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An updated inventory of the vascular flora of Elba island (Tuscan Archipelago, Italy)

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Abstract

We present an updated list of the vascular flora occurring on Elba island (Tuscan Archipelago). The list is based on bibliographic analysis and field studies carried out in the years 2006–2018. With a total of 1,098 specific and subspecific taxa currently occurring on the island (including 101 naturalized aliens), plus 67 casual aliens and 16 hybrid taxa, Elba shows the highest number of species among the islands of the Tuscan Archipelago. Two taxa are new for Tuscany: *Hieracium symphytaceum* s.l. and *Ophrys exaltata* subsp. *morisii*; 22 taxa are new for the island, 34 have been confirmed, while 326 were reliably recorded previously by other authors, but not confirmed by our study. We excluded 41 taxa and considered doubtful the occurrence of 87. Life forms and chorotypes are in agreement with the Mediterranean climate of the island. Despite this, Elba also hosts a considerable proportion of Eurosiberian taxa. We detected significant differences in chorotypes and life forms spectra among different geographical portions of the island, paralleling distinct bioclimatic patterns. Despite the institution of the Tuscan Archipelago National Park, we are still far from an integrated protection of the island flora. Based on our results, it has been possible to arrange a geodatabase of the flora on the island, useful for its protection.

Keywords

alien species, biodiversity, endemics, floristic data, Italy, phytogeography, Tuscany

Introduction

A flora is a useful source of information for biogeographical, ecological and evolutionary studies (Peruzzi 2018 and literature cited therein) and thus, floristic inventories and the analyses of plant species distribution across a geographic area are crucial to provide suitable data for decision-making processes in biodiversity conservation and landscape planning (Luque 2000, Heywood 2017, Thomson et al. 2018).

Particularly, islands have long served as an inspiration for evolutionary hypotheses because their biotic assemblages and ecological processes are clearly delimited by geographical constraints (MacArthur and Wilson 1967, Whittaker and Fernandez-Palacios 2013). Islands are indeed not simply miniature continents (Nunn 2004): they host peculiar and often unique and vulnerable floras.

The Mediterranean Basin is recognised among the most altered hotspots of biological diversity worldwide (Myers et al. 2000). Traditional, long established land use practices in the Mediterranean significantly contributed to the current biological and landscape features (Blondel 2006, Baiamonte et al. 2015). However, significant land use changes mainly associated with a switch from a traditional economy based on agriculture towards an industrial or tourism economy took place since the end of World War II (Vogiatzakis et al. 2008). The effects of land use changes on islands are often stronger than those observed on mainland areas (Delanoë et al. 1996).

The Tuscan Archipelago consists of seven islands and about twenty islets midway between mainland Italy and Corsica (France), and is one of the most interesting areas in the Central Mediterranean area from a naturalistic point of view (Arrigoni et al. 2003, Carta et al. 2013). Despite this, it has been strongly affected by socio-economic changes. All islands have been explored several times by botanists over the last centuries. Between the 19th and 20th centuries, the first comprehensive study on the Tuscan Archipelago flora was published (Sommier 1902, 1903): one of the first studies devoted to a group of small islands (Greuter 1995). With a total area of 220 km^2, Elba is the largest of all islands forming the Tuscan Archipelago. The island reaches a maximum altitude of 1,019 m a.s.l. (Monte Capanne) and shows a high geomorphological variability, leading to the establishment of three distinct bioclimatic belts and a large vegetation diversity (Foggi et al. 2006). Since 1996, over half of the territory is included within the Tuscan Archipelago National Park. Nevertheless, during the last decades, the island experienced a socio-economic transition from an economy largely based on traditional agricultural exploitation to an economy based on tourism, which determined a substantial land use shift (Carta et al. 2018b). This land use shift was paralleled by significant floristic changes mostly due to an increase in the number of alien species (Chiarucci et al. 2017). Altogether, these conditions make Elba an interesting place to study plant assemblages and drawing up an updated floristic inventory.

Starting from the mid-1900s, several studies were devoted to the flora of the Elba island (Fossi Innamorati 1983 and literature cited therein), including two excursions of the Italian Botanical Society (Negri 1950, Signorini et al. 2002), and the completion of a floristic prodrome for the island (Fossi Innamorati 1983, 1989, 1991,

1994, 1997), mainly based on a critical review of the collections made by S. Sommier. Thereafter, several floristic (Mannocci 2004, 2009, Bertacchi et al. 2005, Frangini et al. 2005, 2006, Borzatti de Loewenstern and Mannocci 2008, Foggi et al. 2015), vegetation (Foggi et al. 2006, Carta 2009), and taxonomic (Signorini and Foggi 1998, Peruzzi and Carta 2011, 2013, Ardenghi et al. 2014) studies were published. Also a recent list of names (Chiarucci et al. 2017) was published, however lacking a comprehensive analysis of previous literature and lacking a synthesis using an updated and coherent nomenclature. Hence, the aim of our study is to finalise an updated inventory of vascular flora on Elba island by tracking the current and past records of taxa, possibly identifying their distribution on the island, taking into account recent socio-economic changes that have significantly changed the landscape and the flora. In addition, to analyse more deeply plant distribution patterns, the island was subdivided into 12 bioclimatically homogeneous sectors in which we recorded plant occurrences and thereafter evaluated environmentally driven effects on species number, historical distribution, chorology and life form spectra.

Material and methods

Floristic inventory

We searched all published papers dealing with plants on Elba island and extracted occurrence records for all those species reported for the island. Smaller islets around Elba island were not considered because their flora was already studied and published by Foggi et al. (2009a). In addition to the papers cited in the Introduction, the following references were checked: Koestlin (1780), Thiébaut De Berneaud (1808), Caruel (1860, 1870), Bolzon (1893, 1894), Baroni (1897–1908), Fiori (1923–1929, 1943), Corti (1940), Marcello (1951), Ottens (1967), Arrigoni (1976, 2016, 2017), Jalas and Suominen (1976), Paoli and Romagnoli (1976), Zangheri (1976), Viegi and Cela Renzoni (1981), Pignatti (1982a-b), Nardi (1984), Natali (1988), Banfi (1989, 2017), Landi (1989), Gatteschi and Arretini (1990), Alessandro et al. (1991), Corsi and Garbari (1991), Baldini (1993), Del Prete and Tosi (1994), Bussotti et al. (1997), Hofmann et al. (1998), Rizzotto (1999), Vagge and Biondi (1999), Rinaldi (2000), Breiner and Breiner (2001, 2002), Del Prete (2001), Adamoli and Rigon (2003), Pignotti (2003), Ackermann and Ackermann (2004), Frangini (2004), Group of European Pteridologists (2004), Fanelli and Tescarollo (2005), Frangini et al. (2005, 2006), Tavormina (2006), Atzori (2007), Barsotti (2008), Bedini et al. (2008), Guiggi (2008, 2014), Hoffmann and Hoffmann (2008), Iamonico et al. (2008, 2011), Foggi and Venturi (2010), Arrigoni and Viegi (2011), Frignani and Iiriti (2011), Ferretti and Foggi (2013), Ferretti et al. (2013), Lazzaro et al. (2013a-b, 2014a-b), Ardenghi et al. (2014, 2015), Bagella et al. (2015), Cecchi and Selvi (2015), Iamonico (2015), Signorini and Tani (2015), Roma-Marzio et al. (2016, 2017), Scoppola et al. (2016), Benítez-Benítez et al. (2017), Martini and Viciani (2018), Troia et al. (2018).

Besides the occurrence on the island, the collecting site was also recorded; localities reported on historical publications or herbarium labels were attributed to one or more of the identified operational geographic units (see below). Literature search was complemented by several field surveys carried out during the years 2006–2018 across the whole island; some sites (e.g., low altitude western slopes of Monte Capanne, Capoliveri mines) were visited multiple times during the same year, matching distinct flowering times across the seasons; other sites (e.g., Cala del Pisciatoio, Mola) were specifically visited to verify historical records or to explore under-sampled areas (as emerged from literature analyses). Our most relevant floristic findings were published during the research: Carta (2007, 2010a-b, 2011a-b, 2012, 2015), Carta et al. (2008, 2009, 2010a-b, 2011, 2012a-b, 2013), Carlesi and Peruzzi (2010), Carta and Frangini (2010, 2013), Frangini et al. (2010), Frangini and Carta (2011, 2012), Galasso et al. (2011, 2017), Iamonico and Forbicioni (2011), Forbicioni and Frangini (2012), Gonnelli et al. (2012), Pierini and Peruzzi (2012), Langeneck and Peruzzi (2013), Peruzzi et al. (2009, 2013, 2014, 2017), Forbicioni et al. (2014), Pierini (2014), Carta and Peruzzi (2015).

Nomenclature and circumscription of the taxa follow Bartolucci et al. (2018) and Galasso et al. (2018); angiosperm families are arranged according to APG IV (2016). According to the former authors, for coding the occurrence status of each taxon on Elba island, we refer to the following categories: Doubtfully occurring: "D"; No longer recorded (reliable historical record): "NC"; Recorded by mistake: "NP". Native (or putatively native) plants are in bold in the list; naturalized alien plants are not in bold, while casual aliens and/or cultivated taxa, but also NP taxa, are in italics. The new records for the island are marked as "New", while taxa confirmed for the island in this contribution are marked by the symbol "*". Life forms and chorotypes were attributed according to Pignatti (1982a). The complete dataset assembled for the present study is available in Suppl. material 1.

Temporal, spatial and statistical analyses

The OGUs were identified based on bioclimatic (see Foggi et al. 2006 for further details) and geographical features of the island. Each OGU is labelled by a combination of a number (1, 2, 3) and a letter (a, b, c, d, e). The numbers distinguish the western (1), central (2), and eastern (3) portion of the island, recalling a previous attempt (Arrigoni et al. 2003) to identify the western part of the island as more influenced by Western-Mediterranean Sardinian-Corsican taxa compared to the eastern one. The letters identify different ecological belts (Fig. 1). For analytical purposes, plant occurrences were assembled in two main periods (before 1950 and after 1950) and in twelve sectors (Operational Geographic Units, OGUs thereafter) (Fig. 1); species recorded in a given OGU before 1950 is indicated with an "s" ahead the label of the sector and considered as historical. We selected this temporal threshold because of the socio-economic transition experienced by the island after the 1950s.

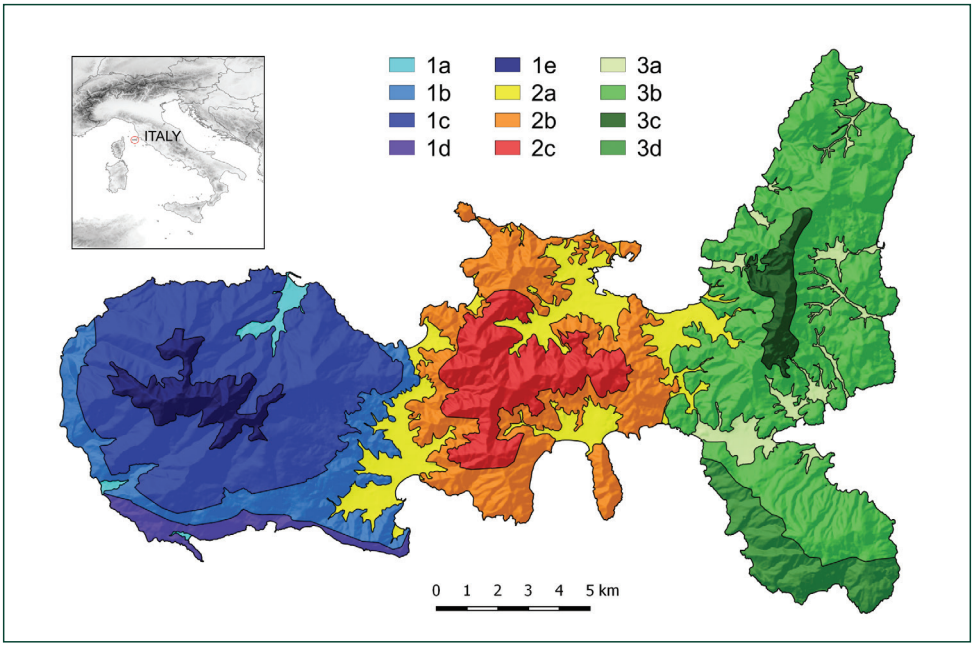

Figure 1. Localisaton of Elba island (red circle) in the Central Mediterranean area and subdivision of the island into 12 Operational Geographic Units. The numbers distinguish the western (**1**), central (**2**), and eastern (**3**) portion of the island, while the letters distinguish ecological belts as follows: (**a**) alluvial plains, stream banks and shores, (**b**) hilly areas below 250 m a.s.l., mostly characterised by a mesomediterranean thermotype and a subhumid ombrotype, (**c**) hilly and mountain areas generally above 250 and below 700 m a.s.l. characterised by mesomediterranean thermotype and humid ombrotype, (**d**) coastal hilly areas with a thermomediterranean thermotype, and (**e**) mountain areas above 700 m a.s.l. characterised by mesomediterranean and supramediterranean thermotypes.

To assess whether observed frequencies of categorical variables (historical occurrence, taxonomic rank, chorology, and life form) differ significantly from theoretical expectations, we used χ^2 tests. In addition, to determine whether there was a significant association between two categorical variables (among those listed above), we also applied a χ^2 test of independence or simple multinomial logit model (for binary categories, namely confirmation). All analyses were performed with the software R (R Development Core Team 2017).

Results

Floristic inventory

A total of 1,098 specific and subspecific taxa currently occur on the island, including 101 naturalized aliens, representing about 9% of the flora, not considering casual aliens

(67) and hybrid taxa (16); *Hieracium symphytaceum* Arv.-Touv. s.l. and *Ophrys exaltata* Ten. subsp. *morisii* (Martelli) Del Prete are new records for Tuscany, and 22 taxa are new for the island (including 3 naturalized and 5 casuals aliens); among them, *Galium verrucosum* Huds. subsp. *halophilum* (Ponzo) Lambinon and *Verbascum conocarpum* Moris subsp. *conocarpum* are of particular relevance. While 34 taxa have been directly confirmed during field surveys (e.g., *Bellevalia romana* (L.) Sweet, *Cerinthe major* L. subsp. *major*, *Lamium purpureum* L.), 326 taxa reliably recorded in the past were not confirmed (e.g., *Asplenium sagittatum* (DC.) Bange, *Thelypteris palustris* Schott, *Nymphaea alba* L., *Sagittaria sagittifolia* L., *Hypecoum procumbens* L. subsp. *procumbens*, *Lotus conimbricensis* Brot.). We excluded 41 taxa (e.g., *Oxalis acetosella* L., *Romulea insularis* Sommier, *Rosa rubiginosa* L.), and considered doubtful the occurrence of 87 taxa (e.g., *Allium parciflorum* Viv., *Briza media* L., *Polygala flavescens* DC. subsp. *flavescens*, *Soleirolia soleirolii* (Req.) Dandy). Overall, neither our direct field effort nor field researches conducted around the 1950 temporal threshold (Negri 1950, Marcello 1951) had a significant effect on current floristic diversity ($p > 0.05$).

Concerning the distribution of floristic diversity, while for 12 taxa a detailed distribution on the island is not available, 3b, 1c, and 2a show, respectively, 589, 546 and 540 taxa, and are the OGUs hosting the highest number of taxa. Floristic diversity is largely comparable among western (1), central (2) and eastern (3) portions of the island, but shows significant differences ($p < 0.001$) among ecological belts, with (d) and (e) being the poorest ecological belts, while (c), and especially (b), are the richest.

Considering the whole island, three families alone cover more than 30% of the total vascular flora (Asteraceae 124, Fabaceae 116, and Poaceae 112). However, an analysis by OGUs revealed that Fabaceae is the most represented family, showing in all sectors slightly more taxa than Asteraceae. The most represented genera are *Trifolium* (35), *Vicia*, and *Carex* (20).

Biological and chorological spectra highlight that therophytes (39%), hemicryptophytes (27%), and geophytes (15%) are the most represented life forms, while Mediterranean (47%), Euro-Mediterranean (24%), and Eurosiberian (11%) are the most frequent chorotypes. Alien taxa represent 6% of the total flora.

Italian endemics (Peruzzi et al. 2014, 2015, Bartolucci et al. 2018) are 26: 11 taxa show wide Italian distribution: *Biscutella maritima* Ten., *Carex microcarpa* Bertol. ex Moris, *Crocus biflorus* Mill., *Genista desoleana* Vals., *Helichrysum litoreum* Guss., *Ophrys appennina* Romolini & Soca, *O. classica* Devillers-Tersch. & Devillers, *O. crabronifera* Mauri, *O. exaltata* Ten. subsp. *montis-leonis* (O.Danesch. & E.Danesch) Soca, *O. tenthredinifera* Willd. subsp. *neglecta* (Parl.) E.G.Camus, and *Ornithogalum etruscum* Parl. subsp. *etruscum*; 6 taxa are Sardinian-Corsican-Tuscan Archipelago endemics: *Hypericum hircinum* L. subsp. *hircinum*, *Ophrys exaltata* subsp. *morisii*, *Pancratium illyricum* L., *Sagina revelierei* Jord. & Fourr., *Stachys salisii* Jord. & Fourr, and *Verbascum conocarpum* subsp. *conocarpum*. Just 1 taxon is endemic to Tuscan Archipelago (*Linaria capraria* Moris & De Not.), while 8 taxa are narrow endemic to Elba: *Biscutella pichiana* Raffaelli subsp. *ilvensis* Raffaelli, *Centaurea aetaliae* (Sommier) Bég., *C. ilvensis* (Sommier) Arrigoni, *Crocus ilvensis* Peruzzi & Carta, *Festuca gamisansii* Kerguélen

subsp. *aethaliae* Signorini & Foggi, *Hieracium elbanum* Belli ex Baroni, *Limonium ilvae* Pignatti, and *Viola corsica* Nyman subsp. *ilvensis* (W.Becker) Merxm.

Further 19 taxa occurring on the island are of high phytogeographical interest: *Cymbalaria aequitriloba* (Viv.) A.Chev. subsp. *aequitriloba*, *Dorycnopsis gerardii* (L.) Boiss., *Dryopteris tyrrhena* Fraser-Jenk. & Reichst., *Eudianthe laeta* Rchb. ex Willk., *Gagea granatellii* (Parl.) Parl., *Fumana scoparia* Pomel, *Isoëtes gymnocarpa* (Gennari) A.Braun, *Mesembryanthemum nodiflorum* L., and *Urtica atrovirens* (Req.) Loisel. are at the margin of their distribution range on Elba Island, while *Carex paui* Sennen, *Cosentinia vellea* (Aiton) Tod. subsp. *vellea*, *Gennaria diphylla* (Link) Parl., *Juncus ranarius* Songeon & E.P.Perrier, *Oeosporangium pteridioides* (Reichard) Franser-Jenk. & Pariyar, *Phalaris elongata* Braun-Blanq., *Poa perligularis* H.Scholz, *Sedum brevifolium* DC., *Stachys marrubiifolia* Viv., and *Thymbra capitata* (L.) Cav. can be found in Tuscany only on Elba Island (Peruzzi and Bedini 2015 onwards).

Temporal and spatial analyses

Taxa confirmations are not equally distributed among life forms, chorotypes, and OGUs (Figs 2, 3). Not confirmed taxa are significantly more abundant (significance level $p < 0.001$) among therophytes and especially hydrophytes, but also ($p < 0.001$) within the Eurosiberian chorotype. The portion of the island with less confirmed taxa is the sector 2, especially within belt (b). Whilst taxa confirmations resulted equally distributed ($p > 0.05$) among families, Apiaceae, Boraginaceae, Caprifoliaceae, and Fabaceae show respectively 37%, 20%, 30% e 25% of not recently confirmed taxa.

Families are mostly equally distributed ($p > 0.05$) among sectors and belts. Life forms and chorotypes are however not equally distributed ($p < 0.001$) among families. Lamiaceae and Plantaginaceae well represent chamaephytes (12% each, after excluding the three richest families), Orchidaceae and Amaryllidaceae prevail among geophytes (26% and 11% respectively), Alismataceae dominate the hydrophytes (21%), and Rosaceae dominate the nanophanerophytes (26%). Taxa showing wide (cosmopolitan/subcosmopolitan) distribution prevail in Poaceae, while Fabaceae are especially common among Mediterranean taxa (16%), and Asteraceae prevail within the Eurosiberian chorotype (11%).

Life forms are significantly associated ($p < 0.001$) with chorotypes: Mediterranean taxa are mostly represented by therophytes (46%), and Eurosiberian taxa are mostly represented by hemicryptophytes (40%). Italian endemics are mostly hemicryptophytes (39%) and geophytes (34%), while alien taxa are mostly represented by phanerophytes and therophytes (more than 60% altogether).

Life forms are also significantly associated ($p < 0.001$) with OGUs (Fig. 2), particularly: chamaephytes are especially frequent (37%) on belt (b) and hydrophytes on belt (a) (71%); therophytes are underrepresented in 1e (around 35%; exceeding 40% in all other OGUs), and hemicryptophytes dominate 1e and the OGUs of belt (c).

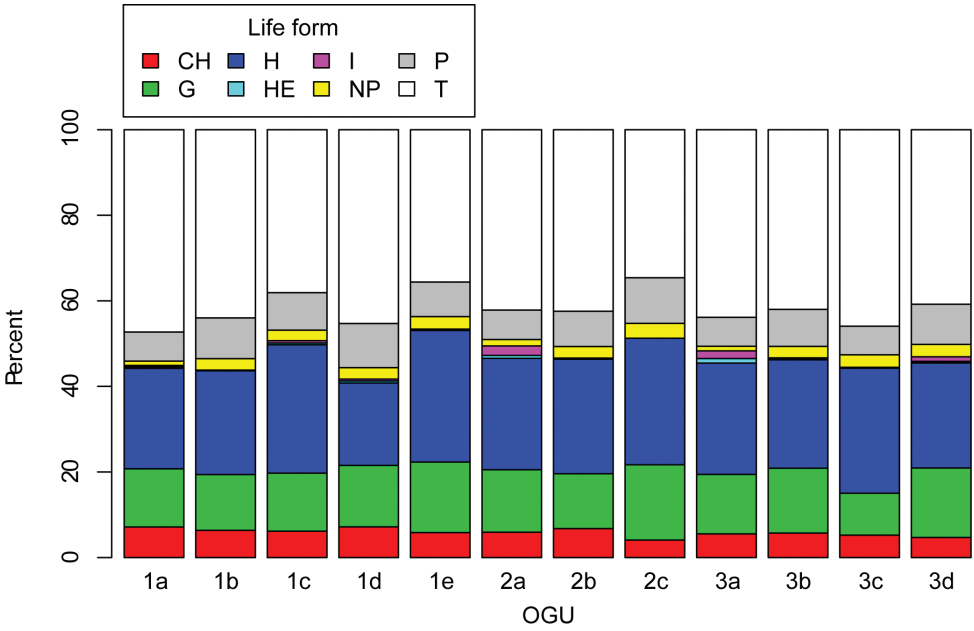

Figure 2. Life form spectra for each Operational Geographic Unit. CH = Chamaephytes, G = Geophytes, H = Hemicryptophytes, HE = Helophytes, I = Idrophytes, NP = Nanophanerophytes, P = Phanerophytes, T = Therophytes.

Chorotypes are also significantly associated ($p < 0.001$) with the OGUs (Fig. 3), with 1e particularly characterised by Italian endemics (5.5%), while the warmest and most urbanised OGUs (1a, 1d, 2a, 2b, 3a, 3b, and 3d) are associated with the occurrence of aliens. Finally, Eurosiberian taxa are underrepresented (less than 2%) in the warmest OGUs (1d and 3d).

Discussion

With a total of 1,098 specific and subspecific taxa currently occurring on the island, Elba is confirmed as the island hosting the highest number of vascular taxa in the Tuscan Archipelago. This is mostly due to the larger extension of Elba compared to other islands (Chiarucci et al. 2017), but also to a larger geological and bioclimatic variability leading to higher habitat and niche diversity (Foggi et al. 2006, Carta et al. 2013). However, further analyses based on species-area relationship are required to disentangle the main ecological factors driving plant richness (D'Antraccoli et al. 2017), and possibly plant diversity (Carta et al. 2018a), on Elba island. In order to ascertain whether Elba can considered as a vascular plant diversity centre (see Carta et al. 2018a for pteridophytes), the data published here should be analysed by means of phylogenetic comparative methods.

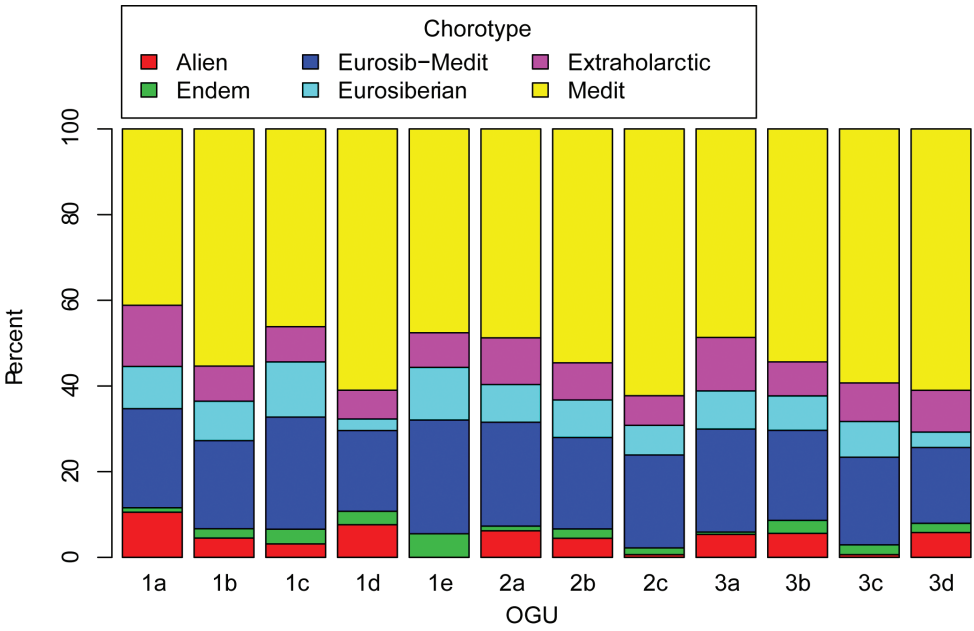

Figure 3. Chorological spectra for each Operational Geographic Unit. Alien = alien species, Endem = Italian endemic species, Extraholarctic = species showing range larger than Holarctic floristic kingdom, Eurosiberian = species showing range within the Eurosiberian floristic region, Eurosib-Medit = species showing range across Eurosiberian and Mediterranean floristic regions, Medit = species showing range within the Mediterranean floristic region.

The overall analysis of life forms and chorotypes revealed that the major component of the flora reflects the Mediterranean setting of the island and the prevalence of anthropogenic, secondary forms of vegetation (Arrigoni et al. 2003), belonging to the evergreen oak series (Foggi et al. 2006). Indeed, the most frequent life forms include herbs that especially grow in open, sunny habitats derived from the degradation of woodlands. Human influence has been massive since Roman times, but the vegetation has recently evolved towards more structured communities after the decrease of mining and agricultural activity (Carta et al. 2018b), possibly leading to a reduction of annual species (Chiarucci et al. 2017). However, it should be highlighted that 33 taxa considered as extinct or not recently confirmed by other authors (Fossi Innamorati 1997, Bertacchi et al. 2005, Chiarucci et al. 2017) have been eventually confirmed in our study. Nevertheless, our analysis highlights that the overall species confirmation is not depending from a single research group, but from several researchers separately active and in different times (especially after the world war II).

Elba hosts around 80% of the flora of the entire Tuscan Archipelago (Arrigoni et al. 2003, Carta et al. 2013), making any attempt to compare floras among Archipelago islands rather superfluous. However, besides being characterised by typical Mediterranean features, the flora of Elba also hosts a considerable proportion of Eurosiberian

taxa, largely not occurring on other islands. On the contrary, the flora of temporary wet habitats (Carta 2009) is also well represented in other islands of the Archipelago, especially in Capraia (Foggi et al. 2009). Shrubs and nanophanerophytes (Lamiaceae, Plantaginaceae, and Rosaceae) are linked with mesophilous habitats and are more common on Elba than in other islands. The ruderal flora associated with cultivated lands, and often represented by several crop wild relatives, is well represented on the island. However, we were not able to quantify it and further analyses are required to assess the influence of current agricultural activities on the survival of the species belonging to this peculiar flora and to make comparisons with other islands (especially Pianosa, for its long standing cultivations, see Baldini 2000).

The problem of alien species has already been highlighted by Chiarucci et al. (2017), and the number of aliens after our study is even higher than previously reported (84 naturalized and 45 casual aliens in Chiarucci et al. 2017, 101 naturalized and 67 casual aliens in our study). The total flora also including casual aliens lists 1,166 taxa, while Chiarucci et al. (2017) listed 1,013 and Fossi Innamorati (1997) 1,396 taxa. Nevertheless, Chiarucci et al. (2017) also include several species considered here as doubtful and especially lack a coherent nomenclature, while Fossi Innamorati (1997) include in the published number doubtful, not confirmed and even reported-by-mistake taxa. When all these categories are also included, our inventory exceeds 1,500 taxa, so that we conclude that these differences with previous published floras are illusory, or mostly linked to the recent acquisition of alien taxa.

The OGUs hosting the higher number of species (3b, 1c, 2a) are also the largest ones (Fig. 1). Nevertheless, we showed that plant species are non evenly distributed on the island, and the analyses suggest that the main factor influencing plant distribution is indeed local climate. A turnover analysis (Legendre 2014) would be needed to clearly demonstrate plant distribution variation among OGUs, but we detected significant differences in chorotypes and life forms spectra among OGUs, reflecting an altitudinal/bioclimatic trend (especially 1b > 1c > 1e). Furthermore, sectors 1d, 1e, 2a, and 3a host a peculiar flora compared to other sectors for climatic and edaphic reason. While 1d is particularly rich in xeric taxa, sectors 2a and 3a host the largest number of aquatic or wetland plants, even if in these alluvial sectors the fresh and brackish water habitats have been strongly reduced from past decades (Carta et al. 2018b).

OGU 1e, besides hosting a flora with temperate features, also hosts the majority of Italian endemics, albeit a few endemics are however also occurring in coastal habitats (*Limonium ilvae*) or in rocky cliffs spread across the island (*Linaria capraria*). Although it is difficult to reconstruct the geological events that possibly provided past links between Elba and other territories, some endemics show clear taxonomic relationships with the Sardinian-Corsican flora (Signorini and Foggi 1998, Borzatti de Loewenstern and Mannocci 2009, Carta and Peruzzi 2015) while others show a clear relationship with the Italian peninsula (Arrigoni 2003, Peruzzi and Carta 2011). Furthermore, several authors (Arrigoni 1976, Arrigoni et al. 2003, Carta et al. 2013, Foggi et al. 2015) repeatedly reported a higher western-Mediterranean (and especially Sardinian-Corsican) phytogeographical affinity for the western portion of the island

compared with the eastern one. Despite this, we did not detect significant differences in the major chorotype proportions between these two geographical sectors.

Conclusions

In spite of the institution of the Tuscan Archipelago National Park, including several specific *in situ* and *ex situ* conservation activities (Carta et al. 2012c, Foggi et al. 2015), we are still far from an integrated protection of the island flora. Based on our results, it has been possible to arrange an updated geodatabase of the flora on the island useful for its protection (Peruzzi and Bedini 2015 onwards). To this end, however, a landscape management plan avoiding land-use polarization through tourism, especially along the coast, promoting instead traditional use of woodland and agricultural activities should be promoted. Challenges remain at the policy level, particularly the decision making process and the opportunity to better define the role of science and protected areas in plant diversity conservation.

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References

Ackermann M, Ackermann M (2004) Orchideenfunde auf der Insel Elba. Journal of Europäischer Orchideen 36(3): 691–734.

Adamoli R, Rigon D (2003) Natura Mediterranea Flora elbana di Lacona. Documentazione Salute Ambiente Lacona-Capoliveri, Isola d'Elba.

Alessandro V, Bagnoli M, Bargelli S, Di Gregorio A, Giordano A, Ongaro L, Puglisi C, Rodolfi G, Sarfatti P, Ambrosini I, Angelini S, Brandolini G, Dell'Agnello A, De Luca M, Fais I, Galzerano CM, Giudiceandrea AMP, Mahdaoui M, Palavicino J, Peirano M, Rosati I, Salvucci R, Sericola A, Timchebeche ML (1991) Carta delle Unità di Terre dell'isola d'Elba. Ministero degli Affari Esteri, Istituto di Agronomia Oltremare, Firenze.

APG IV (2016) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. Botanical Journal of the Linnean Society 181(1): 1–20. https://doi.org/10.1111/boj.12385

Ardenghi NMG, Banfi E, Galasso G (2015) A taxonomic survey of the genus *Vitis* L. (Vitaceae) in Italy, part II: the "EuroAmerican" hybrids. Phytotaxa 224(3): 232–246. https://doi.org/10.11646/phytotaxa.224.3.2

Ardenghi NMG, Galasso G, Banfi E, Zoccola A, Foggi B, Lastrucci L (2014) A taxonomic survey of the genus *Vitis* L. (Vitaceae) in Italy, with special reference to Elba Island (Tuscan Archipelago). Phytotaxa 166(3): 163–198. https://doi.org/10.11646/phytotaxa.166.3.1

Arrigoni PV (1976) Rapporti floristici tra l'Arcipelago Toscano e le terre vicine. Biogeographia, nuova serie 5(1974): 1–11. https://doi.org/10.21426/B65110064

Arrigoni PV (2003) Le Centauree italiane del gruppo *Centaurea paniculata* L. Parlatorea 6: 49–78.

Arrigoni PV (2016) Flora analitica della Toscana, Vol. 1. Edizioni Polistampa, Firenze.

Arrigoni PV (2017) Flora analitica della Toscana, Vol. 2. Edizioni Polistampa, Firenze.

Arrigoni PV, Baldini RM, Foggi B, Signorini MA (2003) Analysis of the floristic diversity of the Tuscan Archipelago for conservation purposes. Bocconea 16(1): 245–259.

Arrigoni PV, Viegi L (2011) La flora vascolare esotica spontaneizzata della Toscana. Regione Toscana, Firenze, 216 pp.

Atzori S (2007) Una popolazione di *Cosentinia vellea* (Aiton) Tod. (Hemionitidaceae, Pteridophyta) nell'Isola d'Elba. Annali del Museo Civivo di Rovereto, Sezione Architettura, Storia, Scienze Naturali 22(2006): 195–199.

Bagella S, Peruzzi L, Caria MC, Filigheddu R (2015) Unraveling the taxonomy and nomenclature *Isoetes histrix* Bory species complex (Isoetaceae, Lycopodiidae). Turkish Journal of Botany 39(2): 383–387. https://doi.org/10.3906/bot-1404-121

Baiamonte G, Domina G, Raimondo FM, Bazan G (2015) Agricultural landscapes and biodiversity conservation: a case study in Sicily (Italy). Biodiversity and Conservation 24: 3201–3216. https://doi.org/10.1007/s10531-015-0950-4

Baldini RM (1993) The genus *Phalaris* L. *(Gramineae)* in Italy. Webbia 47(1): 1–53. https://doi.org/10.1080/00837792.1993.10670531

Baldini RM (2000) Flora vascolare dell'Isola di Pianosa (Arcipelago Toscano): revisione tassonomica ed aggiornamento. Webbia 55(1): 107–189. https://doi.org/10.1080/00837792.2000.10670691

Banfi E (1989) Osservazioni sulle specie italiane del genere *Setaria* P.Beauv. (Poaceae). Atti della Società Italiana di Scienze Naturali, Museo Civico di Storia Naturale di Milano 130(13): 189–196.

Banfi E (2017) Poaceae. In: Pignatti S (Ed.) Flora d'Italia 1. Edagricole, New Business Media, Milano, 512–780.

Baroni E (1897–1908) Supplemento generale al Prodromo della Flora Toscana di T. Caruel. Società Botanica Italiana, Firenze.

Barsotti G (2008) Flora, vegetazione ed ambiente delle isole dell'Arcipelago toscano. Pacini Editore, Pisa.

Bartolucci F, Peruzzi L, Galasso G, Albano A, Alessandrini A, Ardenghi NMG, Astuti G, Bacchetta G, Ballelli S, Banfi E, Barberis G, Bernardo L, Bouvet D, Bovio M, Cecchi L, Di Pietro R, Domina G, Fascetti S, Fenu G, Festi F, Foggi B, Gallo L, Iamonico D, Iberite M, Jiménez-Mejías P, Lattanzi E, Marchetti D, Martinetto E, Masin RR, Medagli P, Passalac-

qua NG, Peccenini S, Pennesi R, Pierini B, Poldini L, Prosser F, Raimondo FM, Roma-Marzio F, Rosati L, Santangelo A, Scoppola A, Scortegagna S, Selvaggi A, Selvi F, Soldano A, Stinca A, Wagensommer RP, Wilhalm T, Conti F (2018) An updated checklist of the vascular flora native Italy. Plant Biosystems 152(2): 179–303. https://doi.org/10.1080/11263504.2017.1419996

Bedini G, Giannelli L, Barzanti L, Bisti M, Frangini G, Filippi L (2008) Orchidaceae: nuove segnalazioni per l'Etruria marittima e l'isola d'Elba. GIROS Notizie 37: 29–36.

