Biodiversity Journal, 2017, 8 (1): 87–104

MONOGRAPH

The wild vascular flora of the Archaeological Park of Neapolis in Syracuse and surrounding areas (Sicily, Italy)

Pietro Minissale[1] & Saverio Sciandrello[2]

[1]Department of Biological, Geological and Environmental Science, Section of Animal Biology, University of Catania, Italy
[1, 2] C.U.T.G.A.N.A. Centro Universitario per la Tutela e la Gestione degli Ambienti Naturali e degli Agroecosistemi Università di Catania, Italy

ABSTRACT This paper presents an updated list of the wild vascular flora growing in the Archaeological Park of Syracuse and surrounding areas. The list of plants is the result of a bibliographic analysis and field surveys carried out in 2013–2015. A total of 343 specific and infraspecific taxa are reported. The families most represented are Poaceae (43), Fabaceae (38) and Asteraceae (35 taxa). The analysis of the biological spectrum of the vascular flora indicate the predominance of therophytes (51%) and hemicryptophytes (20%) while, from a chorological point of view, most of the species show a Mediterranean distribution (134 taxa). The phytogeographical value of some rare species, in particular *Origanum onites*, *Elatine gussonei*, *Callitriche truncata*, *Aristolochia altissima* and *Brassica souliei* subsp. *amplexicaulis* is discussed. The presence of some alien species, such as *Vachellia karroo*, *Lantana camara*, *Ailanthus altissima* is also highlighted, because in this area they represent a serious threat to native plant biodiversity.

KEY WORDS *Origanum onites*; *Elatine gussonei*; Habitats of Community interest; conservation; alien species.

Received 13.01.2016; accepted 19.05.2016; printed 30.03.2017
Proceedings of the 3rd International Congress "Biodiversity, Mediterranean, Society", September 4th-6th 2015, Noto-Vendicari (Italy)

INTRODUCTION

The Archaeological Park of Syracuse, famous for the big Greek Theater and other vestiges of Greek and Roman times, houses elements of flora and vegetation of great natural value which are maintained over time thanks to the protection of the archaeological site itself. This constraint prevents very common activities on the outside areas such as grazing, fire and urbanization. In this way the protection and conservation of species and plant communities of great importance, indicators of special microhabitats were indirectly guaranteed. In 2013 the execution of major maintenance of the inside public green, made by the Forestry of Syracuse, following the provisions of the Superintendence, gave the opportunity to carry out a study on the flora aimed at its protection during worksite activities. In this way it was possible to update the knowledge on the vascular flora and to highlight some emergencies and peculiarities so far not fully known, which make even more extraordinary the cultural and natural value of the area. The research has taken account of earlier studies. In particular is worthy of mention the floristic research of Zodda (1928, 1929), who recorded many species for the archaeological site in question within a study on the flora of the municipality of Syracuse. More recently, studies on the flora and vegetation of the archaeological areas of Syracuse were made by Corbetta et

al. (2002), on the Greek Theatre and the surrounding areas; by Salmeri & Guglielmo (2012) on the Latomie of Syracuse; Guglielmo et al. (2002) on "Latomia dei Cappuccini"; Guglielmo et al. (2006) on the archaeological sites in eastern Sicily.

MATERIAL AND METHODS

The plants list is the result of a bibliographic analysis and field surveys carried out during the years 2013–2016. The study focused on the census of native vascular flora with particular regard to the species of phytogeographical or natural interest, but also to the naturalized non-native species, potentially invasive and their location on the site; including their GIS mapping.

The nomenclature follows Giardina et al. (2007); relatively to the Orchidaceae the reference was Delforge (2005). Flora of Italy (Pignatti, 1982), Med-Checklist (Greuter et al., 1984, 1986) and Flora Europaea (Tutin et al., 1964–1980) were also consulted.

The collected samples are preserved in the herbarium of the Department of Biological Geological and Environmental Sciences of Catania University (CAT).

Study area

The study area includes the fenced archaeological park, which covers about 23 hectares and the outside area to the west of the park on the southern side of the "Colle Temenite", which is also subjected to archaeological restrictions. Geographically the site falls in the Hyblaean district (Fig.1), a distinct area from the rest of Sicily, both in geological (Manuella et al., 2015) and phytogeographical terms (Brullo et al., 2011). The area is characterized by a Miocene carbonatic series, consisting mainly of calcirudite, belonging to the formation Monti Climiti. The whole area is affected by various forms of surface erosion as alveolar cavities, grooves, and trays of corrosion. Throughout the area tectonic fractures are also present, many of them are perpendicular to the surface and therefore easily accessible for the rainwater that increases their expansion. The area is also affected by forms of underground karstification (Lena, 1990).

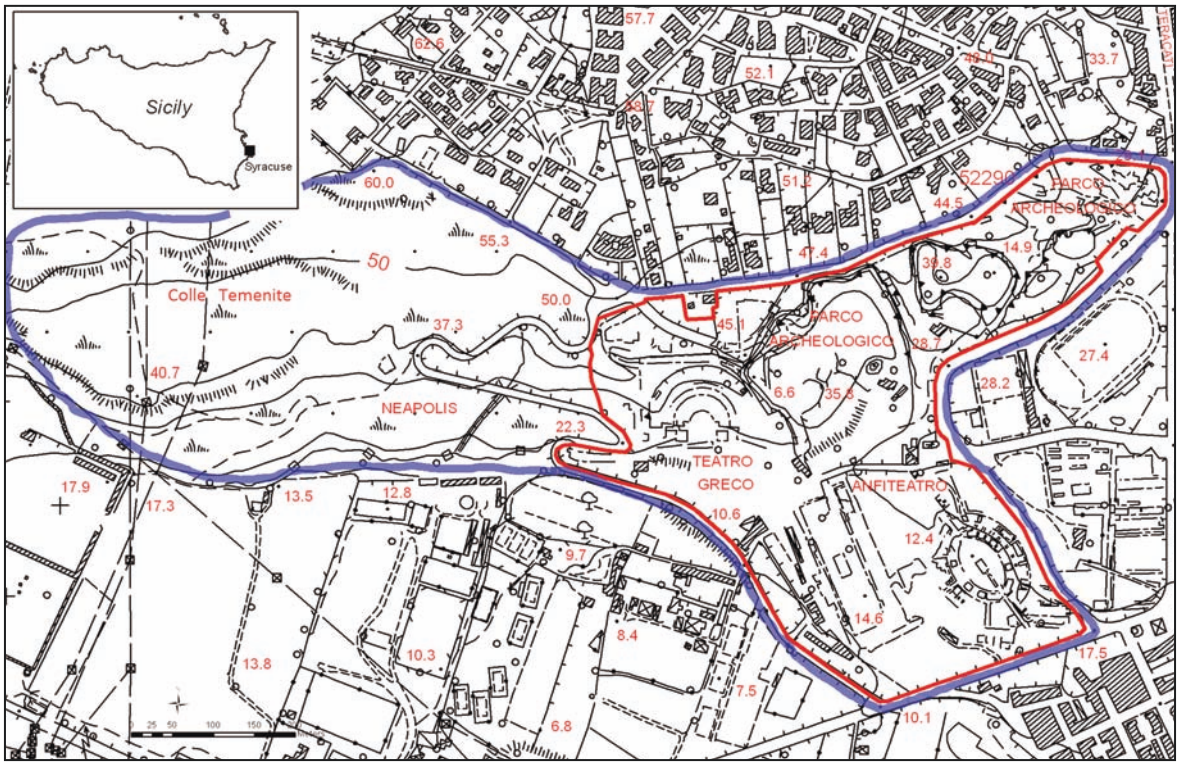


Figure 1. Study area: the Archaeological Park of Syracuse and surrounding areas (Sicily, Italy).

Regarding the climate, the Syracuse thermo-pluviometric station records average annual temperatures of 18.2 ° C and average annual rainfall of 543 mm (Zampino et al., 1997). Overall the bio-climate of the area can be defined lower thermomediterranean, lower dry, according to Rivas-Martinez (1994) and Bazan et al. (2015).

RESULTS AND DISCUSSION

The research allowed to update the list of flora, which has resulted in 343 recorded species, some of them are of great phytogeographical and conservation value. Previously Zodda (1928, 1929) had reported 158 entities, by making collections of flora in the town of Syracuse for the archaeological area and Temenite hill; then Corbetta et al. (2002), for the area of the archaeological park, reported 191 entities, many of which not recorded by Zodda. The current study has led to a considerable increase of the flora's list for the area, also confirming the presence of the rarest species previously reported. Taking account of the limited size of the site, and by the fact that a fairly wide area is used as a garden, the vascular wild flora, overall, is quite rich and diversified. There are also many ornamental species that are not mentioned here with the exception of those showing autonomous capacity to spread. For the ornamental species census, see Salmeri & Guglielmo (2012) and Minissale et al. (2016).

