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Lichens of Bahrain

Abstract

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The desert regions of Bahrain island were surveyed for lichens. Although only seven, all crustose, species were found, most of them occurred in all or most of the investigated areas. The presence of one lichenicolous fungus species, *Intralichen christiansenii,* is also recorded.

Introduction

Since Lamb (1936), recording six species, there have been no papers on the lichen flora of Bahrain or of the eastern part of Saudi Arabia. In fact, relatively little is known about the lichen flora, habitats and diversity of large tracts of the Arabian Peninsula and there is no comprehensive treatment, despite the sporadic surveys over the past 30 years in Saudi Arabia (Abu-Zinada & Hawksworth 1975, Abu-Zinada & al. 1986, Kürschner 1984, Bokhary & al. 1993), Oman (Ghazanfar & Rappenhöner 1994, Kürschner & Ghazanfar 1998, Ghazanfar & Gallagher 1998, Brown & al. 2002), Kuwait (Brown 1998, Schultz & al. 2000), Qatar (Babikir & Kürschner 1992) and Yemen (Mies 1994, Schultz 1998, Sipman 2002, Mies & Schultz 2004, Schultz & Mies 2003). These studies collectively record more than 230 lichen species for the Arabian Peninsula.

Materials and methods

Lichens were collected from January to May 2004 during surveys in the central and southern parts of Bahrain island by the first author and identified by the second author; representative material is deposited in the herbarium of the Adviesbureau voor Bryologie en Lichenologie (ABL) and the Mycology Herbarium of the Department of Biology, University of Bahrain. All lichens were identified on the basis of morphological characters and spot reactions, and were compared to those of Lamb (1936).

Location

The Kingdom of Bahrain is an island group located off the central southern shores of the Arabian Gulf (26°00'N, 50°33'E). The archipelago comprises 33 natural, low desert islands, with a total

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land area of about 707 km^2. The largest of these, accounting for nearly 85 % of the total area of the Kingdom, is Bahrain island. Its barren desert is interspersed with outcrops of limestone, which form low rolling hills, stubby cliffs and shallow ravines. The limestone is covered by saline sand, capable of supporting salt tolerant shrubs, grasses and a few trees.

Bahrain, like most of the coastal mainland of the Arabian Peninsula, has a climate, characterised by mild winters with scanty rainfall (mean 9.3 mm, usually between October and April) and hot, humid, rainless summers. The mean annual temperature is 27.4 °C, with a mean daily maximum from May to August of 34.1 °C, and a December to March mean daily minimum of 19.5 °C. Evaporation is generally high, the highest and lowest recorded means in June and January being 12.5 mm and 4.05 mm respectively. Solar radiation is usually high with over 300 sunny days throughout the year. Relative humidity is often high, with daily means in January and May of 69.5 % and 49.5 % respectively. Winds that are usually damp, known as Shamals, blow from the north and northwest, with an average speed of 8.95 knots hr^{-1}; those that are hot and dry, known as Quws, blow from the southwest with an average speed of 8 knots hr^{-1}.

Lichen habitats and distribution

On the main island of Bahrain five physiographic zones can be recognized (Doornkamp & al. 1980). The lichen species reported here come from three of these, namely the Central Plateau and Jabals, the Interior Basin and Main Blackslope. The Central Plateau and Jabals, a denuded dome consisting mostly of sedimentary dolomitic limestone rocks in the centre of the island has a number of steep-sided and flat-topped residual hills, and rises to a maximum elevation of 122.4 m above sea level. The Interior Basin, an asymmetrical ring of lowlands that surrounds the Central Plateau, is formed of clay and silt towards the centre, but elsewhere fans of debris composed of sands, silt and gravel form the basin floor. Winter rain often results in run-off in channels and extensive sheets of standing water in the marginal depressions of the Basin can occur. The Main Backslope is a monotonous landscape with shallowly incised valleys. Lichen collections in this zone were mainly from 4000-year old man-made burial mounds of the Dilmun Empire, a civilization thought to have extended for over 800 km along the southern shore of the Arabian Gulf, from Mesopotamia in the north to Qatar in the south. More than 100 000 mounds are thought to have been constructed, ranging in size from 2 m diam. by 1.2 m high to 10 m diam. by 6 m high, and are composed of silt, gravel, limestone and boulders derived from debris of adjacent areas (Doornkamp & al. 1980).

Only crustose lichens were found, on dolomite limestone, rocks or exposed bedrock crevices with few on granite and igneous or stony regolith (Table 1). No lichens were noted on bare soil, salt crusts or coastal sea shores or cliffs. Weathered pavement stones in a silt matrix were often colonized by lichens, which became obvious only immediately after precipitation. In the Dilmun mound fields (Main Blacklope) and Central Plateau, lichens preferred the slightly more shady, moist and cool northern side. In low-lying desert locations, lichens are distributed in rather large discrete but randomly distributed communities at elevations of 20-30 m. Higher population and

Table 1. Occurrence of lichens in desert habitats in Bahrain. Frequency: +++ (high), ++ (medium), + (low), – (absent). Substrata: DL (dolomitic limestone), G (granite), SR (stony regolith)

Lichen species	Substratum	Central Plateau	Interior Basin	Main Blackslope
Buellia tesserata Körb.	DL	+	++	+++
Caloplaca aurantia (Pers.) J. Steiner	DL / SR	–	+++	+
Caloplaca lithophila Magn.	DL / G	+	+	+
Caloplaca variabilis (Pers.) Müll. Arg.	DL	+	++	+++
Lecania turicensis (Hepp.) Müll. Arg.	DL	+	++	–
Peltula obscurans (Nyl.) Gyelnik	DL	+	++	++
Psorotichia schaereri (Massal.) Arnold	DL / SR	+++	+++	+++

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species diversity have been encountered in areas with winter water channels in the Interior Basin and between burial mounds where the soil is mostly sandy or sandy loam. Communities with *Caloplaca* spp. and *Psorotichia schaereri* are well developed and dominate over other lichen species.

Discussion

The lichen biodiversity in the investigated areas is remarkably low, with only seven, all crustose, species recorded. Moreover, many specimens of *Peltula obscurans* and *Psorotichia schaereri* were heavily infested with the lichenicolous fungus *Intralichen christiansenii* (D. Hawksw.) D. Hawksw. & M. S. Cole (Hawksworth & Cole 2002). The species composition shows remarkably little correlation with the substratum type. Even the differences between more acidic and more basic rock types are not expressed by the lichen vegetation. The reason is most probably the omnipresence of a fine dust layer, which enables lichen growth of both usually basic and usually siliceous assemblages.

Most species occurred in all or most of the investigated areas; all species are new records for the country. None of the six lichens (including four macrolichens) reported by Lamb (1936) have been found, which may suggest that the lichen flora has been impoverished over the recent decades due to disturbance by winter season camping, recreational activities, animal grazing, reclamation and urbanization. However, since many potential collection localities are either inaccessible or restricted now, it should be emphasized that the limited species recovery is perhaps an outcome of a rather confined survey area and a limited number of collecting trips to only a few localities.

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