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Remarkable lichens from the Sultanate of Oman

by

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With 1 figure

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Abstract: Information of the lichen flora of Oman is as yet fragmentary and incomplete. Of the approximately 230 species so far recorded from the Arabian Peninsula and Socotra, only 36 species are fully identified from the Sultanate of Oman. The majority of the lichens are distributed in three ecogeographical regions. These are: (1) the higher altitudes of the northern mountains, (2) the fog-affected eastern region of central Oman and the eastern islands, and (3) the fog-affected escarpment woodlands of southern Oman. All three growth-forms viz. crustose, foliose and fruticose lichens are found in Oman and occur on tree-bark, soil, rocks and stones. In general, fruticose and foliose lichens are present on the exposed, sea-facing habitats, whilst crustose lichens occur in all lichen habitats.

Keywords: Lichens, Arabia, Oman, fog-desert, gazelle.

I. Introduction

More than 230 species of lichens have been recorded from the Arabian Peninsula and Socotra (Abuzinada et al. 1986, Bokhary et al. 1993, Ghazanfar & Rappenhöner 1994, Krog 1983, Kürschner & Ghazanfar 1998, Mies 1994, Mies et al. 1995). The highest number of species, c. 165, have been recorded from Socotra, including a new genus *Feigeana socotrana* (Mies et al. 1995) and about 70 species have been recorded from Saudi Arabia (Abuzinada et al. 1986, Bokhary et al. 1993). As yet, no published list exists for Yemen, though the lichen flora is expected to be rich and diverse. No lichen species' lists have been published for the Gulf States, though a few species occur on stones in Bahrain (pers. obs.) and on limestone rocks and tree bark in the United Arab Emirates (pers. comm.) and Qatar (Babikir & Kürschner 1992).

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In Oman lichens are perhaps the least studied component of its vegetation with records reported in floristic papers by Mandaville (1974), Cope (1988) and Ghazanfar & Rappenhöner (1994).

In this paper we present an annotated checklist of 34 species from Oman. All species listed are identified to specific level; those which have been identified only at the generic level are not included. Species are listed alphabetically with their collection data and distribution. Where relevant, reference is made to Abu-Zinada et al. (1986) for description and illustration.

II. Material and methods

Lichens were collected and identified by various collectors and experts during the last 10 years (see citations for collectors in the checklist) and identified by B.J. Coppins, H. Sipman, J. David, M.E. Halle and D.L. Hawksworth. Collections (duplicates and some originals) are present at the National Herbarium, Oman (ON). D. Rappenhöner's collections are present at B (Berlin), T.A. Cope's at K (Royal Botanic Gardens, Kew), M.D. Gallagher's at E (Royal Botanic Garden, Edinburgh) with duplicates at ON and IMI (International Mycological Institute, UK) and S.A. Ghazanfar's in her private herbarium with duplicates at IMI and ON.

III. Distribution and ecology

The distribution of lichens in Oman indicates that they prefer to live in cool, relatively moist locations, areas with frequent dew-fall in the early morning and late evening hours or in areas where cool night temperatures and the availability of moisture results in seasonal fogs. Lichens are commonest in the following three regions (see also Ghazanfar 1992, and Fig. 1):

1) Northern mountains

Lichens are found at altitudes from 400-2500 m, where temperatures are relatively cool and there is seasonal rain, and occasional low cloud or fog (mean annual temperature from 17°C in the winter to 29°C in the summer; seasonal rainfall, generally from December to March and in August, with an annual mean of 250 mm; see Fisher 1994 and Fisher & Membry in press). Lichens occur on shaded rocks, under rock overhangs, on compact soil in rock crevices and in rock shade and on the bark of trees. Communities of terricolous lichens such as *Catapyrenium lachneum, Fulgensia fulgens, Psora decipiens* and *Toninia diffracta* are commonly found on compact calcareous soil in the northern mountains of Oman, but corticolous or saxicolous communities are poor and consist of a single of two species.

