Article

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G. Caruso, S. Casavecchia, E. Biondi

The vascular flora of Uria basin (Catanzaro, S-Italy) and its conservation relevance

Abstract

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The inventory of the taxa collected during a survey held in 2011-2013 in Uria Basin, Catanzaro Province (Calabria, S-Italy) is here reported. The investigated territory, part of an area locally known as Presila Catanzarese, is located between the Ionian Sea and the Sila Massif, along the Ionian coast of Calabria region. The vascular flora of the area is scarcely known. The floristic samplings were performed in 318 sites selected as representative of the local environmental diversity as regards to climate, litho-morphology and land-use. The research led to the identification of 871 species and subspecies of vascular plants (652 of which never recorded before in the area), belonging to 100 families and 452 genera. Among these taxa, 8 are new [the most relevant being *Erodium salzmannii*, *Helianthemum jonium*, *Hypericum hircinum* subsp. *hircinum*, *Leontodon siculus*, *Populus nigra* subsp. *neapolitana*] and 3 confirmed for Calabrian flora, 51 are endemic to Italy, 32 included in IUCN Red Lists of Italian flora. In the area have been found 54 alien species, 2 of which new to Italy [*Eucalyptus astringens* and *E. propinqua*], 2 formerly considered native (or crytogenic) to Italy (*Oxalis corniculata* and *Juglans regia*). Data confirmed the great relevance of this territory for plant diversity and the need of long-term protection that seems to justify the recent establishment of two specific protected areas (Valli Cupe Regional Natural Reserve and ZSC Valle Uria - IT9330185).

Key words: Calabria, conservation, endemism, flora, Presila catanzarese, Valli Cupe Regional Natural Reserve.

Introduction

The floristic knowledge of a territory is of considerable importance for scientific and conservation (Carli & al. 2018) purposes. In particular, the information concerning the endemic plants, such as their distribution and threats, are key elements to drive national conservation strategies (Brundu & al. 2017; Orsenigo & al. 2018) and legislation addressing nature conservation (European Commission 2019a, 2019b; European Union 2014; Brundu & al. 2020). Wild vascular plants were recently used in some areas of Italy to evaluate the long-term changes in the floristic composition of vegetation of mountain ecosys-

tems (Calabrese & al. 2018; Frate & al. 2018) and for risk assessment and management of soils polluted by industrial processes (Visconti & al. 2018).

The hydrographic basin of the Uria River, as well as likely the rest of the Presila Catanzarese, due to the richness of habitats of this territory supported by a heterogeneous morphology, geology, altitude, water availability is expected to host a rich vascular flora. In addition to traditional land uses (e.g. forestry, pasture, agriculture, etc.) this territory has been characterized, during the last two decades, by an increasing eco-touristic interest. Around twenty, maybe thirty thousand tourists now rambles yearly the area, representing a huge opportunity for the economy of the place, but also a potential threat for the long term conservation of the natural resources of the area. This make it urgent a systematic research addressed to increase the floristic knowledge of this territory.

Materials & methods

Study area

Calabria is the southernmost continental administrative region of Italian peninsula. Itself a peninsula, with an area of about 15,223 sq km, it results biologically quite isolated by the rest of Apennine range, because separated northward by the Pollino Massif and surrounded by about 740 km of sea coasts (Ionian Sea eastward and southward, Tyrrhenian Sea westward). Because of its geographical position, right at the center of the Mediterranean basin, of its complex geological and biological history, and because of its habitat richness (due mostly to the wide variation of geomorphology, geology and climate) the region shows a very rich and complex native vascular flora (Bartolucci & al. 2018) counting 2,627 taxa of specific and subspecific rank. According to Peruzzi & al. (2014), 60 (2%) of the Calabrian plants are strictly regional endemic, and 210 (8%) are Italian endemic (total 10% endemics), while, according to Celesti-Grapow & al. (2010), 179 are the alien plant taxa occurring in the region (totalizing 2,806 plants, both native and alien).

The regional territory doesn't result homogeneously well known from a botanical point of view. According to Scoppola & Blasi (2005) many poorly studied areas still occur in Calabria (Fig. 1). Among the less investigated territories of Calabria, at the NE corner of the Catanzaro Province (interesting the municipalities of Magisano, Sellia Marina, Sersale, Soveria Simeri, Zagarise), a hilly belt commonly known as Presila Catanzarese exists, and part of the study area (Uria basin) overlaps this area, just between the Sila Massif and the Ionian Sea (Fig. 2).

The study area also overlaps some protected areas: the Sila National Park (NW corner of the study area) and the most recent site of community importance established in the Italian Republic (Valle Uria - IT9330185) as part of the European environmental network Rete Natura 2000. The establishment of a new SCI has been possible because inside the regional territory one of the habitats listed in the Habitat Directive 43/92 (European Community 1992; Biondi 2007; Biondi & al. 2005), the 92C0 *Platanus orientalis* and *Liquidambar orientalis* woods (*Platanion orientalis*) wasn't represented (Gianguzzi & al. 2016). Recently in this territory has also been established, through the Regional Law 41/2016, a regional natural reserve named "Valli Cupe" (Consiglio Regionale Calabria 2016a, 2016b). The reserve encompasses three different areas, one of which totally, and

