

Flora and vegetation of the island of Psittalia (Saronic Gulf, Greece)

Autor(en): **Vallianatou, Irini / Koumpli-Sovantzi, LEMONIA / Yannitsaros, Artemios**

Objektyp: **Article**

Zeitschrift: **Candollea : journal international de botanique systématique = international journal of systematic botany**

Band (Jahr): **49 (1994)**

Heft 1

PDF erstellt am: **22.07.2024**

Persistenter Link: <https://doi.org/10.5169/seals-879539>

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Flora and vegetation of the island of Psittalia (Saronic Gulf, Greece)

IRINI VALLIANATOU
LEMONIA KOUMPLI-SOVANTZI
&
ARTEMIOS YANNITSAROS

ABSTRACT

VALLIANATOU, I., L. KOUMPLI-SOVANTZI & A. YANNITSAROS (1994). Flora and vegetation of the island of Psittalia (Saronic Gulf, Greece). *Candollea* 49: 209-224. In English, English and French abstracts.

This paper lists a total of 216 plant taxa (2 Pteridophyta, 4 Gymnospermae, 210 Angiospermae) from the island of Psittalia in the Saronic Gulf. Almost all the listed taxa are reported for the first time from Psittalia and 15 of them are new records for the islands of the Saronic Gulf. A short description of the existing vegetation types and some remarks on the changes of the flora and vegetation during the last years are also given.

RÉSUMÉ

VALLIANATOU, I., L. KOUMPLI-SOVANTZI & A. YANNITSAROS (1994). Flore et végétation de l'île de Psittalia (golfe Saronique, Grèce). *Candollea* 49: 209-224. En anglais, résumés anglais et français.

Une liste de 216 taxa (2 ptéridophytes, 4 gymnospermes, 210 angiospermes) de l'île de Psittalia dans le golfe Saronique est présentée. La plupart d'entre eux n'étaient pas encore connus de Psittalia et 15 sont mentionnés pour la première fois dans le golfe de Saronique. Suivent une brève description des types de végétation et quelques remarques sur les changements de la flore et de la végétation observés dans les dix dernières années.

KEY-WORDS: Floristics — Psittalia — Greece — Mediterranean vegetation.

Introduction

From a floristic point of view the group of the islands in the Saronic Gulf belong to the well or reasonably well explored areas of Greece, from where some of the available information has been published (GREUTER & al., 1976). Until now, however, the flora of the island of Psittalia was unknown.

As far as recently the known human activities on the island were limited. There is a record by STRAVON (Ed. Meineke, 1853) that in ancient times Psittalia was an uninhabited island. During 1856, a lighthouse was constructed in the eastern part of the island (LYKOUDIS, 1934). Much later the prisons of the navy were founded and were on active service till recently. Marble graves of some greek notable persons and foreign officers are found on the island. There is also a cenotaph devoted to the unknown seaman and a small church. During 1986, waste-water treatment plants started on Psittalia. Here, the sewage coming from the cities of Athens, Piraeus and other adjacent towns will be treated at the primary stages. The present study started almost at the same time with these

works and was performed during the years 1986-1991. The purpose of the study is to fill in a floristically blank spot in the area of the Saronic Gulf and to monitor the impact of the recent human activities on the flora and vegetation of the island.

Area investigated

Psittalia is a small island (ca. 0.43 km²) located eastwards of the island of Salamis in the northern Saronic Gulf, opposite the Kinosoura peninsula and in the entrance of the Keratsini bay. It is situated 2.8 km SW. of the Piraeus harbour and ca. 1 km from the Cape Keos (Fig. 1). The island extends between 23°34'53"E. and 23°35'48"E. longitudes and 37°56'13"N. and 37°56'43"N. latitudes.

Most of the area under study consists of pliocene marly limestones and sandstones. In some places there are middle-upper Triassic layers of limestones (VOREADIS, 1927; I.G.M.R., 1982).

Temperature and annual precipitation, which are the main climatic factors affecting the vegetation, are given in Figure 2. The climatic data originate from the Piraeus — station located ca. 5 km NW. of the island of Psittalia. The bioclimate of the area is illustrated by the climatic diagram of EMBERGER (1955, 1959) modified by SAUVAGE (1961) (Fig. 3). According to the Emberger and Sauvage-climatic diagram the island belongs to the semi-arid bioclimatic zone with warm winter. According to the xerothermic index (x) (BAGNOULS & GAUSSEN, 1953), Psittalia belongs to a strong Thermo-mediterranean Type (ca. 139 biologically dry days). The dry period lasts from early April to late September.



Fig. 1. — The position of Psittalia in the Saronic Gulf.

