

Article

The Fujairah Scientific Herbarium – a new herbarium in the United Arab Emirates

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Abstract

A brief introduction to a new scientific Herbarium of United Arab Emirates in Fujairah Emirate is given and a code (FSH) is proposed for it. The Herbarium, which is situated in the quarantine zone of Wadi Wuraya National Park and Reserve, is based on the 2017–2020 collections made in Fujairah and neighbouring regions of the UAE and Oman, and currently includes ca. 6000 specimens. It contains up to 80–90% of the species previously listed for Fujairah, as well as those not previously listed. The article also provides a general summary of the Fujairah flora and a list of genera and families represented in the Fujairah Scientific Herbarium.

Keywords: botany, flora of Arabia, Fujairah Emirate, new herbarium, United Arab Emirates

Introduction

The authors of the current paper have been actively researching the flora of the Emirate of Fujairah in the United Arab Emirates (UAE) during 2017–2020. At least 60 different places in the emirate were visited (Figs. 1–7 in Appendix 2) and field studies of native and alien plants carried out and herbarium specimens prepared for each of the surveyed areas.

As a result, ca. 11000 specimens with duplicates were prepared. Some of these collections are now stored at the Komarov Botanical Institute of RAS, St. Petersburg (LE; herbarium codes as in Thiers, 2020) and approximately 3000 will be transferred in the future. About 6000 original collections and duplicates collected during 2018–2020 are preserved in Fujairah, where they are organized in a new herbarium – The Fujairah Scientific Herbarium with the proposed code FSH, which is not yet used in Index Herbariorum, <http://sweetgum.nybg.org/science/ih/> although the authors of the current paper plan to register it.

Until now, there have been only two herbaria in UAE officially registered in IH: the Herbarium of UAE University (ABDH) and that of the Environmental Agency in Abu Dhabi

(AED, <https://www.ead.ae/arabic/SitePages/Home.aspx>). The AED contains 5000 specimens of higher plants and was founded in 2001. Important collections by S. Sakkir, M.A. Mehairbi and G.M. Brown, mainly from Abu Dhabi, are deposited there. The ABDH with its 22000 specimens of higher plants was founded in 1979 and holds important collections by M.T. Moussa from UAE. In addition to the two herbaria mentioned above, there is a smaller herbarium without a registered code in Sharjah, the Sharjah Seed Bank & Herbarium.

The United Arab Emirates is located in the southeast of the Arabian Peninsula with an area of 83600 square kilometers. The country is mostly desert with massive sand dunes and scattered oases. The Hajar Mountain Range lies in the northeast, and this is where Fujairah, one of the seven emirates, is situated (Fig. 2).

The new Fujairah Scientific Herbarium (FSH)

The new Fujairah Scientific Herbarium (FSH), is located in the quarantine zone at Wadi Wuraya National Park and Reserve (Fig. 2), 4.5 km northwest of Khor Fakkan and 80 km north of Fujairah ($25^{\circ}23'26.55''N$, $56^{\circ}18'18.81''E$). The quarantine area is near the office of Wadi Wurayah National Park, 2.5 km east of Al Haray, 5 km southwest of Al Bidya, Fujairah Emirate and 4.5 km northwest of Khor-Fakkan, Sharjah Emirate, UAE. The Herbarium Manager at the FSH is Mikhail V. Korshunov. Herbarium specimens are deposited in one of the buildings in Wadi Wuraya National Park and Reserve (Figs. 8–12). The plants were collected by the authors of the current paper from the following places in Fujairah and its surroundings: Bidiyah, Al Qidfa, Al Gurfa, Masafi, Al Qurraya, Al Siji, Al Fujairah, Al Tawyeen, Al Halah, Al Bathnah, Sharm, Dibba Fujairah, Al Ferfar, Al Aqah, Al Hail, Rul Dadnah, Mirbah, Al Taiba and Awhala, as well as the large wadis (valleys): Wadi Wurayah, Wadi Saham, Wadi Al Hayl, Wadi Tayybah, Wadi Siji, Wadi Al Hilo and Wadi Al Ayn Ghamour. In addition, there are collections from other emirates – Sharjah (Khor-Fakkan and outskirts of Sharjah and of Kalba), Ras al-Khaimah (Persian Gulf Coast and Mazafi), Ajman (Manama), Sharjah enclave in Oman enclave (Madha Village, Nakhwa) as well as collections from the enclave of Oman proper (i.e., foreign herbarium). Altogether, ca. 6000 specimens have been added to the herbarium.

