NICHOLAS J. TURLAND

Anthemis samariensis (Asteraceae, Anthemideae), a new species from the mountains of W Kriti (Greece)

Abstract

Turland, N. J.: *Anthemis samariensis (Asteraceae, Anthemideae),* a new species from the mountains of W Kriti (Greece). – Willdenowia 38: 61-69. – ISSN 0511-9618; © 2008 BGBM Berlin-Dahlem. doi:10.3372/wi.38.38103 (available via http://dx.doi.org/)

Anthemis samariensis is described as a new species, illustrated and compared with other taxa. This perennial chasmophyte belonging to the large *A. cretica* complex was discovered in 2007 on high-altitude cliffs in the Lefka Ori (White Mountains) of W Kriti (Crete). From the same area, two new localities are reported for the critically endangered *Bupleurum kakiskalae (Apiaceae).* IUCN Red List categories are discussed for both species. In addition, *Alyssum lassiticum (Brassicaceae)* is reported for the first time from the Lefka Ori.

Additional key words: *Compositae, Anthemis cretica* complex, endemism, Crete, *Bupleurum kakiskalae, Apiaceae*, *Alyssum lassiticum, Brassicaceae,* IUCN Red List.

In June 2007 I was preparing for a field trip to study high-altitude cliff vegetation in the Lefka Ori (White Mountains) of W Kriti (Crete), Greece. Only five days before travelling, I received from Lance Chilton (Hunstanton, U.K.) a photograph of a flowering *Anthemis* plant growing on a cliff in the Lefka Ori. It had been sent him for identification by Jean Bienvenu (Kalathas, Kriti), who had taken the photograph a few days previously on 12 June. The plant appeared to be a member of the *A. cretica* L. complex. I contacted Jean Bienvenu and he provided me with precise details of how to find the plant. On 2 July I visited the locality, which is at the head of a side valley of the Samaria gorge 4 km from the nearest driveable road and 1.2 km from the nearest footpath. A valley between two mountains gradually slopes upward to the W until the brink of the Samaria gorge is reached, whereupon the ground abruptly drops down a huge vertical series of barely accessible calcareous cliffs for 675 m to the forested valley below. The grey-hairy cushions of the *Anthemis* were one of the first chasmophytes I observed on the uppermost cliffs at 1775 m. Most individuals were growing on the shady N-facing cliffs, although a few were in more sunny W-facing situations. The plants were finishing anthesis and the ligules were starting to wither and reflex against the phyllaries. On some individuals the achenes appeared to be ripe and readily fell out of the capitula. The photograph taken by Jean Bienvenu on 12 June showed an individual at full anthesis. A herbarium gathering was made and the latitude, longitude and altitude were recorded by global positioning system (GPS).

On close examination the *Anthemis* indeed proved to be a member of the *A. cretica* complex, which comprises possibly more than 30 taxa (species or subspecies) distributed from Spain and Algeria to the Caucasus. *A. cretica* s.str., despite the specific epithet and cited provenance "Habitat in Creta?" (Linnaeus 1753: 895), has never been confirmed as occurring in Kriti, although its broad distribution, from Spain and Algeria to Romania, Bulgaria and Turkey-in-Europe, includes Greece and the East Aegean Islands. There are records for Kriti of *A. cretica* (L.) Nyman (an illegitimate later homonym based on *Anacyclus creticus* L.), but that name applies to a very different, annual species now treated as *A. rigida* Boiss. ex Heldr.

After examining some 280 sheets of *Anthemis cretica* s.l., including *A. abrotanifolia* (Willd.) Guss. (endemic to the mountains of Kriti, see below) and *A. laconica* Franzén (endemic to the mountains of Peloponnisos, S Greece), it is evident that the plants from the Samaria gorge cliffs lie just outside the range of variation of the highly polymorphic *A. cretica* complex. The morphological differences from all other members of the complex, the isolated geographical distribution – at high altitude on an island – and the long period during which Kriti has been isolated from the continents, at least since the beginning of the Pliocene (Greuter 1972, 1975), together justify recognition of a new taxon.

