On the distribution and habits of *Apteranthes joannis* (Maire) Plowes

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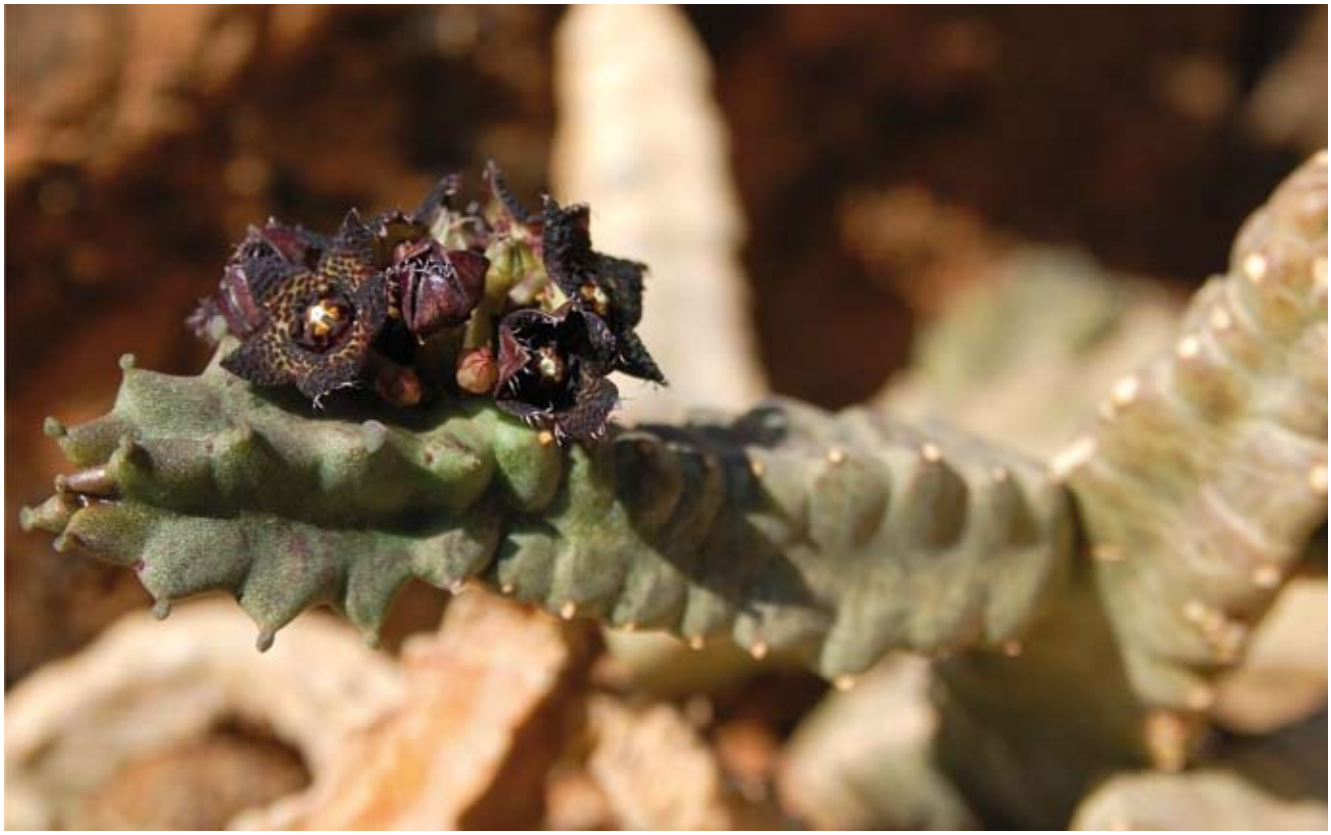


Figure 1. *Apteranthes joannis* in flower at a new site in the Anti Atlas.

