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STUDIES IN THE FLORA OF ARABIA: XXXIV. SIXTY NEW RECORDS FROM THE SULTANATE OF OMAN

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Sixty new or updated records of plants species are reported from the Sultanate of Oman, as a result of fieldwork and research undertaken. Five taxa represent new records for Arabia, twenty-seven taxa are new records for Oman, and twenty-eight records represent an extended distribution within Oman. Some previously doubtful records are confirmed. Brief comments are given on the phytogeography, taxonomy and ecology of the taxa. Most new records have been collected in mountainous areas, either in southern Oman or in northern Oman, mainly in areas that previously were botanically poorly known.

Keywords. Arabia, new records, Oman, phytogeography.

Introduction

The Sultanate of Oman in the southern Arabian Peninsula is mainly characterised by arid habitats, with much of the region occupied by sand dunes or rock and gravel desert. However, and often in stark contrast to the deserts, the country also contains a number of unique habitats. Endemics are found in all vegetation types throughout the country, and five regional centres of endemism have been recognised. Some habitats are particularly rich in range-restricted species (Patzelt, 2015a).

The past four decades have seen intensified botanical research in Oman (e.g. Miller & Morris, 1988; Miller & Cope, 1996; Ghazanfar, 2003; Cope, 2007; Ghazanfar, 2007; Feulner, 2011; Patzelt, 2014; Patzelt *et al.*, 2014; Ghazanfar, 2015; Patzelt, 2015a, 2015b; Ghazanfar, 2018; Patzelt & Al Hinai, 2019). There has been good progress extending our knowledge of the flora of Oman, resulting in the description of 103 new, range-restricted species from 1980 to 2009 by various botanists (summarised in Patzelt, 2014) and the documentation of 4 new records for Arabia, 26 new records for the country, and 30 extended distribution records (Patzelt *et al.*, 2014).

Significant species-rich habitats include the monsoon-affected mountains in southern Oman, the Northern Hajar Mountains, and the coastal areas of the Central Desert; these areas represent regional centres of plant endemism (Patzelt, 2014, 2015a; Borrell *et al.*, 2019). The new records were mostly found in these regions.

The Hajar Mountains of northern Oman are part of an arid, subtropical mountain system extending from southern Arabia to Southwest Asia. In Oman, the northern mountain

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system includes the Western Hajar (highest peak, 3009 m), Eastern Hajar (c.2200 m) and Musandam Mountains (2008 m). The climatic conditions of the Hajar Mountains are arid to semi-arid, with a potential evapotranspiration of over 2000 mm/year. Mean annual precipitation rarely exceeds 400 mm in the Western Hajar, with rainfall concentrated in the early spring and late summer. This exemplifies the climatic transition of the area from subtropical summer rain to extratropical winter rain. The Eastern Hajar and Musandam are marked by very low rainfall, estimated to be around 160–200 mm; detailed climatic data for the Eastern Hajar and Musandam are scarce. Run-off from the slopes is considerable, and permanent surface water is quite scarce. Soils generally are shallow and contain low levels of organic matter. Half of the new or extended records (31 species) listed in this article have been collected in in the Western and Eastern Hajar Mountains, and one-third of the new records (21 species) were found in Musandam.

The vegetation zones are different for the three mountain ranges. The distinct flora and vegetation of the Eastern Hajar (Fig. 1A), as well as that of Musandam, have often been inadequately included in botanical descriptions of the Western Hajar; however, recent and ongoing field-based research emphasises the distinctive botanical character of these two mountain ranges, which is significantly distinct from that of the Western Hajar Mountains (Fig. 1B). The significant increase in species numbers recorded over the past few years is a direct function of sustained botanical fieldwork resulting in many new records.

The large number of new records from Musandam as well as from the Western Hajar Mountains demonstrate that although recent comprehensive reviews of the flora as a result of many years of fieldwork give an comprehensive overview (Feulner, 2011; Patzelt, 2015b), such areas in Oman still reveal a larger number of new records, especially in years of exceptionally good rainfall.

Musandam (Oman territory only) is home to about 28% of the national total flora. At least 91 species, representing 6.5% of the total flora of Oman, are restricted to Musandam. This exemplifies the unique character of the flora of Musandam, which can be described as a key plant diversity area within Oman.

Musandam has always been under-collected due to its remoteness and difficulties of access to its mountains. In recent years, a number of Oman Botanic Garden field expeditions carried out intense research in the Musandam Mountains. Especially rewarding were expeditions in spring 2014 (April and May), because precipitation was exceptionally high that year (Fig. 1C). This resulted in the collection of many species that are now known to be new records for the area. Those species must have been present in the seed bank but seemingly did not germinate for many years, due to the arid conditions. The vegetation is characterised by many species that are restricted to Musandam within Oman but also occur in the high plateau of central Iran or the Eastern Mediterranean area.

The Western Hajar Mountains above 1500 m hold at least 302 species (representing 21% of the national total) (Patzelt, 2015b).

The mountains of southern Oman (Dhofar) lie in the monsoon belt, and for three months each year, from mid-June to mid-September, the area comes under the influence of the southwest monsoon (Fig. 1D), part of a larger phenomenon, the Intertropical Convergence Zone.

FIG. 1. A, The high-montane vegetation of the Eastern Hajar Mountains is characterised by xeromorphic shrubland and woodlands with the Irano-Turanian Arabian almond *Prunus arabica* (Olivier) Meikle, the regional endemic *Ceratonia oreothauma* Hillc., G.P.Lewis & Verdc. and the Oman-endemic *Ziziphus hajarensis* Duling, Ghaz. & Prend. B, The high-montane *Teucrium mascatense–Juniperus seravschanica* woodlands are characteristic vegetation at altitudes above 2200 m in the Western Hajar Mountains. C, The exceptionally high precipitation in spring 2014 led to the appearance of many annuals, which were new records. D, The southern mountains of Oman are influenced by the southwest monsoon. The steep south-facing escarpment mountains are covered by deciduous cloud-forest vegetation, found in a narrow band on the sea-facing mountains. Photographs by Annette Patzelt: A, September 2012; B, March 2017; C, April 2014; D, September 2014.

The monsoon-affected area of southern Oman is an outstanding example of an island-like refugium and represents a fragile ecosystem that is unique on a global scale (Miller, 1994; Kürschner *et al.*, 2004; Hildebrandt & Eltahir, 2006; Patzelt, 2014). The vegetation is dominated by a narrow band of deciduous vegetation growing along the coastal mountains from southern Oman into eastern Yemen. The desert cloud oasis is among the most diverse ecosystems of the Arabian Peninsula and includes a large number of rare and endemic plant species as well as endemic vegetation types. The escarpment cloud forest and associated habitats are globally unique, with a strong interdependence between the vegetation and the climatic system.

The high number of range-restricted species in the relatively low coastal areas of the Central Desert is a function of the ecological niches provided by the escarpments and the

wadi systems. The influence of occasional fogs provides a relatively stable supply of moisture and may also contribute to the high number of range-restricted species in the Central Desert.

The Jiddat Al Arkad, the southern part of the Central Desert, displays a regionally unique climate with higher intra-annual stability, due in part to the influence of the southern monsoon. The co-occurrence of a high number of endemic species within a narrow monsoon-influenced region is indicative of a refugium with low climate-change velocity. There is strong evidence for a southern Arabian Pleistocene refugium in Oman's Central Desert (Borrell *et al.*, 2019). This refugium has acted as an isolated temperate and mesic island in the desert, resulting in the evolution of these narrow range endemic flora. Based on the composition of species, this system may represent the northernmost remnant of a continuous belt of mesic vegetation, formerly ranging from Africa to Asia, with close links to the flora of East Africa (Patzelt, 2015b; Borrell *et al.*, 2019).