The new scientific herbarium most completely represents the flora of Fujairah and is undoubtedly of great value as a regional herbarium. Herbarium collections of 2017–2019 revealed the previous paucity of knowledge of the flora of the Emirate. As of today, we have identified at least 200 alien (adventive) and dozens of native species for the flora of the Emirate (unpublished data), and each new botanical excursion supplements and refines this list. All

genera and families represented in the FSH are listed in Appendix 1 in accordance with APG IV (2019), and some of the plants are illustrated in Appendix 2 (Figs. 13–25).

As for the UAE as a whole, its flora has been much better studied (Western, 1989; Boér, 2000; Jongbloed *et al.*, 2003; Karim and Fawzi, 2007). However, it appears that during the time when the floras were produced, field research in the emirate of Fujairah was practically non-existent and herbarium materials thus drastically under-represented the flora compared with the rest of the UAE. Those were preserved in Al Ain and Abu Dhabi depositories as well as in some European herbaria including a significant collection (ca. 2000 sheets) in Edinburgh (E).

The new Herbarium (FSH) contains up to 80–90% of the species previously indicated for Fujairah as well as many species that were not previously listed for this area, which makes it especially valuable for further studies of the UAE flora as a whole. It must be emphasized that it is still difficult to establish the exact number of wild plant species growing in the UAE. In the book on the native flora of the UAE, Western (1989) mentioned 501 species in the country. The publication by Jongbloed with colleagues (Jongbloed *et al.*, 2003) on the same topic counts ca. 680 species of vascular plants. Karim and Fawzi (2007) added ca. 70 taxa to the number of plants, although many of the species listed earlier by other authors were omitted from their publication. Feulner (2011) also discussed in detail the plant diversity of the UAE and listed 789 species. Later works of other researchers revealed the presence of twelve more species of flowering plants in the UAE (Mahmoud *et al.*, 2015; Shahid, 2014; Shahid, Rao, 2014a, b, 2015, 2016a, b) bringing the total to 801.

Our research has shown that this number is still much smaller than the true one. In particular, not more than 450 species of higher plants were previously listed for Fujairah in the literature. We can now estimate the flora of the Emirate Fujairah at 600 species of native and alien wild species and no less than 550 alien cultivated species (unpublished data). In addition, there is a number of very rare plants, such as *Cladium mariscus* L. (Cyperaceae) or *Epipactis veratrifolia* Boiss. & Hohen. (Orchidaceae) which is illustrated in Fig. 14. We estimate that the flora of the UAE includes at least 950–1000 species. Earlier, we published a note based on our herbarium collections and literature data and containing a preliminary analysis of the adventive fraction of the flora of Fujairah and the UAE as a whole (Byalt and Korshunov, 2018).

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Authors' contributions

Vyacheslav V. Byalt (VB) initiated the project: together with MK and VK, collected, preserved, identified and labeled plants, analysed material prepared by MK, wrote the manuscript, participated in discussion and revision of the manuscript, and coordinated the project.

Mikhail V. Korshunov (MK) together with VB and VK collected, preserved and identified plants, participated in the discussion of the manuscript, organized the herbarium.

Vladimir M. Korshunov (VK) organized and participated in the botanical excursions in UAE and discussion of the manuscript.

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Appendix 1

List of genera and families represented in the Fujairah Scientific Herbarium

The number of species is provided for each genus; genera with only cultivated species are marked with an asterisk. The names of the taxa, authors' abbreviations the nomenclatural database, International Plant Name Index (IPNI, 2020).

PTERIDOPHYTA Cronquist, Takht. & W.Zimm.