Benítez-Benítez C, Míguez M, Jiménez-Mejías P, Martín-Bravo S (2017) Molecular and morphological data resurrect the long neglected *Carex laxula* (Cyperaceae) and expand its range in the western Mediterranean. Anales del Jardín Botánico de Madrid 74(1): e057. https://doi.org/10.3989/ajbm.2438

Bertacchi A, Kugler PC, Lombardi T, Mannocci M, Monaldi M, Spinelli P, Tomei PE (2005) Appendice al Prodromo della flora vascolare della provincia di Livorno. Edizioni ETS, Pisa, 156 pp.

Blondel J (2006) The "design" of Mediterranean landscapes: a millennial story of humans and ecological systems during the historic period. Human Ecology 34: 713–729. https://doi.org/10.1007/s10745-006-9030-4

Bolzon P (1893) Erborizzazione all'isola dell'Elba. Bollettino della Società Botanica Italiana 1893: 23–31, 166–173, 237–243, 306–313, 350–357, 411–418.

Bolzon P (1894) La Flora del territorio di Carrara. Bollettino della Società Botanica Italiana 1894: 104–112.

Borzatti de Loewenstern A, Mannocci M (2009) *Stachys salisii* Jord. & Fourr. (Lamiaceae), endemismo sardo-corso nuovo per l'Arcipelago Toscano. Quaderni del Museo di Storia Naturale di Livorno 21(2008): 1–9.

Breiner E, Breiner R (2001) Orchideen der Insel Elba. Berichte aus den Arbeitskreisen Heimische Orchideen 18(2): 171–175.

Breiner E, Breiner R (2002) Orchideen der Insel Elba – Fundortverzeichnis. Berichte aus den Arbeitskreisen Heimische Orchideen 19(1): 82–84.

Bussotti L, Garbari F, Nannoni R (1997) Le stazioni di *Chamaerops humilis* L. (Arecaceae) nell'Arcipelago Toscano. Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 103(1996): 115–118.

Carlesi V, Peruzzi L (2010) Notulae alla checklist della Flora vascolare italiana, 9: 1663. Informatore Botanico Italiano 42(1): 379.

Carta A (2007) Indagini fitosociologiche nel comune di Campo nell'Elba (Livorno). M.Sc. Thesis in Management and Estimation of Natural Resources, University of Pisa, A.A. 2006–2007.

Carta A (2009) Contributo alla conoscenza della classe Isoëto-Nanojuncetea dell'Isola d'Elba (Arcipelago Toscano – Livorno). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 115(2008): 35–42.

Carta A (2010a) Notulae alla checklist della Flora vascolare Italiana, 10: 1712. Informatore Botanico Italiano 42(2): 519.

Carta A (2010b) Segnalazioni 1–14. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. I. (1–85). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 116(2009): 33–44.

Carta A (2011a) Notulae alla checklist della Flora vascolare Italiana, 12: 1848. Informatore Botanico Italiano 43(2): 361.

Carta A (2011b) Segnalazioni 95–102. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. II. (86–142). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 117(2010): 23–31.

Carta A (2015) Segnalazioni 345–346. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. VI. (320–356). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 121(2014): 29–35.

Carta A, Bedini G, Foggi B, Probert RJ (2012c) Laboratory germination and seed bank storage of *Ranunculus peltatus* subsp. *baudotii* seeds from the Tuscan Archipelago. Seed Science and Technology 40(1): 11–20. https://doi.org/10.15258/sst.2012.40.1.02

Carta A, Bedini G, Guidi T, Foggi B (2013) Tuscan Archipelago flora: from genesis to conservation. 2nd Botanical Conference in Menorca. Proceedings and abstracts. Islands and plants: preservation and understanding of flora on Mediterranean Islands, 157–176.

Carta A, Frangini G (2010) Segnalazioni 24–26. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. I. (1–85). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 116(2009): 33–44.

Carta A, Frangini G (2013) Segnalazione 216. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. IV (181–246). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 119(2012): 23–32.

Carta A, Frangini G, Gestri G, Lazzeri V, Pierini B, Peruzzi L (2012a) Segnalazione 158. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. III. (143–180). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 118(2011): 39–46.

Carta A, Gestri G, Mannocci M, Pierini B, Peruzzi L (2010a) Segnalazione 27. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. I. (1–85). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 116(2009): 36.

Carta A, Gestri G, Peruzzi L (2010b) Segnalazioni 15–18. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. I. (1–85). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 116(2009): 33–44.

Carta A, Limoncelli M, Peruzzi L (2013) Segnalazione 195. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. IV (181–246). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 119(2012): 23–32.

Carta A, Peruzzi L (2015) Contributo alla conoscenza della flora vascolare endemica di Toscana ed aree contermini. 6. *Hypericum hircinum* subsp. *hircinum* (Hypericaceae). Informatore Botanico Italiano 47(1): 27–31.

Carta A, Pierini B, Peruzzi L (2008) Distribuzione di *Ophioglossum lusitanicum* L. (Psilotopsida) in Toscana. Informatore Botanico Italiano 40(2): 135–141.

Carta A, Pierini B, Peruzzi L (2009) Aggiornamenti e novità sulla distribuzione di *Isoëtes gymnocarpa* e *I. histrix* (Lycopodiophytina) in Toscana. Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 115(2008): 43–45.

Carta A, Pierini B, Peruzzi L (2011) Segnalazione 86. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. II. (86–142). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 117(2010): 23–31.

Carta A, Pierini B, Peruzzi L (2012b) Segnalazione 178. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. III. (143–180). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 118(2011): 39–46.

Carta A, Pierini B, Roma-Marzio F, Bedini G, Peruzzi L (2018a) Phylogenetic measures of biodiversity uncover pteridophyte centres of diversity and hotspots in Tuscany. Plant Biosystems 152(4): 831–839. https://doi.org/10.1080/11263504.2017.1353550

Carta A, Taboada T, Müller JV (2018) Diachronic analysis using aerial photographs across fifty years reveals significant land use and vegetation changes on a Mediterranean island. Applied Geography: in press.

Caruel T (1860) Prodromo della Flora Toscana. Firenze.

Caruel T (1870) Secondo supplemento al Prodromo della Flora Toscana di T. Caruel. Firenze.

Cecchi L, Selvi F (2015) Synopsis of Boraginaceae subfam. Boraginoideae tribe Boragineae in Italy. Plant Biosystems 149(4): 630–677. https://doi.org/10.1080/11263504.2015.1057261

Chiarucci A, Fattorini S, Foggi B, Landi S, Lazzaro L, Podani J, Simberloff D (2017) Plant recording across two centuries reveals dramatic changes in species diversity of a Mediterranean archipelago. Scientific Reports 7(1): 5415. https://doi.org/10.1038/s41598-017-05114-5

Corsi G, Garbari F (1991) Elba, isola d'erba. Quaderni di S. Caterina. Eremo di S. Caterina, Rio nell'Elba. Ed. Pacini, Pisa.

Corti R (1940) Appunti sulla vegetazione dell'Isola d'Elba. I. Una gita a M. Orello e ai monti tra Rio Alto e Portolongone, con osservazioni sui distretti ofiolitici dell'Isola. Nuovo Giornale Botanico Italiano, nuova serie 47: 494–504.

D'Antraccoli M, Roma-Marzio F, Carta A, Landi S, Bedini G, Chiarucci A, Peruzzi L (2017) L'uso delle relazioni specie-area come strumento per confrontare flore. Notiziario della Società Botanica Italiana 1(2): 178–179.

Delanoë O, Montmollin de B, Olivier L (1996) Conservation of Mediterranean island Plants. I. Strategy for Action. I.U.C.N./S.S.C. Mediterranean Islands Plant Specialist Group.

Del Prete C (2001) Le orchidee spontanee. Elba, territorio e civiltà di un'isola. RS editore, Genova.

Del Prete C, Tosi G (1994) Le orchidee spontanee. Il Monte Capanne un'isola verde nell'Elba. RS editore, Genova, 51–77.

Fanelli G, Tescarollo P (2005) La vegetazione echinofitica a *Genista desoleana* del Massiccio del Monte Capanne (Isola d'Elba, Toscana, Italia). Parlatorea 7: 39–46.

Ferretti G, Foggi B (2013) Segnalazioni 245–246. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. IV (181–246) Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 119(2012): 23–32. https://doi.org/10.4081/nhs.2013.115

Ferretti G, Lazzaro L, Giuliani C, Foggi B (2013) Secondo contributo alla conoscenza della flora esotica dell'Arcipelago Toscano, Italia. Atti della Società Italiana di Scienze Naturali, Museo Civico di Storia Naturale di Milano 154(2): 115–130.

Fiori A (1923–1929) Nuova Flora Analitica d'Italia, Vol. 1–2. Tipografia M. Ricci, Firenze.

Fiori A (1943) Flora Italica Cryptogama, Vol. 5. Pteridophyta. Firenze.

Foggi B, Cartei L, Pignotti L, Signorini MA, Viciani D, Dell'Olmo L, Menicagli E (2006) Il paesaggio vegetale dell'Isola d'Elba (Arcipelago Toscano). Studio di fitosociologia e cartografico. Fitosociologia 43(1, Suppl. 1): 3–95.

Foggi B, Guidi T, Capecchi M, Baldini RM, Grigioni A (2009a) Biological flora of the Tuscan Archipelago islets (Tyrrhenian Sea). Webbia 64(1): 23–45. https://doi.org/10.1080/00837792.2009.10670851

Foggi B, Guidi T, Venturi E, Ghisolfi M (2009) Interventi per la conservazione dell'habitat Natura 2000 "Stagni temporanei mediterranei" nell'isola di Capraia (Arcipelago Toscano): primi risultati. Atti della Società Toscana di Scienze Naturali, Memorie, serie B 115(2008): 47–56.

Foggi B, Venturi E (2010) Segnalazioni 79. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. I. (1–85). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 116(2009): 33–44.

Foggi B, Viciani D, Baldini RM, Carta A, Guidi T (2015) Conservation assessment of the endemic plants of the Tuscan Archipelago, Italy. Oryx 49(1): 118–126. https://doi.org/10.1017/S0030605313000288

Forbicioni L, Frangini G (2012) Notulae alla checklist della flora vascolare italiana, 14: 1932. Informatore Botanico Italiano 44(2): 392.

Forbicioni L, Frangini G, Pierini B, Ferretti G, Foggi B, Giuliani C, Lazzaro L (2014) Segnalazione 261. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. V (247–319). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 120(2013): 35–44.

Fossi Innamorati T (1983) La flora vascolare dell'Isola d'Elba (Arcipelago Toscano). Prima parte. Webbia 36(2): 273–411. https://doi.org/10.1080/00837792.1983.10670255

Fossi Innamorati T (1989) La flora vascolare dell'Isola d'Elba (Arcipelago Toscano). Parte seconda. Webbia 43(2): 201–267. https://doi.org/10.1080/00837792.1989.10670454

Fossi Innamorati T (1991) La flora vascolare dell'Isola d'Elba (Arcipelago Toscano). Parte terza. Webbia 45(1): 137–185. https://doi.org/10.1080/00837792.1991.10670494

Fossi Innamorati T (1994) La flora vascolare dell'Isola d'Elba (Arcipelago Toscano). Parte quarta. Webbia 49(1): 93–123. https://doi.org/10.1080/00837792.1994.10670574

Fossi Innamorati T (1997) Addenda ed emendanda alla flora vascolare dell'Isola d'Elba (Arcipelago Toscano). Webbia 51(2): 385–389. https://doi.org/10.1080/00837792.1997.10670625

Frangini G (2004) *Gennaria diphylla* (Link) Parl., primo ritrovamento in Toscana (Isola d'Elba). GIROS Notizie 27: 28–29.

Frangini G, Carta A (2011) Segnalazione 103. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. II (86-142). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 117(2010): 23–31.

Frangini G, Carta A (2012) Segnalazione 171. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. III (143–180). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 118(2011): 39–46.

Frangini G, Carta A, Galasso E (2010) Notulae alla flora esotica d'Italia, 3: 42. Informatore Botanico Italiano 42(2): 533.

Frangini G, Romolini R, Sodi F, Bisti M, Filippi L, Mannocci M, Quochi B (2006) Orchidee dell'Isola d'Elba (Arcipelago Toscano). Nota aggiuntiva. GIROS Notizie 33: 7–15.

Frangini G, Romolini R, Sodi F, Bisti M, Mannocci M, Quochi B (2005) Orchidee dell'Isola d'Elba (Arcipelago Toscano). GIROS Notizie 28: 1–16.

Frignani F, Iiriti G (2011) The genus *Romulea* in Italy: taxonomy, ecology and intraspecific variation in relation to the flora of Western Mediterranean islands. Fitosociologia 48(2): 13–20.

Galasso G, Conti F, Peruzzi L, Ardenghi NMG, Banfi E, Celesti-Grapow L, Albano A, Alessandrini A, Bacchetta G, Ballelli S, Bandini Mazzanti M, Barberis G, Bernardo L, Blasi C, Bouvet D, Bovio M, Cecchi L, Del Guacchio E, Di Pietro R, Domina G, Fascetti S, Gallo L, Gubellini L, Guiggi A, Iamonico D, Iberite M, Jiménez-Mejías P, Lattanzi E, Marchetti D, Martinetto E, Masin RR, Medagli P, Passalacqua NG, Peccenini S, Pennesi R, Pierini B, Podda L, Poldini L, Prosser F, Raimondo FM, Roma-Marzio F, Rosati L, Santangelo A, Scoppola A, Scortegagna S, Selvaggi A, Selvi F, Soldano A, Stinca A, Wagensommer RP, Wilhalm T, Bartolucci F (2018) An updated checklist of the vascular flora alien to Italy. Plant Biosystems 152(3): 556–592. https://doi.org/10.1080/11263504.2018.1441197

Galasso G, Domina G, Bonari G, Buono S, Chianese G, Cortesi G, Frangini G, Iamonico D, Olivieri N, Peruzzi L, Pierini B, Roma-Marzio F, Scoppola A, Soldano A, Stinca A, Tomaselli V, Veronico G, Nepi C (2017) Notulae to the Italian alien vascular flora: 4. Italian Botanist 4: 33–41. https://doi.org/10.3897/italianbotanist.4.21666

Galasso G, Gestri G, Peruzzi L, Banfi E (2011) Notulae alla flora esotica d'Italia, 4: 69. Informatore Botanico Italiano 43(1): 147.

Gatteschi P, Arretini C (1990) I rimboschimenti dell'Arcipelago Toscano: storia, realtà e prospettive. Annali dell'Accademia Italiana di Scienze Forestali 39(1989): 33–54.

Gonnelli V, Carta A, Zoccola A, Landi M, Viciani D, Ferretti G, Quilghini G, Parri F, Giombini R, Marsiaj G (2012) Segnalazione 179. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. III (143–180). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 118(2011): 39–46.

Greuter W (1995) Origin and peculiarities of Mediterranean island floras. Ecologia Mediterranea 21(1/2): 1–10.

Group of European Pteridologists (2004) GEP NEWS 12: 1–8.

Guiggi A (2008) Catalogo delle Cactaceae naturalizzate in Italia con osservazioni tassonomiche, nomenclaturali e corologiche. Rivista Piemontese di Storia Naturale 29: 103–140.

Guiggi A (2014) Repertorium Cactorum Italicum. Cactology 4: 1–20.

Heywood VH (2017) Plant conservation in the Anthropocene – challenges and future prospects. Plant Diversity 39(6): 314–330. https://doi.org/10.1016/j.pld.2017.10.004

Hofmann A, Goretti D, Tabacchi G, Vignoli M, Bernetti G (1998) L'inventario forestale. Boschi e macchie di Toscana. Firenze, Regione Toscana, 1–219.

Hoffmann V, Hoffmann W (2008) Auf Orchideensuche im Naturpark Toskanischer Archipel, Insel Elba (Italien). Journal of Europäischer Orchideen 40(1): 109–152.

Iamonico D (2015) Taxonomic revision of the genus *Amaranthus* (Amaranthaceae) in Italy. Phytotaxa 199(1): 1–84. https://doi.org/10.11646/phytotaxa.199.1.1

Iamonico D, Forbicioni L (2011) Segnalazione 91. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. II (86–142). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 117(2010): 23–31.

Iamonico D, Forbicioni L, Frangini G (2008) Notulae alla checklist della flora vascolare italiana, 6: 1505. Informatore Botanico Italiano 40(2): 259.

Iamonico D, Forbicioni L, Frangini G (2011) A new hybrid in the genus *Ophrys* L. (Orchidaceae) from Elba Island (Central Italy). Annales Botanici Fennici 48(6): 435–438. https://doi.org/10.5735/085.048.0508

Jalas J, Suominen J (Eds) (1976) Atlas Florae Europaeae. Salicaceae to Balanophoraceae. Helsinki, 128 pp.

Koestlin CH (1780) Lettres sur l'histoire naturelle de l'Isle d'Elbe écrites a son excellence Monsieur le Comte de Borch. Chez Jean Paul Kraus, Vienne.

Landi S (1989) Flora e ambiente dell'isola d'Elba. Ed. Azzurra, Cavalese, Trento.

Langeneck J, Peruzzi L (2013) Segnalazione 192. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. IV (181–246). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 119(2012): 23–32.

Lazzaro L, Ferretti G, Galasso G, Lastrucci L, Foggi B (2013a) Contributo alla conoscenza della flora esotica dell'Arcipelago Toscano, Italia. Atti della Società Italiana di Scienze Naturali, Museo Civico di Storia Naturale di Milano 154(1): 3–24.

Lazzaro L, Ferretti G, Giuliani C, Foggi B (2014a) A checklist of the alien flora of the Tuscan Archipelago (Italy). Webbia 69(1): 157–176. https://doi.org/10.1080/00837792.2014.907981

Lazzaro L, Giuliani C, Ferretti G, Guiggi A (2013b) Notulae alla flora esotica d'Italia, 9: 200. Informatore Botanico Italiano 45(2): 310.

Lazzaro L, Mariotti D, Viciani D, Benesperi R, Ferretti G (2014b) Segnalazione 318. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. V (247–319). Atti della Società Toscana di Scienze Naturali, Memorie Serie B, 120(2013): 35–44.

Legendre P (2014) Interpreting the replacement and richness difference components of beta diversity. Global Ecology and Biogeography 23(11): 1324–1334. https://doi.org/10.1111/geb.12207

Luque SS (2000) The challenge to manage the biological integrity of nature reserves: a landscape ecology perspective. International Journal of Remote Sensing 2: 2613–2643. https://doi.org/10.1080/01431160050110205

MacArthur RH, Wilson EO (1967) The Theory of Island Biogeography. Princeton University Press.

Mannocci M (2004) Segnalazioni Floristiche Italiane: 1105–1107. Informatore Botanico Italiano 36(1): 81.

Mannocci M (2009) Notulae alla checklist della Flora vascolare Italiana, 8: 1613–1616. Informatore Botanico Italiano 41(2): 356.

Marcello A (1951) Rilevamenti fitofenologici all'Isola d'Elba (Aprile 1950). Nuovo Giornale Botanico Italiano, nuova serie 58: 73–96. https://doi.org/10.1080/11263505109430799

Martini G, Viciani D (2018) What happened to Linnaeus's *Iris florentina*? Re-evaluation of this taxon at species level. Taxon 63(2): 395–400. https://doi.org/10.12705/672.8

Myers N, Mittermeier RA, da Fonseca GAB, Kent J (2000) Biodiversity hotspots for conservation priorities. Nature 403: 853–858. https://doi.org/10.1038/35002501

Nardi E (1984) The genus *Aristolochia* L. (Aristolochiaceae) in Italy. Webbia 38: 221–300. https://doi.org/10.1080/00837792.1984.10670308

Natali A (1998) Le groupe *Galium lucidum* (Rubiaceae) dans le domaine cyrno-sarde. Candollea 53(2): 484–488.

Negri G (1950) Escursione della Società Botanica all'Isola d'Elba (aprile 1950). Appunti sulla vegetazione. Nuovo Giornale Botanico Italiano, nuova serie 57: 276–293.

Nunn PD (2004) Through a mist on the ocean: human understanding of island environments. Tijdschrift voor Economische en Sociale Geografie 95(3): 311–325. https://doi.org/10.1111/j.1467-9663.2004.00310.x

Ottens C (1967) Über Orchideenvorkommen auf der Insel Elba. Die Orchidee 18(2): 63–66.

Paoli P, Romagnoli G (1976) La flora vascolare dell'isola di Montecristo (Arcipelago Toscano). Webbia 30(2): 303–456. https://doi.org/10.1080/00837792.1976.10670055

Peruzzi L (2018) Floristic inventories and collaborative approaches: a new era for checklists and floras? Plant Biosystems 152(2): 177–178. https://doi.org/10.1080/11263504.2017.1419997

Peruzzi L, Bedini G (Eds) (2015 onwards) Wikiplantbase #Toscana v. 2.1. http://bot.biologia.unipi.it/wpb/toscana/index.html [accessed 1 March 2018]

Peruzzi L, Carta A (2011) *Crocus ilvensis* sp. nov. (sect. *Crocus*, Iridaceae), endemic to Elba Island (Tuscan Archipelago, Italy). Nordic Journal of Botany 29(1): 6–13. https://doi.org/10.1111/j.1756-1051.2010.01023.x

Peruzzi L, Carta A (2013) A taxonomic revision of *Silene nocturna* species complex (Caryophyllaceae) in Italy. Phytotaxa 88(3): 38–48. https://doi.org/10.11646/phytotaxa.88.3.1

Peruzzi L, Carta A, Gestri G, Pierini B (2009) Aggiornamenti e novità sulla distribuzione del genere *Gagea* (Liliaceae) in Toscana. Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 115(2008): 95–98.

Peruzzi L, Conti F, Bartolucci F (2014) An inventory of vascular plants endemic to Italy. Phytotaxa 168(1): 1–75. https://doi.org/10.11646/phytotaxa.168.1.1

Peruzzi L, Domina G, Bartolucci F, Galasso G, Peccenini S, Raimondo FM, Albano A, Alessandrini A, Banfi E, Barberis G, Bernardo L, Bovio M, Brullo S, Brundu G, Brunu A, Camarda I, Carta L, Conti F, Croce A, Iamonico D, Iberite M, Iiriti G, Longo D, Marsili S, Medagli P, Pistarino A, Salmeri C, Santangelo A, Scassellati E, Selvi F, Soldano A, Stinca A, Villani M, Wagensommer RP, Passalacqua NG (2015) An inventory of the names of vascular plants endemic to Italy, their loci classici and types. Phytotaxa 196(1): 1–217. https://doi.org/10.11646/phytotaxa.196.1.1

Peruzzi L, Jarvis CE, Carta A (2014) On the application of the Linnaean names *Cucubalus reflexus*, *Silene nocturna* and *Silene mutabilis* (Caryophyllaceae).Taxon 63(3): 651–652. https://doi.org/10.12705/633.6

Peruzzi L, Pierini B, Gestri G (2013) Notulae alla flora esotica d'Italia, 9: 185. Informatore Botanico Italiano 45(2): 308.

Peruzzi L, Viciani D, Angiolini S, Astuti G, Banfi E, Benocci A, Bonari G, Bruni G, Caramante P, Caré M, Carta A, Castagnini P, Cheli A, Ciampolini F, D'Antraccoli M, Ferretti G, Ferruzzi S, Fiaschi T, Foggi B, Fontana D, Galasso G, Gallo L, Galvani D, Gestri G, Grazzini A, Lastrucci L, Lazzaro L, Loppi S, Manganelli G, Mugnai M, Piazzini S, Pierini B, Roma-Marzio F, Sani A, Selvi F, Soldano A, Stinca A, Bedini G (2017) Contributi per una flora vascolare di Toscana. IX (507–605). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 124: 73–86.

Pierini B (2014) Segnalazioni 262–264. In: Peruzzi L, Viciani D, Bedini G (Eds) Contributi per una flora vascolare di Toscana. V (247–319). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 120(2013): 35–44.

Pierini B, Peruzzi L (2012) Notulae alla flora esotica d'Italia, 6: 136. Informatore Botanico Italiano 44(2): 399.

Pignatti S (1982a) Flora d'Italia, Vol. 1–3. Edagricole, Bologna.

Pignatti S (1982b) New species of *Limonium* from Italy and Tunesia. Webbia 36(1): 47–56. https://doi.org/10.1080/00837792.1982.10670239

Pignotti L (2003) *Scirpus* L. and related genera (Cyperaceae) in Italy. Webbia 58(2): 281–400. https://doi.org/10.1080/00837792.2003.10670754

R Development Core Team (2017) The R Foundation for Statistical Computing. version 3.4.3.

Rinaldi G (2000) Flora dell'Arcipelago Toscano. Ed. Archipelagos, Portoferraio, Livorno.

Rizzotto M (1999) Research on the genus *Limonium* (Plumbaginaceae) in the Tuscan Archipelago (Italy). Webbia 53(2): 241–282. https://doi.org/10.1080/00837792.1999.10670663

Roma-Marzio F, Bedini G, Müller, Peruzzi L (2016) A critical checklist of the woody flora of Tuscany. Phytotaxa 287(1): 1–135. https://doi.org/10.11646/phytotaxa.287.1.1

Roma-Marzio F, Najar B, Alessandri J, Pistelli L, Peruzzi L (2017) Taxonomy of prickly juniper (*Juniperus oxycedrus* group): a phytochemical-morphometric combined approach at the contact zone of two cryptospecies. Phytochemistry 141: 48–60. https://doi.org/10.1016/j.phytochem.2017.05.008

Scoppola A, Lattanzi E, Bernardo L (2016) Distribution and taxonomy of the Italian clovers belonging to *Trifolium* sect. *Vesicastrum* subsect. *Mystillus* (Fabaceae). Italian Botanist 2: 7–27. https://doi.org/10.3897/italianbotanist.2.10361

Signorini MA, Foggi B (1998) A survey of the genus *Festuca* L. (Poaceae) in Italy. *Festuca gamisansii* Kerguélen subsp. *aethaliae*, subsp. *nova*. Plant Biosystems 132(2): 105–112. https://doi.org/10.1080/11263504.1998.10654197

Signorini MA, Foggi B, Baldini R (Eds) (2002) Escursione all'Arcipelago Toscano. Atti e Resoconti Sociali. Informatore Botanico Italiano 34(1): 232–234.

Signorini MA, Tani C (2015) Numeri Cromosomici per la Flora Italiana: 1499. Informatore Botanico Italiano 47(1): 61–62.

Sommier S (1902) La flora dell'Arcipelago Toscano. Nuovo Giornale Botanico Italiano, nuova serie 9(2): 319–354.

Sommier S (1903) La flora dell'Arcipelago Toscano. Nota II. Nuovo Giornale Botanico Italiano, nuova serie 10(2): 133–200.

Tavormina G (2006) Succulente della flora italiana. Le specie esotiche naturalizzate in Italia. Piante Grasse 26(4): 140–150.

Thiébaut De Berneaud A (1808) Voyage a l'Isle d'Elbe, suivi d'une notice sur les autres isles de la Mer Tyrrhénienne. Colas, Paris.

Thomson SA, Pyle RL, Ahyong ST, Alonso-Zarazaga M, Ammirati J, Araya JF, Ascher JS, Audisio TL Azevedo-Santos VM, Bailly N, Baker WJ, Balke M, Barclay MVL, Barrett RL, Benine RC, Bickerstaff JRM, Bouchard P, Bour R, Bourgoin T, Boyko CB, Breure ASH, Brothers DJ, Byng JW, Campbell D, Ceríaco LMP, Cernák I, Cerretti P, Chang CH, Cho S, Copus JM, Costello MJ, Cseh A, Csuzdi C, Culham A, D'Elía G, d'Udekem d'Acoz C, Daneliya ME Dekker R, Dickinson EC, Dickinson TA, van Dijk PP, Dijkstra KB, Dima B, Dmitriev DA, Duistermaat L, Dumbacher JP, Eiserhardt WL, Ekrem T, Evenhuis NL, Faille A, Fernández-Triana JL, Fiesler E, Fishbein M, Fordham BG, Freitas AVL, Friol NR,

Fritz U, Frøslev T, Funk VA, Gaimari SD, Garbino GST, Garraffoni ARS, Geml J, Gill AC, Gray A, Grazziotin FG, Greenslade P, Gutiérrez EE, Harvey MS, Hazevoet CJ, He K, He X, Helfer S, Helgen KM, Heteren AH van, Hita Garcia F, Holstein N, Horváth MK, Hovenkamp PH, Hwang WS, Hyvönen J, Islam MB, Iverson JB, Ivie MA, Jaafar Z, Jackson MD, Jayat JP, Johnson NF, Kaiser H, Klitgård BB, Knapp DG, Kojima JI, Kõljalg U, Kontschán J, Krell FT, Krisai-Greilhuber I, Kullander S, Latella L, Lattke JE, Lencioni V, Lewis GP, Lhano MG, Lujan NK, Luksenburg JA, Mariaux J, Marinho-Filho J, Marshall CJ, Mate JF, McDonough MM, Michel E, Miranda VFO, Mitroiu MD, Molinari J, Monks S, Moore AJ, Moratelli R, Murányi D, Nakano T, Nikolaeva S, Noyes J, Ohl M, Oleas NH, Orrell T, Páll-Gergely B, Pape T, Papp V, Parenti LR, Patterson D, Pavlinov IY, Pine RH, Poczai P, Prado J, Prathapan D, Rabeler RK, Randall JE, Rheindt FE, Rhodin AGJ, Rodríguez SM, Rogers DC, Roque FO, Rowe KC, Ruedas LA, Salazar-Bravo J, Salvador RB, Sangster G, Sarmiento CE, Schigel DS, Schmidt S, Schueler FW, Segers H, Snow N, Souza-Dias PGB, Stals R, Stenroos S, Stone RD, Sturm CF, Štys P, Teta P, Thomas DC, Timm RM, Tindall BJ, Todd JA, Triebel D, Valdecasas AG, Vizzini A, Vorontsova MS, de Vos JM, Wagner P, Watling L, Weakley A, Welter-Schultes F, Whitmore D, Wilding N, Will K, Williams J, Wilson K, Winston JE, Wüster W, Yanega D, Yeates DK, Zaher H, Zhang G, Zhang ZQ, Zhou HZ (2018) Taxonomy based on science is necessary for global conservation. PLoS Biology 16(3): e2005075. https://doi.org/10.1371/journal.pbio.2005075

Troia A, Santangelo A, Gianguzzi L (2018) Nomenclatural remarks on *Carex* sect. *Sylvaticae* (Cyperaceae): *C. laxula* and related names. Phytotaxa 349(1): 79–84. https://doi.org/10.11646/phytotaxa.349.1.10

Vagge I, Biondi E (1999) La vegetazione delle coste sabbiose del Tirreno settentrionale italiano. Fitosociologia 36(2): 61–95.

Viegi L, Cela Renzoni G (1981) Flora esotica d'Italia: le specie presenti in Toscana. C.N.R., Coll. Progr. Final. "Promozione della Qualità dell'ambiente", AQ/1/132, Roma.

Vogiatzakis IN, Pungetti G, Mannion AM (2008) Mediterranean island landscapes: natural and cultural approaches. Springer Science & Business Media. https://doi.org/10.11646/phytotaxa.349.1.10

Whittaker RJ, Fernandez-Palacios JM (2013) Island Biogeography. Ecology, Evolution and Conservation. Oxford University Press, Oxford.

Zangheri P (1976) Flora Italica, Vol. 1–2. Cedam, Padova.

Supplementary material 1

Supplementary data

Authors: Angelino Carta, Leonardo Forbicioni, Giuliano Frangini, Brunello Pierini, Lorenzo Peruzzi

Data type: specimens data

Explanation note: 1. Floristic list and records. 2. Toponyms arranged by Operational Geographic Unit.

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RESEARCH ARTICLE

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Rediscovery of *Crocus biflorus* var. *estriatus* (Iridaceae) and its taxonomic characterisation

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Abstract

The Italian endemic *Crocus biflorus* usually shows white or lilac flowers with three-to-five striking violet longitudinal stripes on the outer tepals, but unstriped plants were recorded in the past. These plants were originally described as *C. annulatus* subvar. *estriatus*, and subsequently recombined as a variety of *C. biflorus*. The rediscovery of such plants in Toscana gave us the opportunity to clarify their systematic relationships, so that we typified the name, and performed karyological and ITS analyses. These plants share the same chromosome number ($2n = 2x = 8$) and ITS sequence with *C. biflorus* s. str.

Keywords

Chromosome number, Herbert, Italian endemics, ITS, typification

Introduction

The genus *Crocus* L. (Iridaceae) consists of about 200 recognized species, ranging from western Europe and north-western Africa to western China, with a centre of diversity in the Balkan Peninsula and in Turkey (Mathew 1982, Harpke et al. 2015, 2016, Peruzzi 2016).

This genus is currently subdivided in two sections (*C.* sect. *Crocus* and *C.* sect. *Nudiscapus* B.Mathew) and 15 series (Harpke et al. 2016). Among them, *C.* ser. *Biflori* B.Mathew is characterised by corms with membranous or coriaceous tunics generally

splitting into rings, trilobe style, and winter flowering (Mathew 1982). The type species of *C.* ser. *Biflori* is *Crocus biflorus* Mill., an Italian endemic (Harpke et al. 2016) occurring in all regions, with the exception of Valle d'Aosta and Sardegna (Bartolucci et al. 2018).

Although *C. biflorus* usually shows white or lilac flowers with three-to-five striking violet longitudinal stripes on the outer tepals (Maw 1886, Mathew 1982, Harpke et al. 2016), unstriped plants were recorded in the past (Mathew 1982). These plants were described by W. Herbert (1778–1847) as *C. annulatus* Herb. subvar. *estriatus* Herb. (Herbert 1841), and subsequently recombined by P.A. Tchichatscheff (1812–1890) as a variety of *C. biflorus* (Tchichatscheff 1860).

Herbert (1841) quoted this plant "*prope Florentia*" (near Firenze) for Toscana (Italy), and later Maw (1881), added the Chartreuse of Firenze and the Botanical Garden of Roma (Lazio) as further localities. Then, the name *C. biflorus* var. *estriatus* was used by Fiori (1908), who did not specify any locality and stated that this variety can be found in the same area of striped plants. Other authors of Italian floras (Parlatore 1860, Arcangeli 1882, Fiori 1923, Pignatti 1982, Colasante 2017) did not mention any name for plants showing unstriped tepals. On the contrary, Arcangeli (1882) used the name *C. biflorus* var. *lineatus* (Jan.) Nyman to indicate regularly striped plants.

During a field survey in Empoli (Firenze), we discovered a population of *C. biflorus* showing all the individuals marked by flowers with unstriped tepals (Fig. 1). This discovery gave us the opportunity to clarify the systematic relationships of these plants, so that we typified the name *Crocus annulatus* subvar. *estriatus* and we performed karyological and ITS analyses.

Material and methods

Typification of the name

According to Stafleau & Cowan (1979), the Herbert Herbarium is preserved at K, whereas other specimens cited in the protologue (i.e. Herbarium of J.D. Hooker and Herbarium of A.B. Lambert) are preserved at BM, E, G, K, and MANCH (herbarium acronyms follow Thiers 2018). Hence, for typification purposes, we searched for original material in these herbaria and carried out bibliographic investigations starting from the information published by Herbert (1841) along with the protologue.

Karyological and molecular analyses

Plants were collected in Empoli (Firenze, Toscana) (Fig. 1). The population, uniformly made by plants with unstriped flowers, consisted of about 210 individuals and covered an area of approximately 110 m^2.

Figure 1. *Crocus biflorus* var. *estriatus* from the epitype locality in Empoli, Firenze (photos by L. Peruzzi).

For the karyological study, young developing ovaries were pre-treated with 0.4% colchicine for 3 hours and then fixed in Carnoy fixative solution for 1 hour. Then, after hydrolysis in HCl 1N at 60° C, the material was stained in leuco-basic fuchsine. Meristematic cells were squashed on a slide, adding a drop of acetic orceine, and then analysed under light microscope for the detection of metaphasic plates.

Genomic DNA was extracted from about 10 mg of silica-dried leaf material with the DNeasy Plant DNA Extraction Kit (Qiagen) according to the protocol of the manufacturer. DNA concentration and quality were afterwards checked on 0.8% agarose gels. The ITS region (ITS1, 5.8S rDNA, ITS2) was amplified using the primers ITS-A and ITS-B (Blattner 1999), according to Harpke et al. (2013). Both strands of the PCR products were directly sequenced with Applied Biosystems BigDye Terminator technology on an ABI 3730xl automatic DNA sequencer using the primers from PCR amplifications. Forward and reverse sequences from each directly sequenced amplicon were inspected, manually edited where necessary, and combined in a single consensus sequence. The sequence obtained in this study was deposited in the EMBL nucleotide database under accession number LS991340. The derived ITS sequences were compared to the already published sequence data of *C. biflorus* s. str. (Harpke et al. 2016).

Geographical distribution

In order to investigate the distribution of *Crocus biflorus* var. *estriatus*, we studied specimens from the two main Tuscan herbaria of FI and PI, including the separate collections PI-ARC, PI-CAR, PI-GUAD, PI-PASS, and PI-PELL. Finally, using QGIS 2.18 software, we georeferenced all the specimens and literature data in order to draw a distribution map.