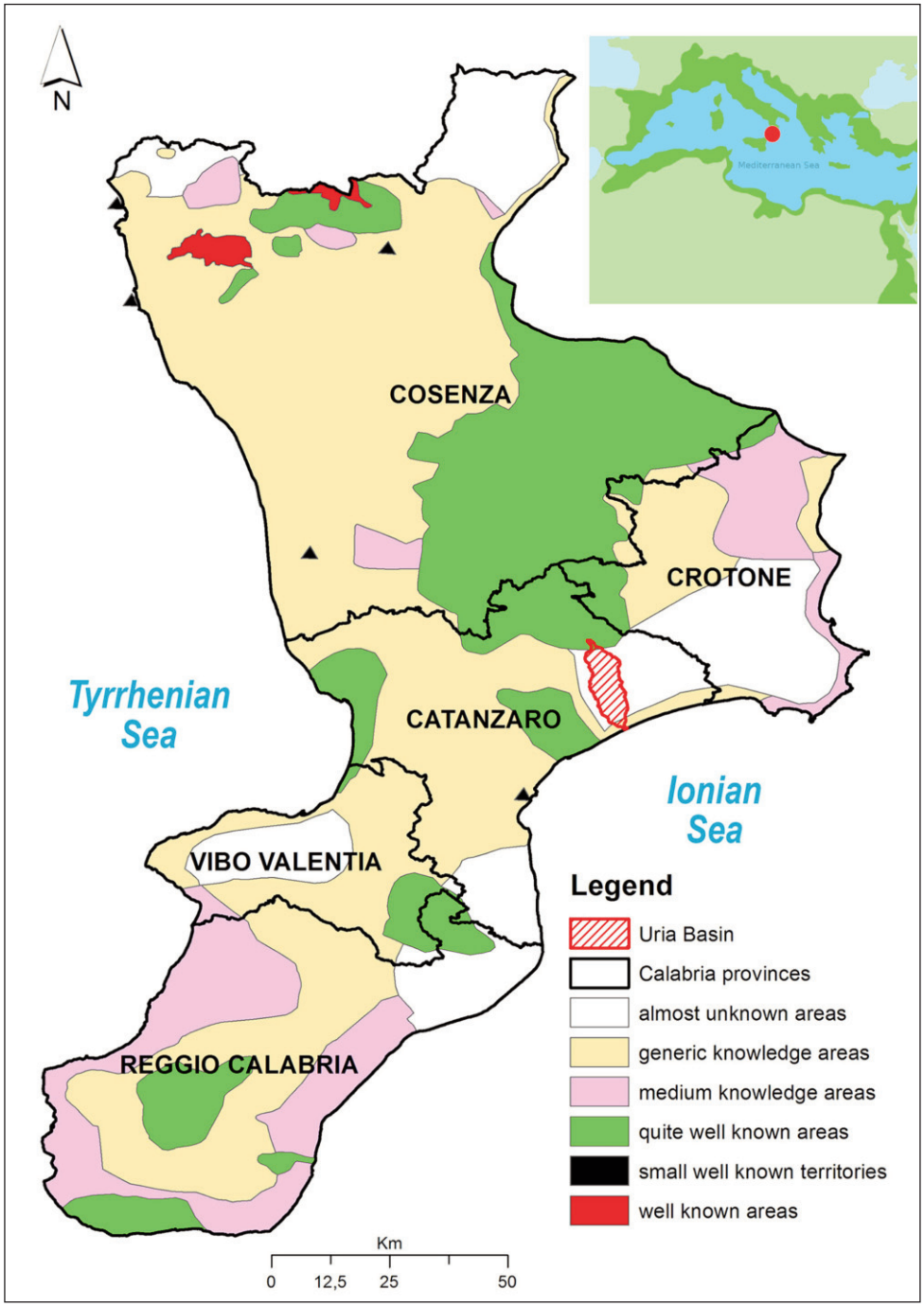


Fig. 1. Different levels of floristic knowledge recorded inside the territory of Calabria according to Bernardo & al. (2005, modified), provinces administrative borders and location of the study area.

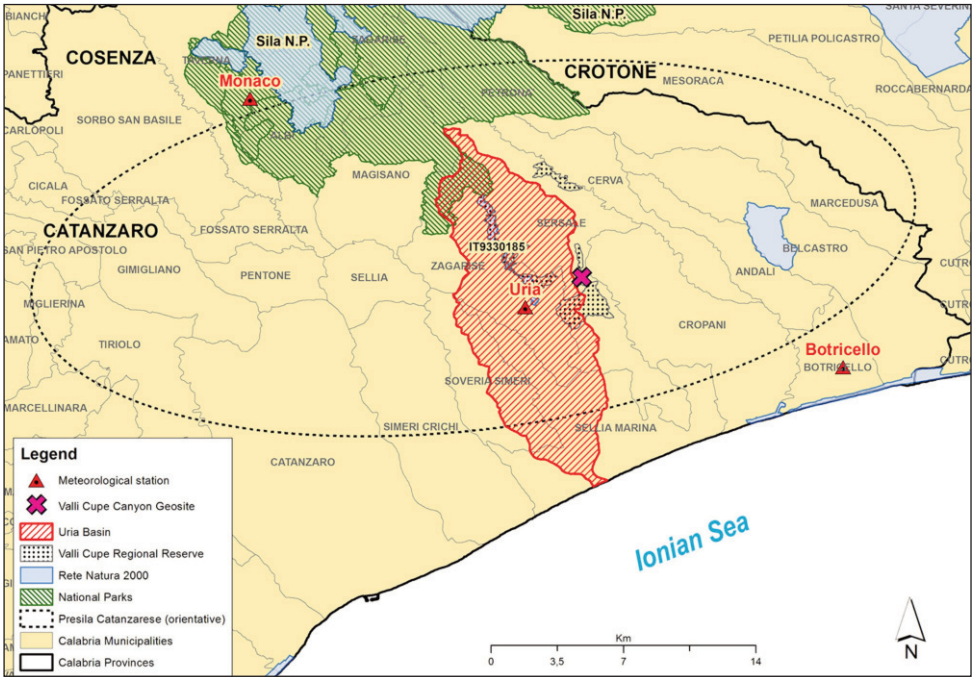


Fig. 2. The NE corner of Catanzaro Province, including Presila Catanzarese (no precise administrative border exists), Uria basin (study area), municipalities, protected areas located close to the study area or overlapping it.

another partially overlapping the study area. A few years ago has been also identified a site (Valli Cupe Canyon Geosite) of geological interest (Procopio 2006) just outside of the study area perimeter (Fig. 2).