On the whole, the chorological spectrum (Fig. 2) shows the prevalence of species with broad Mediterranean range (134 taxa); some others have a partial Mediterranean range (34), few species have a range which extends in temperate regions (84 taxa) or in tropical/arid areas (43 taxa) or almost all over the world (12 taxa). Important features of this flora are: on the one hand the endemics (9 taxa, Sicilian or S Italy and Sicily endemics), precious elements of this site, and on the other hand the high number of alien naturalized species (27 taxa), that trivializes the flora and might threaten native species. The biological spectrum shows, as expected, the prevalence with over 50% of therophytes followed by hemicryptophytes and geophytes (Fig. 3).

Among the species already known in this area, the presence of *Origanum onites* has a phytogeographic relevance, this species having an east Mediterranean distribution, widespread on Greek and Turkish coasts of the Aegean Sea and in most of the Aegean islands (Vokou et al., 1988; Aykut Tonk et al. 2010). It is also present in Sicily only near Syracuse (Fig. 4) and reported in Malta (Greuter et al., 1986), but no longer found because probably only cultivated (Mifsud, 2007). It is to remark that the species was described by Linnaeus (1753) from a herbarium specimen just collected from Syracuse (Fig. 5). Before Linnaeus, Boccone (1697) had already shown this species to Syracuse, identified, as was the custom at that time, with a diagnostic phrase "Origanum *lignosum Syracusanum, perenne umbella amplissima, brevi lato, nervoso folio, nigricante*". He pointed out that it grew in Sicily only at Syracuse, on the road for Melilli, about two miles from the town, that is in

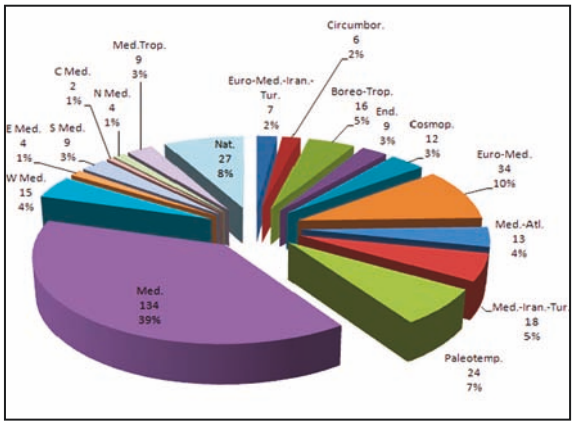


Figure 2. Chorological spectrum (see text).

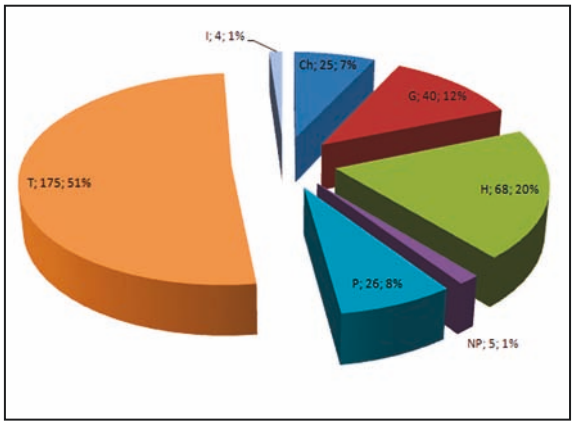


Figure 3. Biological spectrum (see text).

Figure 4. *Origanum onites*: Siracusa May 30, 2013. Figure 5. *Origanum onites* diagnosis in Linnaeus (1753, 2: 590).

the same places where it is found today. He also compares it with a plant represented by Alpini (1592), called *Hyssopus graecorum*, while Anguillara (1561) describes a hyssop of the Greeks that would be nothing but an oregano that grows in the Cyclades and Crete. On this basis Boccone rightly thought that these entities were the same species and highlights in this way its east Mediterranean range, with a disjunction in Syracuse.

In the archaeological site, where in more recent times was signaled by Zodda (1928), it is found mainly on the rock edges overlooking the "Latomia del Paradiso" and "Intagliatella" and on rocky outcrops of "Colle Temenite", external to the archaeological park, up to the slope, above the cemetery of Syracuse. Other locations near Syracuse, where the species was reported from Fagotto & Longhitano (1989) are Acradina, "Latomia dei Cappuccini", Santa Panagia tuna fishery and "Contrada Pantanelli". The species, from the investigations carried out in the course of this study, is still present in these locations, only Pantanelli has not been confirmed; in any case the most substantial population, formed from some hundreds of individuals remains that of Colle Temenite including archaeological park. This species seems well integrated in the natural vegetation and therefore could be considered a spontaneous species with disjoined areal confined in Sicily, in Syracuse surroundings. However you could not exclude an ancient introduction by the Greeks themselves at the time of the Syracuse foundation in the eighth century BC, or in the following centuries.

Another species of phytogeographical interest is *Brassica souliei* (Batt.) Batt. with the subsp. *amplexicaulis* (Desf.) Greuter et Burdet distributed in Morocco and Sicily (Greuter et al., 1984). In the island is quite common on clay gullies of the central area (Giardina et al., 2007; Brullo et al., 2011), but rare or absent elsewhere. In Syracuse it has already been reported by Pignatti (1982). Since in the rest of Hyblaean district it is not reported, the presence in the archaeological area of the Temenite hill could be traced back, but as accidental introduction, due to intensive exchanges, in the Greek era, with the city of Gela which was connected with Syracuse by a specific road (Burgio, 2005).

The research also helped to highlight an extraordinary, hitherto little known, peculiarity of the archaeological area that significantly enhances the floristic value of this area. The hard Miocenic limestones subjected to natural erosion have dimples and natural excavations where in winter accumulates rainwater that drains into the spring. These dimples in the archaeological area were created in great numbers and in more regular form also by ancient Greek colonists that used to carve rock blocks of various sizes, sometimes leaving cavities and shallow dimples (Mastelloni, 2014). Thus a somewhat peculiar system of temporary pools, for the flora which grows there, originated (Figs. 6, 7).

The most important species found in the pools is *Elatine gussonei* (Fig. 8), so far known only for the Maltese Islands and Lampedusa. Only recently it has been reported to some localities of the southern Hyblaean Mounts (Molnar et al., 2014) and Minissale & Sciandrello (2016) report it for the Neapolis of Syracuse especially in the rock pools around the Tomb of Archimedes (Fig. 9), above the Greek Theatre, but also in outdoor areas on rocky outcrops crossed by the panoramic road near the west side of the archaeological park (Fig.10). In the past it has been confused with the related *Elatine macropoda* Guss.; under this name it has been reported for the archaeological area of

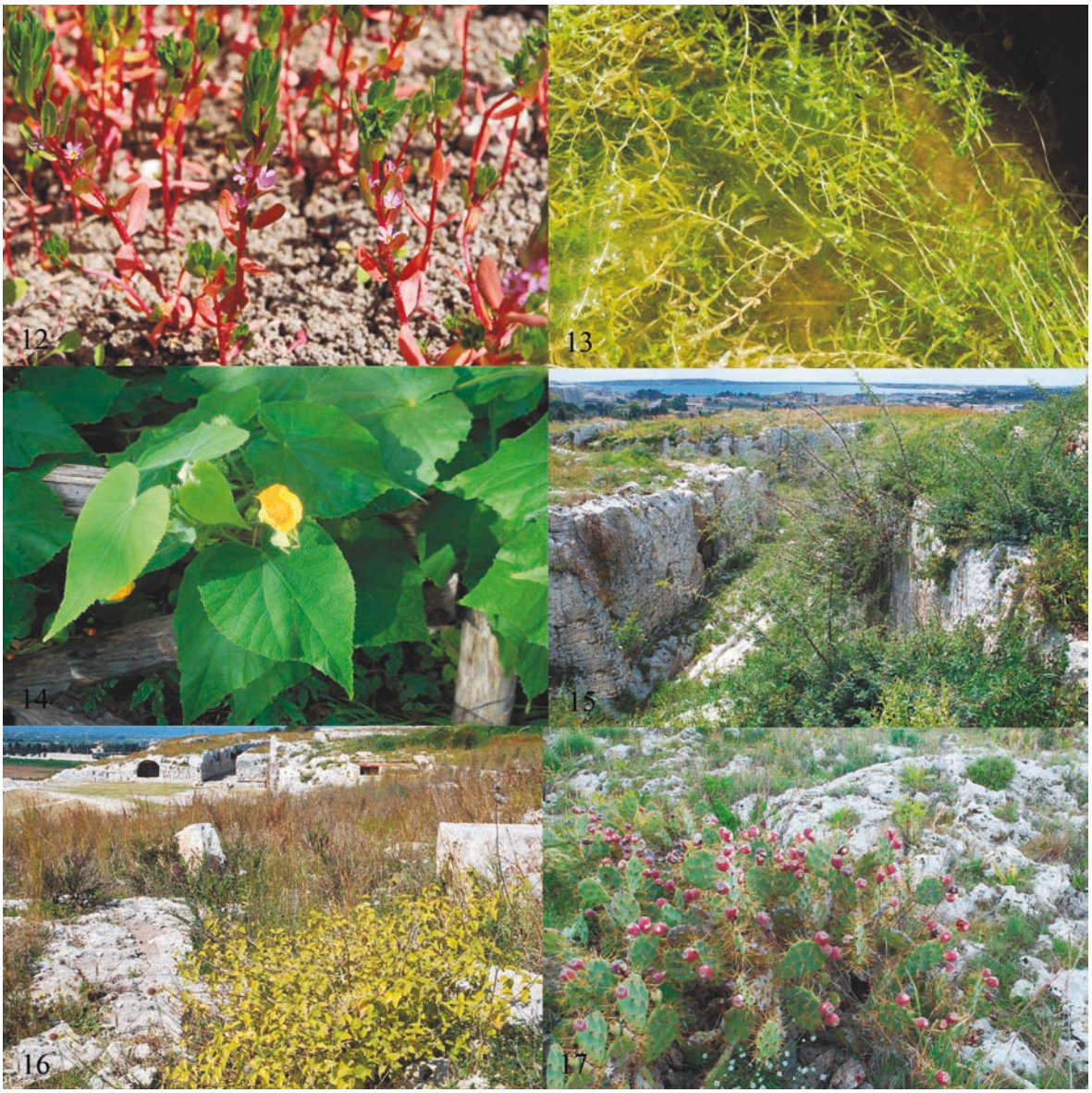
Syracuse by Nicotra (1890) and since then it was no longer observed. In addition Minissale & Sciandrello (2016) showed that the samples collected in some locations in western Sicily can be referred to this species thus becoming a Sicilian-Maltese endemic. The discovery in the archaeological site is of exceptional value considering that just the monuments protection has indirectly favored its survival by preventing activities such as fire, grazing and especially the urbanization that has been rampant over most of the areas bordering the archaeological site. The investigation however, allowed to find *Elatine gussonei* in other places of the outskirts of Syracuse; this is particularly the crags of Akradina and near the old tuna fishery of Santa Panagia.