Conservation Aspects

Oman has a total of 191 range-restricted species, representing 13.6% of the total flora (Patzelt, 2014). Many of the habitats of Oman form part of fragile ecosystems, are highly sensitive to disturbance, and are exceptionally slow to regenerate. Extended areas of the unique vegetation of the country have today been over-exploited or destroyed, or are suffering from habitat degradation. In the past, traditional land-use management played an essential role in protection against over-exploitation. Today, many traditional land uses are either modified or have been completely abandoned. This is especially true for the management of vegetation in the mountains and, to a lesser degree, the traditionally managed agricultural settlements. The most serious change is the dramatic increase in livestock numbers, which has resulted in extensive overgrazing. Urban extension and infrastructure development are equally placing pressure on many habitats.

Warming as a result of climate change is also assumed to be increasingly affecting fragile ecosystems. Temperatures in Oman have increased significantly over the past two to three decades; minimum temperatures rose by 3–6°C from 1980 to 2008 (AlSarmi & Washington, 2011). The data underscore the concerns about the effects of climate change on the flora and vegetation of the Arabian Peninsula. These changes will especially affect the vegetation of the higher mountain areas, where most of the new records stem from, underscoring the need to document these species.

New Records for Arabia and Oman

The species in the present account are arranged first according to the scale of the record, and then alphabetically by family and species. Specimens cited are deposited in one or several of the following herbaria: the Herbarium of the Royal Botanic Garden Edinburgh, UK (E) (herbarium catalogue available: Royal Botanic Garden Edinburgh, no date), the Oman Botanic Garden, Oman (OBG), the National Herbarium of Oman (ON), and Sultan Qaboos University Herbarium, Oman (SQUH). Specimen citations are abbreviated and standardised.

The taxonomic treatment adopted by the *International Plant Names Index* (Royal Botanic Gardens, Kew, Harvard University Herbaria & Australian National Herbarium, continuously updated) and *World Checklist of Selected Plant Families* (WCSP, 2020) is followed. Family assignations and circumscriptions follow the *Angiosperm Phylogeny Group* (Angiosperm Phylogeny Group, 2016; Stevens, 2001–). The plant community classifications follow Patzelt (2015a).

New Records for Arabia

Cyperaceae

Erioscirpus comosus (Wall.) Palla

This new record for Arabia is only known from one location in Oman, the species being confined to a very small population at the bottom of a wadi. The record represents the westernmost distribution of this Asian species. The species has not been re-collected since its first collection in 1993.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, at the bottom of a wadi 3 km from Saiq, *I. McLeish* 2050 (ON).

Elatinaceae

Bergia ammannioides Roxb.

This species has been re-collected only once from Oman, in 1993, by I. McLeish. It was recorded from a wadi at low altitude. Since 1993, the species has not been collected or recorded again. This is a widespread tropical species and further records from the Arabian Peninsula are expected. Intense search for the species in the area in 2018, a year of exceptional rainfall, did not reveal any findings.

Specimens. Oman. **Southern Oman**: Wadi Ayn (between Mirbat and Sadah), 16°58′N, 054°53′E, 0–250 m, *I. McLeish* 2616 (ON).

Fabaceae

Medicago coronata (L.) Bartal.

Otherwise known from the Mediterranean to Central Asia, this species has not previously been recorded for the Arabian Peninsula. It was found in 1994, growing with other annuals and grasses in largely abandoned terraces in Musandam. Small legumes such as this are easily dismissed, and careful examination may reveal further records of its occurrence in Oman.

Specimens. Oman. **Northern Oman**: Musandam, disused terraces, Khasab to Jabal Harim road, 26°02′48″N, 056°13′04″E, 530 m, *A.G. Miller* 13121 (E).

Lamiaceae

Isodon rugosus (Wall. ex Benth.) Codd

This new record for Arabia represents the westernmost distribution of the species. In Oman, this species is only known from a few locations, all from the Western Hajar Mountains. The species rarely occurs in the high-montane *Teucrium mascatense–Juniperus seravschanica* community, in the Jabal Akhdar area, as well as on the isolated mountain massif Jabal Khawr.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Jabal Akhdar, 23°05′16.8′′N, 057°39′14.7′′E, 2380 m, *A. Patzelt* AP 2915 (SQUH); Jabal Khawr, 23°09′09.6′′N, 056°59′09.1′′E, 2100 m, *A. Patzelt, S. G. Knees, G. Al Issai* AP 4207 (OBG); Jabal Khawr, Khab Salman, 23°08′28.4′′N, 057°00′06.4′′E, 2475 m, *A. Patzelt & S. Al Hatmi* AP 4885 (OBG); Jabal Khawr, Khab Salman, 23°08′27.8′′N, 057°00′06.5′′E, 2485 m, *A. Patzelt & S. Al Hatmi* AP 4891 (OBG); Jabal Shams, 3000 m, *A.G. Miller & J.A. Nyberg* M 9577 (E, ON); Jabal Shams, 3000 m, *R. Whitcombe* 239 (ON); Wadi Bani Awf, 23°10′14.1′′N, 057°25′31.2′′E, 1567 m, *A. Patzelt & A. Al Hinai* AP 4896 (OBG).

Ranunculaceae

Ranunculus arvensis L.

The corn buttercup is widely distributed from Europe to Central Asia; it is hereby newly recorded from Arabia. In Oman, it is restricted to the high mountain areas of Jabal Shams. It so far has been found only in the agricultural terraces from one village only.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Jabal Shams, village of Al Marrat, 23°16′40.8′′N, 057°11′45.9′′E, 2090 m, *A. Patzelt & S. Al Hatmi* AP 5260/PAHA 428 (OBG).

New Records for Oman

Apocynaceae

Rhytidocaulon macrolobum Lavranos

This species was found at two different locations: on the high plateau of Jabal Samhan as well as the foothills of Jabal Jingari, an isolated mountain south of Jabal Samhan. Both locations are in the most eastern range of the Dhofar mountains. In Arabia, the species is also recorded from Saudi Arabia and Yemen. The records from Oman represent the easternmost distribution of the species and extend the known distribution area by c.1200 km to the east. It has, however, not been recorded from the areas in between.

Specimens. Oman. **Southern Oman**: Jabal Samhan, escarpment cliffs close to low shrub community, 17°09′N, 054°45′E, 1550 m, *A. Patzelt* AP 3609 (OBG); Jabal Jingari, foothills on crystalline basement bedrock, 85 m, 17°01′51.2′′N, 055°01′05.9′′E, photographic record, *A. Patzelt*; Oman, NW slopes of J. Samhan, steep-sided wadi, 17°09′N, 054°42′E, 1270 m, *Knees, Mackinder, MacLaren & Tsaliki* 9235, field record only.

Boraginaceae

Arnebia decumbens (Vent.) Coss. & Kralik

On the Arabian Peninsula, this species was previously only known from Saudi Arabia, Bahrain and Kuwait. It was recorded from Musandam, however, without detailing if the record was from Oman or the adjacent United Arab Emirates (UAE) (Feulner, 2011). We hereby confirm the presence of this species in Oman. It is only recorded from one location in Oman, from the high-montane *Artemisia sieberi–Ephedra pachyclada* desert community.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, As Sahosa, 25°57′18.0′′N, 056°12′09.8′′E, 1433 m, *A. Patzelt, S. Al Hatmi, A. Anderson* AP 4570/PHA 69 (OBG).

Trichodesma stocksii Boiss.