The study area is located by the Ionian coast of Calabria from the coastline towards inland approximately for 19.8 km, while it is not wider than 5.5 km. The area, so resulting longer than wider, it is almost N-S oriented. It occupies a 72.8 sq km area (0.48% of the total Calabrian surface), and has a perimeter about 48.5 km long. Its centroid has the following coordinates: 16°42’20”E - 38°57’50”N (Fig. 3A).

The geomorphology is characterized by the alternation of hills and watersheds, except in the lower part, southward, which is roughly flat. Slopes steepness is higher inland (in some cases almost vertical and even jutting), mainly where the contour lines are close each other. Watersheds are mostly oriented in N-S direction and all of them converge towards the central valley. The altitude range is around 0-1,300 m a.s.l., maximum in the north, minimum in the south, close to the sea coast (Fig. 3B). According to Marchetti & al. (1970a; 1970b; 1968; 1971), the northern part of the study area is dominated by sedimentary rocks (conglomerate and sandstone) alternate with crystalline substrata (granite, schist). The southern part is dominated by clay, sand and alluvial formations (Fig. 3C). Hydrography is concentrated on the central axis, with changing names from wellspring

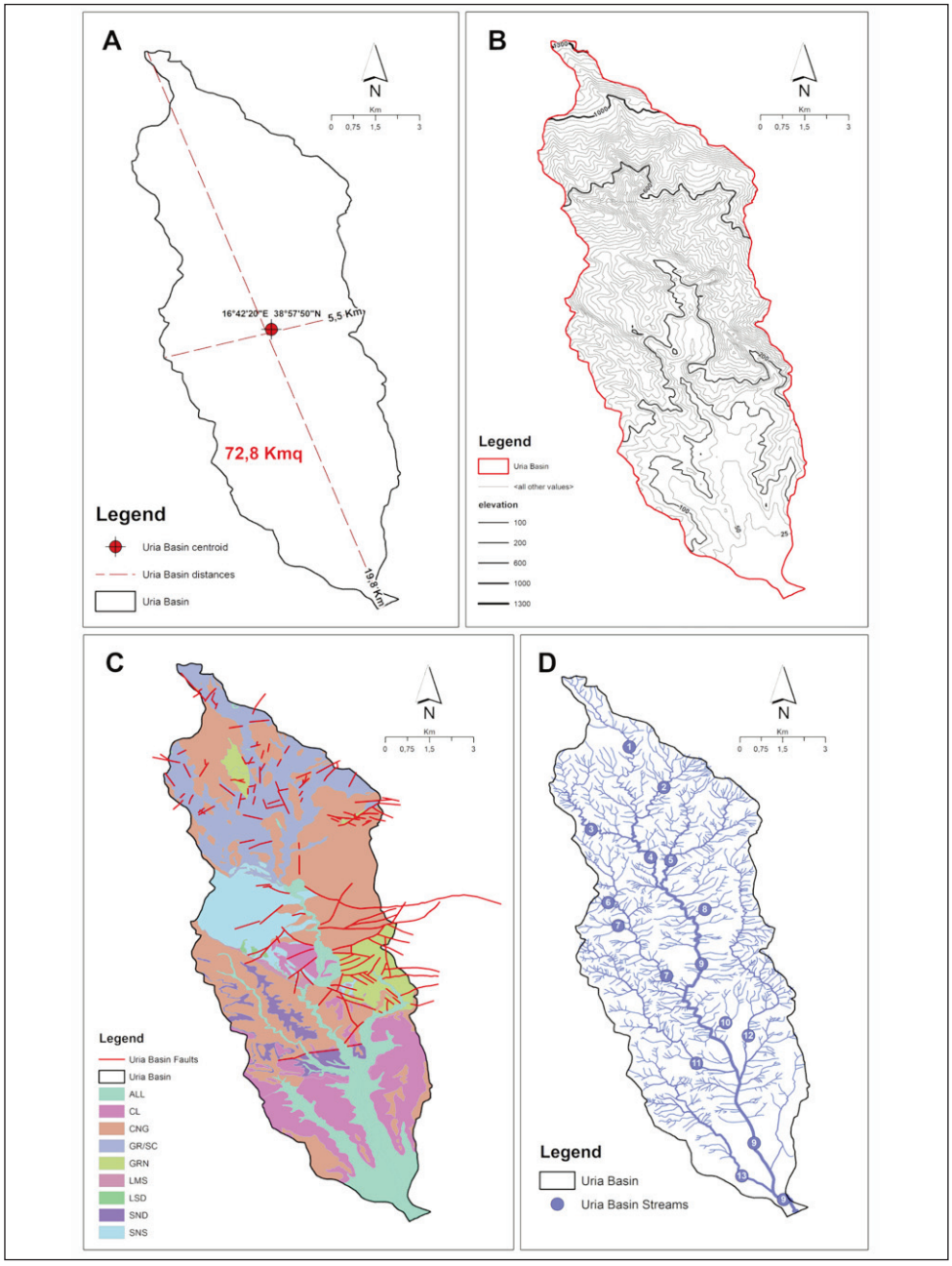


Fig. 3. Location and general geographic features of the Uria basin, the study area (A), geomorphology (contour lines) (B), geology (with faults) (C) and hydrography of Uria valley with main tributaries: 1 - Torrente Campanaro; 2 - Fosso di Rupa; 3 - Fosso di Cona; 4 - Torrente Ervarulo; 5 - Fosso Rovetto; 6 - Fosso Triarie; 7 - Fosso Valle; 8 - Fosso Catoia; 9 - Torrente Uria; 10 - Fosso Gufo; 11 - Torrente Scilotraco; 12 - Torrente Raga; 13 - Fosso Umbro (D).

(Campanaro), along the stream (Ervarulo) down to the mouth (Uria). Uria branch, the only one in the basin with permanent water, is where many smaller streams converge to, both from the right (Fosso Valle, Torrente Scilotraco, Fosso Umbro) and the left (Fosso di Rupa, Fosso Rovetto, Fosso Catoia, Fosso Gufo, Torrente Raga) sides of the basin (Fig. 3C).