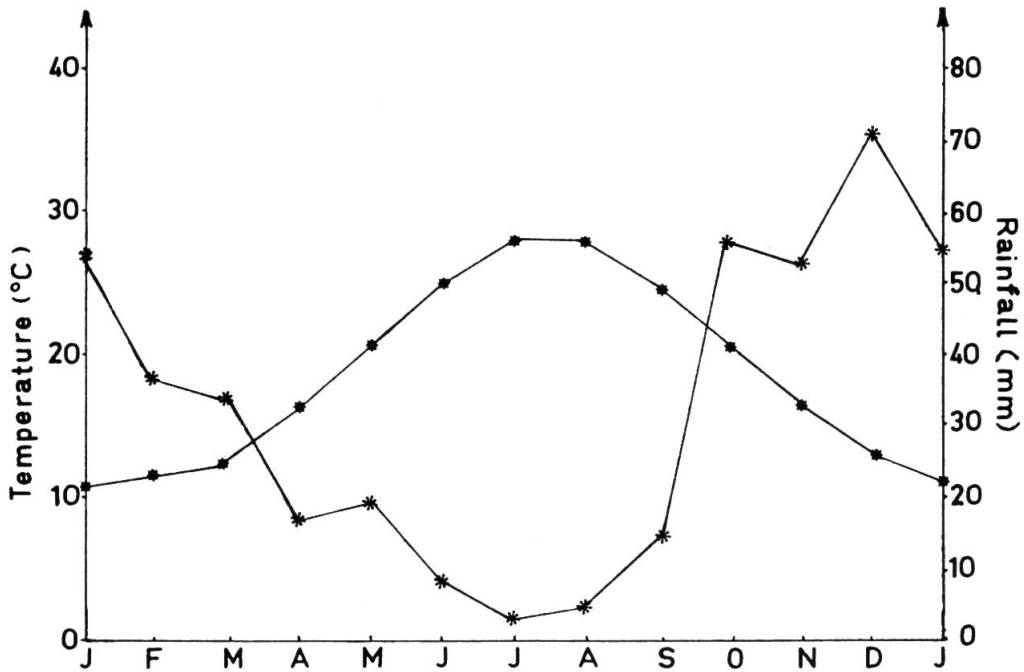


Fig. 2. — Ombro-thermic diagram of Piraeus Meteorological Station.

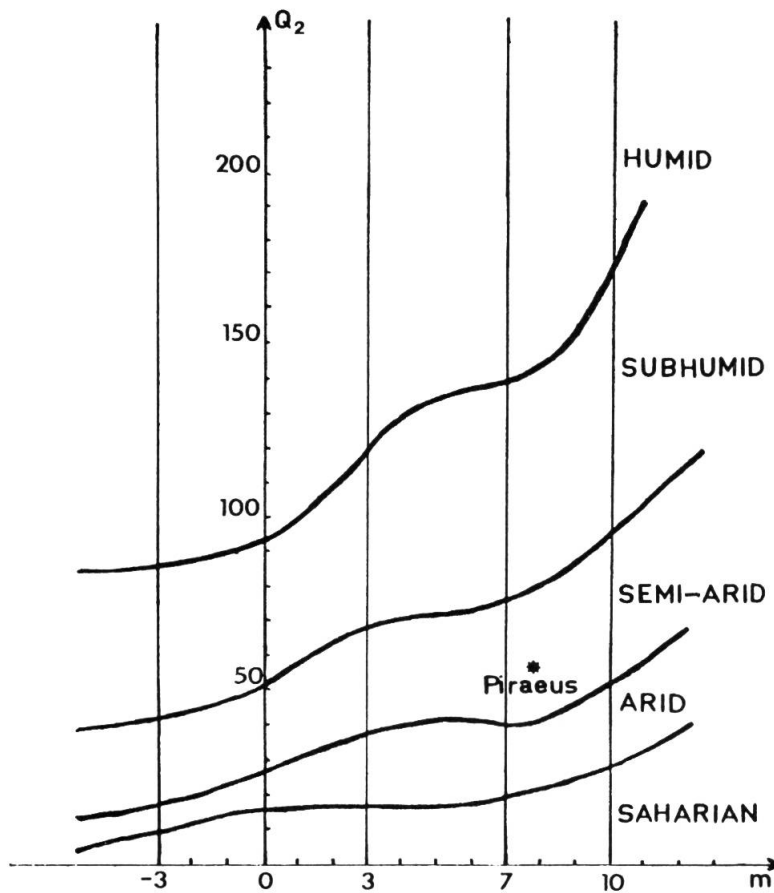


Fig. 3. — Biological classification of the Psittalia area (with the Meteorological Station of Piraeus) according to Emberger-Sauvage. m = mean temperature of the coldest month of the year. Q_2 = ombrothermic quotient according to Emberger.

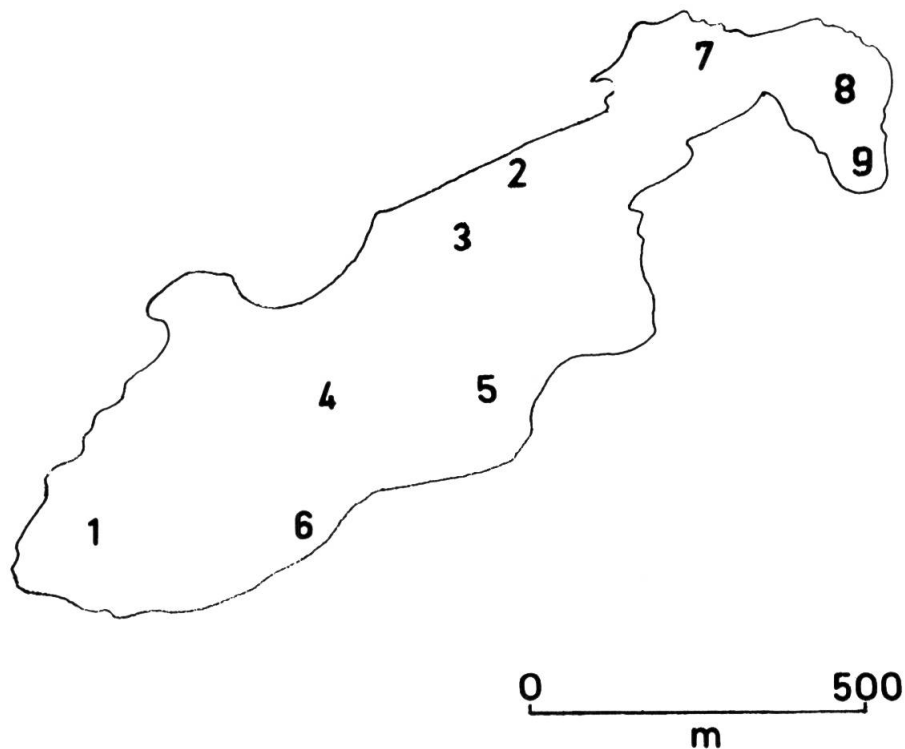


Fig. 4. — Map indicating the collecting localities.