As for the appropriate rank, it seems useful at this point to quote Grierson's comment under *Anthemis* in Flora of Turkey (Grierson 1975: 174): "The classification presented here is a simple one, possibly oversimplified. *Anthemis* has suffered too long from botanists who assume that minute differences warrant specific rank. It is, however, evidently an actively evolving genus in great need of further critical work, not by indiscriminate collecting, but by judicious field work and accumulation of carefully annotated specimens." Under *A. cretica* Grierson recognized 12 subspecies in Turkey and noted (Grierson 1975: 184): "This is a highly polymorphic species in which a number of different taxa are recognizable and have been variously treated at specific or infraspecific levels by previous authors. The following is a tentative classification but, such is the degree of intergradation, no satisfactory scheme seems possible without some biosystematic study; numerous intermediates occur between the subspecies recognized here". Subsequent authors followed Grierson's broad species concept in recognizing further subspecies within *A. cretica* (Fernandes 1976; Franzén 1986, 1991; Chandjian 1990; Govaerts 1995; Oberprieler & Greuter in Greuter & al. 2003; Greuter in Greuter & Raus 2005). This has culminated in the Euro+Med Plantbase (Greuter 2005-07) currently recognizing 25 subspecies across the full geographic distribution of *A. cretica,* with five species "preliminary accepted" within *A. cretica,* and *A. abrotanifolia* and *A. laconica* accepted as separate species.

Occasionally two of the subspecies of *Anthemis cretica* are sympatric, e.g. on the mountain Baba Dağ, SE of Fethiye in SW Turkey, where *A. cretica* subsp. *anatolica* (Boiss.) Grierson and *A. cretica* subsp. *leucanthemoides* (Boiss.) Grierson occur almost side-by-side. The former was collected around the summit (1969 m) in 1947 (*P. H. Davis 13664,* E00257288), and the latter was collected on screes at 1800 m in 1976 (*O. Polunin 14002* [discoid form], E00257351 and *O. Polunin 14004* [radiate form], E00257320). Baba Dağ is a very steep E-W ridge with extensive screes on both the N and S sides. In terms of ground distance, any point at 1800 m altitude is within a few hundred metres of the summit. The specimens of the two taxa are morphologically quite different, and one wonders if two taxa that exist in such close proximity but remain phenotypically separate would better be treated as species rather than subspecies. Strid (1987) reported different chromosome numbers for the two taxa based on SW Turkish material: $2n = 18$ (diploid) for subsp. *anatolica* from Çalbalı Dağ and Tahtalı Dağ near Antalya, and $2n = 36$ (tetraploid) for subsp. *leucanthemoides* from Manisa Dağı near Izmir.

A similar situation occurs in the Lefka Ori of Kriti, where *Anthemis abrotanifolia* exists in the same mountain massif (Franzén 1986: 43, 1991: 427; Greuter & al. 1985: 270) as the *Anthemis* population on the Samaria gorge cliffs. The two taxa are geographically more or less sympatric but are morphologically and ecologically very distinct (see Comparison with other taxa, below).

I am not suggesting that all currently recognized subspecies of *Anthemis cretica* should be treated at specific rank (as most were, originally), only that the current taxonomy may be an oversimplification, as was hinted at by Grierson over 30 years ago. In order properly to understand

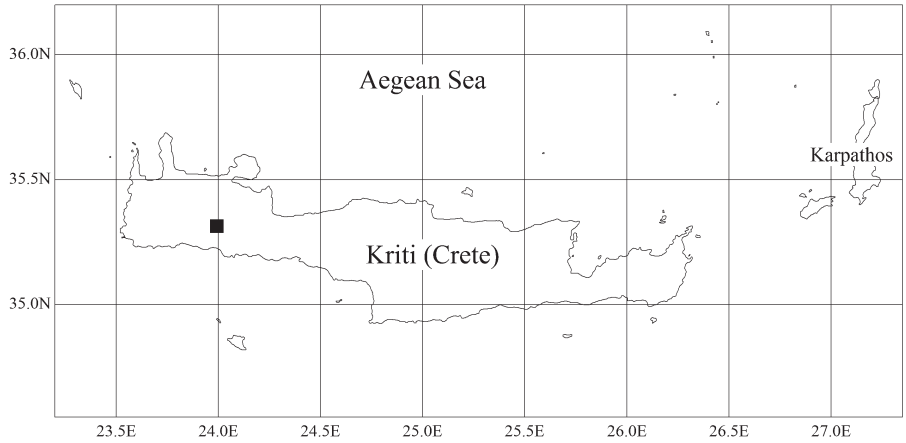

Fig. 1. Distribution of *Anthemis samariensis* (■). – Map created with Alan Morton's DMAP for Windows version 7.2a.

evolutionary relationships between members of the complex, and therefore arrive at a taxonomy that appropriately reflects phylogeny, an in-depth study of the whole complex is needed, employing modern molecular methods. This, however, is beyond the scope of the present contribution.

