New records of three species of Asteraceae in Fujairah, United Arab Emirates

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Received: 5 November 2020 | Accepted by: Alexander Sennikov 12 December 2020 | Published online: 16 December 2020

Edited by: Keith Chamberlain

Abstract
A brief report on the discovery of three newly recorded species of Asteraceae, Anthemis odontostephana Boiss., Jurinea berardioides (Boiss.) O.Hoffm. and Jurinea carduiformis Jaub. & Spach, in Fujairah, United Arab Emirates (UAE) is given. Two species, J. berardioides and J. carduiformis, are reported as new to the UAE. Diagnostic characters and distributions of the studied species are provided.

Key words: Anthemis, Asteraceae, Compositae, Flora of Fujairah, Jurinea

Introduction
This work is a part of the project, Flora of Fujairah, UAE, under a cooperation agreement between the Office of the Crown Prince of Fujairah and the Komarov Botanical Institute of the Russian Academy of Sciences, St. Petersburg. The project is divided into five stages: (1) – field observations and collecting herbarium material; (2) – organizing the new Herbarium of Fujairah; (3) – identification of the collected plants and publishing new records for Fujairah; (4) – compiling a checklist for the flora of Fujairah; (5) – writing and publishing Flora of Fujairah. During 2017–2020 we studied the flora of the Emirate of Fujairah, surveyed several places in this Emirate, collected native and alien plants, and organized the new Herbarium of Fujairah (Byalt et al., 2020). The first three stages of the project show that the flora of Fujairah still has a lot to reveal.

Asteraceae (= Compositae) is one of the largest families in the flora of UAE (Jongbloed et al., 2003; Karim, Fawzi, 2007; Shabana et al., 2020). In March 2020 we visited the high mountains at the border with Oman (Mussandam), where several species new to Fujairah, including Asteraceae, were found in rather small numbers on rocky ledges and in rock crevices of the high plateau, 1100–1360 m a.s.l., in the northern part of Fujairah (Figs. 1–2).
Material and methods

The collected specimens were identified using the original descriptions in the protologues (Jaubert and Spach, 1842; Boissier, 1846), all available local Floras and guides for UAE (Western, 1989; Jongbloed et al., 2003; Karim and Fawzi, 2007; Feulner, 2011) and Floras of neighboring countries (Rechinger, 1980; Collenette, 1985; Wood, 1997; Ghafoor, 2002; Ghafoor, 2019, Ghazanfar et al., 2019). Morphological characters were observed in
detail in the field, and later the collected herbarium material was compared with herbarium specimens available to the authors in the following herbaria: A, BM, CAS, E, GH, H, HAL, JE, K, LE, M, P, SA, W, WAG (Herbarium Codes hereafter as in Thiers, 2020; in bold – accessed via JSTOR Global Plants, 2020). The online resource, Global Biodiversity Information Facility (GBIF, 2020) was used for additional information on the distribution of studied taxa which was first critically analysed by the authors of this paper. Our herbarium collections were deposited at LE and FSH. The names of the taxa, authors’ abbreviations and places of publication were checked against the protologues and records in the International Plant Name Index (IPNI, 2020). The feedback to IPNI was sent where necessary to correct its records. Accepted names are in bold. Taxonomic decisions were made by studying the relevant literature and the data in available taxonomic databases, Catalogue of Life (CoL, 2020), Plants of the World Online (POWO, 2020), Tropicos (2020) and the World Checklist of Vascular Plants (WCVP, 2020). Distribution data are provided as recommended in the World Geographical Scheme for Recording Plant Distribution (Brummitt, 1992).

New records in Asteraceae (= Compositae)


On the Arabian Peninsula, Anthemis odontostephana was found in Oman (Ghazanfar, 1992; Jongbloed et al., 2003). Western (1989) reported A. odontostephana, mostly at high altitudes (1100–1800 m), on Jebel Aswad (East Hajar) and the Musandum Mountains [N. Oman: Mandaville 6763 (BM, ON); Musandam Ash 15 (E, ON); Gallagher 6716/5 (E, ON)]. In Oman it was reported as common in the Ru'us al-Jibal (Feulner, 2011). However, A. odontostephana was not recorded in the UAE by Karim and Fawzi (2007) but is mentioned as present in the UAE in the e-Flora of Pakistan (2020), based on Ghafoor (2002), and also by Ghazanfar et al. (2019) without an exact location or citation of herbarium specimens. This species has not been reported for Fujairah (Western, 1989; Böer, 2000; Jongbloed et al., 2003; Karim and Fawzi, 2007). Thus, it is a new species to the flora of Fujairah. It grows on the high plateau and on ledged rocky slopes in the Al Tawyeen area (Fig. 3).