List of taxa

The following catalogue of taxa is based on Vallianatou's collections (herb. I. Vallianatou, duplicates in ATHU) and field observations.

The determinations were mainly made according to HALACSY (1900-1904), HAYEK (1924-1933), RECHINGER (1943), TUTIN & al. (1964-1980) and DAVIS (1965-1988). Nomenclature follows that of TUTIN & al. (l.c.) and/or DAVIS (l.c.) except for the part revised by GREUTER & al. (1984-1989) where the latter is followed. In some cases, the determinations were made according to PRESS (1988), GEORGIU-KARAVATA (1990), ZIMMER (1991), thus the nomenclature was also modified respectively.

The collecting sites have been numbered 1-9 (Fig. 4). The collection numbers follow in brackets after the corresponding locality in the list of taxa.

The collecting dates and numbers of the material which has been used in this study may be summarised as follows: 24.4.1986 (259-335), 28.4.1986 (336-438), 18.7.1986 (439-451), 10.11.1986 (452-465), 19.3.1987 (654-726), 14.5.1990 (3127-3132a), 2.5.1991 (4500-4546), 2.8.1991 (4547-4612).

Almost all the following taxa are new records for Psittalia and those preceded by an asterisk are to our knowledge new for the islands of Saronic Gulf.

PTERIDOPHYTA

Polypodiaceae

Cheilanthes acrostica (Balbis) Tod. (s.l.) — 4 (4552).

Asplenium ceterach L. — 4 (4553).

S P E R M A T O P H Y T A — G Y M N O S P E R M A E

Pinaceae

Pinus halepensis Miller — 4 (723).

**Pinus brutia* Ten. — 3 (437). Cultivated.

Cupressaceae

Juniperus phoenicea L. — 7 (457).

Ephedraceae

**Ephedra campylopoda* C. Meyer — 8 (4597).

A N G I O S P E R M A E — D I C O T Y L E D O N E S

Urticaceae

Urtica urens L. — 1 (4589).

Urtica pilulifera L. — 1 (obs.).

Parietaria lusitanica L. subsp. *lusitanica* — 4 (4557, 4561).

Parietaria cretica L. — 9 (4516).

Polygonaceae

Rumex bucephalophorus L. subsp. *gallicus* (Stein.) Rech. fil. var. *aegaeus* (Rech. fil.) Maire — 1 (454).

Chenopodiaceae

**Beta macrocarpa* Guss. — 2 (3130), 3 (341), 5 (378).

This taxon was reported by HALACSY (1904) from two localities in Attiki (Phaliron and Ergastiria Lavriou). According to GREUTER (1976), *B. macrocarpa* is a rare species known only from two Aegean localities (on Karpathos and Psara). BUTTLER (1977) supports, that wild populations of annual *Beta* can be associated with three types:

- 1) a western group with connivent thin tepals distributed mainly in the western Mediterranean area from Sicily to the Canary Islands and with outspots in Attiki, the East Aegean region (Psara) and Palestine;
- 2) an Aegean group with connivent spongy tepals in the South Aegean region (Karpathos) and Attiki;
- 3) an eastern group with appressed tepals ranging from Asia Minor to Palestine and north-eastern Greece.

The names *B. macrocarpa* and *B. bourgaei* Cosson belong to the widespread western group, *B. adanensis* Pamukçuoğlolu to the third type, but the Aegean plants remain unnamed and possibly have to be included in *B. macrocarpa*. There is also a recent record of *B. macrocarpa* from Crete (GREUTER & al., 1984) but it is not certain to which of Buttler's types it belongs. Our specimens, on the ground of their tepals and other morphological characters seem to belong to the second group.

- Beta maritima* L. var. *grisea* Aellen — 2 (283, 3131).
Chenopodium murale L. — 5 (371).
Atriplex halimus L. — 2 (452).
Suaeda vera J. F. Gmelin — 5 (380), 8 (4608).

Aizoaceae

- Carpobrotus acinaciformis* (L.) L. Bolus — 5 (375). Subspontaneous.

This adventive species was already reported from Psittalia by VALLIANATOU & YANNI-TSAROS (1992).

- Mesembryanthemum nodiflorum* L. — 2 (273), 5 (377).

Caryophyllaceae

- Arenaria leptoclados* (Reichenb.) Guss. — 4 (4525).
Minuartia mediterranea (Link) K. Malý — 1 (4547).
Stellaria media (L.) Vill. — 4 (4570).
Paronychia capitata (L.) Lam. — 2 (286), 5 (433).
Herniaria hirsuta L. — 9 (4515).
Polycarpon tetraphyllum (L.) L. — 1 (4583).
Spergularia bocconeii (Scheele) Graebner — 5 (718), 7 (331).
Silene sedoides Poiret — 2 (264), 6 (359, 4521).
Silene nocturna L. — 4 (4550), 9 (4592).
 **Silene apetala* Willd. — 4 (704).

Ranunculaceae

- Anemone pavonina* Lam. — 4 (705).
Clematis cirrhosa L. — 4 (4522).
Ranunculus sprunerianus Boiss. — 5 (711).

Papaveraceae

- Papaver rhoeas* L. — 2 (291), 3 (663).
Papaver hybridum L. — 4 (702).
Glaucium flavum Crantz — 2 (275).
Fumaria macrocarpa Parl. — 8 (4601).
Fumaria petteri Reichenb. — 4 (4565, 4575), 5 (369).
Fumaria densiflora DC. — 3 (657).

Capparaceae

- Capparis spinosa* L. — 2 (265, 453), 6 (339, 344).