2) Gravel and stony desert plains and limestone coastal hills (e.g. central and eastern Oman and the eastern islands of Damaniyat, Masirah and Hallaniyah

A relatively hot climate with usually high day and low night temperatures (mean annual temperature of 27°C) . Dew is common and a source of available water for plants, and there are seasonal fogs, usually between January and June and between October and November (Schemenauer 1989, Stanley-Price et al. 1986, Ghazanfar & Rappenhöner 1994).

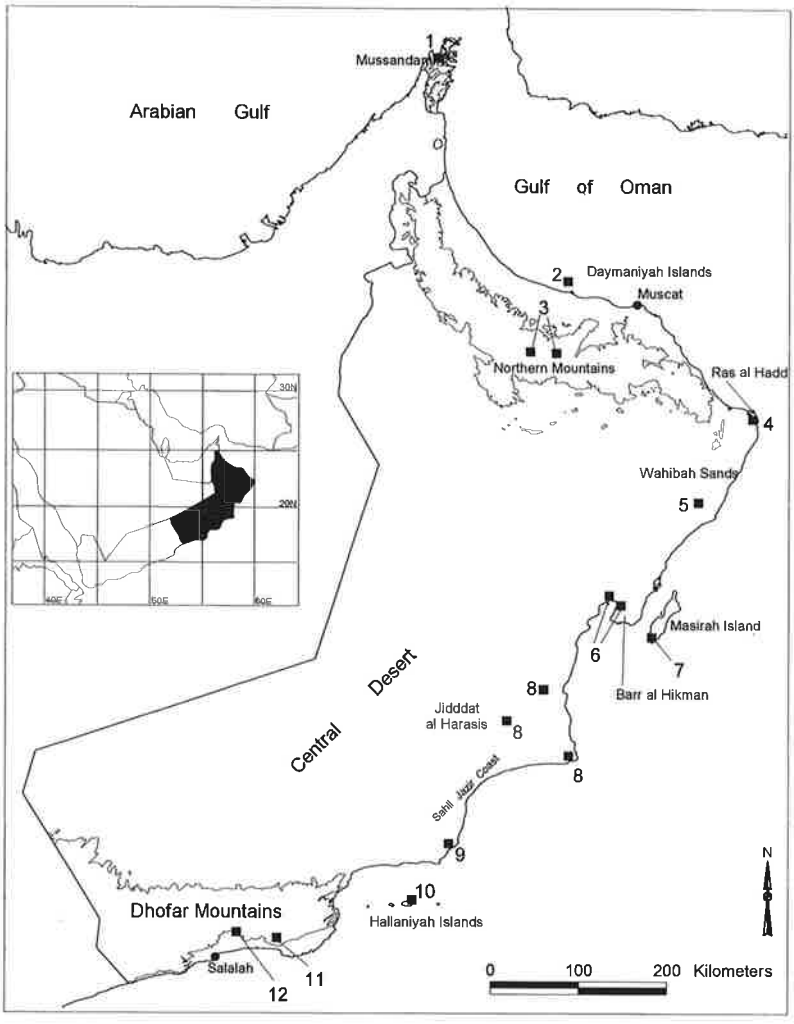

Fig. 1. ■ Sites where lichens have been collected in Oman. 1 Musandam mountains, 2 Jebel Kabir, Daymaniyah Islands, 3 Jebel al Akhdhar, 4 Khawr Jaramah, 5 Prosopis woodlands in Wahibah Sands, 6 Bar al Hikman peninsula, 7 Jebel Suwayr, Masirah Island, 8 Jiddat al Harasis, 9 Wadi Ghudun, Sahil Jazir coast, 10 Al Hallaniyah, 11 Jebel Samhan, 12 Jebel Qara. (The northern and Dhofar mountains are indicated by the 500 m contour).

