

Checklist of the wetland facultative vascular flora from Morocco

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ABSTRACT

Wetlands are of increasing interest for scientists and managers. Numerous works were carried out on wetland vascular plants from Morocco, but it not obvious to come up with a comprehensive synthesis or an update of the data. To highlight the current state of knowledge on wetland facultative vascular plants from Morocco, a synthesis of previous related works was carried out. Thus, an inventory of 338 plant taxa, belonging to 220 genera and 72 botanical families, has been established. The endemic taxa are represented by 65 species and subspecies. In addition, 58 species and subspecies are included in the IUCN red list. The geographical distribution and, where appropriate, the auto-ecological data have also been reported for each taxon inventoried.

Key words: Wetland, Flora, Diversity, Distribution, Conservation, Morocco.

Introduction

Wetlands are areas where drylands come into contact with water or are water-saturated and are characterized by the presence of water-dependent plant and animal species (Shine and de Klemm, 1999). The total value of wetlands depends on their ecological characteristics and socio-economic environment (Woodward and Wui, 2001; De Groot *et al.*, 2007).

The ecological functions of wetlands include retention and recycling of mineral salts and macro-nutrients (Ennabili *et al.*, 1998, 2000; Turner *et al.*, 2000; Trepel and Palmeri, 2002; Ennabili and Radoux, 2006), improving water quality (Dorioz and Ferhi

1994; Ezzahri *et al.*, 2001, 2010; Libiad *et al.*, 2012; Libiad, 2013; Ennabili *et al.*, 2019; Ennabili and Radoux, 2020), groundwater recharge and water liberation (Turner *et al.*, 2000; *in* De Groot *et al.*, 2007; SECEE, 2009), habitat for aquatic and avifauna species, plant and animal biomass production, flood control, sediment stabilization (Ennabili and Ater, 2005; Ennabili *et al.*, 1998, 2000; *in* Woodward and Wui, 2001; SECEE, 2009), retention of toxic substances, and maintenance of biodiversity (Turner *et al.*, 2000; Libiad, 2013; Libiad *et al.*, 2012, 2015). Plants of wetlands can also be used for wetlands conservation and management and, in turn, indirectly improve their physico-chemical characteristics (Cronk and Fennessy, 2001; Ennabili and

Gharnit, 2003a; Libiad, 2013).

Moroccan wetlands are in decline because of the combined effect of human interventions and climate change, which could negatively affect the vegetation of these habitats. It is said that about 50% of Moroccan wetlands have been lost in the last 50 years, and consequently, 22% of Moroccan flora may disappear by 2050.

With regard to the moisture tolerance, wetland plants include three groups: (i) hygrophilous taxa, i.e. wetland plants, growing and thriving in wet habitats; (ii) semi-hygrophilous taxa, i.e. wetland facultative plants, thriving at a time in wet habitats and xeric areas, or periodically colonizing wetlands; and (iii) non-hygrophilous or opportunistic taxa, accidentally found in wetlands or colonizing them in post-submersion periods (Ennabili and Ater, 1996; Ennabili, 1999; Fennane *et al.*, 1999, 2007, 2014; Ennabili and Gharnit, 2003b; Hammada *et al.*, 2004; Hammada, 2007; Libiad *et al.*, 2012; Libiad, 2013).

The vascular flora from Morocco has been the subject of studies and surveys from the end of the 18th century until the current one (e.g. Valdés *et al.*, 2002; Ozenda, 2004; Fennane *et al.*, 1999, 2007, 2014). Moreover, about 16% of the Moroccan vascular flora corresponds to wetland plants (hygrophilous plants), of which 16.2% are endemic and 44.8% are on the IUCN Red List (Khabbach *et al.*, 2020).

According to the current state of the knowledge, together with of data on geographical distribution, endemism, conservation and autoecology, this work aims to develop a taxonomic inventory of the wetland facultative vascular flora (semi-hygrophilous flora) from Morocco, thriving in variable wet habitats, including land-water margins, shallow waters, and temporary or intermittently wet lands and substrates.

Methods

This work consisted of a comprehensive exhaustive consultation of works on wetland flora, conducted in a chronological publication for more than 20 years. These works were done in varying contexts and involved scales ranging from one sub-locality (Ennabili and Gharnit, 2003a; Khabbach *et al.*, 2011, 2019; Libiad *et al.*, 2011) to more than one region (Ennabili *et al.*, 1996; Ennabili and Ater, 1996; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Ozenda, 2004), or even the whole country (Hammada *et al.*, 2004; Fennane *et al.*, 1999, 2007, 2014); others have targeted a category of wetlands such as temporary

ponds (Molina *et al.*, 2009; Rhazi *et al.*, 2012; El Madihi *et al.*, 2017). Additional data from field prospecting not having been published were also taken into account in this work under the mention “Unpublished data”.

The checking of herbaria related to these studies is not the subject of the current work given the complexity of this task: multitude of herbaria involving more than one establishment and/or country, insufficient upstream traceability of exsiccata, problem of herbaria conservation, modest research means... Instead, the focus will be on updating of taxonomy, geographical distribution, conservation status, and autoecology of the semi-hygrophilous flora from the Moroccan wetlands on the basis of the studies published during the last two decades.

The nomenclature and the status of wetland vascular plants were updated, and reviewed critically and comparatively according to APB (2020) and IUCN (2017) respectively. The adopted floristic distribution is composed of 11 geographical divisions (Figure1). The endemism concerns the proximal territories of Morocco (MAR), namely Algeria (DZA), Canary Islands (ESP.CN), Iberian Peninsula (ESP.PRT), Mauritania (MRT) and Tunisia (TUN).

The status of taxa included in the IUCN Red List is identified on the basis of the following types of threat: Critically endangered (CE), Endangered (E), Near threatened (Nt), Vulnerable (V), Least concern (Lc) and Data deficient (Dd). As concerns the population trend of taxa, four categories are defined depending on their conservation status: increasing (I), stable (S), decreasing (D) and unknown (U) (IUCN, 2017).

Where appropriate, information on autoecology, habitat and origin of taxa are given, and the following abbreviations were used: In, introduced and/or naturalized; Hm, mesohalophilous; Ha, halophilous; Sc, sciaphilous; Ni, nitrophilous, including hedge and rubble habitats; and Ps, psammophilous.

Results

The taxa are numbered consecutively and presented as follows: “species or subspecies [synonym (s)]; geographical distribution; endemism; the IUCN red list status; auto-ecology and habitat”, depending on the data availability. The data sources are grouped subsequently after each botanical family to make the text more readable



Fig. 1. Floristic divisions of Morocco. *Caption:* AA, Anti Atlas; As, Saharan Atlas; HA, High Atlas; LM, Mediterranean Coastline; MA, Middle Atlas; Mam, Middle Atlantic Morocco; Man, North Atlantic Morocco; Ms, Saharan Morocco; Om, Mountains of the Eastern Morocco; Op, Plateaus of the Eastern Morocco; R, Rif. *Source:* Khabbach *et al.* (2020)

SELAGINELLALES

Selaginellaceae

(Ennabili and Ater, 1996; Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Euro+Med, 2006-; Chambouleyron, 2012; IUCN, 2017; APB, 2020).

1. *Selaginella balansae* (A. Braun ex Kuhn) Hieron; AA-HA-LM-Mam-Man-R; MAR; Lc-S.
2. *Selaginella denticulata* (L.) Spring; As-HA-LM-MA-Mam-Man-Om-Op-R; Lc-S; Sc.

PINALES

Taxaceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; IUCN, 2017;

APB, 2020).

3. *Taxus baccata* L.; HA-LM-MA-Man-Op-R; Lc-I; Sc.

OPHIOGLOSSALES

Ophioglossaceae

(Ennabili and Ater, 1996; Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Ozenda, 2004; Chambouleyron, 2012; IUCN, 2017; APB, 2020).