Cruciferae

- Sisymbrium irio* L. — 5 (420, 677).
Sisymbrium orientale L. — 2 (271, 3132), 3 (659), 4 (4587).
Malcolmia flexuosa (Sm.) Sm. subsp. *naxensis* (Rech. fil.) A. L. Stork — 2 (263), 3 (654), 5 (432, 710).
Alyssum simplex Rudolphi — 5 (692), 8 (4603).
Clypeola jonthlaspi L. — 5 (685).

- Capsella bursa-pastoris* (L.) Medicus — 5 (678, 697).
Biscutella didyma L. — 2 (277), 5 (691).
 **Cardaria draba* (L.) Desv. subsp. *draba* — 4 (4549).
Hirschfeldia incana (L.) Lagrèze-Fossat — 2 (3127), 5 (422, 675).
Carrichtera annua (L.) DC. — 4 (667), 7 (314).

Resedaceae

- Reseda alba* L. — 2 (278, 726).

Crassulaceae

- Umbilicus horizontalis* (Guss.) DC. — 4 (4588).
Sedum sediforme (Jacq.) Pau — 5 (354, 448).
Sedum caespitosum (Cav.) DC. — 5 (367).

Leguminosae

- Astragalus hamosus* L. — 4 (4581).
Bituminaria bituminosa (L.) Stirton — 5 (425).
Vicia peregrina L. — 5 (681, 694).
Lathyrus cicera L. — 5 (708).
Ononis ornithopodioides L. — 7 (326).
Melilotus indicus (L.) All. — 4 (4555), 5 (365, 382).
Trigonella balansae Boiss. & Reuter — 2 (4612).
Trigonella spruneriana Boiss. — 4 (4581).
Medicago monspeliaca (L.) Trautv. — 4 (4580), 6 (450).
Medicago truncatula Gaertner — 2 (288), 8 (4609).
Medicago littoralis Loisel. var. *littoralis* — 4 (666).
Medicago coronata (L.) Bartal. — 4 (4524).
Medicago disciformis DC. — 2 (281), 5 (4535).
Trifolium tomentosum L. — 1 (4541).
Trifolium campestre Schreber — 5 (384).
Trifolium scabrum L. — 2 (267, 284).
Trifolium stellatum L. — 5 (353), 8 (4500).
Trifolium infamia-ponertii Greuter — 4 (338).
Lotus edulis L. — 2 (266, 3128), 5 (700).
Lotus cytisoides L. — 1 (4600).
Anthyllis hermanniae L. — 5 (421), 7 (334).
Hippocrepis ciliata Willd. — 9 (4513).
Scorpiurus muricatus L. — 9 (4512).

Geraniaceae

- Geranium rotundifolium* L. — 5 (699).
 **Geranium molle* L. subsp. *molle* — 5 (689).
Erodium malacoides (L.) L'Hér. — 5 (674, 686), 7 (302).

Linaceae

- Linum strictum* L. subsp. *spicatum* (Pers.) Nyman — 5 (400), 7 (316).

Euphorbiaceae

- Mercurialis annua* L. — 3 (655), 5 (373).
Euphorbia acanthothamnus Boiss. — 3 (662).
Euphorbia helioscopia L. — 5 (670).
Euphorbia peplus L. — 5 (4528), 9 (4508).
Euphorbia taurinensis All. — 4 (706).

Anacardiaceae

- Pistacia lentiscus* L. — 2 (441), 7 (459).

Malvaceae

- Malva aegyptia* L. — 7 (328).
Malva cretica Cav. subsp. *cretica* — 5 (345, 366).
 **Malva parviflora* L. — 7 (330).
 **Lavatera cretica* L. — 2 (293), 5 (351).
Althaea hirsuta L. — 5 (356, 4529).

Cistaceae

- Cistus creticus* L. subsp. *eriocephalus* (Viv.) Greuter & Burdet — 5 (722).
Fumana thymifolia (L.) Webb var. *viridis* (Ten.) Boiss. — 5 (390), 8 (4594).

Frankeniaceae

- Frankenia hirsuta* L. — 5 (417), 6 (357, 436).

Umbelliferae

- Lagoecia cuminoides* L. — 5 (416), 7 (325).
Scandix australis L. (s.l.) — 4 (4558).
Scandix pecten-veneris L. subsp. *pecten-veneris* — 3 (661).
Pimpinella cretica Poiret var. *cretica* — 4 (4526), 5 (374).
Bupleurum trichopodium Boiss. & Spruner — 5 (395), 7 (329).
Bupleurum semicompositum L. — 1 (4543), 8 (4611).
Ferulago nodosa (L.) Boiss. — 5 (402).
Tordylium apulum L. — 5 (709), 7 (310).
 **Thapsia garganica* L. — 5 (447), 7 (319).
Torilis nodosa (L.) Gaertner — 4 (4582).

Primulaceae

- Cyclamen graecum* Link — 2 (454), 7 (455, 456), 8 (462).
Anagallis arvensis L. — 2 (299), 5 (362, 682).
Asterolinon linum-stellatum (L.) Duby — 4 (706a, 8 (4501)).

Plumbaginaceae

- Limonium narbonense* Miller — 6 (350).
Limonium virgatum (Willd.) Fourr. — 2 (439), 6 (449).
Limonium echioides (L.) Miller — 9 (4517).

Oleaceae

Olea europaea L. subsp. *oleaster* (Hoffmanns. & Link) Negodi — 4 (330, 4590).

Gentianaceae

Centaureum tenuiflorum (Hoffmanns. & Link) Fritsch (s.l.) — 5 (634, 4534).

Rubiaceae

Sherardia arvensis L. — 5 (716).

Crucianella latifolia L. — 5 (383).

Galium murale (L.) All. — 9 (4510).

Galium aparine L. — 3 (660), 4 (4574).