Figures 6–11 Species and plant communities in the archaeological park. Fig. 6: Rock pools and excavations near the Greek Theatre (March 26, 2013). Fig. 7: Grooves and dimples at the Tomb of Archimedes (April 4 2013). Fig. 8: *Elatine gussonei*, detail of flowers and capsules (April 4, 2013). Fig. 9: *Elatine gussonei* community in a small pool at the Tomb of Archimedes (April 4, 2013). Fig. 10: A pool temporary already dry in early spring on the Temenite hill: *Elatine gussonei* vegetation bordered by *Tillaea vaillantii* vegetation (March 26, 2013). Fig. 11: *Tillaea vaillantii* near the Greek Theatre (March 26, 2013).

Other hygrophilous species of considerable rarity found here are *Tillaea vaillantii*, (Fig. 11), *Lythrum hyssopifolia* (Fig. 12), *Callitriche truncata* (Fig. 13).

Each of these hygrophilous ephemeral species characterizes different, typical of temporary pools, plant micro-communities, but each one diversified for flooding period and soil depth (Minissale & Sciandrello, 2016).

In the wide areas of the archaeological park affected by reforestation of pines and eucalyptus trees, flora does not present normally peculiarities of remark, but sometimes species of some interest may be found, as *Aristolochia altissima*, subendemic species of Hyblean Mounts and Algeria, found at the altar of Hieron and upstream of the Greek theater, *Oprhys sicula*, near the Roman amphitheater, *Orchis*



Figures 12–17 Plant species at the archaeological park. Fig. 12: *Lythrum hissopifolia* in pools with deep soil above the Greek Theatre (March 26, 2013). Fig. 13: *Callitriche truncata* in the deeper artificial pools near the tomb of Archimedes (April 4, 2013). Fig. 14: *Abutilon theophrasti* in Latomia Santa Venera (December 14, 2015). Fig. 15: *Vachellia karroo* on the walls of the sacred way above the Greek Theatre (March 26, 2013). Fig. 16: *Lantana camara* (March 26, 2013). Fig. 17: *Opuntia dillenii* (March 26, 2013).

papilionacea var. *grandiflora*, in outside areas of the archaeological park. Another species particularly rare in Sicily (Giardina et al., 2007), is *Abutilon theophrasti*, found in Latomia Santa Venera (Fig. 14).

Alongside these floristic findings of great value, the study also highlighted critical issues, such as the presence and sometimes large spread of some invasive alien species which threaten not only local biodiversity but also the monuments themselves. These are *Vachellia karroo*, native to southern Africa, which can settle easily even in small crevices and cracks in the rock and it is present with hundreds of specimens mainly in the upstream portion of the Greek Theatre (Fig. 15) and close to the tomb of Archimedes. In order to preserve the archaeological site is necessary to pursue over time a schedule for the eradication of this alien species from the archaeological site and where possible from neighboring areas. The risk of its settlement throughout the site is far from negligible, because even if cut at the base of the stem, it has great ability to regrowth. Its ability to occupy niches and rocky ravines, in the long run, leads to the fragmentation of the rocks with serious damage to the archaeological site, but also for the flora and the natural habitats present. They require repetitive tasks such as cutting, chemical control, localized to the stumps in order to reduce the risk of contamination to the rest of the flora and fauna.

Other exotic species spread in the area, with independent propagation capacity, are *Lantana camara* (Fig. 16), *Washingtonia robusta*, *Opuntia dillenii* (Fig. 17). Also for these species containment interventions, and, if possible, eradication, prolonged in time, are required.

Inside the quarries, characterized by greater coolness and moisture of the soil, *Ailanthus altissima*, highly invasive species, took great development, so intensive cuts were carried out during the last works in order to keep it under control; but for the future a stronger action needs to be made such as the uprooting and chemical treatment.

The distribution map of the abovementioned "good" and "bad" floristic emergencies, in the study area, is showed in figure 18.

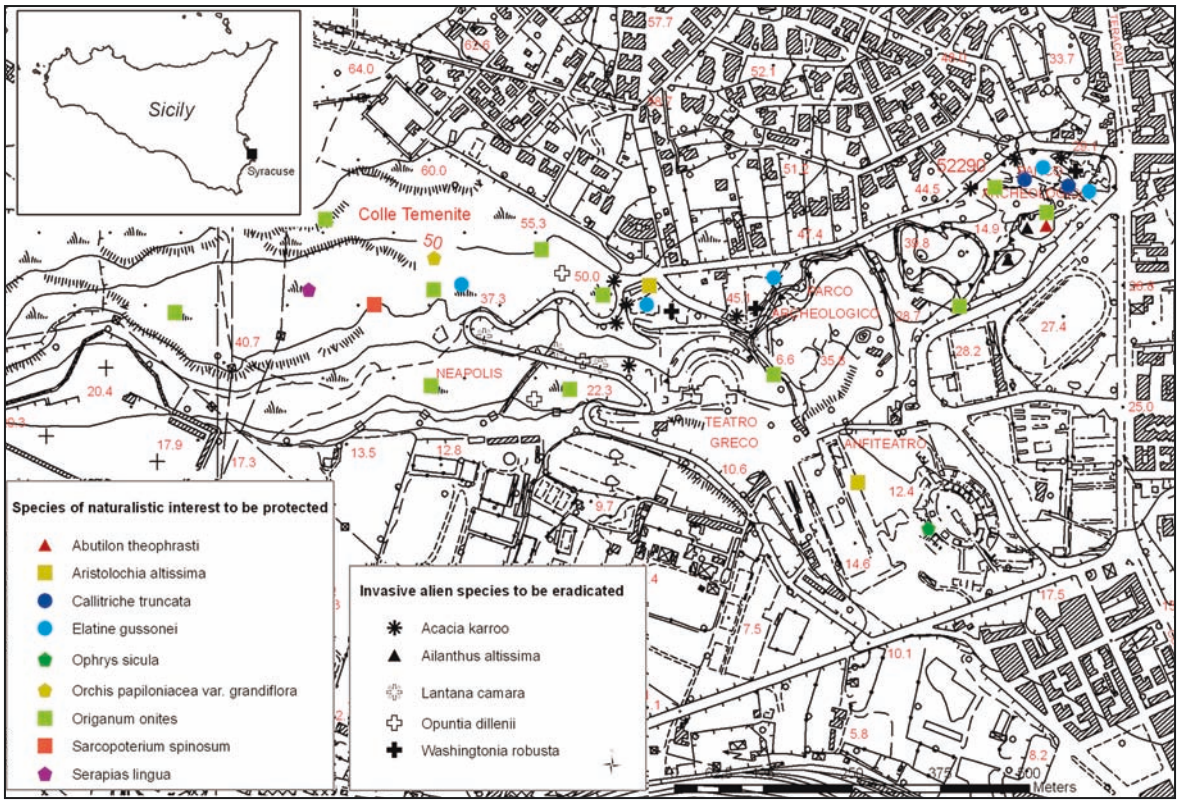


Figure 18. Map of floristic emergencies recorded in the study area: the Archaeological Park of Syracuse and surrounding areas (Sicily, Italy).