Specimina visa

ITALY. **Tuscany**. Dans les prairies des Cascines, Florence, 26 February 1850, *T. Caruel* (PI-CAR); Prairie des Cascine pres Florence, Italie, 20 February 1861, *T. Caruel* (PI); Cascine, Florence, February 1870, *A. Archbald* (FI); Firenze a Boboli, March 1872, *Scafferi* (FI); abunde in pratis ambulacri florentini "le Cascine", 20 February 1874, *E. Levier* (FI); in prati seccis ambulacrum le Cascine prope Florentiam, 13 February 1876, *J. Arcangeli* (PI-ARC); Cascine di Firenze nel prato misto con la [?], February 1880, *U. Martelli* (FI); Environs de Florence (Italie): prairies surtout dans les cascines, March 1888, *H. Groves* (FI); Firenze nei prati delle Cascine, 19 March 1898, *U. Martelli* (PI); Cascine prope Florentiam, in pratis, 4 March 1903, *G. Stefanini* (FI); prope Florentiam (Firenze), vulgatus in pratis loco dicto Le Cascine, 10 March 1904, *R. Pampanini et P. Baccarini* (FI, PI-GUAD); prope Florentiam alle Cascine, prato al Quercione (ora al Calcio), 9 January 1916, *G. Gervasi* (FI); Empoli (Firenze), sul Lungarno poco prima di giungere alla Tinaia provenendo da Empoli (WGS84: 43.734473 N, 10.964509 E), incolto con prevalenza di *Dactylis glomerata* e *Artemisia verlotiorum*, 27 m s.l.m., 28 January 2018, *L. Peruzzi et F. Roma-Marzio* (PI n° 011333–011336); Empoli (Firenze), presso la foce dell'Orme (WGS84: 43.726944 N, 10.951719 E), incolto con prevalenza di *Dactylis glomerata* e *Artemisia verlotiorum*, 22 m s.l.m., 28 January 2018, *L. Peruzzi et F. Roma-Marzio* (PI n° 011337). **Campania**. Valle di San Rocco, 24 April 1834, *A. Orsini* (FI); *ibidem*, February 1869, *coll. illeg.* (PI-CAR); Valle di S. Rocco, 1893, *Avellino* (FI).

Typification of the name

***Crocus biflorus* Mill. var. *estriatus* (Herb.) Tchich., Asie Min., Bot. 2: 520 (1860)**

≡*Crocus annulatus* Herb. subvar. *estriatus* Herb., Botanical Magazine 67: t. 3862. (1841)
≡*Crocus annulatus* Herb. var. *estriatus* (Herb.) Herb., J. Hort. Soc. London 2: 286 (1847)
≡*Crocus biflorus* Mill. var. *estriatus* (Herb.) Maw *comb. superfl.* Gard. Chron. 16: 749 (1881)

Lectotype (here designated): *Crocus pusillus*. Edward's Bot. Reg., 23: plate 1987 [icon] (image available at: https://biodiversitylibrary.org/page/240669). **Epitype** (here designated): Empoli (Firenze), sul Lungarno poco prima di giungere alla Tinaia provenendo da Empoli (WGS84: 43.734473 N, 10.964509 E), incolto con prevalenza di *Dactylis glomerata* e *Artemisia verlotiorum*, 27 m s.l.m., 28 January 2018, *L. Peruzzi et F. Roma-Marzio* (PI n° 011333; isoepitypes PI n° 011334; PI n° 011335; PI n° 011336. Image of epitype and isoepitypes are available at: http://herbarium.univie.ac.at/database/search.php?collection=PI).

In the protologue, Herbert (1841) refers to an iconography of "*Crocus pusillus*" published by Lindley (1837) and quotes two specimens: a first one collected in "*Tiflim*" (probably Tiflis, an old name for Tiblisi the capital of Georgia) in the Her-

barium of J.D. Hooker (1817–1911), and a second one from an unspecified eastern locality ("*Spec. orientale*") collected by P.S. Pallas (1741–1811) and preserved in the Herbarium of A.B. Lambert (1761–1842).

In all the investigated herbaria we did not find specimens recognisable as original material (Art. 9.3 of ICN, Turland et al. 2018), so that we selected as lectotype the illustration published by Lindley (1837), i.e. the only available original material. This illustration clearly shows cultivated plants with unstriped tepals, whose original provenance is indicated as "native of the southern parts of Italy" by Lindley (1837). Anyway, to avoid any possible ambiguity concerning the application of this name (Art. 9.8 of ICN), we also designated an epitype collected in Empoli, not far for Firenze, a locality explicitly cited in the protologue by Herbert (1841).

Karyology, molecular systematics, and distribution

Our karyological analysis revealed a diploid chromosome count $2n = 2x = 8$ (Fig. 2), whereas ITS sequence is 665 bp long and is identical to that of regularly striped *Crocus biflorus* individuals from its type locality.

Concerning the distribution of unstriped plants, according to herbarium and literature data they are recorded for three different localities in the province of Firenze (Toscana), for a single locality in Campania near Napoli, and for the Botanical Garden of Roma, albeit the only currently confirmed locality is that from Empoli, Firenze (Fig. 3).

Figure 2. *Crocus biflorus* var. *estriatus*: metaphasic plate with $2n = 2x = 8$ chromosomes. Scale bar: 10 μm.

Discussion

Unstriped plants share the same chromosome number ($2n = 2x = 8$) with *C. biflorus* s. str. (Brighton et al. 1973, Baldini 1993, Illuminati et al. 1995, Campo et al. 1999, Peruzzi and Cesca 2002). Brandizzi and Grilli Caiola (1997) published a $2n = 18$ chromosome count, putatively obtained from plants collected near Roma; however, as pointed by Bedini et al. (2010 onwards) this count is certainly erroneous, very likely due to a typo in the original paper, where indeed the basic chromosome number is reported as $x = 4$. In addition, ITS sequence is identical to that of *C. biflorus* s. str.

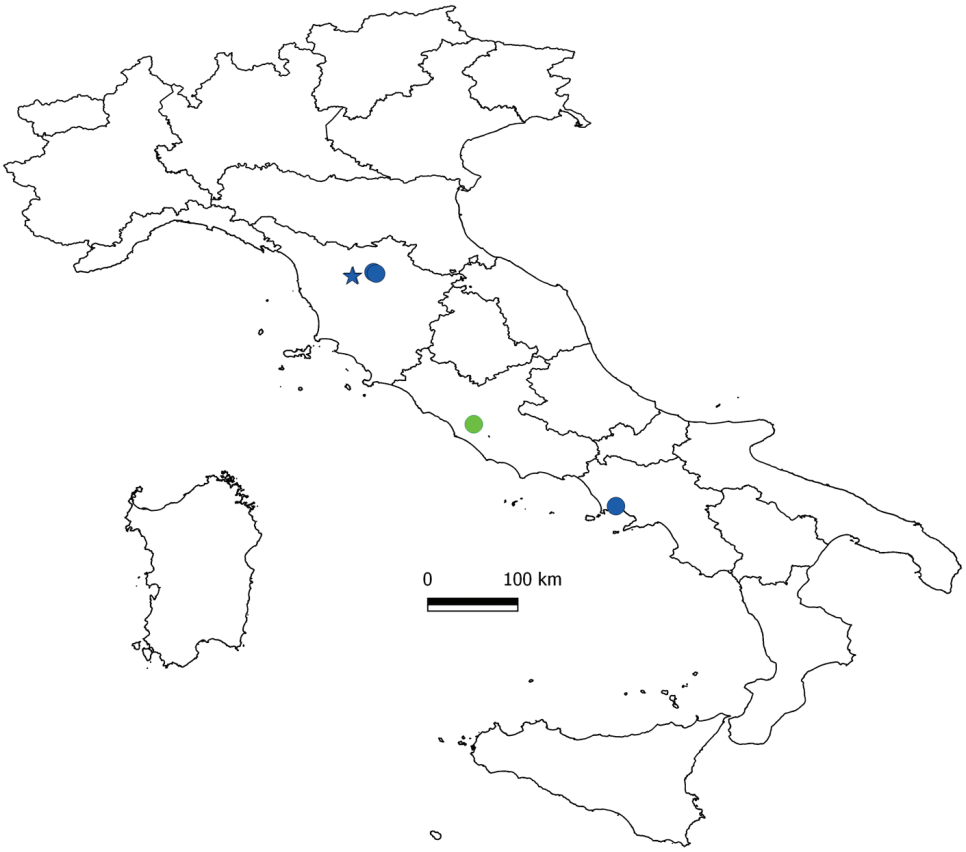

Figure 3. Distribution map of *Crocus biflorus* var. *estriatus*, based on historical herbarium specimens (blue dots) and historical literature (green dots). The blue star represents the newly discovered population (Empoli), which is also the only currently confirmed.

individuals from type locality, again from Toscana (Harpke et al. 2016). These results confirm that unstriped plants fall within the variability of *C. biflorus*, so that a taxonomic treatment at varietal level is appropriate.

Given that *C. biflorus* is an Italian endemic species (Harpke et al. 2016, Bartolucci et al. 2018), after the typification of the name *C. annulatus* subvar. *estriatus* on Italian material, we can assume that the unstriped plants from eastern Mediterranean localities cited in the protologue by Herbert (1841) certainly refer to other taxa. In fact, Harpke et al. (2016) demonstrated that all the 23 previously recognized subspecies of *C. biflorus*, ranging from Balkan Peninsula to Caucasus and Iran, represent independent evolutionary lineages, which should be treated at species level.

Considering that many crocuses are known as popular ornamentals (Harpke et al. 2013), the hypothesis that the spread in Italy of *C. biflorus* var. *estriatus* may have been favoured/caused by human activity is consistent with the distribution of unstriped plants in Italy, since they have been found always not far from urban centres (Herbert 1841, Maw 1881).

References

Arcangeli G (1882) Compendio della flora italiana, E. Loescher, Torino, 889 pp.

Baldini RM (1993) Numeri Cromosomici per la Flora Italiana: 1284–1289. Informatore Botanico Italiano 24(3) (1992): 189–195.

Bartolucci F, Peruzzi L, Galasso G, Albano A, Alessandrini A, Ardenghi NMG, Astuti G, Bacchetta G, Ballelli S, Banfi E, Barberis G, Bernardo L, Bouvet D, Bovio M, Cecchi L, Di Pietro R, Domina G, Fascetti S, Fenu G, Festi F, Foggi B, Gallo L, Gottschlich G, Gubellini L, Iamonico D, Iberite M, Jiménez-Mejías P, Lattanzi E, Marchetti D, Martinetto E, Masin RR, Medagli P, Passalacqua NG, Peccenini S, Pennesi R, Pierini B, Poldini L, Prosser F, Raimondo FM, Roma-Marzio F, Rosati L, Santangelo A, Scoppola A, Scortegagna S, Selvaggi A, Selvi F, Soldano A, Stinca A, Wagensommer RP, Wilhalm T, Conti F (2018) An updated checklist of the vascular flora native to Italy. Plant Biosystems 152(2): 179–303. https://doi.org/10.1080/11263504.2017.1419996

Bedini G, Garbari F, Peruzzi L [Eds] (2010 onwards) Chrobase.it – Chromosome numbers for the Italian flora. http://bot.biologia.unipi.it/chrobase/index.php [Accessed 25 July 2018]

Blattner FR (1999) Direct amplification of the entire ITS region from poorly preserved plant material using recombinant PCR. Biotechniques 29: 1180–1186. https://doi.org/10.2144/99276st04

Brandizzi F, Grilli Caiola M (1997) Quantitative DNA analysis in different *Crocus* species (Iridaceae) by means of flow cytometry. Giornale Botanico Italiano 130 (1996): 643–645.

Brighton CA, Mathew B, Marchant CJ (1973) Chromosome counts in the genus *Crocus* (Iridaceae). Kew Bulletin 28(3): 451–464. https://doi.org/10.2307/4108890

Campo G, Romano S, Marcenò C (1999) Numeri Cromosomici per la Flora Italiana. Informatore Botanico Italiano 30 (1998): 47–51.

Colasante M (2017) Iridaceae. In: Pignatti S (Ed.) Flora d'Italia Ed. 2, vol. 1. Edagricole-New Business Media, Milano, pp. 277–319.

Fiori A (1908) Flora analitica d'Italia vol. 4(3). Tipografia del Seminario, Padova.

Fiori A (1923) Nuova flora analitica d'Italia vol. 1(2). Firenze.

Harpke D, Carta A, Tomović G, Ranđelović V, Ranđelović N, Blattner FR, Peruzzi L (2015) Phylogeny, karyotype evolution and taxonomy of *Crocus* ser. *Verni* (Iridaceae). Plant Systematics and Evolution 301(1): 309–325. https://doi.org/10.1007/s00606-014-1074-0

Harpke D, Meng S, Rutten T, Kerndorff H, Blattner FR (2013) Phylogeny of *Crocus* (Iridaceae) based on one chloroplast and two nuclear loci: ancient hybridization and chromosome number evolution. Molecular Phylogenetics and Evolution 66: 617–627. https://doi.org/10.1016/j.ympev.2012.10.007

Harpke D, Kerndorff H, Pasche E, Peruzzi L (2016) Neotypification of the name *Crocus biflorus* Mill. (Iridaceae) and its consequences in the taxonomy of the genus. Phytotaxa 260(2): 131–143. https://doi.org/10.11646/phytotaxa.260.2.3

Herbert W (1841) *Crocus annulatus* subvar. *estriatus*. Curtis's Botanical Magazine 67: t. 3862.

Herbert W (1847) A history of the species of *Crocus*. Journal of the Horticultural Society of London 2: 249–292.

Illuminati O, Spinosi K, Bianchi G, Marchi P (1995) Numeri Cromosomici per la Flora Italiana: 1358–1371. Informatore Botanico Italiano 27(2–3): 261–274.

Lindley G (1837) *Crocus pusillus*. Edward's Botanical Register, new series 23: 1987.

Mathew B (1982) The Crocus. A Revision of the genus *Crocus* (Iridaceae). Timber Press Inc., Portland, 224 pp.

Maw G (1886) A monograph of the genus *Crocus*. Dulau & Co., Soho Square, London, 520 pp.

Parlatore F (1860) Flora Italiana vol. 3(2). Tipografia Le Monnier, Firenze.

Peruzzi L (2016) *Crocus heuffelianus* (Iridaceae), a new record for the Italian flora. Phytotaxa 261(3): 291–294. https://doi.org/10.11646/phytotaxa.261.3.10

Peruzzi L, Cesca G (2002) Reports 1295–1304. In: Kamari G, Blanché C, Garbari F (Eds), Mediterranean chromosome number reports: 12. Flora Mediterranea 12: 461–470.

Pignatti S (1982) Flora d'Italia, vol. 3. Edagricole, Bologna, 780 pp.

Stafleau FA, Cowan RS (1979) Taxonomic Literature Ed. 2, vol. 3. W. Junk publishers, The Hague, 991 pp.

Tchichatscheff PA (1860) Asie mineure description physique, statistique et archéologique. Botanique, vol. 2. Paris, 683 pp.

Thiers B (2018) Index Herbariorum: a global directory of public herbaria and associated staff. http://sweetgum.nybg.org/ih [Accessed 8 May 2018]

Turland NJ, Wiersema JH, Barrie FR, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Kusber WH, Li DZ, Marhold K, May TW, McNeill J, Monro AM, Prado J, Price MJ, Smith GF [Eds] (2018) International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159. Koeltz Botanical Books, Glashütten. https://doi.org/10.12705/Code.2018

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RESEARCH ARTICLE

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Global and Regional IUCN Red List Assessments: 6

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Abstract

In this contribution, the conservation status assessment of four vascular plants according to IUCN categories and criteria are presented. It includes the assessment of *Epipactis maricae* (Croce, Bongiorni, De Vivo & Fori) Presser & S.Hertel at global level, and the regional assessment of *Cerinthe retorta* Sm. (Italy), *Platanthera kuenkelei* H.Baumann subsp. *kuenkelei* (Europe) and *Typha elephantina* Roxb. (Egypt).

Keywords

conservation, extinction risk, IUCN protocol, threats

How to contribute

The text of the global and regional assessment should be submitted electronically to Simone Orsenigo (Simone.Orsenigo@unimi.it) or to Giuseppe Fenu (gfenu@unica.it); text up to 8000 characters in length (space included) must include a distribution map and a picture of the assessed species.

Red List assessments

Epipactis maricae (Croce, Bongiorni, De Vivo & Fori) Presser & S.Hertel

Global Assessment
Taxonomy and nomenclature
Order: Asparagales *Family*: Orchidaceae

Epipactis maricae (Croce, Bongiorni, De Vivo & Fori) Presser & S.Hertel, Ber. Arbeitskreis. Heimische Orchid. 32(2): 108 (2016) = *Epipactis nordeniorum* Robatsch subsp. *maricae* Croce, Bongiorni, De Vivo & Fori, J. Eur. Orch. 43 (4): 837 (2011)

Common name: Elleborina del Savone (It), Marica's Helleborine (En).

Geographic distribution range: *Epipactis maricae* (Fig. 1) is endemic to the Roccamonfina Volcano (Campania, Italy; Croce et al. 2011). This species was observed only in three sites, located along the deep gorge of the "Savone delle Ferriere" stream (Fig. 2). Further explorations of the lower traits of the stream and of other similar sites on the volcano have been unfruitful.

Distribution: Country of occurrence: Italy.

Biology: *Plant growth form*: perennial (geophyte)

Flowering and fruiting time: from July to August.

Reproduction: *Epipactis maricae* is an autogamous (Croce et al. 2011), probably cleistogamous, plant species. Fruits develop quickly after flowering so that, in the same spike, the lower flowers are fruiting while the top ones are still in bud. It is an anemochorous species; no information on seed germination is available.

Habitat and Ecology: *Epipactis maricae* grows in riparian communities, in shady conditions due to the high tree coverage and the steep slopes of the deep and narrow gorge of the "Savone delle Ferriere" stream, always on wet sandy banks, from 290 to 580 m a.s.l. (Croce and Nazzaro 2012).

Population information: Population dynamics have been monitored since the discovery of this species in 1999. In the largest subpopulation at the *locus classicus* (south-west of the village of Furnolo), the number of ramets fluctuates, with no plants emerging in the driest summer and a maximum of 35 ramets in the favourable years. The other two subpopulations have not been observed again in the last five years.

Threats:

6.1. *Recreational activities*: fishermen and excursionists trampling on the sandy banks have a negative impact on habitat (soil compaction) and mature individuals.

7.3 *Other ecosystem modifications*: severe alteration of the riparian vegetation (tree cutting or falling due to landslides or floods) could affect the environmental conditions (light or soil moisture) of the banks.

8.1.2 *Invasive non-native/alien species (named species)*: in all sites the quick expansion of *Impatiens balfourii* Hook.f. can pose a serious threat to the habitat of the species.

11.4 *Storms & floodings*: landslides, collapse of overhanging cliffs, and floods affect bank morphology by erosion or sediment deposition.

Figure 1. *Epipactis maricae* at the *locus classicus* on the Savone delle Ferriere stream, near the village of Furnolo (Teano, Caserta). Pictures by A. Croce.

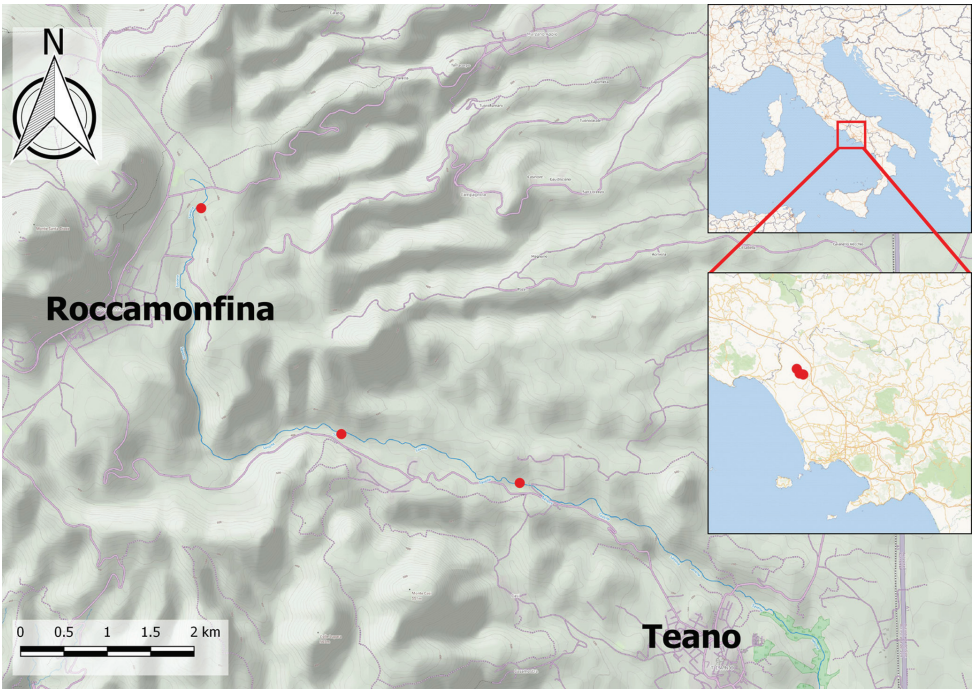

Figure 2. Geographic range and distribution map of *Epipactis maricae*.

CRITERIA APPLIED:

Criterion B: **EOO**: 4 km^2 calculated with a minimum convex hull polygon in QGIS Desktop 2.18.15

a) Number of locations: one, according to threat 11.4

b) Documented decline in quality of the habitat (iii) and number of mature individuals (v)

Criterion D: Number of mature individuals < 50

Red List category and Criteria (Global Assessment)

CR	**Critically Endangered**	**B1ab(iii,v) + D**

Rationale for the assessment: *Epipactis maricae* is an Italian endemic species threatened by alteration of its habitat: it has an EOO of 4 km^2. The known populations are made up of few individuals (less than 50), growing in a very narrow and short belt along the stream. It is, therefore, assessed as Critically Endangered (CR) at a global level.

Previous assessment: Critically Endangered (CR B1ab(v)+2ab(v)+D) at global level (Orsenigo et al. 2018).

Conservation actions: All orchids are protected at the Regional level (LR 40/1996). All populations fall within the Roccamonfina-foce Garigliano natural Park.

Conservation actions needed: Further monitoring and research activities are recommended to assess the presence of the species in similar habitats in other gorges on the volcano or along the Savone stream at lower altitudes. *Ex situ* conservation actions are also recommended.

Antonio Croce, Luciano Bongiorni

Cerinthe retorta Sm.

Regional assessment (Italy)

Taxonomy and nomenclature

Order: Boraginales *Family*: Boraginaceae

Cerinthe retorta Sm., Fl. Graec. Prodr. 1(1): 120 (1806) = *Cerinthe purpurea* Vis., Flora 12(1, Ergänzungsbl.): 8 (1829) = *Cerinthe atropurpurea* Vis. *ex* A.DC., Prodr. 8: 4 (1844).

Common name: Violet honeywort (En).

Geographic distribution range: *Cerinthe retorta* (Fig. 3) grows in Turkey, SE-Europe, and Italy (Selvi et al. 2009, Valdés 2011, Wagensommer et al. 2014). In Italy, it occurs only in Puglia, with a single population on the Gargano Promontory, Valle dell'Inferno, in the municipality of San Giovanni Rotondo (Fig. 4).

Figure 3. *Cerinthe retorta* in Valle dell'Inferno (San Giovanni Rotondo, Italy). Picture by R.P. Wagensommer.

Figure 4. Geographic range and distribution map of *Cerinthe retorta* in Italy.

Distribution: Countries of occurrence: Turkey, Greece, Macedonia, Albania, Italy, and doubtfully Croatia.

Biology: *Plant growth form*: Annual (therophyte). Chromosome number: 2*n* = 18 (material from Greece; Selvi et al. 2009).

Flowering and fruiting time: Flowering from late March to early May, fruiting in May.

Reproduction: Pollination by bees; no information is available on seed germination.

Habitat and Ecology: In Italy, *C. retorta* grows on calcareous rocky slopes, directly on the rocks or among the rocks, at an altitude of 380-400 m a.s.l. Nevertheless, in the Aegean region this species occurs also in secondary sites, such as fields, ruderal sites, road margins, and olive groves (Selvi et al. 2009).

Population information: In Italy, *C. retorta* was first recorded in 2013. In 2013 and 2015, about 240 flowering plants were counted, while in 2014 and 2016 only about 50 flowering plants were present. These fluctuations are natural, given that *C. retorta* is an annual species.

Threats:

2.3.1 *Nomadic grazing*: The area in which the species grows is, sometimes, affected by goat grazing. However, during the monitoring period (2013-2016), grazing did not concern the population of *C. retorta*.

5.2.1 *Gathering terrestrial plants (intentional use):* The species could be affected by collection for its beauty during the flowering period and for scientific purposes by botanists. However, the growing site is far from roads and, therefore, it is visited by a small number of people spending time in nature.

CRITERIA APPLIED:

Criterion D: number of mature individuals: < 250.

Red List category and Criteria (Regional Assessment)

EN	**Endangered**	**D**

Rationale for the assessment: In Italy, *Cerinthe retorta* occurs in a single locality, in an area of approximately 10.000 m^2. The monitoring programme demonstrated that the identified threats are only hypothetical and no continuing decline is expected. In addition, fluctuations in the number of mature individuals are natural. Therefore, criteria B and C cannot be used. Given the number of mature individuals, constantly less than 250 during the four years of monitoring, the species is attributed to the category Endangered (EN), according to criterion D.

Previous assessment: The species was recently recorded in Italy, and assigned to the category Critically Endangered (CR) (Wagensommer et al. 2014). To date, the species was not evaluated (NE) both at global and European levels (Bilz et al. 2011, IUCN 2018).

Conservation actions: *Cerinthe retorta* is not protected by international, national or regional laws. No seed collection from the Italian population exists in germplasm

banks. The Italian growing site is included in the National Park of Gargano and in two Natura 2000 sites: "Valloni e steppe pedegarganiche" (SCI IT9110008) and "Promontorio del Gargano" (SPA IT9110039).

Conservation actions needed: Research activities and a monitoring programme are recommended in order to better understand the reproductive biology and the population trend of the species. *Ex situ* genome resource banking is also recommended within plant translocation programmes aimed at increasing the very low number of individuals of the unique Italian population.

Robert Philipp Wagensommer, Enrico Vito Perrino

Platanthera kuenkelei H.Baumann subsp. *kuenkelei*

Regional assessment (Europe)
Taxonomy and nomenclature
Order: Asparagales *Family:* Orchidaceae

Platanthera kuenkelei H.Baumann, Mitt. Arbeitskreis Heimische Orchid. Baden-Württemberg. 13: 120 (1981) = *Platanthera bifolia* var. *kuenkelei* (H.Baumann) P.Delforge, Naturalistes Belges. 81: 398 (2000) = *Platanthera bifolia* subsp. *kuenkelei* (H.Baumann) Kreutz, Kompend. Eur. Orchid.: 133 (2004).

Common name: Platantera di Künkele (It), Butterfly orchid of Künkele (En).

Geographic distribution range: The current distribution of *Plantathera kuenkelei* H.Baumann subsp. *kuenkelei* (Fig. 5) in Europe consists of a single population located in central-western Sardinia; the nearest populations are reported for Tunisia and Algeria (Fig. 6).

Distribution: Countries of occurrence: Italy (Sardinia), Algeria, Tunisia.

Biology: *Plant growth form:* perennial (geophyte).

Flowering and fruiting time: Flowering from late May to June and fruiting from June to July.

Reproduction: No information on pollination, dispersal strategy and seed germination is available.

Habitat and Ecology: This species shows a relatively narrow ecological range. The unique Sardinian population grows on basaltic substrate near Monte Sant'Antonio (Borore municipality), at about 700 m a.s.l. It is a member of plant communities characterised by *Quercus ichnusae* Mossa, Bacch. & Brullo, *Quercus ilex* L., *Quercus suber* L., and *Ilex aquifolium* L. Its habitat is dominated by *Smilax aspera* L., *Hedera helix* L., *Clematis vitalba* L., *Rubus ulmifolius* Schott, *Rosa sempervirens* L., and *Crataegus monogyna* Jacq.

Population information: There is no detailed information available on population dynamics.

Figure 5. Inflorescence of *Platanthera kuenkelei* H.Baumann subsp. *kuenkelei*. Photograph by V. Rodi.

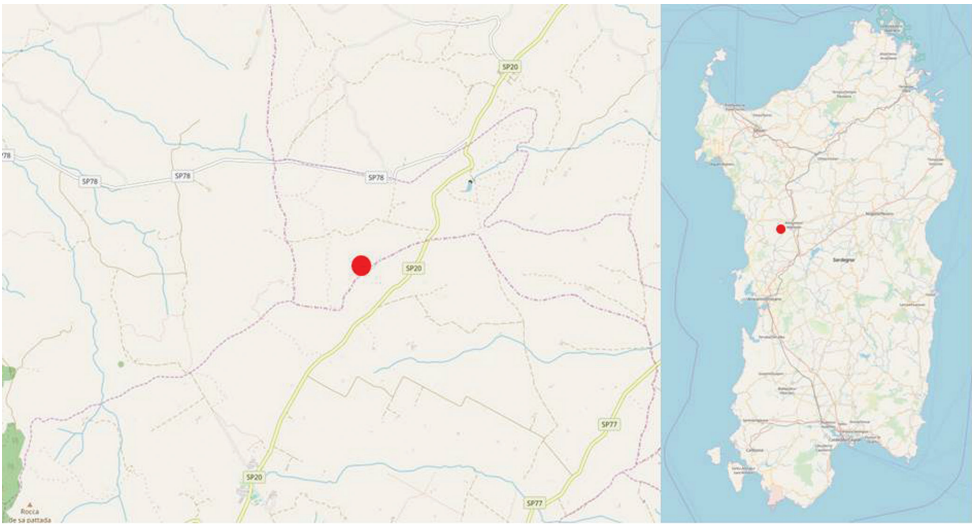

Figure 6. Geographic range and distribution map of *Platanthera kuenkelei* H.Baumann subsp. *kuenkelei* in Sardinia.

Threats:

2.3.1 *Nomadic grazing:* The high number of wild boars (*Sus scrofa*) during the reproductive stage could limit the fitness of this unit.

2.2 *Wood plantations:* silvicultural activities could cause damage to the population.

5.2 *Gathering terrestrial plants:* the only known European population is subject to the attendance of photographers and orchid lovers that might harm plants.

CRITERIA APPLIED:

Criterion B: **AOO:** 4 km^2 calculated with a 2×2 km cell fixed grid

Decline: observed decline in number of mature plants (v).

Criterion C: Population estimated in less than 250 mature plants. Continuous decline observed in the number of mature individuals. Population structure with no subpopulations consisting of more than 50 mature individuals.

Criterion D: Population estimated in less than 50 mature individuals; in the last monitoring (June 2018) only 40 mature individuals were observed.

Red List category and Criteria (Regional Assessment)

CR	**Critically Endangered**	**B2ab(v)+C2a(i)+D**

Rationale for the assessment: The Sardinian population of *Plantathera kuenkelei* subsp. *kuenkelei* is the only population occurring in Europe. Public actions to clean up the underwood in order to prevent fires might seriously damage the population. Moreover, the small size of the population (less than 50 individuals), the observed grazing impact and the frequent visit of orchid photographers caused a decline. For this reason, this plant is assessed as Critically Endangered.

Previous assessment: The taxon was not evaluated previously (NE) (IUCN 2018).

Conservation actions: *Platanthera kuenkelei* H.Baumann subsp. *kuenkelei* is not protected by international, national and regional laws. A fence was built to protect the population from the destructive action of animals and humans.

Conservation actions needed: Research activities and especially monitoring programs are encouraged in order to better understand the reproductive biology of this species; *ex situ* conservation and germination could prevent the risk of extinction.

Notes: Morphometric investigations confirm the close relationship with the populations from North Africa. Genetic analyses support the morphometric analyses and show that European and African populations can be both ascribed to the same subspecies. *Platanthera kuenkelei* differs from *P. algeriensis* for its ecology (it prefers sunny and wet meadows) and for its greenish flowers. In comparison with *P. bifolia*, *P. kuenkelei* is generally taller (50-80 cm) and shows a higher number of flowers (30-60 per inflorescence; Pavarese et al. 2011).

Michele Lussu, Annalena Cogoni, Pierluigi Cortis

Typha elephantina Roxb.

Regional Assessment (Egypt)
Taxonomy and nomenclature
Order: Poales *Family:* Typhaceae

Typha elephantina Roxb. Fl. Ind. 3: 566 (1832) = *T. maresii* Batt., Bull. Soc. Bot. France 34: 389 (1887), *T. schimperi* Rohrb., Verh. Bot. Vereins Prov. Brandenburg 11: 95 (1869)

Common name: Dees, Burdi Elhor (Arabic); Hogla, Indian Reedmace (En).

Geographic distribution range: *Typha elephantina* (Fig. 7) is widespread across Africa, Middle East and southern Asia (Burkill 2000, Boulos 2005). In Egypt, it was recorded in Wadi Natrun by Boulos (2005) and, in particular, on the banks of Al-Gaar, El-Baida, El Khadra, El Fasda, and El-Hamra lakes (Abd El-Ghani et al. 2014) and in Sinai, in the oasis of Ein umm Ahmed, by Danin et al. (1985). However, the Sinai population was no longer confirmed (Boulos 1995, El-Amier 2013). Currently, its distribution in Egypt is restricted to the Wadi Natrun (Fig. 8) only, along the edges of three lakes: Al-Gaar, El-Baida and El-Hamra (unpublished data).

Distribution: Countries of occurrence: Algeria, Chad, China, Egypt, Eritrea, Ethiopia, India, Iran, Israel, Jordan, Libya, Morocco, Myanmar, Nepal, Niger, Pakistan, Palestine, Saudi Arabia, Senegal, Tajikistan, Turkmenistan, Uzbekistan, and Yemen.

Biology: *Plant growth form:* perennial (geophyte).

Flowering and fruiting time: Flowering from June to July, fruiting from September to November.

Reproduction: By seed and vegetative propagation. Wind-pollinated. Seed dispersal anemochorous.

Habitat and Ecology: *Typha elephantina* grows on swamps and sandy terraces bordering permanent lakes of fresh or brackish waters (Boulos 2005, Zahran and Willis 2009). This species typically occurs on muddy soils, rich in organic matter (Zahran and Willis 2009) and in fresh water where the total soluble salts not exceeds 2000 ppm (Abd El-Ghani et al. 2014).

Population information: There is no available detailed information on population dynamics. According to Abdelaal (2013), *T. elephantina* population surface-area was ca. 0.25 km^2; however, the authors observed a decrease to ca. 0.01 km^2 during the last years (unpublished data). Accordingly, also the number of mature individuals can be considered in decline.

Threats:

1.1 *Housing & urban areas:* There is an increase in the urban areas along banks of the lakes.

2.1 *Annual & perennial non-timber crops (2.1.2 Small-holder farming):* Agriculture and newly-reclaimed lands have replaced most of the native habitats.

Figure 7. *Typha elephantina* Roxb. in El-Baida Lake, Wadi Natrun (Egypt). Plants living in their natural habitat and spikes. Pictures by M. Abdelaal.

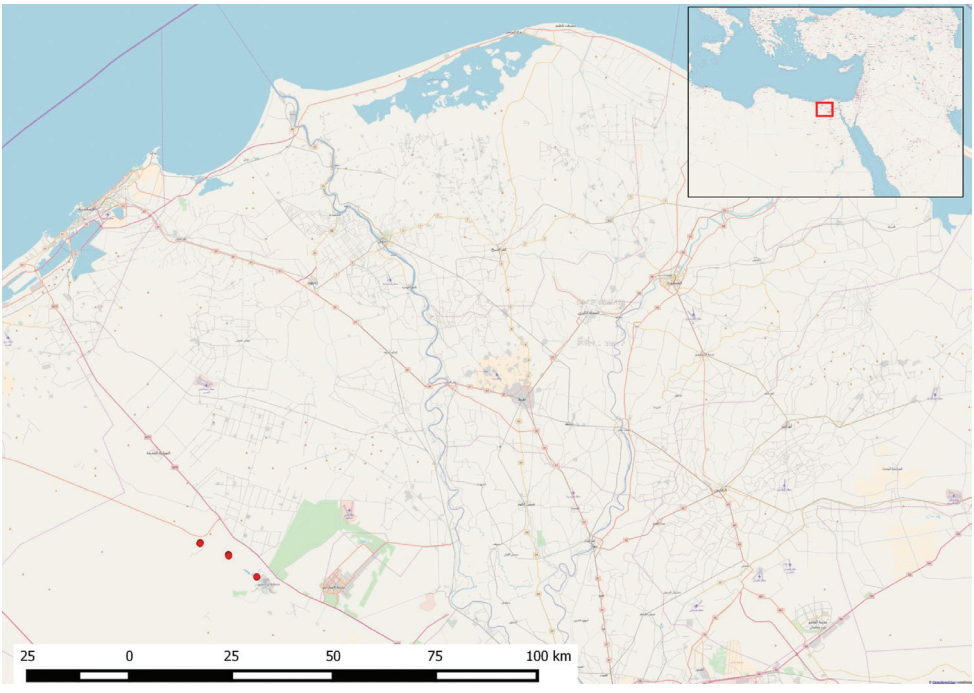

Figure 8. Geographic range and distribution map of *Typha elephantina* in Egypt.

2.3 *Livestock farming & ranching (2.3.1 Nomadic grazing):* All populations are influenced by cattle and sheep trampling.

5.2.1 *Intentional use (species being assessed is the target)*: the plant is used by local inhabitants as a source of fuel during cooking in the absence of alternative combustibles, for making fences, mats, huts, mattresses and paper manufactures.

7.2 *Dams & Water Management/Use: Typha elephantina* vegetation has been replaced in some areas by *Phragmites australis* (Cav.) Trin. ex Steud. and *T. domingensis* (Pers.) Steud., due to changes in water flow patterns from their natural range and due to an increase in salinity levels.

11.4 *Storms and flooding*: Al-Gaar Lake locality is subjected to occasional heavy rainstorms, causing exceptional flash flooding that may affect the environmental conditions needed by this species.

