Floristic and phytosociological investigation of the island Antikythera and nearby islets (SW Aegean, Greece)

Authors: Tzanoudakis, Dimitrios, Panitsa, Maria, Trigas, Panayiotis, and Iatrou, Gregoris

Source: Willdenowia, 36(1) : 285-301

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.36.36123

DIMITRIOS TZANOUDAKIS, MARIA PANITSA, PANAYIOTIS TRIGAS & GREGORIS IATROU

Floristic and phytosociological investigation of the island Antikythera and nearby islets (SW Aegean, Greece)

Abstract

Tzanoudakis, D., Panitsa, M., Trigas, P. & Iatrou, G.: Floristic and phytosociological investigation of the island Antikythera and nearby islets (SW Aegean area, Greece). – Willdenowia 36 (Special Issue): 285-301. – ISSN 0511-9618; © 2006 BGBM Berlin-Dahlem.
doi:10.3372/wi.36.36123 (available via http://dx.doi.org/)

Resulting from field work in all seasons 120 taxa are newly recorded for the island of Antikythera, among them 13 local or Aegean endemics. The total number of native plant taxa on the island is raised to 336. From the nearby islets Thimonies and Prassou, thus far unexplored botanically, 8 and 98 taxa, respectively, are recorded. Chorological and biological spectra of the total flora of the islands are given and discussed. A description of the vegetation of the area is added, including a vegetation map. The need for intensive exploration of the Greek island flora during all seasons is emphasized.

Key words: flora, endemics, vegetation, Thimonies, Prassou, chorology, life forms.

Introduction

The island of Antikythera is very interesting floristically and biogeographically, due to its special geographic position and geohistory. The island is a remnant of a former land bridge connecting Crete with Peloponnisos (Dermitzakis & Papanicolaou 1981). According to paleogeographical data, it became isolated from Crete and Kythera-Peloponnisos in the Pliocene, i.e. 4.5-2.5 million years ago. The remnants of the above-mentioned land bridge consist of three inhabited (Elafonisos, Kythera and Antikythera) and a number of smaller and uninhabited islands (Fig. 1).

Kythera, including its offshore islets, and Elafonisos are floristically well known (Greuter & Rechinger 1967, Yannitsaros 1969, 1971, 1998, 2004, Jagel 1992, Iatrou 1994, Tzanoudakis & al. 1998, Panitsa & al. 2004). The third island, Antikythera, with its adjacent islets Prassou and Thimonies, is scarcely explored and only a single floristic catalogue exists, prepared almost 40 years ago (Greuter & Rechinger 1967). It is a nice coincidence that the results of our explorations can be published in a Festschrift in honour of one of the authors of that contribution. It was based

on collections made by these authors, Dimitrios Phitos (Patras, Greece) and Sven Snogerup (Lund, Sweden), all, although independently, during the first half of May 1964. For this reason our collecting visits were organized in different seasons (early spring, autumn and early summer). Some results have already been published (Tzanoudakis & al. 1998, Tzanoudakis 2000, Artelari & Georgiou 2002). The present paper provides a contribution to the vascular flora, a description of the main vegetation units, and phytogeographical comments.

Geographical background

The island of Antikythera is situated 38 km SSE of the island of Kythera and almost at an equal distance WNW of Crete. It has a surface of 20.04 km^2 and at present less than 50 permanent inhabitants. The islet of Prassou has a surface of c. 0.5 km^2 and is situated c. 8 km north of Antikythera. The two islets called Thimonies are situated close to the NNW end of the island (Fig. 1).

The main island has a very rugged topography with a maximum altitude of 378 m and a coastline of 24 km. The crest of the main mountain range runs NNW to SSE. The northwestern and western slopes are very steep, whereas on the opposite side the inclination is more moderate and some small valleys with temporary streams exist. Small plains and hills, which usually lead up to vertical limestone cliffs, characterize the interior of the island. There is only one small sandy beach, on the NNE end of the island.

Geologically, the area is composed of limestone (mainly biomicrites) of Paleocene-Lower Eocene age in the north and east, and of Upper Cretaceous limestones (mainly micrudites) in the centre, south and east, and on Prassou. There are also lacustrine and marine deposits such as conglomerates, sandstones, marls and clays, sometimes with lignite beds (Bornovas & Rontogianni-Tsiampaou 1983).

As there is no meteorological station on Antikythera, the climate has to be inferred from data from the nearest meteorological stations of Souda (Chania, Crete) and on the island of Kythera. According to these data and Emberger's coefficient (Emberger 1955, Mavrommatis 1980), the area belongs to the subhumid bioclimatic zone with warm winters, almost free of frost and snow, and a dry period of 5.5 months, from early April to mid September.

Material and methods

The plant list given below is based mainly on collections and observations made by the authors during mid November 1996, early April and mid June 1997 and mid April 2000. Vouchers are deposited in Patras (UPA). The floristic information given by Greuter & Rechinger (1967), 226 taxa for Antikythera, has also been considered for the analysis of the flora, but is not listed here. Included are 17 records sent to the authors by Dr Ralf Jahn, who visited the main island on 17-18 May 1995, and not found by us. The identifications and the nomenclature are mainly based on Flora Europaea (Tutin & al. 1968-80, 1993). In a few cases more recent publications have been taken into consideration (Greuter & al. 1984-89, Turland 2004, Turland & al. 1993, Chilton & Turland 1997, Biel 2004, Strid & Tan 1997, 2002).

The chorological categories and analysis follow Pignatti (1982) except for the E Mediterranean element, which follows Davis (1965-85). Adventive and cultivated taxa are included in the list but have not been considered in the floristic analysis. Life-form categories and the corresponding life-form spectrum are according to Raunkiaer (1934). Chorological and life form spectra comprise the total native flora of the area studied and not only the new records presented in the plant list.

The description of the vegetation is based on field work and observations by the authors, including 36 relevés with 179 taxa taken from all different habitats (Panitsa & al. unpubl.). The vegetation map in Figure 1C is based on aerial photographs, supported by field verification.

