua.es

OPEN ACCESS



Abstract: *Helianthemum caput-felis* is an Endangered plant species growing in the western Mediterranean basin. Its distribution is well known to the European and Moroccan regional populations, but no data from its distribution in Algeria have been reported since the middle 20th century. In this study, we provide an up-to-date report on the distribution of the species in Algeria. Fieldwork surveys in the classical locations were unsuccessful in finding the species, probably due to human habitat disturbances; however, a relict location was found in Ain-el-Kerma, near one of the historical known locations. As there is reduced distribution we point out the main causes that threaten the habitat of *H. caput-felis* according to IUCN threats classification scheme and we also propose to label it in the Algerian Red List as regionally Critically Endangered (CRreg B1ab(i,ii,iii, v)+2ab(i,ii,iii,v); C2a(i,ii); D).

Keywords: Conservation, IUCN, Mediterranean flora, northern Africa, threatened flora.

Spanish abstract: *Helianthemum caput-felis* es una planta amenazada del Mediterráneo occidental. Aunque la distribución de sus poblaciones regionales europeas y marroquíes se conoce bien, no se ha publicado nada sobre su distribución en Argelia desde mediados del siglo XX. En este estudio presentamos una actualización de la distribución de la especie en Argelia. La visita a las localidades históricas no permitió encontrar la planta, seguramente debido a su extinción por el deterioro del hábitat. No obstante, encontramos una localidad en Ain-El-Kerma, cerca de una de las localidades históricas conocidas de esta especie. También indicamos las amenazas que afectan al hábitat y a la especie, y proponemos su inclusión en la Lista Roja de Argelia como “En Peligro Crítico” a nivel regional (CRreg B1ab(i,ii,iii, v)+2ab(i,ii,iii,v); C2a(i,ii); D).

DOI: <http://doi.org/10.11609/jott.2592.9.3.9885-9891>

Editor: Errol Vela, University of Montpellier, Montpellier, France.

Date of publication: 26 March 2017 (online & print)

Manuscript details: Ms # 2592 | Received 01 March 2016 | Final received 17 January 2017 | Finally accepted 07 March 2017

Citation: Agulló, J.C., A. Juan, M.B. Crespo, M.A. Alonso & A. Terrones (2017). An updated report on the distribution and conservation status of the endangered Cat's Head Rockrose *Helianthemum caput-felis* (Magnoliopsida: Violales: Cistaceae) in Algeria. *Journal of Threatened Taxa* 9(3): 9885–9891; <http://doi.org/10.11609/jott.2592.9.3.9885-9891>

Copyright: © Agulló et al. 2017. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use of this article in any medium, reproduction and distribution by providing adequate credit to the authors and the source of publication.

Funding: None.

Competing interests: The authors declare no competing interests.

Author Details: JONÁS C. AGULLÓ studies different aspects on the ecology, reproductive biology and genetic diversity of *Helianthemum caput-felis* Boiss. ANA JUAN holds a PhD in reproductive biology and conservation genetics of endemic and rare plant species and works as a Lecturer in Botany. MANUEL B. CRESPO holds a PhD in taxonomy, phylogeny and conservation of Mediterranean flora and works as a Professor in Botany. M. ÁNGELES ALONSO holds a PhD in taxonomy, systematics and evolution of plant species and works as a Lecturer in Botany. ALEJANDRO TERRONES is a PhD student working on spatial genetic structure and gene flow of *Tamarix gallica* L. All authors work at dCARN and institute CIBIO (University of Alicante).

Author Contribution: AJ, MAA and AT carried out the fieldwork. JCA and AJ studied and analysed the information from literature, herbaria sheets and databases. Finally, the paper was written jointly by JCA, AJ and MBC.

Acknowledgements: We thank Caroline Loup, curator of the MPU Herbarium, and Roxali Bijmoer, Collections Manager in the Naturalis Biodiversity Center, for kindly sending photographs of the herbarium material with rare information included in the databases. We also thank to M.M. Martínez-Ortega, J. Peñas and S. Barrios for assistance during the fieldwork. The authors also thank the two anonymous reviewers and the Subject Editor for their helpful comments and suggestions.



Universitat d'Alacant
Universidad de Alicante

INTRODUCTION

Helianthemum caput-felis Boiss. (Cistaceae) is a perennial subshrub growing mostly in coastal cliff cracks and dune systems (Agulló et al. 2010), with a narrow fragmented distribution along the western Mediterranean coastlines (López-González 1993). As a consequence, it suffers the direct pressure of urban expansion (Padilla et al. 2014) and also the impact of tourism and human trampling (Fenu et al. 2012, 2015). Consequently, wild populations of *H. caput-felis* are severely fragmented, the number of mature individuals is decreasing, and active processes of population regression have also been detected (Agulló et al. 2013). Therefore, *H. caput-felis* is included in the Bern Convention (Appendix I), European Habitat Directive (Appendix 2) and Spanish Biodiversity Law (Appendix 2). According to the Red List, *H. caput-felis* has been considered as Endangered (EN, Agulló et al. 2013), though Italian and Spanish National Red Lists of threatened flora catalogued it as Critically Endangered (CR, Rossi et al. 2013) and Endangered (EN, Agulló et al. 2011), respectively. No information has been yet reported from northern African territories however, and the species is not included in the recent Algerian Decree for the list of wild plant species under protection (Executive Decree no. 12-03, 4 Jan 2012).

