



Article

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

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Abstract

A brief report on the discovery of three newly recorded species of Asteraceae, *Anthemis odontostephana* Boiss., *Jurinea berardioides* (Boiss.) O.Hoffm. and *Jurinea carduiiformis* Jaub. & Spach, in Fujairah, United Arab Emirates (UAE) is given. Two species, *J. berardioides* and *J. carduiiformis*, 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).



Figure. 1. The rocky slopes below the high plateau in the environs of Al Tawyeen in the northern part of Fujairah. Photo by V.V. Byalt



Figure. 2. Rocky cliff with ledges surrounding the high plateau. Photo by V.V. Byalt

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)

Anthemis odontostephana Boiss., Diagn. Pl. Orient. ser. 1, 1(6): 85. 1846

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>).



Figure 3. *Anthemis odontostephana* Boiss. on the split of a rock ledge, the environs of Al Tawyeen (Fujairah). Photo by V.M. Korshunov.

Anthemis odontostephana 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. odontostephana* 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 oblanceolate.

Specimens examined: [A00295979!](#); [BM000945973!](#); [BM000945974!](#); [CAS0026941!](#); [E00531534!](#); [E00581724!](#); [E00581726!](#); [E00581728!](#); [E00581731!](#); [E00581732!](#); [E00581734!](#); [GH00295978!](#); [H1623219!](#); [H1754769!](#); [HAL0110897!](#); [HAL0110898!](#); [JE00006581!](#); [K000929315!](#); [K000929316!](#); [K000929317!](#); [K000929318!](#); [K000929319!](#); [K000929320!](#); [K000929321!](#); [K000929323!](#); [K000929324!](#); [L3008657!](#); [LE00018030!](#); [LE00018031!](#); [M0096593!](#); [M0112440!](#); [MO149552!](#); [MO149553!](#); [MO149555!](#); [P00704023!](#); [P00704024!](#); [P00704025!](#); [P00704026!](#); [P00704027!](#); [P00704028!](#); [P00704029!](#); [P00704030!](#); [P00704031!](#); [P00704032!](#); [P00704033!](#); [P00704034!](#); [P00704035!](#); [P00704036!](#); [P00704037!](#); [P00704039!](#); [P00704040!](#); [P00704041!](#); [P00704042!](#); [P00704043!](#); [P00704044!](#); [SAV0003654!](#); [SAV0003667!](#); [W0042793!](#); [WAG0004079!](#); [WAG0004192!](#); [WAG0004193!](#)

Distribution worldwide: Afghanistan, Gulf States, Iran, Iraq, Lebanon-Syria, Oman, Pakistan, Tadjikistan, 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 Fujaira, 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.

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!).

Jurinea berardioides (Boiss.) O.Hoffm., [Nat. Pflanzenfam. \[Engler & Prantl\] 4\(5\): 321. 1893](#) ≡ *Aegopordon berardioides* Boiss., *Diagn. Pl. Orient. ser. 1, 1(6): 113. 1846* ≡ *Onopordum berardioides* (Boiss.) Sch.Bip., [Linnaea 19\(3\): 329. 1846](#) ≡ *Derderia berardioides* (Boiss.) Jaub. & Spach, [III. Pl. Orient. 3\(29\): 134, t. 290. 1850](#).

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.

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. carduiiformis* (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, tetragonous, deeply four-sulcate, in upper part with spongy margins (vs. achenes 5–6 mm long, turning black, obtuse tetragonous, 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 worldwide: Afghanistan, Gulf States, Iran and Pakistan. (Rechinger, 1980; Ghafoor, 2002; 2019; CoL, 2020; POWO, 2020).

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.

Jurinea carduiformis (Jaub. & Spach) Boiss, Diagn. Pl. Orient. ser. 1, 1 (6): 111. 1846 ≡ *Outreya carduiformis* Jaub. & Spach, [Ill. Pl. Orient. 1\(7\): t. 68; 1\(8\): 131. 1843.](#)

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>).



Figure 5. *Jurinea carduiiformis* Jaub. & Spach in flower on a rock ledge, the environs of Al Tawyeen (Fujairah). Photo by V.M. Korshunov.

Jurinea carduiiformis 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, tetragonous, 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, Tadjikistan, 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 carduiiformis* 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.