FLORISTIC LIST

The following floristic list shows, in addition to the binomial with the author, biological form, chorotype, IUCN category. Abbreviations of life forms follow Pignatti (1982). The following letters indicate the species already reported by Zodda (1928), (Z.a); Zodda (1929), (Z.b); Corbetta et al. (2002), (C.); except where otherwise indicated, they were confirmed as present in the current study; the species of new recording for the site are indicated with the letter (n).

PTERIDOPHYTA
Familia ADIANTACEAE

Adiantum capillus-veneris L.; G rhiz; Boreo-Trop.; (C.)

Familia ASPLENIACEAE

Ceterach officinarum Willd.; H ros; Euro-Med.-Iran.-Tur.; (n)

Familia AZOLLACEAE

Azolla mexicana C. Presl.; I nat; Nat., Trop. America.; (n)

Familia POLYPODIACEAE

Polypodium cambricum L. subsp. *serrulatum* (Arcang.) Pichi Serm.; H ros, Euri-Medit.; (n)

Familia SELAGINELLACEAE

Selaginella denticulata (L.) Spring; Ch rept; Med.; (n)

GYMNOSPERMAE
Familia PINACEAE

Pinus halepensis Miller; P scap; Nat., Med. (extensively planted, occasionally of spontaneous growth); (C.)
Pinus pinea L.; P scap; Nat., Euri-Medit. (planted, occasionally of spontaneous growth); (C.)

ANGIOSPERMAE (Dicotyledones)
Familia ACANTHACEAE

Acanthus mollis L.; H scap; W Med.; (C., Z.a)

Familia AMARANTHACEAE

Amaranthus hybridus L.; T scap; Nat., Trop. America; (C.)
Amaranthus retroflexus L.; T scap; Nat., N America; (C.)
Chenopodium album L.; T scap; Cosmop.; (C.)

Familia ANACARDIACEAE

Pistacia lentiscus L.; P caesp; Med.; (C.)
Pistacia terebinthus L.; P caesp; Med.; (C.)

Familia APIACEAE

Apium nodiflorum (L.) Lag.; H scap; Paleotemp.; (C.)
Daucus carota L. subsp. carota; H bien; Euro-Med.; (C., Z.a)
Foeniculum vulgare subsp. *piperitum* (Ucria) Bég.; H scap.; S Med.; (n)
Smyrnium olusatrum L.; H bien; Med.; (C.)
Thapsia garganica L.; H scap; Med.; (n)
Tordylium apulum L.; T scap; Med.; (Z.a)

Familia APOCYNACEAE

Nerium oleander L.; P caesp; Med.; (C., Z.a)
Vinca major L.; Ch rept; Med.; (Z.b)

Familia ARALIACEAE

Hedera helix L. subsp. *helix*; P lian; Paleotemp.; (C.)

Familia ARISTOLOCHIACEAE

Aristolochia altissima Desf.; P lian; SW Med.; LR; (Z.a)

Familia ASTERACEAE

Anthemis arvensis L. subsp. *arvensis*; T scap; Med.; (n)
Bellis annua L.; T scap; Med.; (n)
Carduus pycnocephalus L.; H bien; Med.; (C.)

Carlina corymbosa L.; H scap; W Med.; (C.)
Chamaeleon gummifer (L.) Cass.; H ros; S Med.; (n)
Calendula arvensis L.; T scap; Euro-Med.-Iran.-Tur.; (n)
Carthamus lanatus L.; T scap; Med.-Iran.-Tur.; (n)
Cichorium pumilum Jacq.; T scap; Med.; (Z.a)
Coleostephus myconis (L.) Rchb. Fil.; T scap; Med.; (n)
Cynara cardunculus L. subsp. *cardunculus*; H scap; Med.; (n)
Glebionis coronarium (L.) Spach.; T scap; Med.; (C., Z.a)
Erigeron bonariensis L.; T scap; Nat., America; (C.)
Erigeron canadensis L.; T scap; Cosmop.; (C.)
Symphyotrichum squamatus (Sprengel) Nesom; H scap; Nat., Trop. America; (C.)
Dittrichia graveolens (L.) Greuter; T scap; Med.; (C.)
Dittrichia viscosa (L.) Greuter; H scap; W Med. (C., Z.a)
Eupatorium cannabinum L.; H scap; Euro-Med.; (C., Z.a)
Filago pyramidata L.; T scap; Euro-Med.; (n)
Galactites elegans (All.) Soldano; H bien; Med.; (C., Z.a)
Helminthotheca echioides (L.) Holub; T scap; Med.; (C., Z.a)
Hyoseris radiata L.; H ros; Med.; (Z.a)
Hypochoeris achyrophorus L.; T scap; Med.; (C.)
Hypochoeris radicata L.; H ros; Med.; (n)
Onopordum illyricum L.; H bien; Med. (Z.a)
Pallenis spinosa (L.) Cass.; T scap; Med.; (Z.a)
Phagnalon rupestre (L.) DC. subsp. rupestre; Ch suffr; W Med.; (n)
Phagnalon saxatile (L.) Cass.; Ch suffr; W Med.; LR; (C., Z.a)
Raphanus raphanistrum L. subsp. *raphanistrum*; T scap; Euro-Med.; (Z.a)
Reichardia picroides (L.) Roth var. *picroides*; H scap; Med.; (C., Z.a)
Senecio vulgaris L.; T scap; Paleotemp.; (C., Z.a)
Silybum marianum (L.) Gaertner; H bien; Med.; (C.)
Sonchus oleraceus L.; T scap; Cosmop.; (C.)
Sonchus tenerrimus L.; H scap; Med.; (C., Z.a)
Tragopogon porrifolius L.; H bien; Med.; (C.)
Urospermum picroides (L.) Schmidt; T scap; Med.; (C., Z.a)
Urospermum dalechampii (L.) Schmidt; H scap; Med.; (Z.a)

Familia BORAGINACEAE

Anchusella cretica (Mill.) Bigazzi, Nardi et Selvi;T scap; E Med.; (Z.a), not found now
Borago officinalis L.; T scap; Med.; (n)
Cerinthe major L. subsp. *major*; G bulb; Med.; (C., Z.a)
Cynoglossum creticum Miller; H bien; Med.-Iran.-Tur.; (C., Z.a)
Echium italicum L. subsp. *siculum* (Lacaita) Greuter et Burdet; (n)
Echium plantagineum L.; T scap; Med.; (C.)
Heliotropium europaeum L.; T scap; Euro-Med.-Iran.-Tur.; (C.)
Myosotis arvensis Hill; T scap; Euro-Med.; (C.)

Familia BRASSICACEAE

Biscutella maritima Ten.; T scap; SW Med.; (Z.a)
Brassica souliei (Batt.) Batt. subsp. *amplexicaulis* (Desf.) Greuter et Burdet; T scap; SW Med.; (reported by Pignatti [1982] in Syracuse); (n)
Capsella bursa-pastoris (L.) Medicus; H bien; Cosmop.; (n)
Coronopus didymus (L.) Sm.; T rept; Nat., N America; (C.)
Diplotaxis erucoides (L.) DC.; T scap; Med.-Iran.-Tur.; (C., Z.a)
Diplotaxis tenuifolia (L.) DC.; H scap; Euro-Med.; (C.)
Erophila verna (L.) Chevall.; T scap; Paleotemp.; (n)
Hirschfeldia incana (L.) Lagrèze-Fossat; H scap; Med.; (n)
Lobularia maritima (L.) Desv.; H scap; Med.; (C., Z.a)
Matthiola incana (L.) R. Br. subsp. *incana*; Ch suffr; NW Med.; (C., Z.a)
Sinapis alba L. subsp. *alba*; T scap; A.; Nat., E Medit.; (C.)
Sisymbrium officinale (L.) Scop.; T scap; Euro-Med.; (C.)

Familia CACTACEAE

Opuntia ficus-indica (L.) Mill.; P succ; Nat., Trop. America; (C.)

Opuntia dillenii (Ker-Gawl.) Haw.; P succ; Nat., Trop. America; (n)

Familia CAMPANULACEAE

Campanula erinus L.; T scap; Med.; (C., Z.a)
Trachelium caeruleum L.; Ch suffr; W Medit.; (Z.b)

Familia CAPPARIDACEAE

Capparis spinosa L.; Ch suffr; Med.-Iran.-Tur.; (C.)