Galium setaceum Lam. — 1 (4540).

Valantia hispida L. — 9 (4511).

Valantia muralis L. — 2 (268, 297).

Convolvulaceae

Convolvulus oleifolius Desr. — 2 (290, 442), 5 (406).

Boraginaceae

Echium parviflorum Moench — 5 (669, 683).

Echium arenarium Guss. — 2 (262), 3 (337).

Anchusa variegata (L.) Lehm. — 4 (707).

Labiatae

Teucrium divaricatum Heldr. subsp. *divaricatum* — 5 (381, 409).

Teucrium capitatum L. — 5 (407), 6 (450).

Prasium majus L. — 5 (693), 7 (303).

Phlomis fruticosa L. — 8 (724).

Lamium amplexicaule L. — 5 (715).

Ballota acetabulosa (L.) Bentham — 5 (391).

Satureja nervosa Desf. — 3 (438), 5 (419).

Coridothymus capitatus (L.) Reichb. fil. — 5 (4530).

Scrophulariaceae

Misopates orontium (L.) Rafin. — 4 (399).

Linaria micrantha (Cav.) Hoffmanns. & Link — 5 (717).

**Linaria simplex* (Willd.) DC. — 4 (4548).

Veronica cymbalaria Bodard — 3 (658), 4 (4576).

Globulariaceae

Globularia alypum L. — 7 (333).

Plantaginaceae

- Plantago coronopus* L. — 2 (260), 3 (336).
Plantago amplexicaulis Cav. — 7 (309, 324).
Plantago lagopus L. — 2 (270), 5 (352, 672).
Plantago albicans L. — 4 (342).

Campanulaceae

- Campanula celsii* A. DC. subsp. *celsii* — 4 (347, 4579).
Campanula drabifolia Sm. — 5 (379).
Campanula erinus L. — 9 (4509).

Compositae

- Filago pyramidata* L. — 4 (4571), 9 (4506).
Helichrysum stoechas (L.) Moench subsp. *barrelieri* (Ten.) Nyman — 2 (279), 5 (429, 721).
Phagnalon graecum Boiss. & Heldr. — 2 (287), 5 (389).
Phagnalon methanaeum Hausskn. — 4 (4578).
Inula verbascifolia (Willd.) Hausskn. subsp. *methanaea* (Hausskn.) Tutin — 1 (4584).
Pallenis spinosa (L.) Cass. subsp. *spinosa* 7 (306), 5 (418).
Asteriscus aquaticus (L.) Less. — 2 (300), 6 (358).
Anthemis tomentosa L. f. *tomentosa* — 2 (259), 5 (428), (GEORGIU-KARAVATA, 1990).
Matricaria chamomilla L. var. *recutita* (L.) Grierson — 4 (703).
Chrysanthemum coronarium L. — 2 (289), 5 (355, 712).
 **Chrysanthemum coronarium* L. var. *discolor* d'Urv. — 2 (289a), 5 (393, 680).
Senecio vulgaris L. — 3 (656), 7 (320).
Calendula arvensis L. — 4 (665), 5 (713), 7 (308).
Carlina graeca Heldr. & Sart. — 2 (440), 5 (446).
Atractylis cancellata L. — 2 (285), 5 (401).
Carduus pycnocephalus L. (s.l.) — 5 (423, 698), 7 (335).
Notobasis syriaca (L.) Cass. — 9 (4537).
Onopordum sibthorpiianum Boiss. & Heldr. — 2 (3132a), 5 (688), 7 (312).
Centaurea raphanina Sibth. & Sm. subsp. *mixta* (DC.) Runemark — 5 (431), 8 (4599).
Crupina crupinastrum (Moris) Vis. — 5 (346), 7 (321).
Carthamus lanatus L. — 9 (4518).
Hyoseris scabra L. — 7 (332).
Hedypnois cretica (L.) Dum.-Courset — 9 (4503).
Urospermum picroides (L.) Scop. — 2 (296), 5 (372), 7 (301).
Hypochoeris achyrophorus L. — 2 (282), 5 (430, 701).
Picris pauciflora Willd. — 4 (4560).
Scorzonera crocifolia Sibth. & Sm. — 7 (307).
Scorzonera sublanata Lipschitz — 4 (668).
Tragopogon porrifolius L. subsp. *porrifolius* — 7 (315).
Tragopogon porrifolius L. subsp. *australis* (Jordan) Nyman — 5 (690).
Reichardia picroides (L.) Roth — 3 (444), 4 (465, 4554), 5 (424), 8 (464).
Sonchus oleraceus L. — 2 (3129), 4 (4566), 5 (370, 414, 427, 684, 4536), 6 (4520).
Steptorhamphus tuberosus (Jacq.) Grossh. — 5 (388, 397, 405).
Taraxacum megalorrhizon (Forskål) Hand.-Mazz. (s.l.) — 5 (720), 7 (458).
Crepis multiflora Sm. — 4 (4573), 5 (363, 426).

ANGIOSPERMAE — MONOCOTYLEDONES

Liliaceae

- Asphodelus aestivus* Brot. — 5 (695).
Gagea graeca (L.) A. Teracc. — 4 (4585).
Ornithogalum narbonense L. — 5 (361, 410), 7 (313).
Urginea maritima (L.) Baker — 5 (obs.).
Scilla autumnalis L. — 8 (461).
Muscari comosum (L.) Miller — 5 (387, 415).
Muscari commutatum Guss. — 3 (664).
Allium subhirsutum L. — 5 (368, 386).
 **Allium sphaerocephalon* L. subsp. *trachypus* (Boiss. & Spruner) K. Richter — 5 (446).
 **Asparagus acutifolius* L. — 5 (obs.).
Asparagus aphyllus L. — 4 (4571).