Cryptogrammataceae Pic.Serm. (*Onychium* Kaulf. – 1)

Ophioglossaceae Presl (*Ophioglossum* L. – 1).

Pteridaceae E.D.M.Kirchn. (Actiniopteridaceae Pic.Serm.) (*Actiniopteris* Link – 1, *Adiantum* L. – 1, *Cheilanthes* Sw. – 1)

CYCADOPHYTA Bessey

Cycadaceae Pers. (**Cycas* L. – 1)

Zamiaceae Horan. (**Zamia* L. – 1)

PINOPHYTA Cronquist, Takht. & W.Zimm. ex Reveal

Araucariaceae Henkel & W.Hochst. (**Araucaria* Juss. – 1)

Cupressaceae Bartl. (**Cupressus* L. – 1, **Juniperus* L. – 1, **Platycladus* Spach (*Biota* (D.Don) Endl.) – 1)

GNETOPHYTA Bessey

Ephedraceae Dumort. (*Ephedra* Tourn. ex L. – 2)

MAGNOLIOPHYTA Cronquist, Takht. & W.Zimm. ex Reveal

Classis 1. LILIOPSIDA Batsch

Araceae Juss. (**Alocasia* (Schott) G.Don – 1, *Colocasia* Schott – 1, **Epipremnum* Schott – 1)

Arecaceae Bercht. & J.Presl (Palmae Juss.) (**Caryota* L. – 1, **Chamaerops* L. – 1, **Cocos* L. – 1, **Copernicia* Mart. ex. Endl. – 1, **Livistona* R.Br. – 1, **Phoenix* L. – 2, **Rapis* L.f. ex Aiton – 1, **Roystonea* O.F.Cook – 1, **Washingtonia* H.Wendl. – 1)

Asparagaceae Juss. (Sansevieriaceae Nakai) (**Agave* L. – 2, **Asparagus* Tourn. ex L. – 1, (*Sansevieria* Thunb. – 2).

Asphodelaceae Juss. (*Aloe* L.– 1, *Asphodelus* L. – 1)

Cannaceae Juss. (**Canna* L. – 1)

Commelinaceae Mirb. (*Commelina* Plum ex L. – 1, **Tradescantia* Ruppius ex L.– 1)

Cyperaceae Juss. (*Cladium* P.Browne – 1, *Cyperus* L. – 6, *Eleocharis* R.Br. – 1, *Fimbristylis* Vahl – 3, *Schoenus* L. – 1)

Hydrocharitaceae Juss. (Najadaceae) (*Halodule* Endl. – 1, *Halophila* Thouars – 1, *Najas* L. – 1)

Juncaceae Juss. (*Juncus* L. – 1)

Musaceae Juss. (**Musa* L. – 1)

Orchidaceae Juss. (*Epipactis* Zinn – 1)

Poaceae Barnhart (Gramineae Juss.) (*Aeluropus* Trin. – 1, *Aristida* L. – 2, *Arundo* L. – 1, *Avena* L. – 2–3, *Brachiaria* (Trin.) Griseb. – 2, *Brachypodium* P.Beauv. – 1, *Bromus* L. – 1, *Cenchrus* L. (*Pennisetum* Rich.) – 6, *Chloris* Sw. – 3, *Cymbopogon* Spreng. – 2, *Cynodon* Rich. – 1, *Dactyloctenium* Willd. – 2, *Dichanthium* Willemet – 2, *Digitaria* Haller – 1, *Echinochloa* P.Beauv. – 2, *Eleusine* Gaertn. – 1, *Eragrostis* Wolf – 4–5, *Leptochloa* P.Beauv. – 2, *Lolium* L. – 1, *Ochthochloa* Edgew. – 1, *Panicum* L. – 3, *Paspalum* L. – 1, *Phalaris* L. – 1, *Phragmites* Adans. – 2, *Poa* L. – 1, *Polypogon* Desf. – 1, *Rostraria* Trin. – 2, *Saccharum* L. – 2, *Schismus* P.Beauv. – 2, *Setaria* P.Beauv. – 2, *Sorghum* Moench – 3, *Sporobolus* R.Br. – 3, *Stipellula* Röser & Hamasha (*Stipa* L. p.p.) – 1, *Stipagrostis* Nees – 2, *Tetrapogon* Desf. – 1, *Tragus* Haller – 2, *Tricholaena* Schrad. – 1, *Triticum* L. – 1, *Zea* L. – 1, *Zoysia* Willd. – 1).