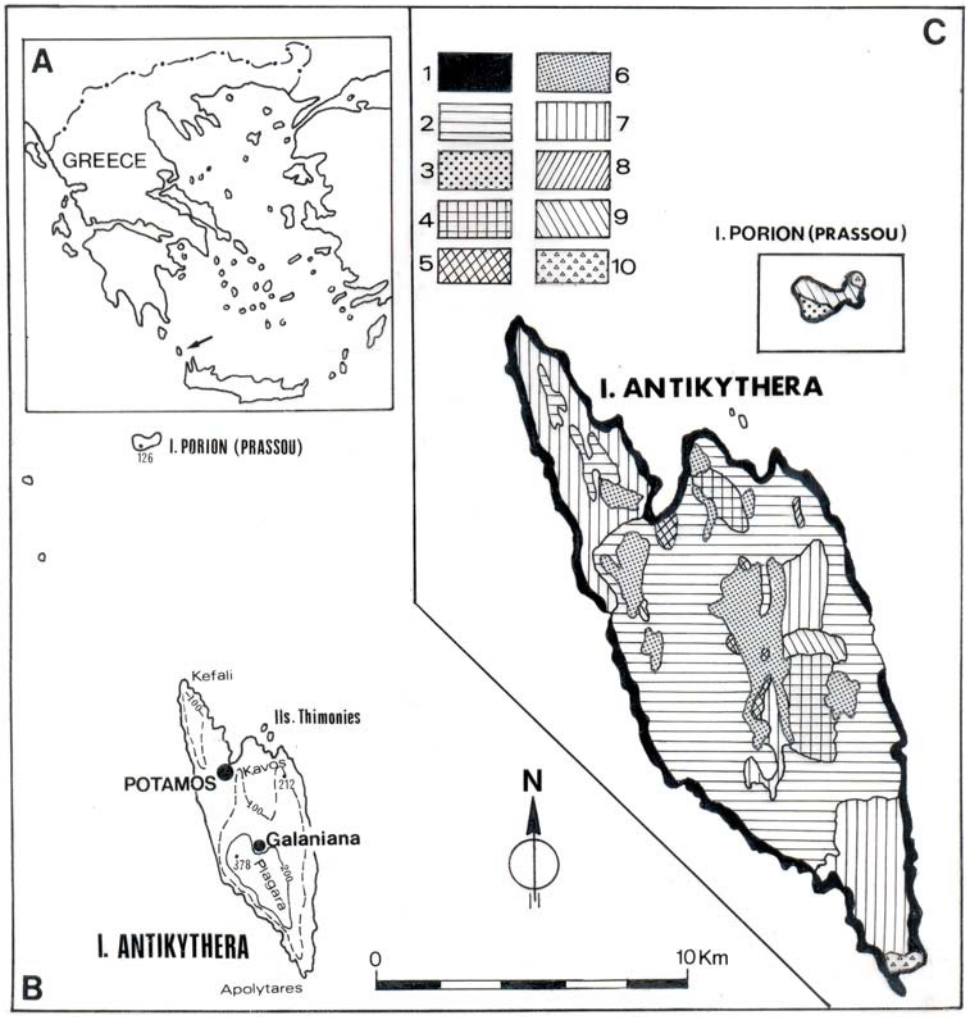

Fig. 1. Geographical position (A), topographical map (B) and vegetation map (C) of the area studied – 1: rocky coastal cliffs; 2: *Genista acanthoclada-Sarcopoterium spinosum* communities; 3: *Euphorbia dendroides* community; 4: *Quercus coccifera* community; 5: Settlement; 6: Arable / abandoned arable land; 7: *Juniperus phoenicea-Pistacia lentiscus* community; 8: interior chasmophytic communities; 9: *Sarcopoterium spinosum-Coridothymus capitatus* community; 10: halophytic communities.

Results

1. Flora

The combination of our results with the report by Greuter & Rechinger (1967; 226 taxa from the island of Antikythera) and a species list send to us by Ralf Jahn (Regensburg, Germany) gives a total of 346 native and 11 adventive/cultivated plant taxa. This includes 336 native taxa from Antikythera, 98 from Prassou and 8 from the Thimonies. Nine of the taxa from Prassou were not found on Antikythera and two of them are Aegean endemics viz. *Salsola aegaea* and *Filago cretensis* subsp. *cretensis.* One "islet specialist", *Lavatera arborea,* was found only on the Thimonies islets. Since Prassou and the Thimonies were investigated for the first time, all taxa

are new records. The same is the case with 120 native taxa from Antikythera, which were not mentioned by Greuter & Rechinger (1967).

All new records are listed below. Added are six taxa recorded by dot maps in Flora Hellenica (Strid & Tan 2002): *Mesembryanthemum nodiflorum, Sedum rubens, Umbilicus horizontalis, Biscutella didyma, Clypeola jonthlaspi* and *Matthiola sinuata.* The list includes 39 families and 102 genera. Five of them are *Pteridophytes,* 84 are *Dicotyledones* and 31 are *Monocotyledones.* The best represented families among the new records are: *Compositae* (13.2 % of the new records), *Leguminosae* (13.2 %), *Liliaceae* s.l. (10.7 %), *Gramineae* (9.1 %), *Caryophyllaceae* (5.8 %). The new records are not evenly distributed among the 39 different families. Some plant families are almost totally represented by new records (e.g. *Valerianaceae, Crassulaceae, Caryophyllaceae, Ranunculaceae* and *Amarylidaceae*), others by c. 50 % (e.g., *Liliaceae* s.l., *Iridaceae*).

An analysis of life forms and chorology of the total flora of the islands, including the earlier reported species, is presented in Tables 1-2. In the life-form (biological) spectrum, therophytes predominate with 53.3 % and 59.2 %, for the flora of Antikythera and Prassou, respectively, followed by the hemicryptophytes (16.7 %) in Antikythera and chamaephytes (15.3 %), in Prassou (Table 1). The chorological spectrum of the islands is characterized by high percentages of Mediterranean elements (72.1 % for Antikythera, 68.4 % for Prassou) and by a significant representation of endemic element reaching 7.4 % for Antikythera and 8.1 % for Prassou (Table 2).

A comparison of the biological and chorological spectra of the newly reported taxa with those of the taxa already mentioned by Greuter & Rechinger (1967) gave some interesting re-

Table 1. Life form spectrum of the total flora of the islands Antikythera and Prassou.

Life forms		**Number of taxa**		**%**	
		Antikythera	Prassou	Antikythera	Prassou
Chamaephytes	(C)	**42**	15	12.5	15.3
Ch. fruticose	[Cfrut]	16	9		
Ch. suffruticose	[Csuffr]	25	6		
Ch. reptant	[Crept]	1			
Geophytes	(G)	**38**	**9**	**11.3**	**9.2**
G. bulbose	[Gbulb]	31	8		
G. rhizomatose	[Grhiz]	7	1		
Hemicryptophytes	(H)	**56**	**12**	**16.7**	**12.2**
H. biennial	[Hbienn]	7	5		
H. caespitose	[Hcaesp]	10			
H. rosulate	[Hros]	8	1		
H. scandent	[Hscand]	2			
H. scapose	[Hscap]	29	6		
Phanerophytes	**(P)**	**21**	**4**	**6.2**	**4.1**
Nano-ph.	[NPh]	21	1		
Nanop-ph. caespitose	[Npcaesp]	–	1		
Nano-ph.scapose	[Npscap]	–	2		
Therophytes	**(T)**	**179**	**58**	**53.2**	**59.2**
Th. parasite	[Tpar]	5	3		
Th. reptant	[Trept]	5	3		
Th. rosulate	[Tros]	3	1		
Th. scapose	[Tscap]	167	52		
Total		**336**	**98**	**100**	**100**

Table 2. Chorological spectrum of the total flora of the islands Antikythera (Ant.) and Prassou (Pr).

Chorological unit	Chorological group	Number of taxa		Percentage %	
		Antikythera	Prassou	Antikythera	Prassou
Widespread	Mediterranean-Atlantic (Med.-Atl.)	10	4	3.0	4.1
	Mediterranean-Turanian (Med.-Turan.)	20	7	6.0	7.2
	Paleotemperate (Paleotemp.)	13	5	3.9	5.1
	Paleotropical (Paleotrop.)	1		0.3	
	Paleosubtropical (Paleosubtrop.)	4		1.2	
	Pantropical (Pantrop.)	1		0.3	
	Neotropical (Neotrop.)	1		0.3	
	Eurasiatic-temperate (Eurasiat.-temp.)	1		0.3	
	European-Caucasian (Europ.-Caucas.)	1		0.3	
	SE-European (SE Europ.)	1		0.3	
	Subcosmopolitan (Subcos)	12	5	3.6	5.1
	Cosmopolitan (Cos)	4	2	1.2	2.0
	Total			20.5	23.5
Mediterranean	E-Mediterranean (EMed)	64	15	19.1	15.3
	Steno-Mediterranean (StMed)	98	30	29.2	30.6
	Euri-Mediterranean (EuMed)	80	22	23.8	22.5
	Total			72.1	68.4
Endemic	Endemic	25	8	7.4	8.1
Total		336	98	100	100

sults. The hemicryptophytes form 20 % of the new reports but only 6 % of those already known. For chamaephytes, on the contrary, the new reports have a lower percentage (5 %) instead of 16.7 % of the already known. 13 endemic taxa (10.8 % of the new records) are added to the 12 endemic taxa already known for Antikythera. Table 3 presents the distribution of 28 endemic taxa: 25 of the total flora of the island of Antikythera (5 of which where also found on the island of Prassou) and 3 found only on Prassou and not on Antikythera. Of the 13 newly recorded endemics for Antikythera, 5 are geophytes, 4 are therophytes, 3 are hemicryptophytes and 1 is chamaephyte. It should be mentioned that 6 of these 13 (46.1 %) are early spring flowering taxa (3 geophytes, 2 therophytes, 1 hemicryptophyte) and 2 (15.4 %) are autumn flowering geophytes.

The new records include also members of the phrygana and chasmophytic communities which, as has been noted by Runemark (1969), show an uneven distribution in the Aegean area. (e.g. *Phlomis fruticosa*).