Familia CAPRIFOLIACEAE

Fedia cornucopiae (L.) Gaertner; T scap; Med.; (Z.a)
Sixalis atropurpurea (L.) Greuter et Burdet subsp. *maritima* (L.) Greuter et Burdet; H bien; Med.; (C.).
Valerianella eriocarpa Desv.; T scap; Med.-Atl.; (C.)
Valerianella microcarpa Loisel.; T scap; Med.; (Z.a)

Familia CARYOPHYLLACEAE

Arenaria serpyllifolia L. subsp. *leptoclados* (Reichenb.) Nyman; T scap; Paleotemp.; (C.)
Cerastium glomeratum Thuill.; T scap; Circumbor.; (Z.a)
Minuartia mediterranea (Ledeb.) K. Maly; T scap; Med.; (C., Z.a)
Paronychia argentea Lam.; H caesp; Med.; (Z.a)
Polycarpon tetraphyllum (L.) L.; T scap; Euro-Med.; (C.)
Sagina apetala Ard. subsp. *apetala*; T scap; Paleotemp.; (C., Z.a)
Silene colorata Poiret; T scap; Med.; (Z.a)
Silene gallica L. T scap; Euro-Med.; (n)
Spergularia bocconei (Scheele) Graebner; T scap; Paleotemp.; (C.)
Stellaria media (L.) Vill. subsp. *media*; T rept; Cosmop.; (C.)
Stellaria pallida (Dumort.) Piré; T scap; Euro-Med.; (Z.b)

Familia CONVOLVULACEAE

Calystegia sylvatica (Kit.) Griseb.; H scand; Med.-Iran.-Tur.; (C., Z.a)
Convolvulus althaeoides L.; H scand; Med.; (C., Z.a)
Convolvulus arvensis L.; G rhiz; Paleotemp.; (C., Z.b)
Convolvulus cantabrica L.; H scap; Euro-Med.; (Z.a)

Familia CRASSULACEAE

Sedum caeruleum L.; T scap; S Med.; (Z.a)
Sedum stellatum L.; T scap; Med.; (n)
Tillaea muscosa L.; T scap; Euro-Med.; (n)
Tillaea vaillantii Willd.; T scap; Med.-Trop.; LR; (Z.a)
Umbilicus rupestris (Salisb.) Dandy; G bulb; Med.-Trop.; (n)

Familia ELATINACEAE

Elatine gussonei (Somm.) Brullo, Lanfranco, Pavone et Ronsisvalle; I rad; End. Sicily Maltese Islands; CR; (n, it had been reported by Nicotra (1890), to the Ear of Dionysius, as *Elatine macropoda* Guss.)

Familia EUPHORBIACEAE

Andrachne telephioides L.; Ch suffr; Med.-Iran.-Tur.; LR; (C., Z.a)
Chamaesyce canescens (L.) Prokh.; T rept; Euro-Med.; (C.)
Euphorbia exigua L. var. *exigua*; T scap; Euro-Med. (Z.a)
Euphorbia helioscopia L.; T scap; Paleotemp.; (C., Z.a)
Euphorbia humifusa Willd.; Nat., Asia; (C.)
Euphorbia peplus L.; T scap; Circumbor.; (C., Z.a)
Euphorbia pinea L.; Ch suffr; Med.; (C.)
Euphorbia terracina L.; T scap; Med.; (C., Z.a)
Mercurialis annua L.; T scap; Paleotemp.; (C., Z.a)
Ricinus communis L.; T scap; Nat., Trop. Africa.; (C., Z.a)

Familia FABACEAE

Acacia saligna (Labill.) Wendl. fil.; P scap; Nat., Australia; (n)
Anagyris foetida L.; P caesp; Med.; (n)
Anthyllis vulneraria L. subsp. *maura* (G. Beck) Maire; H scap; W Med.; (n)

Anthyllis vulneraria L. subsp. *rubriflora* (DC.) Arcangeli; H scap; Euro-Med.; (Z.a)
Astragalus boeticus L.; T scap; Med.-Iran.-Tur.; (Z.a)
Astragalus epiglottis L.; T scap; Med.; (Z.a)
Astragalus hamosus L.; T scap; Med.; (C.)
Bituminaria bituminosa (L.) Stirton; H scap; Med.
Hippocrepis multisiliquosa L.; T scap; W Med.
Lathyrus articulatus L.; T scap; Med.; (C., Z.b)
Lathyrus clymenum L.; T scap; Med.; (C.)
Lotus corniculatus L.; H scap; Paleotemp.; (C.)
Lotus cytisoides L.; Ch suffr; Med.; (C., Z.a)
Lotus edulis L.; T scap; Med.; (C., Z.a)
Lotus ornithopodioides L.; T scap; Med.; (C., Z.a)
Medicago italica (Miller) Fiori subsp. *tornata* (L.) Emberger et Maire; T scap; W Med.; (C.)
Medicago littoralis Rohde ex Loisel. var. *littoralis*; T scap; Med.; (Z.a)
Medicago lupulina L.; T scap; Paleotemp.; (C., Z.a)
Medicago minima (L.) Bartal.; T scap; Euro-Med.; (C.)
Medicago polymorpha L.; T scap; Med.-Iran.-Tur.; (C.)
Medicago truncatula Gaertner; T scap; Med.-Atl.; (C.)
Melilotus indicus (L.) All.; T scap; Med.-Iran.-Tur.; (C.)
Melilotus sulcatus Desf.; T scap; Med.; (C.)
Ononis natrix L. subsp. *ramosissima* (Desf.) Batt.; H caesp; Med.; (Z.a)
Ononis reclinata L.; T scap; Med.; (C.)
Ononis viscosa L. subsp. *breviflora* (DC.) Nyman; T scap; Med.; (C.)
Robinia pseudoacacia L.; P caesp; Nat., N America; (Z.b)
Tetragonolobus purpureus Moench; T scap; Med.; (Z.a)
Trifolium campestre Schreber; T scap; Euro-Med.; (C.)
Trifolium nigrescens Viv. subsp. *nigrescens*; T scap; Med.; (C., Z.a)
Trifolium resupinatum L.; T rept; Med.; (n)
Trifolium scabrum L.; T rept; Med.; (C., Z.a)
Trifolium subterraneum L. subsp. *subterraneum*; T rept; Euro-Med.; (n)
Trifolium tomentosum L.; T rept; Med.; (C.)
Tripodion tetraphyllum (L.) Fourr.; T scap; Med.; (C., Z.a)
Vachellia karroo (Hayne) Banfi et Galasso; P caesp; Nat., S Africa; (C. sub *Acacia karroo* Hayne)
Vicia hybrida L.; T scap; Med.; (Z.a)
Vicia sativa L. subsp. *sativa*; T scap; Med.-Iran.-Tur.; (C.)

Familia FAGACEAE

Quercus ilex L.; P scap; Med.; (C.)

Familia GERANIACEAE

Erodium cicutarium (L.) L'Her.; T scap; Paleotemp.; (C.)
Erodium malacoides (L.) L'Her.; T scap; Med.; (C., Z.a)
Erodium moschatum (L.) L'Her.; T scap; Med.; (C., Z.a)
Geranium molle L. subsp. *molle*; T scap; Paleotemp.; (C., Z.a)
Geranium rotundifolium L.; T scap; Euro-Med.; (C., Z.a)
Geranium robertianum L. subsp. *robertianum*; T scap; Circumbor.; (Z.a)

Familia LAMIACEAE

Ajuga chamaepitys (L.) Schreber subsp. *chamaepytis*; T scap; Med.; (C., Z.a)
Ajuga iva (L.) Schreber; Ch suffr; Med.; (C.)
Ballota nigra L. subsp. *uncinata* (Fiori et Béguinot) Patzak; H scap; Euro-Med.; (C.)
Calamintha nepeta (L.) Savi subsp. *nepeta*; H scap; Euro-Med.; (C.)
Coridothymus capitatus (L.) Reichenb. fil.; Ch frut; Med.; (Z.a)
Lamium amplexicaule L.; T scap; Paleotemp.; (C.)
Mentha pulegium L.; H scap; Euro-Med.-Iran.-Tur; (n)
Mentha suaveolens Ehrh. subsp. *suaveolens*; H scap; Euro-Med.; (C.)
Micromeria canescens (Guss.) Bentham; Ch suffr; End. It.-sic.; (Z.a)
Micromeria consentina (Ten.) N. Terracc.; Ch suffr; End. It.-sic.; reported by Zodda (1928), but probably confused with the next species and therefore it could be excluded from this florula
Micromeria graeca (L.) Bentham subsp. *tenuifolia* (Ten.) Nyman; Ch suffr; End. It.-sic.; (n)
Micromeria microphylla (Durv.) Bentham; Ch suffr; End. It.-sic.; LR; (Z.b)
Micromeria nervosa (Desf.) Bentham Ch suffr; Med.; (Z.a)

Origanum onites L.; Ch suffr; E Med.; VU; (C., Z.a)
Prasium majus L.; Ch frut; Med.; (C., Z.a)
Salvia verbenaca L.; H scap; Med.-Atl.; (Z.a)
Sideritis romana L.; T scap; W Med.; (C.)
Teucrium capitatum L.; Ch suffr; Med.; (n)
Teucrium flavum L. subsp. *flavum*; Ch frut; Med.; (C.)
Teucrium fruticans L.; NP; W Med.; (C., Z.a)

Familia LAURACEAE

Laurus nobilis L.; P caesp; Nat., Med.-Atl.; (C.)