Bearing in mind the points mentioned above, I prefer to recognize the plants from the Samaria gorge cliffs as a new species.

Anthemis samariensis Turland, **sp. nov.**
Holotypus: Greece, Kriti (Crete), Nomós Hanión, Eparhía Sfakión, head of side valley of Farángi Samariás (Samaria gorge) between Mt Melindaoú and Avlimanákou Korifí, W of Petradé (35°18'51"N, 23°59'34"E), 1775 m, crevice of N-facing vertical calcareous cliff, 2.7.2007, *N. J. Turland 1486* (UPA; isotypi: B, K, MO, UPA) – Fig. 2.

Anthemidis creticae subsp. *cassiae* (Boiss.) Grierson typi similis sed caulibus superne (praeter ad apices) glabris vel subglabris, foliorum segmentis secondariis linearibus, angustioribus, 1-1.8 mm latis, segmentorum lateribus parallelibus, phyllariis subglabris, atrobrunneis ad marginem, et acheniorum auriculis longioribus, circa 1.5 mm longis, differt.

Perennial herb forming cushions to 40 cm in diam. *Indumentum* villous with trichomes pale grey, malpighiaceous (T-shaped), stalk distinct, up to 50 µm long, arms unequal, up to 0.8 mm long, ± appressed, slightly flexuous, gradually tapered toward apex, flattened in cross section. *Stems* branched and slightly woody at base; leafy non-flowering shoots present at anthesis; flowering stems decumbent to erect, simple, 15-25 cm tall, angled, leafless or with a few reduced leaves mostly below middle, glabrous or subglabrous except moderately to densely villous immediately below capitulum, sometimes also sparsely villous below middle. *Leaves* not aromatic, 3.5-8.5 cm long, both surfaces moderately to densely villous; petiole distinct, 1.5-4 cm long, 1.5-2 mm wide including narrow wings; leaf blade 2-pinnatisect, broadly ovate in outline, 2-4.5 cm long, 2-3.5 cm wide; primary segments usually 7, each one divided into 2-7 secondary (ultimate) segments; secondary segments linear, 1-1.8 mm wide, apex acute, with a minute brownish cartilaginous glabrous cusp. *Capitulum* solitary, ellipsoid to globose at anthesis, radiate, 8-12 mm in diam. excluding ligules. *Phyllaries* imbricate, green, becoming yellowish brown, lanceolate, 4-6 mm long, 2-2.5 mm wide, outer (abaxial) surface with a few trichomes, midvein sometimes dark brown, margin dark brown, 0.3-0.5 mm wide, membranous, densely and minutely lacerate, apex acute to