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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

- Böer, B.** 2000. Annotated check-list for plants in the United Arab Emirates. Emirates Natural History Group, Abu Dhabi, Al Ain, and Dubai: Zodiac Publishing.
- Boissier, E.** 1846. *Diagnoses Plantarum Orientalium Novarum*. Ser. 1, 1(6). Lipsiae: Apud B. Hermann.
- Brummitt, R.K.** 1992. *World Geographical Scheme for Recording Plant Distributions*, ed. 2. Pittsburgh: Hunt Institute for Botanical Documentation Carnegie Mellon University. TDWG – <https://www.tdwg.org>, <https://www.tdwg.org/standards/wgsrpd/> (Accessed 15 October 2020).
- Byalt, V.V., Korshunov, M.V. and Korshunov, V.M.** 2020. The Fujairah Scientific Herbarium – a new herbarium in the United Arab Emirates. *Skvortsovia* 6(3): 7–29.

- Catalogue of Life (CoL).** 2020. <https://www.catalogueoflife.org/col/> (Accessed 15 October 2020).
- Collenette, S.** 1985. An illustrated guide to the flowers of Saudi Arabia. London: Scorpion Publishing Ltd.
- E-Flora of Pakistan.** 2020. <http://www.tropicos.org/Project/Pakistan> (Accessed 9 December 2020).
- Feulner, G.R.** 2011. The Flora of the Ru'us al-Jibal – the Mountains of the Musandam Peninsula: An Annotated Checklist and Selected Observations. *Tribulus* 19: 4–153.
- Ghafoor, A.** 2002. Asteraceae 1, Anthemideae. In: Ali, S.I. and Qaiser, M. (Eds.). *Flora of Pakistan* 207. Karachi: Department of Botany, University of Karachi: 1–127.
- Ghafoor, A.** 2019. Asteraceae (V): Cardueae). In: Ali, S.I. and Qaiser, M. (Eds.). *Flora of Pakistan* 223. Karachi: University of Karachi: 1–363.
- Ghazanfar, S.A.** 1992. An Annotated Catalogue of the Vascular Plants of Oman and their Vernacular names. *Scripta Bot. Belg.* 2: 1–153.
- Ghazanfar, S.A., Edmonson, J.R. and Hind, D.J.N. (Eds.)** 2019. Compositae. In *Flora of Iraq* 6. Kew: Published on behalf of the Ministry of Agriculture, Republic of Iraq, by Royal Botanic Gardens, Kew: 1–458.
- Global Biodiversity Information Facility (GBIF).** 2020. www.gbif.org (Accessed 15 October 2020).
- International Plant Names Index (IPNI).** 2020. <https://beta.ipni.org/> (Accessed 15 October 2020).
- Jaubert, H. F. and Spach, É.** 1842. *Illustrationes Plantarum Orientalium*: Paris: Roret.
- Jongbloed, M., Feulner G., Böer, B. and Western, A.R.** 2003. *The Comprehensive Guide to the Wild Flowers of the United Arab Emirates*. Abu Dhabi, UAE: Environmental Research and Wildlife Development Agency.
- JSTOR Global Plants (JSTOR)** (2020). <https://plants.jstor.org/> (Accessed 15 October 2020).
- Karim, F. M. and Fawzi, N.M.** 2007. *Flora of the United Arab Emirates* 1–2. Al-Ain: United Arab Emirates University.
- Plants of the World Online (POWO).** 2020. <http://plantsoftheworldonline.org/> (Accessed 15 October 2020).
- Rechinger K.H.** 1980. Compositae III – Cynareae. *Flora Iranica* 139. Wien.
- Shabana, H.A., Sanjay G. and Mahmoud, T.** 2020. *Tridax procumbens* L. (Asterales Asteraceae), a new record to the flora of the United Arab Emirates. *Biodivers. J.* 11(4): 889–896. Doi:10.31396/Biodiv.Jour.2020.11.4.889.896.

Thiers, B. (Ed.) 2020. [Continuously updated] Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available from: <http://sweetgum.nybg.org/science/ih/> (Accessed 15 October 2020).

Tropicos. 2020. <https://www.tropicos.org/home> (Accessed 15 October 2020).

Western, A.R. 1989. The flora of the United Arab Emirates: an introduction. Al Ain: United Arab Emirates University.

Wood, J.R.I. 1997. A handbook of the Yemen Flora. Kew: Royal Botanic Gardens, Kew.

World Checklist of Vascular Plants (WCVP). 2020. <https://wcvp.science.kew.org/> (Accessed 15 October 2020).