2. Plant list

Abbreviations used:

(i) Localities: WP = the village of Potamos and the NW part of the island, EP = the area E-SE of Potamos, G = the village of Galaniana and the SE part of the island, P = the mountainous area from Plagara to the Cape Apolytares, T = islets Thymonies, Pr = islet Prassou.

(ii) Authors/collectors: Tz = D. Tzanoudakis, G. Iatrou, M. Panitsa, P. Trigas, F. Strataki, RJ = R. Jahn

(iii) Life forms: See Table 1.

(iv) Chorology: See Table 2.

(v) Adv.: adventive, Cultiv.: cultivated.

(vi) * = found on Prassou islet and not on Antikythera.

Table 3. Greek endemic taxa in the total flora of the islands of Antikythera and Prassou and their geographical distribution. (Ion: Ionian Islands, StE: Sterea Hellas, Pe: Peloponnisos, Kik: Kiklades, AKT: Antikythera and Prassou (Pr), Kr: Crete, Kp: Karpathos island group, KT: Kythera, Rh: Rodhos and adjacent islands and islets, EAe: East Aegean area except Rh, Sp: Sporades island group, NPi: North Pindos).

						Cardaegean							
	Taxon	**Ion**	**StE**	**Pe**	**KT**	**AKT**	**Kr**	**Kp**	**Rh**	**Kik**	**EAe**	**Sp**	**NPi**
1	*Aegilops biuncialis* subsp. *archipelagica*				*	*		*					
2	*Allium aegilicum*					*							
3	*A. circinnatum* subsp. *peloponnesiacum*			*		*							
4	*A. gomphrenoides*			*	*	*							
5	*A. rubrovittatum*					*	*	*					
6	*Anchusella variegata*	*	*	*		*	*	*		*	*	*	
7	*Anthemis scopulorum*				*	*	*	*	*	*			
8	*Arenaria aegaea*					*	*	*	*	*			
9	*Asperula taygetea*			*	*	*	*						
10	*Biarum tenuifolium* subsp. *abbreviatum*	*	*	*	*	*(Pr)							
11	*Campanula saxatilis* subsp. *cytherea*				*	*							
12	*Crepis cytherea*				*	*							
13	*Crocus boryi* subsp. *tournefortii*		* (Isl.Idra)			*	*	*	*	*	*		
14	*C. laevigatus*		*	*	*	*	*			*			
15	*Dianthus fruticosus* subsp. *occidentalis*	*	* (Isl.Idra)	*	*	*	*						
16	*Filago cretensis* subsp. *cretensis*					*(Pr)	*	*			*		
17	*Inula candida* subsp. *candida*				*	*	*						
18	*Melilotus graecus*	*	*	*	*	*	*						*
19	*Nigella doerfleri*					*	*			*	*		
20	*Ophrys heldreichii*		*	*	*	*	*	*	*	*	*	*	
21	*Ruta chalepensis* subsp. *fumariifolia*				*	*	*	*					
22	*Salsola aegaea*					*(Pr)	*		*	*			
23	*Scorzonera cretica*					*	*	*	*	*			
24	*Sedum creticum*					*	*	*					
25	*Silene integripetala* subsp. *lidenii*					*	*						
26	*Symphytum creticum*	*		*	*	*	*						
27	*Tulipa goulimyi*			*	*	*	*						
28	*Valeriana asarifolia*					*	*	*					

Pteridophyta

Aspleniaceae

Asplenium ceterach L. – Hros, Eurasiat.-temp.; G: *Tz 11362*

Polypodiaceae

Polypodium cambricum L. – Hros, EuMed; P: *Tz 4204*

Selaginellaceae

Selaginella denticulata (L.) Spring – Crept, StMed; EP RJ, P RJ

Sinopteridaceae

Cheilanthes acrostica (Balbis) Tod. – Hros, Med.-Turan.; G: *Tz 11368,* P: *Tz 11527*
Cosentinia vellea (Aiton) Tod. – Hros, Med.-Turan.; G: *Tz 11295*

Angiospermae - Dicotyledoneae

Aizoaceae
Mesembryanthemum nodiflorum L. – Tscap, StMed; WP: *Tz 4215,* Pr: *Tz 11550;* Strid & Tan (2002)

Boraginaceae
Anchusella variegata (L.) Bigazzi & al. – Tscap, Endem.; G: *Tz 11345*
Echium arenarium Guss. – Tscap, StMed; Pr: *Tz 11245*
**Heliotropium dolosum* De Not. – Tscap, Med-Turan.; Pr: *Tz 11549*
Symphytum creticum C. Presl – Hscap, Endem.; P: *Tz 11484*

Campanulaceae
Campanula erinus L. – Tscap, StMed; Pr: *Tz 11597*

Capparaceae
Capparis spinosa subsp. *rupestris* (Sm.) Nyman – NP, StMed; T: *Tz 11818,* Pr: *Tz 11563*

Caprifoliaceae
Lonicera implexa Aiton – NP, StMed; G: *Tz 11614*

Caryophyllaceae
Arenaria aegaea Rech. f. – Tscap, Endem.; P, Pr: T*z 11594*
Dianthus fruticosus subsp. *occidentalis* Runemark – Csuffr, Endem.; WP: *obs.*
**Polycarpon tetraphyllum* (L.) L. – Tscap, Med-Turan.; Pr: *Tz 11589*
Sagina maritima Don – Tscap, Med-Atl.; EP, RJ
Silene colorata Poir. – Tscap, StMed; P, RJ
S. gallica L. – Tscap, SubCos; P: *Tz 13486*
S. integripetala subsp. *lidenii* Oxelman – Tscap, Endem.; WP, EP, P: *Tz 11515*
S. sedoides Poir. subsp. *sedoides* – Tscap, StMed; Pr: *Tz 11603*
Spergularia bocconei (Scheele) Graebn. – Tscap, SubCos; WP: *Tz 11738*
Stellaria pallida (Dumort.) Piré – Trept, Paleotemp.; Pr: *Tz 11215*

Chenopodiaceae
Beta vulgaris subsp. *maritima* (L.) Arcang. – Hscap, EuMed; WP: *Tz 11733*
**Salsola aegaea* Rech. f. – Cfrut, Endemic; Pr: *Tz 11563*
Suaeda vera J. F. Gmel. – Cfrut, Med-Atl.; T: *Tz 11820,* Pr: *Tz 11567*

Cistaceae
Helianthemum salicifolium (L.) Mill. – Tscap, EuMed; G: *Tz 11280*

Compositae
Aetheorhiza bulbosa subsp. *microcephala* Rech. f. – Gbulb, EMed; Pr: *Tz 11250*
**Asteriscus aquaticus* (L.) Less. – Tscap, St.Med; Pr: *Tz 11572*
Anthemis scopulorum Rech. f. – Tscap, Endem.; Pr: *Tz 11214*
Atractylis cancellata L. – Tscap, StMed; EP: *obs.*
Bellis sylvestris Cirillo – Hscap, StMed; G: *Tz 4202*
Bellium minutum (L.) L. – Tscap, EMed; Pr: *Tz 11224*
Carduus pycnocephalus subsp. *albidus* (M. Bieb.) Kazmi – Tscap, Med-Turan.; Pr: *Tz 11562*
Carlina graeca Heldr. & Sart. – Hscap, EMed; Pr: *Tz 11272*
C. lanata L. – Tscap, StMed; Pr: *Tz 11554*
Carthamus lanatus subsp. *baeticus* (Boiss. & Reuter) Nyman – Tscap, EuMed; P RJ
Crepis commutata (Spreng.) Greuter – Tscap, Med-Turan.; EP: *obs.*
C. zacintha (L.) Babc. – Tscap, StMed; EP: Tz *11674*
Dittrichia graveolens (L.) Greuter – Tscap, Med-Turan.; WP: *Tz 4220,* Pr: *Tz 4229*
Filago aegaea subsp. *aristata* Wagenitz – Tscap, EMed; EP: *Tz 11686*
**F. cretensis* Gand. subsp. *cretensis* – Tscap, Endemic; Pr: *Tz 11559*