Up to now, some specific studies about *H. caput-felis* have been carried out based on applications of geographic information system (e.g., Marco et al. 2011; Padilla et al. 2014), reproductive biology (Tébar et al. 1997; Rodríguez-Pérez 2005; Agulló et al. 2015), population genetic diversity (Agulló et al. 2011) and conservation issues (Pujol 2001; Agulló et al. 2010; Fenu et al. 2012, 2015), but mainly from Spanish and Italian regional populations. Although the presence of this taxon in northern Africa is reported by regional floras or herbarium databases (Quézel & Santa 1962–1963; Fennane et al. 1999; GBIF.org 2015), data are still scarce about the current distribution and conservation status in those African territories.

In Algeria, *H. caput-felis* was first recorded by the middle of the 19th century by Munby (1847), who stated its presence “*sur les sables près le Cap Falcon, Oran*”. Later, other authors also reported it from ‘Cap Falcon’ and ‘Aïn-el-Turk’, both areas quite close to Oran (Willkomm 1856; Trabut 1887; Battandier & Trabut 1888). These authors mostly described the habitat of *H. caput-felis* as coastal sands, though it was also reported as a littoral taxon (cf. Trabut 1887). After that, Doumergue (1918) reported this species

from “Andalouses” and “Cap Blanc”. The most recent published mention of this taxon was done by Quézel & Santa (1962–1963), who catalogued it as a rare plant in Algeria. These authors only reported the locality ‘Aïn-el-Turk’, which was included in a large geographical area named as littoral Oran subsector (O1, see Quézel & Santa 1962–1963). Besides, *H. caput-felis* has not been newly collected from ‘Aïn-el-Turk’ or any other Algerian locality since 1945 (see GBIF.org 2015).

Taking into consideration the notable deficiency of data on *H. caput-felis* in Algeria, the aim of this paper is to provide details on historic and recent studies on this species, updating its current distribution in Algeria and assessing the current conservation and the IUCN category at regional level.

MATERIAL AND METHODS

Fieldwork was undertaken from 2010 to 2014 to verify the presence of *H. caput-felis* in the northwestern littoral areas close to Oran, following the data reported in the literature and also the plant material kept in the herbaria BC, MA, MPU, P and RAB (Institut Botànic de Barcelona, Real Jardín Botánico de Madrid, Université de Montpellier 2, Muséum National d’Histoire Naturelle de Paris and Institut Scientifique de Rabat, respectively; acronyms according to Thiers 2016) (see Appendix 1). The survey of labels on sheets offered additional information about localities and even ecological aspects about the species in Algeria. Direct field observations would identify the current condition of those reported localities, which could have notably influenced on the up-to-date distribution of *H. caput-felis*. The status of conservation of *H. caput-felis* in Algeria was analysed according to the IUCN threat classification scheme, version 3.2 (IUCN 2012a). The threat category was assigned following the guidelines for application of IUCN Red List Categories and Criteria at global and national levels (IUCN 2012b, 2014). The abbreviations of author names follow The International Plant Names Index (IPNI 2015). The collected plant material is conserved at the herbarium ABH (University of Alicante, Spain) (see Appendix 1).

RESULTS

Past distribution based on literature and herbaria data

Based on the studied herbarium vouchers (see Appendix 1), *H. caput-felis* was mostly collected for almost

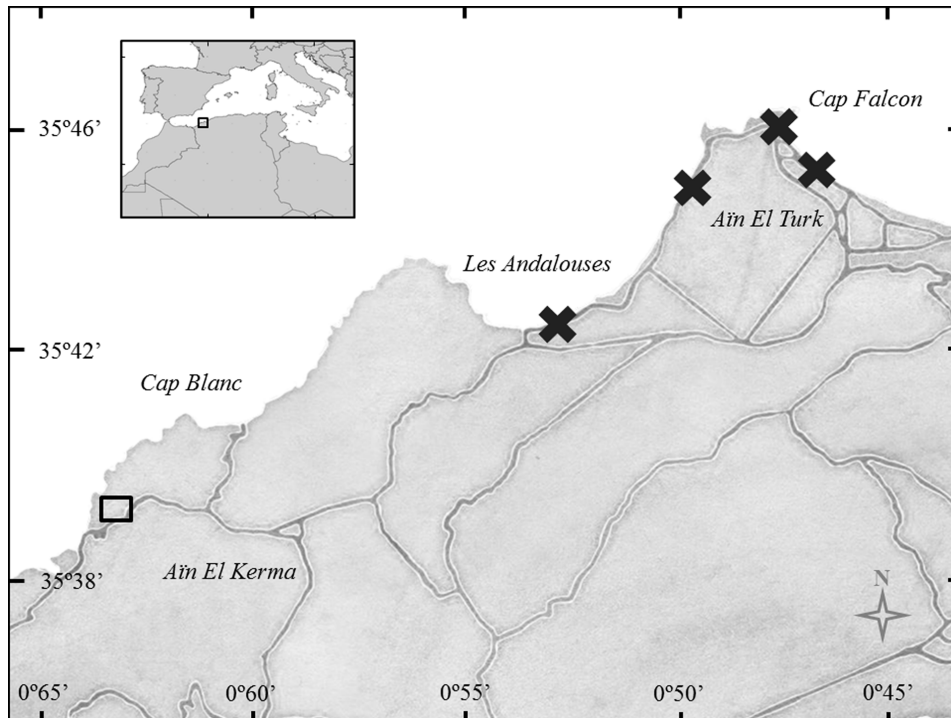


Figure 1. Up-to-date distribution of *Helianthemum caput-felis* in Algeria. Open square (□) depicts the location where the plant species was found, whereas black crosses (X) indicate locations where the species was cited (including classical locations), but currently not found.

