New records for the flora of the United Arab Emirates

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Abstract

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Botanical collections in the United Arab Emirates (UAE) and adjacent areas in Oman over the last three years have revealed the presence of 50 spontaneously occurring species of angiosperms new to the UAE, representing about 6 % of the known UAE flora. Of these, *Roemeria refracta,* and a further species, *Plantago stocksii,* found near the UAE border in Oman, were not previously recorded for the Arabian Peninsula.

Introduction

Scientific work on the flora, vegetation and habitats of the United Arab Emirates (UAE) commenced only recently, and Jongbloed (1987) and Western (1989) were the first monographs on the wildlife of the UAE (Böer & Al-Ansari 1999). Western (1989) gave 501 species of higher plants for the UAE and additional species have been reported by Karim (1991-93, 1995), Böer (1997b), Böer & Eschmann-Grupe (1996) and Feulner (1997). Jongbloed (unpubl. checklist 1996) listed 583 species and with the most recent additions a total of approximately 800 higher plants species are currently known from the UAE (Jongbloed, pers. comm. October 1999). However, the higher plant flora of the country is still incompletely known. Even worse is the knowledge of the non-vascular cryptogams. Bryologically, the UAE remains one of the countries where only very limited information is available. Frey & Kürschner (1988) listed only five species, new records by Kürschner & Böer (1999) increase the total number of known species to 22 (seven liverworts, 15 mosses). The most comprehensive work on marine algae in the Arabian Gulf is that by Clerck & Coppejans (1994). However, their studies were conducted in Saudi Arabian waters, including only fragmentary information on the seagrass beds, marine and freshwater algae of the UAE.

To increase the knowledge of the flora of the UAE, between 1994 and 1996 various areas representing the major ecosystems of the UAE (Roshier & al. 1996) were systematically surveyed for plant species by the authors. We included adjacent areas in Oman in our surveys, as plants that occur there are likely to occur also in similar habitats within the UAE. In this paper we present the new records of angiosperms made on these surveys.

