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## *Filago wagenitziana* (Asteraceae, Gnaphalieae), a new species from western Crete, Greece

### Abstract

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*Filago wagenitziana*, discovered in 2008 in western Kriti (Crete), is described as a new species, illustrated and compared with similar species of the genus. This dwarf annual is a local endemic of the easternmost spurs of the Lefka Ori (White Mountains), growing between 700 and 800 m in altitude. It is restricted to open, shallow, semi-wet quartzite soil, chiefly in semi-shady conditions in or next to mixed mesophilous woodland with *Platanus orientalis*. The total known population of *F. wagenitziana* consists of very few subpopulations, comprising perhaps less than 1000 plants, in an area of about 1 km<sup>2</sup>. This small area, which also harbours the only *Sphagnum* spring fen in Crete, lies only just outside the Natura 2000 site Asfendou-Kallikratis. The habitat of *F. wagenitziana* and its surroundings are endangered by water exploitation.

Additional key words: *Evax*, local endemism, vegetation, Natura 2000, Aegean

During field studies on the Cretan vegetation in 2008 I found a rosulate *Filago* distinct from any other Cretan member of this genus. Later it turned out to represent a hitherto unknown species. Among the Cretan taxa of *Filago*, the new species is in general habit superficially similar, but not closely related, to *F. contracta* (Boiss.) Chrtek & Holub and *F. pygmaea* L., two species which have sometimes been separated from *Filago* L. and treated with others under *Evax* Gaertn.

The immature plants gathered in April 2008 were complemented by a collection from May 2009 from the same site. In 2010 I had the opportunity to search suitable habitats in the surroundings for the new species, with some success. In order to understand better the phylogeny and the evolutionary status of the new species, material for genetic analysis was also collected in 2010 and sent to M. Montserrat Martínez-Ortega, University of Salamanca. Pending this analysis, the relationships of the new species, which has apparently no close relatives in the South Aegean, can only be discussed on the basis of morphological traits.

In its acaulescent habit and pulvinate arrangement of capitula clusters the new species bears a resemblance to most members of *Filago* subg. *Evax* (Gaertn.) Wagenitz (Wagenitz 1969). This relationship is supported by the lack of a persistent pappus on the achenes, the sterile (functionally male) inner florets and the non-divergent phyllaries at the fruiting stage. Most species of *Filago* s.l. in the Aegean area were classified by Wagenitz (1969) in *F.* subg. *Filago* (*F. aegaea* Wagenitz, *F. cretensis* Gand., *F. eriocephala* Guss., *F. germanica* L. and *F. pyramidata* L.) and *F.* subg. *Oglifa* (Cass.) Grenier (= *Logfia* Cass.) (*F. arvensis* L. and *F. gallica* L.). *F.* subg. *Evax* is represented only by *F. contracta* (Boiss.) Chrtek & Holub and *F. pygmaea* L. (Wagenitz 1970). The new species differs from both *F. contracta* and *F. pygmaea* in having linear-lanceolate leaves, green on the upper surface and whitish-tomentose on the lower surface, and outer and middle “phyllaries” (actually receptacular paleae) not cuspidate at the apex but at most very shortly acuminate and strikingly green in the centre, contrasting with a wide hyaline margin (Fig. 1). Short procumbent branches from