4. *Ophioglossum lusitanicum* L.; LM-MA-Mam-Man-R; Lc-U
5. *Ophioglossum polyphyllum* A. Braun; Ms.

POLYPODIALES

Aspleniaceae

(Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Euro+Med, 2006-; Valdés, 2013; APB, 2020).

6. *Asplenium hispanicum* (Coss.) Greuter & Burdet; HA-MA-Man-R; MAR-DZA.ESP.PT, Sc.
7. *Asplenium onopteris* L.; HA-LM-MA-Man-Op-R.
8. *Asplenium trichomanes* L.; HA-LM-MA-Mam-Man-Om-Op-R; Sc.

Dryopteridaceae

(Ennabili and Ater, 1996; Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Chambouleyron, 2012; Valdés, 2013; APB, 2020).

9. *Polystichum aculeatum* (L.) Roth [*Dryopteris aculeata* (L.) Kuntze]; HA-MA-Man-R; Sc.
10. *Polystichum setiferum* (Forssk.) T. Moore ex Woyn.; MA-Man-R; Sc.

Polypodiaceae

(Ennabili and Ater, 1996; Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Valdés, 2013; APB, 2020).

11. *Polypodium cambricum* L.; LM-MA-Man-Om-Op-R.
12. *Polypodium vulgare* L.; HA-LM-MA-Man-Om-Op-R; Sc.

Pteridaceae

(Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; IUCN, 2017; APB, 2020).

13. *Anogramma leptophylla* (L.) Link [*A. leptophylla* (L.) Desv., *Gymnogramma leptophylla* var. *pinnata* Maire, *G. leptophylla* (L.) Desv.]; AA-HA-LM-

MA-Mam-Man-Om-Op-R; Sc.

14. *Pteris incompleta* Cav.; R; Nt-S; Sc.

Woodsiaceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; Valdés, 2013; APB, 2020).

15. *Cystopteris alpina* (Lam.) Desv.; HA-MA-R; Sc.
- *Cystopteris fragilis* (L.) Bernh.; AA-HA-LM-MA-Man-Op-R; Sc. It includes:
16. *C. fragilis* subsp. *diaphana* (Bory) Litard. [*C. viridula* (Desv.) Desv.]; HA-MA-Man-Op-R; Sc.

PIPERALES

Aristolochiaceae

(Valdés *et al.*, 2002; Fennane *et al.*, 1999; Chambouleyron, 2012; IUCN, 2017; APB, 2020).

17. *Aristolochia paucinervis* Pomel; AA-HA-LM-MA-Mam-Man-Om-Op-R; Lc-S.

RANUNCULALES

Papaveraceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; APB, 2020).

18. *Hypecoum imberbe* Sm.; Man-R.

Ranunculaceae

(Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Euro+Med, 2006; Chambouleyron, 2012; IUCN, 2017; APB, 2020).

19. *Clematis cirrhosa* L.; HA-LM-MA-Mam-Man-Om-Op-R.
20. *Clematis flammula* L.; As-HA-LM-MA-Mam-Man-Om-Op-R.
21. *Clematis vitalba* L. [*C. vitalba* var. *integrata* D.C.]; R.
22. *Ficaria verna* subsp. *grandiflora* (Robert) Hayek [*Ranunculus ficaria* subsp. *ficariiformis* F. W. Schultz ex Rouy & Foucaud]; HA-MA-Man-Op-R.
23. *Ranunculus aurasiacus* Pomel; HA-MA; MAR-DZA; Lc-S.
24. *Ranunculus paludosus* Poir.; AA-HA-LM-MA-Mam-Man-Op-R.
25. *Ranunculus parviflorus* L.; HA-LM-MA-Man-Op-R; Sc.

CUCURBITALES

Cucurbitaceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ozenda, 2004; Hammada, 2007; APB, 2020; Unpublished Data).

26. *Citrullus colocynthis* (L.) Schrad.; AA-As-LM-Mam-Man-Ms-Op-R.

MALVALES

Cistaceae

(Ennabili, 1999; Valdés *et al.*, 2002; Rhazi *et al.*, 2012; APB, 2020; Unpublished Data).

27. *Cistus monspeliensis* L.; LM-MA-Mam-Man-Om-Op-R.
 28. *Cistus salviifolius* L.; LM-MA-Mam-Man-Om-Op-R.
 29. *Tuberaria guttata* (L.) Fourr.; LM-MA-Mam-Man-Op-R.

Malvaceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; Euro+Med, 2006-; Rhazi *et al.*, 2012; Libiad, 2013; APB, 2020).

30. *Abutilon theophrasti* Medik.; Man; In.
 31. *Malva hispanica* L.; LM-MA-Mam-Man-Op-R; MAR-DZA.ESP.PRT.

Thymelaeaceae

(Ennabili, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Fennane *et al.*, 2007; APB, 2020; Unpublished Data).

32. *Daphne laureola* L.; HA-LM-MA-Man-Op-R.

SAPINDALES

Anacardiaceae

(Ozenda, 2004; Fennane *et al.*, 2007; APB, 2020; Unpublished Data).

33. *Pistacia atlantica* Desf.; All Morocco.

CARYOPHYLLALES

Aizoaceae

(Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Hammada *et al.*, 2004; Hammada, 2007; APB, 2020).

34. *Mesembryanthemum crystallinum* L.; AA-HA-LM-Mam-Man-Ms-Op-R; Ni-Ps.
 35. *Sesuvium hydaspicum* (Edgew.) Gonç. [*Trianthema hydaspicum* Edgew.]; Ms.
 36. *Sesuvium portulacastrum* (L.) L.; Man-Ms; Hm.
 37. *Trianthema sedifolia* Vis.; Ms.

Amaranthaceae

(Ennabili and Ater, 1996; Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Hammada *et al.*, 2004; Ozenda, 2004; Euro+Med, 2006-; Hammada, 2007;

Chambouleyron, 2012; Libiad, 2013; APB, 2020; Unpublished Data).

38. *Amaranthus albus* L.; LM-Mam-Man-Op-R; In.
 39. *Amaranthus blitoides* S. Watson; LM-MA-Mam-Man-Op-R; In-Ni-Ps.
 40. *Amaranthus deflexus* L.; LM-Mam-Man-Op-R; In-Ni-Ps.
 41. *Amaranthus graecizans* L. [*A. angustifolius* Lamk. subsp. *polygonoides* (Roxb.) Maire & Weiller]; MA-Man-R.
 42. *Amaranthus graecizans* subsp. *sylvestris* (Vill.) Brenan; Man-R; In.
 43. *Amaranthus hybridus* L.; MA-Man-Op-R; In-Ni-Ps.
 44. *Amaranthus powellii* S. Watson; MA-Man-Op.
 45. *Atriplex colerei* Maire; Mam; MAR; Ha.
 46. *Atriplex prostrata* Boucher ex DC.; LM-Mam-Man-Op-R; Ha.
 47. *Beta macrocarpa* Guss.; LM-Mam-Man-Op-R; Hm.
 48. *Chenopodium chenopodioides* (L.) Aellen; MA-Man-R; Ni-Ha.
 49. *Halogeton sativus* (L.) Moq. [*Salsola sativa* L.]; MA-Man-Ms-Op-R; Hm.
 50. *Salsola kali* L.; LM-Mam-Man-Om-Op-R; Ps.
 51. *Suaeda ifniensis* Caball. ex Maire; AA-Mam-Ms; MAR-ESP.CN; Ha.
 52. *Suaeda monodiana* Maire.; Ms.
 53. *Traganopsis glomerata* Maire & Wilczek.; Ms; MAR.

Caryophyllaceae

(Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003a; Hammada *et al.*, 2004; Euro+Med, 2006-; Hammada, 2007; Molina *et al.*, 2009; Chambouleyron, 2012; Rhazi *et al.*, 2012; Libiad, 2013; IUCN, 2017; APB, 2020; Unpublished Data).