a century from three different Algerian localities, 'Aïn-el-Turk' (e.g., MPU028393, MPU028398, MPU028387, RAB077965, P04747855, P05375076), 'Cap Falcon' (e.g., MPU028397, MPU028388, P05375155), and to a lesser extent from 'Plaine des Andalouses' (e.g., MPU028399, P05375154); all these localities belonging to Oran province. This taxon was first collected by G.F. Reuter in 1849 from "Oran, in arenosis, plaine des Andalou" (MPU028399, in sched.); however, none of the published Algerian floras made any mention to this specific locality (cf. Munby 1847; Battandier & Trabut 1888; Quézel & Santa 1962–1963). *H. caput-felis* was also reported and harvested from the coastal sandy dunes close to 'Cap Falcon' and to 'Aïn-el-Turk' (cf. Munby 1847; Willkomm 1856; MPU028505, P04729331), the most recent herbarium material (RAB077964, P04750436) belonging to these localities.

Current distribution based on fieldwork

Although most of the collected plant material came from 'Aïn-el-Turk' and 'Cap Falcon', we were not able to locate any specimen of *H. caput-felis* in these areas. The locality 'Cap Falcon' is a small geographical cape, which nowadays is severely transformed due to the presence of waste, human buildings (including a military restricted area), and livestock. The coastal sand dunes

placed between 'Cap Falcon' and the town of 'Aïn-el-Turk', as well as those from 'Les Andalouses' have also been dramatically modified. In the former, an artificial hillside, plenty of ornamental plants, is now found. In the latter, the dune system is currently replaced by tourist urbanizations. Furthermore, field surveys undertaken around these coastal sand habitats, as well as other better-conserved littoral sand dunes between 'Les Andalouses' and 'Aïn-el-Turk' were also unsuccessful.

Fortunately, we found a location of *H. caput-felis* in the western part of Oran province (Fig. 1), in the municipality of 'Aïn-El-Kerma', between 'Madagh forest' and 'Madagh beach', at 170m (35°38'56.4"N & 01°02'20.40"W). This probably corresponds to the location found in "Cap Blanc, in Wadi Madar" by Doumergue (1918). The number of observed plants was quite reduced, c. 30, though they flowered and fruited normally. The habitat is totally different to those described before for Algeria. In this location, the species grows on littoral calcareous hills (Image 1), not close to the seashore and similarly as it does in Morocco and Melilla, together with shrubby species such as *Cistus heterophyllus* Desf., *C. monspeliensis* L., *Rosmarinus officinalis* L., *Sideritis maura* de Noé, *Lavandula dentata* L. and *Teucrium polium* L. sensu lato, among others. Unlike the abundance of *H. caput-felis* in

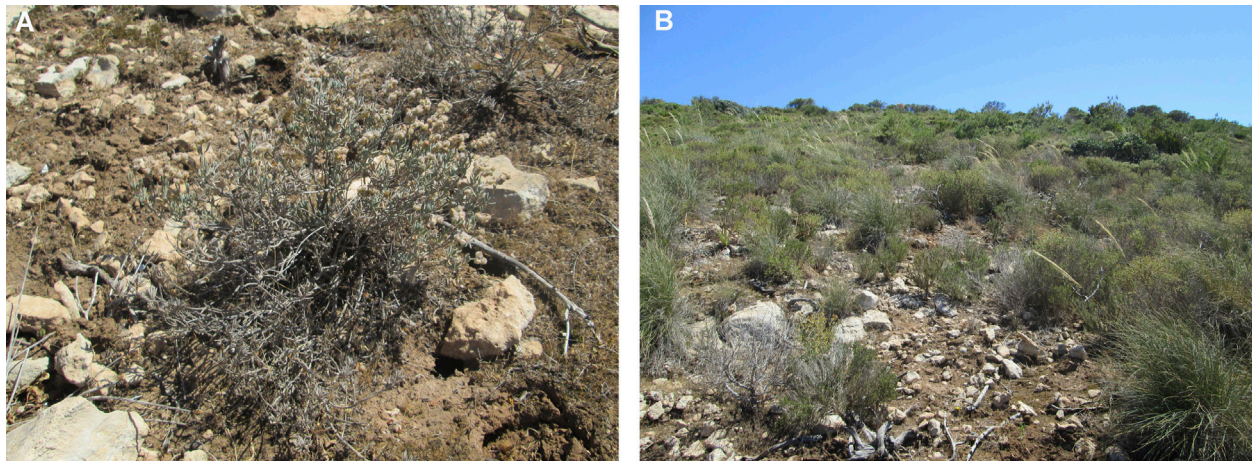


Image 2. A - a fruiting individual of *Helianthemum caput-felis*; B - an overview of the habitat where it grows in Algeria. © A. Terrones.

Table 1. List of the direct threats identified in the Algerian regional population of *Helianthemum caput-felis*, according to IUCN threats classification scheme.