Well developed communities of *Caloplaca holocarpa, Diploicia canescens, Dirinaria picta, Physcia* spp. *Ramalina duriaei, R. lacera* and *Xanthoria parietina* occur on *Acacia tortilis* (Forsskal) Hayne, *A. ehrenbergiana* Hayne and *Prosopis cineraria* (L.) Druce. Communities of crustose lichens, such as *Buellia subalbula* (s.l.) and *Diploicia canescens* occur on exposed calcareous rocks and stones in the fog-affected Huqf escarpment at the eastern edge of the Jiddat al Harasis plateau.

Masirah Island has the highest number of lichen species of any location in Oman (Ghazanfar & Rappenhöner 1994, Kürschner & Ghazanfar 1998), with all species confined to the limestone cliffs in the southern part of the island. There is a luxuriant growth of lichens on these exposed cliffs, which receive moisture-laden winds from the southwest. These communities include *Arthonia* sp., *Dirina massiliensis, Diploicia canescens, Buellia subalbula* (s.l.), *Ramalina* sp. *Roccella balfourii, Simonyella variegata,* and *Roccellographa cretacea.* Two species, *Simonyella variegata* and *Roccellographa cretacea,* previously recorded only from Abdalkuri and Socotra (Mies 1994), are also found there, the former on the Al Hallaniyah as well where it occurs on calcareous rocks on the sea-facing slopes. A few cyanolichens, such as *Gloeoheppia turgida,* are also found on Masirah Island.

A few locations on the eastern coast of Oman (e.g. Ras Madraka, Sahil Jazir coast and the Barr al Hikman Peninsula) also experience occasional fogs, and in such locations lichens are found restricted to the tops of small limestone hills.

Coastal species which receive moisture-laden sea breezes may show a zonation in their distribution affected by salinity as also shown by Fletcher (1973) and Nash & Lange (1988), but no detailed work has been conducted on this aspect in Oman.

Terricolous communities are absent from the fog-affected central desert of Jiddat al Harasis. There the foliose lichen *Ramalina duriaei* forms almost pure stands on the lower branches of *Acacia tortilis,* and in the early hours of the day when dew makes the lichens soft and palatable they are eaten by gazelles (Hawksworth et al. 1984).

3) Southern mountains

Lichens are found above 400 m where the areas are subjected to seasonal fogs and low cloud, particularly during the summer monsoon (annual mean temperature of 25°C , and annual rainfall ranging from 114 mm to 241 mm). Lichens occur on the bark of trees such as *Acacia* spp., *Anogeissus dhofarica* A.J. Scott, *Boscia arabica* Pest, *Cadaba* spp., *Euphorbia balsamifera* subsp. *adenensis* (Defl.) Bally and *Salvadora persica* L., on exposed and shaded rocks and on shaded soil. Pendulous fruticose lichens such as *Usnea* spp. which occur in the fog-affected southwest mountains of Saudi Arabia (Abuzinada et al. 1986, Kürschner & Ghazanfar 1998) are absent in Oman.

Biogeographically the lichen flora of the mountains is a mixture of Mediterranean and tropical elements. The lichen species of the islands and coastal mountains are however unique in the northwestern Indian Ocean (Mies 1994).

IV. Annotated checklist

Buellia subalbula (Nyl) Müll.-Arg. s.l.

On bare aeolianite, Wahibah Sands, c. 30 m, Cope 138 (K) IMI 303049; on limestone, Gallagher 8466/1 (ON) IMI 355208; on stony wall, south of Wadi al Kabir, 310 m, Gallagher 8484 (ON) IMI 355204. on limestone, above Wadi Mayhi, Masirah Island, Gallagher 8466/1 (ON) IMI 355208, Gallagher 8476/32 (ON) IMI 355203; on

exposed rocks and stones, Jiddat al Harasis at the edge of the central limestone plateau, c. 150 m, Ghazanfar 1575a (Herb. Ghazanfar); on exposed south-facing cliffs, Masirah Island, south, 30 m-50 m, Rappenhöner OM91-163c (B); Daymaniyah Islands, Jebel Kabir, on exposed limestone rocks, c. 70 m, Ghazanfar 3076 (Herb. Ghazanfar).