54. *Cerastium arvense* L.; AA-HA-MA-Man-Op-R; Lc-U.
 55. *Cerastium perfoliatum* L.; MA.
 56. *Chaetonychia cymosa* (L.) Sweet; Man-R.
 - *Minuartia hybrida* (Vill.) Schischk.; LM-Mam-Man-Om-Op-R; Ps. It includes:
 57. *M. hybrida* subsp. *laxa* (Jord.) Jauzein; R.
 58. *Moenchia erecta* (L.) P. Gaertn., B. Mey. & Scherb. [*M. e.* subsp. *octandra* (Moris) Coutinho, *M. e.* subsp. *octandra* (Ziz ex Mert. & W.D.J. Koch) Cout.]; HA-MA-Man-R; Ps.
 59. *Silene lagrangei* (Cosson) Greuter & Burdet; Man-R; MAR.

60. *Silene martyi* Emb. & Maire; Man-R; MAR.
 61. *Silene tuberculata* (Ball) Maire & Weiller; LM-MA-Man-Op-R; MAR-ESP.PRT.
 62. *Spergula diandra* (Guss.) Boiss. [*Spergularia diandra* (Guss.) Boiss.]; LM-MA-Mam-Man-Om-Op-R; Hm.
 63. *Spergula marina* (L.) Bartl. & H. L. Wendl. [*S. seminulifera* Maire, *Spergularia salina* J. Presl & C. Presl, *S. marina* (L.) Besser]; HA-LM-MA-Mam-Man-Ms-Op-R; Lc-S; Ha.
 64. *Spergula purpurea* (Pers.) D. Dietr. [*Spergularia purpurea* (Pers.) G. Don]; Mam-Man-Op-R; MAR-ESP.PRT.
 65. *Spergula bocconei* (Scheele) Pedersen [*Spergularia bocconei* (Scheele) Graebner]; AA-HA-LM-MA-Mam-Man-Om-Op-R; Lc-U.
 66. *Spergularia doumerguei* P. Monnier; LM-MA-Man-Op; MAR-DZA; V-D; Hm.
 67. *Spergularia media* (L.) C. Presl; MA-Mam-Man-Ms; Lc-U; Hm.

Frankeniaceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; APB, 2020).
 68. *Frankenia hirsuta* L.; LM-Man-R; Hm.

Illecebraceae

- (Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ozenda, 2004; Hammada, 2007; Molina *et al.*, 2009; APB, 2020).
 69. *Gymnocarpos sclerocephalus* (Decne.) Ahlgren & Thulin [*Sclerocephalus arabicus* Boiss.]; AA-Ms-Op.
 70. *Herniaria cinerea* DC; LM-Mam-Man-Om-Op-R; Ps.
 71. *Herniaria fontanesii* J. Gay; AA-As-LM-Man-Ms-Om-Op-R.
 72. *Paronychia arabica* (L.) DC. subsp. *arabica*; AA-Ms.
 73. *Paronychia echinulata* Chater; AA-As-HA-LM-MA-Mam-Man-Op-R; Ps.
 74. *Paronychia kapela* subsp. *kapela*; MA-R.

Molluginaceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; Molero Briones and Montserrat Martí, 2006; Hammada, 2007; APB, 2020; Unpublished Data).
 75. *Glinus lotoides* L.; Man-Ms-R.

Plumbaginaceae

(Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*,

- 2002; Ennabili and Gharnit, 2003b; Hammada *et al.*, 2004; Ozenda, 2004; Euro+Med, 2006-; Hammada, 2007; IUCN, 2017; APB, 2020).
 76. *Limoniastrum monopetalum* (L.) Boiss.; LM-Man-R; Ha.
 77. *Limonium asparagoides* (Coss. ex Batt.) Maire [*L. asparagoides* (Coss. & Dur.) Maire]; LM-Op-R; MAR-DZA; Ha.
 78. *Limonium cossonianum* Kuntze [*L. gummiferum* (Dur.) Kuntze, *L. g.* var. *corymbulosum* (Coss.) Maire; LM-Op-R; MAR-ESP.PRT; Ha.
 79. *Limonium cymuliferum* (Boiss.) Sauvage & Vindt [*L. c.* var. *sebkarum* (Pomel) Sauvage & Vindt, *L. gummiferum* subsp. *sebkarum* (Pomel) Maire]; LM-Mam-Man-Op-R; MAR-DZA-ESP.PRT; Nt-U; Hm.
 80. *Limonium delicatulum* (Girard) Kuntze; LM-Mam-Man-Ms-Op-R; Ha.
 81. *Limonium mouretii* (Pit.) Maire; HA-MA-Man; MAR; Nt-U.
 82. *Limonium ovalifolium* (Poir.) Kuntze; Man-R; Ha.
 83. *Myriolimon ferulaceum* (L.) Lledó, Erben & M. B. Crespo [*Limonium ferulaceum* (L.) Chaz., *L. ferulaceum* (L.) O. Kuntze, *Myriolepis ferulacea* (L.) Lledó, Erben & Crespo]; Mam-Man-R; Ps-Hm.

Polygonaceae

- (Ennabili and Ater, 1996; Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Ozenda, 2004; Euro+Med, 2006-; Molero Briones and Montserrat Martí, 2006; Hammada, 2007; Molina *et al.*, 2009; Chambouleyron, 2012; Rhazi *et al.*, 2012; APB, 2020; Unpublished Data).
 84. *Calligonum polygonoides* subsp. *comosum* (L'Hér.) Soskov [*C. comosum* L'Hér]; Ms.
 85. *Persicaria bistorta* (L.) Samp.; AA-HA.
 86. *Polygonum aviculare* L. subsp. *aviculare*; Man-R.
 87. *Polygonum aviculare* subsp. *rurivagum* (Jord. ex Boreau) Berher [*P. rurivagum* Jord. ex Boreau]; LM-MA-R.
 88. *Polygonum bellardii* All.; HA-MA-Mam-Man-Op-R.
 89. *Polygonum equisetiforme* Sibth. & Sm.; MA-Man-Ms-R.
 90. *Rumex bucephalophorus* L.; LM-MA-Mam-Man-Om-Op-R; Ps.
 91. *Rumex scutatus* subsp. *induratus* (Boiss. & Reut.) Nyman [*R. induratus* Boiss. & Reut.]; AA-HA-MA-Man-R; MAR-DZA-ESP.CN; Sc.

Portulacaceae

(Valdés *et al.*, 2002; Ozenda, 2004; Chambouleyron, 2012; Libiad, 2013; APB, 2020).

92. *Portulaca oleracea* L.; MA-Man-Ms-Op-R.

Tamaricaceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; Hammada, 2007; APB, 2020).

93. *Tamarix aphylla* (L.) H. Karst.; LM-Ms-Om-Op.

BRASSICALES**Brassicaceae**

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; Hammada *et al.*, 2004; Ozenda, 2004; Euro+Med, 2006-; Hammada, 2007; Rhazi *et al.*, 2012; APB, 2020; Unpublished Data).

94. *Arabis verna* (L.) R. Br.; AA-HA-LM-MA-Man-Om-Op-R; Sc.

95. *Biscutella didyma* L.; Man-Op-R.

96. *Brassica nigra* (L.) W.D.J. Koch; Man-Ms-R; Ni.

97. *Diplotaxis catholica* (L.) DC.; Mam-Man-Op-R; MAR-ESP.PRT.

98. *Diplotaxis olliivieri* Maire.; AA-Mam-Ms; MAR.

99. *Guenthera elongata* subsp. *indrashiana* (Quézel) Gómez-Campo [*Brassica elongata* subsp. *indrashiana* Quézel]; HA; MAR.

100. *Hornungia procumbens* (L.) Hayek subsp. *procumbens*; AA-MA-Mam-Man-Ms.

101. *Lepidium latifolium* L.; Man-R.

102. *Malcolmia arenaria* (Desf.) DC.; MA-Op.

103. *Raphanus raphanistrum* L.; LM-Mam-Man-Op-R.