Level of classification	Description of the threats
1. Residential and commercial development	
1.1. Housing and Urban Areas	Threats from human settlements (e.g. urban areas, suburbs, ranchettes, vacation homes) or other non-agricultural land uses with a substantial footprint
1.2. Commercial and Industrial Areas	Settlements of permanent military bases
1.3. Tourism and recreation areas	Tourism and recreation sites with a substantial footprint
2. Agriculture and aquaculture	
2.3. Livestock farming and ranching	
2.3.2. Small-holder grazing, ranching or farming	Domestic or semi-domesticated animals (e.g. goats) allowed to roam in the wild and supported by natural habitats (ranching)
6. Human intrusions & disturbance	
6.1 Recreational activities	Permanent human trampling related to people spending time in the coastal line for recreational reasons
9. Pollution	
9.4 Garbage & solid waste	Rubbish and other solid materials produced by people leisure activities and inhabitants causing degradation of the habitat

the other northern African locations (i.e., Morocco and Melilla), its presence in Algeria is fairly scarce and not uniformly distributed across the area. This natural area is quite well conserved, without human facilities around, and the accessibility to these calcareous slopes is quite reduced.

IUCN Red List Assessment

The main threats for the historical known locations of *H. caput-felis* in Algeria have been coastal urbanization, grazing, constructions excavation and retreat from the coastlines, and these could affect the remaining location in the medium-term. According to IUCN threats classification scheme (version 3.2, IUCN 2012a) we supply a list of threats identified for the Algerian regional population (Table 1).

According to the Red List guidelines of IUCN, we used criteria B (geographic range), C (small population size and decline) and D (very small or restricted population) to evaluate the status of *H. caput-felis* in Algeria. We could not evaluate criteria A (population size reduction measured along 10 years or 3 generations) and E (quantitative analysis), because there was no previous information available.

Criteria B: based on the reduced extent of occurrence (B1, EOO <100km²), area of occupancy (B2, AOO <10km²), on the number of locations (a = 1) and on the inferred and projected continuing decline in the extent of occurrence (b-i), area of occupancy (b-ii), quality of habitat (b-iii), and number of mature individuals (b-v), the population of *H. caput-felis* in Algeria meets B1ab(i, i, iii, v)+2ab(i, ii, iii, v) for CR.

Criteria C: based on the number of mature individuals (<250) and a projected and inferred continuing decline of the population size (C2) and, satisfying the number of mature individuals in each subpopulation (a-i, ≤ 50) and the percentage of mature individuals in one subpopulation (a-ii, = 90-100%), the population of *H. caput-felis* in Algeria meets C2a(i, ii) for CR.

Criteria D: based on the number of mature individuals (< 50), the population of *H. caput-felis* in Algeria meets

D for CR.

Accordingly, we propose to include *H. caput-felis* in the Red List in Algeria, as regionally Critically Endangered B1ab(i,ii,iii,v)+2ab(i,ii,iii,v); C2a(i,ii); D with justification (Appendix 2).

DISCUSSION

Our study highlights the fragile situation of *H. caput-felis* in Algeria. The significant anthropogenic degradation of the habitat in the historical locations of the species in 'Aïn-el-Turk', 'Cap Falcon' and 'Les Andalouses' should have alerted about the conservation requirements of this species. In the light of the fieldwork results, the continued expansion of residential areas and the rising of tourism activities in the locations where *H. caput-felis* grew should have induced the Algerian authorities to list the species in the decree regulating the conservation of wild plant species. On the contrary, the lack of actions and policies in the conservation of *H. caput-felis* could have contributed to the extinction of the species in these historical areas.

Fortunately, the finding of a relict location gives some hope in the conservation of this species in one of its border historical national range. Due to the growth of this species under different environments (e.g., vertical coastal cliffs, sand and fossil dunes, inland ravines), further field surveys are needed to identify additional locations of *H. caput-felis* across the whole geographical area, especially towards the seashore in the areas between Madagh and Oran, and westwards to the Moroccan border. With the reference of the discovery of this locality, and the probable extinction of *H. caput-felis* in 'Cap Falcon' and the littoral dunes of 'Aïn-el-Turk', the up-to-date distribution of *H. caput-felis* in Algeria points out to consider this taxon as an extremely rare plant.

Additionally, the current status and threats of the Algerian regional population had led us to propose its inclusion in the regional Red List. Following the IUCN guidelines (IUCN 2014), the draft assessment resulted in CR(Regional) B1ab(i,ii,iii,v)+2ab(i,ii,iii,v); C2a(i,ii); D. However, the assessment requires adjusting the preliminary Red List Category to determine the final estimate extinction risk within the region by considering whether extra-regional populations may affect the extinction risk of the regional population (see IUCN 2012b). Because the regional population does not seem to experience any significant immigration of propagules likely to reproduce in the region, the regional population

behaves as an endemic and the Red List Category should be left unchanged (see above). The small geographic range occupied by the species, the very small and restricted regional population and the continuing decline in the extent, quality of habitat and number of individuals instigated by human pressures in the past and the present allow us to project a grim future for the species if no conservation strategies are implemented.