F. pygmaea L. – Trept, StMed; P: *Tz 11490*
F. pyramidata L. – Tscap, EuMed; P RJ
Hedypnois rhagadioloides subsp. *tubaeformis* (Ten.) Hayek – Tscap, StMed; Pr: *Tz 11592*
Hypochaeris achyrophorus L. – Tscap, StMed; EP RJ, P RJ, Pr: *Tz 11213*
Inula candida (L.) Cass. subsp. *candida* – Csuffr, Endem.; Pr: *Tz 4234*
Limbarda crithmoides (L.) Dumort. – Csuffr, Med-Atl.; Pr: *Tz 4232*
Notobasis syriaca (L.) Cass. – Tscap, EuMed; P: *RJ*
Pallenis spinosa (L.) Cass. subsp. *spinosa* – Tscap, EuMed; Pr: T*z 11572*
Picris rhagadioloides (L.) Desf. – Tscap, StMed; G: *Tz 11804*
Ptilostemon chamaepeuce (L.) Less. – Cfrut, EMed; P: *Tz 4208*
Reichardia picroides (L.) Roth – Hscap, StMed; Pr: *Tz 11577*
Scolymus hispanicus L. – Hbienn, EuMed; Pr: *Tz 11571*
Scorzonera cretica Willd. – Hscap, Endem.; Pr: *Tz 11590*
Senecio vulgaris L. – Tscap, Cos; P: RJ, Pr: *Tz 11249*
Sonchus asper subsp. *glaucescens* (Jordan) Ball – Hbienn, Paleotemp.; Pr: *Tz 11568*
S. oleraceus L. – Tscap, SubCos; Pr: *Tz 11240*
Taraxacum aleppicum Dahlst. – Hros, EMed; G: *Tz 4201*
Urospermum picroides (L.) F. W. Schmidt – Tscap, EuMed; Pr: *Tz 11210*

Convolvulaceae
Convolvulus elegantissimus Mill. – Hscand, EMed; EP: obs., P: *RJ*
C. oleifolius Desr. – Cfrut, EMed; Pr: *Tz 11570*

Crassulaceae
Rosularia serrata (L.) A. Berger – Hscap, EMed; P, EP: *Tz 11713*
Sedum creticum C. Presl – Hscap, Endem.; P, EP: *Tz 11714*
S. litoreum Guss. – Tscap, StMed; Pr: *Tz 11258*
S. rubens L. – Tscap, EuMed; EP: *RJ,* P: *RJ;* Strid & Tan (2002).
Umbilicus horizontalis (Guss.) DC. – Gbulb, StMed; G: *Tz 11332,* Pr: *Tz 11594;* Strid & Tan (2002).

Cruciferae
Aurinia saxatilis subsp. *megalocarpa* (Hausskn.) T. R. Dudley – Csuffr, EMed; EP: *Tz 11641,* G: *Tz 11702,* P: *Tz 11627*
Biscutella didyma L. – Tscap, Med-Turan.; WP: *Tz 11386,* EP: *Tz 11444;* Strid & Tan (2002).
Brassica cretica subsp. *aegaea* (Heldr. & Halácsy) Snogerup & al. – Csuffr, EMed; EP: *obs.*
B. nigra (L.) W. D. J. Koch – Tscap, EuMed; WP: *Tz 11747*
Clypeola jonthlaspi L. – Tscap, StMed; P RJ; Strid & Tan (2002).
Malcolmia flexuosa subsp. *naxensis* (Rech. f.) A. L. Stork – Tscap, EMed; Pr: *Tz 11573*
Matthiola sinuata (L.) R. Br. – Hscap, StMed; WP: *Tz 11739,* T: *Tz 11816,* Pr: *Tz 11225;* Strid & Tan (2002).

Cuscutaceae
Cuscuta palaestina Boiss. subsp. *palaestina* – Tpar, EMed; Pr: *Tz 11555*

Euphorbiaceae
Euphorbia dendroides L. – NP, StMed; Pr: *Tz 4226*
E. peplus L. – Tscap, Cos; Pr: *Tz 11266*
Mercurialis annua L. – Tscap, Paleotemp.; Pr: *Tz 11228*

Frankeniaceae
Frankenia hirsuta L. – Csuffr, Med-Turan.; T: *Tz 11821,* Pr: *Tz 11564*

Gentianaceae
Centaurium tenuiflorum (Hoffmanns. & Link) Fritsch subsp. *tenuiflorum* – Tscap, StMed; Pr: *Tz 11587*

Geraniaceae
Erodium cicutarium (L.) L'Hér. – Tscap., SubCos; Pr: *Tz 11601*
E. gruinum (L.) L'Hér. – Tscap, Med-Turan.; WP: *Tz 11455,* EP: *Tz 11392*
Geranium columbinum L. – Tscap, Paleotemp.; WP: *Tz 11457*
G. molle L. – Hbienn/Hscap, SubCos; EP: obs., Pr: *Tz 11247*

Guttiferae
Hypericum empetrifolium Willd. – Csuffr, EMed; WP: *Tz 11806*

Labiatae
Ballota pseudodictamnus (L.) Benth. subsp. *pseudodictamnus* – Cfrut, EMed; Pr: *Tz 11547*
Phlomis fruticosa L. – NP, StMed; P: *RJ*
Salvia viridis L. – Tscap, StMed; EP: *Tz 11799*
Teucrium capitatum L. – Cfrut. StMed; Pr: *Tz 11582*
T. divaricatum Heldr. subsp. *divaricatum* – Cfrut, EMed; Pr: *Tz 11546*

Leguminosae
**Anagyris foetida* L. – Npcaesp, EuMed; Pr: *Tz 11581*
Anthyllis hermanniae L. – Cfrut, StMed; Pr:*Tz 11607*
Astragalus pelecinus (L.) Barneby – Tscap, EuMed; P: *RJ*
Ceratonia siliqua L. – NP/MPh, StMed; EP:obs., G: *Tz 11329*
Hippocrepis ciliata Willd. – Tscap, StMed; P, G: *Tz 11321*
Lathyrus setifolius L. – Tscap, EuMed; G: *Tz 11323*
Lotus cytisoides L. – Csuffr, StMed; Pr: *Tz 11596*
L. edulis L. – Tscap, StMed; Pr: *Tz 11340*
L. ornithopodioides L. – Tscap, StMed; EP: *Tz 11432,* G: *Tz 11322*
L. tetragonolobus L. – Tscap, StMed; EP: *Tz 11371*
Medicago arborea L. – NP, EMed; EP: *obs.*
M. litoralis Loisel. – Tscap, EuMed; Pr: *Tz 11273*
M. orbicularis (L.) Bartal. – Tscap, EuMed; EP: *obs.,* G: *Tz 11314*
M. rugosa Desr. – Tscap, StMed; G: *Tz 11294*
M. truncatula Gaertn. – Tscap, StMed; WP: *Tz 11778,* G: *Tz 11325*
Melilotus graecus (Boiss. & Spruner) Lassen – Tscap, Endem.; P, EP, G: *Tz 11687,* WP: *Tz 11766*
Ononis mitissima L. – Tscap, StMed; EP: *Tz 11671*
Scorpiurus muricatus L. – Tscap, EuMed; Pr: *Tz 11544*
Spartium junceum L. – NP, EuMed; G: *obs.*
Trifolium campestre Schreb. – Tscap, Paleotemp.; Pr: *Tz 11585*
T. scabrum L. – Tscap, EuMed; Pr: *Tz 11566*
T. stellatum L. – Tscap, EuMed; Pr: *Tz 11542*
T. tomentosum L. – Trept, Paleotemp.; G: Tz 11634, Pr: *Tz 11602*
Vicia cretica Boiss. & Heldr. subsp. *cretica* – Tscap, EMed; EP: *Tz 11372,* G: *Tz 11369,* P: *Tz 11488,* Pr: *Tz 11257*
V. hybrida L. – Tscap, EuMed; G: *Tz 11367*