Amaryllidaceae

- Sternbergia sicula* Tineo ex Guss. — 8 (463).

Iridaceae

- Crocus cancellatus* Herbert subsp. *mazziaricus* (Herbert) Mathew — 8 (460).
 **Romulea* sp. — 4 (4556).

Gramineae

- Lolium* × *hybridum* Hausskn. — 7 (331).
Lolium rigidum Gaudin var. *rottbolioides* Heldr. — 2 (292), 8 (4604).
Catapodium marinum (L.) C. E. Hubbard — 2 (261), 9 (4507).
Catapodium rigidum (L.) C. E. Hubbard subsp. *rigidum* var. *rigidum* — 9 (4505).
Poa bulbosa L. (s.l.) — 8 (4502).
Dactylis glomerata L. subsp. *hispanica* (Roth) Nyman — 2 (295), 5 (412, 413).
 **Lamarckia aurea* (L.) Moench — 8 (4593).
Briza maxima L. — 5 (360).
Melica minuta L. — 4 (4526).
Melica ciliata L. subsp. *ciliata* — 4 (4572).
Bromus intermedius Guss. — 4 (4558), 7 (304).
Trachynia distachya (L.) Link — 4 (4523), 5 (385), 8 (4607).
Aegilops comosa Sm. subsp. *comosa* — 1 (4539).
Aegilops biuncialis Vis. — 4 (349), 5 (4531), 7 (327), 8 (4605).
Hordeum murinum L. subsp. *leporinum* (Link) Arcangeli var. *leporinum* — 2 (272), 5 (403, 673).
Avena barbata Pott ex Link subsp. *barbata* — 5 (714), 7 (318).
Avena sterilis L. (s.l.) — 2 (280), 5 (396).
Rostraria cristata (L.) Tzvelev subsp. *cristata* — 2 (298), 5 (434), 7 (305).
Lagurus ovatus L. — 2 (274), 5 (435).
Parapholis incurva (L.) C. E. Hubbard — 6 (4563).
Phalaris minor Retz. — 4 (348).
Piptatherum miliaceum (L.) Cosson subsp. *miliaceum* — 2 (294), 5 (408).
Stipa capensis Thunb. — 5 (398), 7 (323).
Stipa holosericea Trin. — 8 (4595).

Araceae

Arisarum vulgare Targ.-Tozz. subsp. *vulgare* — 8 (725).

Floristic and phytogeographical remarks

Some floristic and phytogeographical characters of the island of Psittalia are given in Tables 1, 2, 3 and in Figures 5 and 6, from which we can outline the following:

1. — The proportion of monocotyledonous to dicotyledonous plants is 1 : 4.38, which is in accordance with the corresponding relationship appearing in other greek local terrestrial floras.

2. — *Compositae* and *Leguminosae* from *Dicotyledones*, and *Gramineae* and *Liliaceae*, from *Monocotyledones*, are the richest families (in number of taxa), as observed also in other greek floras.

3. — The biological spectrum of the island of Psittalia reveals a supremacy of therophytes (62.4%). A comparison with the biological spectra from other Aegean islands shows that there is a closer agreement with the island of Psara (therophytes' percentage 65.6%) which is due not only to the strong dry type of the mediterranean climate and to the nature of the biotopes, but also to the existing human activities on both islands.

4. — The phytogeographical analysis of the floristic elements shows that the mediterranean taxa predominate (64.48%) and that among them the omnimediterranean ones cover the highest proportion (47.20%). The endemics of Greece, represented by seven taxa (*Anchusa variegata*, *Campanula celsii* subsp. *celsii*, *Campanula drabifolia*, *Phagnalon methanaeum*, *Inula verbascifolia* subsp. *methanaea*, *Centaurea raphanina* subsp. *mixta*, *Scorzonera crocifolia*) and the endemics of mainland Greece and the Aegean area, represented by three taxa (*Malcolmia flexuosa* subsp. *naxensis*, *Carlina graeca*, *Allium sphaerocephalon* subsp. *trachypus*) have low proportions, covering the 3.27% and 1.40% respectively.

During the period of the waste-water treatment plants on the island we noted some changes in its floristic composition. The species *Lavatera cretica* and *Trigonella balansae* seems to be introduced recently, whereas *Pinus brutia* (cultivated on the island) and *Glaucium flavum* became extinct.

The frequency of the species *Carrichtera annua* and *Sisymbrium orientale* changed during the last two years. In the area of the works the former was the dominant species in spring 1990 and the latter in spring 1991.

Vegetation remarks

On the island of Psittalia the dominating vegetation types are phrygana and macchia. Halophytic, chasmophytic and herbaceous vegetation cover small areas. There is also a small area, near the lighthouse, with cultivated plants. The main vegetation types described in short are the following (Fig. 7):

1. — *Phrygana with scattered remnants of bushes*. The vegetation covering ranges between 85% and 90%. *Cistus creticus* subsp. *eriocephalus*, *Globularia alypum*, *Euphorbia acanthothamos*, *Phagnalon graecum* and *Convolvulus oleifolius* are the dominant taxa in phrygana, while *Pistacia lentiscus*, *Juniperus phoenicea* and *Olea europaea* subsp. *oleaster* prevail in bushes. The herb layer is dominated by the following species: *Plantago lagopus*, *Muscari commutatum*, *Trifolium scabrum*, *Ferulago nodosa*, *Avena sterilis*, *Hypochaeris achyrophorus*, *Melilotus indicus*. In