CONSERVATION RECOMMENDATIONS

According to the results of our study, the *H. caput-felis* regional population in Algeria is close to extinction and needs urgent conservation measures. It is necessary to establish the appropriate monitoring of the known locality of this species and to activate in situ and ex situ conservation strategies to protect this particularly rare species from irreversible decline and total extinction in Algeria. Particularly, a greater effort should be made to minimise the direct anthropogenic impact, including urban sprawl and unsustainable tourism. Thus, recreational activities should be regulated around the sole location of the species, preferably by establishing a protected area or a Plant Micro-Reserve (see Kadis et al. 2013) to ensure the viability of the species in the wild. In this respect, Yahi et al. (2011, 2012) have recently proposed the designation of several Important Plant Areas (IPAs) in northern Algeria, in order to prioritise the best sites for plant conservation. Additionally, ex situ strategies should be put into practice. Seed collection and conservation in seed banks and cultivation in botanical gardens will ensure the possibility of future reinforcement or reintroduction of *H. caput-felis* in eventual suitable habitats, as already done in some Spanish regions and lately proposed for Sardinia (Fenu et al. 2015). Moreover, the species should be included in the National Red List and protected by law, incorporating it in the Algerian Decree for the list of wild plant species under protection.

REFERENCES

- Agulló, J.C., A. Juan, M.A. Alonso & M.B. Crespo (2010). *Helianthemum caput-felis* Boiss., pp 76–77. In: Bañares, A., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.). *Atlas y Libro Rojo de la Flora vascular amenazada de España. Addenda 2010*. Dirección General de Medio Natural y Política Forestal (Ministerio de Medio Ambiente, y Medio Rural y Marino) - Sociedad Española de Biología de la Conservación de Plantas., Madrid.
- Agulló, J.C., A. Juan, M.A. Alonso & M.B. Crespo (2013). *Helianthemum caput-felis*. The IUCN Red List of Threatened Species 2013: e.T162013A5530070. (Downloaded on 19 January 2016).

- Agulló, J.C., A. Juan, A. Guilló, M.A. Alonso & M.B. Crespo (2011). Genetic diversity and phylogeographical assessment of *Helianthemum caput-felis* Boiss. (Cistaceae) based on AFLP markers. *Fitosociologia* 48(2)suppl. 1: 21–29.
- Agulló, J.C., C. Pérez-Bañón, M.B. Crespo & A. Juan (2015). Puzzling out the reproductive biology of the endangered cat's head rockrose (*Helianthemum caput-felis*, Cistaceae). *Flora* 217: 75–81; <http://doi.org/10.1016/j.flora.2015.10.001>
- Battandier, J.-A. & L.C. Trabut (1888). *Flora de l'Algérie. Dicotylédones*. Adolphe Jourdan, Alger & F. Savy, Paris, 183pp.
- Doumergue, F. (1918). Sur quelques plantes rares, nouvelles ou peu connues du Département d'Oran (2e note). *Bull. Soc. Géog. Arch. d'Oran* 38: 175–194.
- Fennane, M., M.I. Tattou, J. Mathez, A. Ouyahya & J.E. Oualidi (1999). *Flora Pratique du Maroc. Manuel de détermination des plantes vasculaires*. Institut Scientifique, Université Mohammed V, Agdal, Rabat.
- Fenu, G., D. Cogoni, E. Sulis & G. Bacchetta (2015). Ecological response to human trampling and conservation status of *Helianthemum caput-felis* (Cistaceae) at the eastern periphery of its range. *Acta Botanica Gallica* 162: 191–201; <http://doi.org/10.1080/12538078.2015.1060898>
- Fenu, G., E. Sulis, D. Cogoni & G. Bacchetta (2012). Schede per una Lista Rossa della Flora vascolare e crittogamica Italiana: *Helianthemum caput-felis* Boiss. *Informatore Botanico Italiano* 44: 233–236.
- GBIF.org (2015). GBIF Occurrence Download [query for taxon *Helianthemum caput-felis* Boiss.]. Available from: <http://doi.org/10.15468/dl.gfwan7> (accessed 16 Dec 2015).
- IPNI (2015). The International Plant Names Index. Available from: <http://www.ipni.org> (accessed 1 Jan 2016).
- IUCN (2012a). Guidelines unified classification of direct threats, version 3.2. Available from: <http://www.iucnredlist.org/technical-documents/classification-schemes/threats-classification-scheme> (accessed 27 Jan 2016).
- IUCN (2012b). Guidelines for Application of IUCN Red List Criteria at Regional and National Levels: Version 4.0. IUCN, Gland, Switzerland and Cambridge, UK. Available from: <http://www.iucnredlist.org/technical-documents/red-list-training/red-list-guidance-docs> (accessed 27 Jan 2016).
- IUCN (2014). Guidelines for Using the IUCN Red List Categories and Criteria. Version 11. Prepared by the Standards and Petitions Subcommittee. Downloadable from <http://www.iucnredlist.org/documents/RedListGuidelines.pdf> (accessed 27 Jan 2016).
- Kadis, K., C.A. Thanos & E. Laguna (2013). *Plant Micro-Reserves: from theory to practice*. Utopia publishing, Athens.
- López-González, G. (1993). *Helianthemum* Miller, s.l. (Cistaceae), pp. 365–421. In: Castroviejo, S., C. Aedo, S. Cirujano, M. Laínz, P. Montserrat, R. Morales, F. Muñoz-Garmendia, C. Navarro, J. Paiva & C. Soriano (eds.). *Flora Iberica* 3. Real Jardín Botánico CSIC, Madrid.
- Marco, J.A., P. Giménez, A. Padilla & Á. Sánchez (2011). Crecimiento urbano y conservación de flora amenazada: aplicaciones cartográficas en el caso de *Helianthemum caput-felis* Boiss. *Serie Geográfica* 17: 125–139.
- Padilla, A., P. Giménez, J.A. Marco & Á. Sánchez (2014). Metodología sobre dinámica de poblaciones de *Helianthemum caput-felis* Boiss. a partir del análisis comparativo de los censos de 2006 y 2013 (litoral sur de Alicante, España), pp. 51–58. In: Cámara, R., B. Rodríguez & J.L. Muriel (eds.). *Biogeografía de -Sistemas Litorales. Dinámica y Conservación*. Universidad de Sevilla, Sevilla.
- Pujol, J.A. (2001). La urbanización de la costa alicantina marca el declive de la jarilla de cabeza de gato. *Quercus* 188: 43–46.
- Quézel, P. & S. Santa (1962–1963). *Nouvelle flore de l'Algérie et des régions désertiques méridionales*, 2 tomes. C.N.R.S., Paris, 1170pp.
- Rodríguez-Pérez, J. (2005). Breeding system, flower visitors and seedling survival of two endangered species of *Helianthemum* (Cistaceae). *Annals of Botany* 95: 1229–1236; <http://doi.org/10.1093/aob/mci137>
- Rossi, G., C. Montagnani, D. Gargano, L. Peruzzi, T. Abeli, S. Ravera, A. Cogoni, G. Fenu, S. Magrini, M. Gennai, B. Foggi, R.P. Wagenommer, G. Venturella, C. Blasi, F.M. Raimondo & S. Orsenigo (eds.) (2013). *Lista Rossa della Flora Italiana. 1. Policy Species e altre specie minacciate*. Comitato Italiano IUCN e Ministero dell'Ambiente e della Tutela del Territorio e del Mare, Italy.
- Tébar, F.J., L. Gil & L. Llorens (1997). Reproductive biology of *Helianthemum appeninum* (L.) Mill. and *H. caput-felis* Boiss. (Cistaceae) from Mallorca (Balearic Islands, Spain). *Acta Botanica Malacitana* 22: 53–63.
- Thiers, B. (2016). Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. <http://sweetgum.nybg.org/science/ih/>
- Trabut, L.C. (1887). D'Oran a Mécheria: notes botaniques & catalogue des plantes remarquables. Adolphe Jourdan libraire-éditeur, Alger.
- Willkomm, M. (1856). *Icones et descriptiones plantarum novarum criticarum et rariorum Europae Austro-Occidentalis praecipue Hispaniae*. Leipzig.
- Yahi, N., S. Benhouhou, E. Vela, G. De Belair & R. Gharzouli (2011). Algeria, pp. 27–30. In: Radford, E.A., G. Catullo & B. de Montmollin (eds.). *Important Plant Areas of The South and East Mediterranean Region: Priority Sites for Conservation*. IUCN, Gland, Switzerland and Malaga, Spain.
- Yahi, N., E. Vela, S. Benhouhou, G. De Belair & R. Gharzouli (2012). Identifying Important Plants Areas (Key Biodiversity Areas for Plants) in northern Algeria. *Journal of Threatened Taxa* 4(8): 2753–2765; <http://doi.org/10.11609/JoTT.o2998.2753-65>