This species is rare in Oman and only known from a few collections. Apart from Oman, it only occurs in Iran. It was found in the drought-deciduous xeromorphic colline and submontane woodland and open shrubland, the *Euphorbia larica–Moringa peregrina* community in the Western and Eastern Hajar Mountains.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Jabal Akhdar, 900–1000 m, *J.R. Edmondson* E 3475 (ON); Eastern Hajar Mountains, Jabal Bani Jabir, 1370 m, *J. Henrot* JH 214 (ON); Eastern Hajar Mountains, Wadi Tiwi, 100 m, 22°47′N, 058°14′E, *A. Patzelt* AP 461 (SQUH); Eastern Hajar Mountains, Jabal Bani Jabir, 397 m, 22°52′25.3′′N, 059°11′39.2′′E, *A. Patzelt* AP 4299 (E, OBG); Eastern Hajar Mountains, Jabal Bani Jabir, 397 m, 22°52′25.3′′N, 059°11′39.2′′E, *A. Patzelt* AP 4358/PHS 64 (OBG).

Brassicaceae

Dichasianthus runcinatus (Lag. ex DC.) V.I.Dorof.

This species is only known from one area in Oman, the population being confined to the high-montane *Artemisia sieberi–Ephedra pachyclada* desert shrubland community, the high-montane *Astragalus fasciculifolius–Prunus arabica* shrubland community, and the high-montane *Ixilirion tataricum–Moraea sisyrynchium* bulb community on agricultural fields. Within Arabia, there are few records of this species.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, Sahil Al Sahosa, 25°57′51.4′′N, 056°12′18.8′′E, 1451 m, *A. Patzelt, S. Al Hatmi & A. Anderson* AP 4512/PHA 11 (OBG).

Saudi Arabia. Raidah escarpment 25 km NNW of Abha, 2250 m, *I.S. Collenette* 9339 (E).

Neslia paniculata (L.) Desv.

On the Arabian Peninsula, this species was previously only known from Western Saudi Arabia and Kuwait (Miller & Cope, 1996). It is newly recorded from Oman, where it is restricted to the Jabal Shams area. It so far has been recorded from the agricultural terraces from one village only. The weed vegetation of traditional agricultural terraces and farms in

Oman is rich in species, in part due to the sparse use or even absence of chemical fertiliser, insecticides and pesticides.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Jabal Shams, village of Al Marrat, 23°16′40.8′′N, 057°11′45.9′′E, 2090 m, *A. Patzelt & S. Al Hatmi* AP 5261/PAHA 429 (E, OBG, ON).

Burseraceae

Commiphora myrrha (T.Nees) Engl.

Commiphora myrrha was recorded from northern Oman in 1992 (Ghazanfar, 1992) but was not listed for Dhofar (Miller & Morris, 1988). It was omitted from the Burseraceae account in the *Flora of Oman* (Ghazanfar, 2007), probably grounded on the assumption that the earlier record was based on a misidentification. Hereby, the presence of this species in Oman can be confirmed. It was found in dry wadi system outside of the reach of the monsoon west of Thumrait (Fig. 2A). The population is small and confined to wadi slopes and wadi bottoms in an exceptionally restricted area only. The resin is still used by local people to treat wounds.

Specimens. Oman. **Southern Oman**: Dhofar, Wadi Amat, 17°16′52.0′′N, 053°31′16.2′′E, 682 m, *A. Patzelt, A. Al Hinai & S. Al Hatmi* AP 5326/SHP 336 (M, OBG).

Caprifoliaceae

Pterocephalus brevis Coult.

This species extends from the Eastern Mediterranean area to Iran and the Arabian Peninsula. On the Arabian Peninsula, it was previously only known from Saudi Arabia (Collenette, 1999). It was recorded from Musandam, however, without detailing if the record was from Oman or the adjacent UAE (Feulner, 2011). We hereby confirm the presence of this species in Oman. It is only known from the high-montane *Artemisia sieberi–Ephedra pachyclada* desert shrubland community.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, As Sahosa, 25°57′51.4′′N, 056°12′18.8′′E, 1451 m, *A. Patzelt, S. Al Hatmi, A. Anderson* AP 4539/PHA 38 (OBG); Jabal Harim, As Sahosa, 25°57′29.7′′N, 056°13′05.9′′E, 1451 m, *A. Al Hinai, S. Al Hatmi* SHAH 342 (OBG).

Crassulaceae

Rosularia adenotricha (Wall. ex Edgew.) C.-A. Jansson

This species was first discovered in Oman in 2009 by Tim Harrison in the Eastern Hajar Mountains and identified by A. Patzelt as *Rosularia adenotricha*. It was not found again until 2014, when it was discovered on a mountain cliff in Musandam (Fig. 2B). In Musandam, it is known from one other location in the UAE (Feulner, 2011). The record from the Eastern Hajar Mountains represents the westernmost distribution of this species, extending from the Arabian Peninsula eastwards to the Himalaya.

FIG. 2. A, *Commiphora myrrha* is a highly drought-resistant *Commiphora*. It was found in wadi systems in the rain shadow of the southern mountains of Dhofar. B, *Rosularia adenotricha* is a rare chasmophyte found in Musandam and in the Eastern Hajar Mountains at high altitudes. C, The bulbous bluegrass (*Poa bulbosa*) is a rare species found at high altitudes in Musandam, mainly on abandoned agricultural terraces. D, This is only the second record of *Delphinium ajacis* in the Arabian Peninsula. Photographs by Annette Patzelt: A, December 2019; B, April 2014; C, April 2014; D, April 2019.

Specimens. OMAN. **Northern Oman**: Musandam, Jabal Harim, 25°57′52.0″N, 056°13′18.0″E, 1619 m, *A. Patzelt, S. Al Hatmi & A. Anderson* AP 4596/PHA 95 (OBG); Eastern Hajar Mountains, Jabal Abu Daud, *T. Harrison* (photographic record; OBG).

Cyperaceae

Cyperus brevifolius (Rottb.) Hassk.

From the Arabian Peninsula, this species has so far only been recorded from Soqotra (Miller & Morris, 2004). In Oman, it is only known from two locations, both in villages in the foothills of the Western Hajar Mountains, where it was found at the edge of cultivated fields. This species is widespread in tropical and warm temperate regions. It was found on wet and moist ground, at the seepage of an irrigation channel. It is very likely that the species has been overlooked, and therefore further records are expected.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Nakl (Ayn Thawarah), 23°22′32.4″ N, 057°49′40.6″E, 335 m, *L. MacKinnon* 373 (E); A'Subaykha village (Fanja), 23°22′24.6″N, 057°39′31.2″E, 345 m, *T. Harrison* AP 3761 (OBG).

Euphorbiaceae

Euphorbia falcata L.

Euphorbia falcata occurs from the Mediterranean region to Asia. On the Arabian Peninsula, this species was previously only known from Saudi Arabia, occurring as a weed of cultivation (Collenette, 1999). The species was found in the weed flora in the understorey of rose and walnut plantations, between annual crops such as garlic and onion, as well as in date palm plantations in the Western Hajar Mountains.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Wadi Sahtan, 23°16′02.9′N, 057° 23′56.5′E, 716 m, *A. Patzelt* AP 924 (SQUH); Jabal Al Akhdar, Saiq Plateau, village of Shuraiya, 23° 06′52.3″N, 057°38′59.3″E, 1884 m, *A. Patzelt* AP 1074 (ON); Jabal Al Akhdar, Saiq Plateau, village of Shuraiya, 23°04′N, 057°39′E, 1887 m, *A. Patzelt* AP 1124 (ON); Jabal Al Akhdar, Saiq Plateau, village of Shuraiya, 23°06′52.3″N, 057°38′59.3″E, 2040 m, *A. Patzelt* AP 1691 (OBG); Rustaq city, c.350 m, *A. Radcliffe-Smith* 4020 (ON); Jabal Shams, village of Al Marrat, 23°16′40.8″N, 057°11′ 45.9″E, 2090 m, *A. Patzelt & S. Al Hatmi* AP 5281/PAHA 449 (E, OBG).