Ref. Abu-Zinada et al. 1986, p. 14, fig 9.

Caloplaca cerina (Hedw.) Th. Fr.

On bark of *Prosopis cineraria* trees, Wahibah Sands, 50 m, Cope 40a (K, ON) IMI 303052a.

Caloplaca cf. **decipiens** Müll.-Arg.

On exposed rocks, Barr al Hikman, c. 40 m, Rappenhöner OM91-163a (B, ON), 164b (B).

Caloplaca holocarpa (Hoffm.) Wade

On bark of *Acacia tortilis* and *Prosopis cineraria* trees, Jiddat al Harasis, limestone plateau, c. 200 m, Ghazanfar 1580d (Herb. Ghazanfar); on bark of *Salvadora persica,* Cope 77b (K) IMI 303051b; bark of *Prosopis cineraria,* Cope 40a (K) IMI 303052a.

Ref. Abu-Zinada et al. 1986, p. 14, fig. 13.

Catapyrenium lachneum (Ach.) R. Sant.

(Syn: *Dermatocarpon lachneum* (Ach.) A.L. Sm.)

On soil in shelter of rock on an east-facing hill, Musandam mountains, 1120 m, Gallagher 6704/1 (E); on soil exposed to the sun, northern mountains, Jebel al Akhdhar, nr. Birkat Sharaf, 2300 m, April 1975, J.P. Mandaville Jr. (BM).

Ref. Abu-Zinada et al. 1986, p. 15, fig. 17.

Cresponea chloroconia (Tuck.) Egea & Torrente

(Syn.: *Lecanactis chloroconia* Tuck.)

On east-facing bark of *Acacia tortilis* trees, Wadi Ghudun, Sahil Jazir coast (eastern part of the central Oman) c. 50 m, Gallagher 6763/9 (E). Also recorded from Socotra (Mies 1994).

Dermatocarpon vellereum Zschacke

On unexposed north-facing limestone cliff, northern mountains, Jebel al Akhdhar, c. 2100 m, A. S. Gardner G. 1574 (E; Herb. Ghazanfar).

Diploicia canescens (Dickson) Massal.

On exposed limestone cliffs, c. 30 m, Masirah Island, common, Rappenhöner OM91-240,-241b (B), on bark of *Prosopis cineraria* trees, Wahibah Sands, Cope 38b (K,

ON) IMI 303050b, 39 (K, ON) IMI 303053; on east side of trees, Wadi Ghudun, Sahil Jazir coast, c. 50 m, Gallagher 6763/19a (E).

Diploschistes ocellatus (Vill.) Norman

On compacted soil in crevices of rocks, Dhofar mountains, Jebal Samhan, c. 1200 m, Gallagher 6713 (E); on calcareous rocks, Gallagher 8496/1 (ON) IMI 355207. Also recorded from northern Oman, Musandam mountains, c. 1200 m from soil in crevices (Mandaville 1975).

Ref. Abu-Zinada et al. 1986, p. 16, fig. 22.

Dirina massiliensis Durieu et Mont.

Syn.: *Dirina massiliensis* fo. *sorediata* (Müll.- Arg.) Tehler.

On north-facing exposed limestone cliffs, Jebel Suyawr, Masirah Island, c. 50 m, Rappenhöner OM91-240,-241a (B); Jebal Suwayr, 50 m, Gallagher 8472/18 (ON). Also recorded from Socotra (Mies 1994).

Dirinaria picta (Swartz) Clem. & Shear

On twigs of *Prosopis cineraria* tree, Jiddat al Harasis, limestone plateau, c. 150 m, Gallagher 8555 (ON) IMI 362060. Also recorded from Socotra (Mies 1994).

Fulgensia fulgens (Sw.) Elenkin

On compact soil, under rock overhang and shaded crevices, northern mountains, Jebel al Akhdhar, 1400 m, Ghazanfar 1578 (Herb. Ghazanfar).