Appendix 1. Herbarium material

Algeria. Oran, Ain-el-Turk, Gros, d'Oran, sables marit. sur le chemine du Cap Falcon, 2 June 1884, O. Debeaux (MPU 028386!); Coteaux rocaillieux avoisinant la plage d'Ain-el-Turk, près d'Oran, 6 March 1852, B. Balansa (MPU028387!, P05375076!, P05375078!, P05375081!, P05375165!, WAG1307564!); Oran, Cap Falcon, April 1890, Doumergues (MPU028388!, MPU028392!, MPU028395!); Oran, Ain-el-Turk, 14 April 1887, Doumergues (MPU028389!, MPU028396!, MPU028398!); Cap Falcon, 16 April 1891, Doumergues (P05375155!, MPU028397!, P04638744!, MA80530); Dunes a Ain-el-Turk, près Oran, 2 May 1875, E. Cosson (MPU028390!, P05375074!, P05375161!); Dunes sablonneuses près le Cap Falcon, ens. d'Oran, 8 May 1852, E. Cosson (P05375156!, P05375162!); Oran, Ain el Turk, April 1914, C. d'Alleizette (MPU028391!, P05375159!); Oran, Ain-el-Turk, 4 April 1912, C. d'Alleizette (P05375158!); Ain-el-Turk, March 1919, C. d'Alleizette (MA80531); Sable maritimes á Ain-el-Turk á l'ouest d'Oran, 16 April 1856, E. Bourgeau (MPU028393!, MPU028504!, P05375072!, P05375073!, P05375164!, WAG1307563!); Oran, in arenosis, plaine des Andalous, April 1849, Reuter (MPU028399!, P05375157!); Oran, Plaine des Andalous, 21 June 1858, Roux (MPU028498!); Oran, Ain-el-Turk, March 1919, C. d'Alleizette (MPU028499!, P04747855!); Oran, Cap Falcon, March 1860, Roux (MPU028500!); Oran, Ain-el-Turk, J.A. Battandier (MPU028501!); Ain Turk, Pomel (MPU028502!, MPU028503!); Oran, Cap Falcon, in sterilibus maritimus, April 1852, Munby (MPU028505!); Oran, in maritimus (aux Andalous), April 1850, Munby (MPU028506!, P05375163!); Oran, aux Andalous, plain de l'Hafra, Munby (P05375079!); Oran, aux Andalous, in sterilibus maritimus, April 1849, Munby (P05375080!); Oran, Ain-el-Turk, broussailles, 28 March 1910, A. Faure (AMD60657!); Ain-el-Turk, près Oran, pelouses sablonneuses, 30 March 1930, A. Faure (MPU028507!, P05375160!, BC6684); Ain-el-Turk, près Oran, broussailles sablonneuses, 28 March 1910, A. Faure (P04729331!, BC6684, BC6687, MA80523, L2439332!); idem. 26 March 1945, A. Faure (P0475036!); Ain-el-Turk, près Oran pelouses sablonneuses, 26 March 1941, A. Faure (RAB077965); idem, 30 March 1930, A. Faure (MA80529, U1222673!); Ain-el-Turk, près Oran, pelouses sablonneuses, 26 March 1945, S. Faure (RAB077964); Ain-Turk, près Oran, 12 March 1852, G.-L. Durando (P05375071!, P05375075!, L2439333!); Ain-et-Turk, April 1912, L. Rotereau (P05375077!); Oran, broussailles des collines aux environs d'Ain el Turk, April 1888, J. Garrigues (P05375152!, P05375153!); Oran, Plaine des Andalous, March 1857 (P05375154!); Sponte crec in Algeria, March 1852, B. Balansa n° 463 (MPU028394!); Madagh, Oran province 30SXE7746, 170m, 13 June 2010, A. Juan, M. Mart. Ortega, S. Barrios & J. Peñas (ABH58689!; ABH58691!).

