

Contributions to the flora of the Aegean islands of Santorini and Anafi (Kiklades, Greece)

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BURKHARD BIEL

Contributions to the flora of the Aegean islands of Santorini and Anafi (Kiklades, Greece)

Abstract

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Field work in the Kiklades (Aegean Islands, Greece), carried out by the author in spring 1999 and 2000, resulted in a number of floristic additions to single islands. 14 new records for the flora of Santorini (Thira) and 95 new records for the flora of Anafi are listed and commented.

Introduction

Two collecting tours of the author, in spring 1999 and 2000, to the islands of Santorini (Thira) and Anafi (Greece, Nomos of Kiklades, Eparchia of Thira) have revealed a number of additions to the flora of that part of the Aegean as compared with relevant publications and checklists. Collected material has been revised by specialists for the Aegean flora. A part of the results, concerning the orchid family (*Orchidaceae*), has been published separately (Biel 2001).

General remarks on the investigated islands

The islands of Santorini (76 km², c. 10 500 inhabitants) and Anafi (38 km², c. 300 inhabitants) are situated in the Aegean, at the southern border of the Kiklades, about 110 km north of Crete. They are subject to the Mediterranean winter rain climate. The low amount of rainfall (364 mm/a on Santorini) leads to regular periods of water shortage during summer. However, the surrounding sea and the regular chill and dry etesial (northeasterly) winds, causing fog and more frequent dew, have a compensational effect on the local hydrology.

The geological substrates of the islands can be compared only little with each other, due to the different histories of development. The Santorini island group is still shaped by active volcanism (Philippon 1959, Pichler & Kussmaul 1980). Its single islands are arranged in a broken circular rampart (caldera), the remnant of a destructed old volcano (the former island of Strongili), with younger sea-born volcanic islands in the centre. The main island, Santorini (Thira), forms the sickle-shaped northern, eastern and southern border of the caldera (N-S expansion c. 17 km, W-E expansion c. 6 km). Approximately 70 % of the surface of Santorini is occupied by partly

very massive pumice layers. In the north and south of the island these layers are penetrated by older volcanos, which cover c. 15 % of the surface with their lava and scoria slopes. The limestone massif of Mts Profitis Ilias and Mesa Vouno (upper Triassic to Eocene) projects from the relative uniform volcanic landscape as a conspicuous particularity at the widest part of the island. This basic rock together with limited layers of slightly metamorphic schist cover c. 15 % of the surface.

In contrast, the landmass of Anafi, which is situated c. 21 km E of Santorini, is not shaped by volcanism but by processes of recent erosion of geologically old rock formations, similar to most of the other Kiklades. The geological composition of the present-day island is relatively complex. Four main units can be separated (Philippon 1959, Melidonis 1983): older tertiary flysch with serpentine sheds; massive, green slate layers; a tectonic moraine (Mélange) with youngest kretazic crystalline and ultrabasites; and fluvial-limnic neogen sediments. The island forms a triangle, stretched into W-E direction (length c. 12 km, width c. 7 km) with an attached peninsula in the east and has a distinctly mountainous character (Mt Vigla, 582 m) with an intense relief due to numerous deep radial ravines.

The cultivated land of Santorini occupies nearly all the island's surface (c. 80 %), except the steep coastal cliffs. Vineyards take the greatest expanse on spacious pumice terraces. More unfavourable locations lie fallow or are grazed, respectively. Only small areas are used for the cultivation of vegetables and fruits for self-supply – the lack of water is the limiting factor. Perennial water courses do not exist.

In the western parts of Anafi cereals have been extensively grown in former times on fertile younger sediments. The wider bottoms of valleys have been used for vineyards and orchards, rendered possible by numerous springs and periodic watercourses that result from the more favourable geological situation (water leading and -damming layers), in contrast to Santorini. However, local agriculture is constantly declining. Fallow fields and terraces can be found all over the island.

Natural wood lacks both on Santorini and Anafi. Also cultivation of olive trees, widespread elsewhere in the Mediterranean region, is nearly completely absent.

The range of floral habitats, similar on both islands, is fairly restricted. There are only the following two main and a few additional, limited and specialised habitat types:

- The predominant part takes the typical E Mediterranean thorn-phrygana. It is common on nearly all older fallow land, with different combinations of dominating species, and occupies about 50 % of that habitat type.
- A more or less distinctive ruderal habitat on the younger fallow land takes a share of c. 40 %, which seamlessly passes into the phrygana in some areas.
- Within the phrygana, only few shrubby species define the aspect, such as *Sarcopoterium spinosum*, *Coridothymus capitatus*, *Cistus creticus*, *Thymelaea hirsuta*. More varied phrygana types are restricted to the limestone areas, viz. the northern slopes of Mt Profitis Ilias and the northwesterly slope of Mt Gavrilos on Santorini. On extreme habitats, such as on pumice tuff, monospecific stands of, e.g., *Helichrysum* sp. can be found. On some areas the phrygana may be dominated by neophytes such as *Opuntia ficus-indica*, *Agave americana*, or the conspicuous yellow flowering *Aeonium arboreum*.
- Ruderal (abandoned) habitats in the central mountainous part of Anafi are predominantly grassy fields of annuals on areas still used for slash-and-burn of the phrygana, and on Santorini mostly manured areas increasingly used as paddocks for horses and donkeys.
- Other remarkable but limited habitats are, e.g., the rocky area on the summit ridge of Mt Profitis Ilias on Santorini, rich in geophytes and lichens, and the humid vegetation along the brook banks of scattered periodic water courses on Anafi.

The flora of Santorini has been investigated by numerous explorers almost since 200 years and hence is relatively well known. Basic contributions were made by Heldreich (1899, 1902), Hansen (1971), Rackham (1978), Raus (1991) and Covillot & al. (1997). For the whole of the San-

torini island group the occurrence of c. 550 taxa of ferns and flowering plants has been confirmed up to now.

The flora of the less attractive island of Anafi has been only little explored up to now. Published floristic data were gained by three visitors or teams only, viz. J. Renz (3.-8.6.1927), O. von Wettstein (1934), the results of both published in Rechinger (1943), and Runemark & Snogerup and Runemark & Nordenstam, respectively, who collected on Anafi in 1958, 1960 and 1964 but published no more than thirteen selected records of the rich collections kept in LD (Runemark & al. 1960, Snogerup 1968). Further floristic evidence from Anafi is mapped in the first two volumes of “Flora hellenica” (Phitos & al. 1997, 2002). Therefore the list of published vascular plant taxa for Anafi comprises only a few dozen species so far.

Material and methods

The island of Santorini has been visited by the author three times (25.-30.4.1999, 26.-30.3. and 5.-8.4.2000), and the island of Anafi once (1.-4.4.2000). On Santorini a total of 86 sites with 218 taxa, and on Anafi 68 sites with 164 taxa have been sampled in all. Herbarium vouchers of 114 taxa and photographic proofs of 92 taxa have been taken. The specimens are deposited in the herbarium of the Botanic Garden and Botanical Museum Berlin-Dahlem (B), cited photographs are kept in the author’s private collection. A major number of voucher specimens especially of critical taxa have been revised by Arne Strid, Göteborg, some others by Kit Tan, Copenhagen (*Capparis*), Uwe Raabe, Recklinghausen (*Chara*) and Hans Runemark, Lund (*Adonis*). Collection localities, where taxa new to the area have been sampled or observed, are listed below.

Investigated localities

The general allocation “Greece, Nomos of Kiklades, Eparchia of Thira” applies to all of the sites. Site numbers (Santorini: no. 1-22, Anafi: no. 23-76) are referred to in the floristic catalogue. For each site UTM grid data, location and habitat, altitude, and sampling date are given.

1. LA 62.16 – Santorini, S Pargos, Mt Profitis Ilias, limestone slope with phrygana along old path by chapel ruin, 270 m, 24.4.1999
2. LA 62.16 – Santorini, SSE Pargos, Mt Profitis Ilias, rocky phrygana slope with abandoned olive and fig trees below the monastery, limestone, 270 m, 3.4.2000
3. LA 62.16 – Santorini, SSE Pargos, Mt Profitis Ilias, steep, rocky *Helichrysum-Coridothymus* phrygana by winding road, limestone with a thin pumice layer, 450 m, 26.3.2000
4. LA 62.36 – Santorini, SW Kamari, Mt Profitis Ilias, *Coridothymus-Helichrysum* phrygana along old path by grotto chapel, limestone, 200 m, 25.4.1999
5. LA 62.03 – Santorini, SSW Emborio, Mt Gavrilos, gentle phrygana slope with *Asphodelus*, limestone, 110 m, 26.4.1999
6. LA 62.05 – Santorini, N Emborio, E slope of Mt Profitis Ilias, steep limestone rocks with *Asphodelus*, 150 m, 26.4.1999
7. LA 62.16 – Santorini, S Kamari, Mt Mesavouno, rocky limestone slope with *Coridothymus-Sarcopoterium* phrygana on upper ridge, by the old path, 150 m, 27.4.1999
8. LA 62.26 – Santorini, SE Episkopi Gonias, N foot of Mt Profitis Ilias, heavily grazed pumice terraces with abandoned vineyards and shrubbery below a quarry, 200 m, 28.4.1999
9. LA 62.05 – Santorini, NNE Emporio, Mt Profitis Ilias, steep slope with *Coridothymus* phrygana grazed by cattle, below limestone cliff W of the summit, 320 m, 28.4.1999
10. LA 53.85 – Santorini, S Pori, Mt Mikro Profitis Ilias, partly terraced N slope with *Cistus-Coridothymus* phrygana above the road, basaltic blocks and tuff, 240 m, 1.5.1999
11. LA 53.86 – Santorini, SW Pori, bushy, grazed terraces along path by old chapel below the road, basaltic blocks and tuff, 150 m, 1.5.1999
12. LA 53.87 – Santorini, NW Pori, grassy pasture land with stone walls in a valley, basalt and tuff, 100 m, 1.5.1999