The climatic data provided by the available (Monaco, Uria, Botricello) meteorological stations closer to the study area (Electronic Supplementary File 1, Fig. 1) applied to Rivas-Martinez & Rivas-Saenz (1996-2019) bioclimatic classification system produced pluvio-thermometric diagram shown in the ESF1, Fig. 2.

According to the bioclimatic classification of Italian territory proposed by GIS Natura 2.0 (DEI-MATT-DPN 2002) the macrobioclimate of the study area is mainly mediterranean, except in the northern part where is temperate. The thermotype is thermomediterranean in the southern part, mesomediterranean in the middle and supratemperate in the north. The ombrotype is mainly subhumid in the central part, while it is dry southward and hyperhumid northward (ESF1 Fig. 2).

According to Bernardo & al. (2005) the level of botanical information available for the study area is quite low. Nevertheless, later published papers on the vascular flora of the Presila Catanzarese, demonstrates the presence of native species of conservation interest. A few of these are *Carpinus betulus* L.*, Paragymnopteris marantae* (L.) K.H.Shing subsp. *marantae*, *Osmunda regalis* L., *Platanus orientalis* L., *Pteris cretica* L., *Tilia platyphyllos* Scop. subsp. *platyphyllos*, *Woodwardia radicans* (L.) Sm. (Caruso & al. 2004; Lupia 2004; Caruso & al. 2008; Caruso & al. 2012; Caruso & al. 2013), the South Italian endemics *Lomelosia crenata* subsp. *pseudisetensis* (Lacaita) Greuter & Burdet and *Stipa oligotricha* Moraldo subsp. *oligotricha* (Caruso 2007a; Caruso & Uzunov 2011; Banfi & al. 2015), the strictly endemic *Centaurea calabra* G. Caruso, S.A. Giardina, Raimondo & Spadaro (Caruso & al. 2013d). In the area also exotic species have been found, such as *Crassula lycopodioides* Lam., *Vicia faba* L., *Eucalyptus globulus* Labill., *Callitropsis arizonica* (Greene) D.P. Little (Caruso 2007b; Caruso & al. 2007c; Caruso & al. 2008b). A first fragmentary floristic account on the flora of the study area has been provided by Bernardo & al. (2012), albeit including only a few stands, while the first partial report of the local flora has been presented by Caruso & al. (2013a) as part of a PhD work. A list of the floristic information and visited locations inside the study area before this survey is available in the ESF1, Table 4.

Floristic survey

The floristic investigation of the study area has been performed applying the classic collection based floristic methodology. A systematic botanical collection plan, counting 318 stands (ESF1, Table 5), to be sampled along a 3-year survey period (2011-2013), has been established in order to represent the habitat diversity occurring in the study area. In some cases, the sampled stands are very close due to the complex mosaic of habitats and the variable ecology of the basin. Each stand has been sampled and the collected specimens dried and stored. Afterwards, the taxonomic identification has been carried out using standard floras such as Tutin & al. (1968-1980, 1993), Pignatti (1982) and Pignatti & al. (2017-2019). Part of the collected material has been provided for identification to specialists such as Banfi E. for Poaceae and Gangale C. for *Carex*. Sets of the plant material are stored in the following herbaria: CLU, ANC, MSMN (*Poaceae*) and in one of the authors' personal

collection (Herbarium Giuseppe Caruso). The names applied to native plant species and subspecies follow Bartolucci & al. (2018) and Pignatti & al. (2017-2019); alien species have been named according to Celesti-Grapow & al. (2009; 2010) and Galasso & al. (2018); names of families and genera follow Peruzzi (2010).

Life form following Raunkiaer (1934) and Ellenberg & Mueller-Dombois (1967), along with chorological type according to Pignatti & al. (2017-2019) have been used to calculate the biological and chorological spectra.

The floristic richness expected for the area was calculated according to Cristofolini (1998), by means of the extrapolation of a locally valid linear regression between the logarithm of the surface of some reference areas (in km^2) and the logarithm of their respective taxa densities (nr taxa/km^2) (Table 1). For this purpose, the subregional Calabrian floras published in the last 40 years have been considered (La Valva & Ricciardi 1978; La Valva 1984; Maiorca & Spampinato 1994; Bernardo & Maiorca 1997; Maiorca & al. 2002; Musarella & Tripodi 2004; Maiorca & al. 2007; Maiorca & Puntillo 2009; Di Marco & al. 2012). The regression line represents the expected taxa density logarithm, according to the area extent logarithm. By applying this methodology it is possible to obtain an objective estimation of floristic diversity, irrespective of the size of the area.

Results

The vascular flora of the study area counts 871 species and subspecies. The observed floristic richness for the Uria Valley was higher than expected (745 taxa, according to the linear regression formula), with an observed/expected ratio of 1.17, a value that places the Uria Valley up the regression line (Table 1; Fig. 5). This result could be explained by the high diversity of habitats found along the valley and the high density of sampling areas.

The found taxa belong to 100 families and 452 genera. The most represented taxa belong to the *Asteraceae* with 113 taxa, *Fabaceae* with 93, *Poaceae* 91, *Apiaceae* 44, *Lamiaceae* 39, *Brassicaceae* 37, *Caryophyllaceae* 31, *Rosaceae* 27, *Ranunculaceae* 16, *Plantaginaceae* 16, *Cyperaceae* 16, *Polypodiaceae* 15, *Boraginaceae* 14, *Geraniaceae* 13, *Rubiaceae* 12, *Orchidaceae* 12, *Amaranthaceae* 12, *Caprifoliaceae* 11. The remaining families do contribute to this flora with less than 10 species each (Fig. 6). The most represented genera are *Trifolium* with 22 species, *Carex* with 10, *Geranium*, *Medicago* and *Vicia* with 10, *Silene* with 9, *Lathyrus* 8, *Festuca*, *Galium*, *Hypericum*, *Plantago*, *Rumex* with 7, *Allium*, *Euphorbia*, *Juncus*, *Lotus*, *Rosa*, *Verbascum* with 6, while the rest of genera (434) contributes with less than 6 species. The majority of the genera (91) occurring in the study area counts just 1 or 2 species.