Appendix 2. IUCN Red List Assessment at National Level: *Helianthemum caput-felis* Boiss.

Kingdom: Plantae
 Division: Tracheophyta
 Class: Magnoliopsida
 Order: Malvales
 Family: Cistaceae
 Scientific name: *Helianthemum caput-felis*
 Authority: Boiss.

Common name: Unknown in Algeria [In Italy, it is known as *Eliantemo testa di micio*; in Morocco, its common name is *Fegga*; and in Spain it is referred as *Jarilla cabeza de gato* (Spanish) and *Esteperola cap de gat*, *Romer moixí* or *Setge blanquínós* (Catalonian). Other common names are *Cat's Head Rockrose* (English) and *Hélianthème tête de chat* or *Hélianthème tête de Lion* (French)].

ASSESSMENT INFORMATION

Red List Category and Criteria at National level (Version 4.0): Critically Endangered B1ab(i,ii,iii,v)+ 2ab(i,ii,iii,v); C2a(i,ii); D.

Justification: *Helianthemum caput-felis* is assessed as Critically Endangered in Algeria as it is restricted to only one location with both the extent of occurrence and the area of occupancy less than 1km². The population size is also very small comprising about 30 mature individuals. The species has not been re-collected from its historical localities since 1945, and thus it could be locally extirpated. The threats for the species are high, including heavy grazing, loss and degradation of habitat due to landslides, road widening and growing tourism. Additionally, the regional population of Algeria does not seem to experience any significant immigration of propagules, from any other population, likely to reproduce in the region; and therefore it behaves as an endemic. Thus, the species is likely to be lost in the near future if adequate measures are not taken to protect and conserve it.

GEOGRAPHIC RANGE / DISTRIBUTION INFORMATION

Range description: In Algeria, the species is restricted to Ain-El-Kerma (Oran province).

Countries of occurrence: Native to Algeria (also in Italy, Morocco and Spain).

Extent of Occurrence (EOO): EOO in Algeria is approximately 30 km² considering the present location at Ain-El-Kerma and the extinct locations at historical localities 'Ain-El-Turk', 'Cap Falcon' and 'Les Andalouses' of the species. The present location is at about 15km in aerial distance away from the nearest historical locality.

Area of Occupancy (AOO): AOO is estimated to be less than 1km² considering the extant location at Ain-El-Kerma. The AOO of historical locations are not known.

Number of locations: The species is currently restricted to only one location. The species is probably extirpated from its historical localities and no other locations have been observed.

Range map: Current and historical distribution of the taxon in Algeria is given in Image 1.

POPULATION INFORMATION

Population: The species is estimated to have c. 30 mature individuals.

Population trend: The relict regional population appears to be more or less stable at present, but anthropogenic habitat disturbances could lead to local extinction in the medium-term unless conservation measures are taken.

HABITAT AND ECOLOGICAL INFORMATION

Habitat and ecology: The relict regional population grows on littoral calcareous hills at 170m elevation (Image 2), not close to the seashore and similarly as it does in Morocco and Melilla (Spain), together with shrubby species such as *Cistus heterophyllus* Desf., *C. monspeliensis* L., *Rosmarinus officinalis* L., *Sideritis maura* de Noé, *Lavandula dentata* L. and *Teucrium polium* L., among others. Historical localities where the species is probably extinct were coastal sand dunes; this habitat is now replaced by human facilities.

INFORMATION ON THREAT

Threats: No current threats are affecting the remaining regional population; however, the historical localities were threatened by coastal urbanization, grazing, constructions excavation and retreat from the coastlines. And therefore, similar threats could affect the current population in the long-time.

USE AND TRADE INFORMATION

Use: Local people do not collect the species, as there is no use value for the plant.

Livelihoods and sustenance: Communities are not dependent on this species for their livelihoods or sustenance.

Trend in off take from the wild: Not yet observed.

Trend in off take from cultivation: It is not cultivated, but has potential as an ornamental.