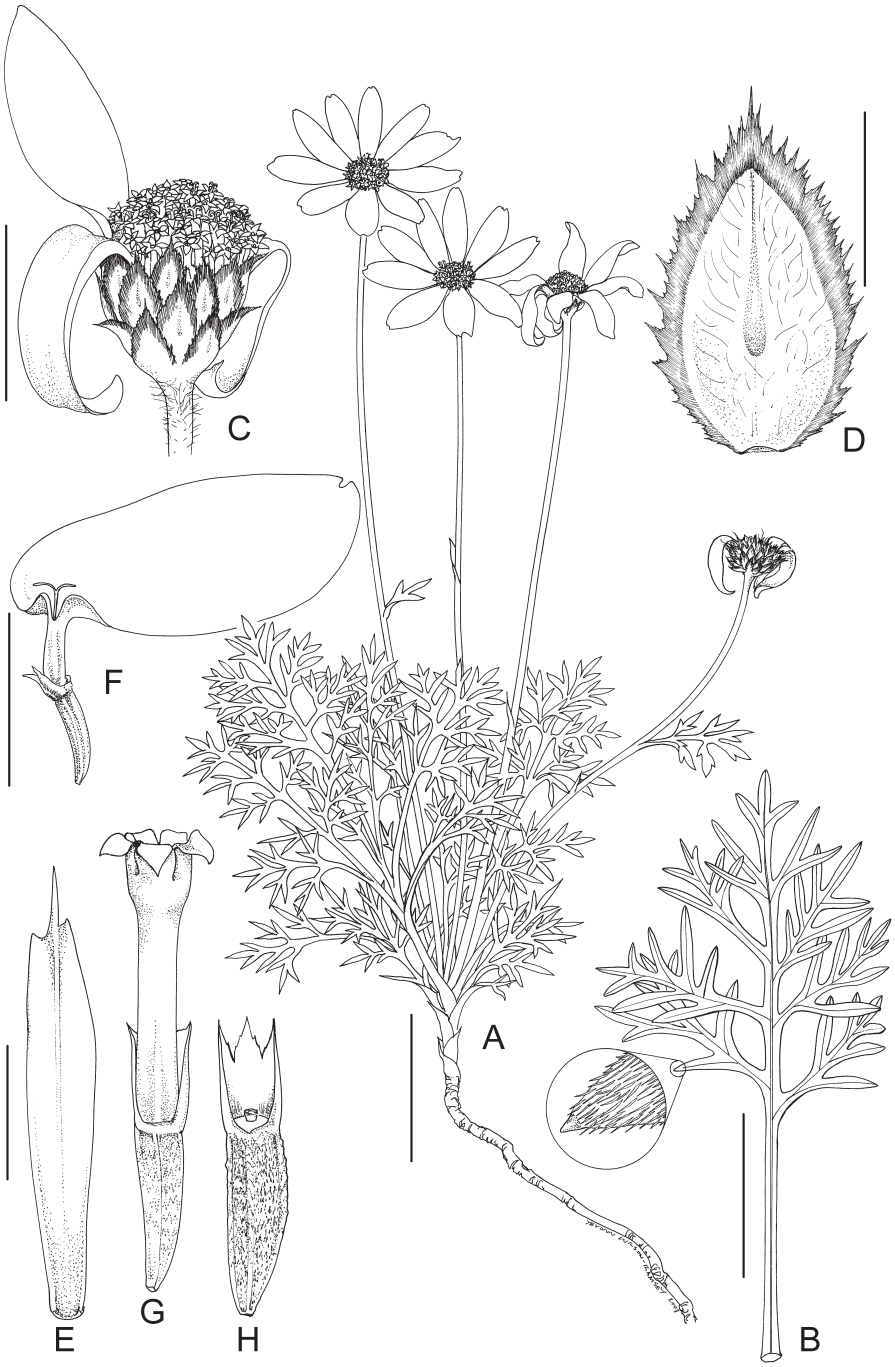

Fig. 2. *Anthemis samariensis* – A: habit; B: leaf; C: capitulum; D: phyllary; E: palea; F: ray floret; G: disk floret; H: achene. – Scale bars: A = 3 cm, B = 2 cm, C = 10 mm, D, E, G, H = 2 mm, F = 5 mm. – Drawn from the isotype at MO by Yevonn Wilson-Ramsey.

acuminate. *Paleae* (receptacular scales) brownish white, oblanceolate, navicular, 6.5-7 mm long, exceeding phyllaries in fruit by c. 2 mm, c. 1 mm wide unflattened, ± rigid, scarious, base obliquely truncate with a thin callus, apex emarginate with a sharply pointed arista c. 1 mm long; arista and midvein near apex pale brown. *Ray florets* 8-11; tube green, becoming brown, cylindric, 1.5-2 mm long, 0.5-0.7 mm in diam.; ligule ± patent at anthesis, later reflexed against involucre, white, oblong, 10-17 mm long, 5-6.5 mm wide. *Disk florets* yellow; tube cylindric but constricted near middle, 3.5-4 mm long, 0.5-0.8 mm in diam.; lobes 5, lanceolate, c. 1 mm long, c. 0.5 mm wide, lower half erect, upper half patent at anthesis. *Achenes* pale brown, narrowly obconic-oblong, weakly 4-angled, slightly curved, (2.1-)2.3-2.5(-2.8) mm long excluding pappus, 0.8-1 mm wide, weakly longitudinally ribbed, surface densely covered with minute, white, rod-like scales. *Pappus* reduced to a rim up to 0.2 mm wide around 180° of achene apex, well-developed and forming an auricle around other 180°; auricle colourless, scarious, c. 1.5 mm long, densely and finely longitudinally veined, margin lacerate into 3 irregular, triangular lobes up to half length of auricle.

Chromosome number. – Not yet known.

Etymology. – The specific epithet refers to the type locality, the Samaria gorge, the largest of the numerous gorges of Kriti.

Distribution. – The new species is known only from two localities c. 2 km apart in the Lefka Ori (White Mountains) of W Kriti (Crete), Greece.