Typhaceae Juss. (*Typha* L. – 1)

Classis 2 MAGNOLIOPSIDA Brongn.

Acanthaceae Juss. (*Blepharis* Juss. – 1, **Pseuderanthemum* Radlk. – 2, **Ruellia* Plum. ex L. – 2–3)

Aizoaceae Martinov (*Aizoon* L. – 2, *Glinus* L. – 2, *Sesuvium* L. – 3, *Trianthema* L. – 1, *Zaleya* Burm.f. – 1)

Amaranthaceae Juss. (Chenopodiaceae Vent.) (*Aerva* Forssk. – 1, *Alternanthera* Forssk. – 4, *Amaranthus* L. – 6, *Gomphrena* L. – 1) + (*Atriplex* L. – 3, *Bassia* All. – 1, *Beta* L. – 1, *Chenopodium* L. – 3, *Cornulaca* Delile – 2, *Haloxylon* Bunge ex Fenz – 1, *Salsola* L. – 2–3, *Seidlitzia* Bunge ex Boiss. – 1, *Suaeda* Forssk. ex J.F.Gmel. – 2)

Anacardiaceae R.Br. (**Mangifera* L. – 1)

Apocynaceae Juss. (Asclepiadaceae R.Br.) (**Adenium* Roem. & Schult. – 1, **Cascabela* Raf. – 1, *Catharanthus* G.Don – 1, *Nerium* L. – 1, **Plumeria* Tourn. ex L. – 2, *Rhazya* Decne. – 1, **Urechites* Müll.Arg. – 1) + (*Calotropis* R.Br. – 1, *Desmidorchis* Ehrenb. (*Caralluma* R.Br. p.p.) – 2, *Glossonema* Decne. – 1, *Leptadenia* R.Br. – 1, *Pentatropis* R.Br. ex Wight & Arn. – 1, *Pergularia* L. – 1, *Periploca* Tourn. ex L. – 1)

Asteraceae Bercht. & J.Presl (Compositae Giseke) (*Aegopordon* Boiss. (*Inula* L. p.p.) – 1, *Anthemis* L. – 1, *Anvillea* DC. – 1, *Artemisia* L. – 1, *Asteriscus* Moench – 1, *Atractylis* L. – 1–2, *Blumea* DC. (*Doellia* Sch.Bip.) – 1, **Calendula* L. – 1, *Carthamus* L. – 1, *Centaurea* L. – 1, *Cichorium* L. – 1, *Conyza* Less. (*Erigeron* L. p.p.) – 2, *Echinops* L. – 2, *Eclipta* L. – 1, *Filago* L. – 1–2, *Garhadiolus* Jaub. & Spach – 1, *Grantia* Griff. ex Voigt – 1, *Helichrysum* Mill. – 2, *Ifloga* Cass. – 1, *Iphiona* Cass. – 3, *Outreya* Jaub. & Spach (*Jurinea* Cass. p.p.) – 1, *Koelpinia* Pall. – 1, *Lactuca* L. – 2, *Launaea* Cass. – 7, *Parthenium* L. – 1, *Pluchea* Cass. – 2, *Pulicaria* Gaertn. – 2, *Reichardia* Roth – 1, *Scorzonera* L. – 1, *Senecio* L. – 2, *Sonchus* L. – 3, *Sphagneticola* O.Hoffm. – 1, **Tagetes* L. – 1, *Tridax* L. – 1, *Urospermum* Scop. – 1, *Verbesina* L. – 1, *Vernonia* Schreb. – 2, *Zoegea* L. – 1)