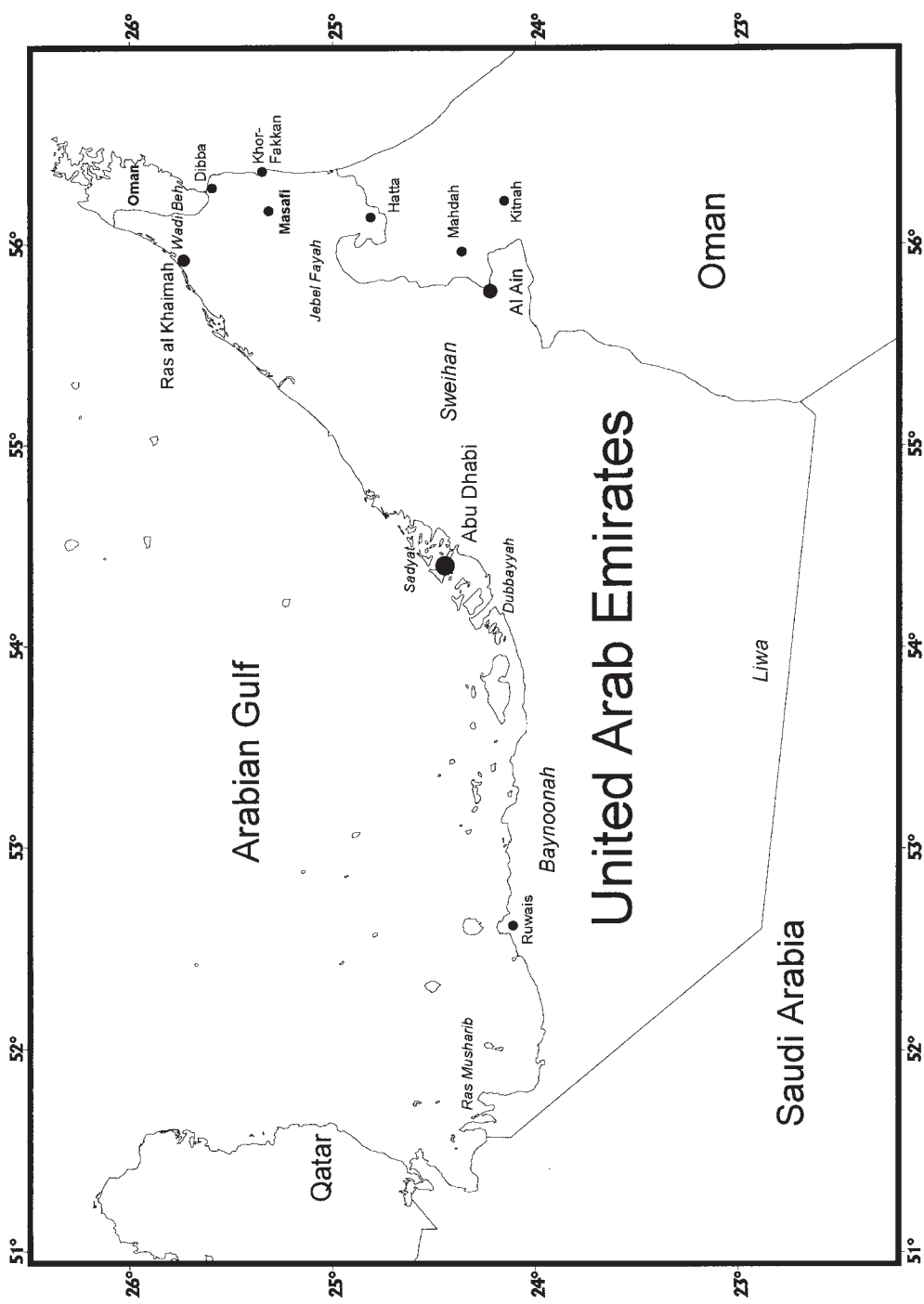

Fig. 1. The United Arab Emirates and adjacent areas in Oman investigated.

The study area

The climate of the UAE is hyperarid and within the country there are different bioclimatic zones (Böer 1997a). In the north-eastern areas there are higher mean precipitation rates and lower temperatures relative to the southern and western regions. The highest mean annual precipitation, i.e. 166 mm, is recorded from Masafi in the north-east and only traces of rain are recorded from Bu Hasa in the south-west of the country. The mean annual temperatures range from 26.8 ºC in the north-eastern mountains to 28.1 °C at the east coast. The temperatures throughout the year range from a minimum of < 5 ºC in the central desert in the winter to a maximum of 49 ºC in the summer.

The geomorphological conditions characterising the UAE have been described by Böer & Gliddon (1997). In short, four major land form classes occur: sand sheets, gravel plains, saline flats and mountains, each with characteristic vegetation adapted to the local soil conditions. The soils are generally nutrient poor.

Important anthropogenic factors influencing the composition of the country's ecosystems are the urbanization together with traditional and modern grazing practices as well as marine pollution (Böer 1998).

Phytogeographically, the UAE participates in two different regions. According to the system proposed by White (1983) and extended by Léonard (1989) and White & Léonard (1991), the western region of the UAE, approximately west of a line drawn between Abu Dhabi and the border-triangle Oman, UAE and Saudi Arabia, belongs to the Saharo-Sindian regional zone. It is characterized on the Arabian Peninsula by, e.g., *Calligonum* spp., *Cornulaca* spp., *Haloxylon salicornicum, Moltkiopsis ciliata, Neurada procumbens, Oligomeris linifolia* and *Rhazya stricta* (Miller & Cope 1996), all of which are widespread and major vegetation elements in this part of the UAE. The area to the east, where *Acacia* is widespread and where recently *Olea europaea* has also been discovered (Feulner 1997), belongs to the Somali-Masai regional centre of endemism, characterized on the Arabian Peninsula by *Acacia* spp., *Commiphora* spp., *Capparaceae, Grewia* spp. and *Olea europaea* (Miller & Cope 1996).

Material and methods

The field work was carried out between January 1994 and December 1996. The identification work was conducted simultaneously and finished in January 1997. The total study area is about 84 000 square kilometres. The investigated areas in UAE and adjacent Oman are shown on the map in Fig. 1.

Where possible, multiple specimens were collected. The collections are deposited in the herbarium of the Terrestrial Environmental Research Centre (TERC) in Abu Dhabi and the National Herbarium of Saudi Arabia in Riyadh (RIY). Some specimens were sent to the herbaria of the Cairo University (CAI), the University of Osnabrück (OSBU), the Sultan Qaboos University in Muscat (SQU) and the University of Kassel (KAS).

Chaudhary & Cope (1983), Collenette (1985), Cope (1985), Chaudhary (1989), Western (1989) and Mandaville (1990) were used for the identification of the taxa. We also used an unpublished plant checklist by Jongbloed of 1996.