13. LA 62.15 – Santorini, ENE Emborio, SW foot of Mt Profitis Ilias, limestone slope E of a quarry, with open *Calicotome-Coridothymus* phrygana, 70 m, 27.3.2000
14. LA 62.25 – Santorini, NW Perissa, S foot of Mt Profitis Ilias, steep limestone slope with open *Calicotome-Coridothymus* phrygana, 50 m, 27.3.2000
15. LA 53.92 – Santorini, SE Imerovigli, slopes by roads and paths with ruderal phrygana, pumice, 260 m, 28.3.200
16. LA 62.16 – Santorini, SSE Pírgos, Mt Profitis Ilias, steep, rocky slopes with *Coridothymus* phrygana below the monastery, 290 m, 3.4.2000
17. LA 53.76 – Santorini, ESE Finikia, Mt Megalo Vouno, rocky phrygana below chapel, basalt and tuff, 310 m, 4.4.2000
18. LA 53.76 – Santorini, E Finikia, Mt Kokkino Vouno, grazed terraces with grassy phrygana along the ridge, pumice, 280 m, 4.4.200
19. LA 62.16 – Santorini, SSE Pírgos, N foot of Mt Profitis Ilias, limestone rocks and steep pumice slopes with phrygana, 300 m, 5.4.2000
20. LA 62.17 – Santorini, SSW Episkopi Gonias, terraced rocky calcareous slope with grassy phrygana and scattered fruit trees, 130 m, 5.4.200
21. LA 52.94 – Santorini, SW Emborio, steep calcareous slope with dense phrygana, 120 m, 6.4.200
22. LA 62.03 – Santorini, S Emborio, limestone slope with *Coridothymus* phrygana, with adjacent terraced pasture land, pumice gravel, 50 m, 6.4.2000
23. LA 82.93 – NE Anafi, *Coridothymus* phrygana above windmill ridge, gravelly metamorphic rock, 220 m, 29. & 31.3.2000
24. LA 92.04 – NE Anafi, grazed terraces with *Calicotome-Coridothymus* phrygana above a path, green schist and sandstone, 200 m, 29.3.2000
25. LA 92.04 – NE Anafi, *Cistus-Coridothymus* phrygana on the pass by the chapel and slopes below, green schist and sandstone, 210 m, 29.3.2000
26. LA 92.04 – NE Anafi, *Cistus-Coridothymus* phrygana and abandoned terraces on steep slopes, schist and marly loam, 180 m, 29.3.2000
27. LA 92.04 – ENE Anafi, grazed terraces with grassy phrygana, schist and marly loam, 160 m, 29.3.2000
28. LA 92.04 – ENE Anafi, gentle grazed terraces with grassy phrygana on top of a hill, schist and marly loam, 160 m, 29.3.2000
29. LA 92.03 – ENE Anafi, grazed terraces with *Calicotome-Cistus* phrygana on slope above farmstead with three stone ovens, schist and marly loam, 150 m, 29.3.2000
30. LA 92.03 – E Anafi, steep slope with *Coridothymus-Calicotome* phrygana above the old path, schist and marly loam, 110 m, 30.3.2000
31. LA 92.03 – ESE Anafi, S exposed *Asphodelus* phrygana by the old path, schist and marly loam, 100 m, 30.3.2000
32. LA 92.13 – ESE Anafi, terraced slopes with *Asphodelus* in a depression by the old path, schist and marly loam, 40 m, 30.3.2000
33. LA 92.13 – E Anafi, slopes with phrygana by the old path, marly loam with gravel, 40 m, 30.3.2000
34. LA 92.13 – E Anafi, meadow and grazed terraces along rivulet (with little running water) by the old path, marly loam with gravel, 20 m, 30.3.2000
35. LA 92.33 – E Anafi, meadow along rivulet near the sea, with adjacent *Coridothymus-Sarcopoterium* phrygana by the old path, 10 m, 30.3.2000
36. LA 92.44 – E Anafi, Moni Zoodochou Pigis, slope with *Coridothymus-Sarcopoterium* phrygana WSW of the monastery, above the old path, marly rock, 40 m, 30.3.2000
37. LA 92.44 – ENE Anafi, Moni Zoodochou Pigis, slope with *Coridothymus-Sarcopoterium* phrygana SW of the monastery, by the old winding path, marly sandstone, 40 m, 30.3.2000
38. LA 92.54 – ENE Anafi, Moni Zoodochou Pigis, ruderal *Coridothymus-Sarcopoterium* phrygana in a walled stockyard with olive tree E of the monastery by the old path, limestone, 80 m, 30.3.2000

