

original scientific paper/izvorni znanstveni rad

A FIRST CHECKLIST OF THE VASCULAR FLORA OF THE POLIGNANO A MARE COAST (APULIA, SOUTHERN ITALY)

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Perrino, E. V., Signorile, G. & Marvulli, M.: A first checklist of the vascular flora of the Polignano a Mare coast (Apulia, southern Italy). Nat. Croat., Vol. 22, No. 2., 295–318, 2013, Zagreb.

For the first time a checklist of the vascular flora of the coast of Polignano a Mare, a town located by the Adriatic Sea, about 30 km south of Bari (the capital of Apulia) is presented. At the end of the floristic work, in total, 457 species were listed. Some of them are more important than others since they are endemic, amphiadriatic, of phytogeographic interest or included under the International Conventions of Berne and CITES, Regional and Italian Red List or the Directive 92/43/EEC. In a review of the literature it was found that three species were not correctly reported, five were not found at all, twelve are considered alien and four are believed to be new entries at the regional level.

Key words: Apulia region, Italy, Polignano a Mare, vascular flora

Perrino, E. V., Signorile, G. & Marvulli, M.: Prvi popis vaskularne flore obale područja Polignano a Mare (Apulija, južna Italija). Nat. Croat., Vol. 22, No. 2., 295–318, 2013, Zagreb.

Po prvi puta se predstavlja popis vaskularne flore obale grada Polignano a Mare, smještenog na obali Jadrana, oko 30 km južno od Barija (glavnog grada Apulije). Ukupno je zabilježeno 457 vrsta. Neke od njih su značajnije zbog toga što su endemske, okojadranske, od fitogeografskog značenja ili su uključene u međunarodnu Bernsku konvenciju i CITES, Regionalni i talijanski Crveni popis, ili Direktivu 92/43/EEC. Pri pregledu literature utvrđeno je da tri vrste nisu ispravno zabilježene, pet ih nije uopće zabilježeno, 12 se smatraju stranim vrstama, a četiri novim nalazom na regionalnoj razini.

Ključne riječi: regija Apulija, Italija, Polignano a Mare, vaskularna flora

INTRODUCTION AND OBJECTIVES

The vascular flora of the central coast of the Apulia region is more studied in the southern part than in the northern part of Bari and in particular it is better known for the municipality of Monopoli (PERRINO & SIGNORILE, 2009), than for the part of coast going from Bari (Capital of Apulia) to Barletta town (ALBANO *et al.*, 2005).

To fill in this gap, the results of recent studies (DI LEVA & MAIELLARO, 1996; PERRINO & SIGNORILE, 2012) along with those of quite old research works (TARSIA INCURIA, 1813), were carefully examined. Each of these studies was done by different scientists in different locations of the central coast of Apulia, although some overlappings occurred. As a first step information coming from the consulted papers was modified to respect the current nomenclature.

The first aim of our work was to make a checklist of the flora of the coast of Polignano a Mare. Surveying the coastline, we went from pioneer alophilous plants and salt psammophilous plants, up to the inland vegetation, with scrublands, grasslands, annual meadows, uncultivated and wetlands.

STUDY AREA

The investigated area is the coast of the municipality of Polignano a Mare (Fig. 1), which extends in the NW-SE direction by the Adriatic Sea, for a total length of 14 km. The coastline morphology is mainly moderately low and rocky in the northern and southern part, while it is steep in the central part with coastal cliffs, high from 5 to 24 m a.s. There are many 'lame' from the hinterland (small canyons or shallow erosion furrows, typical of the Apulian countryside); the most important ones are „Cala Incina” and „Bagiolaro”. Located on the track that extends from Cozze to Cala San Giovanni is the SIC „Posidonieto San Vito – Barletta (IT9120009)”.

The natural landscape includes different types of vegetation, some of which are of high conservation interest, since the following habitats of the Directive 92/43 EEC (ANONYMOUS, 1992) are represented: halophilous (Association *Crithmo-Limonietum apulii* Bartolo, Brullo, Signorello 1989; Alliance *Arthrocnemion glauci* Rivas-Martínez & Costa 1984) and halo-nitrophilous perennial vegetation (Class *Pegano-Salsoletea*), annual psammophilous communities (Class *Cakiletum maritimae* Pignatti 1953), Mediterranean temporary ponds (Class *Isoeto-Nanojuncetea* Br.-Bl. & Tüxen ex Westhoff), annual meadows (Order *Brachypodietalia distachyi* Rivas-Martínez 1978), small groups of perennial prairie (Alliance *Thero-Brachypodium ramosi* Br.-Bl. 1925), chasmophytic vegetation (Class *Asplenietea trichomanis* Br.-Bl. 1934 Oberdorfer 1977), nanophanerofitic and chamaephytic garigues (Alliance *Cisto-Ericion* Horvatić), evergreen sclerophyllous scrubs (Alliance *Oleo-Ceratonion* Br.-Bl. 1936 em. Rivas Martínez 1975), nitrophilous and subnitrophilous



Fig. 1. Geographical position of the studied area.

Tab. 1. Synoptic table. Monthly, seasonal and annual average rainfall (mm); monthly and annual of average (aver.), maximum (max.) and minimum (min.) temperature (°C); monthly absolute minimum (T.min.abs.) and maximum (T.max.abs.) temperature (°C); bioclimatic indexes according to RIVAS-MARTÍNEZ (2004) classification.

POLIGNANO A MARE (24 m a.s.)						
Month	Rainfall (mm)	Temp. (°C)			Bioclimatic indexes (RIVAS-MARTÍNEZ, 2004)	
	aver.	aver.	max.	min.		
J	52.5	9.2	12.1	6.4	Macrobioclimate	Mediterranean
F	63.7	9.8	12.8	6.7		
M	55.2	11.7	15.1	8.3	Bioclimate	Oceanic
A	40.3	14.4	18.2	10.6		
M	32.6	18.4	22.2	14.5	Thermotype (horizon)	Thermomediterranean (lower)
J	28.0	22.2	26.0	18.5		
J	18.0	24.8	28.5	21.1	Ombrotype (horizon)	Dry (lower)
A	28.4	24.9	28.5	21.2		
S	49.9	22.0	25.6	18.4	Ic	15.58
O	60.1	18.0	21.3	14.7		
N	66.9	13.9	17.0	10.7	Io	2.36
D	72.6	10.5	13.3	7.7		
Winter	188.8				Ios2	0.81
Spring	128.0					
Summer	74.3				Ios3	0.90
Autumn	176.9					
T. min. abs.		0.7			Ios4	1.02
T. max. abs.		31.7				
Annual	568	16.6	20.0	13.2	It (Itc)	351.0

communities (Class *Stellarietea-mediae* R. Tüxen, Lohmeyer & Preising ex Rochow 1951) (PERRINO & SIGNORILE, 2012).

The climatic station of reference is Polignano a Mare, located approximately at the center of the investigated area. The local climate was described by applying RIVAS-MARTÍNEZ bioclimatic indexes (2004), using 30 years (1963-1992) of thermo-pluviometric data reported in the Annals of the Hydrological Basin Service of Ministry of Public Works of Italy (Tab. 1).