Resedaceae

(Fennane *et al.*, 1999; Euro+Med, 2006-; Hammada, 2007; APB, 2020).

104. *Reseda battandieri* subsp. *limicola* (Maire & Sam.) Maire; Mam-Man-Ms; Vu-D; MAR.

ERICALES**Ericaceae**

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; Chambouleyron, 2012; Euro+Med, 2006-; IUCN, 2017; APB, 2020).

105. *Calluna vulgaris* (L.) Hull; Man-R; Lc-D; Hm.

106. *Erica scoparia* L. subsp. *scoparia*; Man-Om-R.

Primulaceae

(Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*,

2002; Ozenda, 2004; Hammada, 2007; Chambouleyron, 2012; Libiad, 2013; APB, 2020; Unpublished Data).

107. *Anagallis arvensis* L. subsp. *arvensis*; As-HA-LM-MA-Mam-Man-Om-Op-R.

108. *Lysimachia arvensis* (L.) U. Manns & Anderb. [*Anagallis arvensis* L.]; As-HA-LM-MA-Mam-Man-Ms-Om-Op-R.

109. *Lysimachia foemina* (Mill.) U. Manns & Anderb. [*Anagallis foemina* Mill.]; Man-Om-Op-R; Ni.

FABALES**Mimosaceae**

(Ennabili, 1999; Fennane *et al.*, 2007; Chambouleyron, 2012; APB, 2020).

110. *Acacia saligna* (Labill.) H. L. Wendl.; Man-R.

Fabaceae

(Ennabili, 1999; Valdés *et al.*, 2002; Hammada *et al.*, 2004; Ozenda, 2004; Euro+Med, 2006-; Fennane *et al.*, 2007; Hammada, 2007; Chambouleyron, 2012; Rhazi *et al.*, 2012; Libiad, 2013; El Madihi *et al.*, 2017; IUCN, 2017; APB, 2020).

111. *Astragalus saharae* Pomel; As-HA-Ms-Op.

112. *Astragalus schizotropis* Murb.; Mam; MAR.

- *Astragalus vogelii* (Webb) Bornm. [*A. v.* subsp. *prolixus* (Sieber ex Bunge) Maire]; Ms. It includes:

113. *A. vogelii* subsp. *fatmensis* (Hochst. ex Chiov.) Maire; Ms.

114. *Crotalaria saharae* Coss.; Ms.

115. *Glycyrrhiza foetida* Desf; Mam-Man-R; MAR-DZA-TUN-ESP.PRT.

116. *Hedysarum carnosum* Desf.; As; MAR-DZA-TUN.

117. *Hedysarum membranaceum* Coss. & Balansa; AA-HA-Mam; MAR.

118. *Hedysarum spinosissimum* L.; AA-HA-LM-Mam-Man-Om-Op-R.

119. *Kebirita roudairei* (Bonnet) Kramina & D. D. Sokoloff [*Lotus roudairei* Bonnet]; Ms; MAR-DZA-MRT-TUN.

120. *Lathyrus aphaca* L.; HA-LM-MA-Mam-Man-Op-R.

121. *Leobordea platycarpa* (Viv.) B.-E. van Wyk & Boatwr.; AA-Ms.

122. *Medicago laciniata* (L.) Mill.; AA-As-HA-LM-MA-Mam-Man-Ms-Op-R.

123. *Medicago lupulina* L. AA-HA-LM-MA-Mam-Man-Om-Op-R.

124. *Medicago polymorpha* L.; LM-MA-Mam-Man-Om-Op-R.
 125. *Melilotus infestus* Guss.; HA-MA-Man.
 126. *Melilotus speciosus* Durieu; LM-Mam-Man-Om-Op-R; MAR-DZA-ESP.PRT; Ni.
 127. *Ononis angustissima* Lam. [*O. natrix* subsp. *angustissima* (Lam.) Širj.]; As-HA-LM-MA-Ms-Op-R.
 128. *Ononis antennata* subsp. *massesyli* (Pomel) Širj.; LM-Om-Op; MAR-DZA.
 129. *Ononis cephalantha* subsp. *pseudocephalantha* (Emb. & Maire) Maire; LM-MA-Man-Om-Op-R; MAR.
 130. *Ononis peyerimhoffii* Batt.; AA-Op; MAR.
 131. *Ononis polysperma* Barrate & Murb.; AA-HA-Mam-Ms; MAR.
 132. *Ornithopus compressus* L.; LM-MA-Mam-Man-Op-R.
 133. *Ornithopus pinnatus* (Mill.) Druce; Man-R.
 134. *Retama sphaerocarpa* (L.) Boiss.; As-HA-MA-Ms-Op; MAR-DZA-MRT-TUN-ESP.PRT.
 135. *Trifolium lappaceum* L.; HA-LM-MA-Mam-Man-Ms-Om-Op-R; Ni.
 136. *Trifolium pratense* L.; HA-LM-MA-Man-R; Lc-S.

SAXIFRAGALES

Crassulaceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; Molina *et al.*, 2009; IUCN, 2017; APB, 2020).

137. *Crassula alata* (Viv.) A. Berger; AA-LM-Mam-Man-Ms-Op-R.
 138. *Crassula tillaea* Lest.-Garl.; HA-LM-MA-Mam-Man-Om-Op-R; Lc-I.
 139. *Sedum caeruleum* L.; HA-LM-MA-Mam-Man-Om-Op-R.
 140. *Sedum jahandiezii* Batt.; MA-Mam-Man; MAR.

MYRTALES

Lythraceae

(Ennabili and Ater, 1996; Ennabili, 1999; Ennabili *et al.*, 2000; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Hammada, 2007; Chambouleyron, 2012; El Madihi *et al.*, 2017; IUCN, 2017; APB, 2020; Unpublished Data).

141. *Lythrum acutangulum* Lag.; Man-R.
 142. *Lythrum junceum* Banks & Sol.; LM-MA-Mam-Man-R; Lc-S.

ROSALES

Moraceae

(Ennabili, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Chambouleyron, 2012; Libiad, 2013; IUCN, 2017; APB, 2020; Unpublished Data).
 143. *Ficus carica* L.; MA-Man-Ms-R; Lc-U.

Rhamnaceae

(Ennabili, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; APB, 2020).

144. *Frangula alnus* Mill. [*Rhamnus frangula* L.]; Man-R.

Rosaceae

(Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Euro+Med, 2006; Hammada, 2007; Chambouleyron, 2012; Valdés, 2013; IUCN, 2017; APB, 2020; Unpublished Data).

145. *Crataegus monogyna* Jacq. [*C. monogyna* Jacquin, *C. oxyacantha* subsp. *monogyna* (Jacq.) Rouy & Camus; LM-MA-Man-Op-R; Lc-U.
 146. *Filipendula vulgaris* Moench; HA-LM-MA-R.
 147. *Potentilla erecta* (L.) Raeusch.; LM-Man-R.
 148. *Potentilla maura* Th. Wolf; HA-MA-Man-R; MAR; Nt-S.
 149. *Potentilla supina* L.; MA; Lc-U.
 150. *Potentilla tornezyana* Maire; AA-HA; MAR.
 151. *Prunus avium* (L.) L.; MA-R; Lc-S.

Ulmaceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; IUCN, 2017; APB, 2020; Unpublished Data).

152. *Celtis australis* L.; HA-LM-MA-Man-Om-Op-R; Lc-S.

Urticaceae

(Ennabili, 1999; Fennane *et al.*, 1999; Valdés *et al.*, 2002; IUCN, 2017; APB, 2020).

153. *Parietaria lusitanica* L.; AA-Mam-Man-R.
 154. *Urtica dioica* L.; LM-Mam-Man-R; Lc-U; Ni.

VITALES

Vitaceae

(Ennabili, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Fennane *et al.*, 2007; Chambouleyron, 2012; Libiad, 2013; IUCN, 2017; APB, 2020).