Fabaceae

Microcharis tritoides (Baker) Schrire

On the Arabian Peninsula, this species was previously only known from Saudi Arabia and Yemen (Collenette, 1999; Al Khulaidi, 2013). This species seems to be rare in Oman and has been collected only a few times from the xerophytic vegetation in rocky limestone wadis. The new records from Wadi Dahanoot and Wadi Dahaboon extend the known distribution by c.1300 km to the east and represent the easternmost distribution point of this species. It has so far not been recorded from the area between these regions.

Specimens. Oman. **Southern Oman**: Wadi Dahanoot, north of Hasik, 17°29′01.62″N, 055°12′43.32″ E, 36 m, *A. Patzelt, A.G. Miller, S.G. Knees, I. Al Rashdi, S. Al Hatmi* AP 3168 (OBG); Wadi Dahaboon, Jabal Qara, 17°18′59.0″N, 054°29′56.8″E, 741 m, *A. Patzelt & S. Al Hatmi* AP 5174/PAHA 396 (E, OBG).

Trigonella anguina Delile

Already known in the Gulf states of Kuwait, Bahrain and Qatar, as well as neighbouring Saudi Arabia, this species is now recorded for Oman. Originally collected by A. G. Miller in 1994, the specimen was overlooked and represents an extension of its distribution into the Peninsula by 500 km. It is highly palatable to grazing animals.

Specimens. Oman. **Northern Oman**: Musandam, disused terraces, Khasab to Jabal Harim road, 26°02′48″N, 056°13′04″E, 530 m, *A.G. Miller* 13124 (E).

Vicia monantha Retz.

On the Arabian Peninsula, this species was previously only known from Eastern Saudi Arabia, Bahrain and Qatar. It is newly recorded from Oman, where it is restricted to Musandam. It occurs in agricultural terraces, both cultivated as well as abandoned. The weed vegetation of traditional agricultural terraces and farms in Musandam is rich in species, due to the scarce use or absence of chemical fertiliser, insecticides and pesticides.

Specimens. Oman. **Northern Oman**: Musandam, village of Aqabat, 1500 m, *R.A. Western* (E); Jabal Harim, As Sayh, 25°59′52.6′′N, 056°12′05.9′′E, 1135 m, *S. Al Hatmi & A. Al Hinai* SHAH 196 (OBG); Jabal Harim, As Sayh, 25°57′51.0′′N, 056°12′21.3′′E, 1450 m, *L. Al Harthi & A. Al Hinai* LAH 65 (OBG); beneath Jabal Harim, flat-bottomed, intermontane plain, 25°59′30′′N, 056°12′47′′E, 1150 m, *A.G. Miller* 13093 (E).

Geraniaceae

Geranium rotundifolium L.

This new record for Oman was found in the weed vegetation of cultivated areas on the high plateau of the Musandam Mountains, below the highest peak of Jabal Harim. The weed vegetation of traditional agricultural terraces and farms in Musandam is rich in species, because until today mostly traditional methods of weed control were used, without the application of insecticides, herbicides or pesticides. The species is widespread in temperate Europe and the Mediterranean region. On the Arabian Peninsula, it was previously recorded only from Saudi Arabia (Collenette, 1999).

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, As Sayh, 25°57′18.0′′N, 056°12′09.8′′E, 1500 m, *A. Patzelt, S. Al Hatmi, A. Anderson* AP 4578/PHA 77 (OBG); Musandam, Sahil As Sahosa, 25°57′51.0′′N, 056°12′21.3′′E, 1450 m, *L. Al Harthy, A. Al Hinai* LAH 79 (OBG); Jabal Harim, As Sayh, 25°57′51.0′′N, 056°12′21.3′′E, 1450 m, *D. Lupton* et al. LIHMR 2 (OBG); Jabal Harim, As Sayh, 26°01′N, 056°13′E, *M.D. Gallagher & P.R. Sichel* 5613 (E).

Lamiaceae

Lamium amplexicaule L.

This species, a well-known weed of cultivation, is widespread in temperate Eurasia and North Africa. On the Arabian Peninsula, it was previously recorded only from Saudi Arabia and Yemen (Wood, 1997; Collenette, 1999). It was found in the understorey of irrigated date palm cultivations in a mountain oasis, thus extending known distribution by 1500 km. It has not yet been reported from the areas between these regions.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, village of Balad Sayt, 23°11′32.0′′N, 057°23′20.0′′E, 956 m, *A. Al Hinai* (OBG; photographic record).

Marsileaceae

Marsilea aegyptiaca Willd.

This small semiaquatic fern was collected from a muddy and silty depression in the Central Desert. The new country record represents the easternmost distribution of the species. The population in Oman is c.1200 km further east than the previously known populations from Saudi Arabia and Yemen; it has not been recorded from the areas between these regions. This species is easily overlooked, and further collections from southern and central Oman and possibly also the Hadramaut and Al Mahrah area in Yemen are to be expected.

Specimens. Oman. **Central Oman**: Shalim, 18°00′13.5′′N, 055°37′0.91′′E, 259 m, *S. Al Hatmi & A. Al Hinai* SHAH 310 (E, OBG); Shalim, 18°00′36.3′′N, 055°37′04.0′′E, 276 m, *A. Patzelt & S. Al Hatmi* AP 5027/PAHA 189 (OBG).

Papaveraceae

Hypecoum pendulum L.

This species was previously recorded only from Saudi Arabia, Bahrain and Kuwait (Miller & Cope, 1996). The new record for Oman was collected on a rocky limestone plateau in Musandam, in the high-montane *Artemisia sieberi–Ephedra pachyclada* desert shrubland community. The new record extends the known distribution in the Arabian Peninsula by c.600 km further east; it has not been recorded from the areas in between. The species seems to be quite rare, because on expeditions to the same location, as well as searches in the wider area in following years, no further specimens could be found.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, As Sahosa, 25°57′51.0′′N, 056°12′21.3′′E, 1450 m, *A. Al Hinai* AHIN 58 (OBG).

Plantaginaceae

Plantago afra L.

This species was recorded from Musandam, but without detailing if the record was from Oman or the adjacent UAE (Feulner, 2011). We hereby confirm the presence of this species in Oman and extend the distribution range to the Western and Eastern Hajar Mountains. In the Western Hajar Mountains, the species was found among the weed flora in the understorey of pomegranate and apricot plantations, whereas in the Eastern Hajar Mountains it was found in a layer of annuals in the shade of *Vachellia gerrardii* (Benth.) P.J.H.Hurter and *Ceratonia oreothauma* Hillc., G.P.Lewis & Verdc. On the Arabian Peninsula it is otherwise is known from Saudi Arabia (Collenette, 1999).

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Wadi Mistal, 23°08′35.6′′N, 057°44′00.5′′E, 1496 m, *A. Patzelt* AP 2927 (OBG); Wadi Bimah (Nizwa area), 23°12′71′′N, 057°23′19′′E, 800 m, *M. Gallagher* 8767/16 (ON); Jabal Saiq, 23°04′N, 057°36′, 2000 m, *I. McLeish* 3939 (ON); Eastern Hajar Mountains, Jabal Bani Jabir, Salma plateau, around 7th Hole, 22°51′33.9′′N,

059°07′00.2′′E, 1348 m, *A. Patzelt, A. Al Hinai, S. Al Hatmi* AP 4320/PHS 21; Salma plateau, around 7th Hole, 22°51′33.9′′N, 059°07′00.2′′E, 1348 m, *A. Patzelt* AP 4288 (OBG).

Plantago notata Lag.