The rainfall of the investigated area with 568 mm is one of the lowest recorded in Apulia (Tab. 1). The analysis of the seasonal rainfall distribution shows a winter solstice regime (188.8 mm) with a maximum absolute in December (74.3 mm). Rainfall is the highest in autumn (176.9) and winter (188.8), with an aggregate of about 366 mm, while it is lowest in the summer time (74 mm), causing aridity. The average 30 year annual

temperature is 16.6 °C, with a delta of 15.7 °C between August, the hottest month (24.9) and January, the coldest one (9.2) (Tab. 1).

According to the RIVAS-MARTÍNEZ bioclimatic classification (2004), on the basis of the continental (15.58) and ombrothermic (2.36) combination index values, the investigated area may be included into the Mediterranean macrobioclimate and Oceanic bioclimate. The thermicity (351.0), the ombrothermic (2.36) and the summer ombrothermic compensated (Ios2, Ios3 e Ios4) indexes identify a low thermo-Mediterranean thermotype and a low-dry ombrotype (Tab. 1).

METHODS

The study of the vascular flora of the investigated area (Fig. 1) already started by PERRINO & SIGNORILE (2010) was carried on, covering new localities and sites with the aim of making the survey as complete as possible and in some cases integrating field research with data from literature. The study was carried out from 2008 to 2012. The botanical identification of the collected specimens was based on PIGNATTI (1982) and TUTIN *et al.* (1964-80), whereas *taxa* nomenclature followed CONTI *et al.*, (2005) and subsequent integration (CONTI *et al.*, 2007), except for a few cases such as the genus *Aegilops* L. (VAN SLAGEREN, 1994), *Juniperus turbinata* Guss. (ADAMS *et al.*, 2013; MINISSALE & SCI-ANDRELLO, 2013), *Limonium apulum* Brullo (BRULLO *et al.*, 1990), *Taraxacum* Weber (PIGNATTI, 1982) and *Thymra capitata* (L.) Cav. (MORALES VALVERDE, 1987). The systematics of the families and their arrangement followed PERUZZI (2010). Species were alphabetically arranged within the families. The biological forms and the chorology refer to RAUNKIAER (1934); the acronyms related to the biological forms and chorotypes are reported in the *Appendix*. For species of conservation interest, acronyms are as follows: **CR** (critically endangered); **EN** (endangered); **VU** (vulnerable); **LR** (lower risk); **NT** (near threatened); **I** (endemic); **Ad** (amphi-Adriatic); **PI** (phytogeographic interest); **B** (International Convention of Berne) (ANONYMOUS, 1979); **CI** [(Convention on International Trade in Endangered Species (CITES)] (ANONYMOUS, 1973); **DH** (Habitat Directive 92/43 EEC) (ANONYMOUS, 1992); **r** (rare); **n** (new in Apulia region). The threatened categories of species follow CONTI *et al.* (1997), and only for *Aegilops biuncialis*, *Asyneuma limonifolium* subsp. *limonifolium* and *Sarcopoterium spinosum*, the categories follow PERRINO & WAGENSOMMER (2013), PERRINO *et al.* (2012) and GARGANO *et al.* (2008) respectively. Binomials marked by one asterisk (*) refer to taxa not directly observed in the course of the present study but reported in previous ones (TARSIA INCURIA, 1813; DI LEVA & MAIELLARO, 1996). In the case of alien species additional information for species is indicated by the following categories: casual (non-native species that grow and reproduce spontaneously but do not form stable populations and depend on the continuous supply of new propagules provided by people), naturalized (non-native species that form stable populations independent from the contribution of new propagules by people), invasive (a subset of naturalized species that spread quickly even at a considerable distances from the original sources of propagules), and locally invasive (non-native species detected as invasive in a few stations) (CELESTI GRAPOW *et al.*, 2010).

RESULTS AND DISCUSSION

A total of 449 taxa were found in the course of the floristic surveys in the course of subsequent investigations. Very few species were reported in previous works and the presence of 8 of those reported in literature (TARSIA INCURIA, 1813; DI LEVA & MAIELLARO,

1996) was not confirmed by direct visual observation. In particular, it seems that *Micromeria filiformis* (Aiton) Benth. subsp. *cordata* (Bertol.) Pignatti, *Papaver argemone* L. subsp. *argemone*, and *Stipa juncea* L., reported by TARSIA INCURIA (1813), are absent in the Apulia region (CONTI *et al.*, 2005). In addition, the surveys did not reveal *Sarcopoterium spinosum* (L.) Spach, *Spergularia rubra* (L.) J. & C. Presl, reported for north-western coast of Polignano a Mare by TARSIA INCURIA (1813), *Anthemis maritima* L., *Medicago marina* L., and *Limonium narbonense* Mill., reported for Torre Ripagnola by DI LEVA & MAIELLARO (1996). The floristic list reported a relatively high number of taxa, equal to 457, which means 400 species more than those reported by earlier works.



Fig. 2. Herbarium specimen 35965 of *Ophioglossum lusitanicum* L. (Herbarium Horti Botanici Barensis – BI).



Fig. 3. *Ophioglossum lusitanicum* L. Specimen sampled near Torre Calvani.

Among the taxa directly sampled, 27 are of conservation interest: seven taxa are reported in the Regional Red List (CONTI *et al.*, 1997; PERRINO *et al.*, 2012; PERRINO & WAGENSOMMER, 2013); seven are endemic; five are of phytogeographic interest; three are amphi-Adriatic; ten are included under the CITES Convention; two under the Berne Convention; one is listed in Annex II of Directive 92/43/EEC. For instance: *Vincetoxicum hirundinaria* Medik. subsp. *adriaticum* (Beck) Markgr., *Asyneuma limonifolium* (L.) Janch. subsp. *limonifolium* and *Scrophularia lucida* L. are amphi-Adriatic taxa, the first two are also listed in the Red List, while the last two are also of phytogeographic interest; *Stipa austroitalica* Martinovský subsp. *austroitalica* is endemic and it is even reported in the International Convention of Berne and in the Annex II of Directive Habitat 92/43/EEC; *Serapias vomeracea* (Burm. F.) Briq. subsp. *orientalis* Greuter is endemic to Apulia and it is listed in the Regional Red List and the CITES Convention too. Most of the species of conservation interest grow in garigues, in „small natural pockets“ of soil in the rocky lands and in the annual meadows.

One of the most important findings is the discovery of the fern *Ophioglossum lusitanicum* L. (PERRINO *et al.*, 2012) (Fig. 2 & 3), considered to be at lower risk (LR) (CONTI *et al.*, 1997). The genus *Ophioglossum* is of considerable phylogenetic interest because it is considered part of the oldest lineage that still exists of vascular cryptogams megaphylls (SMITH *et al.*, 2006; CARTA *et al.*, 2008). This species grows in very small temporary ponds appearing during the winter season thanks to the joint actions of the calcareous nature of the soil and the rainfall.