Commercial value: The species has no known local, domestic, national or international commercial value.

INFORMATION ON CONSERVATION ACTIONS

Conservation actions: The species is not in any systematic conservation programme. The species does not occur in any formal protected area. An urgent conservation action is needed to protect the species from anthropogenic threats as well as site protection.

Research in place: There is no systematic research in place other than our recent surveys.

Research needed: Systematic surveys in surrounding areas, monitoring, propagation studies, effects of threats on population, and introduction of specimens in historical localities and similar habitats in nature are some of the much needed research actions.

Monitoring in place: There is no monitoring of the species, population or habitat in place.

Monitoring needed: Population and site monitoring is essential and must be implemented at the earliest.

Education in place: Formal or informal education about the species in place is not known.

Education needed: Outreach programmes about the species to local communities and forest department are crucial.

**OPEN ACCESS**

The Journal of Threatened Taxa is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at www.threatenedtaxa.org. All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use of articles in any medium, reproduction, and distribution by providing adequate credit to the authors and the source of publication.

ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

March 2017 | Vol. 9 | No. 3 | Pages: 9885–10020

Date of Publication: 26 March 2017 (Online & Print)

DOI: 10.11609/jott.2017.9.3.9885-10020

www.threatenedtaxa.org

Articles

An updated report on the distribution and conservation status of the endangered Cat's Head Rockrose *Helianthemum caput-felis* (Magnoliopsida: Violales: Cistaceae) in Algeria
-- Jonás C. Agulló, Ana Juan, Manuel B. Crespo, María Ángele Alonso & Alejandro Terrones, Pp. 9885–9891

A comparative study of the diet of the Indian Eagle Owl *Bubo bengalensis* (Franklin, 1831) from two distinct habitats in the Tamil Nadu - Puducherry area, southern India
-- M. Eric Ramanujam & Tushita Singh, Pp. 9892–9902

Review

Status, distribution and threats of kraits (Squamata: Elapidae: *Bungarus*) in Bangladesh
-- M.F. Ahsan & M.M. Rahman, Pp. 9903–9910

Communications

Ecology of marine macro algal flora of Visakhapatnam coastal areas, Bay of Bengal, India
-- I. Vishnupriya Sowjanya & P.S. Raja Sekhar, Pp. 9911–9919

Distribution pattern, population estimation and threats to the Indian Pangolin *Manis crassicaudata* (Mammalia: Pholidota: Manidae) in and around Pir Lasura National Park, Azad Jammu & Kashmir, Pakistan
-- Faraz Akrim, Tariq Mahmood, Riaz Hussain, Siddiqa Qasim & Imad-ul-din Zangi, Pp. 9920–9927

Impact of vehicular traffic on vertebrate fauna in Horton plains and Yala national parks of Sri Lanka: some implications for conservation and management
-- Suranjan Karunaratna, Sudheera Ranwala, Thilina Surasinghe & Majintha Madawala, Pp. 9928–9939

Forest ghost moth fauna of northeastern India (Lepidoptera: Hepialidae: *Endoclita*, *Palpifer*, and *Hepialiscus*)
-- John R. Grehan & Vijay Anand Ismavel, Pp. 9940–9955

First record of tapeworm *Moniezia* (Cestoda: Anoplocephalidae) infections in Leopards: Coprological survey of gastrointestinal parasites of wild and captive cats in Sri Lanka
-- Vishvapali Kobbekaduwa, Caroline Fillieux, Ashan Thudugala, R.P.V. Jayantha Rajapakse & Rupika S. Rajakaruna, Pp. 9956–9961

Short Communications

Macrofungi in two botanical gardens in southwestern India
-- Mundamoole Pavithra, Kandikere R. Sridhar & Ammatanda A. Greeshma, Pp. 9962–9970

A report on some butterflies (Lepidoptera) from Ladakh in Jammu & Kashmir and Lahaul in Himachal Pradesh, India
-- Sanjay Sondhi, Balakrishnan Valappil, Yash Sondhi & Anchal Sondhi, Pp. 9971–9987

Status, abundance and habitat preference of butterflies (Insecta: Lepidoptera) in Chittagong University Campus, Chittagong, Bangladesh

-- Ibrahim Khalil Al Haidar, M. Mizanur Rahman, M. Farid Ahsan & M. Ariful Islam, Pp. 9988–10003

A preliminary report on the impact of road kills on the herpetofauna species in Nilgiris, Tamil Nadu, India
-- P. Santhoshkumar, P. Kannan, A. Veeramani, A. Samson, S. Karthick & J. Leonaprinicy, Pp. 10004–10010

Notes

Lifecycle and fecula measurements of *Cheritra freja* (Lepidoptera: Lycaenidae), as relevant to the different larval stages
-- Tharaka Sudesh Priyadarshana & Ishara Harshajith Wijewardhane, Pp. 10011–10013

New distribution record of Nagarjunasagar Racer *Platyceps bholanathi* (Reptilia: Squamata: Colubridae) in Sigur, Nilgiris landscape, India
-- Arockianathan Samson, Palanisamy Santhoshkumar, Balasundaram Ramakrishnan, Sivaraj Karthick & Chandrashekaruni Gnaneswar, Pp. 10014–10017

A first report of the presence of the Indian Wild Pig *Sus scrofa cristatus* from Kajinag Range, Kashmir, India
-- Riyaz Ahmad, Intesar Suhail & Yash Veer Bhatnagar, Pp. 10018–10020