CRITERIA APPLIED:

Criterion B: **AOO:** 12 km^2 calculated with a 2×2 km cell fixed grid
EOO: 12 km^2 calculated with minimum convex hull in ArcGIS 9.1

a) Number of locations: three locations (Al-Gaar, El-Baida and El-Hamra) have been identified according to the main threats 1.1. and 2.1.2.

b) Decline: continuing decline was observed in EOO (i), quality and extent of the habitat (iii) and number of mature individuals (v).

Red List category and Criteria (Regional Assessment)

EN	**Endangered**	**B1ab(i,iii,v) + 2ab(i,iii,v)**

Rationale for the assessment: *Typha elephantina* is widespread across Africa, Middle East and southern Asia, but it is restricted to only three localities in Egypt. It has an area of occurrence (AOO) of 12 km^2 and a decline in terms of extent of occurrence, population size and habitat quality, was estimated during the last years. Such regional population behaves as an endemic, according to the IUCN guidelines for regional assessments (IUCN 2012), due to the impossibility of any propagules coming from neighbouring regions to recolonize current growing sites in case of extinctions. According to the number of locations (three), it has been regionally assessed as Endangered according to the formula B1ab(i,iii,v)+2ab(i,iii,v).

Previous assessment: Least Concern (LC) in Zhuang (2011) at global level and Least Concern (LC) in García et al. (2015) at regional level for the Arabian Peninsula.

Conservation actions: To our knowledge, *T. elephantina* is not protected by either international, national or regional laws.

Conservation actions needed: Monitoring and research activities are recommended in order to better understand the effective distribution, population size and trend; *ex situ* and *in situ* conservation programs (e.g. enclosures, protected area or seed and vegetative collections) are encouraged.

Mohamed Abdelaal, Mauro Fois, Gianluigi Bacchetta

References

Abd El-Ghani M, Hamdy RS, Hamed A (2014) Aspects of vegetation and soil relationships around athalassohaline lakes of Wadi El-Natrun, Western Desert, Egypt. Journal of Biology and Earth Sciences 4: 21–35.

Abdelaal M (2013) Plant life in the different habitats in El-Behira Governorate, Egypt: ecology and economic potentialities. PhD Thesis, Mansoura University, Egypt.

Bilz M, Kell SP, Maxted N, Lansdown RV (2011) European Red List of Vascular Plants. Publications Office of the European Union, Luxembourg.

Boulos L (1995) Flora of Egypt: Checklist. Al-Hadara Publishing, Cairo.

Boulos L (2005) Flora of Egypt (vol. 4). Al-Hadara Publishing, Cairo.

Burkill HM (2000) The useful plants of West Tropical Africa (2nd edn) – Volume 5, Families S–Z, Addenda. Royal Botanic Gardens, Kew, Richmond.

Croce A, Bongiorni L, De Vivo R, Fori S (2011) *Epipactis nordeniorum* subsp. *maricae*, una nuova sottospecie dal Vulcano di Roccamonfina (Campania, Sud Italia). Journal Europäischer Orchideen 43(4): 833–846

Croce A, Nazzaro R (2012) The Orchid Flora of Roccamonfina-Foce Garigliano Regional Park (Campania, Italy). Journal Europäischer Orchideen 44 (3): 509–583.

Danin A, Shmida A, Liston A (1985) Contributions to the flora of Sinai, III. Checklist of the species collected and recorded by the Jerusalem team 1967–1982. Willdenowia 15: 255–322.

El-Ameir YA (2013) Spatial distribution and nutritive value of two *Typha* species in Egypt. Egyptian Journal of Botany 53: 91–113.

García N, Harrison I, Cox N, Tognelli MF (2015) The status and distribution of freshwater biodiversity in the Arabian Peninsula. IUCN, Gland, Cambridge, and Arlington. https://doi.org/10.2305/IUCN.CH.2015.MRA.4.en

IUCN (2012) Guidelines for Application of IUCN Red List Criteria at Regional and National Levels: Version 4.0. IUCN, Gland and Cambridge. [accessed on 2018/10/01]

IUCN (2018) The IUCN Red List of Threatened Species (Version 2018–1). http://www.iucnredlist.org [accessed on 2018/08/23]

Orsenigo S, Montagnani C, Fenu G, Gargano D, Peruzzi L, Abeli T, Alessandrini A, Bacchetta G, Bartolucci F, Bovio M, Brullo C, Brullo S, Carta A, Castello M, Cogoni D, Conti F, Domina G, Foggi B, Gennai M, Gigante D, Iberite M, Lasen C, Magrini S, Perrino EV, Prosser F, Santangelo A, Selvaggi A, Stinca A, Vagge I, Villani MC, Wagensommer RP, Wilhalm T, Tartaglini N, Duprè E, Blasi C, Rossi G (2018) Red Listing plants under full national responsibility: extinction risks and threats in the vascular flora endemic to Italy. Biological Conservation 224: 213–222.

Pavarese G, Tranchida-Lombardo V, Cogoni A, Cristaudo A, Cozzolino S (2011): Where do Sardinian orchids come from: a putative African origin for the insular population of *Platanthera bifolia* var. *kuenkelei*? Botanical Journal of the Linnean Society 167: 466–475. https://doi.org/10.1111/j.1095-8339.2011.01190.x

Selvi F, Cecchi L, Coppi A (2009) Phylogeny, karyotype evolution and taxonomy of *Cerinthe* L. (Boraginaceae). Taxon 58(4): 1307–1325.

Valdés B (2011) Boraginaceae. Euro +Med Plantbase – The information resource for Euro-Mediterranean plant diversity. http://ww2.bgbm.org/euroPlusMed/query.asp [accessed on 2018/08/23]

Wagensommer RP, Fröhlich T, Fröhlich M (2014) First record of the southeast European species *Cerinthe retorta* Sibth. & Sm. (Boraginaceae) in Italy and considerations on its distribution and conservation status. Acta Botanica Gallica: Botany Letters 161(2): 111–115. https://doi.org/10.1080/12538078.2014.892438

Zahran MA, Willis AJ (2009) The vegetation of Egypt (2nd edn). Springer, Netherlands.

Zhuang X (2011) *Typha elephantina*. The IUCN red list of threatened species. https://doi.org/10.2305/IUCN.UK.2011-1.RLTS.T164162A5757751.en

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RESEARCH ARTICLE

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Notulae to the Italian native vascular flora: 6

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Abstract

In this contribution, new data concerning the distribution of native vascular flora in Italy are presented. It includes new records, confirmations and status changes to the Italian administrative regions for taxa in the genera *Alchemilla*, *Arundo*, *Bupleurum*, *Clematis*, *Clinopodium*, *Cota*, *Crassula*, *Cytisus*, *Euphorbia*, *Hieracium*, *Isoëtes*, *Lamium*, *Leontodon*, *Linaria*, *Lychnis*, *Middendorfia*, *Ophrys*, *Philadelphus*, *Pinus*, *Sagina*, *Sedum*, *Taeniatherum*, *Tofieldia*, *Triticum*, *Veronica*, and *Vicia*. Nomenclature and distribution updates, published elsewhere, and corrigenda are provided as supplementary material.

Keywords

Floristic data, Italy, nomenclature

How to contribute

The text for the new records should be submitted electronically to Chiara Nepi (chiara.nepi@unifi.it). The corresponding specimens along with its scan or photograph have to be sent to FI Herbarium: Sezione di Botanica "Filippo Parlatore" del Museo di Storia Naturale, Via G. La Pira 4, 50121 Firenze (Italy). Those texts concerning nomenclatural novelties (typifications only for accepted names), status changes, exclusions, and confirmations should be submitted electronically to: Fabrizio Bartolucci (fabrizio.bartolucci@gmail.com). Each text should be within 2,000 characters (spaces included).

Floristic records

Alchemilla filicaulis Buser (Rosaceae)

+ **TOS:** Abetone (Pistoia), Loc. Lago Nero, prateria secondaria su versanti arenacei esposti prevalentemente ad Est (WGS84: 44.065763°N; 10.380465°E), 1774 m, 11 August 2016, Leg. *G. Buccomino*, Det. *G. Tondi*, *F. Festi* (FI). – Species confirmed for the flora of Toscana.

This species was generically quoted for Toscana by Kurtto et al. (2007) and not reported in Bartolucci et al. (2018). The collected plants show very dense hairiness on all parts and belong to *A. filicaulis* var. *vestita* Buser (Festi 2000, Festi et al. 2015). This taxon has been collected at the side of the path also in Val di Luce at 1600 m s.l.m. (WGS84: 44.065763°N; 10.380465°E, Herb. Buccomino).

G. Buccomino, G. Tondi, F. Festi

Alchemilla tenuis Buser (Rosaceae)

+ **EMR:** Parco regionale del Frignano, Pievelago (Modena), Loc. Lago Turchino, area umida ad Est del lago (WGS84: 44.071251°N; 10.355938°E), 1612 m, 13 August 2016, Leg. *G. Buccomino*, Det. *G. Tondi*, *F. Festi* (FI). – Species confirmed for the flora of Emilia-Romagna.

This species was reported for Emilia-Romagna by Festi (2000), but results as "no longer recorded" in Bartolucci et al. (2018). Other samples were collected on 9 August 2011 (WGS84: 44.173226°N; 10.232708°E) between the Passo della Cisa and Monte Cusna (Herb. Buccomino).

G. Buccomino, G. Tondi, F. Festi

Arundo plinii Turra (Poaceae)

+ (CAS) **TAA:** Besenello (Trento), strada per Folgaria 400 m prima (a NW) di Dietrobeseno, lato a valle della strada (WGS84: 45,9299°N; 11,1140°E), scarpata erbosa, 320 m, 18 March 2018, *F. Prosser* (ROV No. 73984, FI). – Casual alien species new for the flora of Trentino-Alto Adige.

This steno-Mediterranean species, typical of clayey slopes and road margins (Pignatti 2017), is reported as native in all regions of Italy from Liguria southwards (Bartolucci et al. 2018). The population found near Dietrobeseno was very probably introduced, perhaps by greening. Currently, the plants form a compact patch of approximately 5 × 10 m. The plants regularly flower but they do not seem to produce viable seeds, and the propagation via stolons is hindered by the surrounding vegetation, so that the presence of this species is evaluated as casual.

F. Prosser

Bupleurum fruticosum L. (Apiaceae)

+ (C) **TOS:** Candeli (Bagno a Ripoli, Firenze), C.da Ulivelli, 500 m a est di Villa La Tana (WGS84: 43.764080°N; 11.348720°E), margine di macchia, 205 m s.l.m., 15 July 2018, *F. Roma-Marzio*, *P. Liguori* (FI, PI No. 011168, Herb. Roma-Marzio). – Cryptogenic species confirmed for the flora of Toscana.

Bupleurum fruticosum L. is a steno-Mediterranean species, occurring as native from Morocco to Greece, and introduced in Great Britain, Germany, Ukraine, and Crimea (Hand 2011). In Italy, this species is native in Sicily, Sardinia, and Liguria, and not confirmed in Puglia (Bartolucci et al. 2018). In the latter region, however, it is considered as doubtfully native by Pignatti (2018). Although *B. fruticosum* is not reported in the recent checklist of woody flora of Toscana (Roma-Marzio et al. 2016), this species was actually mentioned as cultivated by Baroni (1897–1908), and Montelucci (1933) indicated this species for the park of Sammezzano and near Rignano sull'Arno around Florence. Negri (1946) confirmed the presence of cultivated plants at Sammezzano, but the same author also reported a new locality for *B. fruticosum* in Candeli, south-eastern of Florence, Bagno a Ripoli, in the ex hunting lodge of Villa La Tana. Negri (1946) admitted that that presence of *B. fruticosum* could be the result of a naturalization from plants cultivated in the past, but he also hypothesized that this species could be native in Candeli (see also Corti 1959). We confirmed the occurrence of *B. fruticosum* in Candeli: we observed mature plants, several young individuals and some seedling. Although the plants are well integrated in the local maquis shrubland vegetation, considering the historical indications of cultivated plants and that all the known localities are more or less close to old mansions and parks, we opt to consider *B. fruticosum* in Tuscany as a cryptogenic species.

F. Roma-Marzio, L. Peruzzi

EX (C) **PUG:** – Cryptogenic species extinct in Puglia.

Bupleurum fruticosum was reported in Puglia only for Salento (Capo di Leuca), more than 130 years ago (Groves 1887). Two years later, Caruel (1889) indicated this species as cultivated in peninsular Italy, and considered *B. fruticosum* as probably alien at Capo di Leuca. More recently, Mele et al. (2006) considered this species as possibly extinct in Salento, but Bartolucci et al. (2018) indicated it as a native, not confirmed species. No specimen is preserved in FI, and field research carried out by one of us (PM) in the last years allows to exclude the current occurrence of *B. fruticosum* in the Salento area. Furthermore, we consider it as cryptogenic in Puglia, in accordance with Caruel (1889) and Pignatti (2018).

F. Roma-Marzio, P. Medagli, R.P. Wagensommer

Clematis rigoi W.T.Wang (Ranunculaceae)

+ **PUG:** Castellaneta (Taranto), a ovest di Masseria Signora Nunzia (WGS 40.541400°N; 16.906533°E), 12 m s.l.m., bosco igrofilo a Frassino meridionale, 21 May 2018, *F.*

Carruggio, *G. Pazienza*, *D. Saulle*, *L. Forte* (BI Nos. 41955-41956-41957). – Species confirmed for the flora of Puglia.

Clematis rigoi is quite similar to the western Mediterranean species *C. campaniflora* Brot. (Fernández Carvajal 1986, Wang 2000), with which it was confused in the past (Cavara 1907). It is endemic to southern Italy, and it was certainly known so far only for Basilicata and Calabria, while it was no longer recorded in Puglia (Bartolucci et al. 2018). Some authors reported Lesina in the Gargano Promontory as the only one regional site of occurrence for this species (Cavara 1907 under the name *C. campaniflora* Brot., Fiori 1924 under the name *C. viticella* L. var. *scandens* (Huter, Porta & Rigo) Arcang.). This new locality lies in a narrow-leafed ash hygrophilous wood, in the Lato river basin.

F. Carruggio, G. Pazienza, D. Saulle, L. Forte

Clinopodium acinos (L.) Kuntze subsp. *acinos* (Lamiaceae)

+ **BAS:** Parco naturale Gallipoli Cognato Piccole Dolomiti Lucane, Pietrapertosa (Potenza), Monte dell'Impiso (WGS84: 40.285088°N; 16.055150°E), versante boscato a lato del sentiero, 1288 m, 21 June 2013, *G. Buccomino* (FI); Parco nazionale del Pollino, Viggianello (Potenza), Piano Ruggio (WGS84: 39.918879°N; 16.137209°E), pascolo arido su suolo calcareo, 1560 m, 21 June 2014, *F. Caldararo* (FI). – Subspecies new for the flora of Basilicata.

The first notice of this report appeared in the web-forum Acta Plantarum (http://www.floraitaliae.actaplantarum.org/viewtopic.php?t=74633).

G. Buccomino, F. Caldararo

Cota tinctoria (L.) J.Gay subsp. *australis* (R.Fern.) Oberpr. & Greuter (Asteraceae)

+ (NAT) **SAR.** – Status change from casual to naturalized alien for the flora of Sardegna.

This taxon has a European-Pontic distribution (Pignatti 2018), and it is native to the mainland Italy (Bartolucci et al. 2018). Atzei (1996) reported *C. tinctoria* subsp. *australis* for the first time in Sardegna from Mt. Limbara. This species plant is now diffuse in several localities of that mountain, from 1000 to 1350 m, normally growing on roadsides and disturbed places, but also in clearings of reforestations, along paths, and in garrigues.

G. Calvia, A. Ruggero

Crassula tillaea Lest.-Garl. (Crassulaceae)

+ **LOM:** Pavia (Pavia), Via Sant'Epifanio, davanti all'entrata dell'Orto Botanico, interstizi sabbiosi dell'acciottolato; vegetazione: *Ochlopoa annua*, *Polycarpon tetraphyllum*, *Herniaria hirsuta* (*Saginion procumbentis*), 74 m, 11 May 2010, *N. Ardenghi* (Herb.

N. Ardenghi); *ibidem* (WGS84: 45.18531°N; 9.16285°E), acciottolato, 74 m, 29 May 2018, *N. Ardenghi* (FI). – Species confirmed for the flora of Lombardia.

Bartolucci et al. (2018) indicated this species as "extinct" in Lombardia, but it is present in front of the entrance of the Pavia Botanical Garden since at least 2010. About 100 individuals were counted in 2018. The only record for the province of Pavia (consisting of two localities fromthe municipalities of Linarolo and Miradolo Terme) dates back to Nocca and Balbis (1816) and has been repeated by subsequent local and national floras until Pignatti (1982).

N.M.G. Ardenghi

Cytisus scoparius (L.) Link subsp. *scoparius* (Fabaceae)

+ (INV) **SAR.** – Status change from naturalized to invasive alien for the flora of Sardegna.

This is an European species, which is native to Italy but reported as naturalized in Sardegna (Arrigoni 2010, Podda et al. 2012, Camarda et al. 2016, Puddu et al. 2016, Bartolucci et al. 2018). Actually, it became locally invasive, above all on Mt. Limbara, where it was introduced in the 1960's (Veri and Bruno 1974). It is gradually expanding in clearings, roadsides, garrigues and meadows above 950 m, but it is also starting to colonize wilder and isolated areas below, un po 500 m.

G. Bacchetta, G. Calvia, A. Ruggero

Euphorbia cuneifolia Guss. (Euphorbiaceae)

+ **CAL:** Montalto Uffugo (Cosenza), contrada Mavigliano (WGS84: 39.39378°N; 16.22858°E), pratelli terofitici su suolo argilloso umido, 170 m, 18 April 2018, *L. Bernardo, G. Maiorca* (FI, CLU No. 26197). – Species confirmed for the flora of Calabria.

Euphorbia cuneifolia was described by Gussone (1826) on samples coming from Calabria, near Brancaleone, Roseto, and Capo Bruzzano. Later authors confirmed its occurrence for the same localities (Tenore 1831, Parlatore 1867, Fiori 1926) or generically for Calabria (Pignatti 1982, 2018). However, there have been no further reports for this region. At present, this species is known for central and southern Italian regions, excluding Marche, Abruzzo, and Basilicata, doubtfully occurring in Umbria (Bartolucci et al. 2018).

L. Bernardo, G. Maiorca

Euphorbia illirica Lam. (Euphorbiaceae)

+ **VEN:** Negrar (Verona), Monte Tondo in località Case Antolini (WGS84: 45.537681°N; 10.974972°E), 650 m, 24 July 2018, *F. Menini* (VER). – Species confirmed for the flora of Veneto.

According to Bartolucci et al. (2018), this species has been indicated in Veneto by mistake. However, the report published by Goiran (1897–1904) for Contrada Antolini was certainly correct, as evidenced by herbarium vouchers conserved in VER (leg. Goiran, June 1889, under the name *E. pilosa* L.). Prosser in Buffa et al. (2017), indicated this species as extinct in the province of Verona. A search near Case Antolini by the first author led instead to a confirmation of the old record. The population consists of several individuals located mainly at the edge of the meadow (*Arrhenatheretum*) and wood in a radius of about 200 m. It grows in a mesophilous habitat, with *Hypericum hirsutum* L., *Trifolium patens* Schreb., and *Veratrum nigrum* L. In the woods, we can note the presence of *Castanea sativa* Mill. Also in areas bordering Veneto *E. illirica* is very rare, being known in Friuli Venezia Giulia only in four localities in the resurgence belt (F. Martini, pers. comm.), and having been collected in central-eastern Lombardy for the last time in 1985 (Martini et al. 2012).

F. Menini, F. Prosser

Hieracium pellitum Fr. subsp. *pellitum* (Asteraceae)

+ **MOL:** San Massimo (Campobasso), tra Campitello Matese e Monte Miletto (WGS84: 41.449873°N; 14.382191°E), pascolo, 1450-1775 m, 4 July 2016, Leg. *A. Stinca, L. Frate, A. Scolastri*, Det. *G. Gottschlich* (FI, PORUN, Herb. Gottschlich No. 66949). – Species new for the flora of Molise.

In Italy, *Hieracium pellitum* subsp. *pellitum* is recorded only for Piemonte, Liguria, Marche, and Abruzzo (Bartolucci et al. 2018). Therefore, our finding represents the new southern limit of the species range in the Italian Peninsula.

A. Stinca, G. Gottschlich

Isoëtes echinospora Durieu (Isoëtaceae)

+ **TAA:** Mezzana (Trento), Laghi del Malghetto di Mezzana, lago Inferiore (WGS84: 46.2794°N; 10.8102°E), sul fondo del laghetto, soprattutto a 2 m di profondità, 2001 m, 24 August 2017, *D. Miserocchi*, *C. Steffanini* (FI, ROV No. 73577). – Species confirmed for the flora of Trentino-Alto Adige.

The distribution of *I. echinospora* in Italy was previously limited to Piedmont and Lombardy (Troìa and Greuter 2014). This species has also been reported by Huber (1906) for Lago Grande di Monticolo (Bolzano, Südtyrol), but this report not confirmed by recent surveys, is considered doubtful by Beck and Wilhalm (2010). Recently, this species was considered as not confirmed for Trentino-Alto Adige by Bartolucci et al. (2018). After the first findings in the upper and lower lakes of Malghetto di Mezzana (5 August 2017, *Redolfi*, *Miserocchi*, *Pegoretti*), we have looked for *I. echinospora* in further lakes of the eastern Adamello Group (Pinzolo, Trento), also finding it on the following sites: Tre Laghi, Lago Medio (WGS84: 46.2607°N; 10.7978°E), 2271 m

and Lago Inferiore (WGS84: 46.2593°N; 10.7976°E), 2257 m, 21 September 2017; Lago delle Malghette (WGS84: 46.2675°N 10.8172°E), 1880 m, 21 September 2017; Lago di Pradalago (WGS84: 46.2491°N; 10.8131°E), 2082 m, 29 September 2017. This species was therefore found in six alpine lakes, approximately in 3.5 km from North to South. In some of these lakes, *I. echinospora* forms submerged prairies. All lakes are located on acid rock (tonalite). We have searched for this species in further 13 lakes in the area, but without success.

D. Miserocchi, A. Cavagna, C. Steffanini, F. Prosser

Lamium bifidum Cirillo subsp. *balcanicum* Velen. (Lamiaceae)

+ **BAS:** Viggianello (Potenza), Piano di Ruggio (WGS84: 39.910604°N; 16.130958°E), prato nitrofilo a bordo nevaio, 1550 m, 30 May 2015, *L. Bernardo, D. Gargano* (FI, CLU No. 26200); *ibidem*, 23 May 2016, *F. Caldararo* (CLU No. 26201). – Subspecies new for the flora of Basilicata.

This report extends southward the distribution of this subspecies, so far reported only for Marche, Lazio, and Abruzzo (Conti et al. 2008, Bartolucci et al. 2018).

L. Bernardo, F. Caldararo, D. Gargano

Leontodon rosanoi (Ten.) DC.

+ **PUG:** Agro di Roseto Valfortore, Foggia (WGS84 41.375674°N; 15.118577°E), pascolo roccioso a *Bromopsis erecta*, 890 m slm, 11 July 2018, *M. Terzi, F.S. D'Amico* (FI). – Species confirmed for the flora of Puglia.

Pittoni (in Pignatti 1982) indicated *Leontodon rosanoi* [under the name *Leontodon villarsii* (Willd.) Loisel.; see Mariotti Lippi and Garbari 2004] for all the regions of the Italian Peninsula. However, in the recent updated checklist of the flora of Italy (Bartolucci et al. 2018), this species is considered as a "no longer recorded" in Puglia.

M. Terzi, F.S. D'Amico

Linaria simplex (Willd.) Desf. (Plantaginaceae)

+ (NAT) **VEN:** Verona, in Lungadige Attiraglio, nei pressi di Ponte Catena (WGS84: 45.44964813°N; 10.98327089°E), sull'argine in pietra, 60 m, 9 April 2018, *M. Trenchi*, *F. Di Carlo* (FI, ROV, VER); Castel Montorio (Verona), di fronte alla chiesetta sconsacrata (WGS84: 45.45900395°N; 11.05028927°E), prato arido, 125 m, 26 Mai 2018, *M. Trenchi* (VER). – Naturalized alien species confirmed for the flora of Veneto.

Although Pignatti (1982, 2018) quotes this euri-Mediterranean species also for Veneto, Bartolucci et al. (2018) report its doubtful occurrence in this region. Indeed, we do not know any precise data for Veneto, neither from bibliography, nor from

herbaria (FI, PAD). It has never been found by the botanists who have been active in Verona and it is not listed in the most recent local flora (Di Carlo and Bianchini 2014). *Linaria simplex* is indicated by Bartolucci et al. (2018) as native in all Italian regions, with the exception of Emilia-Romagna (doubtful), Lombardy (extinct; Martini et al., 2012), Trentino-Alto Adige (casual), and Friuli-Venezia Giulia (naturalized). In the latter three regions, this species has been mentioned for the first time, as casual, by Angiolini and Scoppola (1999) based on herbarium specimens in PESA. In Verona, *L. simplex* grows widely in a stretch of approximately 150 m of Lungadige, on the stone embankment. It grows together with mostly annual species, including: *Avena barbata* Pott ex Link, *Erigeron canadensis* L., *Euphorbia cyparissias* L., *E. helioscopia* L. subsp. *helioscopia*, *Medicago rigidula* (L.) All., *Myosotis ramosissima* Rochel subsp. *ramosissima*, and *Saxifraga tridactylites* L.

M. Trenchi, F. Di Carlo, F. Prosser

Lychnis coronaria (L.) Desr. (Caryophyllaceae)

+ **TOS:** Bibbiena (Arezzo), Parco Nazionale delle Foreste Casentinesi, lungo la strada sterrata tra Serravalle e Tramignone, nei pressi di un castagneto e di un impianto di noce (WGS84: 43.780926°N; 11.847683°E), ca. 890 m, 4 July 2018, *D. Viciani, L. Lazzaro* (FI). – Species confirmed for the flora of Toscana.

Lychnis coronaria is reported as a species doubtfully occurring in Toscana by Bartolucci et al. (2018). It is a Mediterranean-Turanian species, occurring in almost all the regions of continental Italy, mostly as alien in Northern Italy, and as native in Central-Southern Italy (Bartolucci et al. 2018). In Toscana, this species was doubtfully reported by Caruel (1866), based on a record by G. Santi for Pitigliano (Grosseto), and later on for Bibbiena (Arezzo) by Baroni (1897–1908), a record neglected by Viciani et al. (2010). Actually, this plant was recently documented also by Selvi (2002) and Viciani et al. (2004) close to San Quirico (Grosseto). We confirm its presence also close to Bibbiena (Arezzo), in the area of the "Parco Nazionale delle Foreste Casentinesi, Monte Falterona e Campigna". The population reported here is far enough from residential areas to support its native status in Toscana, and the growing conditions are close to those described by Selvi (2002).

D. Viciani, L. Lazzaro

Middendorfia borysthenica (Schrank) Trautv. (Lythraceae)

+ **TOS:** Porcari (Lucca), Padule, loc. Chiuso delle Canne (WGS84: 43.80000°N; 10.63265°E), fanghi umidi di un chiaro di caccia, 6 m, 15 June 2016, *A. Sani* (FI). – Species confirmed for the flora of Toscana.

This annual, submediterranean species (Pignatti 2017) occurs in Italy in Piemonte, Lazio, Puglia, Sicilia, and Sardegna, but it was doubtfully recorded for Toscana (Bar-

tolucci et al. 2018). For the latter region, only six ancient records from Caruel (1860–1864) and Baroni (1897–1908) were available so far. Two of them refer to Maremma (Lago Secco and Doganella in the Capalbio area, Grosseto), where this species was not found again recently (Selvi 2010). The remaining four records (Altopascio, Asciano, Bientina, and Castagnolo) refer to plain areas in the low Arno valley, i.e. the same area in which we were able to find this species again.

A. Sani, L. Peruzzi

Ophrys sphegodes Mill. subsp. *sphegodes* (Orchidaceae)

+ **LAZ:** Barbarano Romano (Viterbo), loc. Chiesaccia (Parco *Marturanum*), boscaglia su terreno argilloso-sassoso (WGS 84: 42.229557°N; 12.050115°E), 327 m, 7 March 2018, *S. Buono* (FI). – Species confirmed for the flora of Lazio.

Within *Ophrys sphegodes* group, two close taxa are considered vicariant in Italy: *O. sphegodes* subsp. *sphegodes*, occurring only in the northern regions, and the taxonomically doubtful species *O. classica* Devillers-Tersch. & Devillers, recorded for central and southern Italy (Bartolucci et al. 2018). The two taxa differ mainly for the presence of bulges in the lip. In particular, *O. sphegodes* subsp. *sphegodes* shows a lip with no bulges or with very small ones, while *O. classica* is always characterized by prominent, rounded bulges in the lip (GIROS 2016). The population reported here was made up of plants with no bulges in the lip.

S. Magrini, S. Buono, M. Rempicci

Philadelphus coronarius L. (Hydrangeaceae)

+ (CAS) **MAR:** San Benedetto del Tronto (Ascoli Piceno), margine della massicciata ferroviaria alla periferia dell'abitato (WGS84 42.9375°N; 13.889444°E), ca. m 6, 10 July 2018, *N. Olivieri* (FI). – Casual alien species new for the flora of Marche.

A single individual of the species grows at the edge of the railway embankment, on the eastern side, in an area characterized by rather humid pebbly substratum. The site is located on the southern outskirts of the town. This species grows with *Equisetum ramosissimum* Desf., and some young individuals of *Chamaerops humilis* L. *Philadelphus coronarius* is considered native in Lombardia, Veneto, Trentino-Alto Adige, and probably also in Toscana (Bartolucci et al. 2018, Pignatti 2018). In the rest of the Italian territory, this species has been introduced for ornamental purposes and is – in case – locally naturalized. It is cultivated in some gardens near the observation area.

N. Olivieri

Pinus nigra J.F.Arnold subsp. *laricio* Palib. ex Maire (Pinaceae)

+ (INV) **SAR.** – Status change from caual to invasive alien for the flora of Sardegna.

This taxon, endemic to Corsica, Calabria, and Sicilia (Jeanmonod and Gamisans 2013), also occurs in Toscana (Bartolucci et al. 2018). In Sardinia it has been introduced in reforestations starting from 1929/1930 (Pavari 1935), being reported as a casual alien by Bartolucci et al. (2018). On the eastern side of the Gennargentu Massif (Arzana, Villagrande Strisaili), subjected to abundant reforestations, it is now naturalized. In the area of Monte Limbara as well, it is spreading rapidly, invading almost all degraded areas over 900 m, up to 1.5 km far from plantation sites. Abundant trees, saplings and seedlings occupy vast areas, especially invading heaths and garrigues with endemic dwarf brooms, as well as rocky places, paths, and roadsides. The density of saplings and seedlings is higher close to reforestation sites. Locally, the trees compete with the native *Pinus pinaster* Ait.

G. Bacchetta, G. Calvia, A. Ruggero

Sagina micropetala Rauschert (Caryophyllaceae)

+ **CAL:** Montalto Uffugo (Cosenza), contrada Mavigliano (WGS84: 39.39378°N; 16.22858°E), pratelli terofitici su suolo argilloso umido, 170 m, 18 April 2018, *L. Bernardo, G. Maiorca* (FI, CLU No. 26196). – Species new for the flora of Calabria.

In southern Italy, this species is recorded only for Campania and Puglia (Bartolucci et al. 2018), probably due to misidentification with *S. apetala*, Ard. which is however distinguished by different morphological and ecological features (Bomble 2015).

L. Bernardo, G. Maiorca

Sedum caespitosum (Cav.) DC. (Crassulaceae)

+ **CAL:** San Lorenzo Bellizzi (Cosenza), strada per Cerchiara di Calabria, sotto Pietra S. Angelo (WGS84: 39.878427°N; 16.337091°E), margine strada, 820 m, 30 April 2005, *L. Bernardo* (FI, CLU No. 19870); Serra Pedace (Cosenza), San Nicola Silano, ca. 250 m NW dalla SP11, a S della ferrovia, lungo la strada per Silvana Mansio (WGS84: 39.312096°N; 16.541050°E), prato arido su sabbie granitiche, 1420 m, 15 May 2013, *L. Bernardo* (CLU No. 25956). – Species new for the flora of Calabria.

Based on this report, *S. caespitosum* occurs in all the southern regions of Italy, but it has not been recently confirmed for Campania (Bartolucci et al. 2018).

L. Bernardo, G. Maiorca

Taeniatherum asperum (Simonk.) Nevski (Poaceae)

+ **CAL:** Cerchiara di Calabria (Cosenza), pendici Nord di Coste Aquafredda (Monte Sellaro), nei pressi di Casa Francomano (WGS84: 39.86135°N; 16.35719°E), prato arido su calcare, 1010 m, 28 June 2018, *L. Bernardo, N.G. Passalacqua* (FI, CLU No 26202). – Species new for the flora of Calabria.

In Italy, *Taeniatherum asperum* was known only for Puglia, Basilicata, Sardegna, and Sicilia (Bartolucci et al. 2018).

L. Bernardo, G. Maiorca, N.G. Passalacqua

Tofieldia calyculata (L.) Wahlenb. (Tofieldiaceae)

+ **MAR:** Mt. Nerone – loc. Fiamba (Pesaro-Urbino) (WGS84: 43.542063°N; 12.577614°E), moist meadow on limestone substrate at the head of the stream of the Fiamba gorge 780 m, 14 May 2016, *G. Mei* (FI). – Species new for the flora of Marche.

The presence of *Tofieldia calyculata* was not yet reported for Marche (Bartolucci et al. 2018). It is interesting to note that this species, along the Apennines, is limited to the main mountainous massifs, exclusively on the Adriatic side.

G. Mei

Triticum biunciale (Vis.) K.Rich. subsp. *biunciale* (Poaceae)

+ **CAL:** Amendolara (Cosenza), tra le contrade Monachicchio e Civegna (WGS84: 3993982°N; 16.55893°E), incolto a margine strada, 275 m, 22 May 2018, *L. Bernardo, D. Gargano* (FI, CLU No. 26195); Cerchiara di Calabria (Cosenza), margini strada SS 92 (WGS84: 39.863379°N; 16.35899°E), incolto, 970 m, 17 June 2017, *L. Bernardo, G. Maiorca* (CLU No. 26199); Villapiana (Cosenza), alveo Fiumara Saraceno (WGS84: 39.84204°N; 16.50835°E), prato arido su pietraia, 5 m, 30 May 2018, *L. Bernardo, D. Gargano* (CLU No. 26203); Crosia (Cosenza), contrada Macchia della Bura, incolto retrodunale, 5 m, 27 April 2018, *L. Bernardo, D. Gargano* (CLU No. 26198). – Species new for the flora of Calabria.

According to Perrino et al. (2014) and Pignatti (2017), *T. biunciale* occurs in Veneto, Toscana, Campania, Basilicata, and Puglia. However, Bartolucci et al. (2018) confirm its occurrence only for Campania and Puglia. It is widespread in the Ionian side of northern Calabria, often mixed with the more common *T. neglectum* (Req. ex Bertol.) Greuter.

L. Bernardo, D. Gargano, G. Maiorca

Veronica acinifolia L. (Plantaginaceae)

+ **SAR:** Gairo (Ogliastra), versante nord-orientale di Perda Liana, bordo di ruscello montano (WGS84: 39.914700°N; 9.418400°E ± 100 m), 950 m, 9 June 2018, *G. Mereu* (FI). – Species confirmed for the flora of Sardegna.

The presence of this species in Sardegna was indicated by Moris (1827), but later no longer confirmed by the same author (Moris 1858–1859).

G. Mereu

Vicia nigricans (M.Bieb.) Coss. & Germ. (Fabaceae)

+ **LIG:** Vobbia (Genova), ai piedi del Castello della Pietra (WGS84: 44.61321°N; 9.01594°E), prateria xerofila su conglomerati, 538 m, S, 18 May 2016, *N. Ardenghi* (FI). – Species confirmed for the flora of Liguria.

This species is indicated as "recorded by mistake" in Liguria by Bartolucci et al. (2018), but it is quite frequent on the rocky cliffs at the base of the castle in Vobbia.

N.M.G. Ardenghi

Nomenclature and distribution updates from other literature sources, and corrigenda

Nomenclature and distribution updates according to Gutermann and Kropf (2009), Marcenò and Gristina (2010), Pezzetta (2011), Al-Shehbaz (2012), Gennai et al. (2012), Martini et al. (2012), Domina and Jaouadi (2013), Marchetti (2015), Mavrodiev et al. (2015), Peruzzi et al. (2015), Ardenghi and Polani (2016), Fraser-Jenkins et al. (2016), Martignoni et al. (2016), Arrigoni (2017, 2018), Benítez-Benítez et al. (2017), Gottschlich (2017), Lasen and Da Pozzo (2017), Minissale et al. (2017), Pignatti (2017), Sáez and Aymerich (2017), Soreng et al. (2017), Astuti and Peruzzi (2018), Bräuchler (2018), Brock et al. 2018, Carta et al. (2018), Dentant et al. (2018), Erben et al. (2018), Esmailbegi et al. (2018), Gargano (2018), Hassemer (2018), Iamonico and Mosyakin (2018), Koopman (2018), Macháčková et al. (2018), Míguez et al. (2018), Mosyakin (2018), Pignatti (2018), Raab-Straube and Raus (2018), Särkinen et al. (2018), Siadati et al. (2018), Španiel et al. (2018), Steffan (2018), Sukhorukov et al. (2018), Troia et al. (2018), Vogt et al. (2018) and corrigenda to Bartolucci et al. (2018) are provided in Supplementary material 1.