Some species are common in all the national territory, but are not present in the checklist of CONTI *et al.* (2005), and were found for the first time in Apulia region. They are:

Avena sativa L., *Pitosporum tobira* (Thunb.) W.T. Aiton, *Prunus dulcis* Miller D.A. Webb, and *Sinapis alba* L. subsp. *alba*.

Twelve of the newly recorded taxa for the coast of Polignano a Mare are considered alien species (i.e. plant species introduced by humans outside of their natural habitats) by CELESTI GRAPOW *et al.* (2010). In particular, *Robinia pseudacacia* L., *Xanthium orientale* L. subsp. *italicum* (Moretti) Greuter and *Xanthium spinosum* L. are naturalized; *Agave americana* L., *Oxalis pes-caprae* L., *Amaranthus retroflexus* L., *Carpobrotus acinaciformis* (L.) Bolus and *Opuntia ficus-indica* (L.) Miller are invasive; *Carpobrotus edulis* (L.) N.E. Br., *Cydonia oblonga* Mill. and *Punica granatum* L. are casual; *Myoporum tenuifolium* G. Forst. is locally invasive.

FLORISTIC LIST

OPHIOGLOSSIDAE

OPHIOGLOSSACEAE

Ophioglossum lusitanicum L. – G – Msab – LR

This fern is a very rare species in Apulia and in Italy (MARCHETTI, 2004). It is listed in the Regional and National Red List with the status of lower-risk (LR) (CONTI *et al.*, 1997). It was observed near Torre Calvani (Polignano a Mare). A sample is preserved in the Herbarium (*Herbarium Horti Botanici Barensis* – BI) of the Botanical Garden Museum of University of Bari (number of herbarium specimen: 35965).

POLYPODIIDAE

ASPLENIACEAE

Ceterach officinarum Willd. – H – Ese

POLYPODIACEAE

Polypodium vulgare L. – H – Cb

PINIDAE

CUPRESSACEAE

Juniperus oxycedrus L. subsp. *macrocarpa* (Sibth. & Sm.) Neilr. – P – Me

Juniperus turbinata Guss – P – Me

PINACEAE

Pinus halepensis Miller – P – Ms

MAGNOLIIDAE

ARACEAE

Arisarum vulgare Targ.-Tozz. – G – Ms

Lemma gibba L. – Hy – Cs

Lemma minor L. – Hy – Cs

POSIDONIACEAE

Posidonia oceanica (L.) Delile – G – Ms – B

DIOSCORACEAE

Tamus communis L. – G – Me

COLCHICACEAE

Colchicum cupanii Guss. – G – Ms

SMILACACEAE

Smilax aspera L. – NP – Tps

ORCHIDACEAE

Anacamptis pyramidalis (L.) Rich. – G – Me – CI

Ophrys bertolonii Moretti – G – Msw – CI

Ophrys bombyliflora Link – G – Msw – CI

Ophrys incubacea Bianca – G – Ms – CI

Ophrys lutea Cav. – G – Ms – CI

Orchis lactea Poir. – G – Ms – CI

Ophrys tenthredinifera Willd. – G – Ms – CI

Serapias cordigera L. – G – Ms – CI

Serapias vomeracea (Burm. F.) Briq. – G – Me – CI

Serapias vomeracea (Burm. F.) Briq. subsp. *orientalis* Greuter – G – I – CI – VU

This is a confirmation of the presence of this endemic orchid of Apulia in Ripagnola locality. Already reported along the coast to the nearby town of Monopoli (PERRINO & SIGNORILE, 2009).

IRIDACEAE

Crocus thomasii Ten. – G – PI

Endemic taxon of southern Italy and some areas of the eastern Adriatic littoral (Dalmatia in Croatia and Herzegovina in Bosnia and Herzegovina) (Fig. 4).

Gladiolus italicus Mill. – G – Me

Hermodactylus tuberosus (L.) Mill. – G – Msn

Iris germanica L. – G – Avv

Moraea sisyrinchium (L.) Ker-Gawl. – G – Ms

Romulea bulbocodium (L.) Sebast. & Mauri – G – Ms

Romulea columnae Sebast. & Mauri – G – Ms



Fig. 4. *Crocus thomasii* Ten. Specimen sampled in Pozzovivo.

XANTHORRHOEACEAE

Asphodelus fistulosus L. – H – Tpsp*Asphodelus ramosus* L. subsp. *ramosus* – G – Ms

AMARYLLIDACEAE

Allium atroviolaceum Boiss. – G – Mte – **VU**

Eastern Mediterranean-Turanian species. In Italy it is reported in the Regional Red List with the status of vulnerable (VU) for Apulia and low-risk (LR) for other Italian regions (CONTI *et al.*, 1997).

Allium chamaemoly L. subsp. *chamaemoly* – G – Ms*Allium commutatum* Guss. – G – Mse*Allium roseum* L. – G – Ms*Allium subhirsutum* L. – G – Ms*Narcissus serotinus* L. – G – Ms*Pancratium maritimum* L. – G – Ms

ASPARAGACEAE

Agave americana L. – P – An – *invasive**Asparagus acutifolius* L. – NP – Ms*Charybdis pancration* (Steinh.) Speta – G – Msm*Loncomelos narbonensis* (Torm. in L.) Raf. – G – Me*Muscari botryoides* (L.) Mill. – G – Msb*Muscari commutatum* Guss. – G – Mece*Muscari comosum* (L.) Mill. – G – Me*Ornithogalum umbellatum* L. – G – Me

TYPHACEAE

Typha latifolia L. – G – C

JUNCACEAE

Juncus acutus L. subsp. *acutus* – H – Me*Juncus hybridus* Brot. – T – Ma

CYPERACEAE

Carex flacca Schreber subsp. *serrulata* (Biv.) Greuter – G – E*Cyperus rotundus* L. – G – Cs/Tps

POACEAE

Aegilops ovata Auct. – T – Mst*Aegilops biuncialis* Vis. – T – Meaw – **VU**

Western Mediterranean-Asiatic chorotype, known in Italy only in Apulia (CONTI *et al.*, 2005) and Campania regions (DEL VICO *et al.*, 2007). The population of Cala Lapilli is characterized by a very few individuals. The threat category was lowered, thanks to the new recent stations found and the application of the criterion B (IUCN, 2012), has changed the status of the species from Critically Endangered (CR) (CONTI *et al.*, 1997) to Vulnerable [VU B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv)] (PERRINO & WAGENSOMMER, 2013).