155. *Vitis vinifera* subsp. *sylvestris* (C. C. Gmel.) Hegi; HA-LM-MA-Mam-Man-Om-R; Lc-U.

ZYGOPHYLLALES**Zygophyllaceae**

(Hammada *et al.*, 2004; Ozenda, 2004; Fennane *et al.*, 2007; Hammada, 2007; APB, 2020; Unpublished Data).

156. *Fagonia bruguieri* DC.; Ms.
- *Tetraena gaetula* (Emb. & Maire) Beier & Thulin [*Zygophyllum gaetulum* Emberger & Maire]; Ms; Ps-Ha. It includes:
157. *T. gaetula* subsp. *waterlotii* (Maire) Beier & Thulin [*Zygophyllum gaetulum* subsp. *waterlotii* (Maire) Jacquem. & Jordan, *Z. waterlotii* Maire]; Ms; MAR-DZA-MRT-ESP.CN.

MALPIGHIALES**Euphorbiaceae**

- (Ennabili, 1999; Valdés *et al.*, 2002; Ozenda, 2004; Fennane *et al.*, 2007; Hammada, 2007; Chambouleyron, 2012; Rhazi *et al.*, 2012; Euro+Med, 2006-; APB, 2020).
158. *Euphorbia chamaesyce* subsp. *chamaesyce*; AA-HA-LM-MA-Mam-Man-Om-Op-R.
159. *Euphorbia clementei* Boiss.; LM-Man-Op-R.
160. *Euphorbia granulata* Forssk.; LM.
161. *Euphorbia helioscopia* L.; LM-Mam-Man-Om-Op-R.
162. *Euphorbia terracina* L.; All Morocco.
163. *Mercurialis elliptica* Poir.; AA-HA-MA; MAR-ESP.PRT.
164. *Mercurialis reverchonii* Rouy; LM-MA-Man-Op-R; MAR-ESP.PRT.
165. *Ricinus communis* L.; All Morocco; In-Ni.

Hypericaceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; Chambouleyron, 2012; Valdés, 2013; El Madihi *et al.*, 2017; APB, 2020).

166. *Hypericum humifusum* L.; Man-R.

Violaceae

(Fennane *et al.*, 1999; Valdés *et al.*, 2002; Hammada *et al.*, 2004; Euro+Med, 2006-; Hammada, 2007; IUCN, 2017; APB, 2020).

167. *Viola maroccana* (Maire) Maire [*V. maroccana* Maire]; HA-MA; MAR; Lc-S; Sc.
168. *Viola riviniana* Rchb.; LM-MA-Man-R; Sc.

GERANIALES**Gentianaceae**

(Ennabili, 1999; Ennabili and Gharnit, 2003b;

Hammada *et al.*, 2004; Fennane *et al.*, 2007; Libiad, 2013; APB, 2020; Unpublished Data).

169. *Blackstonia perfoliata* (L.) Huds. [*B. p.* subsp. *perfoliata*]; HA-LM-MA-Man-Om-Op-R.
170. *Centaurium maritimum* (L.) Fritsch; LM-MA-Mam-Man-Op-R.
171. *Geranium lanuginosum* Lam.; Man-R.

APIALES**Apiaceae**

(Ennabili, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Fennane *et al.*, 2007; Hammada, 2007; Ozenda, 2004; Euro+Med, 2006-; Chambouleyron, 2012; Rhazi *et al.*, 2012; Khabbach, 2013; Libiad, 2013; IUCN, 2017; APB, 2020; Unpublished Data).

172. *Ammodaucus leucotrichus* Coss. & Durieu; Ms.
173. *Anthriscus caucalis* M. Bieb; As-HA-LM-MA-Mam-Man-Om-R; Sc.
174. *Anthriscus sylvestris* (L.) Hoffm.; MA-Man-Om-Op; Sc.
175. *Bupleurum fruticosum* L.; LM-MA-Man-R.
176. *Bupleurum semicompositum* L.; All Morocco.
177. *Conium maculatum* L.; HA-LM-MA-Mam-Man-Om-Op-R; Ni.
178. *Drusa glandulosa* (Poir.) Bornm. [*D. oppositifolia* DC.]; AA-Man; MAR; Sc.
179. *Foeniculum vulgare* Mill.; MA-Mam-Man.
180. *Heracleum sphondylium* L.; AA-HA-MA-Mam-Man-Op; Lc-S.
181. *Oenanthe lachenalii* C. C. Gmel.; Man-R.
182. *Pseudorlaya biseriata* (Murb.) Sáenz de Rivas [*Daucus biseriatatus* Murb.]; As-Ms; MAR-DZ.
183. *Smyrniolum olusatrum* L.; HA-LM-MA-Mam-Man-Om-Op-R; Ni-Sc.
184. *Torilis arvensis* (Huds.) Link; HA-LM-MA-Mam-Man-Om-Op-R.
185. *Torilis nodosa* (L.) Gaert.; LM-MA-Man-Op-R.
186. *Visnaga daucooides* Gaertn. [*Ammi visnaga* (L.) Lam.]; LM-Man-Op-R.

SOLANALES**Convolvulaceae**

(Valdés *et al.*, 2002; Hammada, 2007; APB, 2020).
187. *Ipomoea imperati* (Vahl) Griseb. [*I. stolonifera* (Cirillo) J. F. Gmel.]; Man; Hm.

LAMIALES**Boraginaceae**

(Ennabili, 1999; Valdés *et al.*, 2002; Euro+Med, 2006;

Fennane *et al.*, 2007; Hammada, 2007; Rhazi *et al.*, 2012; Libiad, 2013; IUCN, 2017; APB, 2020; Unpublished Data).

188. *Echium plantagineum* L. [*E. p.* var. *plantagineum* Sauvage & Vindt, *E. alonsoi* Sennen & Mauricio, *E. lycopsis* L.]; LM-MA-Mam-Man-Om-Op-R; Ps.
 189. *Echium trygorrhizum* Pomel; As-HA-Ms.
 190. *Myosotis atlantica* Vestergr.; AA-HA-MA; MAR; Nt-U.
 191. *Myosotis decumbens* subsp. *rifana* (Maire) Geuter & Burdet; R; MAR-DZA.

Lamiaceae

(Ennabili and Ater, 1996; Ennabili *et al.*, 1996; Ennabili, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Hammada *et al.*, 2004; Fennane *et al.*, 2007; Hammada, 2007; Molina *et al.*, 2009; Libiad *et al.*, 2011; Chambouleyron, 2012; Khabbach *et al.*, 2011; 2012; Rhazi *et al.*, 2012; Libiad, 2013; El Madihi *et al.*, 2017; IUCN, 2017; APB, 2020; Unpublished Data).

192. *Lavandula stoechas* L.; LM-MA-Mam-Man-Om-Op-R.
 193. *Mentha pulegium* L.; All Morocco; Lc-S.
 194. *Micromeria inodora* (Desf.) Benth. [*Satureja barceloi* (Willk.) Pau]; LM-Man-Op-R.
 195. *Nepeta granatensis* Boiss.; HA-MA; MAR-ESP.PRT.
 196. *Prunella laciniata* (L.) L.; LM-MA-Man-Op-R.
 197. *Salvia taraxacifolia* Hook. f.; AA-HA; MAR.
 198. *Stachys ocymastrum* (L.) Briq.; LM-MA-Man-Op-R.

Lentibulariaceae

(Fennane *et al.*, 2007; Chambouleyron, 2012; APB, 2020).

199. *Pinguicula lusitanica* L.; Man-R.

Oleaceae

(Fennane *et al.*, 2007; APB, 2020).

200. *Ligustrum vulgare* L.; MA.

Orobanchaceae

(Chambouleyron, 2012; APB, 2020).

201. *Rhynchosorys elephas* (L.) Griseb.; R.