F. Bartolucci, G. Galasso

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References

Al-Shehbaz IA (2012) A generic and tribal synopsis of the Brassicaceae (Cruciferae). Taxon 61(5): 931–954.

Angiolini C, Scoppola A (1999) Segnalazioni floristiche italiane: 943. Informatore Botanico Italiano 31(1–3): 87.

Ardenghi NMG, Polani F (2016) La flora della provincia di Pavia (Lombardia, Italia settentrionale). 1. L'Oltrepò Pavese. Natural History Sciences 3(2): 51–79. https://doi.org/10.4081/nhs.2016.269

Arrigoni PV (2010) Flora dell'Isola di Sardegna, Vol. 3. Carlo Delfino Editore, Sassari.

Arrigoni PV (2017) Flora analitica della Toscana. Volume 2. Edizioni Polistampa, Firenze, 335 pp.

Arrigoni PV (2018) Flora analitica della Toscana. Volume 4. Edizioni Polistampa, Firenze, 510 pp.

Astuti G, Peruzzi L (2018) Notes on the typification of the names *Utricularia bremii* Heer and *U. intermedia* Dreves & Hayne (Lentibulariaceae). Phytotaxa 350(2): 172–176. https://doi.org/10.11646/phytotaxa.350.2.7

Atzei AD (1996) Segnalazioni Floristiche Italiane: 845–847. Informatore Botanico Italiano 28(2): 272–273.

Baroni E (1897–1908) Supplemento generale al Prodromo della Flora Toscana di T. Caruel. Società Botanica Italiana, Firenze.

Bartolucci F, Peruzzi L, Galasso G, Albano A, Alessandrini A, Ardenghi NMG, Astuti G, Bacchetta G, Ballelli S, Banfi E, Barberis G, Bernardo L, Bouvet D, Bovio M, Cecchi L, Di Pietro R, Domina G, Fascetti S, Fenu G, Festi F, Foggi B, Gallo L, Gottschlich G, Gubellini L, Iamonico D, Iberite M, Jiménez-Mejías P, Lattanzi E, Marchetti D, Martinetto E, Masin RR, Medagli P, Passalacqua NG, Peccenini S, Pennesi R, Pierini B, Poldini L, Prosser F, Raimondo FM, Roma-Marzio F, Rosati L, Santangelo A, Scoppola A, Scortegagna S, Selvaggi A, Selvi F, Soldano A, Stinca A, Wagensommer RP, Wilhalm T, Conti F (2018) An updated checklist of the vascular flora native to Italy. Plant Biosystems 152(2): 179–303. https://doi.org/10.1080/11263504.2017.1419996

Beck R, Wilhalm T (2010) Die Farnpflanzen Südtirols. Veröffentlichungen des Naturmuseums Südtirol 7: 1–172.

Benítez-Benítez C, Míguez M, Jiménez-Mejías P, Martín-Bravo S (2017) Molecular and morphological data resurrect the long neglected *Carex laxula* (Cyperaceae) and expand its range in the western Mediterranean. Anales del Jardín Botánico de Madrid 74(1): e057. https://doi.org/10.3989/ajbm.2438

Bomble FW (2015) *Sagina apetala* (Kronblattloses Mastkraut) und *S. micropetala* s.l. (Aufrechtes Mastkraut i. w. S.) mit Anmerkungen zu *S. procumbens* (Niederliegendes Mastkraut). Jahrbuch des Bochumer Botanischen Vereins 6: 247–253.

Bräuchler C (2018) And now for something completely different—new names in *Clinopodium* with comments on some types. Phytotaxa 356(1): 71–80. https://doi.org/10.11646/phytotaxa.356.1.6

Brock JR, Dönmez AA, Beilstein MA, Olsen KM (2018) Phylogenetics of *Camelina* Crantz. (Brassicaceae) and insights on the origin of gold-of-pleasure (*Camelina sativa*). Molecular Phylogenetics and Evolution 127: 834–842. https://doi.org/10.1016/j.ympev.2018.06.031

Buffa G, Carpenè B, Casarotto N, Da Pozzo M, Filesi L, Lasen C, Marcucci R, Masin R, Prosser F, Tasinazzo S, Villani M, Zanatta K (2016) Lista rossa regionale delle pianti vascolari della Regione del Veneto, Regione del Veneto e Società Botanica Italiana.

Camarda I, Cossu TA, Carta L, Brunu A, Brundu G (2016) An updated inventory of the non-native flora of Sardinia (Italy). Plant Biosystems 150(5): 1106–1118. https://doi.org/10.1080/11263504.2015.1115438

Carta A, Forbicioni L, Frangini G, Pierini B, Peruzzi L (2018) An updated inventory of the vascular flora of Elba island (Tuscan Archipelago, Italy). Italian Botanist 6: 1–22. https://doi.org/10.3897/italianbotanist.6.26568

Caruel T (1860–1864) Prodromo della Flora Toscana. Firenze.

Caruel T (1866) Supplemento al Prodromo della Flora Toscana di T. Caruel. Atti della Società Toscana di Scienze Naturali – Memorie serie B 8: 1–52.

Caruel T (1889) Flora Italiana, Vol. 8(2). Le Monnier, Firenze.

Cavara F (1907) La *Clematis campaniflora* Brot. nell'Italia meridionale. Nuovo Giornale Botanico Italiano, nuova serie, XIV(IV): 523–526.

Conti F, Bartolucci F, Manzi A, Miglio M, Tinti D (2008) Aggiunta alla flora d'Abruzzo III contributo. Annali dei Musei Civici-Rovereto 23: 127–140.

Corti R (1959) Specie rare o minacciate della flora mediterranea in Italia (piante erbacee e suffrutici) La Terre et la Vie 1959 Supplément.

Dentant C, Lavergne S, Malécot S (2018) Taxonomic revision of West-Alpine cushion plant species belonging to *Androsace* subsect. *Aretia*. Botany Letters, https://doi.org/10.1080/23818107.2018.1450784

Di Carlo F, Bianchini F (2014) Flora della regione veronese. Parte X (Gentianales – Campanulales). Bollettino del Museo Civico di Storia Naturale di Verona 38: 3–125.

Domina G, Jaouadi W (2013) Suivi Botanique de l'Archipel de Zembra. Marseille, Conservatoire du littoral.

Erben M, Del Guacchio E, Caputo P (2018) A nomenclatural study on *Statice densiflora* (Plumbaginaceae) and its linked names. Phytotaxa 369(3): 185–199. https://doi.org/10.11646/phytotaxa.369.3.2

Esmailbegi S, Al-Shehbaz IA, Pouch M, Mandáková T, Mummenhoff K, Rahiminejad MR, Mirtadzadini M, Lysak MA (2018) Phylogeny and systematics of the tribe Thlaspideae (Brassicaceae) and the recognition of two new genera. Taxon 67(2): 324–340. https://doi.org/10.12705/672.4

Fernández Carvajal MC (1986) *Clematis* L. In: Castrovejo S, Laínz M, López González G, Montserrat P, Muñoz Garmendia F, Pavia J, Villar L (Eds) Flora Iberica, Vol. 1. Real Giardín Botánico, C.S.I.C., Madrid, 268–272.

Festi F (2000) Chiave d'identificazione per le specie italiane del genere *Alchemilla* L. (Rosaceae). Annali dei Musei Civici-Rovereto 14[1998]: 105–174.

Festi F, Lasen C, Prosser F, Argenti C (2015) Contributo alla conoscenza del gen. *Alchemilla* L. (Rosaceae) sulle Alpi italiane: province di Belluno, Trento e Verona. Annali dei Musei Civici-Rovereto 30[2014]: 221–289.

Fiori A (1924) Nuova flora analitica d'Italia, Vol. 1. Tipografia M. Ricci, Firenze.

Fiori A (1926) Nuova flora analitica d'Italia, Vol. 2. Tipografia M. Ricci, Firenze.

Fraser-Jenkins CR, Gandhi KN, Kholia BS, Benniamin A (2016) An annotated checklist of Indian Pteridophytes. Part 1 (Lycopodioaceae to Thelypteridaceae). Bishen Singh Mahendra Pal Singh.

Galasso G, Bartolucci F, Peruzzi L (2018) Printed, or just indelible? On the earliest legitimate names, authorship and typification of the taxa described from Italy by Huter, Porta and/or Rigo. Phytotaxa 361(1): 77–86. https://doi.org/10.11646/phytotaxa.361.1.6

Gargano ML (2018) The genus *Tamarix* (Tamaricaceae) in Apulia (southern Italy). Flora Mediterranea 28: 137–143.

Gennai M, Lastrucci L, Galasso G (2012) *Caldesia parnassifolia* (Bassi) Parl. In: Rossi G, Foggi B, Gargano D, Montagnani C, Orsenigo S, Pedrini S (Eds) Schede per una Lista Rossa della Flora vascolare e crittogamica Italiana. Informatore Botanico Italiano 44(2): 421–424

GIROS (2016) Orchidee d'Italia. Guida alle orchidee spontanee. 2ª edizione. Il Castello, Cornaredo, Milano.

Goiran A (1897–1904) Flora Veronensis (Phanerogamae). Franchini, Verona.

Gottschlich G (2017) Ergebnisse von Herbarstudien zur Gattung *Hieracium* in Bayern. Berichte der Bayerischen Botanischen Gesellschaft zur Erforschung der heimischen Flora 87: 83–92.

Groves E (1887) Flora della costa meridionale della Terra d'Otranto. Nuovo Giornale Botanico Italiano 19: 110–219.

Gussone G (1826) Plantae rariores. Regia Tipografia, Napoli.

Gutermann W, Kropf M (2009) Typification of Kerner names 7: *Anthyllis montana* var. *jacquinii* (Leguminosae). In: Vitek E, Till W, Wallnöfer B, Igersheim A, Rainer H (Eds) Short botanical notes. Annalen des Naturhistorischen Museums in Wien, Serie B 110 (2008): 271–272.

Hand R (2011) Apiaceae. Euro+Med Plantbase – the information resource for Euro-Mediterranean plant diversity. http://ww2.bgbm.org/EuroPlusMed/PTaxonDetail.asp?NameCache=Bupleurum%20fruticosum&PTRefFk=7500000 [accessed 16.07.2018].

Hassemer G (2018) Advances to the taxonomic knowledge of *Plantago subulata* (*Plantago* sect. *Maritima*, Plantaginaceae). Turkish Journal of Botany 42: 653–661. https://doi.org/10.3906/bot-1801-51

Huber G (1906) Monographische Studien im Gebiete der Montigglerseen (Südtirol) mit besonderer Berücksichtigung ihrer Biologie. Archiv für Hydrobiologie und Planktonkunde 1: 5–12, 49–55.

Iamonico D, Mosyakin S (2018) Studies on *Chenopodium album* s.l. (Chenopodiaceae / Amaranthaceae s. l.): *Chenopodium pedunculare*. Annali di Botanica (Roma) 8: 67–74.

Jeanmonod D, Gamisans J (2013) Flora Corsica, 2nd Edition. Bulletin de la Société Botanique du Centre-Ouest, numéro spécial 39: 1–1072.

Koopman J (2018) *Carex hartmaniorum* A. Cajander, de gecorrigeerde naam voor *Carex hartmanii* Cajander (Cyperaceae). Gorteria 40: 40–41.

Kurtto A, Fröhner SE, Lampinen R (Eds) (2007) Atlas Florae Europaeae, Vol. 14. Rosaceae (*Alchemilla* and *Aphanes*) The Committee for Mapping the Flora of Europe & Societas Biologica Fennica Vanamo, Helsinki.

Kurtto A, Weber HE, Lampinen R, Sennikov AN (Eds) (2010) Atlas Florae Europaeae, Vol. 15. Rosaceae (*Rubus*) The Committee for Mapping the Flora of Europe & Societas Biologica Fennica Vanamo, Helsinki.

Lasen C, Da Pozzo M (2017) *Carex maritima* Gunnerus (Cyperaceae). Rara specie artico-alpina scoperta sulle dolomiti d'Ampezzo. Frammenti 7: 95–99.

Macháčková P, Majeský L, Hroneš M, Hřibová E, Trávníček B, Vašut RJ (2018) New chromosome counts and genome size estimates for 28 species of *Taraxacum* sect. *Taraxacum*. Comparative Cytogenetics 12(3): 403–420. https://doi.org/10.3897/CompCytogen.v12i3.27307

Marcenò C, Gristina AS (2010) Su *Chaenorhinum rubrifolium* DC. Fourr. Scrophulariaceae, specie nuova per la flora siciliana e sull'ecologia e distribuzione del genere *Chaenorhinum* DC. Reichenb. in Sicilia. Naturalista Siciliano 343(4): 477–485.

Marchetti D (2015) Note floristiche tosco-liguri-emiliane. XII. Alcune fanerogame indigene osservate o raccolte nella provincia della Spezia (Liguria). Parte seconda (Resedaceae – Apiaceae). Annali dei Musei Civici-Rovereto 30 (2014): 291–324.

Mariotti Lippi M, Garbari F (2004) *Leontodon villarsii* (Willd.) Loisel. and *L. rosani* (Ten.) DC.(Asteraceae): nomenclatural, palynological, karyological, and micromorphological aspects. Plant Biosystems 138(2): 165–174. https://doi.org/10.1080/11263500412331283690

Martignoni M, Banfi E, Galasso G (2016) Conservazione della flora in aree ad alta urbanizzazione: il caso dell'aeroporto di Milano Malpensa. Notiziario della Società Botanica Italiana 0: 55–56.

Martini F, Bona E, Danieli S, Fantini G, Federici G, Fenaroli F, Mangili L, Perico G, Tagliaferri F, Zanotti E (2012) Flora vascolare della Lombardia centro-orientrale, Vols. 1–2. Lint, Trieste.

Mavrodiev EV, Laktionov AP, Alexeev YuE (2015) On new dogbanes of South-Eastern European Russia due to the acceptance of the genus *Poacynum* Baill. (Apocynaceae). Novosti Sistematiki Vysshikh Rastenii 46: 157–163. [In Russian]

Mele C, Medagli P, Accogli R, Beccarisi L, Albano A, Marchiori S (2006) Flora of Salento (Apulia, Southeastern Italy): an annotated checklist. Flora Mediterranea 16: 193–245

Míguez M, Martín-Bravo S, Jiménez-Mejías P (2018) Reconciling morphology and phylogeny allows an integrative taxonomic revision of the giant sedges of *Carex* section *Rhynchocystis* (Cyperaceae). Botanical Journal of the Linnean Society 188(1): 34–58. https://doi.org/10.1093/botlinnean/boy040

Minissale P, Molina JA, Sciandrello S (2017) *Pilularia minuta* Durieu (Marsileaceae) discovered in south-eastern-Sicily: new insights on its ecology, distribution and conservation status. Botany Letters 164(3): 197–208. https://doi.org/10.1080/23818107.2017.1357051

Montelucci G (1933) Contributo alla flora del Valdarno superiore. Piante raccolte nei dintorni di Rignano sull'Arno. Nuovo Giornale Italiano, nuova serie 40: 479–530. https://doi.org/10.1080/11263503309437297

Moris JH (1827) Stirpium Sardoarum elenchus, Vol. 1. Ex typis Regiis, Carali.

Moris JH (1858–1859) Flora Sardoa seu historia plantarum in Sardinia et adjacentibus insulis vel sponte nascentium vel ad utilitatem latius excultarum, Vol. 3. Ex Regio Typographeo, Taurini.

Mosyakin SL (2018) On *Hemionitis atreyu*, an invalid and unnecessary name, and on the correct name for that species if placed in *Hemionitis* (Pteridaceae subfam. Cheilanthoideae). Phytotaxa 373(2): 164–168. https://doi.org/10.11646/phytotaxa.373.2.7

Negri G (1946) Sul probabile indigenato di *Bupleurum fruticosum* in Toscana. Nuovo Giornale Italiano, nuova serie 53: 326–331.

Nocca D, Balbis GB (1816) Flora Ticinensis, 1. Tipographia J.J. Capelli, Ticini [Pavia].

Pavari A (1935) I rimboschimenti in Sardegna. Atti del 12 congresso geografico italiano, 3–11.

Parlatore F (1867) Flora Italiana, Vol. 4. Le Monnier, Firenze.

Perrino EV, Wagensommer RP, Medagli P (2014) *Aegilops* (Poaceae) in Italy: taxonomy, geographical distribution, ecology, vulnerability and conservation. Systematics and Biodiversity 12(3): 331–349. doi:10.1080/14772000.2014.909543

Peruzzi L, Domina G, Bartolucci F, Galasso G, Peccenini S, Raimondo FM, Albano A, Alessandrini A, Banfi E, Barberis G, Bernardo L, Bovio M, Brullo S, Brundu G, Brunu A, Camarda I, Carta L, Conti F, Croce A, Iamonico D, Iberite M, Iiriti G, Longo D, Marsili S, Medagli P, Pistarino A, Salmeri C, Santangelo A, Scassellati E, Selvi F, Soldano A, Stinca A, Villani M, Wagensommer RP, Passalacqua NG (2015) An inventory of the names of vascular plants endemic to Italy, their loci classici and types. Phytotaxa 196(1): 1–217. https://doi.org/10.11646/phytotaxa.196.1.1

Pezzetta A (2011) Prodromo della Flora di Lama dei Peligni (Regione Abruzzo r Parco Nazionale Della Majella). Annales, Series Historia Naturalis 21(2): 185–204.

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

Pignatti S (2017) Flora d'Italia, seconda edizione, Vol. 1. Edagricole, Milano.

Pignatti S (2018) Flora d'Italia, seconda edizione, Vols. 2–3. Edagricole, Milano.

Podda L, Lazzeri V, Mascia F, Mayoral García-Berlanga O, Bacchetta G (2012) The checklist of the Sardinian exotic flora: an update. Notulae Botanicae Horti Agrobotanici Cluj-Napoca 40(2): 14–21, 1–11. [+ Annex I checklist]

Puddu S, Podda L, Mayoral O, Delage A, Hugot L, Petit Y, Bacchetta G (2016) Comparative analysis of the alien vascular flora of Sardinia and Corsica. Notulae Botanicae Horti Agrobotanici Cluj-Napoca 44(2): 337–346. https://doi.org/10.15835/nbha44210491

Raab-Straube E von, Raus T (Eds) (2018) Euro+Med-Checklist Notulae, 9. Willdenowia 48(2):195–220. https://doi.org/10.3372/wi.48.48203

Roma-Marzio F, Bedini G, Müller J, Peruzzi L (2016) A critical checklist of the woody flora of Tuscany (Italy). Phytotaxa 287(1): 1–135. https://doi.org/10.11646/phytotaxa.287.1.1

Sáez L, Aymerich P (2017) New nomenclatural combinations in vascular plants. Orsis 31: 31–35. https://doi.org/10.5565/rev/orsis.48

Särkinen T, Poczai P, Barboza GE, van der Weerden GM, Baden M, Knapp S (2018) A revision of the Old World black nightshades (Morelloid clade of *Solanum* L., Solanaceae). PhytoKeys 106: 1–223. https://doi.org/10.3897/phytokeys.106.21991

Selvi F (2002) Contributo alla conoscenza floristica della Maremma Grossetana. Nuove stazioni di piante rare, minacciate o poco osservate in Toscana. Informatore Botanico Italiano 34(1): 119–124.

Selvi F (2010) A critical checklist of the vascular flora of Tuscan Maremma (Grosseto province, Italy). Flora Mediterranea 20: 47–139.

Siadati S, Salmaki Y, Mehrvarz SS, Heubl G, Weigend M (2018) Untangling the generic boundaries in tribe Marrubieae (Lamiaceae: Lamioideae) using nuclear and plastid DNA sequences. Taxon 67(4): 770–783. https://doi.org/10.12705/674.6

Soreng RJ, Peterson PM, Romaschenko K, Davidse G, Teisher JK, Clark LG, Barbera P, Gillespie LJ, Zuloaga FO (2017) A worldwide phylogenetic classification of the Poaceae (Gramineae) II: an update and a comparison of two 2015 classifications. Journal of Systematics and Evolution 55: 259–290. doi:10.1111/jse.12262

Španiel S, Kaplan K, Bovio M, Mártonfiová L, Cetlová V (2018) *Alyssum rossetii* (Brassicaceae), a new species from the Aosta Valley in Italy based on morphological and genome size data. Phytotaxa 360(3): 269–281. https://doi.org/10.11646/phytotaxa.360.3.7

Steffan MM (2018) Una popolazione nativa di *Goodyera repens* in Abruzzo, nuovo limite meridionale di distribuzione delle specie in Italia. GIROS Notizie 61(1): 143–148.

Sukhorukov AP, Kushunina M, El Mokni R, Goñalonsd LS, El Aounie MH, Daniel TF (2018) Chorological and taxonomic notes on African plants, 3. Botany Letters 165(2): 228–240. https://doi.org/10.1080/23818107.2018.1465467

Tenore M (1831) Sylloge Plantarum Vascularium Florae Neapolitanae. Typographia Fibreni, Neapoli.

Troia A, Greuter W (2014) Critical Flora of Italy: a critical conspectus of Italian *Isoetes* (Isoetaceae). Plant Biosystems 148(1): 13–20. https://doi.org/10.1080/11263504.2013.878409

Troia A, Santangelo A, Gianguzzi L (2018) Nomenclatural remarks on *Carex* sect. *Sylvaticae* (Cyperaceae): *C. laxula* and related names. Phytotaxa 349(1): 79–84. https://doi.org/10.11646/phytotaxa.349.1.10

Turland NJ, Wiersema JH, Barrie FR, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Kusber W-H, Li D-Z, Marhold K, May TW, McNeill J, Monro AM, Prado J, Price MJ, Smith GF (Eds) (2018) International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159: 1–254. https://doi.org/10.12705/Code.2018

Veri L, Bruno F (1974) La flora del massiccio del Limbara (Sardegna settentrionale). Annali di Botanica (Roma) 33: 83–139.

Viciani D, Gonnelli V, Sirotti M, Agostini N (2010) An annotated check-list of the vascular flora of the "Parco Nazionale delle Foreste Casentinesi, Monte Falterona e Campigna" (Northern Apennines Central Italy). Webbia 65(1): 3–131. https://doi.org/10.1080/00837792.2010.10670867

Viciani D, Sforzi S, Selvi F (2004) L'alta valle del Torrente Lente (Toscana meridionale): contributo alla conoscenza floristica e vegetazionale. Webbia 59(2): 309–347. https://doi.org/10.1080/00837792.2004.10670775

Vogt R, Konowalik K, Oberprieler C (2018) Karyological analysis reveals two new polyploid marguerite taxa (*Leucanthemum*, Compositae – Anthemideae) in S France and NW Italy. Willdenowia 48(2): 221–226. https://doi.org/10.3372/wi.48.48204

Wang WT (2000) Notes on the genus *Clematis* (Ranunculaceae) (I). Acta Phytotaxonomica Sinica 38(4): 305–336.

Zohary D, Hopf M (2000) Domestication of plants in the Old World, Ed. 3. Oxford University Press, Oxford.

Supplementary material 1

Supplementary data

Authors: Fabrizio Bartolucci, Gabriele Galasso

Data type: species data

Explanation note: 1. Nomenclature updates; 2. Distribution updates; 3. Synonyms, misapplied or included names.

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RESEARCH ARTICLE

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Notulae to the Italian alien vascular flora: 6

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Abstract

In this contribution, new data concerning the distribution of vascular flora alien to Italy are presented. It includes new records, confirmations, exclusions, and status changes for Italy or for Italian administrative regions of taxa in the genera *Acalypha*, *Acer*, *Canna*, *Cardamine*, *Cedrus*, *Chlorophytum*, *Citrus*, *Cyperus*, *Epilobium*, *Eucalyptus*, *Euphorbia*, *Gamochaeta*, *Hesperocyparis*, *Heteranthera*, *Lemna*, *Ligustrum*, *Lycium*, *Nassella*, *Nothoscordum*, *Oenothera*, *Osteospermum*, *Paspalum*, *Pontederia*, *Romulea*, *Rudbeckia*, *Salvia*, *Sesbania*, *Setaria*, *Sicyos*, *Styphnolobium*, *Symphyotrichum*, and *Tradescantia*. Nomenclature and distribution updates, published elsewhere, and corrigenda are provided as supplementary material.

Keywords

Alien species, floristic data, Italy

How to contribute

The text for the new records should be submitted electronically to Chiara Nepi (chiara.nepi@unifi.it). The corresponding specimen along with its scan or photograph has to be sent to FI Herbarium: Museo di Storia Naturale (Botanica), Sistema Museale di Ateneo, Via G. La Pira 4, 50121 Firenze (Italy). Those texts concerning nomenclatural novelties (typifications only for accepted names), status changes, exclusions, and confirmations should be submitted electronically to: Gabriele Galasso (gabriele.galasso@comune.milano.it). Each text should be within 2,000 characters (spaces included).

Floristic records

Acalypha australis L. (Euphorbiaceae)

+ (CAS) **LAZ**: Castrocielo (Frosinone), loc. Capodacqua (WGS84: 41.518520°N; 13.708890°E), prato, 110 m, 23 September 2016, *G. Nicolella, M. Iberite* (FI, RO). – Casual alien species new for the flora of Lazio.

This record is the first one for peninsular Italy, as the taxon was known only for some northern regions (Galasso et al. 2018a). This Asiatic species was observed growing on the left shore of a small lake characterized by disturbed vegetation, along with *Bidens vulgata* Greene (Nicolella et al. 2017), *Lemna minuta* Kunth, *Zantedeschia aethiopica* (L.) Spreng., and other alien species. The introduction of *Acalypha australis* in Italy is probably accidental, and related both to plant nursery activities (Banfi and Galasso 2010) and contamination of agricultural seeds (Kravchenko 2008). It naturally colonizes river banks and other wet habitats, and it is a feared weed in agriculture, with special regard to its ability to spread into maize fields (Zuo et al. 2008). This population was also reported in the Acta Plantarum Forum (http://www.floraitaliae.actaplantarum.org/viewtopic.php?t=102122).

E. Fanfarillo, D. Iamonico, M. Iberite, M. Latini, G. Nicolella

Acer saccharinum L. subsp. *saccharinum* (Sapindaceae)

+ (CAS) **ABR**: Teramo (Teramo), Via A. De Gasperi, presso l'alveo del Torrente Vezzola (WGS84: 42.662558°N; 13.708741°E), margine stradale, ca. 252 m, 20 June 2018, *N. Olivieri* (FI). – Casual alien subspecies new for the flora of Abruzzo.

Some young individuals grow near a street edge in a cool and shady area located at the base of a slope, on arenaceous soil, not far from the Stream Vezzola, together with *Parietaria judaica* L. and young individuals of *Celtis australis* L. subsp. *australis*, *Laurus nobilis* L., *Quercus pubescens* Willd. subsp. *pubescens*, and *Viburnum tinus* L. subsp. *tinus*. The young plants originated from the samaras produced by two trees planted nearby for ornamental purposes. This species is native to the eastern regions of North America and was introduced in Italy in 1760 (Maniero 2015) as an ornamental plant, marked by rapid growth.

N. Olivieri

Canna indica L. (Cannaceae)

+ (CAS) **MAR**: San Benedetto del Tronto (Ascoli Piceno), lungo la ferrovia all'interno dell'abitato presso Via G. Sgambati (WGS84: 42.941111°N; 13.887777°E), margine della massicciata ferroviaria, ca. 6 m, E, 10 July 2018, *N. Olivieri* (FI). – Casual alien species new for the flora of Marche.

A group of plants are located on the edge of the railway embankment, close to the Adriatic Sea, on rather damp gravelly substratum, beneath a young individual of *Phoenix canariensis* H.Wildpret. In the area the herbaceous vegetation is mainly constituted by *Equisetum ramosissimum* Desf. and *Parietaria judaica* L.

N. Olivieri

Cardamine occulta Hornem. (Brassicaceae)

+ (CAS) **MAR**: Camerino (Macerata), Viale G. Leopardi 14, at the Botanical Garden (WGS84: 43.136004°N; 13.069947°E), greenhouse soil, synanthropic habitat, 635 m, no exp., 30 March 2018, *S. Ballelli, R. Pennesi* (FI, CAME); Fabriano (Ancona), Piazzale Santa Maria Maddalena (WGS84: 43.331993°N; 12.899302°E), flower vases soil, synanthropic habitat, 340 m, no exp., 5 April 2018, *S. Ballelli* (FI, CAME). – Casual alien species new for the flora of Marche.
+ (CAS) **UMB**: Foligno (Perugia), Via Gran Sasso 23, near Restaurant Winner (WGS84: 42.960197°N; 12.689901°E), flower vases soil, synanthropic habitat, 230 m, no exp., 23 February 2014, *S. Ballelli* (FI, CAME). – Casual alien species new for the flora of Umbria.

Several authors reported this taxon under different names, but Marhold et al. (2016) clarified that the oldest name applicable for the so-called "Asian *Cardamine flexuosa*" is *C. occulta*. In Italy, *C. occulta* was first found in Sardegna (Lazzeri et al. 2013, under the name *C. flexuosa* With. subsp. *debilis* O.E.Schulz), then in other Italian regions (Toscana and Lombardia: Ardenghi and Mossini 2014, under the name *C. flexuosa* subsp. *debilis*; Piemonte: Verloove and Ardenghi 2015, under the name *C. hamiltonii* G.Don; Veneto: Marhold et al. 2016; Trentino-Alto Adige: Galasso et al. 2016a; Campania: Stinca et al. 2017; Lazio: Galasso et al. 2018b). The present findings broaden its distribution in central Italy both in Marche and Umbria. *Cardamine occulta* has been found growing together with the similar *C. hirsuta* L. in urban environments, especially in flower pots. Its presence in these regions could date back to several years ago; additionally its distribution may be much broader than reported, given the possible confusion with *C. hirsuta* (see Šlenker et al. 2018 for differences).

S. Ballelli, R. Pennesi

Cedrus atlantica (Endl.) G.Manetti ex Carrière (Pinaceae)

+ (NAT) **SAR.** – Status change from casual to naturalized alien for the flora of Sardegna.

This species is endemic to the Atlas Mountains, in Morocco and Algeria, but it has been used in reforestations and as an ornamental tree in many countries (Farjon 2017). In Sardegna it was reported as cultivated by Pavari and De Philippis (1941), and recently indicated as a casual alien species (Bacchetta et al. 2009, Puddu et al. 2016, Galasso et al. 2018a). Actually, the species is naturalized in those places where it was abundantly introduced since the 1930s, such as the State Forests of Bono, Bultei, Ane-

la, and Monte Limbara (Pavari and De Philippis 1941), but also in the State Forests of Orgosolo, Arzana, and Villagrande Strisaili (Montes, M. Idolo, Bau Muggeris). In these sites, there is an important renewal and adult trees occur in woodlands, garrigues, heaths, roadsides, and reforestations.

G. Bacchetta, G. Calvia, A. Ruggero

Chlorophytum comosum (Thunb.) Jacques (Asparagaceae)

+ (CAS) **ABR**: Teramo (Teramo), bordo di Via C. Battisti (WGS84: 42.659936°N; 13.703644°E), margine stradale, ca. 268 m, 14 June 2018, *N. Olivieri* (FI). – Casual alien species new for the flora of Abruzzo.

Some individuals of this species can be found near the edge of the road and the base of a building in a shady and humid site, near a rain gutter downspout, in a central area of the town. Probably these individuals were vegetatively generated from plants grown as ornamentals on surrounding buildings. *Chlorophytum comosum* is native to southern Africa and is a popular cultivated plant.

N. Olivieri

Citrus ×*aurantium* L. (Rutaceae)

+ (CAS) **MAR**: San Benedetto del Tronto (Ascoli Piceno), presso Viale delle Palme (WGS84: 42.950919°N; 13.884188°E), aiuola occupata da arbusti di *Westringia fruticosa*, ca. 8 m, 10 July 2018, *N. Olivieri* (FI). – Casual alien nothospecies new for the flora of Marche.

A young individual has grown within a flowerbed of a public garden, among shrubs of *Westringia fruticosa* (Willd.) Druce and *Melaleuca citrina* (Curtis) Dum.Cours. The place is located at short distance from the Adriatic Sea and is protected from cold easterly winds by the presence of *Pinus halepensis* Mill. subsp. *halepensis* trees and buildings. The young plant probably originated from seeds produced by an adult specimen cultivated in the gardens not far away. Along the southernmost part of the Marche coast, the cultivation of *Citrus* ×*aurantium* and other *Citrus* fruits has been present since the 12th century D.C. (Zavatti 1966, Manzi and Vitelli 2016).

N. Olivieri

Cyperus microiria Steud. (Cyperaceae)

+ (CAS) **TOS**: Pisa (Pisa), nei pressi dell'aeroporto (WGS84: 43.691115°N; 10.412054°E), campi coltivati, ca. 5 m, 17 October 2017, *R. Guarino* (FI). – Casual alien species new for the flora of Toscana.

This is a late-flowering annual species of eastern Asiatic origin, widely naturalized in Europe and U.S.A. (Verloove 2014). In Italy, it was first collected near Como in 1908

(Camperio and Fiori 1910) and currently it is recorded as invasive alien in Lombardia and Emilia-Romagna, naturalized in Piemonte and Veneto, and casual in Trentino-Alto Adige and Friuli Venezia Giulia (Galasso et al. 2018a). Our finding, in a regularly disturbed field edge next to the airport of Pisa, is the first record south of the Apennines because a previous record from Calabria was found to be erroneus (Galasso et al. 2016b, 2018a).

R. Guarino, L. Peruzzi

Epilobium brachycarpum C.Presl (Onagraceae)

+ (NAT) **ITALIA** (**EMR**): Bologna (Bologna), scalo merci di Bologna San Donato, tratto compreso tra il Posto A e il Posto B (WGS84: 44.506283°N; 11.390399°E), pietrisco fine e compattato di natura calcareo-marnosa tra i binari, 50 m, 26 September 2017, leg. *A. Alessandrini*, det. *N.M.G. Ardenghi* (FI). – Naturalized alien species new for the flora of Italy (Emilia-Romagna).

Epilobium brachycarpum is a therophyte native to western North America. In Europe, it was first recorded in Spain in 1978 and, by the 1990s, in different countries of the central and north-western parts of the continent: France, Germany, Belgium, and United Kingdom. It colonizes disturbed, dry and warm habitats characterized by short-lived ruderal communities, with a distinct preference for railway areas, where many of the European records come from (Izco 1983, Bönsel and Ottich 2005, Verloove and Lambinon 2009, Gregor et al. 2013, Remacle 2014). It is regarded as an invasive species in central Europe (Nierbauer et al. 2016), its rapid expansion being promoted by the high production of seeds, dispersed by wind and probably vehicles, and the strong competition on bare soils with other ruderal plants (Gregor et al. 2013). The population discovered in Bologna is located at the entrance of the almost disused freight yard of Bologna San Donato that has been one of the most important railway yards in Europe. In summer, *E. brachycarpum* forms a dense monospecific stand, covering an area of about 50 ha. Due to the population extent, it is likely that the species was introduced years ago, probably through imported freight or railroad cars from France (via the Torino-Milano-Bologna line) or Germany (via the Verona-Bologna line). Photos of the population are available at: http://www.floraitaliae.actaplantarum.org/viewtopic.php?t=99257.

A. Alessandrini, N.M.G. Ardenghi

Eucalyptus polyanthemos Schauer subsp. *polyanthemos* (Myrtaceae)

+ (CAS) **ITALIA** (**SAR**): Villacidro (Sud Sardegna), Campu s'Isca, Rio Leni (WGS84: 39.39538°N; 8.65812°E), materassi alluvionali granitico-metamorfici, 329 m, 20 July 2018, *G. Bacchetta, G. Brundu, L. Podda* (FI, CAG). – Casual alien subspecies new for the flora of Italy (Sardegna).

This Australian species, identified according to the Centre for Plant Biodiversity Research (2006) and Slee et al. (2015), was introduced in Sardegna for reforestation in the period 1914–1921. It shows a scarce tendency to naturalization, unlike *E. camaldulensis* Dehnh. subsp. *camaldulensis* and *E. globulus* Labill. subsp. *globulus*, occurring only with a dozen young trees near the reforestation site.

G. Bacchetta, G. Brundu, L. Podda

Euphorbia berteroana Balb. ex Spreng. (Euphorbiaceae)

– **ITALIA** (**SIC**). – Alien species to be excluded from the flora of Italy (Sicilia).

On the basis of the following record concerning *E. ophthalmica* Pers., this species should be excluded from Italy.

M. Mugnai, L. Di Nuzzo, L. Lazzaro, G. Ferretti

Euphorbia hypericifolia L. (Euphorbiaceae)

+ (CAS) **PUG**: Melendugno (Lecce), fraz. Borgagne, nella masseria (WGS84: 40.239834°N; 18.376283°E ± 1 Km), 20 m, unica pianta presente nel sito, 23 June 2014, *E.S. Mauri* (FI sub *Chamaesyce hyssopifolia*). – Casual alien species new for the flora of Puglia.

On the basis of the following record concerning *E. hyssopifolia* L., *E. hypericifolia* should be considered as new for the flora of Puglia. Indeed, the Apulian record of *Euphorbia hyssopifolia* by Buono et al. (2017) should be referred to *E. hypericifolia*.

M. Mugnai, L. Di Nuzzo, L. Lazzaro, G. Ferretti

Euphorbia hyssopifolia L. (Euphorbiaceae)

– **ITALIA** (**PUG**, **SIC**). – Alien species to be excluded from the flora of Italy (Puglia and Sicilia).