Agrostis stolonifera L. – H – Cb*Aira caryophyllea* L. subsp. *caryophyllea* – T – Tps*Ammophila arenaria* (L.) Link subsp. *australis* (Mabille) Lainz – G – Me*Andropogon distachyus* L. – H – Tmp*Arundo donax* L. – G – Cs – *invasive**Arundo plinii* Turra – G – Ms*Avena barbata* Pott. ex Link – T – Me

- Avena sativa* L. – T
Brachypodium retusum (Pers.) P. Beauv. – H – Msw
Brachypodium rupestre (Host) Roem. & Schult. – H – Asb
Briza maxima L. – T – Tps
Bromus diandrus Roth – T – Tpsp
Bromus hordeaceus L. – T – Cs
Bromus madritensis L. – T – Me
Catapodium balearicum (Willk.) H. Scholz – T – Ma
Catapodium rigidum (L.) C.E. Hubb. – T – Me
Cynodon dactylon (L.) Pers. – G – C
Cynosurus echinatus L. – T – Me
Dactylis glomerata L. subsp. *hispanica* (Roth) Nyman – H – Ms
Dasypyrum villosum (L.) P. Candargy – T – Met
Digitaria sanguinalis (L.) Scop. – T – Cs
Echinochloa crus-galli (L.) P. Beauv.
Elymus athericus (Link) Kerguélen – G – Me
Elymus farctus (Viv.) Runemark ex Melderis subsp. *farctus* – G – Me
Elymus repens (L.) Gould subsp. *repens* – G – Cb
Eragrostis cilianensis (All.) Vignolo Lutati ex Janch. – T – Ctr
Hordeum murinum L. subsp. *leporinum* (Link) Arcang. – T – Cb
Hyparrhenia hirta (L.) Stapf subsp. *hirta* – H – Tpp
Lagurus ovatus L. subsp. *ovatus* – T – Ms
Lolium rigidum Gaudin – T – Tpsp
Melica ciliata L. – H – Met
Parapholis incurva (L.) C.E. Hubb. – T – Ma
Phalaris minor Retz. – T – Tpsp
Phleum arenarium L. subsp. *caesium* H. Scholz – T – Ma
Phleum pratense L. – H – Cb
Phragmites australis (Cav.) Trin. ex Steud. – He/G – Cs
Piptatherum miliaceum (L.) Coss. subsp. *miliaceum* – H – Mst
Poa annua L. – T – C
Poa bulbosa L. – H – Tmp
Rostraria hispida (Savi) Dogan – T – Mssw
Setaria viridis (L.) Beauv. – T – Cs
Silybum marianum (L.) Gaertner – H – Mt
Sorghum halepense (L.) Pers. – G – Ctr – *invasive*
Sporobolus virginicus Kunth – G – Tps
Stipa austroitalica Martinovský subsp. *austroitalica* – H – **I – B – DH**
 A taxon of great conservation interest because it is an endemic of southern Italy, protected to Directive Habitats 92/43 EEC (Annex II) and listed in the Berne International Convention. It is rare along the Polignano a Mare coast, where it grows in rocky soil in non anthropized sites.
Stipa capensis Thunb. – T – Ms
 **Stipa juncea* L. – H – Msnw
 Reported by mistake for the north-western coast of Polignano a Mare (TARSIA INCURIA, 1813). This taxon is absent in Apulia region (CONTI et al., 2005).
Trachynia distachya (L.) Link – T – Ms
Tragus racemosus (L.) All. – T – Ctr
Tyrimnus leucographus (L.) Cass. – T – Ms
Vulpia ciliata Dumort. – T – Me

PAPAVERACEAE

Fumaria capreolata L. subsp. *capreolata* – T – Me

Fumaria officinalis L. – H – Mem

Fumaria parviflora Lam. – T – Mt

Glaucium flavum Crantz – H – Me

Papaver hybridum L. – T – Mt

**Papaver argemone* L. subsp. *argemone*

Reported by mistake, as *Papaver argemone*, for the north-western coast of Polignano a Mare (TARSIA INCURIA, 1813). This taxon is absent in Apulia region (CONTI *et al.*, 2005). Probably confused with *Papaver hybridum* L., a species similar to it by reason of several morphological characters.

Papaver rhoeas L. subsp. *rhoeas* – T – Mes

Papaver somniferum L. – T – Cs

RANUNCULACEAE

Adonis annua L. – T

Anemone coronaria L. – G – Ms

Anemone hortensis L. subsp. *hortensis* – G – Mn

Clematis cirrhosa L. – P – Mst

Clematis flammula L. – P/H – Me

Clematis vitalba L. – P – Eca

Delphinium halteratum Sm. subsp. *halteratum* – T – Ms

Nigella arvensis L. – T – Me

Nigella damascena L. – T – Me

Ranunculus bullatus L. – H – Ms

Ranunculus ficaria L. – G/H – Ea

CRASSULACEAE

Sedum acre L. – Ch – Eca

Sedum caespitosum (Cav.) DC. – T – Ms

Sedum ochroleucum Chaix – Ch – Mmn

Sedum rubens L. – T – Meas

Umbilicus horizontalis (Guss.) DC. – G – Ms

VITACEAE

Vitis vinifera L. – P

ZYGOPHYLLACEAE

Tribulus terrestris L. – T – C

FABACEAE

Anagyris foetida L. – P – Mss

Anthyllis vulneraria L. subsp. *maura* (Beck) Maire – H – Mssw

Astragalus boeticus L. – T – Msd

Astragalus hamosus L. – T – Mt

Bituminaria bituminosa (L.) C.H. Stirt. – H – Me

Calicotome villosa (Poir.) Link – P – Ms

Ceratonia siliqua L. – P – Mss

Coronilla scorpioides (L.) W.D.J. Koch – T – Me

Dorycnium hirsutum (L.) Ser. – Ch – Me

Hippocrepis ciliata Willd. – T – Ms

Lathyrus cicera L. – T – Me

Lathyrus ochrus (L.) DC. – T – Ms
Lathyrus pratensis L. – H – Tmp
Lotus creticus L. – Ch – Ms
Lotus cytisoides L. – Ch – Ms
Lotus edulis L. – T – Ms
Lotus ornithopodioides L. – T – Ms
Medicago arabica (L.) Huds. – T – Mw
 **Medicago marina* L. – Ch – Me

Reported for Torre Ripagnola (DI LEVA & MAIELLARO, 1996). Its presence cannot be excluded even if it has not been found during the surveys for this research.