Linaceae
Linum bienne Mill. – Hbienn, EuMed; Pr: *Tz 11230*
L. corymbulosum Rchb. – Tscap, StMed; P: *RJ*
L. strictum subsp. *spicatum* (Pers.) Nyman – Tscap, StMed; Pr: *Tz 11588*

Malvaceae
Althaea hirsuta L. – Tscap, EuMed; Pr: *Tz 11593*
Lavatera arborea L. – Hscap, StMed; T: *Tz 11817*
L. cretica L. – Tscap, StMed; G: *Tz 11288*
Malva aegyptica L. – Tscap, StMed; EP: *obs.,* G: *Tz 11354*

Oleaceae
Olea europaea subsp. *oleaster* (Hoffmanns. & Link) Negodi – NP, StMed; Pr: *Tz 11253*

Orobanchaceae
Orobanche pubescens d'Urv. – Tpar, EuMed; EP: RJ, Pr: *Tz 11237*

Oxalidaceae
Oxalis pes-caprae L. – Gbulb, Adv.; G: *Tz 11284*

Papaveraceae
Papaver purpureomarginatum Kadereit – Tscap, EMed; EP: RJ, Pr: *Tz 11237*

Plantaginaceae
Plantago weldenii Rchb. subsp. *weldenii* – Tros, EuMed; Pr: *Tz 11574*

Plumbaginaceae
Limonium sieberi (Boiss.) Kuntze – Csuffr, EMed; T: *Tz 11501,* Pr: *Tz 4237*

Polygonaceae
Rumex pulcher subsp. *raulinii* (Boiss.) Rech. f. – Hscap, EMed; P, G: *Tz 11341*

Primulaceae
Anagallis arvensis L. – Trept, SubCos; WP, EP, G, P: *obs.,* Pr: *Tz 11248*
Asterolinon linum-stellatum (L.) Duby – Tscap, StMed; WP, EP, Pr: *Tz 11255*
Cyclamen hederifolium Aiton – Gbulb, EuMed; G, WP: *Tz 13485,* Pr

Ranunculaceae
Anemone coronaria L. – Gbulb, StMed; WP: Tz 11449, EP: *Tz 11410,* G: *Tz 4180*
Clematis cirrhosa L. – NP, StMed; G: *Tz 11289*
Nigella damascena L. – Tscap, EuMed; EP, G: *Tz 11286*
Ranunculus cytheraeus (Halácsy) Baldini – Hros, EMed; G: *Tz 4179*
R. cf. *chius* DC. – Tscap, EMed; G: *Tz 11350*

Rosaceae
Pyrus spinosa Forssk. – NP, StMed; EP: *obs.*
Sarcopoterium spinosum (L.) Spach – Cfrut, EMed; Pr: *Tz 11600*

Rubiaceae
Galium murale (L.) All. – Tscap, EuMed; Pr: *Tz 11262*
Rubia tenuifolia d'Urv. – NP, EMed; EP: *Tz 11684,* G: *Tz 11330*
Valantia hispida L. – Tscap, StMed; Pr: *Tz 11238*
V. muralis L. – Tscap, StMed; Pr: *Tz 11575*

Rutaceae
Ruta chalepensis subsp. *fumariifolia* (Boiss. & Heldr.) Nyman – Csuffr, Endem.; Pr: *Tz 11586*

Scrophulariaceae
Kickxia elatine subsp. *crinita* (Mabille) Greuter – Tscap, Med-Turan.; WP: *Tz 11786*
Scrophularia peregrina L. – Tscap, StMed; G: *Tz 11346*

Solanaceae
Hyoscyamus albus L. – Hscap, EuMed; Pr: *Tz 11236*
Mandragora autumnalis Bertol. – Hros, EuMed; Pr: *Tz 11244*

Umbelliferae
Daucus carota subsp. *maritimus* (Lam.) Batt. – Hbienn, StMed; Pr: *Tz 11598*
Kundmannia sicula (L.) DC. – Tscap, StMed; WP: *Tz 11805*
Tordylium apulum L. – Tscap, StMed; Pr: *Tz 11252*
Torilis nodosa (L.) Gaertn. – Tscap, Med-Turan.; Pr: *Tz 11606*

Urticaceae
Parietaria cretica L. – Trept, EMed; Pr: *Tz 11269*

Valerianaceae
Centranthus calcitrapae (L.) Dufr. subsp. *calcitrapae* – Tscap, StMed; EP: *obs.,* P: *Tz 11516*
Valeriana asarifolia Dufr. – Hscap, Endem.; G, EP: *Tz 11824*
Valerianella coronata (L.) DC. – Tscap, Paleotemp.; WP, G: *Tz 11302*
V. discoidea (L.) Loisel. – Tscap, StMed; P: *RJ*

Monocotyledones

Alliaceae
Allium aegilicum Tzanoud. – Gbulb, Endem.; WP: *Tz 11767,* G: *Tz 9722*
A. ampeloprasum L. – Gbulb, EuMed; WP, EP, G: *Tz 11808*
A. circinnatum subsp. *peloponnesiacum* Tzanoud. – Gbulb, Endem.; WP: *Tz 11453*
A. commutatum Guss. – Gbulb, StMed; EP: *Tz 11736,* T: *obs.*
A. longanum Pamp. – Gbulb, EMed; WP: *Tz 11439,* G: *Tz 11277,* P: *Tz 11503*
A. rubrovittatum Boiss. & Heldr. – Gbulb, Endem.; G, EP: *Tz 11730,* P: *Tz 11636*

Amaryllidaceae
Narcissus serotinus L. – Gbulb, StMed; G: *Tz 4196*
N. tazetta L. – Gbulb, StMed;G: *Tz 13484*
**Sternbergia lutea* (L.) Spreng. – Gbulb, Eu.Med; Pr: *Tz 4223*

Asparagaceae
Asparagus aphyllus subsp. *orientalis* (Baker) P. H. Davis – Cfrut, StMed; Pr: *Tz 4240*

Araceae
Arisarum vulgare O. Targ.-Tozz. subsp. *vulgare* – Grhiz, StMed; EP: *RJ,* G: *RJ,* P: *RJ,* Pr: *Tz 4227*
**Biarum tenuifolium* subsp. *abbreviatum* (Schott) Richt. – Gbulb, Endem.; Pr: *Tz 11551*

Cyperaceae
Carex halleriana Asso – Hcaesp, EuMed; EP: *RJ*

Gramineae
Aira elegantissima Schur – Tscap, EuMed; EP: *obs.*
Arundo donax L. – Grhiz, Adv.; EP: *RJ*
Avellinia michelii (Savi) Parl. – Tscap, StMed; EP: *RJ,* P: *RJ*
Avena barbata Link – Tscap, EuMed; Pr: *Tz 11239*
A. sterilis subsp. *ludoviciana* (Durieu) Gillet & Magne – Tscap, Med-Turan.; EP: *RJ*
Brachypodium pinnatum (L.) P. Beauv. – Hcaesp, Paleotemp.; EP: *Tz 11698,* G: *Tz 11629*
Bromus fasciculatus C. Presl – Tscap, EMed; Pr: *Tz 11560*
B. madritensis L. – Tscap, EuMed; Pr: *Tz 11559*
Catapodium marinum (L.) C. E. Hubb. – Tscap, EuMed; Pr: *Tz 11578*
Cynosurus echinatus L. – Tscap, EuMed; G: *Tz 11339,* P: *Tz 11660*
Digitaria sanguinalis (L.) Scop. – Tscap, Adv.; WP: *Tz 11741*
Elymus farctus subsp. *rechingeri* (Runemark) Melderis – Grhiz, EMed; T: *Tz 11819*
Gastridium phleoides (Nees & Meyen) C. E. Hubb. – Tscap, EuMed; P: *RJ*
Hordeum leporinum Link – Tscap, EuMed; Pr: *Tz 11221*
Hyparrhenia hirta (L.) Stapf – Hcaesp, Paleotrop.; G: *Tz 11664*
Lagurus ovatus L. – Tscap, EuMed; Pr: *Tz 11270*
Parapholis incurva (L.) C. E. Hubb. – Tscap, Med-Atl.; Pr: *Tz 11268*
Phleum exaratum subsp. *aegaeum* (Vierh.) Doğan – Tscap, EMed; Pr: *Tz 11561*
Polypogon monspeliensis (L.) Desf. – Tscap, Paleosubtrop.; EP: *RJ*
Rostraria cristata (L.) Tzvelev – Tscap, SubCos; Pr: *Tz 11595*