Ecology. – Crevices of N- to W-facing vertical calcareous cliffs, known from 1675-1775 m, but possibly also occurring lower. Growing with *Athamanta macedonica* (L.) Spreng., *Campanula jacquinii* (Sieber) A. DC., *Cephalaria squamiflora* (Sieber) Greuter, *Dianthus juniperinus* Sm. subsp. *juniperinus, Onobrychis sphaciotica* Greuter and *Satureja spinosa* L.

Phenology. – Flowering from June to early July. Achenes ripening from the beginning of July.

Comparison with other taxa. – The new species is quite unlike either *Anthemis cretica* subsp. *cretica* or *A. cretica* subsp. *leucanthemoides,* both of which have much smaller leaves 1-4 cm long and often with very narrow ultimate segments 0.3-1.5 mm wide. Raus (1996: 28) recorded subsp. *cretica* from the island of Karpathos, located E of Kriti and part of the Cretan floristic area ('Cr'), following the taxonomy of Carlström (1987: 89), who included subsp. *leucanthemoides* in the synonymy of subsp. *cretica*. The former taxon is distributed in the East Aegean Islands and Turkey and was Raus's original determination for the Karpathos plant (Raus, pers. comm., 7.8.2007). Although the relevant two sheets of *T. Raus 10035* are on loan from B to LD and could not be checked, I have no reason at all to doubt Raus's determination.

A member of the *Anthemis cretica* complex already known from Kriti is *A. abrotanifolia,* endemic to the four main mountain massifs, including the Lefka Ori. However, that species is quite different from *A. samariensis,* both morphologically and ecologically. It has flowering stems shorter, 3-15(-25) cm tall, sparsely to densely villous; leaves smaller, 0.8-4 cm long; leaf blade sometimes only 1-pinnatisect; capitula smaller, 4-8(-12) mm in diam.; phyllaries smaller, 2-5 mm long, ± densely villous, margin usually pale brown; disk florets often pinkish, smaller, 2.5-4 mm long including lobes; and, according to Franzén (1986: 43; 1991: 427), achenes smaller, 1.3-2 mm long. It grows not as a chasmophyte but on calcareous rocks and screes, open stony ground and flat clayey areas in the bottoms of dolines. Plants of *A. abrotanifolia* nearly always have discoid capitula, but radiate capitula characterize *A. abrotanifolia* f. *ligulata* Greuter & al. (1985: 270), described from the E part of the Psiloritis massif in central Kriti. The holotype specimen of that form, *H. Risse 1100* at B (B 10 0093121, see digital image, Röpert 2000-), has ligules 3-6 mm long and 2-3 mm wide. Two other specimens at B (*H. Risse 482* and *W. Greuter & H. Risse 19861*) have ligules in the same size range.

In the Greek flora, the most similar taxon morphologically to *Anthemis samariensis* is *A. cretica* subsp. *carpatica* (Willd.) Grierson (*A. carpatica* Willd.), which has a wide general distribution from the Pyrenees to NW Turkey and from the Carpathians to NW Greece. That taxon,

however, has leaves generally smaller, 1.5-5.5(-7.5) cm long, often only sparsely villous to completely glabrous so as to appear greenish or green, both surfaces often with minute pits containing a pellucid globule; leaf blade with narrower ultimate segments, 0.5-1.3 mm wide; and achene auricles absent or reduced to a very narrow rim around the achene apex, up to 0.2 mm long.

When the *Anthemis cretica* complex is considered throughout its distribution, *A. samariensis* is perhaps closest to *A. cretica* subsp. *cassia* (Boiss.) Grierson, and in particular to two isotype specimens of *A. cassia* Boiss. at E (E00257489) and K (K000372821, digital image) collected from Akra Dağ (Mt Cassius) in S Turkey adjacent to the Syrian border and the Mediterranean coast. Those specimens have flowering stems ± densely villous throughout, ultimate leaf segments broadest toward the apex (i.e. linear-oblanceolate), 1.4-3 mm wide, and phyllaries ± densely villous with pale margins. *A. samariensis* differs in having flowering stems glabrous or subglabrous (except at the apex), or sparsely villous below the middle, ultimate leaf segments parallel-sided (i.e. linear), somewhat narrower, 1-1.8 mm wide, and phyllaries with only a few trichomes and with a dark brown margin. Grierson (1975: 189) described the achene auricle of *A. cretica* subsp. *cassia* as c. 0.5 mm long, whereas the plants from the Samaria gorge cliffs have a much longer achene auricle, c. 1.5 mm long. Both the Edinburgh and Kew isotypes are at anthesis, the former with one capitulum damaged by insects, the latter with three capitula in good condition; not even immature achenes are visible, and these could not be examined without destructive sampling (a paper capsule attached to the Edinburgh sheet contains no achenes). *A. cretica* subsp. *cassia* is distributed not only in Turkey but also in Syria and Lebanon (if *A. blancheana* Boiss. is included).