Familia LINACEAE

Linum bienne Mill. var. *bienne*; H bien; Med.-Atl.; (Z.a)
Linum strictum L.; T scap; Med.-Iran.-Tur.; (n)

Familia LYTHRACEAE

Lythrum hyssopifolia L.; T scap; Paleotemp.; (n)

Familia MALVACEAE

Abutilon theophrasti Medik. Tscap; Paleotemp.; (n)
Malva nicaeensis All.; T scap; Med.; (Z.a)
Malva parviflora L.; T scap; Med.; (C.)
Malva sylvestris L.; H scap; Euro-Med.; (C., Z.a)

Familia MORACEAE

Ficus carica L.; P scap; N Med .; (C.)

Familia NYCTAGINACEAE

Mirabilis jalapa L.; G bulb; Nat., S America; (C., Z.b)

Familia OLEACEAE

Olea europaea L. subsp. *oleaster* (Hoffmanns et Link) Negodi; P caesp; Med.; (C.)

Familia OROBANCHACEAE

Bellardia trixago (L.) All.; T scap; Med.; (Z.a)
Parentucellia viscosa (L.) Caruel; T scap; Med.-Atl.; (Z.a)

Familia OXALIDACEAE

Oxalis corniculata L.; H rept; Cosmop.; (C., Z.a)
Oxalis pes-caprae L.; G bulb; Nat., S Africa; (C., Z.a)

Familia PAPAVERACEAE

Fumaria bastardii Boreau; T scap; Med.-Atl.; (Z.a)
Fumaria capreolata L.; T scap; Euro-Med.; (C.)
Fumaria flabellata Gasparr.; T scap; Med.; (Z.a)
Fumaria muralis Sonder ex Koch; T scap; Euro-Med.; (Z.a)
Fumaria officinalis L. subsp. *officinalis*; T scap; Paleotemp.; (Z.a)
Papaver rhoeas L. subsp. *rhoeas*; T scap; Paleotemp.; (C.)
Papaver setigerum DC.; T scap; Med.; (C.)

Familia PHYTOLACCACEAE

Phytolacca americana L.; G rhiz; Nat., N America; (n)

Familia PLANTAGINACEAE

Antirrhinum siculum Miller; Ch frut; End. It.-sic.; (C., Z.a)
Callitriche truncata Guss. subsp. *truncata*; I rad; Med.-Atl.; VU; (Z.a)
Kickxia commutata (Bernh.) Fritsch subsp. *commutata*; H rept; Med.; (C.)
Kickxia elatine (L.) Dumort. subsp. *elatine*; T scap; Euro-Med. (n)
Linaria reflexa (L.) Desf.; T rept; C Med.; (C., Z.a)
Plantago afra L. subsp. *afra*; T scap; Med.; (C., Z.a)
Plantago lagopus L.; T scap; Med.; (C., Z.a)
Veronica arvensis L.; T scap; Paleotemp.; (C., Z.a)
Veronica cymbalaria Bodard; T scap; Med.; (C., Z.a)
Veronica hederifolia L.; T scap; Paleotemp.; (Z.a)
Veronica polita Fries; T scap; Circumbor.; (Z.a)

Familia PLUMBAGINACEAE

Plumbago europaea L.; Ch frut; Med. (n)

Familia POLYGONACEAE

Polygonum aviculare L.; T rept; Boreo-Trop.; (n)

Rumex bucephalophorus L. subsp. *bucephalophorus*; T scap; Med.; (Z.a)
Rumex patientia L.; H scap; Nat., E Europe; (Z.a)
Rumex pulcher L. subsp. *pulcher*; H scap; Med.-Atl.; (C.)

Familia PORTULACACEAE

Portulaca oleracea L. subsp. *oleracea*; T scap; Boreo-Trop.; (C.)

Familia PRIMULACEAE

Anagallis arvensis L.; T rept; Boreo-Trop.; (C.)
Anagallis foemina Miller; T rept; Boreo-Trop.; (Z.a)
Samolus valerandi L.; H caesp; Boreo-Trop.; (C., Z.a)

Familia RANUNCULACEAE

Anemone coronaria L.; G bulb; Med.; (n)
Clematis vitalba L.; P lian; Euro-Med.; (Z.b)
Nigella damascena L.; T scap; Med.; (n)
Ranuncuus bullatus L.; H ros; N Med.; (n)
Ranunculus muricatus L.; T scap; Med.; n

Familia RESEDACEAE

Reseda alba L.; T scap; Med.; (C., Z.a)

Familia RHAMNACEAE

Rhamnus alaternus L.; P caesp; Med.; (C., Z.a)

Familia ROSACEAE

Pyrus spinosa Forssk.; P caesp; Med.; (Z.b)
Rubus ulmifolius Schott; NP; Euro-Med.; (C., Z.a)
Sarcopoterium spinosum (L.) Spach; NP; E Med.; LR; (n)

Familia RUBIACEAE

Asperula aristata L. fil. subsp. *scabra* (Presl) Nym.; H scap; Euro-Med.; (n)
Crucianella angustifolia L.; T scap; Med.; (Z.a)
Galium murale (L.) All.; T scap; Med.; (Z.a)
Galium aparine L.; T scap; Paleotemp.; (C.)
Galium verrucosum Huds. subsp. *verrucosum*; T scap; Euro-Med.
Rubia peregrina L.; P lian; Med. (n)
Sherardia arvensis L.; T scap; Euro-Med.; (Z.a)
Valantia muralis L.; T scap; Med.; (C., Z.a)

Familia RUTACEAE

Ruta chalepensis L.; Ch suffr; Med.; (Z.a)

Familia SCROPHULARIACEAE

Scrophularia peregrina L.; T scap; Med.; (C.)
Verbascum sinuatum L.; H bien; Med.; (C.)

Familia SIMAROUBACEAE

Ailanthus altissima (Miller) Swingle; P scap; Nat., China; (n)

Familia SOLANACEAE

Hyoscyamus albus L.; T scap; Med.; (C.)
Mandragora autumnalis Bertol.; H ros; Med.; (C.)
Solanum nigrum L. subsp. *nigrum*; T scap; Boreo-Trop.; (C.)

Familia ULMACEAE

Celtis australis L.; P scap; Med.; (Z.a)

Familia URTICACEAE

Parietaria judaica L.; H scap; Euro-Med.-Iran.-Tur; (C., Z.a)
Parietaria lusitanica L. subsp. *lusitanica*; T rept; Med.; (C.)
Urtica membranacea Poiret; T scap; Med.; (C.)

Familia VERBENACEAE

Lantana camara L.; P caesp; Nat., Trop. America; (C.)
Verbena officinalis L.; H scap; Boreo-Trop.; (C.)

Familia ZYGOPHYLLACEAE

Tribulus terrestris L.; T rept; Cosmop.; (C.)

ANGIOSPERMAE (Monocotyledones)
Familia ARACEAE

Arisarum vulgare Targ.-Tozz.; G rhiz; Med.; (C., Z.a)
Arum italicum Miller; G rhiz; Med.-Atl.; (Z.a)

Familia CYPERACEAE

Carex cuprina (Sandor ex Heuffel) Nendtwich ex A. Kern.; H caesp ; Euro-Med.-Iran.-Tur.; (n)
Carex divisa Hudson; G rhiz; Med.-Atl.; (Z.b)
Cyperus aureus Ten.G rhiz; Med.-Trop.; (C.)
Cyperus longus L. subsp. *badius* (Desf.) Asch. et Gr.; G rhiz; Med.; (n)
Cyperus rotundus L.; G rhiz; Med.-Trop.; (C.)

Familia IRIDACEAE

Gladiolus italicus Mill.; G bulb; Med.-Iran.-Tur.; (n)
Gynandriris sisyrinchium (L.) Parl.; G bulb; Med.; (Z.a)
Gynandriris todaroana Cif. et Giac.; G rhiz; End. sic.-sard.-cors.; (Z.a); not found now
Hermodactylus tuberosus (L.) Salisb.; G rhiz; N Med.; (n)
Iris florentina L.; G rhiz; Nat., unknown origin ; (Z.b)
Iris planifolia (Miller) Dur. et Sch.; G bulb; W Med.; (Z.a)
Romulea bulbocodium (L.) Sebast. et Mauri; G bulb; Med.; (n)

Familia JUNCACEAE

Juncus ambiguus Guss.; T caesp; Cosmop.; (Z.a) not found now
Juncus bufonius L.; T caesp; Boreo-Trop.; (n)
Juncus foliosus Desf.; T scap; SO-Med.; (n)
Juncus hybridus Brot.; T caesp; Euro-Med.; (n)

Familia ALLIACEAE

Allium neapolitanum Cyr.; G bulb; Med.; (Z.b)
Allium roseum L.; G bulb; Med.; (C.)
Allium obtusiflorum DC.; G bulb; End. Sicily (collected by Brullo in 1980, [Brullo et al. 1994] not found now)
Nothoscordum gracile (Aiton) Stearn; G bulb.; Nat., America; (n)

Familia AMARYLLIDACEAE

Narcissus serotinus L.; G bulb; Med.; (n)

Familia ASPARAGACEAE

Asparagus acutifolius L.; NP; Med.; (C.)
Asparagus albus L.; NP; W Med.; (n)

Familia ASPHODELACEAE

Asphodelus fistulosus L.; H bien; Med.; (C., Z.a)
Asphodelus ramosus L.; G rhiz; Med.; (C.)