Apteranthes joannis (Maire) Plowes is a stapeliad (Asclepiadoideae, Apocynaceae) that is endemic to Morocco. The species was described by Maire (1940) as *Caralluma joannis*. Together with other Moroccan stapeliads, it has been placed in the genus *Caralluma* R.Br. in many publications, even until recently (e.g., Audissou 2005; Fennane *et al.* 2007). In his revision of *Caralluma sensu lato*, Plowes (1995) ascribed this species to the genus *Apteranthes* Mikan. Although much remains unresolved regarding the taxonomy of *Caralluma* s.l. (Bruyns 2002), the delimitation of species into smaller units

Figure 2. Site 1 along the Aït Baha-Tafraout road in the Anti Atlas, a new site for *Apteranthes joannis*.

is in accord with morphological and molecular divergence, as well as the geographical distribution of species within the group (Crespo Villalba 2006)which is further reinforced by the molecular (DNA) studies of Meve and Liede (2002). The placement of this species within *Apteranthes* thus seems sensible.

A. joannis was originally found at Taberbourt in 1933 and at nearby Aoulouz three years later, on limestone cliffs. These sites lie in the valley of the Oued Souss, between the High and Anti Atlas mountain ranges. When the site at Aoulouz was revisited in 1940, it had been largely destroyed by the construction of a bridge over the Oued Souss and only three plants were found (Jonkers & Walker 1993). The species was rediscovered in the wild by Audissou (1994), on limestone cliffs near Aoulouz, and this site was assumed to be one of the last remaining sites for this fascinating species (Audissou 2005). The plants on the cliffs at Aoulouz are pendant in habit, with shoots up to a metre long (Audissou 1994, 2006). Audissou (2006) predicted that this was not an adaptation to cliff-dwelling and that the presence of plants on cliffs alone was perhaps a result of overgrazing, which poses a grave problem to plants in the Souss valley as it does in most of Morocco. He then supposed that probably, *A. joannis* once grew on less vertical faces with more ground cover, at a time when overgrazing was less of a problem. As evidence of this, he cited the morphology and development of stolons of specimens in cultivation, stolons being barely present in the Aoulouz population.

In November 2008, we visited southern Morocco on a biological expedition organised jointly by the Gibraltar Ornithological & Natural History Society (GONHS) and the Institut Scientifique de Rabat, Université Mohammed V-Agdal. The team consisted of researchers with diverse interests and included members specialising in succulent flora. Although the identification of *Apteranthes* species that are not in flower is problematic (Audissou 2005), it had rained shortly before our visit and we found that most stapeliads were in perfect condition and in flower, allowing identification of most plants *in situ*. During our visit, we were able to visit the Aoulouz site, confirming the continued presence of *A. joannis* there and collecting some cuttings for the purpose of *ex situ* conservation. In our searches for stapeliads in other parts of southern Morocco, we were able to locate *A. joannis* at two new sites in the Anti Atlas, at a considerable distance from its current known locality. With this article, we expand the known distribution of *Apteranthes joannis*

Figure 3. *Apteranthes joannis* at Site 1.

and report observations on its habits.

The following data are summarised for *A. joannis* found during our visit to the south of Morocco: number of clones collected with their collection numbers, habitat, orientation of cliff or slope, associated plant species and elevation. Cuttings were taken from more than one plant at each locality. In all cases, only a few cuttings were taken and no plants were removed completely. Taller cliffs were scrutinised with 10× binoculars for the presence of *A. joannis*. GPS coordinates and elevation were taken with a hand-held Garmin GPS receiver. Coordinates have been withheld to keep over-enthusiastic collectors from impacting these populations and to encourage searches for the species at new localities.

Aoulouz

720m a.s.l.

4 ex. clones collected on 17.xi.2008. Leg. K. Bensusan, M. Amezian, C. Perez & A. Mataame. Coll. Nos. KB&BML/2008-1, KB&BML/2008-2, KB&BML/2008-3 and KB&BML/2008-4.