Our plants match the protologue of A. odontostephana (Boissier, 1846: 85) as well as the species description in the e-Flora of Pakistan (2020), the specimens identified as Anthemis odontostephana seen at JSTOR and the herbarium specimens accessible through GBIF (https://www.gbif.org/species/3122675).
Anthemis odonthostephana differs from A. cotula L., also known in Arabia, by stems up to 15–20 cm tall, leaves 1 (-2)-pinnatisect and cypselas more than 2 mm long (vs. stems usually over 25 cm tall, leaves 2-3-pinnatisect and cypselas 1–1.5 mm long in A. cotula). According to Ghafoor (2002), A. odonthostephana is different from the other closely related species, Anthemis altissima L., A. arvensis L., A. kandharica Iranshahr, and A. rhodocentra Iranshahr, which are known from the regions neighbouring Arabia (Iran, Iraq, and Pakistan), by its receptacle chaffy in the upper half, scales linear-subulate but not receptacle chaffy all over, paleae oblong-spathulate or oblong-lanceolate to oblongate.


Distribution worldwide: Afghanistan, Gulf States, Iran, Iraq, Lebanon-Syria, Oman, Pakistan, Tadzhikistan, Turkmenistan, Uzbekistan (Rechinger, 1980; Ghazanfar, 1992; Gafoor, 2002; Jongbloed et al., 2003; Feulner, 2011; Ghazanfar et al., 2019; CoL, 2020; POWO, 2020).

Distribution in UAE: United Arab Emirates. Emirate of Fujairah, NW environs of Tawaian, 25°37'21.2"N, 56°05'39.7"E, ca. 1300 m a.s.l., common on rocky ledges, 27.III.2017, fl., V.V.

Figure 3. Anthemis odonthostephana Boiss. on the split of a rock ledge, the environs of Al Tawyeen (Fujairah). Photo by V.M. Korshunov.
Byalt (LE!); UAE, Fujairah Emirate, Al Tawyeen area, small village 0.8 km west-northwest of the mountain peak. 25°38'59.41"N, 56°7'17.88"E, elevation 1360 m, on rock ledges, 13.III.2020, fl., V.V. Byalt, M.V. Korshunov 355 (LE!; FSH!).


This species is native to the eastern Arabian Peninsula, where it was found on the higher summits of the Hajar Mountains in Oman, above 800–900 m a.s.l. but was reported as very rare everywhere (Jongbloed et al., 2003; Feulner, 2011). Two records are known from the Ru’us al-Jibal in Mussandam according to the Global Biodiversity Information Facility (GBIF, 2020). From Fujairah, in particular, and the UAE in general, this species has not been reported (Western, 1989; Böer, 2000; Jongbloed et al., 2003; Karim and Fawzi, 2007).

We found and photographed this species first in the spring of 2006 (Fig. 4) in the mountains at 1300 m a.s.l. near the village of Al Tawyeen (Fujairah), although no herbarium specimens were collected at that time. In the spring of 2020, we revisited the same place and collected herbarium material of the species which was in bud.

![Figure 4 (a & b). Jurinea berardioides (Boiss.) O.Hoffm. in the environs of Al Tawyeen (Fujairah). Photos by V.M. Korshunov.](https://www.gbif.org/species/9406225)

Our specimens match the protologue (Boissier, 1846: 113), as well as Rechinger’s description of *J. berardioides* (1980), herbarium specimens identified as *Aegopordon berardioides* and *Jurinea berardioides* seen on JSTOR (2020), and the specimens of *J. berardioides* accessed via GBIF (https://www.gbif.org/species/9406225).

Jurinea berardioides differs from *J. carduiformis* (Jaub. & Spach) Boiss. by simple leaves with obtuse apices, heads 2–4 cm long (vs. pinnatifid leaves, heads 2–2.5 cm long in *J. 
carduiformis), achenes 4–5 mm long, brownish, not turning black, tetragonal, deeply four-sulcate, in upper part with spongy margins (vs. achenes 5–6 mm long, turning black, obtuse tetragonal, truncate on top, not deeply sulcate in J. berardioides).

Specimens examined: BM000996188!; BM000996187!; E00469413!; K000792128!; K000792154!; P00726140!; P00726146!; P00726148!; P00726139!; P00726142!; P00726143!; P00726144!; P00726145!; P00726147!; W0042722.


Distribution in UAE: Fujairah Emirate, Al Tawyeen area, small village 0.8 km west-northwest of the mountain peak, 25°38’59.41”N, 56°7’17.88”E, elevation 1200–1360 m, on rock ledges, 13.III.2020, fl. juv., V.V. Byalt, M.V. Korshunov (LE!)