39. LA 92.54 – ENE Anafi, Kalamos, N exposed, open, heavily grazed *Coridothymus-Calicotome* phrygana with limestone rocks, by the old winding path, 120 m, 30.03.2000
40. LA 92.63 – E Anafi, Kalamos, N exposed, open, heavily grazed *Coridothymus-Calicotome* phrygana with limestone rocks, by the old winding path, 340 m, 30.3.2000
41. LA 92.63 – E Anafi, Kalamos, N exposed, open, rocky, heavily grazed *Coridothymus-Erica* phrygana by the old path, limestone, 400 m, 30.3.2000
42. LA 92.04 – NE Anafi, terraced slope with grazed *Asphodelus* phrygana by the old path, gravelly schist, 170 m, 31.3.2000
43. LA 92.05 – NNE Anafi, rocky ravine (only little water) with phrygana by the old path, schist/limestone, 160 m, 31.3.2000
44. LA 92.05 – NE Anafi, *Coridothymus* phrygana in a branching-off valley by the old path, schist, 180 m, 31.3.2000
45. LA 92.05 – NE Anafi, grazed *Sarcopoterium* phrygana on terraces on the pass by the old path, gravelly schist, 260 m, 31.3.2000
46. LA 92.15 – NE Anafi, Mt Vounia, grazed *Sarcopoterium* phrygana on terraces on the W ridge by the old path, gravelly and marly schist, 320 m, 31.3.2000
47. LA 92.16 – NE Anafi, Mt Vounia, grazed terraces (partly burnt) with *Coridothymus* phrygana on the northern plateau by the old path, calcareous sandstone, 300 m, 31.3.2000
48. LA 92.16 – NE Anafi, Mt Vounia, grazed terraces and fallow fields with *Coridothymus* phrygana on the northern plateau near a chapel by the old path, calcareous sandstone, 300 m, 31.3.2000
49. LA 92.06 – NNE Anafi, Mt Vigla, grassy hill with *Coridothymus-Calicotome* phrygana along W ridge by the old path, black gravelly schist and sandstone, 360 m, 31.3.2000
50. LA 92.06 – NNE Anafi, Mt Vigla, grazed terraces with open *Coridothymus-Calicotome* phrygana along W ridge by the old path, limestone, 400 m, 31.3.2000
51. LA 82.97 – N Anafi, Mt Vigla, heavily grazed terraces (partly burnt) with open *Coridothymus* phrygana at the N pass by the old path, calcareous loam, 400 m, 31.3.2000
52. LA 82.96 – N Anafi, Mt Vigla, grazed, rocky *Coridothymus-Calicotome* phrygana (partly burnt) at NW slope by the old path, limestone, 400 m, 31.3.2000
53. LA 82.96 – N Anafi, Mt Vigla, gentle rocky limestone slope with grazed *Coridothymus-Calicotome* phrygana (partly burnt) at NW slope by the old path, 390 m, 31.3.2000
54. LA 82.94 – NNE Anafi, rocky limestone slope with phrygana by the old path, 260 m, 1.4.2000
55. LA 82.95 – N Anafi, E exposed slope with phrygana and scattered olive trees by the old path, 320 m, 1.4.2000
56. LA 82.95 – N Anafi, hill with grazed phrygana by the old path, 340 m, 1.4.2000
57. LA 82.86 – NNW Anafi, Mt Vigla, *Sarcopoterium-Calicotome* phrygana and grazed terraces at the rocky W ridge, metamorphic conglomerates, 190 m, 1.4.2000
58. LA 82.76 – NW Anafi, grazed terraces with open *Calicotome-Coridothymus* phrygana, metamorphic and marly conglomerates, 140 m, 1.4.2000
59. LA 82.76 – NW Anafi, meadow in narrow valley by rivulet with running water, and adjacent *Calicotome-Coridothymus* phrygana, marl, 40 m, 1.4.2000
60. LA 82.75 – NW Anafi, grazed terraces with *Calicotome-Coridothymus* phrygana along the new road, sandstone gravel, 140 m, 1.4.2000
61. LA 82.75 – NW Anafi, grazed terraces with *Calicotome-Coridothymus* phrygana by road junction, sandstone gravel, 140 m, 1.4.2000
62. LA 82.74 – WNW Anafi, gentle slope with *Coridothymus* phrygana at the new road pass and below at the old path, marly sandstone, 160 m, 1.4.2000
63. LA 82.84 – WNW Anafi, slope with *Coridothymus* phrygana above the new road, sandstone, 140 m, 1.4.2000
64. LA 82.83 – W Anafi, terraces with *Coridothymus* phrygana below the new road, sandstone, 130 m, 1.4.2000