Stipa capensis Thunb. – Tscap, StMed; G: *Tz 11320*
Trachynia distachya (L.) Link – Tscap, Med-Turan.; Pr: *Tz 11579*

Hyacinthaceae
Bellevalia dubia (Guss.) Rchb. – Gbulb, StMed; G: *Tz 11301,* P: *Tz 11498*
Charybdis maritima (L.) Speta – Gbulb, StMed; Pr: *Tz 11275*
Muscari commutatum Guss. – Gbulb, EMed; WP: *Tz 11454,* EP: *Tz 11418,* P: *Tz 11524*
Ornithogalum collinum Guss. – Gbulb, EuMed; G: *Tz 11298*
Scilla autumnalis L. – Gbulb, EuMed; G: *Tz 4187,* P: *obs.*

Iridaceae
Crocus laevigatus Bory & Chaub. – Gbulb, Endem.; G: *Tz 11499*
Hermodactylus tuberosus (L.) Mill. – Gbulb, EMed; G: *Tz 11281*
Moraea sisyrinchium (L.) Ker.-Gawl. – Gbulb, EuMed; EP: *Tz 11690*

Liliaceae
Gagea graeca (L.) A. Terracc. – Gbulb, EMed; WP: *Tz 11462,* EP: *Tz 11387*
Tulipa goulimyi Sealy & Turrill – Gbulb, Endem.; G: *Tz 11282*
Colchicum cupanii Guss. – Gbulb, StMed; G: *Tz 11352*

Orchidaceae
Anacamptis pyramidalis (L.) Rich. – Gbulb, Med-Atl.; Pr: *Tz 11591*
Ophrys sicula Tineo – Gbulb, StMed; WP: *Tz 11438,* EP: *Tz 11391,* Pr: *Tz 11229*
Spiranthes spiralis (L.) Chevall. – Grhiz, Europe-Caucas.; G: *Tz 4190*

3. Vegetation

Four main vegetation types can be distinguished on Antikythera and Prassou: (1) halophytic communities, (2) chasmophytic communities, (3) dwarf shrub communities (phrygana) and (4) scrub communities with *Juniperus phoenicea, Pistacia lentiscus, Quercus coccifera* and *Euphorbia dendroides*. Figure 1C shows the main distribution of these vegetation types. Small areas with these types or their characteristic species exist outside the mapped areas. Chasmophytic and halophytic communities are assigned a higher value for naturalness since they prefer places not suitable to human activities. Scrub with *Quercus coccifera* and phrygana are considered as secondary communities due to human interference (agriculture, land-clearance, grazing and fires), see, e.g., Bohn & al. (2000-03).

The best developed halophytic communities have been observed on the SSW end of both Antikythera and Prassou (Fig. 1C-10), where the inclination of the coast is more moderate (less than 30 %). They belong to the class and order Crithmo-Staticetea Br.-Bl. 1947 (-etalia Mol. 1934) and the alliance Crithmo-Frankenion Mayer 1995. Characteristic species of the order and class are: *Crithmum maritimum, Limonium* spp., *Silene sedoides, Lotus cytisoides, Reichardia picroides* and *Parapholis incurva,* while *Frankenia hirsuta* is the characteristic species of the alliance. *Limonium virgatum* and *L. sieberi* are the characteristic species of the associations Crithmo-Limonietum virgati Mayer 1995 and Crithmo-Limonietum sieberi Gehu & al. 1987, respectively.

The Thimonies islets are almost in total exposed to sea waves and wind and for this reason only one of them, the one protected by the other, is inhabited by halophytic species, which can resist these extreme conditions. It has a flora dominated by islet specialists such as *Allium commutatum, Lavatera arborea, Matthiola sinuata* subsp. *glandulosa, Elymus farctus* subsp. *rechingeri,* accompanied by *Frankenia hirsuta, Suaeda vera, Limonium sieberi* and *Capparis spinosa* subsp. *rupestris*. The inclination is about 70 % and the vegetation cover at the upper part of the islet is about 80 %.

The halophytic zone is followed by the epilitoral zone, which is dominated by *Cichorium spinosum* in combination with, e.g., *Limonium sieberi, Trigonella monspeliaca, Anthemis sco-*

pulorum, Silene sedoides, Rostraria cristata, Dactylis glomerata subsp. *hispanica, Malcolmia flexuosa* subsp. *naxensis* and *Allium gomphrenoides*. The vegetation cover in this zone is about 60 %.

Although most of the coastline consists of limestone cliffs (Fig. 1C-1), the strong waves do not permit the establishment of a chasmophytic flora on most of their surface. This is restricted to the upper part and consequently the species are not easily reached. The best-developed interior cliff system exists on the NNW part of Antikythera (Fig. 1C-8). The communities here consist of, e.g., *Aurinia saxatilis* subsp. *megalocarpa, Asperula taygetea, Campanula saxatilis* subsp. *cytheraea, Scrophularia heterophylla* subsp. *heterophylla, Inula candida* subsp. *candida, Scorzonera cretica, Allium gomphrenoides, Brassica cretica* subsp. *aegaea, Valeriana asarifolia, Rosularia serrata* and *Sedum creticum*. The plant coverage is not more than 50 % and the vegetation height about 25 cm. The species *Inula candida* subsp. *candida* and *Asperula taygetea* are characteristic for the association Inulo candidae-Asperuletum taygeteae Zaffran 1982 described from Crete. This association belongs, according to Zaffran (1990), to the class Asplenietea trichomanis (Br.-Bl. 1934) corr. Oberdorfer 1977, order Petromaruletalia pinnatae Zaffran 1990 and the alliance Scutellarion sieberi Zaffran 1990. According to Dimopoulos & al. (1997), "the low altitude order Petromaruletalia pinnatae with a high number of diagnostic taxa is a Cretan endemic syntaxon. The alliance Scutellarion sieberi is prevailing by Cretan, Aegean and East Mediterranean elements and the geographical range of its diagnostic species coincides with the range of the alliance, which at present seems to be restricted to calcareous cliffs at low altitude in Crete".

Where phrygana formations of the class and order Cisto-Micromerietea (-etalia) are well developed (Fig. 1C-9), xerophilous dwarf shrubs such as *Sarcopoterium spinosum* and *Coridothymus capitatus* dominate. These species are accompanied by *Helichrysum conglobatum, Erica manipuliflora, Phlomis cretica, Dorycnium hirsutum* and *Cistus* spp., as well as many annuals. Intense grazing and fires or land-clearance lead to the dominance of spiny shrubs, mostly *Genista acanthoclada* (Fig. 1C-2).

In the interior of Antikythera on non-cultivated hillsides formations of evergreen, sclerophyllous shrubs appear, characterized by the dominance of *Juniperus phoenicea* and *Pistacia lentiscus* (Fig. 1C-4). They belong to the class Quercetea ilicis Br.-Bl., the order Pistacio-Rhamnetalia Rivas-Martinez 1974 and the alliance Ceratonio-Rhamnion Barbero & Quezel 1980. In the east and southeast of Antikythera dense, well-developed communities with *Juniperus phoenicea* (plant coverage 100 %, main vegetation height c. 1.8 m) have been observed on hills with an inclination of about 60-70 % (Fig. 1C-7).

Well-developed *Quercus coccifera* communities are also present on Antikythera, where *Quercus coccifera* is dominating in combination with *Calicotome villosa, Pistacia lentiscus* and *Coridothymus capitatus*.

The SSE part of Prassou is characterized by a vegetation type dominated by *Euphorbia dendroides* with plant coverage of 80-100 % and a main vegetation height exceeding 1 m (Fig. 1C-3). Combinations of species such as *Pistacia lentiscus, Olea europaea* subsp. *oleaster* or *Juniperus phoenicea* with, e.g., *Erica manipuliflora, Calicotome villosa* and *Phlomis cretica* are widespread. A few spots of vegetation of a similar composition with *Euphorbia dendroides* have been observed on the WSW part of the main island.