New records

Our studies revealed a total of 51 new records of spontaneously occurring angiosperms. Two of these were not previously recorded for the Arabian Peninsula, viz. *Roemeria refracta* DC. found in the UAE and *Plantago stocksii* Boiss. ex Decne. found in Oman near the border to UAE. The latter species can be expected to occur in the UAE too. A total of 50 species (about 6 % of the known UAE flora) are new to the UAE, increasing the number of documented higher plant species to some 800.

Unless otherwise indicated, the material was determined by S. Chaudhary & B. Böer. The taxa new to the Arabian Peninsula are marked with an asterisk (*). The habitats are coded as follows:

SS = sand sheets
G = gravel plain
M = mountains
SF = saline flats
R = ruderal places
I = intertidal zone

Dicotyledoneae

Aizoaceae

Sesuvium sesuvioides (Fenzl) Verdc. – UAE, Abu Dhabi International Airport area, I, *Böer,* det. S. Ghazanfar (SQU, herb. TERC).

Sesuvium portulacastrum L. – UAE, Sweihan Research Station, R, *Böer,* det. H. Lieth (herb. TERC).

Boraginaceae

Heliotropium strigosum (Forssk.) Willd. – UAE, Jebel Fayah, G, M, *Chaudhary & Böer* (RIY 16478).

Brassicaceae

Cakile arabica Velen. & Bornm. – UAE, Wadi Beh, M, *Chaudhary & Böer (*RIY 16323, herb. TERC 1593).

Caryophyllaceae

Arenaria serpyllifolia L. – UAE, Wadi Beh, M, *Chaudhary & Böer* (RIY 16378, herb. TERC 594).

Polycarpon tetraphyllum (L.) L. – UAE, Dibba, G, *Chaudhary & Böer* (RIY).

Pteranthus dichotomus Forssk. – UAE, Wadi Beh, M, *Chaudhary & Böer* (RIY).

Chenopodiaceae

Cornulaca arabica Botsch. – UAE, Liwa area, SS, *Böer,* det. B. Böer (herb. TERC).

Salicornia europaea L. – UAE, Umm al Quwain, SF, *Böer & Lieth,* det. H. Freitag (KAS, herb. TERC).

Salsola cyclophylla Bak. – UAE, Ras Musharyb and on Dubbayyah, SF, *Böer,* det. S. Chaudhary (RIY, herb. TERC 600).

Salsola drummondii Ulbrich – UAE, Ruwais and Ain al Fayda, SF, *Böer & Roshier,* det. B. Böer & D. Roshier (herb. TERC 248); UAE, Ras Al Khaimah, SF, *Chaudhary & Böer* (RIY 16478).

Suaeda maritima (L.) Dumort. – UAE, Rafiq Island and Ras al Khaimah beach, SF, *Böer,* det. B. Böer (OSBU).

Compositae

Artemisia cf. *oliveriana* J. Gay ex Besser – UAE, Wadi Beh, M, *Böer & Chaudhary,* det. S. Chaudhary (RIY 16341, herb. TERC 573).

Pulicaria cf. *arabica* (L.) Cass. – UAE, Hatta area, M, *Chaudhary & Böer* (RIY).

Crassulaceae

Crassula alata (Viv.) A. Berger – UAE, Wadi Beh, M, *Chaudhary & Böer* (RIY 16234, herb. TERC 517, 577).

Sedum hispanicum L. – UAE, Wadi Beh, M, *Chaudhary & Böer* (RIY 16355, herb. TERC 597).

Umbilicus horizontalis (Guss.) DC. – UAE, Wadi Beh, M, *Chaudhary & Böer* (RIY 16387).

Cucurbitaceae
Luffa cf. *acutangula* (L.) Roxb. – UAE, close to the Ruwais sewage farm, R, *Chaudhary & Böer* (RIY).

Fabaceae
Indigofera colutea (Burm.f.) Merrill – UAE, Wadi Beh, SS, *Chaudhary & Böer* (RIY).
Indigofera spinosa Forssk. – UAE, Wadi Beh, SS, *Chaudhary & Böer* (RIY).
Ononis sicula Guss. – UAE, Wadi Beh, M, *Chaudhary & Böer* (RIY 16349).
Tephrosia purpurea (L.) Pers. – UAE, Jebel Fayah, M, G, *Chaudhary & Böer* (RIY 16486).

Papaveraceae
**Roemeria refracta* DC., UAE, Wadi Beh, A, M, *Chaudhary & Böer* (RIY 16372, herb. TERC 554).