65. LA 82.93 – W Anafi, steep slope with grazed *Calicotome-Coridothymus* phrygana by the old path, calcareous sandstone, 130 m, 1.4.2000
66. LA 92.04 – NE Anafi, narrow, rocky valley with pools (little running water), sandstone and schist, 120 m, 2.4.2000
67. LA 92.04 – NE Anafi, terraced slope with olive trees and phrygana near a farm building, schist and black pumice, 160 m, 2.4.2000
68. LA 92.04 – NE Anafi, grassy hill with scattered olive trees by the old path, schist, 220 m, 2.4.2000
69. LA 92.14 – NE Anafi, grazed terraces with *Sarcopoterium* phrygana by the old path, schist, 240 m, 2.4.2000
70. LA 92.15 – NE Anafi, steep ravine with dense *Coridothymus-Sarcopoterium* phrygana, schist, 210 m, 2.4.2000
71. LA 92.25 – NE Anafi, Mt Vounia, grazed terraces with *Coridothymus* phrygana on SE exposed slope, gravelly conglomerates, 180 m, 2.4.2000
72. LA 92.25 – NE Anafi, Mt Vounia, heavily grazed terraces with *Coridothymus-Calicotome* phrygana at the E pass by the old path, schist and gravel, 250 m, 2.4.2000
73. LA 92.26 – NE Anafi, grazed slope with *Coridothymus-Calicotome* phrygana near a farm house by the old path, limestone, 250 m, 2.4.2000
74. LA 92.25 – ENE Anafi, Mt Kasteli, grazed slope with *Calicotome* phrygana near chapel at the N pass by the old path, schist, 230 m, 2.4.2000
75. LA 92.24 – ENE Anafi, Mt Kasteli, grazed terraces with *Calicotome* phrygana by the old path, schist, 170 m, 2.4.2000
76. LA 92.14 – NE Anafi, steep grassy road verge with little phrygana, metamorphic conglomerates, 200 m, 30. 3.2000

New records to Santorini and Anafi

Records previously not published from the islands of Santorini and Anafi are alphabetically listed in the following floristic catalogue. For each entry locality number(s), voucher(s) and facultative comments are given. San = Santorini, Ana = Anafi.

- Aeonium arboreum* (L.) Webb & Berthel. – San: 6, 11, 13, 20; *Biel*, photo 1b/8. – Ana: 42; *Biel*, photo 2b/86. – Species planted for ornament, locally naturalized on several abandoned field terraces on both islands, where it grows in large stands.
- Agave americana* L. – San: 4, 7; *Biel*, obs. – Ana: 34; *Biel*, obs. – Species planted for ornament and fencing purposes, partly naturalized on abandoned field terraces and coastal rocks on both islands.
- Allium neapolitanum* Cirillo – Ana: 62; *Biel* BB_SA00.097.
- Allium roseum* L. – Ana: 44; *Biel*, obs.
- Allium subhirsutum* L. – Ana: 41, 67; *Biel*, obs.
- Anagallis arvensis* L. var. *arvensis* – Ana: 59; *Biel*, obs.
- Anagallis arvensis* var. *coerulea* (L.) Gouan – Ana: 23, 59; *Biel*, obs.
- Anagyris foetida* L. – Ana: 28, 47, 50, 54, 60, 63, 64; *Biel* BB_SA00.080. – Groups of shrubs are widely distributed on Anafi.
- Anchusa aegyptiaca* (L.) DC. – Ana: 34; *Biel*, obs.
- Anchusa italica* Retz. – San: 15; *Biel*, obs.
- Anemone pavonina* Lam. – Ana: 24, 25, 28, 30; *Biel*, obs.
- Anthemis chia* L. – Ana: 54; *Biel* BB_SA00.082.
- Anthemis rigida* Heldr. – Ana: 74; *Biel*, BB_SA00.105.
- Anthyllis vulneraria* subsp. *rubriflora* (DC.) Arcang. – Ana: 49; *Biel*, obs.
- Apium graveolens* L. – Ana: 59; *Biel* BB_SA00.092.
- Arisarum vulgare* O. Targ.-Tozz. – Ana: 38, 42, 64; *Biel*, obs.