Euphorbia hyssopifolia was recorded as new for the flora of Italy by Banfi and Galasso (2014), based on specimens collected in Sicilia, and it was subsequently reported in Puglia by E.S. Mauri in Buono et al. (2017). We analysed the exsiccata from Sicilia and Puglia conserved in FI. These specimens were compared to scans of type specimen and revised according to Ma and Gilbert (2008) and Steinmann et al. (2016). We also submitted the specimens to Victor Steinmann, an expert of *Euphorbia* sect. *Anisophyllum* Roep. According to our inquiries, both records correspond to *Euphorbia hypericifolia* L., a species reported so far in Italy for Toscana and Sicilia (Galasso et al. 2018a). Accordingly, *E. hyssopifolia* should be excluded from the flora of Italy.

M. Mugnai, L. Di Nuzzo, L. Lazzaro, G. Ferretti

Euphorbia ophthalmica Pers. (Euphorbiaceae)

+ (CAS) **ITALIA** (**SIC**): Palermo (Palermo), in cultis, in H.B. Panorm copiosa sponte qui crescit (WGS84: ca. 38.112642°N; 13.374495°E), September 1880, *M. Lojacono Pojero* (P sub *E. berteroana*); *ibidem*, in cultis humentibus subsponte in Hortis Palermo (WGS84: ca. 38.112642°N; 13.374495°E), October 1882, *M. Lojacono Pojero* (FI sub *E. berteroana*); *ibidem*, subsponte in Hortis Palermo (WGS84: ca. 38.112642°N; 13.374495°E), September 1883, *M. Lojacono Pojero* (FI sub *E. berteroana*); *ibidem*, subsponte in H.B. Panorm (WGS84: ca. 38.112642°N; 13.374495°E), August 1886, *s.c.* (TO sub *E. berteroana*); *ibidem*, culta in R.H.B.P. (WGS84: ca. 38.112642°N; 13.374495°E), s.d., *s.c.* (PAL No. 51733 sub *E. berteroana*); Catania (Catania), als Unkraut im Botanischen Garten Catania [infestante nel giardino botanico di Catania] (WGS84: ca. 37.515680°N; 15.083732°E), September 1928, leg. *K. Müller* sub *E. nutans*, revidit *G. Hügin* 1995 sub *E. hirta*, revidit *G. Hügin* 1997 sub *E. berteroana* (STU); Ribera (Agrigento), Azienda Pizzuto, infestante degli agrumeti (WGS84: 37.500000°N; 13.267000°E ± 2 Km), agrumeti, sporadica, s.d. [1970s: G. Ferro, in verbis], *G. Ferro* (FI sub *E. berteroana*); *ibidem*, Fondo Cipolla, negli agrumeti (WGS84: 37.500000°N; 13.267000°E ± 2 Km), agrumeti, ca. 100 m, s.d. [1970s: G. Ferro, in verbis], *G. Ferro* (FI sub *E. berteroana*); *ibidem*, infestante degli agrumeti (WGS84: 37.500000°N; 13.267000°E ± 2 Km), agrumeti, 200 m, non molto diffusa, s.d. [1970s: G. Ferro, in verbis], *G. Ferro* (FI sub *E. berteroana*); *ibidem* (WGS84: 37.500000°N; 13.267000°E ± 2 Km), ai margini di un frutteto (quasi ruderale), ca. 180 m, s.d. [1970s: G. Ferro, in verbis], *G. Ferro* (FI sub *E. berteroana*). – Casual alien species new for the flora of Italy (Sicilia).

We revised the herbarium specimens from Italy referred to *E. berteroana* Balb. ex Spreng., concluding that they should be referred to *E. ophthalmica*. Indeed, *E. berteroana* was reported in Sicilia at the turn of the 20th century by Lojacono Pojero (1907) and cited by Fiori (1926, 1928), Giardina et al. (2007), and Pignatti (1982, 2017). Nevertheless, Galasso et al. (2018a) do not mention *E. berteroana* as occurring in Italy. We searched for herbarium specimens that could be linked to such reports, retrieving exsiccata preserved in FI, P, PAL, and TO. In addition, we retrieved more recent specimens of *E. berteroana* in STU, collected in 1928 by K. Müller, and in FI, collected in the 1970s by G. Ferro. Such material was compared to the type material and revised using different identification keys (Burch 1965, Steinmann et al. 2016, Burger and Huft 1995) and the expert opinion of Victor Steinmann. *Euphorbia berteroana* shows affinities with *E. ophthalmica* and *E. hirta* L., but can be clearly distinguished from these species. Indeed, *E. berteroana* shows ovate-elliptic leaf blades with obtuse apex, while *E. hirta* and *E. ophthalmica* leaves show leaf blades generally rhombic, with acute apex. In addition, *E. ophthalmica* differs from *E. hirta* in having capitula strictly terminal or on leafy lateral stalks, and stem branching from base to tips. Our conclusion is that the Italian exsiccata correspond to *Euphorbia ophthalmica*, a species never recorded before for Italy. In addition, based on the revised herbarium specimens, the true *E. berteroana* was never collected in Italy, and the reports by Lojacono Pojero

(1907), Fiori (1926, 1928), Giardina et al. (2007), and Pignatti (1982, 2017) should be considered erroneous.

M. Mugnai, L. Di Nuzzo, L. Lazzaro, G. Ferretti

Euphorbia prostrata Aiton (Euphorbiaceae)

+ (NAT) **SAR.** – Status change from casual to naturalized alien for the flora of Sardegna.

This is a species native to North America (Pignatti 2017), which behaves as invasive alien in Italy and casual in Sardegna (Galasso et al. 2018a). It was reported from various localities of southern Sardegna by Bocchieri et al. (1982) and Bocchieri (1984), and then confirmed by Arrigoni (2010). Later, Puddu et al. (2016) indicated it as a casual alien in Sardegna, while Camarda et al. (2016) reported it as naturalized. It is widespread in Gallura, Logudoro, Ogliastra, Sulcis-Iglesiente, Sarrabus-Gerrei and Campidano, from sea level to 1,050 m a.s.l., along roadsides and in fallow land, ruderal places, and gardens, mainly on sandy granitic soils.

G. Bacchetta, G. Calvia, L. Podda, A. Ruggero

Euphorbia thymifolia L. (Euphorbiaceae)

– **ITALIA** (**LIG**, **TOS**, **LAZ**). – Alien species to be excluded from the flora of Italy (Liguria, Toscana, and Lazio).

To our knowledge, *Euphorbia thymifolia* was reported (sub *E. thymifolia* Burm.) for the first time for the flora of Italy in Toscana by Arcangeli (1894), and subsequently for Lazio and Toscana by Chiovenda (1895). This species was also tentatively recorded by Sommier (1898) for Valle d'Aosta. However, the same author stated that all his previous reports should be actually referred to *E. maculata* L. instead of *E. thymifolia* (Sommier 1903), as confirmed in Fiori (1901) for all Italian specimens and recently by Bovio (2014) for Valle d'Aosta. Notwithstanding, *E. thymifolia* was subsequently reported as a literature record (Viegi and Cela Renzoni 1981, Del Prete et al. 1991, Arrigoni and Viegi 2011), confirmed for Lazio and Toscana as a naturalized alien species and recorded as historical record for Liguria (Galasso et al. 2018a). We revised the specimens collected by Chiovenda (FI and RO) according to Steinmann et al. (2016) and Hügin (1998), and we attributed them to *E. maculata* (in agreement with Sommier 1903 and Fiori 1901). In addition, we revised herbarium specimens of *E. maculata* and *E. thymifolia* in FI, FIAF, PI, and RO, concluding that all these specimens correspond to *E. maculata*. Accordingly, *E. thymifolia* should be excluded from the Italian alien flora. These two species are similar, but clearly distinguishable by capsules scarcely exserted from the involucre at maturity in *E. thymifolia* vs., well exserted in *E. maculata*.

M. Mugnai, L. Di Nuzzo, L. Lazzaro, G. Ferretti

Gamochaeta argyrinea G.L.Nesom (Asteraceae)

+ (NAT) **SAR**: Arzachena (Sassari), Nuraghe La Prisgiona (WGS84: 41.025332°N; 9.214608°E), macchie, 130 m, 30 April 2012, *G. Calvia* (*Herb. Calvia, Berchidda*); *ibidem*, Tomba di Giganti Coddu 'Ecchju (WGS84: 41.030579°N; 9.212391°E), prati, incolti, 90 m, 30 April 2012, *G. Calvia* (*Herb. Calvia, Berchidda*); *ibidem*, loc. Capichera, dintorni della Tomba di Giganti Coddu 'Ecchju (WGS84: 41.030027°N; 9.212321°E), prati, incolti, cigli stradali, 85–90 m, 21 July 2018, *G. Calvia* (FI, CAG). – Naturalized alien species new for the flora of Sardegna.

Gamochaeta argyrinea is native to North America (Nesom 2006). According to Galasso et al. (2018a), it is a naturalized alien in Toscana. In Sardegna, it was found in the countryside of Arzachena, and collected in April 2012. It is known from at least five localities, but apparently expanding.

G. Calvia

Hesperocyparis arizonica (Greene) Bartel (Cupressaceae)

+ (CAS) **LAZ**: Alatri (Frosinone) (WGS84: 41.742540°N; 13.327508°E), sotto e nei pressi di rimboschimenti a conifere, 570 m, 9 February 2018, *E. Fanfarillo* (FI, RO). – Casual alien species new for the flora of Lazio.

This northwestern American species, widely used for ornamental purposes and reforestations, is reported as casual for many Italian regions and as naturalized in Toscana (Galasso et al. 2018a). Many small individuals were observed near and under cultivated plants, colonizing the understory of a degraded conifer plantation.

E. Fanfarillo, D. Iamonico, M. Iberite, M. Latini, G. Nicolella

Hesperocyparis macrocarpa (Hartw. ex Gordon) Bartel (Cupressaceae)

+ (NAT) **LAZ**: Alatri (Frosinone) (WGS84: 41.744605°N; 13.327046°E), sotto e nei pressi di rimboschimenti a conifere, 550 m, 9 February 2018, *E. Fanfarillo* (FI, RO). – Naturalized alien species new for the flora of Lazio.

So far, this species was reported as casual in Umbria and Sardegna (Galasso et al. 2018a). Many sexually reproductive individuals originated from cultivated plants, some of which are several metres tall. Although not previously observed, the size of the individuals and the occurrence of several fertile generations suggest that the population is self-sustaining. Thus, the species can be considered as naturalized in Lazio.

E. Fanfarillo, D. Iamonico, M. Iberite, M. Latini, G. Nicolella

+ (CAS) **MOL**: Petacciato (Campobasso), fraz. Marina di Petacciato (WGS84: 42.032463°N; 14.860958°E), margine di impianto di rimboschimento costiero,

ca. 3 m, 16 June 2018, *N. Olivieri* (FI). – Casual alien species new for the flora of Molise.

Some young individuals of the species grow on the edge of an artificial pine forest composed mainly of *Pinus halepensis* Mill. subsp. *halepensis* and *Pinus pinea* L., along with *Acacia saligna* (Labill.) H.L.Wendl., *Cupressus sempervirens* L., *Eucalyptus camaldulensis* Dehnh. subsp. *camaldulensis*, and *Hesperocyparis macrocarpa*. They are located on a sandy soil, in shady areas not far from the Adriatic coast. *Hesperocyparis macrocarpa* is an American species native to California, where it lives in two small areas southwest of the city of Monterey. The species was introduced in Italy in 1851 (Maniero 2015) and is planted especially in coastal areas as a windbreak.

N. Olivieri

Heteranthera reniformis Ruiz & Pav. (Pontederiaceae)

+ (CAS) **SAR**: Cabras (Oristano), nei pressi dello stagno di Cabras (WGS84: 39.96151°N; 8.51118°E), risaia, 6 m, 9 August 2017, leg. *V. Lozano, P. Capece, G. Brundu*, det. *G. Brundu* (FI, SS). – Casual alien species new for the flora of Sardegna.

Heteranthera reniformis is an annual or pluriannual submerged or floating plant, native to freshwater wetlands of North, Central, and South America (Hussner 2012). This species was introduced accidentally in Europe, probably with seeds of rice, and it is also widely cultivated as ornamental plant.

V. Lozano, P. Capece, G. Brundu

Lemna minuta Kunth (Araceae)

+ (INV) **TOS**. – Status change from casual to invasive alien for the flora of Toscana.

Lemna minuta is native to temperate and subtropical areas of America (Banfi and Galasso 2010), and it is recorded as invasive or naturalized alien in almost all Italian Regions (Galasso et al. 2018a). In Toscana, this species was recorded for the first time in the Migliarino-San Rossore-Massaciuccoli Regional Park by Peruzzi and Savio (2011). Although these authors reported the species as casual alien, they suggested to carefully monitor it, hypothesizing an ongoing naturalization process. During field surveys in the same areas, we observed that this species is widely distributed. Moreover, in the meantime, *L. minuta* was recorded for several other sites in Toscana (Lastrucci et al. 2016, Carta et al. 2018). We noticed that *Lemna minuta* commonly shares the habitat with the native species *L. minor* L. and/or *L. gibba* L., generally behaving as a strong competitor. Considering the quick expansion and the severe competition with native species, we retain most appropriate the status of invasive alien in Toscana for *L. minuta*.

M. D'Antraccoli, F. Roma-Marzio

Ligustrum sinense Lour. (Oleaceae)

+ (CAS) **VDA**: Arnad (Aosta), fraz. Arnad le Vieux (WGS84: 45.645338°N; 7.720963°E), giovani individui naturalizzati nelle zone incolte e muretti a secco presso la sede comunale, 368 m, 15 October 2017, *M. Lonati, S. Ravetto Enri, M. Probo* (FI). – Casual alien species new for the flora of Valle d'Aosta.

Young individuals were observed in fallows and dry stone walls. They originated from seeds from plants cultivated in a neighbouring garden. This species should be monitored in this Region, since it shows a high invasion potential in the plain forests of the neighbouring Piemonte (Lonati et al. 2014, Vacchiano et al. 2016, Regione Piemonte 2018).

M. Lonati, S. Ravetto Enri, M. Probo

Lycium boerhaviifolium L.f. (Solanaceae)

+ (NAT) **ITALIA** (**SAR**): Cagliari (Cagliari), pressi di Viale Buoncammino (WGS84: 39.221681°N; 9.115990°E), calcari miocenici, 91 m, 23 July 2018, *G. Bacchetta, P.L. Nimis, L. Podda* (FI, CAG). – Naturalized alien species new for the flora of Italy (Sardegna).

This species is native to South America (Levin et al. 2011). In the city of Cagliari, it behaves as a ruderal nitrophilous plant, which colonizes urban sites as walls or slopes, mainly on the Miocene sedimentary stones "Pietra Cantone" and "Pietra Forte". To our knowledge, this is the first report as a naturalized alien in Europe.

G. Bacchetta, A. Moro, P.L. Nimis, L. Podda

Nassella tenuissima (Trin.) Barkworth (Poaceae)

+ (CAS) **VEN**: Bassano del Grappa (Vicenza), Via Passalacqua (WGS84: 45.771104°N; 11.742118°), bordo di marciapiede, 130 m, 21 May 2017, leg. *G. Busnardo*, det. *F. Prosser* (FI, ROV). – Casual alien species new for the flora of Veneto.

This species of South American origin is increasingly planted in southern Europe, where it shows a tendency to escape from cultivation (Verloove 2005). In Italy, this species was reported, as casual, only from Bolzano (Wilhalm et al. 2017). In Trentino-Alto Adige, it has recently been collected as escaped from cultivation also in the province of Trento (Villa Lagarina, at least 10 tufts born spontaneously in the area surrounding the roundabout - within which the species is cultivated - at the "Rovereto Sud" entrance of the motorway, 4 July 2018, *F. Prosser*, ROV). In Bassano, a few casual specimens have been noticed on the edge of a sidewalk, certainly deriving from a flowerbed a dozen meters away.

G. Busnardo, F. Prosser

Nothoscordum borbonicum Kunth (Amaryllidaceae)

+ (NAT) **SAR**. – Status change from casual to naturalized alien for the flora of Sardegna.

For this Central American species, Ardenghi et al. (2011) proposed the status of casual alien in Sardegna. However, *N. borbonicum* seems actually naturalized, given its abundance in Cagliari and its suburbs, where it colonizes roadsides, fallow land, gardens, ruderal places, and even walls. It has been also found in Olbia (Sassari).

G. Bacchetta, G. Calvia, L. Podda

Oenothera lindheimeri (Engelm. & A.Gray) W.L.Wagner & Hoch (Onagraceae)

+ (CAS) **TOS**: Capraia Isola (Livorno), Isola di Capraia, spontanea sotto il Castello del paese di Capraia Isola (WGS84: 43.048211°N; 9.844937°E), in una fessura tra le rocce, 52 m, 19 May 2018, *L. Lazzaro, M. Distefano* (FI). – Casual alien species new for the flora of Toscana.

Oenothera lindheimeri is a species native to southern North America (Louisiana and Texas), where it is widely cultivated as ornamental. In Italy, it was already recorded as a casual alien in Lombardia, Veneto, Campania, and Puglia (Galasso et al. 2018a). This species is widely cultivated in other sites in Toscana, mainly in urban flowerbeds. The material was identified according to Raven and Gregory (1972).

M. Mugnai, L. Di Nuzzo, L. Lazzaro, G. Ferretti

Osteospermum ecklonis (DC.) Norl. (Asteraceae)

+ (CAS) **ABR**: Giulianova (Teramo), prato litoraneo presso giardino privato (WGS84: 42.750277°N; 13.973872°E), prato litoraneo, ca. 8 m, 12 July 2018, *N. Olivieri* (FI). – Casual alien species new for the flora of Abruzzo.

Some individuals of this species have developed in an arid coastal meadow occupied by psammophilous herbaceous vegetation dominated by *Cenchrus longispinus* (Hack.) Fernald, near a private garden. The site is located south of the harbour of Giulianova, not far from the beach. The plants have developed from seeds produced by individuals grown as ornamentals in a nearby garden.

N. Olivieri

Paspalum distichum L. (Poaceae)

+ (INV) **CAL**: Scalea (Cosenza), centro (WGS84: 39.815757°N; 15.787249°E), fessure della pavimentazione, 6 m, 20 August 2014, *A. Stinca* (PORUN); Roccabernarda (Crotone), Valle Niffi (WGS84: 39.107406°N; 16.873521°E), torrente,

122 m, 26 July 2018, *A. Stinca* (PORUN); *ibidem*, lungo il Fiume Tacina in corrispondenza di loc. Filicetto (WGS84: 39.116179°N; 16.860654°E), argine fluviale, 102 m, 26 July 2018, *A. Stinca* (PORUN); Calopezzati (Cosenza), foce del Torrene Calamitti (WGS84: 39.561422°N; 16.833549°E), argine fluviale, 1 m, 17 August 2018, *A. Stinca* (PORUN); Corigliano-Rossano (Cosenza), fraz. Rossano, tra la foce del Fiume Trionto e la loc. Faro Trionto (WGS84: 39.621369°N; 16.754349°E), terreno fangoso, 4 m, 17 August 2018, *A. Stinca* (PORUN); Cropalati (Cosenza), lungo il Fiume Trionto (WGS84: 39.510398°N; 16.732697°E), argine fluviale, 160 m, 18 August 2018, *A. Stinca* (PORUN); Paludi (Cosenza), loc. V.ne S. Martino (WGS84: 39.539589°N; 16.688078°E), torrente, 220 m, 19 August 2018, *A. Stinca* (PORUN); Strongoli (Crotone), loc. C. Serra Piani (WGS84: 39.264594°N; 17.019728°E), terreno fangoso, 138 m, 22 August 2018, *A. Stinca* (PORUN); Roggiano Gravina (Cosenza), Lago dell'Esaro (WGS84: 39.638220°N; 16.160279°E), sponde, 135 m, 23 August 2018, *L. Peruzzi* (PI No. 011541); Castelsilano (Crotone), Fiume Lese (WGS84: 39.216942°N; 16.865315°E), argine fluviale, 101 m, 8 October 2018, *A. Stinca* (PORUN); Caccuri (Crotone), Fiume Lese (WGS84: 39.231899°N; 16.850924°E), argine fluviale, 125 m, 9 October 2018, *A. Stinca* (PORUN); *ibidem*, Torrente Lepre (WGS84: 39.217925°N; 16.836326°E), argine fluviale, 133 m, 11 October 2018, *A. Stinca* (PORUN); Casabona (Crotone), lungo la Fiumara Vitravo (WGS84: 39.254953°N; 16.905314°E), argine fluviale, 140 m, 12 October 2018, *A. Stinca* (PORUN). – Status change from naturalized to invasive alien for the flora of Calabria.

Paspalum distichum is recorded for all Italian regions, with the exception of Valle d'Aosta and Trentino-Alto Adige (Galasso et al. 2018a). The latter authors reported this species as naturalized in Calabria. However, we found large populations of this neophyte mostly along the banks of several rivers, streams, and lakeshores of the provinces of Crotone, Catanzaro, and Cosenza, forming belts of 1 to 60 m. In addition to the places indicated in the samples, we have observed a large population also along the Crocchio River (Cropani, Catanzaro province, WGS84: 38.916399°N; 16.826309°E). Accordingly, this species should be considered invasive in Calabria.

A. Stinca, F. Bartolucci, L. Peruzzi

Pontederia cordata L. (Pontederiaceae)

+ (NAT) **LAZ**: Sabaudia (Latina), loc. Bella Farnia, Strada Litoranea (WGS84: 41.367494°N; 12.978081°E), fosso, 110 m, 25 June 2013, *M. Iberite* (FI, RO). – Naturalized alien species new for the flora of Lazio.

This is the first record of this taxon for peninsular Italy. Galasso et al. (2018a) report it as a naturalized alien for Lombardia and Veneto, and Montanari et al. (2015) recorded its occurrence in Emilia-Romagna. The population, still present in 2018, covers an extension of about 5 m^2; flowering was observed, but the plants probably reproduce only vegetatively. *Pontederia cordata* is recognized since many years to be a potentially

invasive species in Europe, namely because of its clonal growth ability (Weber and Gut 2004). This calls a careful monitoring.

E. Fanfarillo, D. Iamonico, M. Iberite, M. Latini, G. Nicolella

Romulea rosea (L.) Eckl. (Iridaceae)

+ (NAT) **SAR**: Cardedu (Nuoro), Monte Ferru (WGS84: 39.743000°N; 9.624400°E ± 100 m), prato con modesta ritenuta idrica invernale, 540 m, SE, piante concentrate nel prato, con una buona densità; individui sparsi sono presenti fino a un centinaio di metri di distanza, sconfinando nella rada macchia mediterranea, 23 March 2017, *G. Mereu* (MSNM); *ibidem*, propaggine nord-orientale del Monte Ferru, versante E (WGS84: 39.743000°N; 9.624400°E ± 100 m), prato e bordo della macchia mediterranea, 540 m, SE, 15 April 2018, *G. Mereu* (FI). – Naturalized alien species confirmed for the flora of Sardegna.

The presence of this species was considered doubtful for Sardegna and for Italy in Galasso et al. (2018a). It appears to be naturalized since a long time in the indicated area. Evidence suggests that the plants were already present in 1992, when the site was subjected to human intervention following the creation of the "Cantiere forestale di Monte Ferru". Considering that there are no other reports for Italy and that the population reported for France has been identified as *Romulea arnaudii* Moret (Moret at al. 2000), this naturalized population is the only one currently documented in Italy and Europe.

G. Mereu

Rudbeckia triloba L. (Asteraceae)

+ (CAS) **TOS**: San Marcello Piteglio (Pistoia), fraz. Maresca, tra le loc. Case Bizzarri e Case Alte (WGS84: 44.053978°N; 10.857800°E), scarpata erbosa al margine della strada, 866 m, 10 November 2017, *G. Ferretti, F. Ferraro* (FI). – Casual alien species new for the flora of Toscana.

Rudbeckia triloba is an alien species from North America, recorded in Italy for Valle d'Aosta, Piemonte, Lombardia, Trentino-Alto Adige, and Veneto (Galasso et al. 2018a). It is used as ornamental and the recorded plants may have originated from a private garden. The plants were identified according to Ardenghi and Galasso (2013) and Maslo and Šarić (2018).

M. Mugnai, L. Di Nuzzo, L. Lazzaro, G. Ferretti

Salvia hispanica L. (Lamiaceae)

+ (CAS) **LAZ**: Bracciano (Roma), Vigna di Valle, Centro Sportivo dell'Aeronautica Militare presso l'Aeroporto di Vigna di Valle (WGS84: 42.084050°N; 12.222806°E),

riva del lago, 157 m, 29 October 2017, leg. *S. Buono*, det. *S. Magrini* (FI). – Casual alien species new for the flora of Lazio.

Salvia hispanica, commonly known as 'chia', is a species native to central and southern Mexico and Guatemala (Cahill 2003). This species is increasingly cultivated in Europe for human food, as its seeds are a rich source of omega-3 and other nutraceuticals (Muñoz et al. 2013). The first record of its occurrence as a casual alien in Italy, from Marche, is very recent (Ballelli 2015). Galasso et al. (2018a) recorded this species also for Lombardia, Trentino-Alto Adige, Emilia-Romagna, and Sicilia. A single individual was observed on sandy soil near Lake Bracciano, together with other alien species, such as *Amorpha fruticosa* L., *Datura stramonium* L., *Pavonia hastata* Cav. (Galasso et al. 2017), and *Physalis peruviana* L. (Galasso et al. 2018b). The plant regularly develops flowers and fruits.

S. Buono, S. Magrini

Sesbania punicea (Cav.) Benth. (Fabaceae)

+ (NAT) **SAR.** – Status change from casual to naturalized alien for the flora of Sardegna.

Sesbania punicea, native to South America (Erb 1980), is now widespread in many countries as an ornamental plant, becoming locally invasive. Its first report from Sardegna was by Camarda (1998). After a few years, Brundu et al. (2003) and Camarda et al. (2004) indicated it as naturalized in the island. Later, several authors confirmed the same status (e.g., Podda et al. 2011, Camarda et al. 2016, Puddu et al. 2016), but finally Bacchetta and Podda in Galasso et al. (2018a) reported it as a casual alien. Recently, a new locality on sandy substrata was observed, near the dam along Rio Leni (Villacidro), where about 100 shrubs colonize a slope.

G. Bacchetta, G. Brundu, L. Podda

Setaria italica (L.) P.Beauv. subsp. *pycnocoma* (Steud.) de Wet (Poaceae)

+ (CAS) **MAR**: Acqualagna (Pesaro e Urbino), fraz. Furlo, loc. Abbazia di San Vincenzo al Furlo (WGS84: 43.636404°N; 12.692410°E), scarpata stradale, 185 m, 28 July 2018, *G. Mei* (FI, ANC, *Herb. G. Mei*). – Casual alien subspecies new for the flora of Marche.

The presence of *Setaria italica* subsp. *pycnocoma* was not yet reported for Marche (Galasso et al. 2018a). This species has been found in an area previously subjected to weeding of the road margins. Most of the population occurs only along road margins, while a few plants have been observed in the nearby abandoned fields. In Italy, this plant colonizes only strongly anthropized areas (Bossard et al. 2000), such as urban suburbs, abandoned railway tracks, road margins, flowerbeds and, less frequently, recently abandoned fields (Banfi and Galasso 2010, Celesti-Grapow et al. 2009).

G. Mei

Sicyos angulatus L. (Cucurbitaceae)

+ (INV) **LAZ**: Morolo (Frosinone), argini e sponde del Fiume Sacco in loc. Ponte di Morolo (WGS84: 41.652513°N; 13.218388°E), argini e sponde fluviali, 150 m, 8 September 2018, *E. Fanfarillo* (RO); Supino (Frosinone), argini e sponde del Fiume Sacco in loc. Ponte di Supino (WGS84: 41.638706°N; 13.253182°E), argini e sponde fluviali, 147 m, 8 September 2018, *E. Fanfarillo* (RO); Patrica (Frosinone), sponde del Fiume Sacco in loc. Tomacella (WGS84: 41.608884°N; 13.290797°E), sponde fluviali, 139 m, 8 September 2018, *E. Fanfarillo* (RO). – Status change from casual to invasive alien for the flora of Lazio.

This species was first recorded in Lazio in 2002 along the Sacco River in Morolo (Frosinone), where its presence was defined "quite rare" (Salerno et al. 2006). After re-surveying the same locality and adjacent ones in 2018, this taxon appeared widespread along the river, forming dense populations both on the ground and on trees on a surface of about 2 km^2, and sparsely invading the roadsides. Further down the river, two new sites of occurrence were found at a distance of 4 and 10 km.

E. Fanfarillo, G. Nicolella

Styphnolobium japonicum (L.) Schott (Fabaceae)

+ (CAS) **ABR**: Teramo (Teramo), margine di parcheggio presso la Circonvallazione Ragusa (WGS84: 42.660794°N; 13.703624°E), margine, ca. 265 m, 21 June 2018, *N. Olivieri* (FI). – Casual alien species new for the flora of Abruzzo.

The species is present with some young individuals in a narrow belt of uncultivated land at the edge of a car park set in an internal courtyard, between the buildings, located behind the church of Sant'Agostino. These young plants, which may exceed the height of 1 m, originated from the seeds produced by a large individual growing on one side of the parking lot. *Styphnolobium japonicum* is a tree native to East Asia, which was introduced in Italy in 1799 (Maniero 2015).

N. Olivieri

Symphyotrichum squamatum (Spreng.) G.L.Nesom (Asteraceae)

+ (INV) **CAL**: Roggiano Gravina (Cosenza), Lago dell'Esaro (WGS84: 39.638220°N; 16.160279°E), sponde, 135 m, 23 August 2018, *L. Peruzzi* (PI No. 011540). – Status change from naturalized to invasive alien for the flora of Calabria.

Symphyotrichum squamatum is recorded for all Italian regions, with the exception of Valle d'Aosta (Galasso et al. 2018a). The latter authors reported this species as naturalized in Calabria but, given the extent of occurrence and density observed at the lakeshore, it is better considered as an invasive alien: a narrow belt of *S. squamatum* surrounded a large *Paspalum distichum* L. population in slightly drier areas, all around the lake.

L. Peruzzi

Tradescantia pallida (Rose) D.R.Hunt (Commelinaceae)

+ (CAS) **SIC**: Misilmeri (Palermo), Via Palmerino (WGS84: 38.035184°N; 13.455890°E), bordi di marciapiedi, 11 June 2018, *F. Scafidi* (FI). – Casual alien species new for the flora of Sicilia.

Some young individuals of this species were found along the edges of a sidewalk; they probably originated from seeds produced by cultivated plants in private flowerbeds. This species was likely introduced in Italy for ornamental purposes, and it was so far known as casual alien for Lazio, Calabria, and Sardegna (Galasso et al. 2018a).

F. Scafidi, G. Domina

Nomenclature and distribution updates from other literature sources

Nomenclature, status, and distribution updates according to Fiori (1902), Leigheb and Cameron-Curry (1999), Zohary and Hopf (2000), Orlandi and Arduini (2010), Levin et al. (2011), Alessandrini et al. (2012), Bona (2015), Montanari et al. (2015), Ardenghi and Polani (2016), Korotkova et al. (2017), Scafidi and Raimondo (2017, 2018), Selvi et al. (2017), Arrigoni (2018), Belyaeva et al. (2018), Brock et al. (2018), Carta et al. (2018), Galasso (2018), Gallo et al. (2018), Gargano (2018), Mayoral et al. (2018), Mosyakin et al. (2018), Motti et al. (2018), Nemati et al. (2018), Nesom (2018), Pellegrini (2018), Pellegrini et al. (2018), Pignatti (2018), Särkinen et al. (2018), Siadati et al. (2018), Sukhorukov et al. (2018), Truzzi (2018), Turland et al. (2018), and corrections to Bartolucci et al. (2018) and Galasso et al. (2018a) are provided in Supplementary material 1.

G. Galasso, F. Bartolucci

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References

Alessandrini A, Fontanesi G, Galasso G, Morelli V, Sturloni S (2012) Integrazioni alla flora del Reggiano con alcune novità per la flora dell'Emilia-Romagna. Informatore Botanico Italiano 44(suppl. 1): 7–12.

Arcangeli G (1894) Compendio della Flora Italiana, Ed. 2. Loescher, Torino, Roma.

Ardenghi NMG, Galasso G (2013) Notulae 166–167. In: Galasso G, Banfi E (Eds) Notulae ad plantas advenas longobardiae spectantes: 3 (141–208). Pagine Botaniche 36(2012): 29–31.

Ardenghi NMG, Mossini S (2014) *Cardamine flexuosa* subsp. *debilis* O.E.Schulz. In: Raab-Straube E von, Raus T (Eds) Euro+Med-Checklist Notulae, 3. Willdenowia 44(2): 287–299. https://doi.org/10.3372/wi.44.44211

Ardenghi NMG, Parolo G, Di Gregorio B (2011) Notulae: 57–60. In: Barberis G, Nepi C, Peccenini S, Peruzzi L (Eds) Notulae alla flora esotica d'Italia: 4 (54–89). Informatore Botanico Italiano 43(1): 57–60.

Ardenghi NMG, Polani F (2016) La flora della provincia di Pavia (Lombardia, Italia settentrionale). 1. L'Oltrepò Pavese. Natural History Sciences 3(2): 51–79. https://doi.org/10.4081/nhs.2016.269

Arrigoni PV (2010) Flora dell'Isola di Sardegna, Vol. 3. Carlo Delfino Editore, Sassari.

Arrigoni PV (2018) Flora analitica della Toscana, Vol. 4. Edizioni Polistampa, Firenze.

Arrigoni PV, Viegi L (2011) La flora vascolare esotica spontaneizzata della Toscana. Regione Toscana, Direzione generale Politiche territoriali, ambientali e per la mobilità, Settore Tutela e valorizzazione delle risorse ambientali, Firenze.

Bacchetta G, Mayoral O, Podda L (2009) Catálogo de la flora exótica de la isla de Cerdeña (Italia). Flora Montiberica 41: 35–61.

Ballelli S (2015) Notula: 286. In: Galasso G, Nepi C, Domina G, Peruzzi L (Eds) Notulae alla flora esotica d'Italia: 12 (244–287). Informatore Botanico Italiano 47(1): 89.

Banfi E, Galasso G (Eds) (2010) La flora esotica lombarda. Museo di Storia Naturale di Milano, Milano, 274 pp. [+ CD-Rom]

Banfi E, Galasso G (2014) Notula: 216. In: Barberis G, Nepi C, Peccenini S, Peruzzi L (Eds) Notulae alla flora esotica d'Italia: 17 (2027–2070). Informatore Botanico Italiano 46(1): 85.

Bartolucci F, Peruzzi L, Galasso G, Albano A, Alessandrini A, Ardenghi NMG, Astuti G, Bacchetta G, Ballelli S, Banfi E, Barberis G, Bernardo L, Bouvet D, Bovio M, Cecchi L, Di Pietro R, Domina G, Fascetti S, Fenu G, Festi F, Foggi B, Gallo L, Gottschlich G, Gubellini L, Iamonico D, Iberite M, Jiménez-Mejías P, Lattanzi E, Marchetti D, Martinetto E, Masin RR, Medagli P, Passalacqua NG, Peccenini S, Pennesi R, Pierini B, Poldini L, Prosser F, Raimondo FM, Roma-Marzio F, Rosati L, Santangelo A, Scoppola A, Scortegagna S, Selvaggi A, Selvi F, Soldano A, Stinca A, Wagensommer RP, Wilhalm T, Conti F (2018) An updated checklist of the vascular flora native to Italy. Plant Biosystems 152(2): 179–303. https://doi.org/10.1080/11263504.2017.1419996

Belyaeva IV, Epantchintseva OV, Govaerts RHA, McGinn K, Hunnex J, Kuzovkina YA (2018) The application of scientific names to plants in cultivation: *Salix vitellina* L. and related taxa (Salicaceae). Skvortsovia 4(2): 42–70.

Bocchieri E (1984) Contributo alle conoscenze floristiche del territorio di Pula (Sardegna meridionale): la fascia costiera dal Rio Santa Margherita al Capo di Pula. Rendiconti del Seminario della Facoltà di Scienze dell'Università di Cagliari 54(1): 143–177.

Bocchieri E, Mulas B, Poledrini A (1982) Segnalazioni floristiche italiane: 151–156. Informatore Botanico Italiano 14(2–3): 283–284.

Bona E (Ed.) (2015) Flora esotica del fiume Oglio e dei suoi principali affluenti a nord del Sebino. Tipografia Brenese, Breno, Brescia.

Bönsel D, Ottich I (2005) Über neue Funde des Kurzfrüchtigen Weidenröschens (*Epilobium brachycarpum*) in Frankfurt am Main. Botanik und Naturschutz in Hessen 18: 43–54.

Bossard M, Feranec J, Otahel J (2000) CORINE Land Cover technical guide – Addendum 2000. Technical report No 40. European Enviroment Agency, Copenhagen. http://www.geography.sav.sk/documents/2000-feranec-corine.pdf [accessed 01.07.2018]

Bovio M (2014) Flora vascolare della Valle d'Aosta. Testolin Editore, Sarre, Aosta.

Brock JR, Dönmez AA, Beilstein MA, Olsen KM (2018) Phylogenetics of *Camelina* Crantz. (Brassicaceae) and insights on the origin of gold-of-pleasure (*Camelina sativa*). Molecular Phylogenetics and Evolution 127: 834–842. https://doi.org/10.1016/j.ympev.2018.06.031

Brundu G, Camarda I, Satta V (2003) A methodological approach for mapping alien plants in Sardinia (Italy). In: Child LE, Brock JH, Brundu G, Prach K, Pyšek P, Wade M, Williamson M (Eds) Plant invasions: ecological threats and management solutions. Backhuys Publishers, Leiden, 41–62.