Bignoniaceae Juss. (**Handroanthus* Mattos – 1, **Tabebuia* Gomes ex DC. – 3, **Tecoma* Juss. – 1, **Tecomella* Seem. – 1, **Tecomaria* Spach – 1)

Boraginaceae G.Don (*Anchusa* L. – 1, *Arnebia* Forssk. – 1 (2?), **Cordia* L. – 1, *Echiochilon* Desf. – 2, **Ehretia* P.Browne – 1, *Heliotropium* L. – 6, *Lappula* Moench – 1, *Paracaryum* Boiss. – 1, *Trichodesma* R.Br. – 3)

Brassicaceae Burnett (Cruciferae O.E.Schulz) (*Anastatica* L. – 1, *Brassica* L. – 2, *Clypeola* L. – 1, *Coronopus* Zinn. – 1, *Diplotaxis* DC. – 1, *Eremobium* Boiss. – 1, **Eruca* Mill. – 1, *Erucaria* Gaertn. – 1 (2), *Farsetia* Turra – 3, *Lepidium* L. – 2, *Malcolmia* W.T.Aiton – 1, *Morettia* DC. – 1, *Notoceras* R.Br. – 1, *Physorhynchus* Hook. – 1, *Raphanus* L. – 1, *Savignya* DC. – 1, *Sisymbrium* L. – 3)