- Arundo donax* L. – Ana: 32, 34, 59, 66, 70; *Biel*, obs. – Planted and persisting from former cultivation in abandoned areas.
- Asphodelus ramosus* L. – Ana: 25, 28, 35, 34, 39, 44, 45, 51, 55, 64; *Biel*, obs.
- Calendula arvensis* L. – Ana: 23, 64; *Biel*, obs.
- Capparis spinosa* subsp. *aegyptia* (Lam.) Kit Tan & Runem. – San: 17; *Biel* BB_SA00.123. – *C. spinosa* was listed by Raus (1991) without referring to subspecies. This rather rare subspecies was found on the rocks of the caldera rim, SE of the village of Ia.
- Capparis spinosa* subsp. *rupestris* (Sm.) Nyman – San: 18, 20; *Biel* BB_SA00.124. – This subspecies is widespread on Santorini (see preceding note).
- Carex flacca* subsp. *serrulata* (Biv.) Greuter – Ana: 62; *Biel*, obs.
- Centaurium pulchellum* (Sw.) Druce – San: 5, 7; *Biel*, photo 1a/55.
- Chara vulgaris* L. – Ana: 66; *Biel* BB_SA00.022. – This macrophytic alga is well represented in periodical ponds in a little river bed in the SE part of Anafi.
- Cistus salviifolius* L. – Ana: 57, 59; *Biel*, obs.
- Colchicum cupanii* Guss. – Ana: 23, 25, 28, 30, 39, 45; *Biel*, obs. – This geophyte is common and widely distributed on Anafi.
- Convolvulus althaeoides* L. – Ana: 64, 74; *Biel*, obs.
- Convolvulus cantabrica* L. – Ana: 23, 31; *Biel*, obs.
- Cynanchum acutum* L. – San: 12; *Biel* BB_SA00.122.
- Cynoglossum creticum* Mill. – Ana: 54; *Biel* BB_SA00.083.
- Cytinus hypocistis* subsp. *clusii* Nyman – San: 10; *Biel*, obs.
- Dianthus diffusus* Sm. – San: 1; *Biel* BB_SA00.118. – Extension of the known southernmost occurrence (Phitos & al. 1997: map 700) of this species.
- Diurichia viscosa* (L.) Greuter – Ana: 59, 66; *Biel*, obs.
- Dracunculus vulgaris* Schott – Ana: 34, 35; *Biel*, obs.
- Equisetum ramosissimum* Desf. – Ana: 66; *Biel* BB_SA00.099, BB_SA00. 100, photo 2b/87.
- Erodium gruinum* (L.) L'Hér. – Ana: 23, 28, 44, 67; *Biel*, obs.
- Erodium moschatum* (L.) L'Hér. – Ana: 42; *Biel*, obs.
- Euphorbia acanthothamnus* Boiss. – Ana: 40; *Biel*, obs.
- Euphorbia helioscopia* L. – Ana: 28; *Biel*, obs.
- Filago contracta* (Boiss.) Chrték & Holub – Ana: 58, 61; *Biel* BB_SA00.089a.
- Foeniculum vulgare* subsp. *piperitum* (Ucria) Cout. – Ana: 25, 66; *Biel*, obs.
- Fumana arabica* (L.) Spach – Ana: 23, 31, 42, 68; *Biel*, photo 2b/50 + 51.
- Fumana thymifolia* (L.) Webb – Ana: 31, 58; *Biel*, obs.
- Gagea graeca* (L.) A. Terracc. – Ana: 24, 42, 44, 67, 69; *Biel*, obs.
- Gladiolus italicus* Mill. – Ana: 43; *Biel*, obs.
- Gynandris sisyrrinchium* (L.) Parl. – Ana: 23, 26, 34, 39, 59, 60, 74; *Biel*, photo 2b/95.
- Helichrysum orientale* (L.) Gaertn. – Ana: 64; *Biel* BB_SA00.107.
- Hymenocarpus circinnatus* (L.) Savi – Ana: 74; *Biel* BB_SA00.106.
- Hyoseris scabra* L. – Ana: 23; *Biel* BB_SA00.050.
- Hypocoum procumbens* L. – Ana: 38; *Biel* BB_SA00.068.
- Hypericum triquetrifolium* Turra – Ana: 28; *Biel*, obs.
- Juncus bufonius* L. – Ana: 35; *Biel* BB_SA00.064.
- Lamium amplexicaule* L. – Ana: 28; *Biel*, obs.
- Lathyrus clymenum* L. – Ana: 23; *Biel* BB_SA00.108.
- Lilium candidum* L. – San: 9; *Biel*, obs. – Escaped from cultivation, observed as naturalized (obviously not planted) on a steep phrygana slope NNE of Emborio.
- Linaria pelissieriana* (L.) Mill. – Ana: 54; *Biel* BB_SA00.084.
- Lotus edulis* L. – Ana: 23; *Biel* BB_SA00.071, photo 2b/86.
- Lupinus angustifolius* L. – Ana: 44; *Biel*, obs.
- Lupinus pilosus* L. – Ana: 44; *Biel*, obs.
- Malva sylvestris* L. – Ana: 23, 28, 42; *Biel*, obs.