The biological spectrum of the vascular flora of the study area, according to Raunkiaer (1934) and Ellemberg & Mueller-Dombois (1967) is dominated by therophytes (36.3%) and hemicryptophytes (33.7%), while helophytes (0.2%) and hydrophytes (0.6%) are the less represented (Fig. 7).

The chorological spectrum of the Uria basin shows a prevalence of stenomediterranean (21%) and eurimediterranean (20.6%) taxa. The contingent of endemic (and subendemic) species counts 51 entities (5.9%) while the alien (and cultivated) species are 54 units (6.2%) (Fig. 8).

Table 1. Expected and observed floristic diversity in subregional floras published in the last 40 years (including the present). The values of observed and expected nr. taxa/km^2 ratio higher than 1 are marked in bold font.

Subregional Calabrian floras	area (km^2)	nr. taxa	log area (x)	log taxa/area (y)	logarithmic regression (y = -0,8315x + 2,5584)	observed taxa/area	expected taxa/area ($y=10^x$)	obs./exp.
Pentedattilo Cliff	0.01	251	-2	4.34	4.2214	25100	16649.45	**1.51**
Argentino Valley	39.8	846	1.599883072	1.33	1.228097226	21.26	16.91	**1.26**
Mavigliano Wood	6.5	602	0.812913357	1.97	1.882462544	92.62	76.29	**1.21**
Cassano High	1	421	0	2.62	2.5584	421	361.74	**1.16**
Crati Outlet	3	482	0.477121255	2.21	2.161673677	160.67	145.10	**1.11**
Dino Island	0.5	295	-0.301029996	2.77	2.808706441	590	643.73	0.92
La Vota Lakes	1.85	243	0.267171728	2.12	2.336246708	131.35	216.89	0.61
Cirella Island	0.12	161	-0.920818754	3.13	3.324060794	1341.67	2108.92	0.64
Papasidero	54.65	580	1.737590166	1.03	1.113593777	10.61	12.99	0.82
Uria Valley	72.8	871	1.862131379	1.08	1.010037758	11.96	10.23	**1.17**

The Uria basin vascular flora survey revealed a pool of 8 taxa new to Calabria flora: *Carduus collinus* Waldst. & Kit. subsp. *collinus, Erodium salzmannii* Delile, *Helianthemum jonium* Lacaita & Grosser, *Hypericum hircinum* L. subsp. *hircinum, Leontodon siculus* (Guss.) Nyman, *Populus nigra* subsp. *neapolitana* (Ten.) Asch. & Graebn., *Tommasinia altissima* (Mill.) Reduron, *Torilis leptophylla* (L.) Rchb.f.. Additional 3 taxa are confirmed to Calabria flora: *Chamaemelum fuscatum* (Brot.) Vasc., *Foeniculum vulgare* Mill. subsp. *vulgare*, *Geranium brutium* Gasparr.

Among the 88 native taxa listed in the ESF1, Table 1, the most threatened endemics are *Acer cappadocicum* subsp. *lobelii* (Ten.) A.E. Murray, *Centaurea calabra* G. Caruso, S.A. Giardina, Raimondo & Spadaro, *C. sarfattiana* Brullo, Gangale & Uzunov, *Chaerophyllum hirsutum* L., *Crepis apula* (Fiori) Babc., *Dianthus vulturius* Guss. & Ten. subsp. *vulturius*, *D. longicaulis* Ten., *Euphorbia meuselii* Geltman, *Hypericum barbatum* subsp. *calabricum* (Spreng.) Peruzzi & N.G. Passal., *Lomelosia crenata* subsp. *pseudisetensis* (Lacaita) Greuter & Burdet, *Pimpinella anisoides* V.Brig., *Salix apennina* A.K. Skvortsov, *S. brutia* Brullo & Spamp., *Silene echinata* Otth, *Stipa oligotricha* Moraldo subsp. *oligotricha*. Other threatened taxa are the native *Barlia robertiana* (Loisel.) Greuter, *Clematis cirrhosa* L., *Dracunculus vulgaris* Schott, *Ephedra distachya* L. subsp. *distachya*, *Equisetum palustre* L., *Genista monspessulana* (L.) L.A.S.Johnson, *Limodorum abortivum* (L.) Sw., *Lotus biflorus* Desr., *Ophrys bertolonii* Moretti subsp. *bertolonii*, *Platanus orientalis* L., *Pteris cretica* L., *Saponaria calabrica* Guss., *Serapias parviflora* Parl., *Spiranthes spiralis* (L.) Chevall., *Tilia platyphyllos* Scop. subsp. *pseudorubra* C.K. Schneid., *Ulmus glabra* Hudson.

Discussion

According to the available literature (Caruso & al. 2004, 2008, 2012, 2013; Lupia 2004; Caruso 2007a, 2007b; Bernardo & al. 2012; Banfi & al. 2015; Roma-Marzio & al. 2017) (Fig. 4) 219 vascular plant taxa were formerly recorded for the Uria basin. This survey added 652 unrecorded taxa to the local vascular flora, which now counts 871 units, significantly improving the floristic knowledge of the area.