- Burseraceae** Kunth (*Boswellia* Roxb. ex Colebr. – 1)
- Cactaceae** Juss. (*Opuntia* Mill. – 3)
- Campanulaceae** Juss. (*Campanula* L. – 1)
- Capparaceae** Juss. (*Capparis* Tourn. ex L. – 3, *Dipterygium* Decne. – 1)
- Caprifoliaceae** Juss. (Dipsacaceae A.Juss.) (*Lonicera* L. – 1, *Scabiosa* L. – 1)
- Caricaceae** Dumort. (**Carica* L. – 1)
- Caryophyllaceae** Juss. (*Arenaria* L. – 1, *Cometes* L. – 1, *Dianthus* L. – 1, *Gymnocarpos* Forssk. – 1, *Gypsophila* L. – 1, *Herniaria* Tourn. ex L. – 2, *Paronychia* Mill. – 1, *Polycarpaea* Lam. – 3, *Polycarpon* Loefl. – 1, *Sclerocephalus* Boiss. – 1, *Silene* L. – 3–4, *Spergula* L. – 1, *Spergularia* (Pers.) J.Presl & C.Presl – 2, *Sphaerocoma* T.Anderson – 1, *Stellaria* L. – 1).
- Casuarinaceae** R.Br. (**Casuarina* L. – 1)
- Cleomaceae** Bercht. & J.Presl (*Cleome* L. – 7)
- Cistaceae** Juss. (*Helianthemum* Mill. – 3)
- Combretaceae** R.Br. (*Combretum* Loefl. – 1, *Conocarpus* L. – 2, *Terminalia* L. – 2)
- Convolvulaceae** Juss. (Cuscutaceae Dumort.) (*Convolvulus* L. – 6, *Cressa* L. – 1, *Cuscuta* L. – 3, *Ipomoea* L. – 6(7), **Jacquemontia* Choisy – 1, *Seddera* Hochst. – 1)
- Crassulaceae** J.St.-Hil. (*Bryophyllum* Salisb. – 2, *Sedum* L. – 1)
- Cucurbitaceae** Juss. (*Citrullus* Schrad. ex Eckl. & Zeyh. – 2, *Coccinia* Wight & Arn. – 1, *Cucumis* L. – 1, *Cucurbita* L. – 2, **Lagenaria* Ser. – 1, **Luffa* Mill. – 2, *Melo* Mill. – 1, *Mukia* Arn. – 1)
- Euphorbiaceae** Juss. (*Acalypha* L. – 3, *Andrachne* L. – 2, *Chrozophora* Neck. ex A.Juss. – 3, *Croton* L. – 1, *Euphorbia* L. – 9, *Jatropha* L. – 3, *Ricinus* L. – 1)
- Fabaceae** Lindl. (Leguminosae Juss.) (*Acacia* Mill. – 4, *Albizia* Durazz. – 1, *Alhagi* L. – 1, *Alysicarpus* Desv. – 1, *Argyrolobium* Eckl. & Zeyh. – 1, *Astragalus* L. – 4, **Bauhinia* Plum. ex L. – 2, *Caesalpinia* Plum. ex L. – 1, *Crotalaria* L. – 2, *Hippocratea* L. – 2, *Indigofera* L. – 4, *Leucaena* Benth. – 1, *Lablab* Adans. – 1, *Lotononis* (DC.) Eckl. & Zeyh. – 1, *Lotus* L. – 2, *Medicago* L. – 2, *Melilotus* Mill. – 2, *Parkinsonia* Plum. ex L. – 1, *Pithecellobium* Mart. – 1, *Prosopis* L. – 1, *Pseudolotus* Rech.f. – 1, *Rhynchosia* Lour. – 2, *Senna* Mill. – 4, *Sesbania* Scop. – 2, **Tamarindus* Tourn. ex L. – 1, *Taverniera* DC. – 1, *Tephrosia* Pers. – 5, *Trigonella* L. – 2)
- Frankeniaceae** Desv. (*Frankenia* L. – 1)
- Gentianaceae** Juss. (*Centaurium* Haller – 1)
- Geraniaceae** Juss. (*Erodium* L'Hér. ex Aiton – 3, *Geranium* L. – 2–3, *Monsonia* L. – 2)
- Gisekiaceae** Nakai (*Gisekia* L. – 1)
- Lamiaceae** Martinov (Labiatae Juss.) (**Clerodendrum* L. – 2, *Gmelina* L. – 1, *Lallemantia* Fisch. & C.A.Mey. – 1, *Lavandula* L. – 1, *Leucas* R.Br. – 1, *Mentha* L. – 2, *Ocimum* L. – 2, *Pleudia* Raf. – 1, *Salvia* L. – 2, *Teucrium* L. – 2, **Volkameria* L. – 1)
- Linaceae** DC. ex Perleb (*Linum* L. – 2)
- Lythraceae** J.St.-Hil. (Punicaceae Horan.) (*Lawsonia* L. – 1, *Punica* L. – 1)
- Malpighiaceae** Juss. (**Tristellateia* Thouars – 1)
- Malvaceae** Juss. (Tiliaceae Juss.) (*Abutilon* Mill. – 3, *Corchorus* L. – 4, **Gossypium* L. – 1, *Grewia* L. – 1, *Hibiscus* L. – 3, *Malva* Tourn. ex L. – 2, *Melhania* Forssk. – 1, *Sida* L. – 1, **Thespesia* Sol. ex Corrêa – 1)
- Meliaceae** Juss. (**Azadirachta* A.Juss. – 1, **Melia* L. – 1)
- Menispermaceae** Juss. (*Cocculus* DC. – 1)
- Moraceae** Gaudich. (*Ficus* Tourn. ex L. – 8, *Morus* L. – 1)
- Moringaceae** Martinov (*Moringa* Adans. – 2)
- Myrtaceae** Juss. (*Callistemon* R.Br. – 2, *Eucalyptus* L'Hér. – 1, **Myrtus* Tourn. ex L. – 1, *Syzygium* Gaertn. – 3)