This species was recorded from Musandam, but without detailing if the record was from Oman or the adjacent UAE (Feulner, 2011). We hereby confirm the presence of this species in Oman. This species was found in fallow fields with bulb species as well as in the high-montane *Artemisia sieberi–Ephedra pachyclada* desert community.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, As Sahosa, 25°57′51.0′′N, 056°12′21.3′′E, 1450 m, *D. Lupton, G. Al Issai, A. Al Hinai* et al. LIHMR 36 (OBG); Jabal Harim, As Sahosa, 25°57′51.4′′N, 056°12′18.8′′E, 1451 m, Khasab, 25°02′N 056°13′E, 300 m, *R.A. Braund* 112 (ON).

Poaceae

Bromus pumilio (Trin.) P.M.Sm.

From the Arabian Peninsula, this species has so far only been recorded from Saudi Arabia (Cope, 2007). The new record from Oman extends its known distribution in Arabia by c.1800 km to the east and fills the distribution gap between the populations from the Al Hijaz mountain range in Saudi Arabia and the populations in Southwest Asia. It is so far not recorded from the area between these regions. The species was found in the high-montane *Artemisia sieberi–Ephedra pachyclada* desert shrubland community in Musandam.

Specimens. Oman. **Northern Oman**: Musandam, Sahil As Sahosa, 25°57′18.0′′N, 056°12′09.8′′E, 1433 m, *A. Patzelt, S. Al Hatmi, A. Al Hinai* AP 4658/SHP 112 (OBG); Musandam, cliff below Jabal Harim, 25°57′52.0′′N, 056°13′18.0′′E, 1619 m, *A. Patzelt, S. Al Hatmi, A. Anderson* AP 4676/SHP 148 (OBG).

Diplachne fusca (L.) P.Beauv. ex Roem. & Schult.

This widespread species occurs throughout the tropical and subtropical Old World. It has previously been reported from most countries of the Arabian Peninsula, but not from Oman (Cope, 2007). The species was found in the Muscat area, at the edge of a seasonally flooded wadi on the coastal plain.

Specimens. Oman. **Northern Oman**: Capital area, Al Khuwair, 10 m; *T. Harrison* AP 3774 (OBG).

Piptatherum holciforme (M.Bieb.) Roem. & Schult.

Piptatherum holciforme was recorded from Musandam, but without detailing if the record was from Oman or the adjacent UAE (Feulner, 2011). We hereby confirm the presence of this species in Oman. It was found in between the weed community on agricultural terraces.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, Sayh plateau, 25°59′32.3′′N 056°12′51.6′′E, 1136 m, *S. Al Hatmi* SAHATM 66 (OBG).

Poa bulbosa L.

The bulbous bluegrass has recently been added to the flora of the UAE (Feulner, 2011). The first collections of this species from Oman were made in 2014, after exceptionally rich spring rains (Fig. 2C). The species was locally abundant in the mountains of Musandam, in the As Sahosa, a plateau at about 1450–1550 m between the two highest peaks, Jabal Harim and Jabal Jais, on abandoned agricultural fields.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, Sahil As Sahosa, 25°57′51.4′′N 056° 12′18.8′′E, 1451 m, *A. Patzelt, S. Al Hatmi, A. Anderson* AP 4528/PHA 27 (E, OBG, ON).

Poa sinaica Steud.

Poa sinaica has recently been added to the flora of the UAE (Feulner, 2011). The first collections of this species were made in Oman in 2014. The species was locally abundant in the mountains of Musandam, in the As Sahosa, a plateau at about 1450 m, on abandoned agricultural fields, growing together with *Poa bulbosa*.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, Sahil As Sahosa, 25°57′51.4′′N 056° 12′18.8′′E, 1451 m, *A. Patzelt, S. Al Hatmi, A. Anderson* AP 4520/PHA 19 (E, OBG, ON); Jabal Harim, Sahil As Sahosa, 25°57′18.0′′N 056°12′09.8′′E, 1451 m, *A. Patzelt, S. Al Hatmi, A. Al Hinai* AP 4664/SHP 122 (OBG); Jabal Harim, Sahil As Sahosa, 25°57′51.0′′N 056°12′21.3′′E, 1450 m, *L. Al Harthi, A. Al Hinai* LAH 69 (OBG).

Triraphis pumilio R.Br.

Apart from the voucher localities, *Triraphis pumilio* was also noted from many other places in the Western and Eastern Hajar Mountains. The new records represent the easternmost distribution of the species. The species occurs frequently in the *Euphorbia larica–Vachellia tortilis* woodland in northern Oman.

Specimens. Oman. **Northern Oman**: Eastern Hajar Mountains, Jabal Amdah (at the head of Wadi Amdah), 23°13′N, 058°22′E, 1310 m, *T. Harrison & A. Patzelt* AP 3963 (OBG); Foothills of the Northern Hajar Mountains, Oman Botanic Garden site, 23°33′28.3′′N, 058°08′38.8′′E, 115 m, *A. Patzelt* AP 4498 (OBG); Foothills of the Northern Hajar Mountains, Oman Botanic Garden site, 23°33′28.3′′N, 058°08′38.8′′E, 105 m, *Z. Al Qassabi* ZQAS 33 (OBG).

Ranunculaceae

Delphinium ajacis L.

The genus *Delphinium* has an interesting history in Oman. *Delphinium penicillatum* Boiss. was described and recorded from Oman by Pierre Boissier and cited in the *Flora Orientalis* (Boissier, 1867–1888). It has been suggested that this record is mislabelled, the species never having occurred in Oman (Ghazanfar, 1996, 2003) or, controversially, being apparently extinct, as it was considered by Miller & Cope (1996).

A *Delphinium* species was recently found in northern Oman, identified as *D. ajacis* (listed by Miller & Cope, 1996, for Saudi Arabia under the synonym *D. orientale* J.Gay).

Delphinium ajacis is a new record for Oman. It needs to be further investigated how this record relates to the record of *Delphinium penicillatum* by Aucher-Éloy. The petals of the new record are clearly united into a three-lobed limb, whereas free petals are characteristic of *Delphinium penicillatum* (Miller & Cope, 1996).

Delphinium ajacis is only known from one location in the Jabal Shams area, in the Western Hajar Mountains. It was collected from the agricultural terraces near one small village at high altitude. Only one plant (about to start to flower, Fig. 2D) was seen in April 2019.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Jabal Shams, village of Al Marrat, 23°16′40.8″N, 057°11′45.9″E, 2090 m, *A. Patzelt & S. Al Hatmi* AP 5276/PAHA 444 (OBG).

Verbenaceae

Verbena officinalis L.

The common vervain has been used traditionally as a medicinal plant in many parts of the world. It is native to Europe but has been introduced to many countries. This species was found in the Western Hajar Mountains in the montane *Sideroxylon mascatense–Olea europaea* woodland. It is likely to be an escape from cultivation.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, 23°01′12.4″N, 057°41′04.2″E, 1771 m, *O. Al Amri* AOO 22 (OBG).

New Distribution Records Within Oman

Amaranthaceae

Alternanthera bettzickiana (Regel) G.Nicholson

This species is native to South America and has so far been recorded from Saudi Arabia (Miller & Cope, 1996) and from southern Oman (Patzelt *et al.*, 2014), possibly as an escape of from cultivation. The new record from northern Oman extends its distribution within Oman by about 800 km to the north. It has, however, not been recorded from the area between these regions. In northern Oman, the species occurs in a weed community of a date palm plantation. It was found along an irrigation channel.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Misfat Al Abriyyin, 23°07′16.8″N, 057°17′14.7″E, 900 m, *A. Patzelt* AP 4804 (OBG).