Ref. Abu-Zinada et al. 1986, p. 16, fig. 25.

Fulgensia subbracteata (Nyl.) Poelt

On rocks, As Sayh, Musandam mountains, 1100 m, Gallagher 6716/1 (E).

Gloeoheppia turgida (Ach.) Gyeln.

On silty limestone rocks, Masirah Island, c. 30 m, Rappenhöner OM91-58 (B).

Ref. Abu-Zinada et al. 1986, p. 17, fig. 26.

cf. **Hymenelia prevostii** (Duby) Krempelh.

On rocks, wadi adjacent to Barr al Hikman, c. 50 m, Rappenhöner OM91-138d (B).

Lecanora lisbonensis Samp.

On calcareous stones on north-face of limestone hill, eastern Oman, island in Khawr Jaramah, west of Ras al Hadd, 20 m, Gallagher 8465 (ON), IMI 355202.

Physcia aff. **stellatis** (L.) Nyl.

On bark of *Acacia tortilis* trees, Jiddat al Harasis, limestone plateau, c. 150 m,

Ghazanfar 1580b (Herb. Ghazanfar); on *Acacia tortilis,* Jaluuni, Jiddat al Harasis, 154 m, Gallagher 8563 (ON) IMI 362062.

Physcia tribacioides Nyl.

On branches of *Acacia* sp., in the fog-affected escarpment mountains, Dhofar mountains, Jebel Samhan, 1200 m, Gallagher 8496/5 (ON) IMI 355200.

Polycoccum opulentum (Th. Fr. et Almq.) Arnold

Crustose lichen on *Verrucaria* sp., exposed limestone cliffs, Masirah Island, c. 30 m, Rappenhöner OM91-257c (B).

Psora decipiens (Hedw.) Hoffm.

(Syn: *Lecidea decipiens* (Hedw.) Ach.)

On sheltered, compact soil and sand, throughout the northern and southern mountains, from 1500-2000 m; common. Northern mountains: on soil exposed to the sun, Jebel al Akhdhar, nr. Birkat Sharaf, 2300 m, April 1975, J.P. Mandaville Jr. (BM); Ghazanfar 1577 (Herb. Ghazanfar); Musandam mountains, Jebel Harim, Gallagher 6701/13 (E), 6704/1 (E), 8288 (ON) IMI 355210. On dry soil, Dhofar mountains, Jebel Samhan, limestone plateau, 1200 m, 8496/3 (ON) IMI 355205.

Ref. Abu-Zinada et al. 1986, p. 20, fig. 49.

Ramalina duriaei (de Not.) Bagl.

On bark of *Acacia tortilis* trees, Jiddat al Harasis, limestone plateau, c. 150 m, Ghazanfar 1579 (Herb. Ghazanfar), 1580c (Herb. Ghazanfar); on E side of trees, Wadi Ghudun, Sahil Jazir coast, Gallagher 6763/19 (E).

Ramalina fragilissima Krog

On calcareous rocks and stones and woody stems of shrubs on the northeast- to northwest-facing slopes, Al Hallaniyah Island, 340 m, Gallagher 6602/20 (holotype: E; isotype: BM, O). Endemic to Oman. (Dichotomously branched, fluticose thallus, dull grey-green. Resembles *R. dendriscoides* var. *nodulosa* Müll.-Arg., which was described from Socotra, but differs in the lack of true soralia and presence of salazinic and seikikaic acid, Krog 1983).

Ramalina lacera (With.) Laundon

On *Acacia tortilis* trees, Jiddat al Harasis, central limestone plateau, c. 154 m, Gallagher 8563 (ON) IMI 362062; on bark and twigs of *Prosopis cineraria* trees, Wahibah Sands, c. 50 m. Cope 38a (K, ON) IMI 303050a.

Ramalina cf. **subfarinacea** J. Steiner

On north-facing exposed limestone cliffs, Masirah Island, c. 50 m, Ghazanfar 1390, (Herb. Ghazanfar) IMI 351077, 1582 (ON).