Medicago minima L. – T – Tscm
Medicago orbicularis (L.) Bartal. – T – Me
Medicago polymorpha L. – T – Me
Medicago rugosa Desr. – T – Msd
Medicago sativa L. – H – Avv
Medicago scutellata (L.) Mill. – T – Me
Medicago truncatula Gaertn. – T – Ms
Melilotus sulcata Desf. – T – Msd
Onobrychis caput-galli (L.) Lam. – T – Ms
Ononis ornithopodioides L. – T – Ms
Ononis reclinata L. – T – Mts
Robinia pseudacacia L. – P – An – naturalized
Scorpiurus muricatus L. – T – Me
Spartium junceum L. – P – Me
Sulla capitata (Desf.) B.H. Choi & H. Ohashi – T – Msw
Tetragonolobus purpureus Moench – T – Ms
Trifolium angustifolium L. subsp. *angustifolium* – T – Me
Trifolium campestre Schreb. – T – Mmpw
Trifolium incarnatum L. – T/H – Me
Trifolium nigrescens Viv. – T – Me
Trifolium pratense L. – T – Cs
Trifolium repens L. – H – Cs
Trifolium resupinatum L. – T – Tmp
Trifolium scabrum L. subsp. *scabrum* – T – Me
Trifolium stellatum L. – T – Me
Trifolium tomentosum L. – T – Tmp
Vicia cracca L. – H – Cb
Vicia hybrida L. – T – Me
Vicia lutea L. – T – Me
Vicia sativa L. – T – Cs
Vicia villosa Roth. – T – Me

ROSACEAE

Crataegus monogyna Jacq. – P – Tmp
Cydonia oblonga Mill. P – Assw – casual
Prunus dulcis Miller D.A. Webb – P – Msd
Prunus spinosa L. subsp. *spinosa* – P – Eca
Pyrus spinosa Forssk. – P – Ms
Rosa sempervirens L. – NP – Ms
Rubus ulmifolius Schott – NP – Me
Sanguisorba minor Scop. – H – Tmp

Sarcopoterium spinosum* (L.) Spach – NP – Msde – **PI – EN

Reported, as *Poterium spinosum*, for the north-western coast of Polignano a Mare (TARSIA INCURIA, 1813). Specific field observations did not find this taxon. It is a threatened (EN) species at regional (CONTI *et al.*, 1997) and national (GARGANO *et al.*, 2008) level. In Apulia only two locations are known: Palude del Capitano (Nardò – Lecce) (ALBANO *et al.*, 2008) and Punta Penne-Punta del Serrone (Brindisi) (IPPOLITO *et al.*, 2012).

RHAMNACEAE

Rhamnus alaternus L. subsp. *alaternus* – P – Me

MORACEAE

Ficus carica L. – P – Mt

URTICACEAE

Mercurialis annua L. – T – Tmp

Parietaria judaica L. – H – Mem

Urtica dioica L. subsp. *dioica* – H – Cs

Urtica urens L. – T – Cs

CUCURBITACEAE

Ecballium elaterium (L.) A. Rich. – G – Me

OXALIDACEAE

Oxalis pes-caprae L. – G – Afs – *invasive*

EUPHORBIACEAE

Chamaesyce prostrata (Aiton) Small – T – An – *naturalized*

Chrozophora tinctoria (L.) Raf. – T – Mt

Euphorbia characias L. – NP – Ms

Euphorbia exigua L. subsp. *exigua* – T – Me

Euphorbia helioscopia L. subsp. *helioscopia* – T – C

Euphorbia paralias L. – Ch – Msw

Euphorbia peplus L. – T – Esb

Euphorbia terracina L. – T – Ms

SALICACEAE

Populus alba L. – P – Tmp

LINACEAE

Linum bienne Mill. – H – Me

Linum strictum L. – T – Ms

HYPERICACEAE

Hypericum perforatum L. – H – Tmp

Hypericum triquetrifolium Turra – H – Mse

GERANIACEAE

Erodium ciconium (L.) L'Hér. – T/H – Mep

Erodium cicutarium (L.) L'Her. – T/H – Cs

Erodium malacoides (L.) L'Hér. subsp. *malacoides* – T – Ms

Geranium dissectum L. – T – Cs

Geranium molle L. – H – Cs

Geranium purpureum Vill. – T – Me

Geranium rotundifolium L. – T – Tmp

LYTHRACEAE

Punica granatum L. – P – Assw – casual

MYRTACEAE

Myrtus communis L. subsp. *communis* – P – Ms

ANACARDIACEAE

Pistacia lentiscus L. – P – Mss

RUTACEAE

Ruta graveolens L. – Ch – Me

MALVACEAE

Malva cretica Cav. – T – Ms

Malva multiflora (Cav.) Soldano, Banfi & Galasso – T – Ms

Malva parviflora L. – T – Me

Malva sylvestris L. subsp. *sylvestris* – H – Esb

Malva veneta (Mill.) Soldano, Banfi & Galasso – H – Ms

THYMELAEACEAE

Daphne gnidium L. – P – Msm

CISTACEAE

Cistus creticus L. – NP – Mec

Cistus monspeliensis L. – NP – Ms

Cistus salvifolius L. – NP – Ms

Fumana thymifolia (L.) Spach ex Webb – Ch – Ms

Helianthemum jonium Lacaita – Ch – I

Endemic species of Morocco (RUIZ DE LA TORRE, 1956) and Italy (CONTI *et al.*, 2005). It is relatively common in the chamaephytic garrigues of the investigated area.

Helianthemum salicifolium (L.) Mill. – T – Me

RESEDACEAE

Reseda alba L. – T – Ms

CAPPARACEAE

Capparis spinosa L. – NP – Ea

BRASSICACEAE

Biscutella didyma L. subsp. *apula* Nyman – T – Mts

Brassica tournefortii Gouan – T/H – Ssm

Cakile maritima Scop. subsp. *maritima* – T – Ma

Capsella bursa-pastoris (L.) Medik. subsp. *bursa-pastoris* – H – C

Diplotaxis erucooides (L.) DC. subsp. *erucooides* – T – Msw

Diplotaxis tenuifolia (L.) DC. – H – Masb

Hirschfeldia incana (L.) Lagr.-Foss. subsp. *incana* – H/T – Mmc

Lepidium coronopus (L.) Al-Shehbaz – T – Cs

Lepidium draba (L.) Desv. subsp. *draba* – G/H – Mt

Lobularia maritima (L.) Desv. subsp. *maritima* – H/Ch – Ms

Raphanus raphanistrum L. – T – Cb

n *Sinapis alba* L. subsp. *alba* – T – Mes

Sinapis arvensis L. subsp. *arvensis* – T – Ms

Sisymbrium irio L. – T – Tm

SANTALACEAE

Osyris alba L. – NP – Me

FRANKENIACEAE

Frankenia hirsuta L. – Ch – Msasc/Afs

TAMARICACEAE

Tamarix gallica L. – P – Mw

PLUMBAGINACEAE

Limonium apulum Brullo – H – I

Endemic species of the Apulian rocky coast, from the eastern slopes of Gargano to Otranto (BARTOLO *et al.*, 1989). On the investigated area it is located in a few stations: Cala Incina, Masseria de Bellis and in front of Scoglio dell'Eremita.

**Limonium narbonense* Mill. – H – Me

Reported, as *Limonium serotinum*, for Torre Ripagnola (DI LEVA & MAIELLARO, 1996). Not found in surveys of this research.