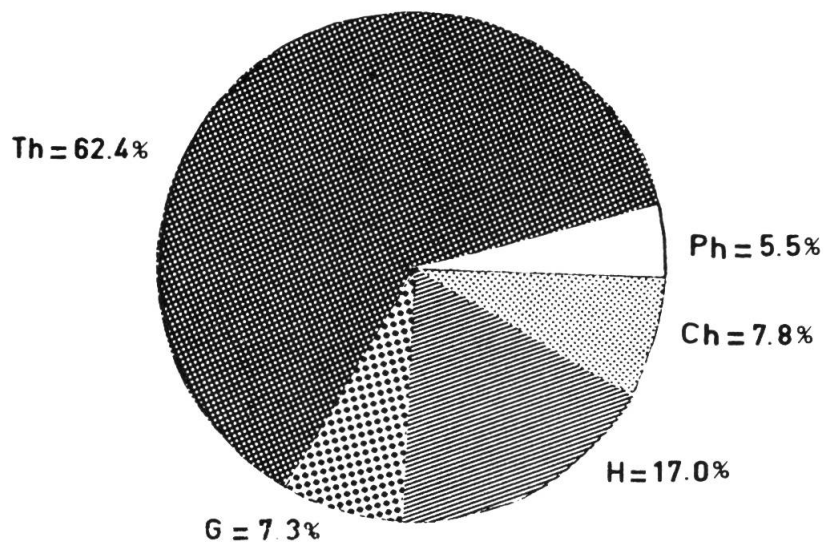


Fig. 5. — Biological spectrum of the island of Psittalia.

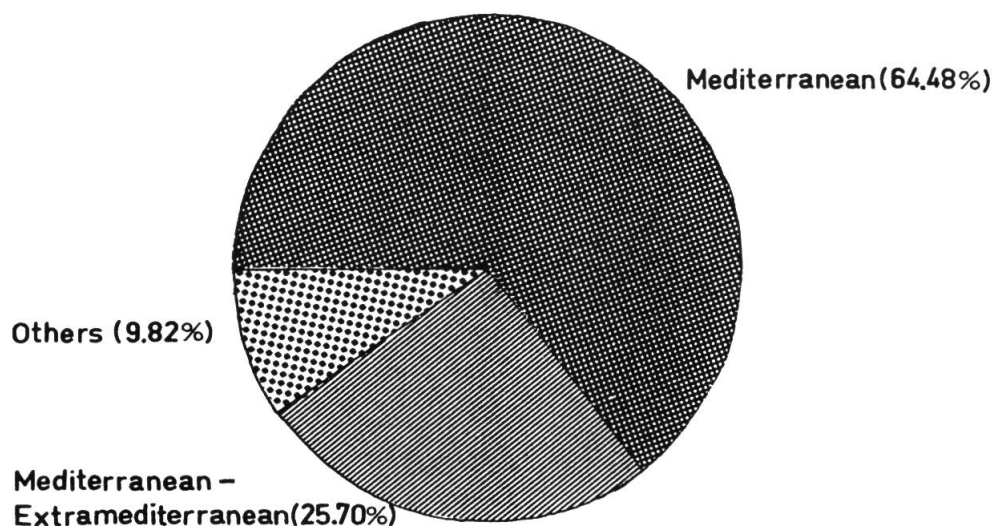


Fig. 6. — Floristic elements of the island of Psittalia.

Taxa	Families	Genera	Species	Hybrids	Subspecies	Varieties	Formas	Species, hybrids and infra-specific taxa
<i>Pteridophyta</i>	1	2	2	—	—	—	—	2
<i>Gymnospermae</i> . . .	3	3	4	—	—	—	—	4
<i>Dicotyledones</i> . . .	33	126	146	—	17	7	1	171
<i>Monocotyledones</i>	5	30	26	1	9	3	—	39
Total	42	161	178	1	26	10	1	216

Table 1. — The composition of the flora of the island of Psittalia.

Families	Genera	Species	Hybrids	Subspecies	Varieties	Formas	Species, hybrids and infraspecific taxa
<i>Compositae</i>	31	26	—	6	2	1	35
<i>Gramineae</i>	18	14	1	6	3	—	24
<i>Leguminosae</i>	13	22	—	—	1	—	23
<i>Liliaceae</i>	8	10	—	1	—	—	11
<i>Caryophyllaceae</i>	8	10	—	—	—	—	10
<i>Cruciferae</i>	9	8	—	2	—	—	10
<i>Umbelliferae</i>	8	8	—	1	1	—	10
<i>Labiatae</i>	7	7	—	1	—	—	8
<i>Rubiaceae</i>	4	7	—	—	—	—	7
<i>Papaveraceae</i>	3	6	—	—	—	—	6

Table 2. — Participation of genera, species, hybrids and infraspecific taxa of the ten largest families in the composition of the flora of the island of Psittalia.

Islands	Ph	Ch	H	G	Th	HE
Psittalia	5.5%	7.8%	17.0%	7.3%	62.4%	
Psara (GREUTER, 1976)*	1.5%	7.9%	16.3%	6.9%	65.6%	
Nisiros (PAPATSOU, 1975)	9.98%	9.31%	16.63%	9.53%	54.54%	
Skopelos (ECONOMIDOU, 1973)*	8.9%	10.1%	18.5%	12.6%	47.4%	1.3%
Skiathos (ECONOMIDOU, 1969)*	8.3%	7.1%	25.0%	12.3%	44.6%	1.8%
Kithira (YANNITSAROS, 1969)	7.61%	10.93%	17.15%	11.48%	52.00%	0.83%

* These spectra also comprise the life-form of Parasites (1.8%, 1.2% and 0.9% respectively) which are included in other forms in the rest spectra.

Table 3. — Biological spectra of Psittalia and some other Aegean islands.

some disturbed places the phryganic vegetation consisting of *Coridothymus capitatus* and some bushes of *Olea europaea* subsp. *oleaster* is enriched with nitrophilous species (*Chenopodium murale*, *Urtica urens* and *U. pilulifera*). Its vegetation cover varies up to 50%.