A high level of phytodiversity occurs in the Uria basin, especially considering it in relation to the whole flora of Calabria, both counting or not alien species. In the first case (aliens included) the Uria flora represents the 31.0% (X_{n+a} = 870 x 100 / 2,806 = 31.0%)

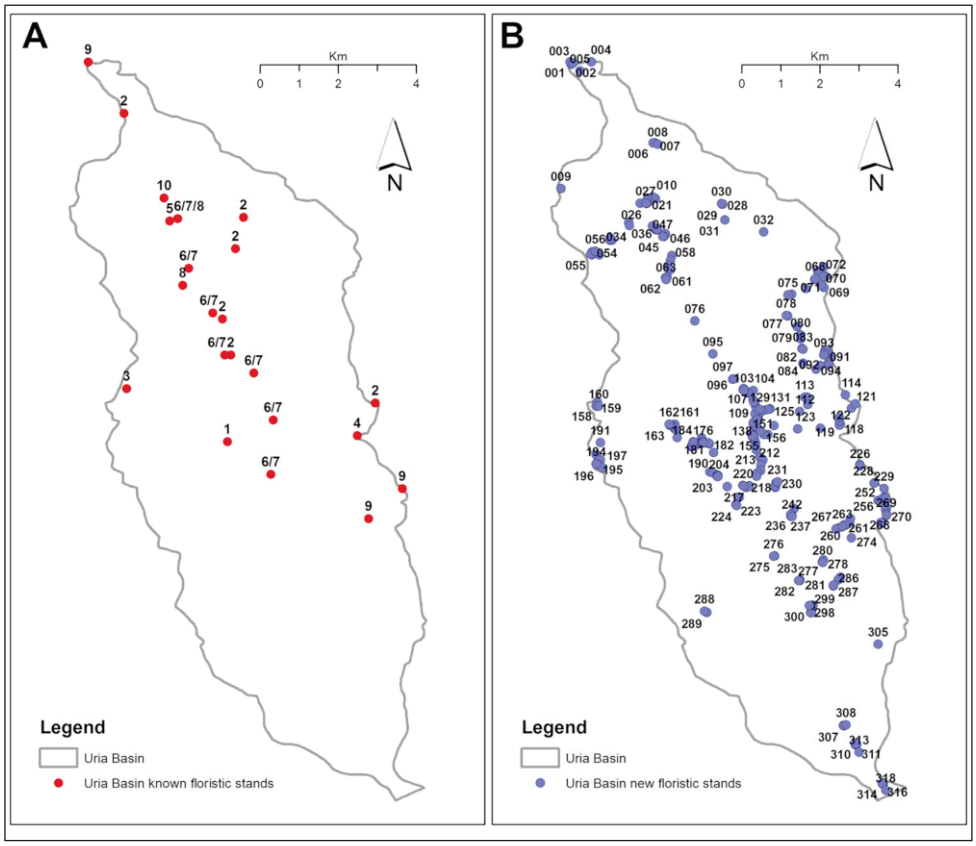


Fig. 4. Distribution of formerly available floristic information in the study area by literature (1. Banfi & al. 2015; 2. Bernardo & al. 2012; 3. Caruso & Uzunov 2011; 4. Caruso 2007; 5. Caruso & al. 2007; 6. Caruso & al. 2008; 7. Caruso & al. 2012; 8. Lupia 2004; 9. Caruso & al. 2013; 10. Roma-Marzio & al. 2017) (A) and distribution of the floristic sampling stands across the study area (B). A few of these stands, at the scale of this map, overlap because very close each other. This close sampling strategy has been necessary to better investigate the complex habitat mosaic of the study area.

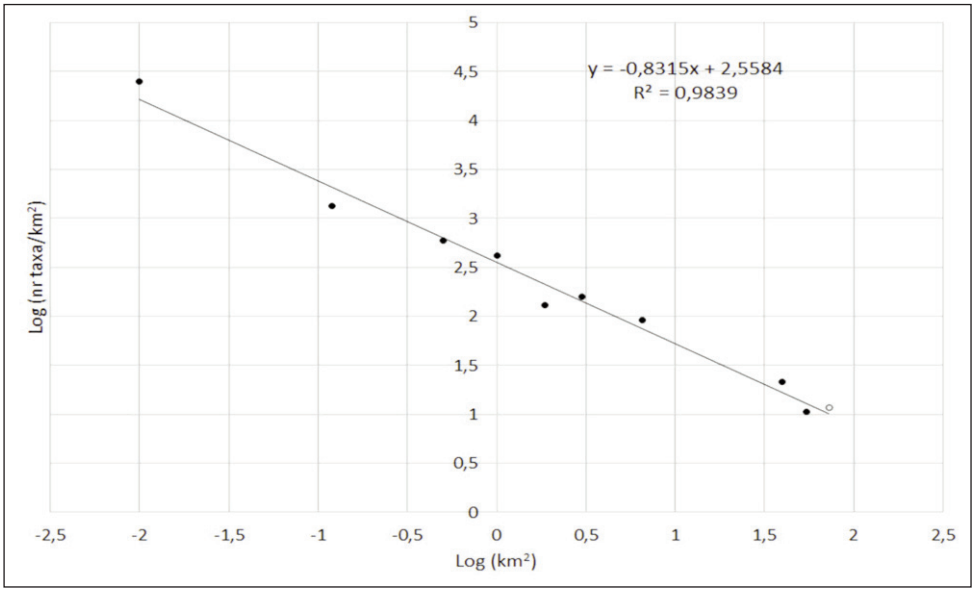


Fig. 5. Subregional Calabrian floras. Linear regression, with relative formula, between the logarithm of areas (km^2) and the logarithm of the ratio nr. taxa/km^2. The value obtained for the Uria Valley is the empty dot.