Asparagaceae

Asparagus capitatus subsp. **gracilis** Browicz

This species was previously considered to be restricted to the Western Hajar Mountains (Ghazanfar, 1992) but has now also been recorded from the Eastern Hajar range. In the Western Hajar Mountains, the species is found in the montane *Sideroxylon mascatense–Olea europaea* woodland. Occasionally, it does also occur in the dry stone terrace walls of

villages. In the Eastern Hajar Mountains, the species was found in the high-montane *Prunus arabica–Ceratonia oreothauma* woodland community. The new record extends the known distribution within Oman by c.200 km to the east. It is not known from the areas in between.

Specimens. Oman. **Northern Oman**: Eastern Hajar Mountains, Jabal Bani Jabir, 22°48′57.8′′N, 059°03′15.1′′E, 1596 m, *A. Patzelt* AP 4210 (OBG).

Asteraceae

Jurinea berardioides (Boiss.) Diels

On the Arabian Peninsula, this Irano-Turanian species has so far been recorded for the UAE and Oman. In Oman, this stemless, perennial, rosette-forming species was considered to be restricted to higher altitude in the mountains of Musandam (Ghazanfar, 2015). The new record extends its distribution to the Eastern Hajar range, c.400 km further south and represents the southernmost limit of the species.

In the Eastern Hajar Mountains, the species occurs in the high-montane limestone plateau, dominated by *Echiochilon persicum* (Burm.f.) I.M.Johnst. and *Helianthemum lippii* (L.) Dum. Cours. and the high-montane *Prunus arabica–Ceratonia oreothauma* woodland community. It has not yet been found in the Western Hajar Mountains.

Specimens. Oman. **Northern Oman**: Eastern Hajar Mountains, Jabal Bani Jabir, Salma plateau, 23°49′33.9′′N, 059°00′40.38′E, 1600 m, *A. Patzelt* AP 3770 (OBG); Jabal Bani Jabir, 22°52′22.6′′N, 059°10′24.1′′E, 1073 m, *A. Patzelt* AP 4298 (OBG).

Lactuca inermis Forssk.

This rare species was previously known only from the Western Hajar Mountains (Ghazanfar, 2015). The new record from the Musandam Mountains extends the known distribution by c.400 km further north; however, it has not yet been recorded from the area between these regions. The species usually grows as single individual plants, and population sizes are very small. It is found in the high-montane *Artemisia sieberi–Ephedra pachyclada* desert shrubland community.

Elsewhere in the Arabian Peninsula, this species is only known from the mountains in Southwest Saudi Arabia (Collenette, 1999) and Yemen. In Yemen it seems to be widespread (Al Khulaidi, 2013), whereas Collenette lists the species as rare in Saudi Arabia (Collenette, 1999).

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, Sahil Al Sahosa, 25°57′51.4′′N, 056°12′18.8′′E, 1433 m, *A. Patzelt, S. Al Hatmi, A. Al Hinai* AP 4502/PHA 1 (E, OBG).

Launaea almahrahensis N.Kilian

This near-endemic species was considered to be extremely restricted in its distribution (Ghazanfar, 2015), but it actually is not uncommon and is quite widespread in Oman.

A number of recent collections extend the known distribution in Oman by c.100 km to the south and 200 km to the north, and its altitudinal records from 100 m (Ghazanfar, 2015) to 1450 m.

Specimens. Oman. **Central Desert**: Plateau east of Shalim, 17°57′20′′N, 055°38′56′′E, 278 m, *A. Patzelt, A.G. Miller, S. Laser*, *S.G. Knees, S. Neale, S. Al Hatmi* AP 3085 (OBG). **Southern Oman**: Jabal Samhan, 17°09′08′′N, 054°45′20′′E, 1404 m, *A. Patzelt, A.G. Miller, S.G. Knees, S. Laser* AP 2729 (OBG); Plateau above Shuwaymiyah, 17°57′22.1′′N, 055°38′51.7′′E, 292 m, *A. Patzelt, S. Al Hatmi, A. Al Hinai* AP 2729 (OBG); Jabal Samhan, 17°09′10.1′′N, 054°45′27.0′′E, 1406 m, *A. Patzelt & S. Al Hatmi* AP 5073/PAHA 270 (OBG).

Notobasis syriaca (L.) Cass.

This species was considered to be restricted to Musandam (Ghazanfar, 2015) but has now also been recorded from the Eastern Hajar range. In the Eastern Hajar Mountains, the species is found in the high-montane *Helianthemum kahiricum–Convolvulus acanthocladus* desert shrubland community. The new record extends the known distribution within Oman by c.350 km to the south. It has not yet been recorded from the Western Hajar Mountains.

Specimens. Oman. **Northern Oman**: Eastern Hajar Mountains, Jabal Asfar, 23°11′18.2′′N, 058°52′58.1′′E, 1530 m, *T. Harrison* AP 3811 (OBG).

Orbivestus cinerascens (Sch. Bip.) H.Rob.

This species was considered to be restricted to southern Oman (Ghazanfar, 2015) but has also been recorded from northern Oman from a few locations. The species occurs in the Western Hajar Mountains in the high-montane *Sideroxylon mascatense–Olea europaea* community and in the Eastern Hajar Mountains in the high-montane *Prunus arabica–Ceratonia oreothauma* woodland.

Specimens. Oman. **Northern Oman**: Wadi Mistal, 23°08′19.2′′N, 057°43′44.5′′E, 1648 m, *D. Lupton, A. Al Hinai,* et al. WAK 15 (OBG); Jabal Abyad, 22°55′22.8′′N, 058°55′49.4′′E, 1270 m, *S. Al Hatmi* SAHATM 82 (OBG); Jabal Abyad, 22°56′17.3′′N, 058°53′18.8′′E, 1525 m, *L. MacKinnon, S. Al Hatmi*, *A. Al Hinai* LEM 309 (OBG).

Boraginaceae

Trichodesma africanum (L.) Sm.

Trichodesma africanum is a plant frequently occurring in northern and southern Oman, in the drought-deciduous *Euphorbia larica–Vachellia tortilis* thorn woodland and open xeromorphic shrubland on plains and lower foothills, and in ruderal and semiruderal locations, along roadsides, pathways and housing areas. It is newly recorded for Musandam, from in the As Sahosa, an area between the two highest peaks Jabal Harim and Jabal Jais.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, Sahil As Sahosa, 25°59′52.6′′N, 056°12′05.9′′E, 1135 m, *S. Al Hatmi, A. Al Hinai* SHAH 709 (OBG).

Campanulaceae

Campanula akhdarensis A.G.Mill. & Whitc.

This chasmophyte has been regarded as being endemic to the higher areas of Jabal Khawr and the higher areas of Jabal Al Akhdar (Miller & Whitcombe, 1983). The new record from the Eastern Hajar Mountains represents the easternmost distribution and significantly extends the known distribution of this rare endemic 150 km to the east and represents the easternmost occurrence of this species.

It prefers shady cliffs and moist shady locations and was found in southwest-facing wadis between 1950 m and 2050 m in the high-montane *Prunus arabica–Ceratonia oreothauma* woodland community. In the Western Hajar, *Campanula akhdarensis* is exceedingly rare in the high-montane evergreen *Teucrium mascatense–Juniperus seravschanica* community; however, it is also found on terrace walls and along water channels of a few mountain villages, where the species has found a secondary habitat.

Specimens. Oman. **Northern Oman**: Eastern Hajar Mountains, Jabal Bani Jabir, 22°42′43.9′N, 059°84′59.7′E, 2047 m, *T. Harrison* AP 3803 (OBG).

Caryophyllaceae

Silene conoidea L.

From Oman, the species was previously only known from the Western Hajar Mountains (Miller & Cope, 1996). The new distribution record from Musandam extends the known distribution within Oman by c.350 km to the north and also extends its known altitudinal range from 50–650 m (Ghazanfar, 2003) to 1450 m. It was found among the weed flora of cultivated terraces.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, As Say, 25°57′29.7′′N, 056°13′05.9′′ E, 1451 m, *S. Al Hatmi & A. Al Hinai* SHAH 206 (OBG).