Discussion

The results of the present study confirm the floristic and biogeographical importance of Antikythera. To the 226 taxa given by Greuter & Rechinger (1967) for the island of Antikythera, 120 new records have been added, incuding 13 Greek endemic taxa. Many of the new records are autumn or early spring flowering taxa and this observation confirms the importance of "all seasons" floristic investigation.

The result of the floristic analysis (biological and chorological spectra) reflects the geographic position and the climate of the area studied as well as the human impact. The later is suggested by the high percentage of therophytes (53.3 %) and of leguminous taxa (14.1 %). These indicate disturbance in Mediterranean ecosystems (Naveh 1974, Arianoutsou & Margaris 1981, Barbero & al. 1990, Panitsa & al. 1994, 2003, Panitsa & Tzanoudakis 1998). Even now intense stock farming takes place in Antikythera. The isolation of the island from the mainland, in combination with the fact that the number of permanent inhabitants of the island in the past was much higher, leaves no doubt that the situation was similar for other agricultural activities until a few years ago.

The high percentage of chamaephytes and hemicryptophytes depends on the frequency of limestone cliffs, which very often harbour endemic taxa (Kypriotakis 1998, Kypriotakis & Tzanoudakis 2001).

The percentage of Greek endemics has increased, compared to that given by Greuter & Rechinger (1967), since among the 120 new records 13 are endemics. One of them, *Allium aegilicum* is a recently described local endemic (Tzanoudakis 2000). Others provide useful information regarding the biogeographical position of the area studied and the biogeographical boundary lines in the Aegean. For some species, Antikythera seems to be the northwesternmost limit of their distribution range, suggesting a close phytogeographical relationship between this island and Crete (Iatrou 1994, Tzanoudakis & al. 1998). This concerns *Allium rubrovittatum, Silene integripetala* subsp. *lidenii* and *Valeriana asarifolia,* which were considered Southern Aegean (Crete, Karpathos) endemics and now their range is shown to include Antikythera. Similar seems to be the situation for *Nigella doerfleri, Sedum creticum* and *Filago cretensis* subsp. *cretensis,* known previously only from the Cardaegean region. *Allium longanum* is also a southern element, but has its main distribution in Africa (Cyrenaica). In Greece it was previously known only from a few remote and isolated stations in the Aegean, viz. islets south of Astipalea, the easternmost end of Crete and the island of Gavdos (Stearn 1977, Tzanoudakis 1986, Bergmeier & al. 1997). Now Antikythera appears to be the northwestern limit of its distribution range. *Ranunculus cytheraeus* shows a similar distribution pattern.

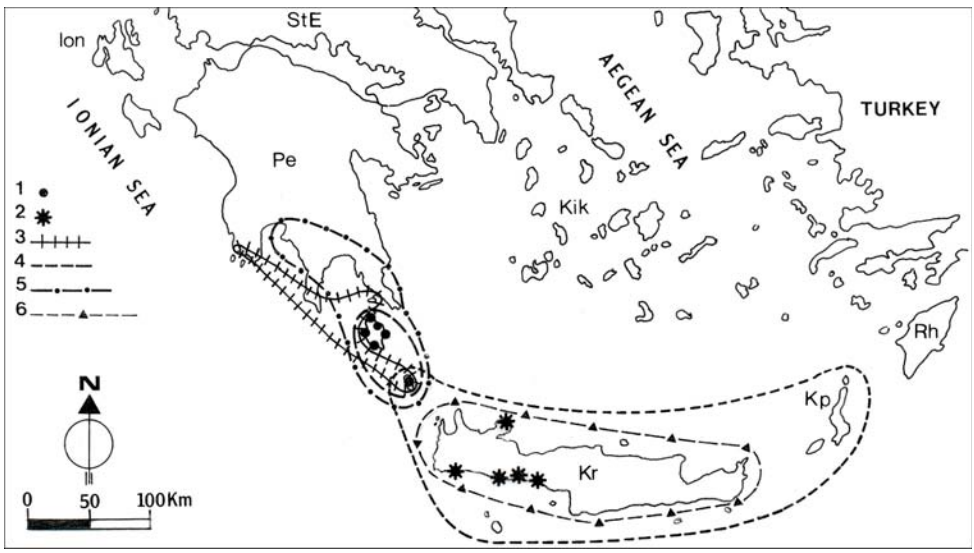

Fig. 2. Distribution of SW Aegean endemic taxa – 1: *Campanula saxatilis* subsp. *cytherea;* 2: *C. saxatilis* subsp. *saxatilis;* 3: *Allium circinnatum* subsp. *peloponnesiacum;* 4: *A. rubrovittatum;* 5: *A. gomphrenoides;* 6: *A. circinnatum* subsp. *circinnatum*. – For abbreviations see Table 3.

Other taxa support phytogeographical relationships to both the southern Aegean and Kythera-Peloponnisos regions, or to only the later one. *Tulipa goulimyi* and *Allium circinnatum* are species extending from Crete to the southern Peloponnisos. A similar distribution range is shown by the species *Campanula saxatilis* and *Allium gomphrenoides,* the first of which, however, is absent from Peloponnisos and the second from Crete (Fig. 2).

In species or species complexes, which are represented by different morphological entities in both areas, the relation of Antikythera to the Peloponnisos prevails. So *Allium circinnatum, Campanula saxatilis* and the *Crepis neglecta* complex are represented in Antikythera not by the Cretan taxon (species or subspecies) but by the Kytherian or the Peloponnesian one.

The presence of *Inula candida* subsp. *candida* and *Asperula taygetea,* characteristics of the association Inulo candidae-Asperuletum taygeteae Zaffran 1982, described from Crete, points to a phytosociological affinity of Antikythera with Crete. This association belongs to the class Asplenietea trichomanis, order Petromaruletalia pinnati, alliance Scutellarion sieberi (Zaffran 1990) and also some characteristic taxa of the order and the alliance occur on the island, *Scorzonera cretica* and *Valeriana asarifolia* (for the order) and *Allium rubrovittatum* (for the alliance). Also present are the low altitude order Petromaruletalia pinnatae, considered a Cretan endemic syntaxon, and the alliance Scutellarion sieberi so far known only from calcareous cliffs at low altitude in Crete. These data show that the phytogeographical affinity of Antikythera with Crete is also reflected in phytosociological units.

Acknowledgements

The authors thank the Greek Ministry of Environment, Regional Planning and Public Works for financial support and the Greek Ministry of Mercantile Marine and the port guard of Neapolis for transport facilities during our visits in the area. The authors appreciate the support by Dr Ralf Jahn who contributed the results of his floristic exploration of the island.

References

Arianoutsou, M. & Margaris, N. S. 1981: Producers and the fire cycle in a phryganic ecosystem. – Pp. 181-190 in: Margaris, N. S. & Mooney, H. A. (ed.), Components of productivity of Mediterranean climate regions. Basic and applied aspects. – The Hague.

Artelari, R. & Georgiou, O. 2002: Biosystematic study of the genus *Limonium (Plumbaginaceae)* in the Aegean area, Greece. III. *Limonium* on the islands Kithira and Antikithira and the surrounding islets. – Nordic J. Bot. **22:** 483-501.

Barbero, M. & Quézel, P. 1980: La végétation forestière de Crète. – Ecol. Medit. **5:** 175-210.

— , Bonin, G., Loisel, R. & Quézel, P. 1990: Changes and disturbances of forest ecosystems caused by human activities in the western part of the mediterranean basin. – Vegetatio **87:** 151-173.[CrossRef]

Bergmeier, E., Jahn, R. & Jagel, A. 1997: Flora and vegetation of Gávdos (Greece), the southernmost European island. I. Vascular flora and chorological relations. – Candollea **52:** 305-358.