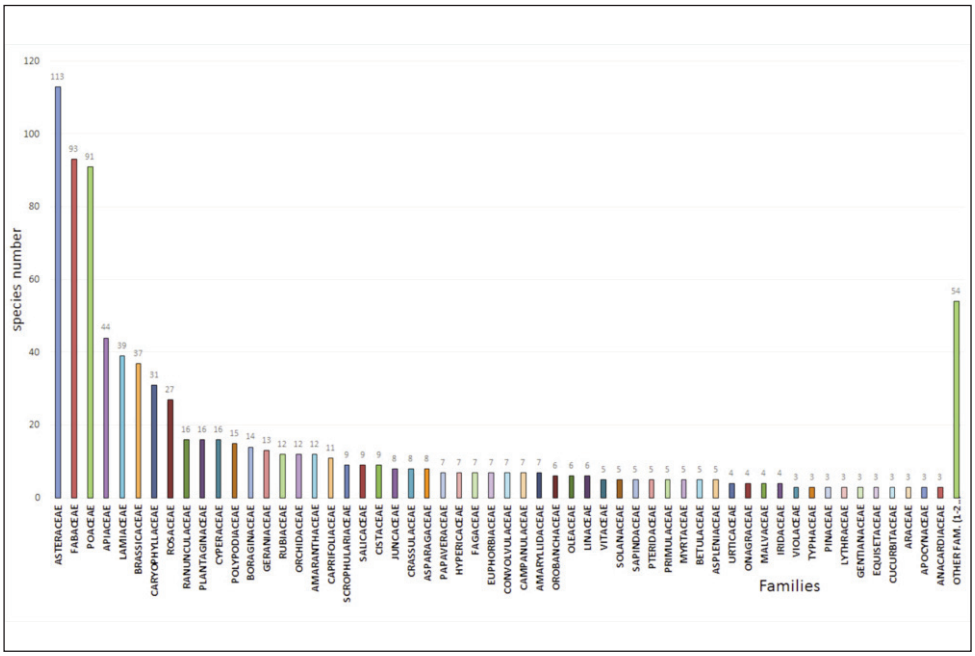
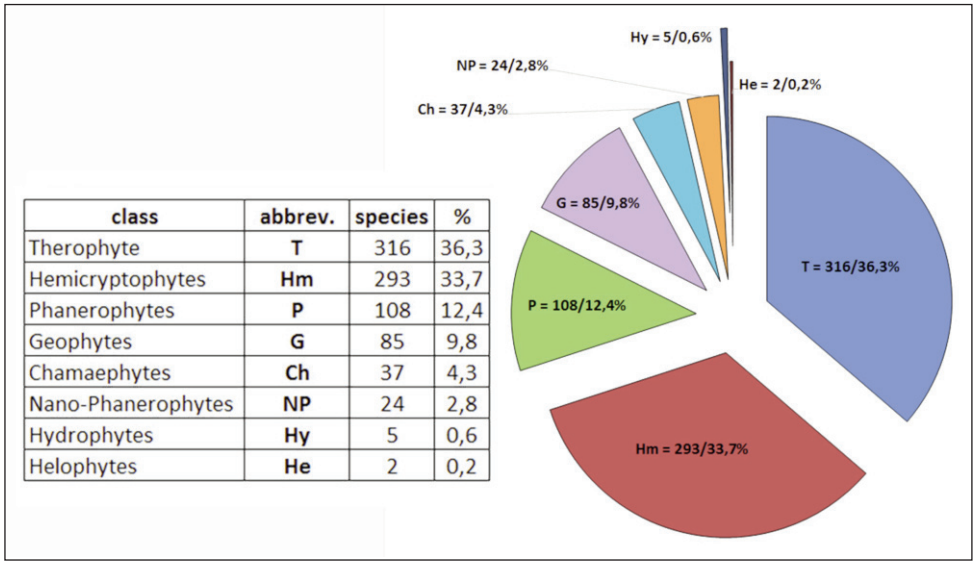
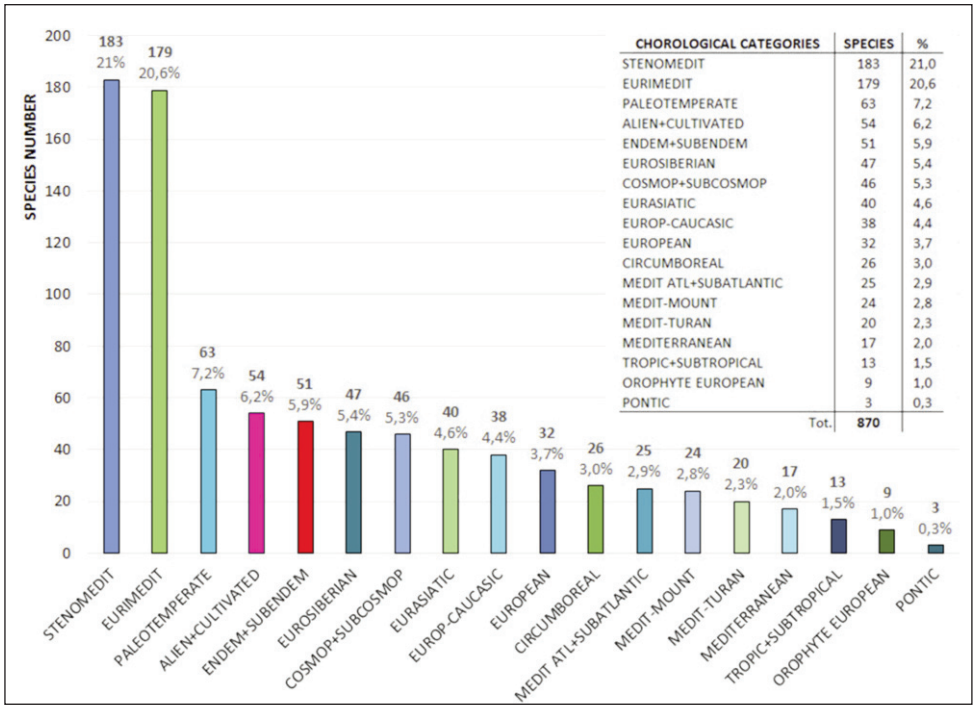


Fig. 6. Number of species per family in the vascular flora of Uria basin.



class	abbrev.	species	%
Therophyte	T	316	36,3
Hemicryptophytes	Hm	293	33,7
Phanerophytes	P	108	12,4
Geophytes	G	85	9,8
Chamaephytes	Ch	37	4,3
Nano-Phanerophytes	NP	24	2,8
Hydrophytes	Hy	5	0,6
Helophytes	He	2	0,2

Fig. 7. Biological spectrum of the vascular flora of Uria basin. The growth forms are grouped by main categories.