Convolvulaceae

Convolvulus leiocalycinus Boiss.

This Irano-Turanian species has recently been newly recorded from Oman (Wood *et al.*, 2015), based on a collection from Musandam (*McLeish* 3736 at E). We collected the species from cliffs within the high-montane *Astragalus fasciculifolius–Prunus arabica* shrubland in Musandam. As a new distribution record, the species is also found c.350 km further south in the Western Hajar Mountains, where it rarely occurs in the high-montane *Teucrium mascatense–Juniperus seravschanica* community.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, 25°57′52.0′′N, 056°13′18.0′′E, 1619 m, *A. Patzelt, S. Al Hatmi & A. Anderson* AP 4669/SHP 135 (OBG); Western Hajar Mountains, Jabal Khawr, Khab Salman, 23°08′28.4′′N, 057°00′06.4′′E, 2475 m, *A. Patzelt & S. Al Hatmi* AP 4883 (OBG); Jabal Akhdar, Saiq Plateau, 23°05′16.98′′N, 057°39′14.7′′E, 2380 m, *A. Patzelt* AP 2197 (SQUH).

Cucurbitaceae

Cucumis canoxyi Thulin & Al-Gifri

This species is near-endemic to Oman, also occurring in the adjacent southeast Yemen (Thulin & Al-Gifri, 1994). In Oman, it was only known from one small population in a wadi west of Mughsayl in southern Oman. The new record from Central Oman extends its known distribution by 300 km to the east. It was found in xeromorphic shrubland with *Stipagrostis sokotrana* (Vierh.) De Winter and the Oman endemic *Xerotia arabica* Oliv.

Specimens. Oman. **Central Oman**: Al Jazir, escarpment above Sawqrah, 18°19′02.1′′N, 056°31′01.5′′E, 115 m, *S. Al Hatmi* SAHATM 340 (OBG).

Fabaceae

Alysicarpus vaginalis (L.) DC.

In Oman, this species has so far only been recorded from southern Oman (Ghazanfar, 2007). The new record from northern Oman extends its distribution within Oman by about 900 km to the north. In northern Oman, the species occurs in the weed vegetation of wadis at low altitude in shady locations. It has not been reported from the area between the currently known locations; however, it is expected to occur in moist and shaded places.

Specimens. Oman. **Northern Oman**: Eastern Hajar Mountains, Wadi Tiwi, 100 m, *A. Patzelt* AP 2869 (ON, SQUH); Wadi Al Arbeyn, village of Suwayh, 23°01′58.4′′N, 058°59′51.8′′E, 106 m, *A. Patzelt, D. Lupton, S. Al Hatmi, A. Al Hinai* AP 3989; village of Suwayh, 23°01′58.4′′N, 058°59′51.8′′E, 106 m, *A. Patzelt* AP 4187 (OBG).

Argyrolobium crotalarioides Jaub. & Spach

In Oman, this species has so far only been recorded from Eastern Hajar Mountains (Ghazanfar, 2007), where it occurs in the high-montane *Helianthemum kahiricum–Convolvulus acanthocladus* desert shrubland community. The new record from the Western Hajar Mountains extends its distribution within Oman by 200 km to the northwest. The species occurs in the submontane zone *Euphorbia larica–Moringa peregrina* community and high-montane *Teucrium mascatense–Juniperus seravschanica* woodland community.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Al Hamra, Jabal Lahmiah, 23°09′47.4′′N, 057°06′37.3′′E, 1121 m, *S. Al Hatmi* SAHATM 213 (OBG); Jabal Al Akhdar, Shnoot, 23°06′48.4′′N, 057°39′12.2′′E, 2332 m, *A. Al Hinai, T. Al Jabri & K. Al Maawali* ATK 20 (OBG); Jabal Al Akhdar, Shnoot, 23°06′48.4′′N, 057°39′12.2′′E, 2332 m, *L. Al Harthy* LH 24 (OBG).

Cullen plicatum (Delile) C.H.Stirt.

This species was previously only recorded from central and southern Oman (Ghazanfar, 2007). The new record extends its known distribution within Oman by c.700 km to the North. It was found in a ruderal habitat in Al Khod village.

Specimens. Oman. **Northern Oman**: As Seeb, Al Khod, 23°35′44.5′′N, 058°05′46.0′′E, 66 m, *G. Al Issai, T. Al Jabri, S. Al Rijeibi, A. Al Hinai* IJHR 16 (OBG, ON).

Indigofera cordifolia B.Heyne ex Roth

In Oman, this annual herb has been reported from in southern and central Oman (Ghazanfar, 2007). The new record from northern Oman extends its distribution within Oman by 500 km to the North. In northern Oman, the species occurs frequently in the open drought-deciduous *Euphorbia larica–Vachellia tortilis* woodland at lower altitude. It is expected to occur in the areas between these regions.

Specimens. Oman. **Northern Oman**: Foothills northern Hajar Mountains, Al Khod, 23°34′11′′N, 058°06′12′′E, 130 m, *A. Patzelt* AP 806 (SQUH); Al Batinah, close to Sultan Qaboos University, 23°34′11′′N, 058°06′12′′E, 89 m, *A. Patzelt* AP 2155 (OBG); northern foothills, Al Khod, Oman Botanic Garden site, 23°33′27′′N, 058°07′44′′E, 105 m, *Z. Al Qassabi* ZQAS 27 (OBG).

Indigofera volkensii Taub.

This species has only been recorded from southern Oman (Ghazanfar, 2007). The new records from central and northern Oman extends its distribution within Oman by 900 km to the north. In northern Oman, the species is abundant in the open drought-deciduous *Euphorbia larica–Vachellia tortilis* thorn woodland at lower altitudes. In the Central Desert, it was found in xeromorphic shrubland with the endemics *Stipagrostis sokotrana* and *Xerotia arabica*.

Specimens. Oman. **Central Oman**: Sahil Al Jazir, 18°09′09.8′′N, 056°31′01.1′′E, 99 m, *A. Patzelt*, S. *Al Hatmi, A. Al Hinai* AP 2846/SHP 204 (OBG); Jiddat Al Arkad, 18°03′25.3′′N, 056°12′41.8′′E, 208 m, S. *Al Hatmi* SAHATM 305 (OBG). **Northern Oman**: Western Hajar Mountains foothills, Al Khod, 23°32′29′′N, 058°05′48′′E, 101 m, *A. Patzelt* AP 2085 (OBG); Foothills of the Northern Hajar Mountains, Oman Botanic Garden site, 23°33′36.6′′N, 058°07′40.9′′E, 101 m, *R. Whitcombe, C. Clarke* RPWNVC 29/ZQAS 93 (OBG);

Lotus laricus Rech.f., Aellen & Esfand.

In Oman, this species has been reported from Musandam, where it was found to growing in agricultural plantations (Ghazanfar, 2007). These are the first records of this species outside of Musandam, extending its distribution within Oman by 400 km to the south. All new records were found among the weed flora of irrigated terraces in moist and shady places. It is likely to be present in the areas between the currently known locations.

Specimens. Oman. **Northern Oman**: Al Batinah, northern foothills, village old Al Khod, 23°34′14′′ N, 058°07′19′′E, 99 m, *A. Patzelt* AP 2941 (OBG); Al Batinah, coastal gravel plain, Al Seeb, 23°39′ 36′′N, 058°12′13′′E, 50 m, *A. Patzelt* AP 1749 (OBG); Wadi Mahil, c.600 m, *A. Radcliffe-Smith* 3890 (ON).

Medicago laciniata var. **brachyacantha** Boiss.