Biel, B. 2004: Ergänzungen zur Orchideenflora der Nördlichen Sporaden (Griechenland), Skiathos, Skopelos und Alonnisos. – Ber. Arbeitskreis. Heimische Orchid. **21(2):** 4-79.

Bohn, U., Neuhäusl, R. with contributions by Gollub, G., Hettwer, C., Neuhäuslova, Z., Raus, Th., Schlüter, H. & Weber, H. 2000-03: Map of the natural vegetation of Europe. Scale 1 : 2 500 000. – Münster.

Bornovas, I. & Rontogianni-Tsiampaou, T. 1983: Geological map of Greece. 1 : 500 000. – Athens.

Braun-Blanquet, J. 1964: Pflanzensoziologie, Grundzüge der Vegetationskunde, ed. 3. – Berlin.

Chilton, L. & Turland, N. J. 1997: Flora of Crete – a supplement. – Retford.

Davis, P. H. (ed.) 1965-1985: Flora of Turkey and the East Aegean islands **1-9.** – Edinburgh.

Dermitzakis, M. D. & Papanikolaou, D. 1981: Paleogeography and geodynamics in the Aegean region during Neogene. – VIIth Int. Congr. Medit Neogene, Athens 1979, Ann. Geol. Pays Hellen. **4:** 245-289.

Dimopoulos, P., Sykora, K. V., Mucina, L. & Georgiadis, T. 1997: The high-rank syntaxa of the rock-cliff and scree vegetation of the mainland Greece and Crete. – Folia Geobot. Phytotax. **32:** 313-334.

Emberger, L. C. 1955: Une classification biogéographique des climats. – Rev. Trav. Fac. Sci. Montpellier, Bot. **7:** 3-43.

Gehu, J. M., Costa, M., Biondi, E., Franck, J. & Arnold, N. 1987: Données sur la végétation littorale de la Crète (Grèce). – Ecol. Medit. **13(1/2):** 93-105.

Greuter, W., Burdet, M. M. & Long, G. 1984-89: Med-Checklist **1, 3, 4.** – Genève & Berlin.

— & Rechinger, K. H. 1967: Flora der Insel Kythera, Gleichzeitig Beginn einer nomenklatorischen Überprüfung der griechischen Gefäßpflanzenarten. – Boissiera **13.**

Iatrou, G. 1994: The endemic flora of the island of Kythera. – Pp. 213-216 in: Anon. (ed.), Proceed. 5th Sci. Conf. Hel. Bot. Soc. Delphi (Greece). – Athens.

Jagel, A. 1992: Zur Flora und Vegetation der Insel Elafonisos (Lakonien, Griechenland). – Diplomarbeit, Ruhr-Universität Bochum.

Kypriotakis, Z. 1998: Contribution to the study of chasmophytic flora of Crete. – PhD thesis, University of Patras, Patras [in Greek].

— & Tzanoudakis, D. 2001: Contribution to the study of the Greek insular flora: The chasmophytic flora of Crete. – Bocconea **13:** 495-503.

Mayer, A. 1995: Comparative study of the coastal vegetation of Sardinia (Italy) and Crete (Greece) with respect to the effects of human influence. – Libri Bot. **15.**

Mavrommatis, G. 1980: Le bioclimat de Grèce. – Dassiki Erevna **1:** 1-63.

Naveh, Z. 1974: Effects of fire in the Mediterranean region. – Pp. 401-434 in: Kozlowski, T. T. & Ahlgren, C. E. (ed.), Fire and ecosystems. – New York.

Panitsa, M. & Tzanoudakis, D. 1998: Contribution to the study of the Greek flora: flora and vegetation of the islands Agathonisi and Pharmakonisi (East Aegean area, Greece). – Willdenowia **28:** 95-116.

— , Dimopoulos, P., Iatrou, G. & Tzanoudakis, D. 1994: Contribution to the study of the Greek flora: flora and vegetation of the Enousses (Oinousses) islands (E Aegean area). – Flora **189:** 367-374.

— , Bazos, I, Dimopoulos, P., Zervou, S., Yannitsaros, A. & Tzanoudakis, D. 2004: Contribution to the study of the flora and vegetation of the Kithira island group: offshore islets of Kithira (S Aegean, Greece). – Willdenowia **34:** 101-115.[CrossRef]

— , Snogerup, B., Snogerup, S. & Tzanoudakis, D. 2003: Floristic investigation of Lemnos island (NE Aegean area, Greece). – Willdenowia **33:** 79-105.

Pignatti, S. (ed.) 1982: Flora d'Italia **1-3.** – Bologna.

Raunkiaer, C. 1934: The life-forms of plants and statistical plant geography. – Oxford.

Rivas-Martinez, S. & Rivas-Goday, S. 1974: Schema syntaxonomique de la classe des Quercetea ilicis dans la péninsule Ibérique. – Coll. C.N.R.S. Montpellier **235:** 431-456.

Runemark, H. 1969: Reproductive drift, a neglected principle in reproductive biology. – Bot. Not. **122:** 90-129.

Stearn, W. T. 1977: *Allium longanum,* a species new for the southeastern Aegean. – Ann. Musei Goulandris **3:** 34-44.

Strid, A. & Tan, K. (ed.) 1997: Flora hellenica **1.** – Königstein.

— & — (ed.) 2002: Flora hellenica **2.** – Ruggell.

Turland, N. J. 2004: Proposal to conserve the name *Chrysanthemum coronarium (Compositae)* with a conserved type. – Taxon **53:** 1072-1074.

— , Chilton, L. & Press, J. R. 1993: Flora of the Cretan area. Annotated checklist and atlas. – London.

Tutin, T. G., Burges, N. A., Chater, A. O., Edmondson, J. R., Heywood, V. H., Moore, D. M., Valentine, D. H., Walters, S. M. & Webb, D. A. (ed.) 1993: Flora europaea, ed. 2, **1.** – Cambridge, etc.

— , Heywood, V. H., Burges, N. A., Moore, D. M., Valentine, D. H., Walters, S. M. & Webb, D. A. (ed.) 1968-80: Flora europaea **2-5.** – Cambridge, etc.

Tzanoudakis, D. 1986: Karyotype variation in *Allium* sect. *Molium* G. Don from Greece. – Caryologia **39:** 69-88.

— 2000: *Allium aegilicum,* a new autumn-flowering species from the island of Antikithira (Greece). – Bot. Chron. **13:** 81-86.

Tzanoudakis, D., Iatrou, G., Panitsa, M. & Trigas, P. 1998: Contribution to the study of the Greek insular flora: Antikythera and the islets around Kythera. – Pp. 177-180 in: Tsekos, I. & Moustakas, M. (ed.), Progress in botanical research, proceedings of the 1st Balkan Botanical Congress. – Dordrecht, etc.

Westhoff, V. & Maarel, E. van der 1978: The Braun-Blanquet approach. – Pp. 278-399 in: Whittaker R. H. (ed.). Classification of plant communities. – The Hague.

Yannitsaros, Á. 1969: Contribution to the knowledge of the flora and vegetation of the island of Kithira (in Greek). – PhD. Thesis, University of Athens, Athens.

— 1971: Notes on the flora of Elaphonesos island (Laconia, Greece). – Biol. Gallo-Hellen. **3:** 149-162.

— 1998, 2004: Additions to the flora of Kithira (Greece) I, II. – Willdenowia **28:** 77-94, **34:** 117-128.[CrossRef]

Zaffran, J. 1990: Contributions à la flore et à la végétation de la Crète. II. Végétation. – Université de Provence.

Addresses of the authors:

Dimitrios Tzanoudakis, Gregoris Iatrou, Division of Plant Biology, Department of Biology, University of Patras, GR-26500 Patras, Greece; e-mail: tzanoyd@upatras.gr, iatrou@upatras.gr

Maria Panitsa, Department of Environmental and Natural Resources Management, University of Ioannina, Seferi 2, GR-30100 Agrinio, Greece; e-mail: mpanitsa@cc.uoi.gr

Panayiotis Trigas, National Agricultural Research Foundation (N.AG.RE.F.), Forest Research Institute, Terma Alkmanos str., Ilisia, GR-11528 Athens, Greece.