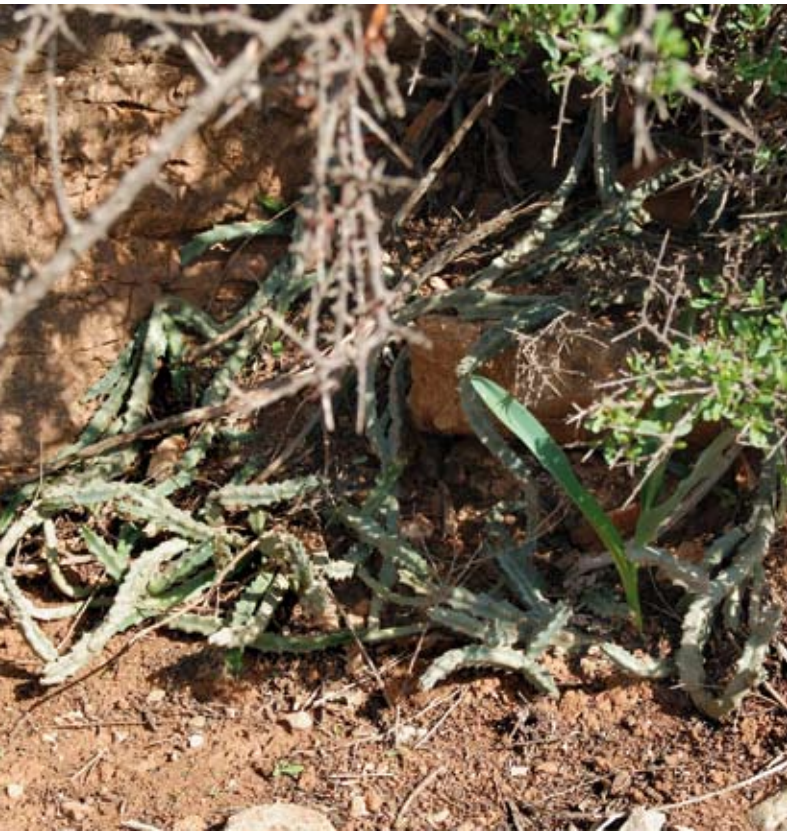
Plants were growing on a NNW-facing, limestone cliff close to the town of Aoulouz, on the southern bank of the Oued Souss. The plants were growing on vertical cliffs as shown in Audissou (2005). There was an abundance of *Kleinia anteuphorbium* (L.) Haw. (Asteraceae) on these cliffs, with *A. joannis* often growing from the base of these. Although plants proved relatively easy to locate, they were not found to occur in the density that the photographs provided in Audissou (1994, 1998 & 2005) suggest. Two plants were found with the remains of seed horns, suggesting propagation by seed at this site. A single plant was observed through binoculars high up on the SSE-facing cliff on the opposite bank of the Souss, after a considerable search. Some of the plants found were in flower. Photographs of the plants at this site, as well as their habitat, are given in Audissou (1994, 1998 & 2005) and Audissou *et al.* (1998).

Road between Aït Baha and Tafraout in Anti Atlas, Site 1 (Fig. 2)

886m a.s.l.

4 ex. clones collected on 17.xi.2008. Leg. K. Bensusan. Coll. Nos. KB&BML/2008-20, KB&BML/2008-45, KB&BML/2008-79 and KB&BML/2008-84.

Plants were growing on a rocky outcrop on a SW-facing rocky slope, close to the summit of the mountain. Plants were found between crevices and on the



Above: Figure 4. *Apteranthes joannis* growing at the base of an Argan tree, *Argania spinosa,* in the Anti Atlas.
Below: Figure 5. Site 2, along the Aït Baha-Tafraout road in the Anti Atlas, a new site for *Apteranthes joannis*.

ground, mostly growing in a similar manner to other *Apteranthes* species (Fig. 3). A few plants displayed a similar pendant habit to those in the Aoulouz population. One large plant was growing at the base of an Argan *Argania spinosa* (L.) Skeels (Sapotaceae), in the protection of its thorny branches (Fig. 4). Other plants present at this habitat were: *Euphorbia echinus* Hook.f. & Coss. (Euphorbiaceae), *Kleinia anteuphorbium* and *Orbea decaisneana* subsp. *hesperidum* (Maire) H. A. Jonkers (Apocynaceae). The ground around the base of the rocky outcrop was degraded, with a lot of loose rock. This population appears to be healthier than the one at Aoulouz. Some of the plants found were in flower.