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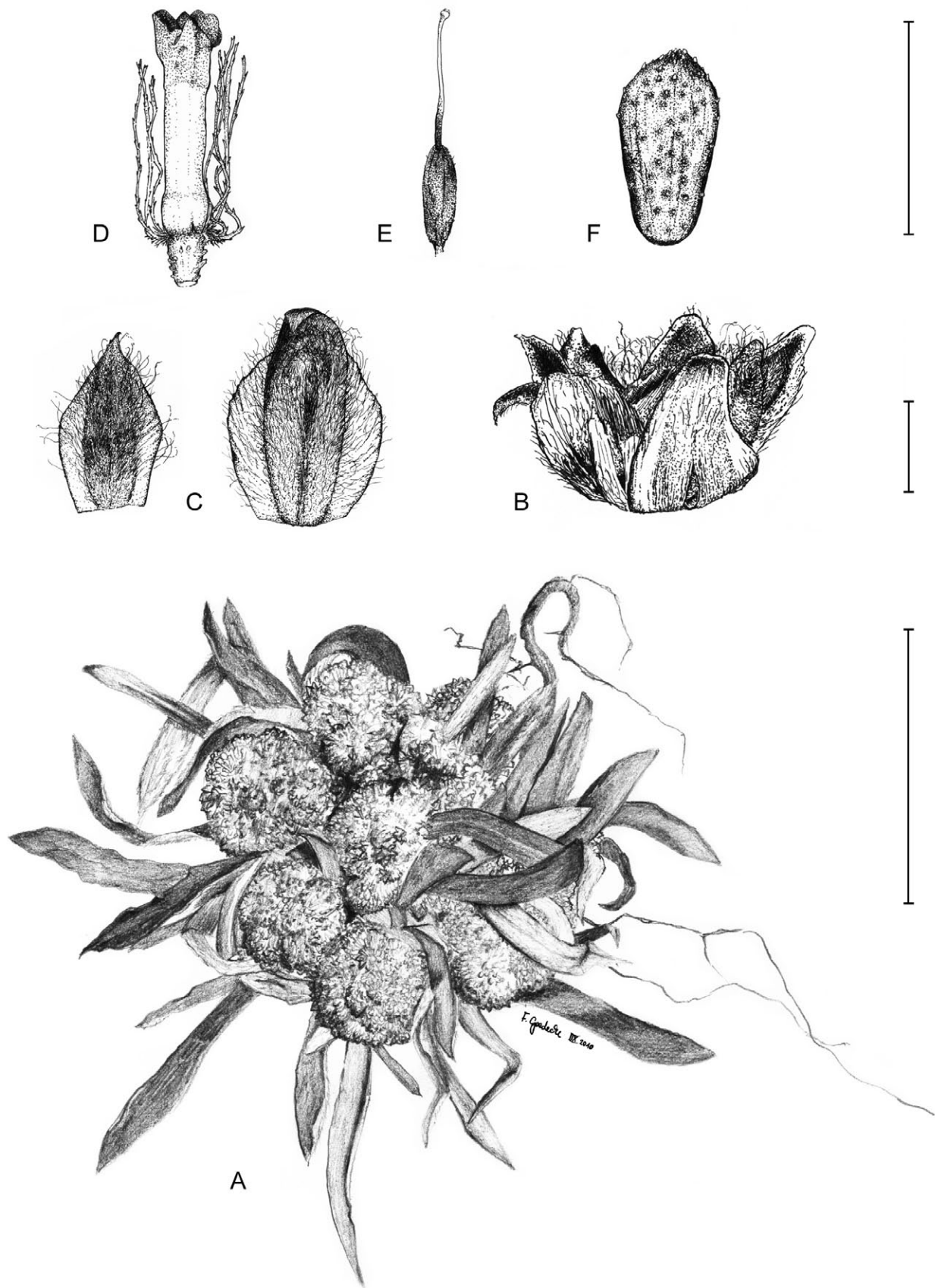


Fig. 1. *Filago wagenitziana* – A: typical acaulescent habit with rosette leaves and capitula clusters; B: capitulum; C: phyllaries; D: male (sterile) tubular floret with pappus bristles; E: female (fertile) pistillate floret; F: achene lacking a pappus. – Scale bars: A = 1 cm, B–C and D–F = 1 mm; drawn from the type collection by Florian Goedecke.