Buono V, Manni QG, Barone R, Campagna P, Civita F, Mauri ES, Pasquali G, Rignanese L, Stone AM, Sturloni S, Taneburgo G (2017) Rassegna di segnalazioni notevoli riguardanti la Puglia comparse nel forum Acta Plantarum. ActaPlantarum Notes 5: 61–67.

Burch DG (1965) A taxonomic revision of the genus *Chamaesyce* (Euphorbiaceae) in the Caribbean. Dissertation, University of Florida. https://doi.org/10.5962/bhl.title.37694

Burger W, Huft M (1995) Flora costaricensis: Family #113 Euphorbiaceae. Fieldiana, Botany, nuova serie 36: 1–169.

Cahill JP (2003) Ethnobotany of chia, *Salvia hispanica* L. (Lamiaceae). Economic Botany 57(4): 604–618. https://doi.org/10.1663/0013-0001(2003)057[0604:EOCSHL]2.0.CO;2

Camarda I (1998) Considerazioni su alcune specie di antica e recente introduzione in Sardegna e loro dinamica di diffusione. Biocosme Mésogéen 15(1): 89–108.

Camarda I, Brundu G, Carta L, Manca M, Satta V (2004) Invasive alien plants in the National Parks of Sardinia. In: Camarda I, Manfredo MJ, Mulas F, Teel TL (Eds) Global challenges of parks and protected area management. Proceedings of the 9th ISSRM. Carlo Delfino Editore, Sassari, 111–123.

Camarda I, Cossu TA, Carta L, Brunu A, Brundu G (2016) An updated inventory of the non-native flora of Sardinia (Italy). Plant Biosystems 150(5): 1106–1118. https://doi.org/10.1080/11263504.2015.1115438

Camperio C, Fiori A (1910) 1231. *Cyperus iria* L. var. *acutiglumis* Fiori. In: Fiori A, Béguinot A (Eds) Schedae ad floram italicam exsiccatam. Series II. Centuriae XIII-XIV. Nuovo Giornale Botanico Italiano, nuova serie 17(4): 582.

Carta A, Forbicioni L, Frangini G, Pierini B, Peruzzi L (2018) An updated inventory of the vascular flora of Elba Island (Tuscan Archipelago, Italy). Italian Botanist 6: 1–22. https://doi.org/10.3897/italianbotanist.6.26568

Celesti-Grapow L, Pretto F, Brundu G, Carli E, Blasi C (Eds) (2009) A thematic contribution to the National Biodiversity Strategy. Plant invasion in Italy, an overview. Ministry for the Environment Land and Sea Protection, Nature Protection Directorate, Rome, 32 pp. [+CD-Rom]

Centre for Plant Biodiversity Research (CPBR) (2006) EUCLID. Eucalypts of Australia. Third Edition (DVD-Rom). CSIRO Publishing, Collingwood.

Chiovenda E (1895) Delle Euforbie della sezione *Anisophyllum* appartenenti alla flora italiana. Bullettino della Società Botanica Italiana 1895: 61–66.

Del Prete C, Balderi F, Garbari F (1991) Geobotanical research on Mount Pisano (Tuscany, Italy): 8. A preliminary checklist of the vascular flora. Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 97(1990): 121–192.

Erb HE (1980) The natural enemies and distribution of *Sesbania punicea* (Cav.) Benth. in Argentina. In: Neser S, Cairns ALP (Eds) Proceedings of the third National Weeds Conference of South Africa. A.A. Balkema, Cape Town, 205–210.

Farjon A (2017) A handbook of the world's conifers. Second, revised edition. Brill, Leiden, Boston.

Fiori A (1901) Euphorbiaceae. In: Fiori A, Béguinot A (Eds) Flora analitica d'Italia, Vol. 2(2). Tipografia del Seminario, Padova, 272–292.

Fiori A (1902) Asclepiadaceae. In: Fiori A, Béguinot A (Eds) Flora analitica d'Italia, Vol. 2(3). Tipografia del Seminario, Padova, 344–347.

Fiori A (1926) Nuova flora analitica d'Italia, Vol. 2(2). Tipografia M. Ricci, Firenze, 161–320.

Fiori A (1928) Nuova flora analitica d'Italia, Vol. 2(6). Tipografia M. Ricci, Firenze, 801–944.

Galasso G (2018) Notulae redazionali 388–397. In: Galasso G, Banfi E (Eds) Notulae ad plantas advenas Longobardiae spectantes: 7 (365–397). Pagine Botaniche 40(2017): 46–50.

Galasso G, Conti F, Peruzzi L, Ardenghi NMG, Banfi E, Celesti-Grapow L, Albano A, Alessandrini A, Bacchetta G, Ballelli S, Bandini Mazzanti M, Barberis G, Bernardo L, Blasi C, Bouvet D, Bovio M, Cecchi L, Del Guacchio E, Domina G, Fascetti S, Gallo L, Gubellini L, Guiggi A, Iamonico D, Iberite M, Jiménez-Mejías P, Lattanzi E, Marchetti D, Martinetto E, Masin RR, Medagli P, Passalacqua NG, Peccenini S, Pennesi R, Pierini B, Podda L, Poldini L, Prosser F, Raimondo FM, Roma-Marzio F, Rosati L, Santangelo A, Scoppola A, Scortegagna S, Selvaggi A, Selvi F, Soldano A, Stinca A, Wagensommer RP, Wilhalm T, Bartolucci F (2018a) An updated checklist of the vascular flora alien to Italy. Plant Biosystems 152(3): 556–592. https://doi.org/10.1080/11263504.2018.1441197

Galasso G, Domina G, Adorni M, Ardenghi NMG, Banfi E, Bedini G, Bertolli A, Brundu G, Calbi M, Cecchi L, Cibei C, D'Antraccoli M, De Bastiani A, Faggi G, Ghillani L, Iberite M, Latini M, Lazzeri V, Liguori P, Marhold K, Masin R, Mauri S, Mereu G, Nicolella G, Olivieri N, Peccenini S, Perrino EV, Peruzzi L, Petraglia A, Pierini B, Prosser F, Roma-Marzio F, Romani R, Sammartino F, Selvaggi A, Signorile G, Stinca A, Verloove F, Nepi C (2016a) Notulae to the Italian alien vascular flora: 1. Italian Botanist 1: 17–37. https://doi.org/10.3897/italianbotanist.1.8777

Galasso G, Domina G, Adorni M, Ardenghi NMG, Bonari G, Buono S, Cancellieri L, Chianese G, Ferretti G, Fiaschi T, Forte L, Guarino R, Labadessa R, Lastrucci L, Lazzaro L, Magrini S, Minuto L, Mossini S, Olivieri N, Scoppola A, Stinca A, Turcato C, Nepi C (2018b) Notulae to the Italian alien vascular flora: 5. Italian Botanist 5: 45–56. https://doi.org/10.3897/italianbotanist.5.25910

Galasso G, Domina G, Ardenghi NMG, Arrigoni P, Banfi E, Bartolucci F, Bonari G, Buccomino G, Ciaschetti G, Conti F, Coppi A, Di Cecco V, Di Martino L, Guiggi A, Lastrucci L, Leporatti ML, López Tirado J, Maiorca G, Mossini S, Olivieri N, Pennesi R, Romiti B, Scoppola A, Soldano A, Stinca A, Verloove F, Villa M, Nepi C (2016b) Notulae to the Italian alien vascular flora: 2. Italian Botanist 2: 55–71. https://doi.org/10.3897/italianbotanist.2.11144

Galasso G, Domina G, Bonari G, Buono S, Chianese G, Cortesi G, Frangini G, Iamonico D, Olivieri N, Peruzzi L, Pierini B, Roma-Marzio F, Scoppola A, Soldano A, Stinca A, Tomaselli V, Veronico G, Nepi C (2017) Notulae to the Italian alien vascular flora: 4. Italian Botanist 4: 33–41. https://doi.org/10.3897/italianbotanist.4.21666

Gallo L, Guiggi A, Perazza G, Prosser F (2018) *Phedimus kamtschaticus* (Crassulaceae) e *Trichocereus candicans* (Cactaceae), nuove esotiche casuali per l'Italia osservate al M. Brione (Trentino-Alto-Adige). Annali del Museo Civico di Rovereto. Sezione: Archeologia, Storia Scienze Naturali 32(2016): 207–216.

Gargano ML (2018) The genus *Tamarix* (Tamaricaceae) in Apulia (southern Italy). Flora Mediterranea 28: 137–143. https://doi.org/10.7320/FlMedit28.137

Giardina G, Raimondo FM, Spadaro V (2007) A catalogue of plants growing in Sicily. Bocconea 20: 5–582.

Gregor T, Bönsel D, Starke-Ottich I, Tackenberg O, Wittig R, Zizka G (2013) *Epilobium brachycarpum*: a fast-spreading neophyte in Germany. Tuexenia 33: 259–283.

Hügin G (1998) Die Gattung *Chamaesyce* in Europa. Bestimmungsschlüssel mit taxonomisch-nomenklatorischen Anmerkungen. Feddes Repertorium 109(3–4): 189–223. https://doi.org/10.1002/fedr.19981090302

Hussner A (2012) Alien aquatic plant species in European countries. Weed Research 52(4): 297–306. https://doi.org/10.1111/j.1365-3180.2012.00926.x

Izco J (1983) *Epilobium paniculatum* nueva adventicia para Europa. Candollea 38(1) (1982): 309–315.

Korotkova N, Borsch T, Arias S (2017) A phylogenetic framework for the Hylocereeae (Cactaceae) and implications for the circumscription of the genera. Phytotaxa 327(1): 1–46. https://doi.org/10.11646/phytotaxa.327.1.1

Kravchenko OE (2008) *Acalypha australis*. In: Afonin AN, Greene SL, Dzyubenko NI, Frolov AN (Eds) Interactive Agricultural Ecological Atlas of Russia and Neighboring Countries. Economic Plants and their Diseases, Pests and Weeds [Online]. http://www.agroatlas.ru/en/content/weeds/Acalypha_australis/ [accessed 01.07.2018]

Lastrucci L, Valentini E, Dell'Olmo L, Vietina B, Foggi B (2016) Hygrophilous vegetation and habitats of conservation interest in the area of the Lake Porta (Tuscany, Central Italy). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 122(2015): 131–146. https://doi.org/10.2424/ASTSN.M.2015.12

Lazzeri V, Mascia F, Sammartino F, Campus G, Caredda A, Carlesi V, Fois M, Gestri G, Mannocci M, Mazzoncini V, Lombraña AC, Santinelli M (2013) Novità floristiche per le regioni Sardegna e Toscana. ActaPlantarum Notes 2: 42–59.

Leigheb G, Cameron-Curry V (1999) Observations on the presence of *Danaus chrysippus* (Linné, 1758) in the Mediterranean area, with special reference to Italy (Lepidoptera, Danaidae). Linneana Belgica 17(2): 61–68.

Levin RA, Bernardello G, Whiting C, Miller JS (2011) A new generic circumscription in the tribe Lycieae (Solanaceae). Taxon 60(3): 681–690.

Lojacono Pojero M (1907) Flora Sicula, Vol. 2(2). Tipo-Litografia S. Bizzarrilli, Palermo.

Lonati M, Meloni F, Vacchiano G, Ferrarato M (2014) Nota floristica piemontese n. 593. *Ligustrum sinense* Lour. (Oleaceae). In: Selvaggi A, Soldano A, Pascale M, Dellavedova R (Eds) Note Floristiche Piemontesi n. 545–604. Rivista Piemontese di Storia Naturale 35: 401.

Ma JS, Gilbert MG (2008) *Euphorbia* Linnaeus. In: Wu ZY, Raven PH, Hong DY (Eds) Flora of China, Vol. 11. Science Press, Beijing, Missouri Botanical Garden Press, St. Louis, 288–313.

Maniero F (2015) Cronologia della flora esotica italiana. Leo S. Olschki, Firenze.

Manzi A, Vitelli G (2016) Giardini d'aranci sull'Adriatico. L'agrumicoltura nelle Marche: aspetti colturali e artistici. Livi Editore, Fermo.

Marhold K, Šlenker M, Kudoh H, Zozomová-Lihová J (2016) *Cardamine occulta*, the correct species name for invasive Asian plants previously classified as *C. flexuosa*, and its occurrence in Europe. PhytoKeys 62: 57–72. https://doi.org/10.3897/phytokeys.62.7865

Maslo S, Šarić Š (2018) Three-lobed coneflower *Rudbeckia triloba* L. (Compositae): new alien species in the flora of Bosnia and Herzegovina. Glasnik Hrvatskog Botaničkog Društva 6(1): 8–12.

Mayoral O, Mascia F, Podda L, Laguna E, Fraga P, Rita J, Frigau L, Bacchetta G (2018) Alien plant diversity in Mediterranean wetlands: a comparative study within Valencian, Balearic and Sardinian floras. Notulae Botanicae Horti Agrobotanici Cluj-Napoca 46(2): 317–326. https://doi.org/10.15835/nbha46210470

Montanari S, Faggi G, Bagli L, Sirotti M, Alessandrini A (2015) Aggiornamenti floristici per la Romagna. Terza serie. Quaderno di Studi e Notizie di Storia Naturale della Romagna 42: 9–30.

Moret J, Guern M, Baudoin R, Baudiere A (2000) Etude phénétique du genre *Romulea* (Iridaceae) en France. Monde des Plantes 95(468): 24–30.

Mosyakin SL, Verloove F, Boiko GV (2018) The correct authorship and nomenclature of *Artemisia umbrosa* (Asteraceae), with comments on some misapplied names and distribution of the species in eastern Europe. Ukrainian Botanical Journal 75(3): 213–229. https://doi.org/10.15407/ukrbotj75.03.213

Motti R, Esposito A, Stinca A (2018) New additions to the exotic vascular flora of Campania (southern Italy). Annali di Botanica, nuova serie 8: 76–85. https://doi.org/10.4462/annbotrm-14156

Muñoz LA, Cobos A, Diaz O, Aguilera JM (2013) Chia seed (*Salvia hispanica*): an ancient grain and a new functional food. Food Reviews International 29(4): 394–408. https://doi.org/10.1080/87559129.2013.818014

Nemati Z, Blattner FR, Kerndorff H, Erol O, Harpke D (2018) Phylogeny of the saffron-crocus species group, *Crocus* series *Crocus* (Iridaceae). Molecular Phylogenetics and Evolution 127: 891–897. https://doi.org/10.1016/j.ympev.2018.06.036

Nesom GL (2006) *Gamochaeta* Weddell. In: Flora of North America Editorial Committee (Ed.) Flora of North America North of Mexico, Vol. 19. Oxford University Press, New York, Oxford, 431–438.

Nesom GL (2018) *Erigeron floribundus* and *E. sumatrensis* (Asteraceae) in the USA and Mexico. Phytoneuron 2018-27: 1–19.

Nicolella G, Antonelli A, Bamonte R, Bececco I, Carbini D, De Santis E, Faggi G, Maggioni L, Molinaro F, Sesto F, Ardenghi NMG (2017) Rassegna di segnalazioni notevoli riguardanti alcune regioni dell'Italia centro-meridionale comparse nel forum Acta Plantarum. Acta-Plantarum Notes 5: 56–60.

Nierbauer KU, Paule J, Zizka G (2016) Invasive tall annual willowherb (*Epilobium brachycarpum* C. Presl) in Central Europe originates from high mountain areas of western North

America. Biological Invasions 18(11): 3265–3275. https://doi.org/10.1007/s10530-016-1216-0

Orlandi C, Arduini I (2010) Note ad integrazione della flora di San Rossore (Pisa). Informatore Botanico Italiano 42(2): 473–477.

Pavari A, De Philippis A (1941) La sperimentazione di specie forestali esotiche in Italia. Risultati del primo ventennio. Annali della Sperimentazione Agraria 38: 1–648.

Pellegrini MOO (2018) Wandering throughout South America: taxonomic revision of *Tradescantia* subg. *Austrotradescantia* (D.R.Hunt) M.Pell. (Commelinaceae). PhytoKeys 101: 1–97. https://doi.org/10.3897/phytokeys.101.25057

Pellegrini MOO, Horn CN, Almeida RF (2018) Total evidence phylogeny of Pontederiaceae (Commelinales) sheds light on the necessity of its recircumscription and synopsis of *Pontederia* L. PhytoKeys 108: 25–83. https://doi.org/10.3897/phytokeys.108.27652

Peruzzi L, Savio L (2011) Notula: 83. In: Barberis G, Nepi C, Peccenini S, Peruzzi L (Eds) Notulae alla flora esotica d'Italia: 4 (54–89). Informatore Botanico Italiano 43(1): 149.

Pignatti S (1982) Flora d'Italia, Vol. 2. Edagricole, Bologna.

Pignatti S (2017) Flora d'Italia, Ed. 2, Vol. 2. Edagricole, Milano.

Pignatti S (2018) Flora d'Italia, Ed. 2, Vol. 3. Edagricole, Milano.

Podda L, Fraga I, Arguimbau P, Mascia F, Mayoral García-Berlanga O, Bacchetta G (2011) Comparison of the invasive alien flora in continental islands: Sardinia (Italy) and Balearic Islands (Spain). Rendiconti Lincei. Scienze Fisiche e Naturali 22(1): 31–45. https://doi.org/10.1007/s12210-010-0112-2

Puddu S, Podda L, Mayoral O, Delage A, Hugot L, Petit Y, Bacchetta G (2016) Comparative analysis of the alien vascular flora of Sardinia and Corsica. Notulae Botanicae Horti Agrobotanici Cluj-Napoca 44(2): 337–346. doi:10.15835/nbha44210491

Raven PH, Gregory DP (1972) A revision of the genus *Gaura* (Onagraceae). Memoirs of the Torrey Botanical Club 23(1): 1–96.

Regione Piemonte (2018) Le specie vegetali esotiche invasive. Black List–Management List (Gestione). http://www.regione.piemonte.it/ambiente/tutela_amb/esoticheInvasive.htm [accessed 19.07.2018]

Remacle A (2014) *Epilobium brachycarpum* (Onagraceae) et *Chondrilla juncea* (Asteraceae), néophytes établis à Arlon (province de Luxembourg, Belgique). Dumortiera 105: 9–12.

Salerno G, Ceschin S, Notamurzi C, Iannuzzi E (2006) Notula: 1262. In: Conti F, Nepi C, Scoppola A (Eds) Notulae alla checklist della flora vascolare italiana: 2 (1192–1266). Informatore Botanico Italiano 38(1): 212.

Särkinen T, Poczai P, Barboza GE, van der Weerden GM, Baden M, Knapp S (2018) A revision of the Old World black nightshades (Morelloid clade of *Solanum* L., Solanaceae). PhytoKeys 106: 1–223. https://doi.org/10.3897/phytokeys.106.21991

Scafidi F, Raimondo FM (2017) Principi di spontaneizzazione in Sicilia di *Talinum paniculatum* (Talinaceae). Quaderni di Botanica Ambientale e Applicata 26(2015): 23–25.

Scafidi F, Raimondo FM (2018) First record of *Pilea microphylla* (Urticaceae) in Sicily. Flora Mediterranea 28: 79–84. https://doi.org/10.7320/FlMedit28.079

Selvi F, Di Fazio L, Ferli S, Carrari E (2017) Contributo alla conoscenza floristica della valle del Torrente Sambre (Fiesole, Toscana). Atti della Società Toscana di Scienze Naturali, Memorie, Serie B 123(2016): 41–63.

Siadati S, Salmaki Y, Mehrvarz SS, Heubl G, Weigend M (2018) Untangling the generic boundaries in tribe Marrubieae (Lamiaceae: Lamioideae) using nuclear and plastid DNA sequences. Taxon 67(4): 770–783. https://doi.org/10.12705/674.6

Slee AV, Brooker MIH, Duffy SM, West JG (2015) EUCLID. Eucalypts of Australia. Fourth Edition. Available on line at: http://keyserver.lucidcentral.org:8080/euclid/data/02050e02-0108-490e-8900-0e0601070d00/media/Html/index.htm [accessed 29.09.2018]

Šlenker M, Zozomová-Lihová J, Mandáková T, Kudoh H, Zhao Y, Soejima A, Yahara T, Skokanová K, Španiel S, Marhold K (2018) Morphology and genome size of the widespread weed *Cardamine occulta*: how it differs from cleistogamic *C. kokaiensis* and other closely related taxa in Europe and Asia. Botanical Journal of the Linnean Society 187(3): 456–482. https://doi.org/10.1093/botlinnean/boy030

Sommier S (1898) Aggiunte alla florula di Capraia. Nuovo Giornale Botanico Italiano, nuova serie 5(1): 106–139.

Sommier S (1903) La flora dell'Arcipelago Toscano. Nota II. Nuovo Giornale Botanico Italiano, nuova serie 10(2): 133–200.

Steinmann VW, Morawetz JJ, Berry PE, Peirson JA, Yang Y (2016) *Euphorbia* Linnaeus sect. *Anisophyllum* Roeper. In: Flora of North America Editorial Committee (Ed.) Flora of North America North of Mexico, Vol. 12. Oxford University Press, New York, Oxford. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=318097 [accessed 01.07.2018]

Stinca A, Chianese G, D'Auria G, Del Guacchio E, Fascetti S, Perrino EV, Rosati L, Salerno G, Santangelo A (2017) New alien vascular species for the flora of southern Italy. Webbia 72(2): 295–301. https://doi.org/10.1080/00837792.2017.1349236

Sukhorukov AP, Kushunina M, El Mokni R, Goñalonsd LS, El Aounie MH, Daniel TF (2018) Chorological and taxonomic notes on African plants, 3. Botany Letters 165(2): 228–240. https://doi.org/10.1080/23818107.2018.1465467

Truzzi A (2018) Notulae 373–376. In: Galasso G, Banfi E (Eds) Notulae ad plantas advenas Longobardiae spectantes: 7 (365–397). Pagine Botaniche 40 (2017): 32–37.

Turland NJ, Wiersema JH, Barrie FR, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Kusber W-H, Li D-Z, Marhold K, May TW, McNeill J, Monro AM, Prado J, Price MJ, Smith GF (Eds) (2018) International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159: 1–254. https://doi.org/10.12705/Code.2018

Vacchiano G, Meloni F, Ferrarato M, Freppaz M, Chiaretta G, Motta R, Lonati M (2016) Frequent coppicing deteriorates the conservation status of black alder forests in the Po plain (northern Italy). Forest Ecology and Management 382: 31–38. https://doi.org/10.1016/j.foreco.2016.10.009

Verloove F (2005) A synopsis of *Jarava* Ruiz & Pav. and *Nassella* E. Desv. (*Stipa* L. s.l.) (Poaceae: Stipeae) in southwestern Europe. Candollea 60(1): 97–117.

Verloove F (2014) A conspectus of *Cyperus* s.l. (Cyperaceae) in Europe (incl. Azores, Madeira and Canary Islands), with emphasis on non-native naturalized species. Webbia 69(2): 179–223. doi:10.1080/00837792.2014.975013

Verloove F, Ardenghi NMG (2015) New distributional records of non-native vascular plants in northern Italy. Natural History Sciences 2(1): 5–14. https://doi.org/10.4081/nhs.2015.219

Verloove F, Lambinon J (2009) *Epilobium brachycarpum* (Onagraceae), xénophyte américaine naturalisée dans le département du Nord (France). Dumortiera 96: 17–19.

Viegi L, Cela Renzoni G (1981) Flora esotica d'Italia: le specie presenti in Toscana. Consiglio Nazionale delle Ricerche, Collana «Promozione della qualità dell'ambiente», Pavia, AQ/1/132.

Weber E, Gut D (2004) Assessing the risk of potentially invasive plant species in central Europe. Journal for Nature Conservation 12(3): 171–179. https://doi.org/10.1016/j.jnc.2004.04.002

Wilhalm T, Aichner G, Kögl C, Leitner G, Madl J, Mair P, Pizzulli A, Sölva E, Spögler E, Stockner W, Tratter W (2017) Ergänzungen und Korrekturen zum Katalog der Gefäßpflanzen Südtirols (7). Gredleriana 17: 29–38.

Zavatti S (1966) La coltivazione degli agrumi nelle Marche meridionali. Bollettino della Società Geografica Italiana, serie 9 5: 3–6.

Zohary D, Hopf M (2000) Domestication of plants in the Old World, Ed. 3. Oxford University Press, Oxford.

Zuo SP, Ma YQ, Inanaga S (2008) Ecological adaptation of weed biodiversity to the allelopathic rank of the stubble of different wheat genotypes in a maize field. Weed Biology and Management 8(3): 161–171. https://doi.org/10.1111/j.1445-6664.2008.00292.x

Supplementary material 1

Supplementary data

Authors: Gabriele Galasso, Fabrizio Bartolucci

Data type: species data

Explanation note: 1. Nomenclature updates; 2. Note updates; 3. Distribution updates; 4. Synonyms, misapplied or included names.

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RESEARCH ARTICLE

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Chromosome numbers for the Italian flora: 6

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Abstract

In this contribution, new chromosome data obtained on material collected in Italy are presented. It includes three chromosome counts for *Bupleurum baldense* Turra, *Colchicum lusitanum* Brot., and *Euphorbia gasparrinii* Boiss. subsp. *gasparrinii*.

Keywords

cytogeography, cytotaxonomy, chromosome number instability

How to contribute

Texts concerning new chromosome data should be submitted electronically to Giovanni Astuti (gastuti@biologia.unipi.it), including indications on voucher specimens and methods used.

Chromosome counts

Bupleurum baldense Turra (Apiaceae)

Chromosome number. 2*n* = 16 (Fig. 1)

Voucher specimen. ITALY. Toscana. Parco Nazionale delle Foreste Casentinesi (San Godenzo, Firenze), Passo del Muraglione lungo il sentiero che porta al Colle tre Faggi (WGS84: 43.92993 N, 11.65807 E), faggeta e ambienti rupestri, 900–950 m, 21 July 2018, *F. Roma-Marzio & L. Peruzzi* (diaspores collected in the field and stored in the Germplasm Bank of Department of Biology, Pisa, under acc. n° 20180055).

Method. Squash preparations were made on root-tips obtained from germinating seeds. Root tips were pre-treated with 0.4% colchicine for 3 hours and then fixed in Carnoy fixative solution for 1 hour. After hydrolysis in HCl 1N at 60 °C, the tips were stained in leuco-basic fuchsine.

Observations. *Bupleurum baldense* is a European species, whose range extends from W Europe (Spain, France, Great Britain) to Albania (Snogerup and Snogerup 2001, Euro+Med 2006 onwards). Despite this species was originally described for Italy (Snogerup and Snogerup 2001), this is the first count for Italian material (Bedini et al. 2010 onwards). Our count is consistent with previous ones published from Spain (Ruiz de Clavijo Jiménez 1993) and France (Cauwet 1967, 1978, Delay 1969, Natarajan 1978, Van Loon et al. 1978, Afzal-Rafii et al. 1985, Snogerup 1994).

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Colchicum lusitanum Brot. (Colchicaceae)

Chromosome number. 2*n* = 108 (Fig. 2)

Voucher specimen. ITALY. Veneto. Verona, in loc. Tre Tempi a nord di Avesa (WGS84: 45.490047 N, 10.982780 E), prato arido su calcare, 340 m, May 2018, *M. Spezia* (corms cultivated in the Botanic Garden of Pisa, under acc. n° 2018-284).

Method. Squash preparations were made on root-tips obtained from potted corms. Root tips were pre-treated with 0.4% colchicine for 3 hours and then fixed in Carnoy fixative solution for 1 hour. After hydrolysis in HCl 1N at 60 °C, the tips were stained in leuco-basic fuchsine.

Observations. *Colchicum lusitanum* is a W Mediterranean species, whose occurrence is well documented for Sardegna and for all central and southern Italian peninsular regions (Bartolucci et al. 2018). According to the latter authors, concerning northern Italy, this species is recorded also for Lombardia, Liguria, and doubtfully for Piemonte. Therefore, the studied population represents a new record for Veneto and for the whole NE Italy. Our chromosome count is in accordance with those reported by Persson (2009) for Toscana and Sardegna. On the contrary, D'Amato (1955, 1957) and Baldini (1997) reported a slightly different number, 2*n* = 106, for many popula-

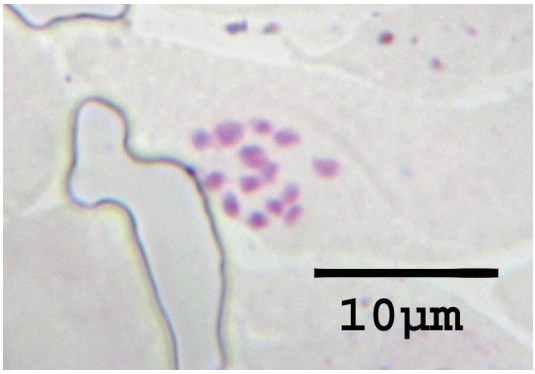

Figure 1. *Bupleurum baldense* Turra, 2*n* = 16. Scale bar: 10 µm.

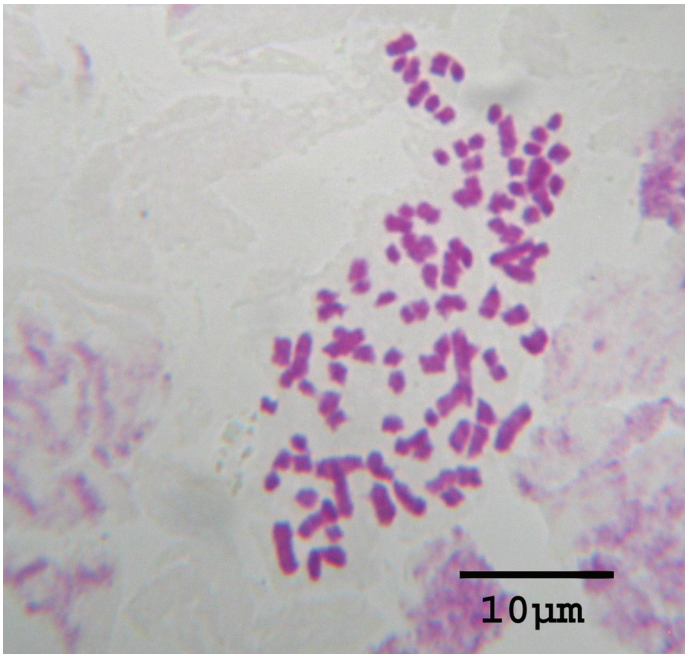

Figure 2. *Colchicum lusitanum* Brot., 2*n* = 108. Scale bar: 10 µm.

tions from central and southern Italy, including Toscana and Sardegna. For the latter region, Camarda (1979) published also a 2*n* = ca. 110 count. All these chromosome numbers were also reported by Fernandes and França (1977) for plants from Portugal. It is possible that 2*n* = 106 and 2*n* = ca. 110 are miscounts for 2*n* = 108, but we cannot exclude some degree of chromosome number instability within this species. Similar disagreements in chromosome counts can be found also in *C. autumnale* L. and *C. gonarei* Camarda. For the former species, D'Amato (1955, 1957) and Peruzzi and Galasso (2012) reported 2*n* = 38, whereas Persson (2009) 2*n* = 36 chromosomes;

for the second species, Camarda (1978) reported $2n$ = 180, whereas Persson (2009) $2n$ = 182 chromosomes. Persson (2009) herself documented chromosome number instability in other *Colchicum* taxa, such as *C. neapolitanum* (Ten.) Ten. subsp. *gracile* (K.Perss.) Fridl., *C. neapolitanum* subsp. *neapolitanum*, and *C. triphyllum* Kunze, with $2n$ = 80/82, $2n$ = 90/92, and $2n$ = 60/62 chromosomes respectively, often within a single population.

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Euphorbia gasparrinii Boiss. subsp. *gasparrinii* (Euphorbiaceae)

Chromosome number. $2n$ = 32 (Fig. 3)

Voucher specimen. ITALY. Sicilia. Parco regionale dei Nebrodi, Alcara Li Fusi (Messina), presso lago Maulazzo (WGS84: 37.940919 N, 14.670092 E), pascoli montani con *Cirsium vallis-demonii* Lojac. al margine della faggeta su substrato argilloso, 1450 m, 26 July 2018, *S. Cambria* (PI n° 012346).

Method. Squash preparations were made on root-tips obtained from germinating seeds. Root tips were pre-treated with 0.4% colchicine for 3 hours and then fixed in Carnoy fixative solution for 1 hour. After hydrolysis in HCl 1N at 60 °C, the tips were stained in leuco-basic fuchsine.

Observations. *Euphorbia gasparrinii* subsp. *gasparrinii* is a taxon endemic to S Italy, i.e. Sicily and Calabria, possibly extinct in the latter region (Bartolucci et al. 2018). Cresti et al. (2019) highlight a close morphometric and phylogenetic relationship of this subspecies with the allopatric *E. gasparrinii* subsp. *samnitica* (Fiori) Pignatti, endemic to C Italy (Abruzzo, Marche, and Molise). The same authors also hypothesized

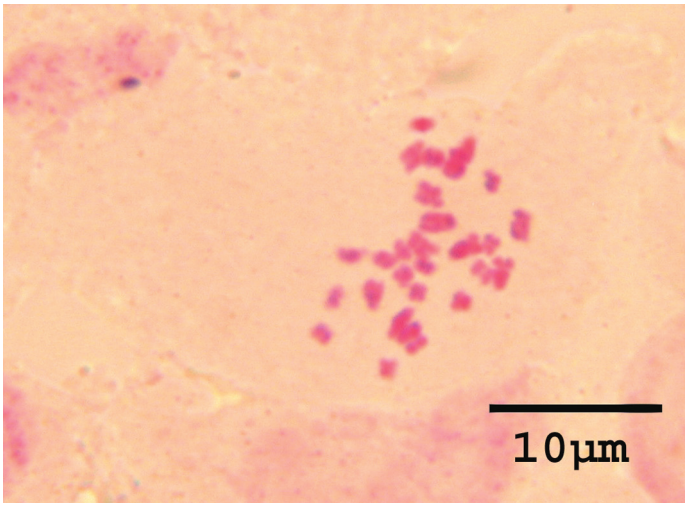

Figure 3. *Euphorbia gasparrinii* Boiss. subsp. *gasparrinii*, $2n$ = 32. Scale bar: 10 µm.

a putative tetraploid level for *E. gasparrinii* subsp. *gasparrinii*, by means of cytofluorimetric Relative Genome Size estimations. This is the first chromosome count for this taxon (Bedini et al. 2010 onwards), verified on the same Sicilian population studied by Cresti et al. (2019). Our count fully confirms the tetraploid status of this subspecies, given that *E. gasparrinii* subsp. *samnitica* was repeatedly reported as diploid with $2n$ = 16 chromosomes (Tessitore et al. 1993, Peruzzi and Cesca 2002, Cresti et al. 2019).

L. Cresti, S. Cambria, L. Peruzzi

References

Afzal-Rafii Z, Vianot J, Ramade M, Bourreil P (1985) Analyse des caractères caryologiques et écologiques de quelques taxons dans les massifs du Luberon, de Lure et du Mont Ventoux. Revue de Cytologie et de Biologie Végétale, Le Botanist 8: 33–62.

Baldini RM (1997) Mediterranean chromosome number reports 7(779–782). Flora Mediterranea 7: 198–204.

Bartolucci F, Peruzzi L, Galasso G, Albano A, Alessandrini A, Ardenghi NMG, Astuti G, Bacchetta G, Ballelli S, Banfi E, Barberis G, Bernardo L, Bouvet D, Bovio M, Cecchi L, Di Pietro R, Domina G, Fascetti S, Fenu G, Festi F, Foggi B, Gallo L, Gottschlich G, Gubellini L, Iamonico D, Iberite M, Jiménez-Mejías P, Lattanzi E, Marchetti D, Martinetto E, Masin RR, Medagli P, Passalacqua NG, Peccenini S, Pennesi R, Pierini B, Poldini L, Prosser F, Raimondo FM, Roma-Marzio F, Rosati L, Santangelo A, Scoppola A, Scortegagna S, Selvaggi A, Selvi F, Soldano A, Stinca A, Wagensommer RP, Wilhalm T, Conti F (2018) An updated checklist of the vascular flora native to Italy. Plant Biosystems 152(2): 179–303. https://doi.org/10.1080/11263504.2017.1419996

Bedini G, Garbari F, Peruzzi L (Eds) (2010 onwards) Chrobase.it – Chromosome numbers for the Italian flora. http://bot.biologia.unipi.it/chrobase/index.php [Accessed 29 October 2018]

Camarda I (1978) Numeri Cromosomici per la Flora Italiana: 402–405. Informatore Botanico Italiano 10: 84–90.

Camarda I (1979) Actuelles connaissances du genre *Colchicum* en Sardaigne. Webbia 34: 481–485. https://doi.org/10.1080/00837792.1979.10670184

Cauwet AM (1967) Contribution a l'etude caryosystematique du genre *Bupleurum* L. I. Bulletin de la Société botanique de France 114: 371–386. https://doi.org/10.1080/00378941.1967.10838375

Cauwet AM (1978) Reports. In: Löve A (Ed.) IOPB chromosome numbers reports: 61. Taxon 27: 385–386.

Cresti L, Schönswetter P, Peruzzi L, Barfuss MHJ, Frajman B (2019) Pleistocene survival in three Mediterranean refugia: origin and diversification of the Italian endemic *Euphorbia gasparrinii* from the *E. verrucosa* alliance (Euphorbiaceae). Botanical Journal of the Linnean Society: under revision.

Delay J (1969) Origine Ouest-Mediterranée, Atlantique et Haute Provence. Informations annuelles de caryosystématique et cytogénétique 3: 25–28.