Conservation status. – Terminology, IUCN Red List categories and criteria for determining those categories follow current IUCN guidelines (IUCN 2001; Standards and Petitions Working Group 2006). Only two subpopulations are known. At the type locality c. 40 mature individuals were observed on 2 July and 6 July 2007. Re-visiting with Jean Bienvenu on 11 June 2008, the plants were at full anthesis and therefore much more conspicuous than in 2007. A few hundred mature individuals were observed on several additional cliffs in the immediate vicinity. On 12 June 2008 we continued S to Avlimanakou Korifi. On the N side of that mountain, 1.9 km S of the type locality (35°17'49"N, 23°59'35"E), at 1675-1700 m on NNE-facing cliffs, another subpopulation of *A. samariensis* was found and at least 60 mature individuals were counted. At present it is not known if the total population is fluctuating with regard to numbers of mature individuals. Because of their cliff habitat almost all the individuals are inaccessible to grazing animals and humans. There seems to be no tangible threat from a natural catastrophic event destroying or severely depleting the population: the vegetation is too sparse for fire to pose any threat; there are no nearby volcanoes; the population must already have survived weather-related events such as high winds, frost and drought. Certainly the total population numbers more than 250 mature individuals, which rules out IUCN Red List categories CR (Critically Endangered) and EN (Endangered) according to criterion D. I estimate that the cliffs surveyed represent no more than 10 % of the potentially suitable habitat, suggesting a potential population size of a few thousand mature individuals. No data exist to suggest a continuing decline or extreme fluctuations in the population. Based on these preliminary data, I recommend that the new species qualifies for Red List category VU (Vulnerable) according to criterion D 2 because the population has a very restricted area of occupancy, only 2 km^2, at two locations.

New localities for the critically endangered *Bupleurum kakiskalae* Greuter *(Apiaceae)*

Re-visiting the type locality of *Anthemis samariensis* on 6 July 2007, with Charalambos Kyriakopoulos (Gargaliani, Peloponnisos and UPA), we attempted a more thorough survey of the cliffs. A steep scree-filled gully provided partial access among the cliffs, but progress was extremely difficult. A genuinely thorough survey would require several days and, ideally, abseiling down the cliffs themselves. We carefully examined the cliffs that we could reach in the time available, i.e. only the uppermost c. 50 m, but these were nevertheless very rich in chasmophy-

tes, including, in addition to the species mentioned under Ecology, above: *Anthyllis vulneraria* L., *Asperula idaea* Halácsy, *Aubrieta deltoidea* (L.) DC., *Bupleurum kakiskalae* Greuter, *Centaurea argentea* subsp. *macrothysana* (Rech. f.) Turland & L. Chilton, *Crepis fraasii* Sch. Bip., *Galium fruticosum* Willd., *Hellenocarum multiflorum* (Sm.) H. Wolff, *Lomelosia albocincta* (Greuter) Greuter & Burdet and *Odontites linkii* subsp. *creticus* (Boiss.) Greuter.

The presence of *Bupleurum kakiskalae* is of great importance because this is a critically endangered species previously known only from its type locality (Greuter 1967) on the opposite side of the Samaria gorge 7.7 km W-WSW, where approximately 100 individuals are estimated to exist (see Montmollin & Strahm 2005: 38-39). The *Bupleurum* was growing on ledges and in crevices of a single very fissured cliff facing WNW at 1750 m. Approximately 35 individuals could be counted with binoculars, and this figure was later confirmed by searching a 10 megapixel digital photograph taken of the cliff; five of the individuals were mature, at full anthesis (the species is monocarpic). None of the individuals would be accessible without abseiling or expert rock-climbing skills. The following taxa were growing with the *Bupleurum: Centaurea argentea* subsp. *macrothysana, Cephalaria squamiflora, Dianthus juniperinus* subsp. *juniperinus, Lomelosia albocincta, Odontites linkii* subsp. *creticus* and *Onobrychis sphaciotica*.