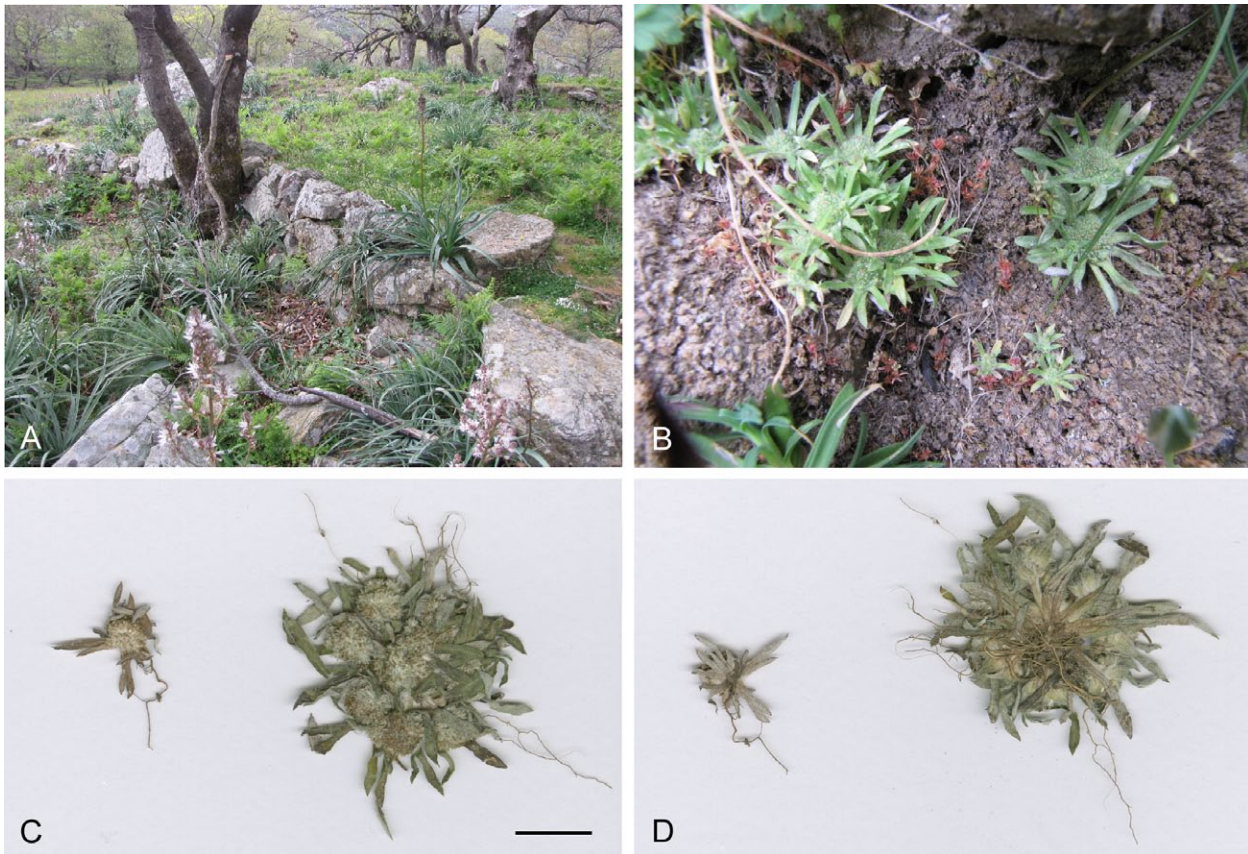


Fig. 2. *Filago wagenitziana* – A: habitat; B: group of plants in situ; C–D: plants of different size from the holotype, seen from above (C) and from the underside (D). – Scale bar: C–D=1 cm. – Photographs by E. Bergmeier.

the base seem to be more common in robust plants of the new species than in *F. contracta* and *F. pygmaea*.

Within *Filago* subg. *Evax*, *F. perpusilla* (Boiss. & Heldr.) Chrtek & Holub, which grows on Mt Parnassos (mainland Greece), resembles the new species in the non-cuspidate phyllaries and their relatively low number per capitulum. *F. perpusilla* is, however, a plant with shorter and wider leaves, which are lanate on both surfaces. *F. asterisciflora* (Lam.) Chrtek & Holub, a species of wider distribution in the W Mediterranean and N Africa, is a somewhat larger plant, which is mostly caulescent. Both *F. perpusilla* and *F. asterisciflora* have larger, long-papillose rather than short-papillose achenes. As with the new Cretan species, the N African *F. mauritanica* (Pomel) Dobignard has pappose male florets but is a caulescent plant resembling species of *Filago* s.str. in general appearance (Alavi 1983). *F. libyaca* (Alavi) Greuter & Wagenitz, described from semi-desert habitats in Tripolitania (NW Libya), is, as illustrated in Alavi (1983), a caulescent plant, whitish-tomentose throughout, with numerous phyllaries which are narrower than in the new species, resembling *F. argentea* (Pomel) Chrtek & Holub. The latter is a N African species, extending to Palestine, with  $\pm$  glabrous phyllaries.

The systematic position of the new species is difficult to ascertain. It combines characters of *Filago* sect. *Evax* (Gaertn.) Wagenitz and *F. sect. Evacopsis* (Pomel) Batt.

(see Wagenitz 1969). As with the new species, members of both sections have sterile inner florets. Most species of *F. sect. Evax* (*F. argentea*, *F. asterisciflora*, *F. contracta*, *F. libyaca*, *F. pygmaea*) are much more robust plants with elongated capitula. The small capitula with rather few phyllaries and the presence of deciduous pappus bristles are characters of *F. sect. Evacopsis*, in which, however, the phyllaries are arranged in five rows. This is not the case in the new species.