Plantaginaceae

(Ennabili, 1999; Ennabili *et al.*, 2000; Valdés *et al.*, 2002; Hammada *et al.*, 2004; Fennane *et al.*, 2007; Hammada, 2007; Molina *et al.*, 2009; Rhazi *et al.*,

2012; Libiad, 2013; IUCN, 2017; APB, 2020; Unpublished Data).

202. *Plantago coronopus* L. [*P. ceratophylla* Hoffmannz. & Link]; All Morocco; Ha.
 203. *Plantago crassifolia* Forssk; Op-R; Hm-Ha.
 204. *Plantago lagopus* L.; All Morocco.
 205. *Plantago maritima* L.; AA-Ms; Lc-U; Ha.

Scrophulariaceae

(Valdés *et al.*, 2002; Hammada *et al.*, 2004; Euro+Med, 2006-; Fennane *et al.*, 2007; Hammada, 2007; Chambouleyron, 2012; Rhazi *et al.*, 2012; IUCN, 2017; APB, 2020).

206. *Kickxia lanigera* (Desf.) Hand.-Mazz. [*Linaria lanigera* Desf.]; MA-Man-Om-R.
 207. *Kickxia spuria* (L.) Dumort.; LM-Mam-Man-Ms-Om-Op-R.
 208. *Scrophularia eriocalyx* Emb. & Maire; LM-Man-Op-R; MAR; E-D.
 209. *Verbascum maurum* Maire & Murb.; HA-MA-Man; MAR-DZA.

Verbenaceae

(Ennabili, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Fennane *et al.*, 2007; Hammada, 2007; APB, 2020; Unpublished Data).

210. *Verbena officinalis* L.; AA-HA-LM-MA-Mam-Man-Ms-Om-Op-R.

GENTIANALES

Rubiaceae

(Valdés *et al.*, 2002; Libiad, 2013; Fennane *et al.*, 2014; APB, 2020; Unpublished Data).

211. *Asperula arvensis* L.; MA-Man-Op-R.
 212. *Asperula laevigata* L.; HA-LM-MA-Man-Op-R.
 213. *Galium verum* L.; HA-Man.
 214. *Theligonum cynocrambe* L.; LM-Mam-Man-R.

DIPSACALES

Caprifoliaceae

(Valdés *et al.*, 2002; Chambouleyron, 2012; Fennane *et al.*, 2014; APB, 2020).

215. *Lonicera periclymenum* subsp. *hispanica* (Boiss. & Reut.) Nyman; LM-MA-Man-R; MAR-ESP.PRT.
 216. *Sambucus nigra* L.; HA-MA-Man-Op-R; Lc-S; In.

Dipsacaceae

(Valdés *et al.*, 2002; Euro+Med, 2006-; Hammada,

2007; Fennane *et al.*, 2014; APB, 2020).

217. *Sixalix semipapposa* (DC.) Greuter & Burdet [*Scabiosa semipapposa* Salzm. ex DC]; LM-Mam-Man-Om-Op-R; MAR-DZA-ESP.PRT.

ASTERALES

Asteraceae

(Ennabili, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Hammada *et al.*, 2004; Ozenda, 2004; Euro+Med, 2006-; Molero Briones and Montserrat Martí, 2006; Hammada, 2007; Molina *et al.*, 2009; Chambouleyron, 2012; Rhazi *et al.*, 2012; Khabbach, 2013; Libiad, 2013; Valdés, 2013; Fennane *et al.*, 2014; Libiad *et al.*, 2015; IUCN, 2017; APB, 2020; Unpublished Data).

218. *Anthemis mauritiana* subsp. *faurei* (Maire) Oberpr.; LM-Om-Op; MAR-DZA.
219. *Anvillea garcinii* subsp. *radiata* (Coss. & Durieu.) Anderb.; AA-As-Mam-Ms-Op.
220. *Anvillea platycarpa* (Maire) Anderb.; Ms; MAR.
221. *Asteriscus aquaticus* (L.) Less; HA-LM-MA-Mam-Man-Om-Op-R.
222. *Asteriscus graveolens* (Forssk.) Less. [*Bubonium graveolens* (Forssk.) Maire]; Ms.
223. *Asteriscus schultzei* (Bolte) Pit & Proust; Mam-Ms; MAR-ESP.CN; Hm.
224. *Atractylis babelii* Hochr.; Ms; MAR-DZA-MRT.
225. *Bellis annua* L.; LM-Mam-Man-Om-Op-R.
226. *Bellis rotundifolia* (Desf.) Boiss. & Reut; MA-Om; MAR-DZA; Sc.
227. *Bidens pilosa* L. [*B. pilosus* L.]; Mam-Man-R.
228. *Brocchia cinerea* (Delile) Vis. [*Cotula cinerea* Delile]; Ms.
229. *Calendula arvensis* (Vaill.) L; LM-MA-Mam-Man-Op-R.
230. *Calendula lanzae* Maire; AA-HA-Mam; MAR.
231. *Calendula tripterocarpa* Rupr.; AA-As-LM-Mam-Ms-Om-Op.
232. *Carlina racemosa* L.; MA-Man-Op-R.
233. *Carthamus lanatus* L.; LM-MA-Man-Om-Op-R.
234. *Cichorium intybus* L. [*C. i.* subsp. *intybus* Maire]; LM-MA-Mam-Man-Om-Op-R.
235. *Cirsium odontolepis* Boiss. ex DC.; MA-R.
236. *Cirsium scabrum* (Poir.) Bonnet & Barrate; Man-R.
237. *Cirsium vulgare* (Savi) Ten.; HA-LM-MA-Mam-R.
238. *Erigeron sumatrensis* Retz; LM-MA-Mam-

Man-Ms-Om-R.

239. *Filago argentea* (Pomel) Chrtek & Holub; AA-LM-MA-Man-Ms-Om-Op-R.
240. *Filago crocidion* (Pomel) Chrtek & Holub; MA-Man-Om-Op; MAR-DZA.
241. *Glebionis coronaria* (L.) Spach [*Chrysanthemum coronarium* L.] LM-MA-Man-Om-Op-R.
242. *Jacobaea erratica* (Bertol.) Fourr.; LM-Mam-Man-R.
243. *Lactuca muralis* (L.) Gaertn.; MA-Man-R.
244. *Leontodon tuberosus* L.; HA-LM-MA-Mam-Man-Om-Op-R.
245. *Limbarda crithmoides* subsp. *longifolia* (Arcang.) Greuter; LM-Mam-Man-R; Ha.
246. *Matricaria aurea* (Loefl.) Sch. Bip.; AA-LM-MA-Mam-Man-Om-Op-R.
247. *Nolletia chrysocomoides* (Desf.) Less.; AA-As-HA-LM-Mam-Ms-Om-Op; Ps.
248. *Pallenis hierichuntica* (Michon) Greuter; Man-Op.
249. *Plagiopus maghrebinus* Vogt & Greuter; R; MAR-DZA-TUN.
250. *Podospermum laciniatum* (L.) DC. [*Scorzonera calcitrapifolia* Vahl, *S. octangularis* Willd., *S. lacinita* subsp. *calcitrapifolia* (Vahl) Maire] LM-MA-Man-Om-Op-R.
251. *Pulicaria sicula* (L.) Moris; LM-MA-Man-Op-R; Lc-U.
252. *Scolymus hispanicus* L.; LM-MA-Mam-Man-Om-Op-R.
253. *Scorzoneroideis palisiae* (Izuzq.) Greuter & Talavera; Man; MAR-ESP.PRT.
254. *Senecio glaucus* subsp. *coronopifolius* (Maire) C. Alexander [*S. gallicus* subsp. *coronopifolius* Maire]; AA-As-HA-Mam-Ms-Op.
255. *Sonchus oleraceus* L. [*S. gracilis* Sennen, *S. spinifolius* Sennen]; LM-MA-Mam-Man-Ms-Om-Op-R.
256. *Symphotrichum squamatum* (Spreng.) G. L. Nesom; LM-Mam-Man-Op-R; In.
257. *Tolpis umbellata* Bertol.; LM-MA-Man-Op-R.
258. *Xanthium orientale* subsp. *italicum* (Moretti) Greuter; LM-Mam-Man-Op-R; In.
259. *Xanthium spinosum* L.; LM-MA-Mam-Man-Om-Op-R.
260. *Xanthium strumarium* L. [*X. brasiliicum* Vell.]; HA-LM-MA-Mam-Man-Op-R; Ni.