Road between Aït Baha and Tafraout in Anti Atlas, Site 2 (Fig. 5)

1460m a.s.l.

2 ex. clones collected on 17.xi.2008. Leg. K. Bensusan. Coll. Nos. KB&BML/2008-25 and KB&BML/2008-57.

Specimens were found on a W-facing slope. Plants were growing free on the ground, out of crevices and between branches of *Euphorbia echinus*. Other plant species present at the site were: *Argania spinosa*, *Opuntia ficus-indica* (L.) P.Mill. (Cacta-

ceae), *Capparis spinosa* L. (Capparaceae) and *Ephedra fragilis* Desf. (Ephedraceae). There was a high density of plants in this large, extremely healthy population (Fig. 6). Again, this population appears healthier than that at Aoulouz. Some of the plants found were in flower.

Our findings show that the distribution of the *A. joannis* is much larger than had previously been thought. The new sites for *A. joannis* in the Anti Atlas lie at a Euclidean distance of some 115km and 125km from Aoulouz, respectively. In addition, the new sites lie at some 35km from each other. Given the similar nature of much of the terrain between these two sites, it is possible that *A. joannis* may be fairly widespread in this part of the Anti Atlas. In fact, it is possible that this species' main area of distribution lies in this mountain range and not the Souss valley. Any area of the western Anti Atlas, particularly between the new sites and Aoulouz, should be surveyed for *A. joannis*. Mountain slopes, especially ones with cliffs, seem to provide suitable habitat for *A. joannis* in the Anti Atlas range. A view of the type of habitat that should be prospected is shown (Fig. 7). The locality at Taberbourt, in the Souss valley between Aoulouz and Taroudannt, was not visited by Jean-André Audissou (*pers. comm.*), or by us. It would be of interest to visit this site and investigate whether *A. joannis* is still to be found there.

During our searches on the journey between Aït Baha and Tafraout we also found *Apteranthes europaea* (Guss.) Plowes, a close relative of *A. joannis*. Interestingly, we only found *A. joannis* along the road from Aït Baha until the second locality reported in this article, and not *A. europaea*. As from a few kilometres from Tafraout, only *A. europaea* was found, where it appears to be common and widespread including around the environs of the town. Since *A. joannis* was found growing healthily between 720-1460m a.s.l. and Tafraout lies at around 1000m, it is unlikely that altitude influences this apparent difference in distribution. Further studies in the area are required to further elucidate the distribution of *A. joannis*, as well as to examine differences in the ecological requirements of this species and *A. europaea* (if indeed any easily discernible differences exist). Audissou *et al.* (1998) give flowering periods as one of the distinguishing characteristics of *A. joannis* when compared to *A. europaea*, in cultivation at least (April-May for *A europaea* and September-October for *A. joannis*). In addition, Audissou (1996) recorded *A. joannis* in flower in early November at the Aoulouz site. We found both species in flower at all sites where they were recorded. In the case of *A. europaea*, most plants found were in flower and it is possible that flowering in habitat may coincide with the onset of rains. Audissou (2005) predicted that the hanging population at Aoulouz did not represent an adaptation to a particular habitat. This prediction was correct: *A. joannis* will also grow among rocks and at the base of spiny plants at its two new localities in the Anti Atlas.