In appreciation of his merits in untangling the systematics, taxonomy and phytogeography of the genus *Filago*, particularly also in the Aegean, I name the new species after Gerhard Wagenitz, professor emeritus in Göttingen.

***Filago wagenitziana* Bergmeier, sp. nov.**

Holotypus: Greece, Kriti (Crete), Grenzgebiet der Nomoi Chania und Rethimno, südl. Asi Gonia, 760 m, Quarzit, sandiger Lehm, wechselfrocken, teilbeschattet unter *Platanus* und *Castanea*, 19.4.2008, Bergmeier 08-128 (GOET; isotypi: B, UPA).

Planta annua, caule valde abbreviato (subnullo), sub glomerulo terminali plerumque ramosa, ramis procumbentibus, 5–10 mm longis omnibus glomerulis terminatis. Folia lineari-lanceolata, 1–2 mm lata, subtus tomentosa, supra viridia tenuiter tomentosa, glabrescentia. Glomeruli ap-

planati, 5–8 mm diametro, foliis superati, c. 5–12-capitulati. Capitula c. 2.5 mm longa. Involucri phyllaria non distincte in serieis disposita, externa lanceolata, in parte centrali laxe tomentosula, in apice saepe extrorse curvata, attenuata, florem foemineum filiformem bracteantia, phyllaria interna breviora, obtusa. Flores disci plerumque 5, tubulosi, tetrameri, masculi, ovario rudimentario, papilloso, pappi setis c. 10 valde deciduis praedito. Achaenia 0.7–0.8 mm longa, papillosa, pappo destituto.

Plants annual, small, less than 1 cm tall, 2–3 cm in diameter, or branched plants 3–5 cm in diameter; *stem* very short or absent, with a leaf rosette and a pulvinate capitula cluster; *leaf rosette* either solitary or branched at base and producing procumbent stems to 1 cm, each terminating in a leaf rosette with a capitula cluster (Fig. 1, 2). *Rosette leaves* 15–20, sessile, spreading close to ground when young or fully developed, later spreading to suberect or sometimes incurved, exposing the whitish abaxial surface; *leaf blade* linear or linear-oblong, slightly expanded and somewhat sheathing at base, slightly widened in distal third, variable in length, (5–)10–15(–18) × 1–1.7(–2) mm, apex acute or acuminate, with a densely tomentose whitish indumentum abaxially, green and loosely tomentose adaxially; *midvein* visible all along leaf, slightly widened in proximal third. *Capitula clusters* (glomerules) 1–5 or more, acaulescent, 5–8(–10) mm in diameter, capitellate, consisting of 5–12 or sometimes more very densely set capitula; *capitula* with c. 14–20 “phyllaries” (actually receptacular paleae). *Phyllaries* not arranged in rows, imbricate, later slightly spreading to release ripe achenes, ovate, convex; outer and middle ones 2–2.4 × 1.2–1.3 mm, apex acute to acuminate, with a short mucro 0.1–0.3 mm, mucro and sometimes entire distal part (0.4–0.6 mm) recurved; inner phyllaries broadly ovate, shorter, 1–1.6 × 0.6–1.2 mm, apex obtuse to acute; all phyllaries green, distally conspicuously dark green, later brown, with a wide contrasting membranous hyaline margin 0.1–0.2 mm wide distally, 0.3–0.4 mm wide proximally, outer surface tomentose, densely so on outer phyllaries, more shortly so and only in central distal part on inner phyllaries, inner surface of all phyllaries glabrous, midvein extending to apex. *Outer florets* female, fertile, 0.8–1.2 mm; *inner florets* tubular, male, c. 1.2 mm long, subtended by few (up to 10) hyaline deciduous scabrid pappus bristles of about same length as the male florets. *Achenes* brown, oblanceolate to ovate, slightly compressed, 0.7–0.8 × 0.3–0.4 mm, with minute hyaline short papillae scattered all over the surface but set more densely in apical part, apex obtuse; *pappus* absent.