Campanulaceae

(Euro+Med, 2006-; Fennane *et al.*, 2014; IUCN, 2017; APB, 2020).

261. *Campanula mairei* Pau ex Maire; HA; MAR; V-S.

ARECALES

Arecaceae

(Ennabili, 1999; Valdés *et al.*, 2002; Hammada, 2007; Libiad, 2013; IUCN, 2017; APB, 2020; Unpublished Data)

262. *Chamaerops humilis* L.; LM-MA-Man-Om-Op-R; Lc-D.

263. *Phoenix dactylifera* L.; All Morocco; In.

ALISMATALES

Araceae

(Ennabili, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Rhazi *et al.*, 2012; Libiad, 2013; Fennane *et al.*, 2014; IUCN, 2017; APB, 2020).

264. *Arisarum vulgare* O.Targ.Tozz.; LM-MA-Mam-Man-Op.

265. *Arum hygrophilum* Boiss.; MA-Mam-Man-Op; Nt-U; Ni.

266. *Arum italicum* Mill.; HA-LM-MA-Mam-Man-Om-Op-R; Ni-Sc.

267. *Colocasia esculenta* (L.) Schott; R; Lc-U; In.

268. *Zantedeschia aethiopica* (L.) Spreng.; R; Lc-U; In-Sc.

POALES

Cyperaceae

(Ennabili, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003b; Chambouleyron, 2012; Fennane *et al.*, 2014; IUCN, 2017; APB, 2020).

269. *Carex depressa* Link; HA-Man-R.

270. *Carex divulsa* Stokes; HA-LM-MA-Mam-Man-Op-R.

271. *Carex extensa* Gooden.; Mam-R; Lc-S; Ha.

272. *Carex leporina* L.; AA-HA-Man-R.; Lc-U.

273. *Carex pendula* Huds.; LM-MA-Man-R.; Lc-S.

274. *Carex remota* L.; Man-R; Lc-S; Sc.

Juncaceae

(Fennane *et al.*, 2014; APB, 2020).

275. *Luzula hispanica* subsp. *nevadensis* (P. Monts.) Rivas Mart.; HA.

Poaceae

(Ennabili and Ater, 1996; Ennabili, 1999; Valdés *et al.*, 2002; Ennabili and Gharnit, 2003a, 2003b; Hammada *et al.*, 2004; Euro+Med, 2006-; Molero Briones and Montserrat Martí, 2006; Hammada, 2007; Molina *et al.*, 2009; Khabbach *et al.*, 2011;

Chambouleyron, 2012; Rhazi *et al.*, 2012; Libiad, 2013; Valdés, 2013; Fennane *et al.*, 2014; Libiad *et al.*, 2015; El Madihi *et al.*, 2017; IUCN, 2017; APB, 2020; Unpublished Data).

276. *Agrostis atlantica* Maire & Trab.; HA; MAR.

277. *Agrostis capillaris* L. [*A. tenuis* Sibth., *A. stolonifera* L.]; R; Lc-S.

278. *Agrostis castellana* Boiss. & Reut. [*A. stolonifera* L. subsp. *castellana* (Boiss. & Reut.) M.]; AA-HA-LM-MA-Man-Om-Op-R.

279. *Agrostis reuteri* Boiss.; HA-LM-MA-Mam-Man-Ms-Om-Op-R.

280. *Agrostis stolonifera* L. [*A. s.* subsp. *scabrida* (Maire & Trabut) Maire]; HA-LM-MA-Mam-Man-Om-Op-R; Lc-S.

281. *Anisantha madritensis* (L.) Nevski [*Bromus madritensis* L., *B. m.* subsp. *madritensis*]; LM-MA-Man-Om-Op-R.

282. *Anthoxanthum odoratum* L.; HA-LM-MA-Man-Om-Op-R.

283. *Anthoxanthum ovatum* Lag.; HA-LM-MA-Mam-Man-Op-R.

284. *Avena sativa* L.; LM-Mam-Op-R.

285. *Avena sterilis* L.; LM-MA-Man-Om-Op-R; Lc-S.

286. *Bothriochloa insculpta* (Hochst. ex A. Rich.) A. Camus [*B. pertusa* (L.) A. Camus]; Mam-Ms.

287. *Brachypodium sylvaticum* (Huds.) P. Beauv.; HA-LM-MA-Man-Op-R.

288. *Briza maxima* L. [*B. m.* var. *pubescens* Mutel, *B. m.* var. *glabrifolia* Rohl.]; LM-MA-Man-Om-Op-R.

289. *Bromopsis benekenii* (Lange) Holub; HA-MA-R.

290. *Bromus hordeaceus* L.; AA-HA-LM-MA-Mam-Man-Om-Op-R.

291. *Bromus lanceolatus* Roth [*B. macrostachys* Desf.]; LM-MA-Man-Om-Op-R.

292. *Bromus scoparius* L.; MA-Mam-Man.

293. *Crypsis schoenoides* (L.) Lam.; MA-Man-R; Lc-S.

294. *Cynodon dactylon* (L.) Pers. [*C. dactylon* L.]; All Morocco.

295. *Danthonia decumbens* (L.) DC.; Man-R.

296. *Deschampsia caespitosa* subsp. *subtriflora* (Lag.) Ehr. Bayer & G. López; AA-HA-R.

297. *Dichanthium annulatum* (Forssk.) Stapf; AA-LM-Mam-Man-Ms-Op.

298. *Echinochloa colona* (L.) Link; HA-LM-MA-Mam-Man-Ms-Op-R; Lc-U; Ni.