In Morocco, *Apteranthes* species are susceptible to grazing by goats and sheep and even harvesting by traditional communities (Audissou 2005). Although the degraded nature of the ground at the first site in particular suggests a certain degree of overgrazing, the state of plants at these two sites in the Anti Atlas, and the vigour with which they were growing suggests that these populations of *A. joannis* have not been impacted heavily by livestock. The presence of *Opuntia ficus-indica* at the second site is of some concern given the impact that exotic *Opuntia* species may have on native floras (e.g., Richardson & van Wilgen 2004). Although *Apteranthes* species often grow between branches of larger plants, much of the *A. joannis* at this site is free-growing and competition for species with *O. ficus-indica* could impact the abundance of

Figure 6. A high density of *Apteranthes joannis* at Site 2.

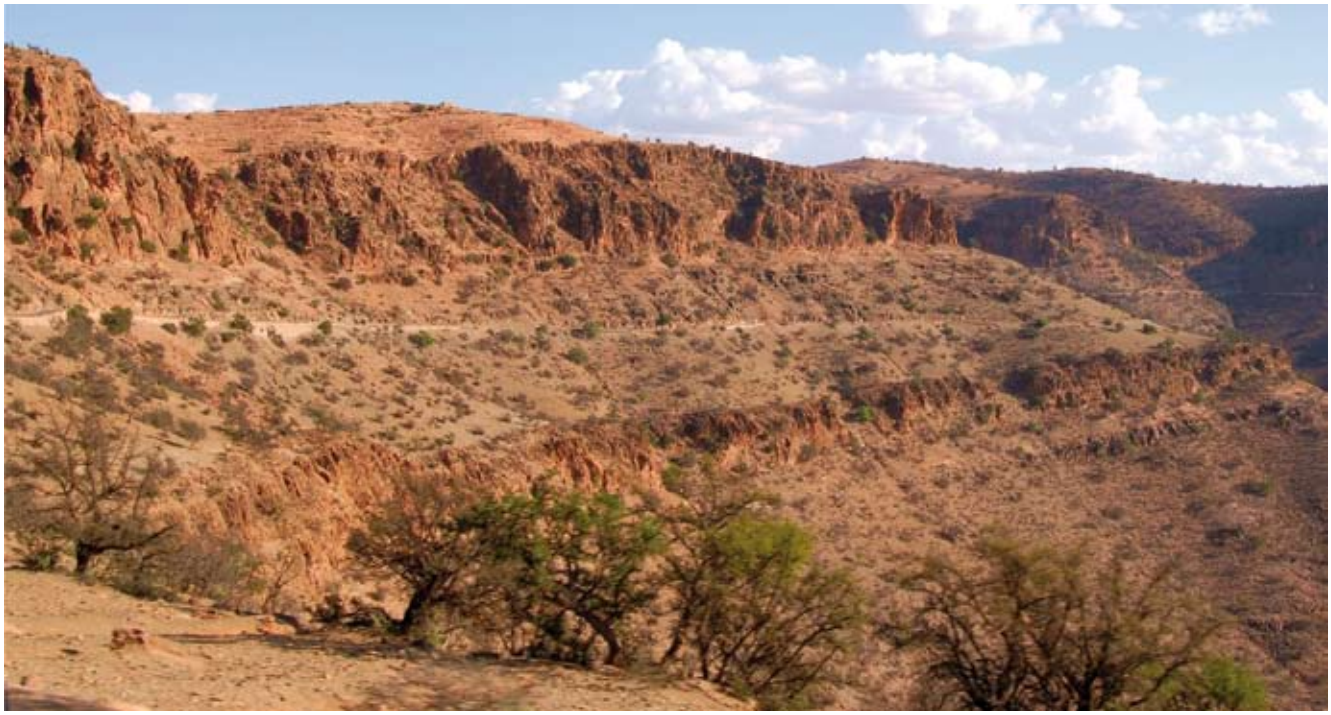


Figure 7. Mountain slopes with associated cliffs in the Anti Atlas of Morocco, suitable habitat for *Apteranthes joannis*.

this very healthy population.

At present, live material of all clones listed is kept at the Gibraltar Botanic Gardens and in the private collection of Mr Brian Lamb. Cuttings will be forwarded to the Royal Botanic Gardens at Kew and the private collection of Mr Darrel Plowes in due course.

Acknowledgements

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