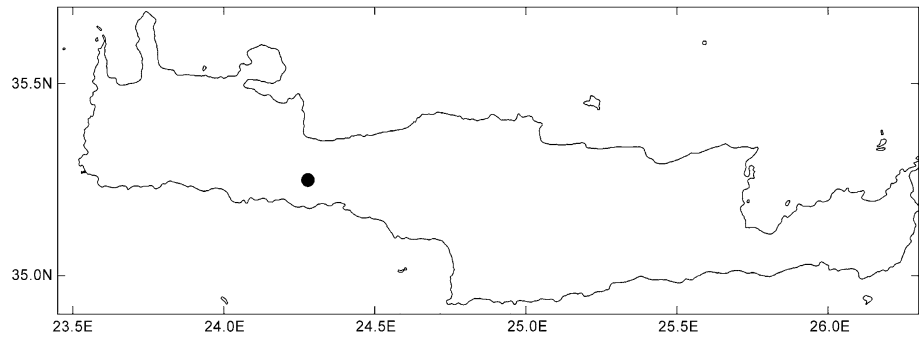


Fig. 3. Known distribution of *Filago wagenitziana* (●).

**Distribution and population size.** — The new species is a local endemic of the easternmost extension of the Lefka Ori in the triangle of the villages of Asi Gonia, Miriokefala and Kallikratis near the boundaries of the prefectures of Chania and Rethimno (Fig. 3). As currently known, it appears to be restricted to an area of probably less than one square kilometre at an altitudinal range between about 700 and 760 m. In this area, the entire population was found in sites of 300 m<sup>2</sup>, 100 m<sup>2</sup>, and 4 times a few square metres each. In these very small sites the species is nowhere abundant but occurs scattered. Only rarely did I find more than 10 mature individuals per square metre. An inventory in the known sites in 2010 revealed c. 530+150+20+20+5+4 plants. From field observations made in consecutive years I infer some fluctuation in individual numbers in the sites.

**Additional specimens (paratypes) and observations.** — Greece, Kriti (Crete), Grenzgebiet der Nomoi Chania und Rethimno, südl. Asi Gonia, 760 m, 24.5.2009, *Bergmeier 09-91* (B, herb. Bergmeier); *ibid.*, 760 m, 11.4.2010, *Bergmeier 10-135* (herb. Bergmeier); *ibid.*, 730 m, 11.4.2010, *Bergmeier* obs.; *ibid.*, 690 m, 11.4.2010, *Bergmeier* obs.; *ibid.*, 750 m, 18.6.2010, *Bergmeier 10-156c* (herb. Bergmeier).

**Ecology.** — *Filago wagenitziana* is restricted to the upper end of a quartzite area with several springs. Quite unusually, except locally in the phyllite-quartzite areas of western Crete, *Platanus orientalis* L. occurs in woodland patches that extend beyond ravine or riverbed habitats. In such terrain with open soil, on flat ground or embankments or in earth-filled crevices of rocks and boulders, the new *Filago* occurs in the semi-shade of mostly *Platanus* or rarely *Castanea sativa* Mill., *Quercus ilex* L. and *Q. coccifera* L., or half-hidden under fronds of *Pteridium aquilinum* (L.) Kuhn. The soil is a ranker with a skeletal component of quartzite. The thin layer of sandy or silty loam is markedly semi-wet, drying out in the course of April. Quartzite boulders and a few derelict terrace walls of quartzite stones add to the fine-scaled habitat heterogeneity. The terrace walls and the *Castanea* trees also bear witness to former cultivation and more variable land-use than today, when the area is used exclusively as wood pasture by the local livestock farmers (Fig. 2).

In microhabitats suitable for *Filago wagenitziana* at the margins of *Platanus* mixed woodland, other annual species occur, such as *Aira elegantissima* Schur, *Anogramma leptophylla* (L.) Link, *Anthemis rigida* Heldr., *Aphanes arvensis* L., *Cerastium deschatresii* Greuter & al., *Filago cretensis* Gand., *F. gallica* L., *F. pyramidata* L., *Galium murale* (L.) All., *Lotus angustissimus* L., *Moenchia graeca* Boiss. & Heldr., *Plantago weldenii* Rchb., *Polycarpon tetraphyllum* (L.) L., *Sagina apetala* Ard., *Sherardia arvensis* L., *Tillaea alata* Viv., *T. muscosa* L., *Trifolium campestre* Schreb., *T. glomeratum* L., *T. micranthum* Viv., *T. subterraneum* L., *T. suffocatum* L., *Valerianella muricata* (Steven) Baxter, *V. turgida* (Steven) Betcke, *Veronica arvensis* L. and *Vulpia muralis* (Kunth) Nees. Among the perennial herbs *Anthoxanthum odoratum* L., *Asphodelus ramosus* L., *Hypericum kelleri* Bald., *Lolium perenne* L., *Ornithogalum collinum* Guss., *Poa bulbosa* L., *Pteridium aquilinum* (L.) Kuhn, *Ranunculus paludosus* Poir., *Tolpis virgata* Bertol. and *Trifolium uniflorum* L. are common. Many of these species are calcifuge and  $\pm$  characteristic of soils that are seasonally or periodically wet and dry during the rest of the year.