- Neuradaceae** Kostel. (*Neurada* B.Juss. – 1)
- Nyctaginaceae** Juss. (*Boerhavia* Vaill. ex L. – 3, *Bougainvillea* Comm. ex Juss. – 2, *Commicarpus* Standl. – 1)
- Oleaceae** Hoffmanns. & Link (**Jasminum* L. – 3, *Olea* L. – 1)
- Orobanchaceae** Vent. (*Lindenbergia* Lehm. – 2, *Orobanche* L. – 1)
- Oxalidaceae** R.Br. (*Oxalis* L. – 3)
- Phyllanthaceae** Martinov (*Phyllanthus* L. – 3)
- Piperaceae** Giseke (*Peperomia* Ruiz & Pav. – 1)
- Plantaginaceae** Juss. (*Kickxia* Dumort. – 2, *Misopates* Raf. – 1, *Plantago* L. – 5, **Russelia* Jacq. – 1, *Schweinfurthia* A.Braun – 2)
- Plumbaginaceae** (Dyerophytum Kuntze – 1, *Plumbago* Tourn. ex L. – 1)
- Polygalaceae** Hoffmanns. & Link (*Polygala* Tourn. ex L. – 2)
- Polygonaceae** Juss. (*Emex* Neck. ex Campd. – 1, *Pteropyrum* Jaub. & Spach – 1, *Rumex* L. – 2)
- Portulacaceae** Juss. (*Portulaca* L. – 3)
- Primulaceae** Batsch ex Borkh. (*Anagallis* L. – 1, *Asterolinon* Hoffmanns. & Link – 1)
- Resedaceae** Martinov (*Ochradenus* Delile – 3, *Oligomeris* Cambess. – 1, *Reseda* Tourn. ex L. – 2)
- Rhamnaceae** Juss. (*Ziziphus* Mill. – 3–4)
- Rosaceae** Juss. (*Amygdalus* Burm. ex Kuntze – 1)
- Rubiaceae** Juss. (*Callipeltis* Steven – 1, *Galium* L. – 2, *Ixora* L. – 2, *Oldenlandia* L. – 1, *Plocama* Aiton – 2, *Pterogaillonnia* Linchevski – 1)
- Rutaceae** Juss. (*Citrus* L. – 3, *Haplophyllum* A.Juss. – 1)
- Salvadoraceae** Lindl. (*Salvadora* Garcin ex L. – 1)
- Sapindaceae** Juss. (*Dodonaea* Mill. – 1)
- Scrophulariaceae** Juss. (*Anticharis* Endl. – 1, **Leucophyllum* Bonpl. – 1, *Scrophularia* Tourn. ex L. – 2)
- Solanaceae** Juss. (**Capsicum* L. – 1, *Datura* L. – 2, *Hyoscyamus* Tourn. ex L. – 1, *Lycium* L. – 1, *Lycopersicon* Mill. – 2, *Nicotiana* L. – 1, *Physalis* L. – 3, *Solanum* L. – 7, *Withania* Pauquy – 1)
- Tamaricaceae** Link (*Tamarix* L. – 2)
- Umbelliferae** Juss. (Apiaceae Lindl.) (*Anethum* L. – 1, *Coriandrum* L. – 1, *Daucus* L. – 1, *Pimpinella* L. – 1, *Pycnocycla* Lindl. – 1)
- Urticaceae** Juss. (*Forsskaolea* L. – 2, *Parietaria* L. – 1, *Pilea* Lindl. – 1, *Urtica* L. – 2)
- Verbenaceae** J.St.Hil. (**Lantana* L. – ?)
- Vitaceae** Juss. (**Vitis* L. – 2)

Appendix 2

Figures



Figure 1. Wadi Wurraya – one of the places where active research of the Furjairah flora was carried out.
Photo by Mikhail V. Korshunov



Figure 2. Emirate Fujairah (modified from Google Maps)



Figure 3. View of Fujairah from Hadjar Mts. Photo by Mikhail V. Korshunov



Figure 4. Bottom of dry pond near Fujairah. Photo by Mikhail V. Korshunov



Figure 5. Nursery near Mazafi. Photo by Vyacheslav V. Byalt



Figure 6. Desert near Manama. Photo by Mikhail V. Korshunov



Figure 7. Wadi with springs near Al Tawiyah.



Figure 8. Quarantine zone at Wadi Wuraya Nat. Pk. & Reserve, herbarium located in foremost building. Photo by Mikhail V.Korshunov.