Familia HYACINTHACEAE

Bellevalia romana (L.) Sweet; G bulb; Med.; (Z.a)
Charybdis pancration (Steinh.) Speta; G bulb; Med.; (C.)
Melomphis arabica (L.) Raf.; G bulb; Med.; (n)
Muscari parviflorum Desf.; G bulb; Med.; LR; (C.)
Ornithogalum gussonei Ten.; G bulb; E Med.; (Z.a)
Prospero autumnale (L.) Speta; G bulb; Med.; (n)

Familia RUSCACEAE

Ruscus hypophyllum L.; Ch frut; SW Med.; (Z.a)

Familia LEMNACEAE

Lemna minor L.; I nat; Boreo-Trop.; (n)

Familia ORCHIDACEAE

Ophrys sicula Tineo; G bulb; Med.; (n)
Orchis papilionacea L. var. *grandiflora* Boiss.; G bulb; W Med.; (C.)
Serapias lingua L.; G bulb; Med.-Atl. (n)

Familia ARECACEAE

Chamaerops humilis L.; P scap; W Med.; (C.)
Washingtonia robusta H.Wendl.; P scap; Nat.; Messico (n)

Familia POACEAE

Andropogon distachyos L.; H caesp; Med.; (C., Z.a)
Anisantha diandra (Roth) Tzvelev; T scap; Euro-Med.; (C.)
Anisantha fasciculata (C. Presl) Nevski; T scap; Med.; (C.)

Anisantha madritensis (L.) Nevski; T scap; Med.-Atl. (C., Z.a)
Anisantha rigida (Roth) Hyl.; T scap; Med.; (Z.a)
Anisantha rubens (L.) Nevski; T scap; Med.-Iran.-Tur.; (C.)
Anisantha sterilis (L.) Nevski; T scap; Paleotemp.; (C.)
Anthoxanthum gracile Biv.; T scap; S Med.; (Z.b)
Avena barbata Potter; T scap; Cosmop.; (C., Z.a)
Avena sterilis L.; T scap; Med.; (C.)
Bromus alopecuros Poir.; T scap; Med; (C.)
Catapodium rigidum (L.) Hubbard subsp. *rigidum*; T scap; Euro-Med.-Iran.-Tur.; (C.)
Cynodon dactylon (L.) Pers.; G rhiz; Boreo-Trop.; (C., Z.a)
Cynosurus echinatus L.; T scap; Med.; (Z.a)
Dactylis hispanica Roth; H caesp; Med.; (Z.a)
Dactyloctaenium aegyptium (L.) Richter; T rept; Nat., subtrop.; (n)
Dasypirum villosum (L.) Borbás; T scap; Med.-Iran.-Tur.; (Z.a)
Digitaria sanguinalis (L.) Scop. subsp. *sanguinalis*; T scap; Boreo-Trop.; (C., Z.a)
Echinochloa colonum (L.) Link; T scap; Boreo-Trop.; (Z.a)
Echinochloa crus-galli (L.) Beauv.; T scap; Boreo-Trop.; (C., Z.a)
Eragrostis minor Host; T scap; Circumbor.; (C.)
Eragrostis pilosa (L.) P. Beauv.; Cosmop.; (n - new record for Hyblaean district)
Hordeum leporinum Link; T scap; Med.; (C., Z.a)
Hyparrhenia hirta (L.) Stapf; H caesp; Med.-Trop.; (C., Z.a)
Hyparrhenia sinaica (Delile) Llauradò; H caesp; Med.-Trop.; (Z.a)
Lagurus ovatus L. subsp. *ovatus*; T scap; Med.; (Z.a)
Lamarckia aurea (L.) Moench; T scap; Med.-Iran.-Tur., (C., Z.a)
Lolium perenne L.; H caesp; Circumbor.; (Z.a)
Panicum repens L.; G rhiz; Med.-Trop.; (C., Z.a)
Phalaris minor Retz.; T scap; Med.-Iran.-Tur.; (C.)
Piptatherum miliaceum (L.) Coss.. subsp. *miliacea*; H caesp; Med.-Atl.; (C., Z.a)
Poa annua L.; T caesp; Cosmop.; (C.)
Poa infirma H.B.K.; T caesp; Med.; (n)
Poa bulbosa L.; H caesp.; Paleotemp.; (n)
Polypogon monspeliensis (L.) Desf.; T scap; Med.-Trop.; (n)
Polypogon maritimus Willd.; T scap; Med.-Iran.-Tur.; (n)
Polypogon viridis (Gouan) Breistr.; H caesp; Med.; (C., Z.a)
Setaria verticillata (L.) Beauv.; T scap; Boreo-Trop.; (C.)
Sorghum halepense (L.) Pers.; G rhiz; Med.-Trop.; (C.)
Stipa capensis Thumb.; T scap; Med.; (C., Z.a)
Trachynia distachya (L.) Link; T scap; Med.-Iran.-Tur.; (C.)
Trisetaria aurea (Ten.) Pign.; T scap; C Med.; (Z.a)
Vulpia myuros (L.) Gmelin; T caesp; Boreo-Trop.; (C.)

Familia TYPHACEAE

Typha angustifolia L.; G rhiz; Cosmop.; (C.)

HABITATS OF COMMUNITY INTEREST AND PROPOSAL FOR S.C.I. INSTITUTION

Despite the vegetation features occurring in the archaeological site are not examined in this paper, since already treated by Corbetta et al. (2012) and Minissale & Sciandrello (2016), here it would point out that in the entire archaeological area of Neapolis, including the non-fenced area placed west of the Greek Theater, which extends to the cemetery in Syracuse, occupying the non urbanized part of "Colle Temenite", there are habitats of Community interest deserving of protection which could be safeguarded, not only in an indirect way by the archaeological restrictions, but also by the establishment of a Site of Community Importance (S.C.I.). In this way good management practices could be introduced and it might be also a legal bulwark against new property speculation that, after the great urban expansions of the 60s and 70s of the last century, do not cease to surround and threaten these sites.

In the area the habitats of Annex I of the European Directive 93/42 EEC, which justify the institution of a Site of Community importance (S.C.I.), are the following:

3170*: Mediterranean temporary ponds, corresponding to temporary pondsa characterized by amphibious community of the *Isoeto-Nanojuncetea* class with *Elatine gussonei* and *Tillaea vaillantii*;

5420: *Sarcopoterium spinosum* phryganas: in this habitat can be included scrubland with *Origanum onites* which is associated with *Corido-*

thymus capitatus and sometimes *Sarcopoterium spinosum*;

6220*: Mediterranean xeric grasslands (*Thero-Brachypodietea*): here including the grasslands dominated by *Hyparrhenia hirta*, but also arid ephemeral grasslands, such as those dominated by *Sedum coeruleum* that colonizes the rock with reduced soil and the grasslands dominated by *Stipa capensis* which prefers a more thick soil.

The rocky habitats, being of artificial origin, although older than 2000 years, still do not host the typical rocky flora, except *Antirrhinum siculum*, and therefore they can not be ascribed to the category as specified in Annex I.

The presence in the study area of the endemic *Elatine gussonei* is of great importance since it is among the few Italian plant species of Community interest included in Annex II of the Habitats Directive, whose conservation requires the designation of special areas of conservation. This is particularly true for the habitat of temporary pools with endemic species not always well protected by the Natura 2000 network as recently highlighted by Bagella et al. (2013).

CONCLUSIONS

The plant cover, both natural and cultivated, of the archaeological park contributes to characterize the site and, as we have seen, it can provide points of interest for visitors, which go far beyond just ornamental value, landscaping or the possibility of having shade and cool in summer; but as evidenced by Minissale et al. (2016), it requires precise and regular management interventions. In particular the "positive" botanical emergencies found in the archaeological site and surrounding areas must be protected with great care; they represent an important natural heritage that enriches the value of the archaeological site and in some cases they are the expression of human actions that occurred in antiquity; including quarry activities of stone blocks that have increased the presence of micro-sites with temporary pools suitable for the flora. On the other hand the problem of invasive alien species should not be underestimated; although very recently, it is likely to become a serious threat to the archaeological site as a whole; therefore, the control of invasive species must be continuous and prolonged in time.

Good management of the "green" will facilitate access to areas, as most of the quarries, that before the works of 2013 were almost inaccessible. For these areas we highlight the opportunity to schedule some intervention to improve the ornamental green cover in order to differentiate it with a more Mediterranean footprint. In this regard, many species of the Mediterranean maquis and garrigue could be used, for the delimitation of the hedges currently made with *Pittosporum tobira* (Thunb.) W.T.Aiton, species of East Asia imported in Europe in XIX century. In this case the use of myrtle (*Myrtus communis* L.), a Mediterranean species, present in Hyblean area, would be especially suitable for the aroma emanating from the foliage and the beautiful summer bloom.