299. *Gaudinia valdesii* Romero Zarco [*G. fragilis*

- subsp. *geminiflora* (Trab.) Maire]; Man; MAR.
300. *Hainardia cylindrica* (Willd.) Greuter [*Lepturus cylindricus* (Willd.) Trin.]; LM-Man-Op-R; Ps.
301. *Holcus lanatus* L.; HA-LM-MA-Mam-Man-Om-Op-R.
302. *Hordeum geniculatum* All. [*H. hystrix* Roth, *H. maritimum* subsp. *gussoneanum* (Parl.) Ascherson & Graebner]; LM-Op-R; Ps.
303. *Hordeum marinum* Huds. [*H. maritimum* Stokes, *H. maritimum* With]; LM-MA-Mam-Man-Ms-Om-Op-R; Lc-S; Hm-Ha.
304. *Hordeum murinum* subsp. *leporinum* (Link) Arcang. [*H. murinum* auct, *H. murinum* L. subsp. *leporinum* (Link.) Asch. & Gr.]; LM-MA-Man-Om-Op-R.
305. *Imperata cylindrica* (L.) Raeusch. [*I. cylindrica* (L.) PB.]; As-LM-Mam-Man-Ms-Op-R; Hm.
306. *Lolium atlantigenum* (St.-Yves) Banfi, Galasso & al. [*Schedonorus arundinaceus* (Schreb.) Dumort. subsp. *atlantigenus* (St.-Yves) H. Scholz]; Man-R.
307. *Lolium mairei* (St.-Yves) Banfi, Galasso & al. [*Schedonorus mairei* (St.-Yves) Dobignard, *Festuca mairei* St-Yves]; As-HA-MA-Om; MAR.
308. *Lolium multiflorum* Lam.; HA-LM-MA-Mam-Man-Ms-Om-Op-R.
309. *Lolium perenne* L.; AA-HA-LM-MA-Mam-Man-Om-Op-R; Lc-S.
- *Lolium rigidum* Gaudin [L. *strictum* C. Presl]; All Morocco. It includes:
310. *L. rigidum* subsp. *lepturoides* (Boiss.) Sennen & Mauricio; LM-Mam-Man-Ms-R; Hm.
- *Molineriella minuta* (L.) Rouy; AA-HA-MA-Mam-Man-Om-R. It includes:
311. *M. minuta* subsp. *australis* (Paunero) Rivas Mart. [*M. australis* (Paunero) E. Rico]; Man-R; MAR-ESP.PRT.
312. *Phalaris aquatica* L.; HA-LM-Mam-Man-Op-R.
313. *Phalaris coerulescens* Desf.; HA-LM-MA-Mam-Man-Om-Op-R.
314. *Piptatherum miliaceum* (L.) Coss.; All Morocco.
315. *Poa annua* L. [*Ochlopoa annua* (L.) H. Scholz]; AA-As-HA-LM-MA-Mam-Man-Om-Op-R; Lc-I.
316. *Poa dimorphantha* Murb. [*Ochlopoa dimorphantha* (Murb.) H. Scholz & Valdés]; Mam-Man-R; MAR; Lc-S.
317. *Poa infirma* Kunth [*Ochlopoa infirma* (Kunth) H. Scholz]; AA-HA-LM-MA-Mam-Man-Om-Op-R.
318. *Poa maroccana* Nannf. [*Ochlopoa maroccana* (Nannf.) H. Scholz]; LM-Mam-Man-Om-Op-R.
319. *Poa nemoralis* subsp. *nemoralis*; AA-HA-MA; Sc.
320. *Poa rivulorum* Maire & Trab. [*Ochlopoa rivulorum* (Maire & Trab.) H. Scholz & Valdés]; AA-HA-LM-MA-R; MAR.
- *Polygonum maritimum* Willd.; HA-LM-MA-Mam-Man-Ms-Om-Op-R; Lc-S; Hm. It includes:
321. *P. maritimum* Willd. subsp. *maritimum*; LM-MA-Man-Om-Op-R; Ps-Ha.
322. *Sphenopus divaricatus* (Gouan) Rchb.; LM-Mam-Man-Ms-Op-R; Hm.
323. *Sporobolus spicatus* (Vahl) Kunth; Ms.

LILIALES

Smilacaceae

(Ennabili, 1999; Valdés *et al.*, 2002; Chambouleyron, 2012; Fennane *et al.*, 2014; APB, 2020).

324. *Smilax aspera* L.; AA-AS-HA-LM-MA-Mam-Man-Om-Op-R; Lc-S.

ASPARAGALES

Alliaceae

(Ennabili, 1999; Valdés *et al.*, 2002; Chambouleyron, 2012; Fennane *et al.*, 2014; APB, 2020).

325. *Allium triquetrum* L.; LM-Man-Op-R; Lc-S.

Amaryllidaceae

(Chambouleyron, 2012; Valdés, 2013; Fennane *et al.*, 2014; APB, 2020).

326. *Acis autumnalis* (L.) Sweet [*Leucojum autumnale* L.]; MA-Mam-Man-Om-R; Lc-S.

Aspargaceae

(Valdés *et al.*, 2002; Hammada, 2007; IUCN, 2017; APB, 2020; Unpublished Data).

327. *Asparagus aphyllus* L.; Man-Op-R; Lc-S.

Asphodelaceae

(Valdés *et al.*, 2002; Euro+Med, 2006-; Fennane *et al.*, 2014; APB, 2020).

328. *Asphodelus gracilis* Braun-Blanq. & Maire.; Man; MAR.

Hyacinthaceae

(Ennabili, 1999; Valdés *et al.*, 2002; Hammada, 2007; Khabbach, 2013; Libiad, 2013; APB, 2020).

329. *Drimia maritima* (L.) Stearn [*Urginea scilla*

Steinh, *U. maritima* (L.) Baker, *Scilla maritima* L.]; LM-MA-Man-Om-Op-R.

Iridaceae

(Valdés *et al.*, 2002; Fennane *et al.*, 2014; El Madihi *et al.*, 2017; APB, 2020).

330. *Iris foetidissima* L.; LM-Man-Om-Op-R.
 331. *Iris xiphium* L.; LM-R.
 332. *Romulea ramiflora* Ten.; LM-MA-Mam-Man-R; Lc-D; Ps.

Orchidaceae

(Valdés *et al.*, 2002; Chambouleyron, 2012; Fennane *et al.*, 2014; APB, 2020).

333. *Anacamptis morio* subsp. *champagneuxii* (Barnéoud) H. Kretzschmar, Eccarius & H. Diétr. [*A. champagneuxii* (Barnéoud) R.M. Bateman, Pridgeon & Chase]; HA-LM-MA-Mam-Man-Op-Om-R.
 334. *Himantoglossum robertianum* (Loisel.) P. Delforge [*Barlia robertiana* (Loisel.) Greuter]; MA-Mam-Man-R.
 335. *Serapias cordigera* L.; Mam-Man-R.
 - *Serapias lingua* L.; HA-MA-Mam-Man-R; Lc-U. It includes:
 336. *S. lingua* L. subsp. *lingua*; Man-R.
 337. *Serapias parviflora* Parl.; Mam-Man-R; Lc-U.
 338. *Serapias strictiflora* Welw. ex Veiga [*S. lingua* subsp. *duriaei* (Rchb. ex Batt.) Maire]; Man-R.

Discussion

This literature review highlighted a rich wetland facultative vascular flora with 338 taxa, including 301 species and 37 subspecies, 220 genera and 72 botanical families, i.e. 8.05% of the vascular flora of Morocco, 50.3% of the Moroccan wetland vascular flora, and 71.0% of the vascular flora of wetlands in Tunisia including transgressive species from terrestrial environments (Valdés *et al.*, 2002; Khabbach *et al.*, 2020). About 3.85% of the inventoried taxa have been introduced and/or naturalized.

Poaceae and Asteraceae encompass 26.9% of the semi-hygrophilous taxa, followed by Fabaceae, Amaranthaceae, Apiaceae, Caryophyllaceae, and Brassicaceae (24.0%). The endemic taxa are represented by 65 species and subspecies, and share endemism with Algeria, the Iberian Peninsula, Tunisia, Mauritania and the Canary Islands at rates ranging from 6.15% to 35.4%. Fabaceae, Asteraceae, Poaceae, Caryophyllaceae, and Plumbaginaceae

cover 53.8% endemic wetland facultative taxa.

In addition, 58 wetland facultative species are on the IUCN Red List and mark the Rif, North Atlantic Morocco, and Middle Atlas areas. Of which, some 25 taxa are almost at risk (population decreasing or with unknown status) in the absence of a specific conservation program for the taxon concerned. The taxa with endangered, near threatened and vulnerable status account for approximately 2.66% of the wetland facultative flora enumerated above, including also 11 endemic taxa.

Referring to the taxa distribution, five floristic subdivision categories can be identified, "North Atlantic Morocco-Rif", "Middle Atlas-Mountains of the Eastern Morocco-Mediterranean Coastline", "Middle Atlantic Morocco-High Atlas-Plateaus of the Eastern Morocco", "Saharan Morocco-Anti Atlas", and "Saharan Atlas", sheltering 70.1-70.6%, 49.7-50.9%, 27.8-40.5%, 16.6-20.7%, and 6.51% of the wetland facultative plants inventoried per floristic region respectively.

Available data on the auto-ecology of wetland facultative plants allowed identifying 37 mesohalophilous and halophilous taxa, followed by 26 sciaphilous, 18 psammo-philous, and 17 nitrophilous ones. *Polygonum aviculare* L., a mesohalophilous species and represented by its two subspecies in the checklist above, has also been recorded in Middle Atlantic and North Atlantic Morocco.

The wetland facultative flora from Morocco, often overlooked by "scientists", is on the contrary too important in ecological, taxonomic and geographical terms, also advocating for the wetland protection.

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