This species was previously recorded from the coastal areas of the capital area around Muscat from 20 to 100 m altitude (Ghazanfar, 2007). It was recorded from Musandam but without detailing if the record was from Oman or the adjacent UAE (Feulner, 2011). We hereby confirm the presence of this species in Oman.

It was found in wadi systems at low altitude and in the high-montane *Artemisia sieberi–Ephedra pachyclada* community. This new record extends the known distribution by c.450 km further north. It is likely to occur in areas between the currently known locations.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, As Sahosa, 25°56′11.7′′N, 056°13′ 45.8′′E, 1450 m, *A. Patzelt, A.G. Miller, S.G. Knees, S. Al Hatmi* AP 3620 (OBG); Wadi Al Bih, 25°49′00.4′′N, 056°09′13.2′′E, 218 m, *L. Al Harthy, A. Al Hinai* LAH 15 (OBG); Wadi Sal Al Ala, *I. McLeish* 3630 (ON).

Senna alexandrina Mill.

In Oman, this species has been reported from northern Oman, from Ras Al Hadd (Filimban *et al.*, 2014). This is first record from southern Oman, extending its distribution within Oman by 800 km to the south. It has not been found in the area between the currently known locations.

Specimens. Oman. **Southern Oman**: Dhofar, Wadi Amat, 17°18′50.3′′N, 053°31′26.9′′E, 614 m, *A. Patzelt, A. Al Hinai & S. Al Hatmi* AP 5341/SHP 353 (OBG).

Senna sophera (L.) Roxb.

This weedy species is widely distributed throughout the tropics. It was previously known only from northern Oman (Ghazanfar, 2007). The new record from Jabal Al Qara in southern Oman extends the known distribution within Oman by c.1000 km further south. The species is found as a ruderal around housing areas and along roadsides. It is expected to occur in moist and ruderal areas in between as well.

Specimens. Oman. **Southern Oman**: Jabal Al Qamar, Tawi Atair, 17°06′15.5′′N, 054°33′36.3′′E, 613 m, *A. Patzelt* AP 3954 (OBG).

Teramnus repens (Taub.) Baker f.

This species was previously known only from southern Oman (Ghazanfar, 2007). The new record from the village of Nakl in the foothills of the Western Hajar Mountains extends the known distribution within Oman by c.1000 km further north. The species is found as a weed in cultivated date palm gardens, in moist and shady locations.

Specimens. Oman. **Northern Oman**: Nakl town, 23°33′85.7′′N, 057°58′98.3′′E, 310 m, *A. Patzelt* AP 2383 (OBG).

Lamiaceae

Endostemon tenuiflorus (Benth.) M.R.Ashby

This short-lived perennial has previously only been recorded from southern Oman (Ghazanfar, 2015). The new record from northern Oman extends its distribution within Oman by c.1000 km to the north. In northern Oman, the species occurs in the high-montane *Sideroxylon mascatense–Olea europaea* community. It has not been recorded from the areas in between and is unlikely to occur, because the species requires cooler and moister conditions.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Jabal Akhdar, close to the abandoned military camp, 23°00′08.8′N, 057°41′56.9′E, 1689 m, *L. Al Harthy & T. Al Jabri* LH 23 (OBG).

Salvia santolinifolia Boiss.

In Oman, this species has so far only been recorded from a few locations in the Western Hajar Mountains at 800 m (Ghazanfar, 2015). The new records of this species from the Eastern Hajar Mountains and from central and southern Oman extend the known distribution by about 200 km to the east and 800 km to the south. The species is found in a number of different plant communities. It is not recorded from the areas between the currently known locations.

Specimens. Oman. **Central Oman**: Between Marmul and Thumrait, 18°15′32.5′′N, 055°20′26.0′′E, 263 m, *S. Al Hatmi & A. Al Hinai* SHAH 91 (OBG). **Northern Oman**: Foothills of the Northern Hajar Mountains, Al Khod, around Sultan Qaboos University, 23°34′19.6′′N, 058°06′20.6′E, 89 m, *A. Patzelt* AP 2437 (OBG); Eastern Hajar Mountains, near Amq, on track from Wadi Ambah, *A. Radcliffe-Smith* 4063 (ON). **Southern Oman**: Wadi Shuwaimiyah, 17°56′07.0′′N, 055°31′35.8′′E, 76 m, *S. Al Hatmi* SHAH 593 (OBG); Wadi Salafant, 17°23′42.1′′N, 054°29′07.9′′E, 657 m, *A. Anderson, S. Al Hatmi* AASH 6/SAHATM 325 (OBG); Jabal Qara, upper Wadi Dawkah, 17°23′15.0′′N, 054°01′57.7′′E, 627 m, *L. MacKinnon, I. Al Rashdi* LEM 258 (OBG); Wadi Dayqah, 17°23′15.1′′N, 054°01′57.5′′E, 627 m, *A. Patzelt, I. Al Rashdi* AP 3902 (OBG); Wadi Andur, 17°38′51.6′′N, 054°40′20.5′′E, 481 m, *A. Patzelt & S. Al Hatmi* AP 4758/PAHS 57; Wadi Dahaboon, 17°23′06.7′′N, 054°29′51.0′′E, 656 m, *A. Patzelt & S. Al Hatmi* AP 5123/PAHA 332 and AP 5138/PAHA 347.

Teucrium oliverianum Ging. ex Benth

This species was recorded from Musandam, but without detailing if the record was from Oman or the adjacent UAE (Feulner, 2011). We hereby confirm the presence of this species in Oman. It is only recorded from one location in Oman, from the high-montane *Artemisia sieberi–Ephedra pachyclada* desert shrubland community.

Specimens. Oman. **Northern Oman**: Musandam, Jabal Harim, As Sahosa, 25°57′29.7′′N, 056°13′05.9′′E, 1451 m, *S. Al Hatmi, A. Al Hinai* SHAH 340 (OBG).

Poaceae

Bromus madritensis L.

In Oman, this species was previously only known from Musandam at 450 m (Cope, 2007; Ghazanfar, 2018). It is now newly recorded from the Western Hajar Mountains. It so far has only been recorded from the agricultural terraces from one village only, growing on the terrace walls and in between the annual crops, such as garlic and onion, at altitudes above 2000 m.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Jabal Shams, village of Al Marrat, 23°16′40.8′′N, 057°11′45.9′′E, 2090 m, *A. Patzelt & S. Al Hatmi* AP 5263/PAHA 431 (OBG, ON) and AP 5285/PAHA 453 (OBG).

Eriochloa barbatus (Trin.) S.Yadav & M.R.Almeida

This species was previously only known from southern Oman (Cope, 2007; Ghazanfar, 2015). The new collection, from an oasis settlement in northern Oman, extends its known distribution within Oman by c.800 km to the north. It was recorded as a weed in cultivated terraces.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, village of A'Subaykha (Samail, Fanja), 23°22′41.0′N, 057°39′52.0′E, 345 m, *A. Patzelt* AP 3749 (OBG).

Gastridium phleoides (Nees & Meyen) C.E.Hubb

This species was previously only known from Musandam from c.1400 m (Cope, 2007; Ghazanfar, 2015). The new collection from the Western Hajar Mountains extends its known distribution within Oman by c.350 km to the south. It was recorded as a weed in cultivated terraces at altitudes of 2300 m.

Specimens. Oman. **Northern Oman**: Western Hajar Mountains, Jabal Al Akhdar, village of Shuraiya, 23°04′08.6′′N, 057°39′29.2′′E, 2304 m, *A. Patzelt* AP 1592 (ON, SQUH); Jabal Al Akhdar, village of Shuraiya, 23°06′45.3′N, 057°38′59.3′E, 2040 m, *A. Patzelt* AP 1687 (ON).

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