Limonium virgatum (Willd.) Fourr. – T – Me*Plumbago europaea* L. – Ch/G – Ms

POLYGONACEAE

Polygonum aviculare L. – T – C*Polygonum maritimum* L. – H – Cs*Rumex crispus* L. – H – Cs*Rumex pulcher* L. – H/T – Me

CARYOPHYLLACEAE

Arenaria leptoclados (Rchb.) Guss. – T – Tmp*Cerastium glomeratum* Thuill. – T – Cs*Cerastium glutinosum* Fr. – T – Me/Ps*Herniaria glabra* L. – T – Tmp*Minuartia verna* (L.) Hiern subsp. *attica* (Boiss. & Spruner) Graebn. – Ch – Me*Petrorhagia dubia* (Raf.) G. Lopez & Romo – G – Msd*Petrorhagia saxifraga* (L.) Link subsp. *gasparrinii* (Guss.) Greuter & Burdet – H – Me*Silene colorata* Poir. – T – Ms*Silene gallica* L. – T – Cs*Silene italica* (L.) Pers. – H – Me*Silene sedoides* Poir. subsp. *sedoides* – T – Ms*Silene vulgaris* (Moench) Garcke subsp. *tenoreana* (Colla) Soldano & F. Conti – H – Mes**Spergularia rubra* (L.) J. & C. Presl – Ch – Cs/T

Reported as *Arenaria rubra* for the north-western coast of Polignano a Mare (TARSIA INCURIA, 1813). Not found in the surveys of this research.

Spergularia salina J. & C. Presl – T – Cs*Stellaria media* (L.) Vill. subsp. *media* – T – C

AMARANTHACEAE

Amaranthus retroflexus L. – T – C – *invasive**Arthrocnemum macrostachyum* (Moris.) Moris – Ch/P – Mmc/Mex*Atriplex halimus* L. – NP – C*Atriplex portulacoides* L. – Ch/P – Cb*Atriplex prostrata* Boucher ex DC. – T – Cb*Beta vulgaris* L. subsp. *maritima* (L.) Arcang. – H – Me*Camphorosma monspeliaca* L. – Ch – AscM

Chenopodium album L. – T – Cs
Chenopodium murale L. – T – Cs
Chenopodium opulifolium Schrad. ex W.D.J. Koch & Ziz – T – Tmp
Chenopodium polyspermum L. – T – Cb
Salicornia patula Duval-Jouve – T – Ew
Salsola kali L. – C – Tmp
Sarcocornia fruticosa (L.) A. J. Scott – Ch – Me/Afs
Suaeda maritima (L.) Dumort. – T – C
Suaeda vera J.F. Gmel. – NP – C

AIZOACEAE

Carpobrotus acinaciformis (L.) L. Bolus – Ch – Afs – *invasive*
Carpobrotus edulis (L.) N.E. Br. – Ch – Afs – *casual*
Mesembryanthemum nodiflorum L. – T – Msd/Afs
 Invasive rare species. A small population is discovered at the administrative boundary of the Monopoli and Polignano a Mare towns.

PORTULACACEAE

Portulaca oleracea L. subsp. *oleracea* – T – Cs

CACTACEAE

Opuntia ficus-indica (L.) Miller – P – Ne – *invasive*

PRIMULACEAE

Anagallis arvensis L. – T – Me

RUBIACEAE

Galium aparine L. – T – Ea
Galium verrucosum Huds. – T – Ms
Galium verum L. – H – Ea
Rubia peregrina L. – P – Msm
Sherardia arvensis L. – T – Cs
Valantia muralis L. – T – Ms

GENTIANACEAE

Blackstonia perfoliata (L.) Huds – T – Me
Centaurium erythraea Rafn – H – Tmp
Centaurium pulchellum (Sw.) Druce subsp. *pulchellum* – T – Tmp

APOCYNACEAE

Cynanchum acutum L. subsp. *acutum* P – Tpsp
Vinca major L. subsp. *major* – Ch – Me
Vincetoxicum hirundinaria Medik. subsp. *adriaticum* (Beck) Markgr. – H – **Ad** – **VU**

In Italy, this amphi-adriatic species is reported only in the Apulia and Basilicata regions. The three most representative populations of Polignano a Mare consists of about 50 individuals, located at Masseria de Bellis, Cala Lapilli and in front of Scoglio dell'Eremita. It is listed in the Regional Red List (CONTI *et al.*, 1997) with the status of vulnerable (VU).

BORAGINACEAE

Alkanna tinctoria (L.) Tausch subsp. *tinctoria* – H – Ms
Anchusa azurea Mill. – H – Me
Borago officinalis L. – T – Me
Buglossoides arvensis (L.) I. M. Johnst. – T – Me
Cerintho major L. – T – Ms

Echium asperrimum Lam. – H – Msw
Echium parviflorum Moench – T – Ms
Echium plantagineum L. – T/H – Me
Echium vulgare L. – H – E
Heliotropium europaeum L. – T – Met

CONVOLVULACEAE

Calystegia sepium (L.) R. Br. subsp. *sepium* – H – Tmp
Calystegia soldanella (L.) Roem. & Schult. – G – C
Convolvulus althaeoides L. – H – Ms
Convolvulus arvensis L. – G – C
Convolvulus cantabrica L. – H – Me
Convolvulus elegantissimus Mill. – H – Mse
Cuscuta epithymum L. – T – Eat

SOLANACEAE

Hyoscyamus albus L. – T/H – Me
Nicotiana glauca Graham – NP – Ams – *invasive*
Solanum nigrum L. – T – C

OLEACEAE

Olea europaea L. – P – Ms
Phillyrea latifolia L. – P – Ms

PLANTAGINACEAE

Kickxia commutata (Bernh. ex Rchb.) Fritsch subsp. *commutata* – H – Ms
Kickxia spuria (L.) Dumort. – T – Ea
Linaria reflexa (L.) Desf. – T – Msdw
Linaria triphylla (L.) Mill. – T – Msw
Misopates orontium (L.) Raf. subsp. *orontium* – T – Tmp
Plantago albicans L. – Ch – Msd
Plantago coronopus L. subsp. *coronopus*
Plantago crassifolia Forssk. – H – Ms/Afs
Plantago lagopus L. – T – Ms
Plantago lanceolata L. – H – Ea
Plantago major L. – H – Cs
Plantago serraria L. – H – Ms
Veronica hederifolia L. – T – Ea

SCROPHULARIACEAE

Myoporum tenuifolium G. Forst. – P – Aus – *locally invasive*
Scrophularia canina L. – H – Me
Scrophularia lucida L. – H/Ch – Mm – **Ad – PI**

Amphi-adriatic species of phytogeographic interest that in Apulia colonizes the natural rock cavities of rocky cliffs, niches reserved for highly specialized species that are able to grow in extreme environmental conditions. In the investigated area it was observed at the Ripagnola locality.

Verbascum blattaria L. – H/T – C
Verbascum sinuatum L. – H – Me
Verbascum thapsus L. – H – Eca

LAMIACEAE

Ajuga iva (L.) Schreber – Ch – Ms

Ballota nigra L. – H – Me

Calamintha nepeta (L.) Savi – H – Oes

Lamium amplexicaule L. – T – Tmp

Marrubium vulgare L. – H – Cs

**Micromeria filiformis* (Aiton) Benth. subsp. *cordata* (Bertol.) Pignatti – I

Reported by mistake, as *Satureja filiformis*, for north-western coast of Polignano a Mare (TARSIA INCURIA, 1813). This taxon is an endemic of Sardinia (CONTI et al., 2005).