Plantaginaceae
**Plantago stocksii* Boiss. ex Decne. – UAE, Oman, Wadi Kitnah area, A, M, G, *Chaudhary & Böer* (RIY 16309).

Rubiaceae
Galium tenuissimum M. Bieb. – UAE, Hatta area, M, *Chaudhary & Böer* (RIY 16392).
Valantia hispida L. – UAE, Wadi Beh, M, *Chaudhary & Böer* (RIY 16325).

Umbelliferae
Daucus subsessilis Boiss. – UAE, Wadi Beh, M, *Chaudhary & Böer* (RIY 16206).
Pimipinella schweinfurthii Asch. – UAE, Hatta area, M, *Chaudhary & Böer* (RIY 16389).
Pimpinella puberula (DC.) Boiss. – UAE, Hatta area, M, *Chaudhary & Böer,* det. Chaudhary (RIY 16497).

Verbenaceae
Vitex agnus-castus L. – UAE, Wadi Shams, M, *Böer,* det. S. Ghazanfar & B. Böer (SQU).

Zygophyllaceae
Fagonia schweinfurthii (Hadidi) Hadidi – UAE, Wadi Beh, M, *Böer,* det. N. El Haddidi & al. (CAI).
Tribulus bimucronatus var. *inermis* (Kralik) H. A. Hosni – UAE, Dibba area, G, R, *Chaudhary & Böer* (RIY, herb. TERC 353).
Zygophyllum mandavillei Hadidi – UAE, Sweihan, SS, *Böer,* det. N. El Haddidi & al. (CAI, herb. TERC 53B, 103).
Zygophyllum boulosii A. I. Hosny – UAE, east coast, SS, *Böer,* det. N. El Haddidi & al. (CAI).

Monocotyledoneae

Cymodoceaceae
Halodule uninervis (Forssk.) Asch. – UAE, Sadyat Island, I, *Böer* (RIY, herb. TERC 350).

Cyperaceae
Cyperus rubicundus Vahl – UAE, Ras al Khaimah beach, SF, *Chaudhary & Böer* (RIY 16395).

Hydrocharitaceae
Halophila ovalis (R. Br.) Hook.f. – UAE, Sadyat Island, I, *Böer* (RIY 16201, herb. TERC 351).

Najadaceae
Najas marina L. – UAE, Khor Fakkan dam, lake, *Böer,* det. S. Ghazanfar & B. Böer (SQU).

Poaceae
Aeluropus littoralis (Gouan) Parl. – UAE, Ras al Khaimah beach, SF, *Chaudhary & Böer* (RIY 16394).

Cymbopogon jwarancusa subsp. *olivieri* (Boiss.) S. Soenarko – UAE, Wadi Beh, M, *Chaudhary & Böer* (RIY 16312, 16451, herb. TERC 565, 570).
Eragrostis aspera (Jacq.) Nees – UAE, Dibba area, G, R, *Chaudhary & Böer* (RIY 16432, herb. TERC 121).
Eragrostis plumosa (L.) Munro ex T. Anderson – UAE, *Chaudhary & Böer BB 35B* (RIY).
Eriochloa cf. *nubica* (Steud.) Hack. & Stapf – UAE, *Chaudhary & Böer* (RIY).
Gastridium phleoides (Nees & Meyen) C. E. Hubb. – UAE, Wadi Beh, *Chaudhary & Böer* (RIY, herb. TERC 146).
Paspalum scrobiculatum L. – Ruwais, UAE, *Chaudhary & Böer BB 110C* (RIY).
Pennisetum orientale L. C. Rich. – UAE, *Chaudhary & Böer* (RIY).
Poa sinaica Steud. – UAE, Wadi Beh, M, *Chaudhary & Böer* (RIY 16313, herb. TERC 516).
Stipagrostis drarii (Täckh.) de Winter – UAE, Baynunah area, SS, *Norton 66A* (RIY).

Potamogetonaceae
Potamogeton lucens L. – UAE, Khor Fakkan dam, fresh water lake, *Böer,* det. S. Ghazanfar & B. Böer (SQU).
Potamogeton pectinatus L. – UAE, Ayn Al Faidah well, lake (brackish), *Böer,* det. S. Ghazanfar & B. Böer (SQU).

Zannichelliaceae
Zannichellia palustris L. – UAE, Liwa area, lake (saline), *Böer,* det. S. Ghazanfar, R. Phillips & B. Böer (SQU).

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