- Mandragora autumnalis* Bertol. – Ana: 24, 27, 28, 32, 40, 42, 46, 47, 51, 60, 64 *Biel*, photo 2b/55 + 61. – This conspicuous species is widely distributed on Anafi.
- Medicago truncatula* Gaertn. – Ana: 23; *Biel* BB_SA00.109.
- Morus alba* L. – San: 8; *Biel*, obs. – Planted and persisting when cultivation is abandoned.
- Muscari commutatum* Guss. – Ana: 26, 28, 30, 39, 45, 57, 64, 71; *Biel*, obs. – This bulbous geophyte is widely distributed on Anafi.
- Muscari comosum* (L.) Mill. – Ana: 34, 45, 64; *Biel*, obs.
- Narcissus tazetta* L. – Ana: 48, 49, 50, 59, 67; *Biel* BB_SA00.079, photo 2b/72. – Species planted for ornament, on Anafi fully naturalized.
- Nerium oleander* L. – Ana: 34, 35, 44, 59, 66, 70; *Biel*, obs.
- Olea europaea* L. – San: 2, 19; *Biel* BB_SA00.112. – Planted and persisting when cultivation is abandoned. Small-leaved plants may represent grazed offsprings of *O. europaea* L. subsp. *europaea* rather than indigenous *O. europaea* subsp. *oleaster* (Hoffmans. & Link) Negodi.
- Opuntia ficus-indica* (L.) Mill. – Ana: 34, 44; *Biel*, obs. – Species planted chiefly for fencing purposes; persisting when cultivation is abandoned.
- Oxalis corniculata* L. – Ana: 35; *Biel*, obs. – Adventive with uncertain degree of naturalisation.
- Oxalis pes-caprae* L. – Ana: 34, 35, 44, 64, 66; *Biel*, obs. – Naturalised xenophyte.
- Phacelia tanacetifolia* Benth. – San: 9; *Biel* BB_SA99.031, photo 1a/76. – Escaped from cultivation, with uncertain degree of naturalisation. A large stand of numerous plants covering an area of c. 250 m² and presumably intended by beekeepers was met caused on a SW exposed slope of Mt Profitis Ilias above Emborio.
- Phragmites australis* (Cav.) Steud. – Ana: 59; *Biel*, obs.
- Pinus halepensis* subsp. *brutia* (Ten.) Holmboe – Ana: 65, 67; *Biel* BB_SA00.098, photo 2b/85. – Only a few single trees grow on Anafi, whether planted or indigenous (remnant of former wood) remains unclear.
- Pistacia terebinthus* L. – San: 22; *Biel*, obs. – Planted and persisting when cultivation is abandoned.
- Pittosporum tobira* (Murray) Aiton fil. – Ana: 76; *Biel*, obs. – Planted and persisting when cultivation is abandoned.
- Polygala venulosa* Sm. – Ana: 24, 72; *Biel* BB_SA00.056.
- Reseda alba* L. – Ana: 31; *Biel*, obs.
- Retama monosperma* (L.) Boiss. – Ana: 76; *Biel* BB_SA00.061, photo 2b/25 + 26. – An old bushy tree, 2.5 m high, was found by the road E of the village Anafi. Its status is unclear so far. This is the second record of the species from Greece (see Biel 2002: 212).
- Romulea bulbocodium* (L.) Sebast. & Mauri – Ana: 41; *Biel* BB_SA00.070.
- Rosmarinus officinalis* L. – Ana: 52, 57, 62, 72; *Biel*, obs. – Escaped and persisting from former cultivation.
- Rubus sanctus* Schreb. – Ana: 59; *Biel*, obs.
- Ruta chalepensis* L. – Ana: 53; *Biel*, obs.
- Salvia verbenaca* L. – Ana: 23, 50; *Biel*, obs.
- Sarcopoterium spinosum* (L.) Spach – Ana: 23, 36, 42, 64, 65, 74; *Biel*, obs.
- Satureja graeca* L. – San: 21; *Biel*, obs. – Ana: 28, 43; *Biel*, obs.
- Schoenus nigricans* L. – Ana: 34, 59; *Biel* BB_SA00.093, BB_SA00.063a.
- Scirpoides holoschoenus* (L.) Soják – Ana: 34, 66; *Biel* BB_SA00.063, BB_SA00.102.
- Scorpiurus muricatus* L. – Ana: 59; *Biel*, obs.
- Scrophularia heterophylla* Willd. – Ana: 54; *Biel* BB_SA00.088.
- Sedum amplexicaule* subsp. *tenuifolium* (Sm.) Greuter & Burdet – San: 3; *Biel* BB_SA00.119. – The species was listed by Raus (1991) without referring to subspecies.
- Selaginella denticulata* (L.) Spring – Ana: 30, 40; *Biel*, obs.
- Silene cretica* L. – Ana: 25, 42, 74; *Biel*, obs.
- Silene vulgaris* subsp. *macrocarpa* Turrill – Ana: 28; *Biel*, obs.
- Smyrniurn creticum* Mill. – Ana: 43, 56; *Biel*, photo 2b/78.
- Solanum nigrum* L. – Ana: 66; *Biel* BB_SA00.103. – Subspecies unclear so far.