Roccella balfourii Müller Arg.

On north-facing exposed limestone cliffs, Masirah Island, c. 35 m, Rappenhöner OM91-21 (ON), OM91-247 (B). Recorded earlier to be endemic to Socotra (Mies 1994).

Roccella phycopsis Ach.

On north-facing exposed limestone cliffs, Masirah Island, c. 50 m, Ghazanfar 1388 (Herb. Ghazanfar) IMI 351076, 1583 (ON).

Roccella tinctoria DC.

On north-facing exposed limestone cliffs, Masirah Island, c. 50 m, Ghazanfar 1387 (Herb. Ghazanfar) IMI 351075, 1581 (ON); Jebal Suwayr, Masirah Island, Gallagher 8472/19 (ON) IMI 355209a. Also recorded from Socotra (Mies 1994).

Roccellographa cretacea J. Steiner

On north-facing exposed limestone cliffs, Masirah Island, c. 35 m, Rappenhöner OM91-248a (B), Jebel Suwayr, on exposed limestone cliffs, Masirah Island, c. 50 m, Gallagher 8472/18 (ON), 6252/16 (BM). Described from Abdalkuri and earlier known only from there and Socotra (Mies 1994).

Simonyella variegata J. Steiner

On north-facing exposed limestone cliffs, Jebel Suwayr, Masirah Island c. 50 m, Ghazanfar 1389 (Herb. Ghazanfar) IMI 351077, 1580 (ON); Rappenhöner OM91-243, -245 (B), OM91-246 (ON), OM91-59 (B). Gallagher 8472/19 (ON) IMI 353209b; exposed limestone cliffs, Al Hallaniyah Island, Gallagher 6252/15 (E). Described from Abdalkuri and earlier known only from there and Socotra (Mies 1994).

Squamarina concrescens (Müll. Arg.) Poelt

On compact soil, under rock overhangs, northern mountains, Jebel al Akhdhar, c. 1000 m, Ghazanfar 1573 (Herb. Ghazanfar).

Ref. Abu-Zinada et al. 1986, p. 21, fig. 54.

Squamarina gypsacea (Sm.) Poelt

On soil on rocks, northern mountains, Jebel al Akhdhar, nr. Birkat Sharaf, 2300 m, April 1975, J.P. Mandaville Jr. (BM).

Squamarina lentigera (Weber) Poelt

On rocks, Musandam mountains, c. 420 m, Gallagher 6704/1 (E).

Teloschistes villosus (Ach.) Norman

On branches of *Euphorbia balsamifera* subsp. *adenenis,* on the fog-affected escarpment mountains, Dhofar mountains, Jebel Samhan, 1200 m, Gallagher 8496/2 (ON)

IMI 355206; on branches of *Euphorbia balsamifera* subsp. *adenenis,* Jebal Samhan, Ghazanfar 2536 (Herb. Ghazanfar).

Ref. Abu-Zinada et al. 1986, p. 21, fig. 55.

Toninia albomarginata Lesd.

On soil on rocks, northern mountains, Jebel al Akhdhar, nr. Birkat Sharaf, 2300 m, April 1975, J.P. Mandaville Jr. (BM).

Toninia diffracta (Massal.) Zahlbr.

On soil, under rock, northern mountains, Jebel al Akhdhar, c. 2000 m, A.S. Gardner G. 1576 (Herb. Ghazanfar).

Xanthoria parietina (L.) Th. Fr.

On bark of *Acacia tortilis,* Jiddat al Harasis, limestone plateau, c. 150 m, Ghazanfar 1580a (Herb. Ghazanfar); on bark of *Salvadora persica,* Wahibah Sands, c. 50 m, common, Cope 77a (K, ON) IMI 303051a; on bark of *Prosopis cineraria,* Wahibah Sands, c. 50 m, Cope 40b (K, ON) IMI 303052b; K.A. Neivens s.n. (E).

Ref. Abu-Zinada et al. 1986, p. 22, fig. 60.

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