Euro+Med (2006 onwards) Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity. http://ww2.bgbm.org/EuroPlusMed/ [Accessed 29 October 2018]

Fernandes A, França F (1977) Le geune *Colchicum* L. au Portugal. Boletim da Sociedade Broteroana 51: 5–36.

Natarajan G (1978) Reports. In: Löve A (Ed.) IOPB chromosome numbers reports: 62. Taxon 27: 526–531.

Ruiz de Clavijo Jiménez E (1993) Números cromosómicos para la flora española: 680. Lagascalia 17: 161–172.

Persson K (2009) Colchicaceae. In: Marhold K (Ed.) IAPT/IOPB chromosome data: 7. Taxon 58: 181–183.

Peruzzi L, Cesca G (2002) Reports 1295–1304. In: Kamari G, Blanche C, Garbari F (Eds) Mediterranean chromosome number reports 12. Flora Mediterranea 12: 461–470.

Peruzzi L, Galasso G (2012) Numeri Cromosomici per la Flora Italiana: 1482. Informatore Botanico Italiano 44: 171–172.

Snogerup S (1994) Reports 267–284. In: Kamari G, Felber F, Garbari F (Eds) Mediterranean chromosome number reports: 4. Flora Mediterranea 4: 254–258.

Snogerup S, Snogerup B (2001) *Bupleurum* L. (Umbelliferae) in Europe – 1. The annuals, *B.* sect. *Bupleurum* and sect. *Aristata*. Willdenowia 31: 205–308. https://doi.org/10.3372/wi.31.31201

Tessitore A, Catonica C, Tammaro F (1993) Numeri Cromosomici per la Flora Italiana: 1290–1296. Informatore Botanico Italiano 25: 47–51.

Van Loon JC, Gadella TWJ, Kliphuis E (1971) Cytological studies in some flowering plants from southern France. Acta Botanica Neerlandica 20: 157–166. https://doi.org/10.1111/j.1438-8677.1971.tb00695.x

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RESEARCH ARTICLE

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Notulae to the Italian flora of algae, bryophytes, fungi and lichens: 6

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Abstract

In this contribution, new data concerning bryophytes, fungi, and lichens of the Italian flora are presented. It includes new records and confirmations for the bryophyte genera *Barbula*, *Fissidens*, *Gymnostomum*, *Jungermannia*, *Riccia*, and *Scapania*, the fungal genera *Hyalopsora* and *Urocystis* and the lichen genera *Arthothelium*, *Chaenotheca*, *Lepraria*, *Lobaria*, *Miriquidica*, *Parmelia*, *Rinodina*, *Solenopsora*, *Thelopsis* and *Xanthoparmelia*.

Keywords
Ascomycota, Basidiomycota, Bryidae, Jungermanniidae, Marchantiidae, floristic data

How to contribute

The text of the records should be submitted electronically to: Cecilia Totti (c.totti@univpm.it) for algae, Marta Puglisi (mpuglisi@unict.it) for bryophytes, Alfredo Vizzini (alfredo.vizzini@unito.it) for fungi, Sonia Ravera (sonia.ravera@unimol.it) for lichens.

Floristic records

BRYOPHYTES

Barbula crocea (Brid.) F.Weber & Mohr (Pottiaceae)

+ **TOS:** Tre Fiumi, Apuan Alps Regional Park, Stazzema (Lucca), in on damp marble walls (UTM WGS84: 32T 601741.4878893), 775 m, 16 January 2016, *G. Pandeli* (SIENA; Herb. Pandeli). – Species confirmed for the flora of Toscana.

This taxon has been recently recorded for Valle d'Aosta, Piemonte, Lombardia, Trentino Alto Adige, Veneto, Friuli Venezia Giulia, Abruzzo, and Campania (Aleffi et al. 2008), whereas old reports from Toscana dated before 1950. The site of Tre Fiumi is characterized by damp marble walls with the alliance *Cratoneurion commutati* Koch, where *Barbula crocea* grows with *Palustriella commutata* (Hedw.) Ochyra, *Orthothecium rufescens* (Dicks. ex Brid.) Schimp., *Pellia endiviifolia* (Dicks.) Dumort., *Pinguicula apuana* Casper & Ansaldi, *Potentilla caulescens* L., and *Saxifraga aizoides* L.

G. Pandeli, F. Cheli, I. Bonini

Fissidens rufulus Bruch & Schimp. ex Bruch & Schimp. & W. Guembel (Fissidentaceae)

+ **CAL:** I Pagliai, Lago di Tarsia (Cosenza), on stones in a little waterfall (UTM WGS84: 33S 612230.4384759), 108 m, 10 May 2018, *D. Puntillo, M. Puntillo* (CLU No. 4151). – Species new for the flora of Calabria.

Fissidens rufulus is a rare species showing coloured brown costa and border. However this character is quite inconstant. This species was recorded as sterile on submerged stones of a small waterfall with clean unpolluted running waters together with *Eucladium verticillatum* (With.) Bruch & Schimp., *Lunularia cruciata* (L.) Lindb. and *Southbya tophacea* (Spruce) Spruce. In Italy, it is known only for few Regions: Friuli Venezia Giulia, Emilia Romagna, Marche, Sardinia, and Umbria (Aleffi et al. 2008; Ellis et al. 2016). Nearly endemic to Europe, *F. rufulus* is an uncommon plant, listed as Nationally Scarce in Britain, Endangered in Switzerland and Luxembourg,

Vulnerable in Austria, Near Threatened in the Czech Republic, Data Deficient in Sweden, Germany and Spain, and Very rare and Susceptible in the Netherlands. It is also known from France, Croatia, Greece, and Russia (Lockhart et al. 2012). In Europe, it is assigned to the Temperate floristic element (Smith 2004).

D. Puntillo, M. Puntillo

Gymnostomum viridulum Brid. (Pottiaceae)

+ **TAA:** Ex road to Pregasina (Trento) (UTM WGS84: 32T 642063.5079950), 320 m, 15 January 2017, *F. Prosser* (Herb. Prosser No. 00293); Frazengi above Campolongo di Noriglio (Trento) (UTM WGS84: 32T 659947.5083744), 435 m, 4 February 2018, *F. Prosser* (Herb. Prosser No. 02199). Below Dosso Tre Croci, Above San Tommaso at Nago (Trento), jutting cliff exposed to South (32T 647250.5082941), 510 m, 24 February 2018, *F. Prosser* (Herb. Prosser No. 02493). – Species new for the flora of Trentino-Alto Adige.

This species is not reported by Aleffi et al. (2008) for Trentino-Alto Adige, and it is indicated as Endangered in Italy by Cortini Pedrotti and Aleffi (1992). *Gymnostomum viridulum* was discovered in wet crevices on south-facing limestone cliffs, growing on shallow and friable tuff layer. In summer, these calcareous cliffs are generally completely dry. All the specimens are sterile, but they carry the typical green propagula in the leaf axil. This species seems to be quite widespread, and it will be probably found in other similar sites of the Region. Taking into account its very small size (the leaves hardly reach 50 µm in length), it may be assumed that this species is not as rare as reported, but simply difficult to find. In Germany, it was also found only recently for the first time (Long 1993).

F. Prosser

Jungermannia borealis Damsh. & Váňa (Jungermanniaceae)

+ **TAA:** Hintere Pilsbergalm, Stelvio National Park, Ultimo, Santa Gertrude (Bolzano) (WGS84 32T 639481.5151395), 2300 m, 28 October 2014, leg. *W. Tratter*, det. *D. Spitale*, conf. *M. Aleffi* (BOZ, no. BRYO 2421). – Species new for the flora of Trentino-Alto Adige.

This finding represents the first record for Trentino-Alto Adige and the fourth in Italy. This plant has been found on stones of an alpine stream, together with *Hygrohypnum smithii* (Sw.) Broth. Earlier, the species had been recorded in Piemonte, Val Gravio (Blockeel et al. 1999), in the Gran Paradiso National Park (Schumacker et al. 1999), and in Veneto, Dolomiti Bellunesi National Park (Tomaselli et al. 2004). Across the Alps, *J. borealis* occurs in Switzerland (http://swissbryophytes.ch) and Austria (Köckinger 2017). It is an arctic-alpine species (Damsholt 2002),

generally found on shady to partially shaded rocks along streams or on moist rocks on high mountains and base-rich snow fields. The preferred substrate is weakly alkaline, but not calcareous.

D. Spitale, W. Tratter, P. Mair

Riccia fluitans L. (Ricciaceae)

+ PIE: north of the Candia Lake in a tributary channel, Candia Canavese (Torino) (UTM WGS84 32T 414071.5019980), 227 m, 9 September 2007, *A. Selvaggi* (Bryophytorum Herbarium A. Selvaggi); pond called "la Paludetta" close to the north-western bank of Candia Lake Candia Canavese (Torino) (UTM WGS84 32T 413691.5019814), 226 m, 22 April 2018, *A. Selvaggi* (Bryophytorum Herbarium A. Selvaggi); ephemeral pond between Cascina Fornace and Rondò dell'Uno, "La Mandria" Regional Park, Venaria Reale (Torino) (UTM WGS84 32T 390247.5000923), 290 m, 14 May 2015, *A. Selvaggi*, *L. Miserere*, *A. Tacchino* (Bryophytorum Herbarium L. Miserere); *ibidem*, 1 July 2015, *L. Miserere* (Bryophytorum Herbarium L. Miserere); San Vitale pond, Roppolo (Biella) (UTM WGS84 32T 427566.5030772), 384 m, 8 August 2007, *A. Selvaggi* (Bryophytorum Herbarium A. Selvaggi); *ibidem*, 9 June 2015, *A. Selvaggi*; *ibidem*, 25 May 2018, *A. Selvaggi* (Bryophytorum Herbarium A. Selvaggi). Swamp with *Salix cinerea* L. on the north-eastern side of Monte Orsetto Roppolo (Biella) (UTM WGS84 32T 426878.5032149), 425 m, 25 May 2018, *A. Selvaggi* (Bryophytorum Herbarium A. Selvaggi); Benne di Saluggia (or Casale Benne), Saluggia (Vercelli) (UTM WGS84 32T 424130.5006159), resurgence stream close to Dora Baltea river, 162 m, 28 September 2010, *A. Selvaggi* (Bryophytorum Herbarium A. Selvaggi); near the road SS 589, north of Cascina Ricchiaretto Rosso and towards Cascina Paolina, Barge (Cuneo) (UTM WGS84 32T 375577.4954261), stream and wetland of resurgence in a alder swamp wood, 9 August 2011, *A. Selvaggi, M. Rastelli* (Bryophytorum Herbarium A. Selvaggi); "Fontanazze" east of Staffarda Abbey, Ravello (Cuneo) (UTM WGS84 32T 377088.4953168), in resurgence area on the left bank of the river Po, 20 July 2011, *A. Selvaggi, M. Rastelli* (Bryophytorum Herbarium A. Selvaggi). – Species confirmed for the flora of Piemonte.

Riccia fluitans is an annual slender thallose liverwort, showing both floating and terrestrial forms. Floating forms grow on stagnant or slow-moving water of ponds, swamps, channels or resurgence areas with oligo- to meso-eutrophic waters. It is part of the floating pioneer vegetation of the *Lemnion trisulcae* Den Hartog & Segal, 1964 related with the UE Habitat "3150 - Natural eutrophic lakes with Magnopotamion- or Hydrocharition-type vegetation", together with *Lemna trisulca* L., *Lemna minor* L., and *Ricciocarpos natans* (L.) Corda. In Europe, *R. fluitans* is considered as Near Threatened (NT) in Italy and Portugal, and Vulnerable (VU) in Spain, Norway, and Switzerland (Schnyder et al. 2004, Hodgetts 2015). In Piemonte, its occurrence has not been confirmed over the last 50 years (Aleffi et al 2008), albeit more recent data were recorded by Varalda et al. (1983–1984) at "Cascina della Noria", Trino Vercellese (Vercelli).

A. Selvaggi, L. Miserere

Scapania gymnostomophila Kaal. (Scapaniaceae)

+ **TAA:** Mount Pasubio, above il Pian del Cheserle to Sorgente Sette Albi (Trento) (UTM WGS84: 32T 664848.5077265), 1490 m, 10 February 2018, *F. Prosser* (Herb. Prosser No. 02208). – Species new for the flora of Trentino-Alto Adige.

This circumboreal liverwort can be easily recognized by having only one big oil body for each leaf cell. It was found on the sheltered side of a limestone boulder together with another small *Scapania*, showing many oil bodies per cell and with *Barbula crocea* (Brid.) F.Weber & D.Mohr. For Italy, Aleffi et al. (2008) quote *S. gymnostomophila* only for Piemonte, based on previous records by Blockeel et al. (1999) from Sagna del Vallone and Rochemolles Valley. This species is very likely more widespread in the Italian Alps, as suggested by its distribution map in Switzerland (http://www.swissbryophytes.ch).

F. Prosser

FUNGI

Hyalopsora polypodii (Pers.) Magnus (Pucciniastraceae)

+ **CAL:** Serra Dolcedorme, Pollino National Park (Cosenza), on the leaves of the fern *Cystopteris fragilis* (L.) Bernh. (UTM WGS84: 33S 603883.4417049), 2179 m, 13 July 2018, *D. Puntillo* (CLU No. 99). – Species new for the flora of Calabria.

Hyalopsora polypodii is an autoecious obligate rust parasite. Because it is inconspicuous, the species is often overlooked. However, observing the lower page of the fern fronds of *Cystopteris fragilis* it was possible to see the yellow sori typical of this species. *Hyalopsora polypodii* has been generically recorded for Italy by De Toni (1888, sub *Uredo polypodii* (Pers.) DC.). Later, it was collected from Lozanna and S. Zeno (Verona) by Pollini (1816) and from Piemonte by Pollini (1824, sub *Uredo aspidii* Pollinii).

D. Puntillo

Urocystis cepulae Frost (Urocystidaceae)

+ **CAL:** Bosco di Mavigliano (Montalto Uffugo, Cosenza), on leaves of *Allium nigrum* L. (UTM WGS84 33S 604884.4360659) 228 m, 30 March 2008, *D. Puntillo* (CLU No. 67, 68). – Species new species for the flora of Calabria.

Urocystis cepulae is of great importance as it infects cultivated garlic species. At the collection site, this species was recorded on leaves of *Allium nigrum* L. *A. ampeloprasum* L., *A. sphaerocephalon* L., and *A. vineale* L. Of the approximately 250 known species of *Allium* L., at least 150 are susceptible to this organism (Anderson 1926). In Italy, this species is known for Friuli Venezia Giulia (Tomasi 2013) and Sicilia (Venturella 1991). It is known also for Torino, Cuneo, and Vicenza (sub *Tuburcinia cepulae* (Frost) Liro)

and for Parma, Modena, and Perugia (sub *Tuburcinia magica* (Pass.) Liro) (Ciferri 1938). Finally, *U. cepulae* has been recorded for Licata (Sicily) from an old collection on *Allium subhirstum* L. (Vànky 1994).

D. Puntillo

LICHENS

Arthothelium ruanum (A.Massal.) Körb. (Arthoniaceae)

+ **CAM:** Gole del Bussento, Morigerati (Salerno), on *Carpinus betulus* L. (UTM WGS 84: 33T 546883.4443458), 180 m, 23 February 2011, leg. *G. Brunialti, V. Genovesi, S. Ravera*, det. *S. Ravera* (Herb. Ravera). – Species new for the flora of Campania.

Arthothelium ruanum is a rare temperate-suboceanic species, mostly collected on smooth bark and shrubs in humid deciduous forests, quite rare at low elevation in the Mediterranean region (Nimis 2016). This crustose lichen morphologically resembles *Arthothelium spectabile* A.Massal., but the latter shows larger spore size (ca. 25–37 × 12–15 μm). This specimen was found in a humid, shaded canyon, listed among the Italian Important Lichen Areas (Ravera et al. 2011) because of its very rare and endangered relictual flora. The record reported here contributes to the knowledge of lichen biodiversity in this area, which is a WWF Oasis also included in the "Cilento, Vallo di Diano and Alburni" National Park. Due to its rarity, *A. ruanum* is red listed in Italy under the Near Threatened category (Nascimbene et al. 2013).

S. Ravera

Chaenotheca brachypoda (Ach.) Tibell (Coniocybaeae)

+ **TOS:** Rocca di Crevole, Murlo (Siena), on *Quercus ilex* L. (UTM WGS 84: 32T 691658.4784036), 320 m, leg. *Italian Lichen Society (SLI) ecology working group*, det. *S. Ravera* (Herb. Ravera). – Species new for the flora of Toscana.

Chaenotheca brachypoda is a "pin lichen" growing on decorticated stumps of deciduous trees and conifers, in old humid forests, previously collected on *Q. ilex* only in Calabria (Puntillo 1996). This species differs from the similar and more common *Chaenotheca furfuracea* (L.) Tibell in having an immersed, not visible, thallus, shorter apothecia and smooth spores. In Italy, this species has been reported from Trentino-Alto Adige, Piemonte, and Calabria (Nimis 2016). Due to its rarity, it is included in the Italian red list of epiphytic lichens under the Endangered category (Nascimbene et al. 2013).

L. Paoli, S. Ravera

Lepraria diffusa (J.R.Laundon) Kukwa (Cladoniaceae)

+ **LOM:** road between Palìne di Borno and Dosso di Scalve, Azzone (Bergamo), on a limestone outcrop in a clearing of a montane wood with beech and spruce (UTM WGS84: 32T 586200.5088906), 970 m, 28 April 2017, leg. *G. Gheza*, det. *H. Mayrhofer* (Herb. Gheza); pathway between Croce di Salven and Valsorda, Angolo Terme (Brescia), on a limestone outcrop and on soil at the base of a spruce in a montane wood with beech and spruce (UTM WGS84: 32T 587883.5088284), 1210–1225 m, 1 January 2018, leg. *G. Gheza*, det. *H. Mayrhofer* (Herb. Gheza); Convento della Santissima Annunciata, Piancogno (Brescia), on terricolous bryophytes at the base of a beech, in a degraded wood dominated by beech (UTM WGS84: 32T 595636.5087262), 700 m, 2 January 2018, leg. *G. Gheza*, det. *H. Mayrhofer* (Herb. Gheza). – Species new for the flora of Lombardia.

In spite of having a wide altitudinal range, *Lepraria diffusa* is considered uncommon in Italy (Baruffo et al. 2006), and it was never reported before for Lombardia. It was found on calcareous rock and on soil overgrowing bryophytes, which are the most common substrates for this species (Baruffo et al. 2006; Nimis 2016). All the specimens contained 4-oxypannaric acid 2-methylester, but this species can rarely contain also atranorin and/or roccellic acid (Saag et al. 2009).

G. Gheza, H. Mayrhofer

Lepraria eburnea J.R.Laundon (Cladoniaceae)

+ **LOM:** Dosso di Scalve, Azzone (Bergamo), on bryophytes on bark of *Acer pseudoplatanus* L. in a shaded and humid montane mixed wood (UTM WGS84: 32T 586355.5090069), 995 m, 28 April 2017, *leg. G. Gheza, det. H. Mayrhofer* (Herb. Gheza); Via Mala, Azzone (Bergamo), on terricolous bryophytes in a montane mixed wood near a stream (UTM WGS84: 32T 585918.5091052), 725 m, 28 April 2017, *leg. G. Gheza, det. H. Mayrhofer* (Herb. Gheza); Lago Moro, Darfo Boario Terme (Brescia), on bark in a mixed deciduous wood (UTM WGS84: 32T 589363.5081082), 450 m, 30 april 2017, *leg. G. Gheza, det. H. Mayrhofer* (Herb. Gheza). – Species new for the flora of Lombardia.

In spite of being a very common species in Italy (Baruffo et al. 2006; Nimis 2016), *Lepraria eburnea* was never reported before from Lombardia. It is able to colonize various substrates (Baruffo et al. 2006; Nimis 2016), and the specimens reported here were collected on terricolous and epiphytic bryophytes and directly on bark, always in shaded situations. All specimens contained alectorialic acid and satellites, and only one specimen contained, in addition, protocetraric acid.

G. Gheza, H. Mayrhofer

Lepraria nivalis (Nyl.) J.R.Laundon (Cladoniaceae)

+ **LOM:** pathway between Croce di Salven and Valsorda, Angolo Terme (Brescia), on a limestone outcrop in a montane wood with beech and spruce (UTM WGS84: 32T 587883.5088284), 1210–1225 m, 1 January 2018, leg. *G. Gheza*, det. *H. Mayrhofer* (Herb. Gheza); road between Palìne di Borno and Dosso di Scalve, Azzone (Bergamo), on mosses and soil in the crevices of calcareous outcrops in a clearing of a montane wood with beech and spruce (UTM WGS84: 32T 586200.5088906), 970 m, 28 April 2017, leg. *G. Gheza*, det. *H. Mayrhofer* (Herb. Gheza). – Species new for the flora of Lombardia.

In spite of being a very common species, showing a wide altitudinal range in Italy (Baruffo et al. 2006; Nimis 2016), *Lepraria nivalis* was never reported before from Lombardia. As *Lepraria eburnea* J.R.Laundon, it is able to colonize various substrates (Baruffo et al. 2006, Nimis 2016), but the records reported here are from calcareous substrates. Two chemotypes were detected: the first specimen contained atranorin and fumarprotocetraric acid, the second atranorin and psoromic acid.

G. Gheza, H. Mayrhofer

Miriquidica deusta (Stenh.) Hertel & Rambold (Lecanoraceae)

+ **TOS:** Miniere di Murlo Valle del Crevole (Siena), above the path Sentiero delle Miniere, on siliceous rocks (UTM WGS84: 32T 693605.4779005), 215 m, 3 December 2017, leg. *L. Paoli*, det. *L. Paoli, Z. Fačkovcová* (SAV). – Species new for the flora of Toscana.

This saxicolous lichen is often overlooked since at first glance its brown, brown-black areolate thallus may resemble *Verrucaria* species. However, fertile thalli of *M. deusta* form black, immersed or moderately sessile apothecia up to 0.7 mm in diameter (Wirth et al. 2013). The lichen usually grows on exposed base-rich siliceous rocks. So far, only few records are known from Italy, although it seems locally common in some parts, e.g., in Sardegna (Nimis 1993, 2016). The specimen from Miniere di Murlo contains also *Rhizocarpon viridiatrum* (Wulfen) Körb. and *Aspicilia intermutans* (Nyl.) Arnold.

L. Paoli, Z. Fačkovcová

Parmelia barrenoae Divakar, M.C.Molina & A.Crespo (Parmeliaceae)

+ **CAL:** Cupone, Sila National Park (Cosenza) on post fence (UTM WGS84: 33S 633215.4360465), 1158 m, 8 June 2018, *D. Puntillo* (CLU No. 17809). – Species new for the flora of Calabria.

Parmelia barrenoae has been described on the basis of both morphological and molecular data, in particular sequences in the ITS region of rDNA and the tubulin gene (Divakar et al. 2005, Molina et al. 2011). This species is very similar to *Parmelia*

sulcata Taylor. However, in the field, it is recognizable for the simple rhizines and ripe lobes with revolute apex (*vs* squarrose rhizines, without revolute apex in *P. sulcata*). The species was recently reported for Molise (Ravera 2012). In the Sila plateau it is quite common on old wooden rustic fence poles and on old wooden fence posts in well-lit sites, but never in direct sunlight.

D. Puntillo, M. Puntillo

Rinodina aspersa (Borrer) J.R.Laundon (Physciaceae)

+ **TOS:** Miniere di Murlo Valle del Crevole (Siena), above the path Sentiero delle Miniere, on siliceous rocks (UTM WGS84: 32T 693605.4779003), 215 m, 3 December 2017, leg. *L. Paoli*, det. *L. Paoli, Z. Fačkovcová* (SAV). – Species new for the flora of Toscana.

This is a saxicolous lichen, generally growing on siliceous rocks. So far, it was found only in Sardegna by Mayrhofer (Nimis and Poelt 1987). It seems fairly common in this locality, showing preference for open situations.

L. Paoli, Z. Fačkovcová

Solenopsora marina (Zahlbr.) Zahlbr. (Catillariaceae)

+ TOS: Località «La Castellaccia», near Convento del Petreto, Scansano (Grosseto), on shaded calcareous outcrops in a mixed oak forest with *Lobaria pulmonaria* (L.) Hoffm, on overhanging rock (UTM WGS84: 32T 691756.4729815), 509 m, 24 March 2018, *L. Paoli, Z. Fačkovcová*; *ibidem*, 1 September 2018, *L. Paoli, A. Bérešová* (SAV). – Species new for the flora of Toscana.

The genus *Solenopsora* A.Massal. had been traditionally placed in the poorly explored family of the Catillariaceae based on characteristic anatomical features (clavate eight-spored asci lacking an ocular chamber (*Catillaria*-type), one-septate, hyaline ascospores, simple paraphyses with brown pigmented clavate apices). However, recent molecular investigations indicate that the genus belongs to a morphologically diverse family, the Leprocaulaceae (Miadlikowska et al. 2014). *Solenopsora marina* has a squamulose thallus forming rosettes or irregular patches (up to 5–6 cm in diameter), pale greenish up to green. Outer squamules are loose, flexuose, folded and with white pruinose margins. Brownish apothecia are sessile, often globose at maturity. It grows on calcareous rocks in shaded and humid sites with low eutrophication (Guttová et al. 2014), mostly in rock fissures or below overhanging rock surfaces. It is a rare species strongly confined to the Mediterranean-type climate. Its distribution in Italy is largerly unknown (Guttová et al. 2018). This is the second record in Italy, and the species was so far known only for Basilicata (Potenza et al. 2014).

L. Paoli, Z. Fačkovcová, A. Guttová

Thelopsis rubella Nyl. (Stictidaceae)

+ **TOS:** Strada di Crevole, Murlo (Siena), on *Quercus ilex* L. (UTM WGS 84: 32T 691658.4784036), 320 m, 1 June 2018, leg. *Italian Lichen Society (SLI) ecology working group*, det. *S. Ravera* (Herb. Ravera). – Species confirmed for the flora of Toscana.

Thelopsis rubella is a crustose epiphytic pyrenolichen, characterized by pale pink-brown, red-brown to dark-brown perithecia, strictly associated with mature trees mostly in the *Lobarion* in ancient woodlands (Rose 1988). It is included in the Italian red list of epiphytic lichens under the Least Concern category (Nascimbene et al. 2013). There are no recent records for Toscana (Baglietto 1871; Saccardo 1894, Rose 1988).

L. Paoli, S. Ravera

Xanthoparmelia glabrans (Borrer) J.R.Laundon (Parmeliaceae)

+ **TOS:** Miniere di Murlo Valle del Crevole (Siena), above the path Sentiero delle Miniere, on siliceous rocks (UTM WGS84: 32T 693600.4779000), 215 m, 3 December 2017, leg. *L. Paoli*, det. *L. Paoli, Z. Fačkovcová* (SAV). – Species new for the flora of Toscana.

This species can be distinguished from similar taxa of the *Xanthoria pulla* group by a characteristic UV+ reaction of the medulla (strongly blue-white), which contains an alectoronic acid (Giordani et al. 2003). In Italy, it has been recorded from a few localities in Trentino-Alto Adige, Valle d'Aosta, and Liguria (Nimis 2016). In the reported locality, it was accompanied by other *Xanthoparmelia* species, such as *X. conspersa* (Ehrh. ex Ach.) Hale, *X. stenophylla* (Ach.) Ahti & D.Hawksw. and *X. tinctina* (Maheu & A.Gillet) Hale.

L. Paoli, Z. Fačkovcová

References

Aleffi M, Tacchi R, Cortini Pedrotti C (2008) Check-list of the Hornworts, Liverworts and Mosses of Italy. Bocconea 22: 1–255.

Anderson PJ (1926) Comparative susceptibility of onion varieties and of species of *Allium* to *Urocystis cepulae*. Journal of Agricultural Research 31: 275–285.

Baglietto F (1871) Prospetto Lichenologico della Toscana. Nuovo Giornale Botanico Italiano 3: 211–298.

Baruffo L, Zedda L, Elix JA, Tretiach M (2006) A revision of the lichen genus *Lepraria* s.lat. in Italy. Nova Hedwigia 83: 387–429. ttps://doi.org/10.1127/0029-5035/2006/0083-0387

Blockeel TL, Porley R, Rothero G (1999) Summer field meeting, Italian Alps, 1997. Bulletin British Bryological Society 72: 17–24.

Ciferri R (1938) Flora Italica Cryptogama, Pars. I: Fungi. Ustilaginales. Fasc. 17. Rocca San Casciano, 119–121, 131–134.

Cortini Pedrotti C, Aleffi M (1992) Lista Rossa delle Briofite d'Italia. In: Conti F, Manzi A, Pedrotti F (Eds) Libro rosso delle Piante d'Italia. Ministero Ambiente, WWF Italia, Società Botanica Italiana, Roma, 557–637.

De Toni GB (1888) Sylloge ustilaginearum et uredinearum. Sylloge Fungorum 7: 857–858.

Damsholt K (2002) Illustrated Flora of Nordic Liverworts and Hornworts. Lund, Nordic Bryological Society, 840 pp

Divakar PK, Molina MC, Lumbsch TH, Crespo A (2005) *Parmelia barrenoae*, a new lichen species related to *Parmelia sulcata* (*Parmeliaceae*) based on molecular and morphological data. Lichenologist 37: 37–46. https://doi.org/10.1017/S0024282904014641

Ellis LT, Aleffi M, Alegro A, Segota V, Asthana AK, Gupta R, Singh VJ, Bakalin VA, Bednarek-Ochyra H, Cykowska-Marzencka B, Benitez A, Borovichev EA, Vilnet AA, Konstantinova NA, Buck WR, Cacciatoro C, Sérgio C, Csiky J, Deme J, Kovács D, Damsholt K, Enroth J, Erzberger P, Fedosov VE, Fuertes E, Gradstein SR, Gremmen NJM, Hallingbäck T, Jukoniene I, Kiebacher T, Larraín J, Lebouvier M, Lüth M, Mamontov YuS, Potemkin AD, Nemeth Cs, Nieuwkoop JAW, Nobis M, Węgrzyn M, Wietrzyk P, Osorio F, Parnikoza I, Virchenko VM, Peralta DF, Carmo DM, Plášek V, Skoupá Z, Poponessi S, Venanzoni R, Puche F, Purger D, Reeb C, R. Rios, Rodriguez-Quiel E, Arrocha C, Sabovljević MS, Nikolić N, Sabovljević AD, dos Santos EL, Segarra-Moragues JG, Ştefănuţ S, Stončius D (2016) New national and regional bryophyte records, 48. Journal of Bryology 38: 235–259. https://doi.org/10.1080/03736687.2016.1206685

Giordani P, Benesperi R, Rellini I, Frati L, Brunialti G, Paoli L, Isocrono D, Elix JA (2003) The lichen genus *Neofuscelia* (Ascomycota, Parmeliaceae) in Italy. The Lichenologist 35: 377–385. https://doi.org/10.1016/j.lichenologist.2003.09.001

Guttová A, Fačkovcová Z, Martellos S, Paoli L, Munzi S, Pittao E, Ongaro S (2018) Ecological specialization of lichen congeners with a strong link to Mediterranean-type climate: a case study of the genus *Solenopsora* in the Apennine peninsula. The Lichenologist: in press.

Guttová A, Zozomová-Lihová J, Timdal E, Kučera J, Slovák M, Piknová K, Paoli L (2014) First insights into genetic diversity and relationships of European taxa of the genus *Solenopsora* (Catillariaceae, Ascomycota) with implications on their delimitation. Botanical Journal of the Linnean Society 176: 203–223.

Hodgetts NG (2015) Checklist and country status of European bryophytes – towards a new Red List for Europe. Irish Wildlife Manuals, No. 84. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland, 130 pp.

Köckinger H (2017) Die Horn- und Lebermoose Österreichs (Anthocerophyta und Marchantiophyta). Catalogus Florae Austriae, II. Teil, Heft 2. Biosystematics and Ecology Series 32, Verlag der Österreichsichen Akademie der Wissenschaften, 382 pp.

Lockhart N, Hodgetts N, Holyoak D (2012) Rare and threatened bryophytes of Ireland. Holywood: National Museums Northern Ireland, 656 pp.

Long DG (1993) *Gymnostomum viridulum* Brid. new to Germany. Journal of Bryology 17: 514. https://doi.org/10.1179/jbr.1993.17.3.514

Miadlikowska J, Kauff F, Högnabba F, Oliver JC, Molnár K, Fraker E, Gaya E, Hafellner J, Hofstetter V, Gueidan C, Otálora MAG, Hodkinson B, Kukwa M, Lücking R, Björk C, Sipman HJM, Burgaz A, Thell A, Passo A, Myllys L, Goward T, Fernández-Brime S,

Hetsmark G, Lendemer J, Lumbsch HT, Schmull M, Schoch CL, Sérusiaux E, Maddison DR, Arnold AE, Lutzoni F, Stenroos S (2014) A multigene phylogenetic synthesis for the class Lecanoromycetes (Ascomycota): 1307 fungi representing 1139 infrageneric taxa, 317 genera and 66 families. Molecular Phylogenetics and Evolution 79: 132–168. https://doi.org/10.1016/j.ympev.2014.04.003

Molina C, Crespo A, Blanco O, Lumbsch HT, Hawksworth DL (2004) Phylogenetic relationships and species concepts in *Parmelia* s. str. (*Parmeliaceae*) inferred from nuclear ITS rDNA and tubulin sequences. Lichenologist 36: 37–54. https://doi.org/10.1017/S0024282904013933

Nascimbene J, Nimis PL, Ravera S (2013) Evaluating the conservation status of epiphytic lichens of Italy: a red list. Plant Biosystems 147: 898–904. https://doi.org/10.1080/11263504.2012.748101

Nimis PL (1993) The lichens of Italy: an annotated catalogue. Monografie XII. Museo Regionale di Scienze Naturali di Torino, 897 pp.

Nimis PL (2016) The Lichens of Italy. A second annotated catalogue. EUT, Trieste, 740 pp.

Nimis PL, Poelt J (1987) The lichens and lichenicolous fungi of Sardinia (Italy). An annotated list. Studia Geobotanica 7 (suppl. 1), 269 pp.

Pollini C (1816) Horti et Provinciae Veronensis plantae. Giornale di Fisica Chimica Storia Naturale Medicina ed Arti 9: 21–35, 94–101, 174–187.

Pollini C (1824) Flora veronensis quam in prodromum florae Italiae septentrionalis. Typis et Expensis Societatis Typographicae. Verona, 3, 898 pp.

Potenza G, Fačkovcová Z, Fascetti S, Grassi A, Guttová A, Paoli L, Puntillo D, Ravera S (2014) Specie nuove ed interessanti per la Basilicata. Notiziario della Società Lichenologica Italiana 27: 62.

Puntillo D (1996) I Licheni di Calabria. Monografie XXII. Museo Regionale di Scienze Naturali Torino, 229 pp.

Ravera S (2012) Notulae Cryptogamicae 5 (16–25). Notula 23. *Parmelia barrenoae* Divakar, M.C.Molina & A.Crespo. Informatore Botanico Italiano 44: 193.

Ravera S, Nimis PL, Brunialti G, Frati L, Isocrono D, Martellos S, Munzi S, Nascimbene J, Potenza G, Tretiach M (2011) The Role of lichens in selecting Important Plant Areas in Italy. Fitosociologia 48: 145–153.

Rose F (1988) Phytogeographical and ecological aspects of *Lobarion* communities in Europe. Botanical Journal of the Linnean Society 96: 69–79. https://doi.org/10.1111/j.1095-8339.1988.tb00628.x

Saag L, Saag A, Randlane T (2009) World survey of the genus *Lepraria* (Stereocaulaceae, lichenized Ascomycota). Lichenologist 41: 25–60. https://doi.org/10.1017/S0024282909007993

Saccardo F (1894) Saggio di una flora analitica dei licheni del Veneto, aggiuntavi l'enumerazione sistematica di altre specie italiane. Tip. Prosperini. Padova, 164 pp.

Schnyder N, Bergamini A, Hofmann H, Müller N, Schubiger-Bossard C, Urmi E (2004) Lista Rossa delle briofite minacciate in Svizzera. UFAM, FUB & NISM. Collana dell'UFAM: Ambiente – Esecuzione, 101 pp.

Schumacker R, Aleffi M, Miserere L (1999) The bryophyte flora of the Gran Paradiso National Park (Aosta Valley and Piedmont, Italy) and its immediate surroundings: a synthesis. Lejeunia 160: 1–107.

Smith AJE (2004) The moss flora of Britain and Ireland. 2nd edn. Cambridge University Press, Cambridge, 1012 pp. https://doi.org/10.1017/CBO9780511541858

Tomasi E (2014) Indagine cecidologica sulla pianura e le lagune friulane (Italia NE). Atti del Museo Civico di Storia Naturale di Trieste 56: 43–202.

Tomaselli M, Petraglia A, Lasen C (2004) Flora briologica e vegetazione delle vallette nivali nelle Vette di Feltre (Parco Nazionale Dolomiti Bellunesi, Italia settentrionale). Gortania 26: 111–136.

Varalda G, Forneris G, Montacchini F (1983–1984) Nuove segnalazioni ed interessanti conferme per la flora del basso Vercellese e dell'Oltrepo alessandrino. Allionia 26: 123–130.

Vànky K (1994) European Smut Fungi. Gustav Fischer Verlag, Stuttgart, Jena, New York: 296.

Venturella G (1991) A check-list of Sicilian fungi. Bocconea 2: 5–221.

Wirth V, Hauck M, Schultz M (2013) Die Flechten Deutschlands. Ulmer, Stuttgart, 1244 pp.