The phenological rhythm of *Filago wagenitziana* is like that of many other short-lived species in the region. The plants flower in April, reach maturity in May, release achenes in May/June and then die. The new species is almost certainly a short-lived biennial (winter-annual), germinating probably in the period of late autumn / early winter.

**Conservation.** — The distribution range of *Filago wagenitziana* is situated near the boundaries of the community of Asi Gonia and the municipality of Sfakia, both belonging to the prefecture (nomos) of Chania, and the municipality of Lappa (Lappei, Lappaioi), administered by the prefecture of Rethimno. The major part of the plant population, if not the entire population, lies in the municipality of Lappa and is thus only just excluded from the Natura 2000 site Asfendou-Kallikratis (site code GR4340012). The northeastern borderline of this site follows that of the prefectures. Asfendou-Kallikratis represents a ‘Site of Community Interest’ (SCI), implemented in performance of the obligations imposed by the EU Habitats Directive. The central part of this SCI, slightly south of the *Filago* locality, has also been classified as a Special Protection Area (SPA) in 2001, a nature conservation area category in fulfilment of the Birds Directive, named Farangi Kallikratis-Argouliano Farangi-Oropedio Manika (site code GR4340019). The whole area has been designated an ‘Important Bird Area’ but there is currently no national or international protection status.

Nevertheless, it is crucial to include the adjoining area of the municipality of Lappa, with its unique *Platanus* wood pastures, acidophytic phrygana, springs and minute fens, in the Natura 2000 site Asfendou-Kallikratis. It would not only help to save the habitat of the new *Filago wagenitziana* but also the unique spring fens with

*Carex troodi* Turrill, *Sibthorpia europaea* L. and *Sphagnum denticulatum* Brid. (= *S. auriculatum* Schimp.). The easternmost occurrences in Crete of *Eleocharis multicaulis* (Sm.) Desv. (Bergmeier 2010, unpubl.) and of the W Cretan endemic *Lathyrus neurolobus* Boiss. & Heldr. are also there (Fielding & Turland 2005; Bergmeier & Abrahamczyk 2007, 2008). The only *Sphagnum* fen on Crete (and southernmost in Europe) is very close to the *F. wagenitziana* locality. The site was discovered in 1994 (Turland & Wilson 1995) and, after the water was piped away, the most significant spring fen was destroyed through desiccation only a few years after its discovery (Fielding & Turland 2005; Bergmeier & Abrahamczyk 2008). Fortunately, another *Sphagnum* population was found nearby in 2004 (Blockeel 2007) and its continued existence confirmed by me in 2010. Two other bryophytes known in Crete only from this locality are *Calypogeia muelleriana* (Schiffn.) K. Müll. and *Polytrichum commune* Hedw. var. *commune* (Blockeel 2007). Over-exploitation of the water resources remains a constant threat for this important area and its unique habitats and flora, including the new *F. wagenitziana*. Due to its small population size and distributional range, the new species is at very high risk of extinction. The global risk assessment according to IUCN Red List criteria (IUCN 2001; criterion B: basically one location, area of occupancy less than 500 km<sup>2</sup>; criterion C: fewer than 2500 mature individuals but more than 250) would thus be ‘Endangered’. In order to assess possible fluctuations or decline in the number of individuals, monitoring of the population is an essential task.

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I am much obliged to Gerhard Wagenitz, professor emeritus in Göttingen, who examined all specimens of the new *Filago* as well as my description. While we discussed the new species and revised the relevant *Filago* collections in GOET, he imparted some of his wide experience in the systematics of the genus to me. He also wrote the Latin description for this paper and read the manuscript. Special thanks are also due to Florian Goedecke, Göttingen, for the meticulous drawings of the tiny specimens. I would like to compliment him on this successful debut as plant illustrator. The map was created using Alan Morton’s DMAP. I also thank Elena Reiner-Drehwald, Göttingen, for the macro-scans, and Panayotis Dimopoulos, Agrinio, for up-to-date information on the conservation status of the Natura 2000 site Asfendou-Kallikratis. The thorough examination of the manuscript by Werner Greuter and Nicholas Turland is gratefully acknowledged, especially also the corrections and useful comments of the latter reviewer.

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