Figure 9. Quarantine zone at Wadi Wuraya Nat. Pk. & Reserve. Photo by Mikhail V. Korshunov



Figure 10. Inside the Herbarium. Photo by Mikhail V. Korshunov



Figure 11. Folders with herbarium specimens. Photo by Mikhail V. Korshunov



Figure 12. Scorpion found in herbarium folder. Photo by Mikhail V. Korshunov



Figure 13. V.M. Korshunov in front of *Handroanthus chrysanthus* (Jacq.) S.O.Grose cultivated in park near Fujairah Government Building. Photo by Mikhail V. Korshunov



Figure 14. The rarest plant in Fujairah Emirate, the only orchid species in UAE – *Epipactis veratrifolia* Boiss. & Hohen. found only in Wadi Wuraya. Photo by Vyacheslav V. Byalt.



Figure 15. *Calotropis procera* (Aiton) W.T.Aiton in desert near Sharji. Photo by Vyacheslav V. Byalt



Figure 16. *Convolvulus virgatus* Boiss. in Wadi Wuraya. Photo by Vyacheslav V. Byalt



Figure 17. Rare plants *Epipactis veratrifolia* Boiss. & Hohen. and *Adiantum capillus-veneris* L. in Wadi Wuraya. Photo by Vyacheslav V. Byalt



Figure 18. *Ficus johannis* Boiss. in wadi on border of Ras al-Khaima and Fujairah Emirates.
Photo by Mikhail V. Korshunov



Figure 19. *Moringa peregrina* (Forssk.)
Fiori in wadi on border of Ras al-Khaima and Fujairah Emirates. Photo by
Mikhail V. Korshunov



Figure 20. *Rumex vesicarius* L., very common species in Hadjar Mts. Photo by Mikhail V. Korshunov

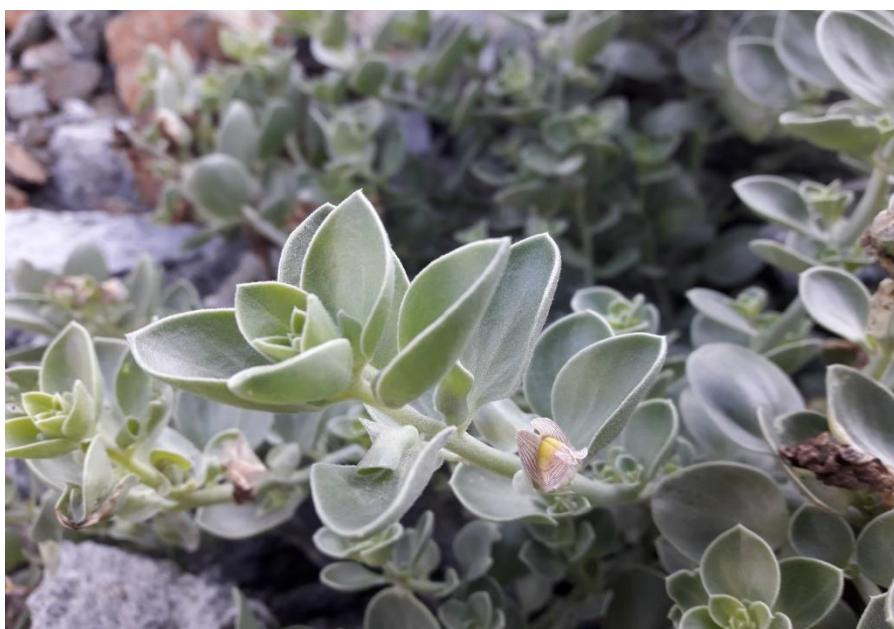


Figure 21. *Schweinfurthia papilionacea* (L.) Boiss. Hadjar Mts. Photo by Mikhail V. Korshunov



Figure 22. *Senna italica* Mill. in Wadi Wuraya. Photo by Vladimir M. Korshunov



Figure 23. *Silene villosa* Forsk. in desert. Photo by Vladimir M. Korshunov



Figure 24. *Zaleya pentandra* (L.) C.Jeffrey, common species in lower parts of Hajar Mts. Photo by Mikhail V. Korshunov



Figure 25. Wasteland near Furjairah overgrown with invasive *Prosopis juliflora* (Sw.) DC. Photo by Mikhail V. Korshunov.