- Tamarix parviflora* DC. – Ana: 76; *Biel*, obs. – A few bushes along roadsides in the E part of Anafi are certainly planted.
- Tetragonolobus purpureus* Moench – Ana: 60 ; *Biel* BB_SA00.096.
- Teucrium brevifolium* Schreb. – Ana: 24, 28, 29, 30, 37, 39, 52, 54, 57, 58, 60, 68, 72; *Biel*, photo 2b/29. – This small chamaephyte is widely distributed on Anafi.
- Thymelaea hirsuta* (L.) Endl. – Ana: 60; *Biel*, obs.
- Tolpis barbata* (L.) Gaertn. – Ana: 54; *Biel* BB_SA00.090.
- Tragopogon crocifolius* L. – Ana: 23, 33; *Biel*, photo 2b/2,
- Trifolium campestre* Schreb. – Ana: 23; *Biel* BB_SA00.049.
- Trifolium uniflorum* L. – Ana: 23, 24, 69, 74; *Biel*, obs.
- Tuberaria guttata* (L.) Fourr. – Ana: 26; *Biel*, obs.
- Typha domingensis* (Pers.) Steud. – Ana: 70; *Biel*, obs.
- Urginea maritima* (L.) Baker – Ana: 23, 24, 38, 42, 49, 57, 75; *Biel*, obs.
- Urospermum picroides* (L.) F. W. Schmidt – Ana: 23; *Biel* BB_SA00.048.
- Valantia muralis* L. – Ana: 45; *Biel* BB_SA00.078.

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References

- Biel, B. 2001: Zur Orchideenflora der Inseln Santorin (Thira) und Anafi, südliche Kykladen, Griechenland. – Ber. Arbeitskreis. Heimische Orchid. **18**: 88-127.
- 2002: Contributions to the flora of the Aegean islands of Lesvos and Limnos, Greece. – *Willdenowia* **32**: 209-219.
- Covillot, J., Charlier, P., Chautems, A., Duperrex, A., Guerne, C., Toni, M.-M. & Toni, V. 1997: Excursion de notre société à Santorin (Cyclades). – *Saussurea* **28**: 219-227.
- Hansen, A. 1971: Flora der Inselgruppe Santorin. – *Candollea* **26**: 109-163.
- Heldreich, Th. 1899: Die Flora der Insel Thera. – Pp. 127-140 in: Hiller von Gaertringen, F. (ed.), Thera. Untersuchungen, Vermessungen und Ausgrabungen in den Jahren 1895-1898. – Berlin.
- 1902: Die Flora von Thera. – Pp. 119-130 in: Hiller von Gaertringen, F. (ed.), Die Insel Thera. Nachtrag. – Berlin.
- Melidonis, M. 1983: Die Geologie der Insel Anafi. – *Geol. Geophys. Res. [Athens, Inst. Geol. Subsurface Res.]* **8**: 53-308.
- Philippon, A. 1959: Die griechischen Landschaften. IV. Das Aegäische Meer und seine Inseln. – Frankfurt am Main.
- Phitos, D., Strid, A. & Snogerup, S. (ed.) 1997: Flora hellenica **1**. – Koenigstein.
- , — & — (ed.) 2002: Flora hellenica **2**. – Rugell.
- Pichler, H. & Kussmaul, S. 1980: Comments on the geological map of the Santorini Islands. – Pp. 413-427 in: Doulas, C. (ed.), Thera and the Aegean world **2**. – London.
- Rackham, O. 1978: The flora and vegetation of Thera and Crete before and after the great eruption. – Pp. 755-764 in: Doulas, C. (ed.), Thera and the Aegean world **1**. – London.
- Raus, Th. 1991: Die Flora (Farne und Blütenpflanzen) des Santorin-Archipels. – Pp. 109-124 in: Schmalfuss, H. (ed.), Santorin – Leben auf Schutt und Asche. Ein naturkundlicher Reiseführer. – Weikersheim.
- Rechinger, K. H. 1943: Flora Aegaea. Flora der Inseln und Halbinseln des Ägäischen Meeres. – Akad. Wiss. Wien, Math.-Naturwiss. Kl., Denkschr. **105(1)**.

- 1955: Zur Flora der Kykladen. —Anz. Österr. Akad. Wiss., Math.-Naturwiss. Kl. **92**: 15-21.
- Runemark, H., Snogerup, S. & Nordenstam, B. 1960: Studies in the Aegean flora I. Floristic Notes. — Bot. Not. **113**: 421-450.
- Snogerup, S. 1968: Studies in the Aegean flora VIII. *Erysimum* sect. *Cheiranthus*. A. Taxonomy. — Opera Bot. **13**: 1-70.

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