On 11 June 2008 five mature individuals of *Bupleurum kakiskalae*, almost at anthesis, were counted on the same cliff as in 2007. Three more mature individuals, at the same stage of development, were observed on another cliff c. 100 m to the N, on the N side of the scree-filled gully by which the cliffs were accessed. On 12 June a further mature individual, comprising a third subpopulation, was observed 1.9 km to the S at the second locality for *Anthemis samariensis* on the N side of Avlimanakou Korifi. This plant was just beginning anthesis and was growing together with *A. samariensis*, *Dianthus juniperinus* subsp. *juniperinus* and *Potentilla speciosa* Willd.

Montmollin & Strahm (2005) gave *Bupleurum kakiskalae* the IUCN Red List category CR (Critically Endangered) according to criteria B1ab(iii,v)c(iv)+2ab(iii,v)c(iv); C2a(ii)b; D, noting that the number of mature individuals fluctuates between zero and 20 each year. On the basis of observations at the second and third localities, I would revise this evaluation only by removing criterion C2a(ii), since 90 % or more of mature individuals are unlikely to be restricted to one subpopulation, at least not on average over several years.

As with *Anthemis samariensis,* it is very likely that more *Bupleurum* occurs in suitable crevices and ledges lower down in the cliff series. The area that could be surveyed is indeed only 'the tip of the iceberg'. If more field study revealed larger subpopulations with more mature individuals present each year, then it might become necessary to re-list the species as endangered.

Alyssum lassiticum Halácsy *(Brassicaceae)* reported for the first time from the Lefka Ori

On 6 July 2007, at the type locality of *Anthemis samariensis*, I observed a single fruiting individual of a perennial, chasmophytic *Alyssum* species. Unable to reach the plant to make a gathering, I misidentified it as the superficially somewhat similar *A. sphacioticum* Boiss. & Heldr., which is locally endemic to the Lefka Ori and possibly also the Psiloritis massif (Hartvig 2002). On 11 June 2008, on the same cliff, I observed the same individual together with two others, of which two were inaccessible and had recently finished anthesis and one could be reached but lacked either flowers or fruits. However, earlier on the same day I had collected specimens with young fruits and dried remains of flowers from a fourth individual 1.6 km to the NNW, on the S side of Mt Melindaou (35°19'39"N, 23°59'07"E), at 2050 m, growing under a low bush of *Berberis cretica* L. (*N. J. Turland 1565,* UPA). This material proved to be an excellent morphological match for two specimens at UPA: *N. J. Turland 766,* from Mt Lazaros (the type locality) and *B. de Montmollin 15.6.80/7* from "Dikte". The chasmophytic habitat also agrees with *A. lassiticum*, rather than with *A. sphacioticum*, which is a plant of screes or sometimes rock crevices, but not cliffs. The presence of *A. lassiticum* in these two apparently very small subpopulations in the Lefka Ori is important because this species was previously thought to be endemic to the Dikti mountain massif in E Kriti (Hartvig 2002).

Acknowledgements

I firstly thank Jean Bienvenu (Kalathas, Kriti) for initially finding the population of *Anthemis samariensis,* for kindly providing me with precise details of the location and for accompanying me there in 2008. Special thanks are also due to Christopher Davidson (Boise, Idaho), whose financial support made my field work in June-July 2007 possible. I also thank Charalambos Kyriakopoulos (Gargaliani, Peloponnisos and UPA) for his good company and valuable assistance in the field, Dimitrios Phitos and Georgia Kamari (UPA) for their warm hospitality and valuable help in Patras, the Botanischer Garten und Botanisches Museum Berlin-Dahlem for access to the herbarium, the Royal Botanic Garden Edinburgh for loaning material of *A. cretica* and its relatives, the Board of Trustees of the Royal Botanic Gardens, Kew, for providing a scanned digital image of an isotype of *A. cassia,* Yevonn Wilson-Ramsey (Saint Louis, Missouri) for executing the line drawing, Lance Chilton (Hunstanton, U.K.) for forwarding Jean Bienvenu's initial inquiry, Werner Greuter and Thomas Raus (B) for useful discussion, Robert Vogt (B) and an anonymous reviewer for their constructive critical reviews of the manuscript, and Josef Schwemberger (Kallergi Mountain Refuge, Kriti) for his hospitality in the Lefka Ori. I also acknowledge the Hellenic Ministry for the Environment, Physical Planning and Public Works, Operational Programme for the Environment (EPPER), Metro 5.2, for the financial support of my field work in Kriti in 2008: grant no. 2007CO7530028 ("The Red Data Book of Rare and Threatened Plants of Greece") to the Hellenic Botanical Society.