Micromeria graeca (L.) Benth. ex Rchb. subsp. *graeca* – Ch – Ms

Prasium majus L. – Ch – Ms

Salvia verbenaca L. – H – Msa

Satureja cuneifolia Ten. – Ch – Msn – PI

Species of phytogeographic interest reported in Italy, ex Yugoslavia and Albania (GREUTER et al., 1986). In Italy it is found only in the Apulia and Basilicata regions (CONTI et al., 2005).

Satureja montana L. – Ch – Omw

Sideritis romana L. subsp. *romana* – T – Ms

Stachys recta L. – H – One

Teucrium capitatum L. subsp. *capitatum* – Ch – Ms

Teucrium chamaedrys L. – Ch – Me

Thymbra capitata (L.) Ca – Ch – Mse

Vitex agnus-castus L. – P – Mst – VU

Stenomediterranean-Turanian species. Deforestation for the benefit of the tourism has led to a drastic reduction in the number of plant populations along the Apulian coast. On the Polignano a Mare coast small relict populations are preserved at Cala Incina, Cala Corvino, Cala Lapilli, in front of Scoglio dell'Eremita and Cozze Nere. The rarefaction of populations in recent years is evidenced by the frequent use of its branches, tenacious and flexible at the same time, used in manufacturing of baskets (BRUNI, 1857). This taxon is reported for the Apulia with the status of vulnerable (VU).

OROBANCHACEAE

Bartsia trixago L. – T – Me

Orobanche canescens C. Prel – T – Mscw

Orobanche crenata Forssk. – T – Met

Orobanche minor Sm. – T – Cs

Orobanche purpurea Jacq. – T – Essb

Parentucellia latifolia (L.) Caruel – T – Me

Parentucellia viscosa (L.) Caruel – T – Mea

ACANTHACEAE

Acanthus mollis L. subsp. *mollis* – H – Msw

Acanthus spinosus L. – H – Mse

VERBENACEAE

Verbena officinalis L. – H – C

CAMPANULACEAE

Asyneuma limonifolium (L.) Janch. subsp. *limonifolium* – H – Ad – PI – NT

This is a phytogeographically interesting species reported in Italy only for the Apulia and Basilicata regions (CONTI et al., 2005). It is listed with the status of near threatened [NT B1ab(iii)+2ab(iii)] (PERRINO et al., 2012). The stations of Ripagnola, Cala Incina and Masseria de Bellis are very important because they represent its westernmost global distribution.

Legousia hybrida (L.) Delarbre – T – Ma

ASTERACEAE

Achillea ageratum L. – H – Msw*Anthemis arvensis* L. – T/H – Cs**Anthemis maritima* L.

Reported for Torre Ripagnola (DI LEVA & MAIELLARO, 1996). Not found in the surveys of this research.

Anthemis tomentosa L. – T – Mne*Bellis annua* L. subsp. *annua* – T – Msm*Bellis perennis* L. – H – Cb*Bellis sylvestris* Cirillo – H – Ms*Calendula arvensis* (Vaill.) L. – T – Me*Calendula officinalis* L. – T/H*Cardopatum corymbosum* (L.) Pers. – H – Mne*Carduus pycnocephalus* L. subsp. *pycnocephalus* – H – Mt*Carlina corymbosa* L. – H – Ms*Carlina gummifera* (L.) Less. – H – Msd*Centaurea nicaeensis* All. – H – Mssw*Centaurea solstitialis* L. – H – Cs*Cichorium intybus* L. – H – Tmp*Cirsium arvense* (L.) Scop. – G – Ea*Crepis corymbosa* Ten. – T – I

Endemic species of central-southern Italy.

Crepis foetida L. – T/H – Me*Crepis rubra* L. – T – Msne*Crepis vesicaria* L. – T/H – Masb*Cynara cardunculus* L. subsp. *cardunculus* – H – Ms*Cynara cardunculus* L. subsp. *scolymus* (L.) Hayek – H – Avv*Dittrichia viscosa* (L.) Greuter – H – Me*Erigeron canadensis* L. – T – *invasive**Filago pygmaea* L. – T – Ms*Galactites elegans* (All.) Soldano – H – Ms*Glebionis coronaria* (L.) Spach – T – Ms*Glebionis segetum* (L.) Fourr. – T – Me*Helichrysum italicum* (Roth) G. Don – Ch – Es*Helminthotheca echioides* (L.) Holub – T – Mee*Hyoseris scabra* L. – T – Ms*Hypochaeris achyrophorus* L. – T – Ms*Klasea flavescens* (L.) Holub – H – Msdw*Lactuca serriola* L. – H/T – Mess*Leontodon hispidus* L. – H – Eca*Leontodon tuberosus* L. – H – Ms*Limbarda crithmoides* (L.) Dumort. – Ch – Esw*Matricaria chamomilla* L. – T – Cs*Onopordum illyricum* L. – H – Ms*Pallenis spinosa* (L.) Cass. subsp. *spinosa* – H – Me*Phagnalon rupestre* (L.) DC. subsp. *annoticum* (Jord. ex Burnat) Pignatti – Ch – Msdw*Picris hieracioides* L. – H – Esb*Reichardia picroides* (L.) Roth – H – Ms*Rhagadiolus stellatus* (L.) Gaertn. – T – Me*Scolymus hispanicus* L. subsp. *hispanicus* – H – Me

Scorzonera villosa Scop. subsp. *columnnae* (Guss.) Nyman – H – I

Exclusive species of the Italian Peninsula (GREUTER *et al.*, 2008), common in meadows and scrublands of the investigated area.

Senecio leucanthemifolius Poir. subsp. *leucanthemifolius* – T – Ms

Senecio vulgaris L. – T – C

Sonchus asper (L.) Hill – T – Ea

Sonchus oleraceus L. – T – Ea

Sonchus tenerrimus L. – T – Ms

Symphotrichum squamatum (Spreng.) G. L. Nesom – T/H – Ne – *invasive*

Taraxacum officinale Weber – H – Cb

Tragopogon porrifolius L. – H – Me

Tripolium pannonicum (Jacq.) Dobroc.