Besides, the creation of thematic paths within the Neapolis will be a valuable support to the use of the site including the purpose of inducing (at least some of the 500,000 visitors per year who access it) to learn more about this exceptional cultural and naturalistic heritage. In any case a rigorous protocol of sustainable use will have to be developed in order to avoid to damage or compromise the existence of the reported floristic peculiarities.

Finally, it is hoped that the scientific results briefly summarized in this article and in Minissale & Sciandrello (2016) can be interfaced with other skills to make them the subject of further scientific publications and dissemination editorial products useful to raise awareness to plant heritage respect, but also in order to plan a proper management of the archaeological site and the surrounding territory.

ACKNOWLEDGMENTS

This research was carried out with the support of the Regional Forestry Company now called Regional Department of Rural and Territorial Development (Dipartimento Regionale Sviluppo Rurale e Territoriale - Assessorato Regionale dell'Agricoltura dello Sviluppo Rurale e della Pesca Mediterranea) office of Syracuse, as part of an agreement for the study and management of the flora of the Archaeological Park of Syracuse promoted by the Superintendence for the Cultural and Environmental Heritage of Syracuse (Soprintendenza per i Beni Culturali e Ambientali di Siracusa - Assessorato Beni Culturali e dell'Identità Siciliana).

We are particularly grateful to the following persons, at that time belonging to these institutions, which have supported and encouraged us for this research: Carmelo Frittitta, Filadelfo Brogna, Maria Amalia Mastelloni and Alessandra Trigilia.

REFERENCES

Alpini P., 1592. De plantis Aegypti liber. Venezia, 84 pp.

Anguillara L., 1561. Semplici... liquali in piu pareri a diversi nobili huomini scritti appaiono, et nuovamente da m. Giovanni Marinello mandati in luce. Venezia, 344 pp.

Aykut Tonk F., Yüce S., Bayram E., Akcali Giachino R., Sönmez C., Telci I. & Alp Furan M., 2010. Chemical and genetic variability of selected Turkish oregano (*Origanum onites* L.) clones. Plant Systematic Evolution, 288:157–165.

Bagella S., Caria M.C. & Filigheddu R. 2013. Gap analysis revealed a low efficiency of Natura 2000 network for the conservation of endemic species in Mediterranean temporary freshwater habitats. Plant Biosystems, 147: 1092–1094.

Boccone P., 1697. Museo di Piante rare della Sicilia, Malta, Corsica, Italia, Piemonte, e Germania. Decade quarta, pp. 43–44. Venezia.

Bazan G., Marino P., Guarino R., Domina G. & Schicchi R., 2015. Bioclimatology and vegetation series in Sicily: a geostatistical approach. Annales Botanici Fennici, 52: 1–18.

Brullo C., Minissale P., Sciandrello S. & Spampinato G., 2011. Phytogeographic survey on the endemic vascular flora of the Hyblaean territory (SE Sicily, Italy). Acta Botanica Gallica, 158: 617–631.

Brullo C., Brullo S., Giusso Del Galdo G. & Minissale P., 2011. *Astragalus raphaelis* (Fabaceae), a critical species from Sicily and taxonomic remarks on *A.* sect. *Sesamei*. Nordic Journal of Botany, 29: 518–533.

Brullo S., Pavone P., Salmeri C. & Tzanoudakis D., 1994. Cytotaxonomical revision of the *Allium obtusiflorum* group (Alliaceae). Flora Mediterranea, 4: 179–190.

Burgio A., 2005. La viabilità in età greca e romana in Sicilia. In: F. Ghedini, J. Bonetto, A.R. Ghiotto, F. Rinaldi (Eds.), Lo Stretto di Messina nell'antichità. Roma 2005: 205–213.

Corbetta F., Pavone P., Spampinato G., Tomaselli V. & Trigilia A., 2002. Studio della vegetazione dell'area archeologica della Neapolis (Siracusa, Sicilia) finalizzato alla conservazione dei manufatti architettonici. Fitosociologia, 39: 3–24.

Delforge P., 2005. Guide des Orchidées d'Europe, d'Afrique du Nord et du Proche-Orient. 3rd ed. Paris, 640 pp.

Fagotto F. & Longhitano N., 1989. Le ultime stazioni di *Origanum onites* L. a Siracusa. Bollettino Accademia Gioenia Scienze Naturali Catania, 22: 139–144.

Giardina G., Raimondo F.M. & Spadaro V., 2007. A catalogue of plants growing in Sicily. Bocconea, 20: 5–582.

Greuter W., Burdet H.M. & Long G., 1984. Med-Checklist. 1. Pteridophyta, Gymnospermae, Dicotyledones (Acanthaceae-Cneoraceae) Conservatoire et Jardin botaniques de la Ville de Genève.

Greuter W., Burdet H.M. & Long G., 1986. Med-Checklist. 3. Dicotyledones (Convolvulaceae-Labiatae). Conservatoire et Jardin botaniques de la Ville de Genève.

Guglielmo A., Pavone P., Salmeri C. & Spampinato G., 2002. La latomia dei Cappuccini a Siracusa: aspetti della flora spontanea e ornamentale. Atti Convegno Giardino storico e paesaggio. CNR Bologna 25.1.2002. Flortecnica: 40–44.

Guglielmo A., Pavone P., Tomaselli V. & Spampinato G., 2006. Analisi della flora e della vegetazione delle aree archeologiche della Sicilia orientale finalizzata alla tutela e valorizzazione dei manufatti architettonici. Aracne Editrice, 226–228.

Lena G., 1990. Il problema geomorfologico, in "Il teatro antico di Siracusa, pars altera". Luigi Polacco (a cura di), Padova.

Linnaeus, 1753. Specie Plantarum 2. Laurentii Salvii, Stockholm, 640 pp. http://www.biodiversitylibrary.org/page/358611#page/31/mode/1up

Manuella F. C., Scribano V., Carbone S. & Brancato A., 2015. The Hyblean xenolith suite (Sicily): an unexpected legacy of the Ionian Tethys realm. International Journal of Earth Sciences, 104: 1317–1336.

Mastelloni M.A., 2014. Cave e materiali utilizzati in alcuni monumenti di Siracusa. in Arquelogía de la Construcción IV: Las canteras en el mundo antiguo: sistemas de explotacion y procesos productivos. Actas del Congreso de Padova, 22-24 de noviembre de 2012 (Bonetto, J. Camporeale, S. Pizzo, A., Eds.). Merida, 223–245.

Mifsud S., 2007. *Origanum onites* on MaltaWildPlants.com.

Minissale P. & Sciandrello S., 2016. Ecological features affect patterns of plant communities in Mediterranean temporary rock pools. Plant Biosystems, 150: 171–179 doi: 10.1080/11263504.2014.986248.

Minissale P., Trigilia A., Brogna F. & Sciandrello S., 2016. Plants and vegetation in the archaeological park of Neapolis of Syracuse (Sicily-Italy). A management effort but also an opportunity for a better enjoyment of the site. Conservation and Management of Archaeological Sites, 17: 340–369.

Molnár V.A.V., Popiela A. & András Lukács B., 2014. *Elatine gussonei* (Sommier) Brullo et al. (Elatinaceae) in Sicily. Plant Biosystems, 148: 27–30. DOI:10.1080/11263504.2013.788099.

Nicotra L., 1890. Schedule speciografiche riferentisi alla flora siciliana. Saggio Nono. Il Naturalista siciliano, 10: 19–24; 65–71.

Pignatti S., 1982. Flora d'Italia. 1–3. Bologna, Edagricole.

Rivas Martinez S., 1994. Bioclimatic classification of the Earth. Folia Botanica Matritensis, 12: 1–23.

Salmeri C. & Guglielmo A., 2012. Il complesso delle latomie di Siracusa: un bene culturale e ambientale da rivalutare Convegno AIAR Sistemi biologici e beni culturali: area tematica biologia e biotecnologie per i beni culturali. Pp. 53–67.

Tutin T.G., Heywood V.H., Burges N.A., Moore D.M., Valentine D.H., Walters S.M. & Webb D.A., editors. 1964–1980. Flora Europaea (1–5). Cambridge: University Press.

Vokou D., Kokkini S. & Bessière J.-M., 1988. *Origanum onites* (Lamiaceae) in Greece: Distribution, volatile oil yield, and composition. Economic Botany, 42: 407–412.

Zampino S., Duro A., Piccione V. & Scalia C., 1997. Fitoclima della Sicilia. Termoudogrammi secondo Walter & Lieth. - Atti 5° Workshop Prog. Strat.C.N.R. "Clima, Ambiente e Territorio nel Mezzogiorno". Amalfi, 2: 7–54.

Zodda G., 1928. Notizie sulla flora di Siracusa. Annuario del R. Liceo Scientifico "O. M.Corbino", Siracusa (Anni scolastici 1925-26 e 1926-27) 2: 71–113.

Zodda G., 1929. Aggiunte alla flora di Siracusa. Annuario del R. Liceo Scientifico "O. M. Corbino", Siracusa (Anno scolastico 1927-28) 3: 81–91.