2. — *Degraded macchia*. The vegetation covering may extend up to 98% and is dominated by *Pistacia lentiscus*, *Olea europaea* subsp. *oleaster*, *Juniperus phoenicea* and *Euphorbia acanthothamnus*. On some places, exposed to the wind areas, *Pistacia lentiscus* with procumbent form is the exclusive dominant species.

3. — *Halophytic vegetation*. It occurs on rocky shores of the littoral zone and its covering varies up to 40%. The taxa dominating here are the following: *Silene sedoides*, *Limonium narbonense*, *Frankenia hirsuta*, *Mesembryanthemum nodiflorum*, *Malcolmia flexuosa* subsp. *naxensis* and *Atriplex halimus*.

4. — *Chasmophytic vegetation*. It is found on rocky cliffs and is characterised by the chasmophytes *Campanula celsii* subsp. *celsii* and *Inula verbascifolia* subsp. *methanaea*.

5. — *Herbaceous vegetation*. Its covering varies up to 100%, dominated by *Avena sterilis*, *Hirschfeldia incana*, *Thapsia garganica*, *Carrichtera annua*, *Plantago amplexicaulis*, *Bituminaria bituminosa*, *Rostraria cristata* subsp. *cristata* and *Beta maritima* var. *grisea*.

It must be noted that waste-water treatment plants lead to a decrease of the areas covered by the above mentioned vegetation types. This change is illustrated in Figure 7.

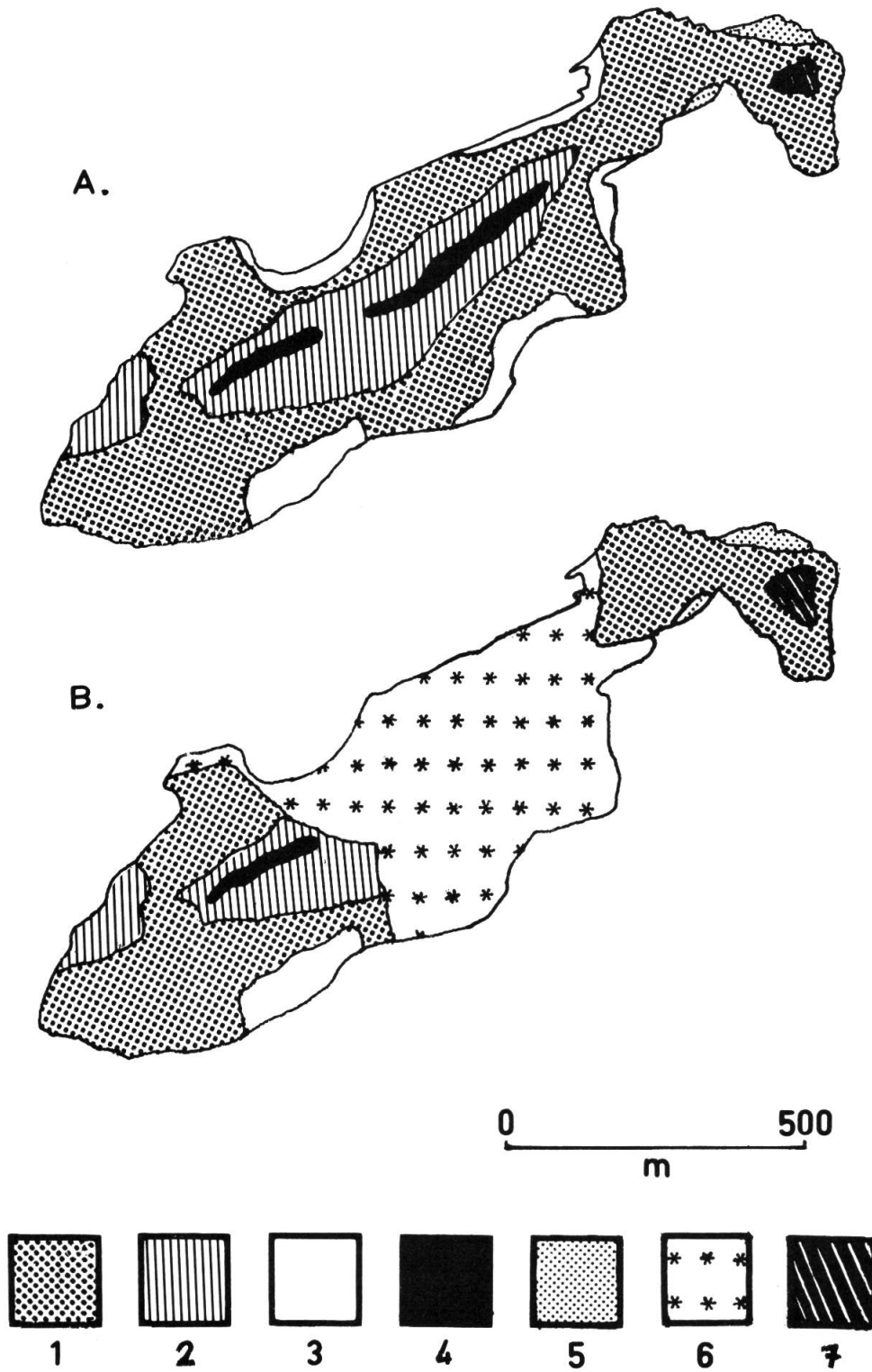


Fig. 7. — Vegetation maps of Psittalia.

A, before the installation of the waste-water treatment plants (1986); **B**, after the installation of the waste-water treatment plants (1991). 1, phrygana with scattered remnants of bushes; 2, degraded macchia; 3, halophytic vegetation; 4, chasmophytic vegetation; 5, herbaceous vegetation; 6, area occupied by the waste-water treatment plants; 7, cultivated area.

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