So far, this is the only place where Jurinea berardioides has been found in UAE and it should therefore be recommended for inclusion in the Red Data Books of the UAE and Fujairah. Along with J. berardioides some other relatively rare plants grow on the plateau and on ledges on rocky slopes, such as Anthemis odontostephana (Fig. 3), Jurinea carduiformis (Fig. 5), Farsetia aegyptia Turra, Senecio glaucus subsp. coronopifolius (Maire) C.Alexander, Convolvulus ulcinus Boiss., Ephedra pachyclada Boiss., and many others.


On the Arabian Peninsula, this species is found in Oman but it is very rare everywhere (Joengbloed et al., 2003; Feulner, 2011; GBIF, 2020). From Fujairah and the UAE generally, this species has not been reported (Western, 1989; Böer, 2000; Jongbloed et al., 2003; Karim and Fawzi, 2007).

This species was previously recorded from Mussandam (an exclave of Oman), where it is found on the high peaks of Mount Ru’us al-Jibal (Jongbloed et al., 2003; Feulner, 2011) where its habitat is among rocks and on abandoned fields above ca. 800 m a.s.l. We first found this species and photographed it in the spring of 2016 (Fig. 5) in the mountains at a height of about 1300 m a.s.l. in the environs of Al Tawyeen (Fujairah). Herbarium material was not collected in 2016 but in the spring of 2020, we visited the site again and collected herbarium specimens, in addition to photographs.

Our plants match the original description of Outreya carduiformis by Jaubert and Spach (1855), Rechinger’s description (1980), the herbarium specimens of Outreya carduiformis and Jurinea carduiformis seen at JSTOR (2020), and the specimens of O. carduiformis and J. carduiformis accessed via GBIF (https://www.gbif.org/species/3109227).
Jurinea carduiformis differs from J. berardioides by pinnatifid leaves, heads 2–2.5 cm long (vs. simple leaves with obtuse apices, heads 2–4 cm long in J. berardioides), flowers filiform, tube not expanding and subequal to the pappus (vs. flowers not filiform, tube expanding, longer than the pappus in J. berardioides), achenes 5–6 mm long, turning black, obtuse tetragonous, truncate on top, not deeply sulcate (vs. achenes 4–5 mm long, not turning black, tetragonal, deeply 4-sulcate, in upper part with spongy margins).

Specimens examined: G00301195!; G00301196!; P00726153!; P00726154!; P00726155!; P00726156!; P00726157!; P00726159!; P00726160!

Distribution worldwide: Afghanistan, Iran, Iraq, Oman, Pakistan, Tadzhikistan, Turkmenistan (Rechinger, 1980; Ghazanfar, 1992; Jongbloed et al., 2003; Feulner, 2011; Ghazanfar et al., 2019; CoL, 2020; POWO, 2020).

Distribution in UAE: Distribution in UAE: Fujairah Emirate, Al Tawyeen (Taween) area, small village 0.8 km west northwest of mountain peak. 25°38'59.41"N, 56°7'17.88"E, elevation 1360 m on rocky ledges, 13.III.2020, fl. juv., V.V. Byalt, M.V. Korshunov (LE!; FSH!).

So far, this is the only place that Jurinea carduiformis has been found in UAE and there is just a small number of individuals. Therefore, it could be recommended for inclusion in the Red Data Books of the UAE and Fujairah.
Acknowledgements

The article constitutes a contribution toward completion of the state assignment for the V.L. Komarov Botanical Institute of the Russian Academy of Sciences, within the project at BIN RAS, *Vascular plants of Eurasia: taxonomy, floristic research, plant resources, No AAAA-A19-119031290052-1*. The authors also express their gratitude to H.E. Salem Al Zahmi (Director of the Office of H.H. Crown-Prince) for their assistance in conducting field work and for their great contribution to the implementation of this study. The authors of this paper thank the reviewers and editors of the journal for valuable corrections and suggestions. Special thanks to Alexander Sennikov (H), who checked the specific terminology used in describing differences between the species included in this research. Irina Belyaeva (K) is gratefully acknowledged for correcting IPNI records of the names included in the manuscript.

Authors’ contributions

Vyacheslav V. Byalt (VB) initiated the project of *Flora of Fujairah, UAE*: together with MK collected, preserved, identified and labeled plants, analysed the 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 collected, preserved and identified plants, participated in the discussion of the manuscript.

Vladimir V. Korshunov (VK) initiated the project of biodiversity exploration of Fujairah, made photos of plants, participated in the discussion of the manuscript.

References