Urospermum dalechampii (L.) F. W. Schmidt – H – Me

Urospermum picroides (L.) Scop. ex F.W. Schmidt – T – Me

Xanthium orientale L. subsp. *italicum* (Moretti) Greuter – T – Es – *naturalized*

Xanthium spinosum L. – T – Ams – *naturalized*

CAPRIFOLIACEAE

Fedia graciliflora Fisch. & C.A. Mey. – T – Ms

Knautia integrifolia (L.) Bertol. subsp. *integrifolia* – T – Me

Lonicera implexa Aiton subsp. *implexa* – P – Ms

Sixalis atropurpurea (L.) Greuter & Burdet ssp. *grandiflora* (Scop.) Sold. & Conti – H – Ms

PITTOSPORACEAE

n *Pittosporum tobira* (Thunb.) W.T. Aiton – NP – Ase

ARALIACEAE

Hedera helix L. – P – Meas

APIACEAE

Ammoides pusilla (Brot.) Breistr. – T – Ms

Bupleurum baldense Turra – T – Me

Cachrys libanotis L. – H – Mnw

Crithmum maritimum L. – Ch – Me

Daucus carota L. subsp. *carota* – H – Cs

Eryngium campestre L. – H – Me

Eryngium maritimum L. – G – Ma

Foeniculum vulgare Miller – H – Msd

Scandix pecten-veneris L. – T – Cs

Seseli tortuosum L. – H – Ms

Thapsia garganica L. – H – Msd

Tordylium apulum L. – T – Ms

Flora and climate

The combination of floristic and climatic data makes it possible to understand how ecosystems have developed and what their evolution will be, which in turn means a better understanding of the mechanisms that may be used for monitoring biodiversity, agrobiodiversity, environmental changes and interactions with human factors and use of natural resources. In fact, the main purpose of the present study was to improve our knowledge of the flora of the investigated area while bearing it in mind that a simple list of species, if not related to the environment and the climate of the territory, may be

useless from the point of view of conservation and utilization of plant genetic resources and more broadly speaking of natural resources. If this is the final goal of the present study, one has to know the flora, species by species, but also how single species interact with the rest of the vegetation in a given territory and climate. This knowledge is important for us to be able to understand or discover the differences of the mechanisms that drive the survival of single species from more complex plant communities and from entire ecosystems. The authors feel that the floristic and climatic data collected in this study may be helpful for improving the monitoring of plant biodiversity and its conservation and utilization.

CONCLUSIONS

The floristic work, carried out from 2008 to 2012 on the Adriatic coast of the town of Polignano a Mare made it possible to make a checklist of 449 taxa, more than 400 of which have been listed for the first time, the rest being those reported in earlier works by DI LEVA & MAIELLARO (1996) and TARSIA INCURIA (1813). The most relevant information was the identification of 27 taxa of conservation interest and the presence of 4 species new for the Apulia region.

The new checklist with 449 taxa represents a substantial contribution for the advancement of knowledge of the vascular flora in the investigated area, but even so the authors feel that the flora of the investigated territory is not yet adequately known. The fact that there are many and small private cultivated fields that during sampling work were almost neglected along with the discovery of new entries suggests there should be a more extensive investigation of the territory, paying special attention to invasive species.

Today floristic diversity is seriously threatened by human activities, like bad management and construction of touristic infrastructure, like beaches, seaside houses, golf fields and so on. In the mentioned territory, the use of the land to build golf courses is certainly a further threat to the conservation of small areas of natural vegetation, where species of conservation interest may have found their shelter. Any project designed for using small fields in areas like that of Polignano a Mare should be carefully evaluated.

The emerging need is to work out adequate *in situ* and *ex situ* conservation strategies, with the aim of protecting most of the threatened species and whenever possible making use of them, for reaching the following goals: conservation of biodiversity, protection of the environment and agro-ecosystems, education of people and in some cases maintenance of traditions, as in the case of ethnobotany, that make use, as a food and/or as non food, of neglected and/or threateaned plant species.

The floristic study combined with that of climatic determination has provided information that should be able to suggest new and more efficient ways for the conservation and valorization of biodiversity and other environmental resources of the investigated area.

ACKNOWLEDGEMENT

The authors would like to thank the Herbarium of the Botanic Garden Museum of the Aldo Moro University of Bari for putting their herbarium images at our disposal. They also thank Prof. Anna Scoppola for discovering the site of *Ophioglossum lusitanicum* population.

Received October 31, 2012

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APPENDIX

Acronyms of the biological forms and chorologic types

Biological Forms. Ch – chamaephytes; P – phanerophytes; G – geophytes; H – hemipterophytes; He – helophytes; Hy – hydrophytes; NP – nanophanerophytes; T – therophytes.

Chorologic types. A – Atlantic; Ad – Amphiadriatic; Afs – south-African; An – northern American; Ams – southern American; Asb – Subatlantic; AscM – centre Asiatic-Medit.; Ase – eastern Asiatic; Assw – south-western Asiatic; Asw – western Asiatic; Aus – Australian; Avv – adventitious; C – Cosmopolitan; Cb – Circumboreal; Cn – China; Cs – Subcosmopolitan; Ctr – Thermocosmopolitan; E – European; Ea – Euroasiatic; Easw – western European-Asiatic; Eat – Euroasiatic temperate; Ec – central-European; Eca – European-Caucasic; EcCa – central-European Caucasic; Ecs – south-central European; Es – southern European, Esb – Eurosiberian; Ese – south-eastern European; Esep – south-eastern European Pontic; Esp – southern European Pontic; Essb – European and southern Siberian; Esw – south-western European; Ew – western European; Hi – Himalaya; I – Endemic; Ma – Medit.-Atlantic; Man – northern Medit.-Atlantic; Masb – Medit.-Subatlantic; Me – Eurimedit.; Mea – Eurimedit.-Atlantic; Meas – Eurimedit.-Subatlantic; Meaw – Medit. – western-Asiatic; Mec – central-Medit.; Mece – centre-eastern Medit.; Mecw – central-Medit. western; Mee – eastern Medit.; Mem – Eurimedit.-Macaronesian; Menp – northern Euromedit.-Pontic; Mep – Euromedit.-Pontic; Mess – Eurimedit. sou-

thern-Siberian; Met – Eurimedit.-Turanian; Mex – Mexico; Mne – north-eastern Medit.; Mm – Medit.-Mountain; Mmc – Medit.-Macaronesian; Mmms – southern Medit.-Macaronesian; Mmne – north-eastern Medit.-Mountain; Mmw – western Medit.-Mountain; Mn – northern Medit.; Mnw – north-western Medit.; Ms – Stenomedit.; Msa – Stenomedit.-Atlantic; Msab – Stenomedit.-Subatlantic; Msasc – Stenomedit. – centre-Asiatic; Msb – Submedit.; Mscw – Stenomedit. central-western; Msd – southern Medit.; Msde – south-eastern Medit.; Msdw – south-western Medit.; Mse – eastern Stenomedit.; Msm – Stenomedit.-Macaronesian; Msn – northern Stenomedit.; Msnw – north-western Stenomedit.; Msp – Stenomedit. Pontic; Mss – southern Stenomedit.; Mssw – south-western Stenomedit.; Mst – Stenomedit.-Turanian; Msw – western Stenomedit.; Mt – Medit.-Turanian; Mte – eastern Medit.-Turanian; Mts – southern Medit.-Turanian; Mw – western Medit.; Ne – Neotropical; Oes – Orophil south-European; Oesec – Orophil European-Caucasic south-eastern; Omne – north-eastern Orophil-Medit.; Omw – western Orophil-Medit.; One – northern Orophil-Medit.; P – Pontic; Pn – Pantropical; Ps – subpontic; Ssm – Saharo-Sind. Medit.; T – Temperate; Tmp – Paleotemperate; Tmpw – western Paleotemperate; Tpp – Paleotropical; Tps – Subtropical; Tpsp – Paleo-Subtropical.