References

Carlström, A. 1987: A survey of the flora and phytogeography of Rodhos, Simi, Tilos and the Marmaris peninsula (SE Greece, SW Turkey). – PhD thesis, University of Lund, Lund.

Chandjian, N. S. 1990: Rod *Anthemis* L. *(Asteraceae)* v yuzhnom Zakavkaz'e [Genus *Anthemis* L. *(Asteraceae)* in Caucaso meridionali]. – Novosti Sist. Vyssh. Rast. **27:** 152-163.

Fernandes, R. 1976: *Anthemis* L. – Pp. 145-159 in: Tutin, T. G., Heywood, V. H., Burges, N. A., Moore, D. M., Valentine, D. H., Walters, S. M. & Webb, D. A. (ed.), Flora europaea **4.** – Cambridge, etc.

Franzén, R. 1986: *Anthemis cretica (Asteraceae)* and related species in Greece. – Willdenowia **16:** 35-45.

— 1991: *Anthemis* L. – Pp. 420-431 in: Strid, A. & Tan, K. (ed.), Mountain flora of Greece **2.** – Edinburgh.

Govaerts, R. 1995: World checklist of seed plants **1(1).** – Antwerp.

Greuter, W. 1967: Beiträge zur Flora der Südägäis 8-9. – Bauhinia **3:** 243-254.

— 1972: The relict element of the flora of Crete and its evolutionary significance. – Pp. 161-177 in: Valentine, D. H. (ed.), Taxonomy, phytogeography and evolution. – London & New York.

— 1975: Historical phytogeography of the southern half of the Aegean area. – Pp. 17-21 in: Jordanov, D. (ed.), Problems of Balkan flora and vegetation. Proceedings of the first international symposium on Balkan flora and vegetation, Varna, June 7-14, 1973. – Sofia.

— (ed.) 2005-07: *Asteraceae.* – In: The Euro+Med Plantbase – the information resource for Euro-Mediterranean plant diversity. – Published on the Internet at http://ww2.bgbm.org/EuroPlusMed/query.asp

— , Matthäs, U. & Risse, H. 1985 ["1984"]: Additions to the flora of Crete, 1973-83 (1984) **II.** – Willdenowia **14:** 269-297.

— , Oberprieler, C. & Vogt, R. 2003: The Euro+Med treatment of *Anthemideae (Compositae)* – generic concepts and required new names. – Willdenowia **33:** 37-43.

— & Raus, T. (ed.) 2005: Med-Checklist Notulae, 23. – Willdenowia **35:** 55-64. [CrossRef]

Grierson, A. J. C. 1975: *Anthemis* L. [perennial species]. – Pp. 174-221 in: Davis, P. H. (ed.), Flora of Turkey and the East Aegean Islands **5.** – Edinburgh.

IUCN 2001: IUCN Red List categories and criteria. Version 3.1. – Gland & Cambridge.
Hartvig, P. 2002: *Alyssum* L. – Pp. 199-224 in Strid, A. & Tan, K. (ed.), Flora hellenica **2.** – Ruggell.
Linnaeus, C. 1753: Species plantarum. – Stockholm.
Montmollin, B. de & Strahm, W. (ed.) 2005: The top 50 Mediterranean island plants. Wild plants at the brink of extinction, and what is needed to save them. – Gland & Cambridge.
Raus, T. 1996: Additions and amendments to the flora of the Karpathos island group (Dodekanesos, Greece). – Bot. Chron. **12:** 21-53.
Röpert, D. (ed.) 2000- (continuously updated): Digital specimen images at the Herbarium Berolinense. – Published on the Internet http://ww2.bgbm.org/herbarium/ (Barcode: B 10 0093121, ImageId: 213619) [accessed 29.10.2007].
Standards and Petitions Working Group 2006: Guidelines for using the IUCN Red List categories and criteria. Version 6.2. – Published on the Internet at http://app.iucn.org/webfiles/doc/SSC/RedListGuidelines.pdf
Strid, A. 1987: Chromosome numbers of Turkish mountain plants. An annotated list of 34 taxa. – Notes Roy. Bot. Gard. Edinburgh **44:** 351-356.

Address of the author:
Nicholas J. Turland, Missouri Botanical Garden, P.O. Box 299, Saint Louis, Missouri 63166-0299, U.S.A.; e-mail: nicholas.turland@mobot.org