CHOROLOGICAL CATEGORIES	SPECIES	%
STENOMEDIT	183	21,0
EURIMEDIT	179	20,6
PALEOTEMPERATE	63	7,2
ALIEN+CULTIVATED	54	6,2
ENDEM+SUBENDEM	51	5,9
EUROSIBERIAN	47	5,4
COSMOP+SUBCOSMOP	46	5,3
EURASIATIC	40	4,6
EUROP-CAUCASIC	38	4,4
EUROPEAN	32	3,7
CIRCUMBOREAL	26	3,0
MEDIT ATL+SUBATLANTIC	25	2,9
MEDIT-MOUNT	24	2,8
MEDIT-TURAN	20	2,3
MEDITERRANEAN	17	2,0
TROPIC+SUBTROPICAL	13	1,5
OROPHYTE EUROPEAN	9	1,0
PONTIC	3	0,3
Tot.	870	

Fig. 8. Chorological spectrum of the Uria basin vascular flora.

of Calabria flora, while in the second (just native plants) Uria flora represents the 31.4% (X_n = 824 × 100 / 2,627 = 31.4%) of the regional flora. By relating this already startling information to the percentage of the surface of Calabria region occupied by Uria basin (X_U = 72.8 × 100 / 15,223 = 0.48%) it is possible to appreciate how much of Calabrian phytodiversity is concentrated in such a small territory: almost one third of the regional flora inside less than 0.5% of the whole regional surface. But, even more important, applying a methodology useful to measure floristic diversity irrespective of the size of the area the flora of the Uria Valley confirms its high level of phytodiversity. Data confirm the high quantitative interest of the vascular flora hosted in the Uria valley, bus also its qualitative importance, how demonstrate 3 taxa confirmed and 8 firstly recorded for Calabrian native flora (ESF1, Tables 1 and 5). Among these, considerable, from a phytogeographic point of view, are *Erodium salzmannii* Delile formerly occurring only in Sardinia on the Italian territory, *Carduus collinus* Waldst. & Kit. subsp. *collinus* and *Helianthemum jonium* Lacaita & Grosser, both here at southernmost known location, the Tyrrhenian *Hypericum hircinum* L. subsp. *hircinum*, the Sicilian endemic *Leontodon siculus* (Guss.) Nyman, *Populus nigra* subsp. *neapolitana* (Ten.) Asch. & Graebn., *Tommasinia altissima* (Mill.) Reduron and *Torilis leptophylla* (L.) Rchb.f.

Equally relevant is the high frequency of endemic (and subendemic) taxa (51 units), 32 of which included in IUCN Red Lists of Italian flora, 19 never assessed. Relevant, is also the occurrence of a rich contingent (37 taxa) of native plants whose extinction risk has been assessed, because of their conservation significance, according to IUCN rules (ESF1, Table 2).

Not less important, for opposite reasons, is the occurrence in the Uria basin of 54 alien species, 2 of which new to Italy [*Eucalyptus astringens* (Maiden) Maiden and *E. propinqua* H.Deane & Maiden] and 2 formerly considered native (or at least cryptogenic) to Italy (*Oxalis corniculata* L. and *Juglans regia* L.). For all alien taxa whose degree of invasiveness wasn't formerly known, an evaluation is here proposed at regional (Calabria) or national (Italy) level, ranging from casual to invasive (ESF1, Table 3).

Conclusions

The rich vascular flora of the Uria basin would deserve this territory to be included, as soon as possible, among Important Plant Areas and/or Biodiversity Hot-Spots. Because of this, it would seem that recently established protected areas (SCI "Valle Uria" and Regional Natural Reserve "Valli Cupe") could certainly play an active role in the conservation of this rich floristic diversity, and maybe even in the management of the important amount of alien species found, a threat for ecosystems and one of the main drivers of worldwide biodiversity loss (Bellard & al. 2016).

Some concern do emerge, mostly about the future interpretation, and destiny itself, of the habitat 92C0 [*Platanus orientalis* and *Liquidambar orientalis* woods (*Platanion orientalis*)] in Italy. Many Italian Rete Natura 2000 sites in fact, SCI "Valle Uria" included, do owe their inclusion in the European environmental network mainly to the presence of *Platanus orientalis*, which was, at the time, considered native to Italy. The changed status of this species, native to archeophyte, proposed by Rosati & al. (2015) could affect the recognizability of the habitat in the country. Recently, Rinaldi & al. (2019) surveying the

genetic structure and variation of *Platanus orientalis* in populations from Albania, Bulgaria, Greece, S-Italy (Uria included), Sicily and Turkey, found an overall decrease in estimated genetic diversity towards western populations, with those from S-Italy and Sicily showing the lowest values, resulting, according to the authors, from range fragmentation experienced by the species during the Tertiary at its westernmost limit. This would be confirmed by the high level of genetic isolation of these populations. In our opinion, this issue, considering the phytogeographic, ecological, phytosociological and conservation role played by this taxon, deserves further investigation, perhaps extending the genetic study to the whole range of the species, including many other populations eastward.

Further floristic investigation is also desirable for the hydrographic basins adjoining Uria valley, and in general for Presila catanzarese. Information doubtlessly will improve national floristic dataset and will support the conservation policies even in facing the growing touristic interest in the area.

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Addresses of the authors:
Giuseppe Caruso[1,2*], Simona Casavecchia[3], Edoardo Biondi[3],
[1]Istituto Tecnico Agrario Statale "V. Emanuele II", via Cortese 1 – 88100 Catanzaro. E-mail: caruso_g@libero.it
[2]Dipartimento di Agraria, Università Mediterranea di Reggio Calabria, località Feo di Vito – 89122 Reggio Calabria. E-mail: giuseppe.caruso@unirc.it
[3]Dipartimento di Scienze Agrarie, Alimentari e Ambientali, Università Politecnica delle Marche, via Brecce Bianche – 60131 Ancona. E-mail: s.casavecchia@staff.univpm.it, e.biondi@univpm.it
[*]Corresponding author.