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Article

Salsola tragus L. (Amaranthaceae) and *Thymelaea gussonei* Boreau (Thymelaeaceae): new records for the native vascular flora of Calabria (S-Italy) with some remarks about their taxonomy and distribution

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Abstract: Recent field investigations, performed across some of the less floristically known sectors of Calabria, have led to the discovery of *Salsola tragus* and *Thymelaea gussonei*, two new species for the regional vascular flora. By providing crucial biogeographical and taxonomic remarks, this work aims to contribute to the improvement of the knowledge of the rich, diversified and still poorly known native flora of Calabria. The biogeographical value of these new findings underlines the decisive role of field survey in the enhancement of the information on regional biodiversity, the essential basis for every further ecological study and conservation effort.

Keywords: Autochthonous Species; Biodiversity; Floristic Data; Herbarium Specimens; Native Species; New Floristic Records; Plant Diversity; Southern Italy

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1. Introduction

Calabria is one of the floristically richest regions of continental Italy, with approximately 2,550 native vascular taxa [1] and around 270 endemic taxa, according to Peruzzi *et al.* [2]. Biogeographical isolation and dramatically changing ecology (mountains close to the coast, diversified geology, geomorphology and bioclimate, etc.) have significantly contributed to its great phytodiversity [3-7].

Over the last century, the floristic survey of Calabria has led to a significant improvement in our understanding of the regional vascular flora, even resulting in the description of new taxa [8-11]. Despite this significant enhancement, according to Bernardo *et al.* [12], large areas of Calabria still lack adequate floristic knowledge.

In fact, despite the richness of the Calabrian flora, the analysis carried out by D'Antraccoli *et al.* [13] provided a low value of SAR (species-area ratio) for the region, thus possibly underestimating its floristic abundance, and, above all, demonstrating the crucial role of detailed floristic survey in the evaluation of species richness for a given geographical area. In Italy, *Salsola tragus* L. and *Thymelaea gussonei* Boreau did not receive satisfying taxonomic treatments, resulting in frequent misidentifications and possibly incomplete distribution data. According to Bartolucci *et al.* [1], *S. tragus* occurs as a native species in the administrative regions of Lombardy, Veneto, Friuli Venezia-Giulia, Liguria, Emilia-Romagna, Tuscany, Latium, Campania, Apulia, Basilicata, Sicily and Sardinia (as

a cryptogenic, naturalized or casual alien in Valle D'Aosta, Piedmont and Trentino Alto-Adige), whereas *Th. gussonei* is known to occur in Tuscany, Marche, Sicily and Sardinia.

Salsola tragus belongs to the highly critical group of taxa formerly known as *Salsola* sect. *Kali* Dumort., temporarily transferred to the genus *Kali* Mill. [14] and, shortly after, proposed to be maintained under the genus *Salsola* with its conserved type *S. kali* L. [15]. This taxonomic group is currently represented in Italy by *S. tragus* and *S. squarrosa* Steven ex Moq. subsp. *controversa* (Tod. ex Lojac.) [1]. For a long time, this latter taxon has been considered by Italian authors as *Salsola kali* [e.g. 16,17], whereas it has subsequently been referred to as *S. tragus* L. subsp. *pontica* (Pall.) Rilke [18].

Salsola tragus was described by Linnaeus [19], three years after *S. kali* L. [20], as having delicate (*laevibus*) leaves, and quoting, among the synonyms, the polynomial name "*Kali spinosum foliis longioribus & angustioribus*" provided by Tournefort [21]. In the second edition of *Species Plantarum*, Linnaeus [22] added the adjective "*scabra*" (scabrous) to *S. kali*, while no further information was given for the indumentum of *S. tragus*. With regard to past treatments of the Italian flora, it emerges that almost all authors regarded *S. tragus* as a species typically occurring in coastal habitats, thereby coexisting with the other taxon once thought to be *S. kali* and now designated as *S. squarrosa* subsp. *controversa* [23]. Furthermore, the same Italian authors often adopted diagnostic characters that usually are no longer emphasized in modern treatments. This could imply that some of the plants treated as *S. tragus* in the earlier Italian works could have been simply forms of *S. squarrosa* subsp. *controversa*. Therefore, it is also possible that *S. tragus* could be quite rare, or even absent, in many Italian regions.

Thymelaea gussonei belongs to the genus *Thymelaea* Mill., which comprises about 33 herbaceous and bushy species with a Mediterranean-Asiatic distribution [24]. *T. gussonei* belongs to the sect. *Ligia* (Fasano) Meisn., which includes annual herbaceous species with a thin and slender habit, monoecious, andromonoecious or hermaphroditic flowers, amphistomatic leaves, inflorescences in axillary glomeruli protected by 2 bracts and persistent hypanthium [25]. This taxon has a Mediterranean distribution, occurring in Spain, Portugal, Italy, Malta, France (Corse), Cyprus, Israel, Palestine, Jordan, Lebanon, Syria, European and Asiatic Turkey, Algeria, Greece, Morocco, Tunisia [25-28], and also outside the strictly Mediterranean area, in Bulgaria [28,29].

Originally described as *Stellera pubescens* Guss. [30] for many Sicilian localities, it has been later renamed by the same author as *Passerina pubescens* Guss. [31], as distinct from *Thymelaea passerina* (L.) Coss. & Germ. (at that time named as *Passerina annua* Wikstr.) on the basis of the different flowering period, hairiness and length of bracts in relation to flowers and fruits. It was later considered as a variety of *T. passerina* by some authors [32-34], but not by others [35,16,17]. Recent treatments [36,37,27] point out as diagnostic features the indumentum of the upper part of the stem (sparse to rather dense in *T. gussonei*, glabrous to very sparse in *T. passerina*), the length of the bracts and the sexuality of flowers. *T. passerina* has only bisexual flowers, while in *T. gussonei* male, female and rarely hermaphroditic flowers are usually represented in the same specimen [25,27]. Female and hermaphroditic flowers may be easily pinpointed because the ovary soon swells. Based on these characters, Lazzeri *et al.* [38] documented the presence of *T. gussonei* in Tuscany, where it turned out to be more prevalent than *T. passerina*.

This research aims to report the first findings of these two native species in the region as part of a broader strategy of botanical survey of the Calabrian territory performed by this research group.

2. Materials and Methods

2.1. Study area

Calabria is the southernmost continental region of Italy, surrounded by the Ionian and Tyrrhenian Sea to the east and west, and by Messina Strait to the south. It is abruptly

separated from continental Italy by the Pollino massif, whose highest mountain top is represented by Serra Dolcedorme (2,267 m a.s.l.). The complex orography – characterized by the proximity of the mountain ranges of the Calabrian Apennine (Pollino, Orsomarso, Sila, Catena Costiera, Serre and Aspromonte) to the coastline – coupled with its highly heterogeneous geology, are the underlying cause of the considerable climatic and floristic diversity occurring in Calabria [39].

As part of the investigation of floristically poorly known areas of central Calabria, many localities have been surveyed during the last years. Among these, one stand occurring in the province of Vibo Valentia and two in the province of Crotone provided interesting floristic data here reported (Figure 1).

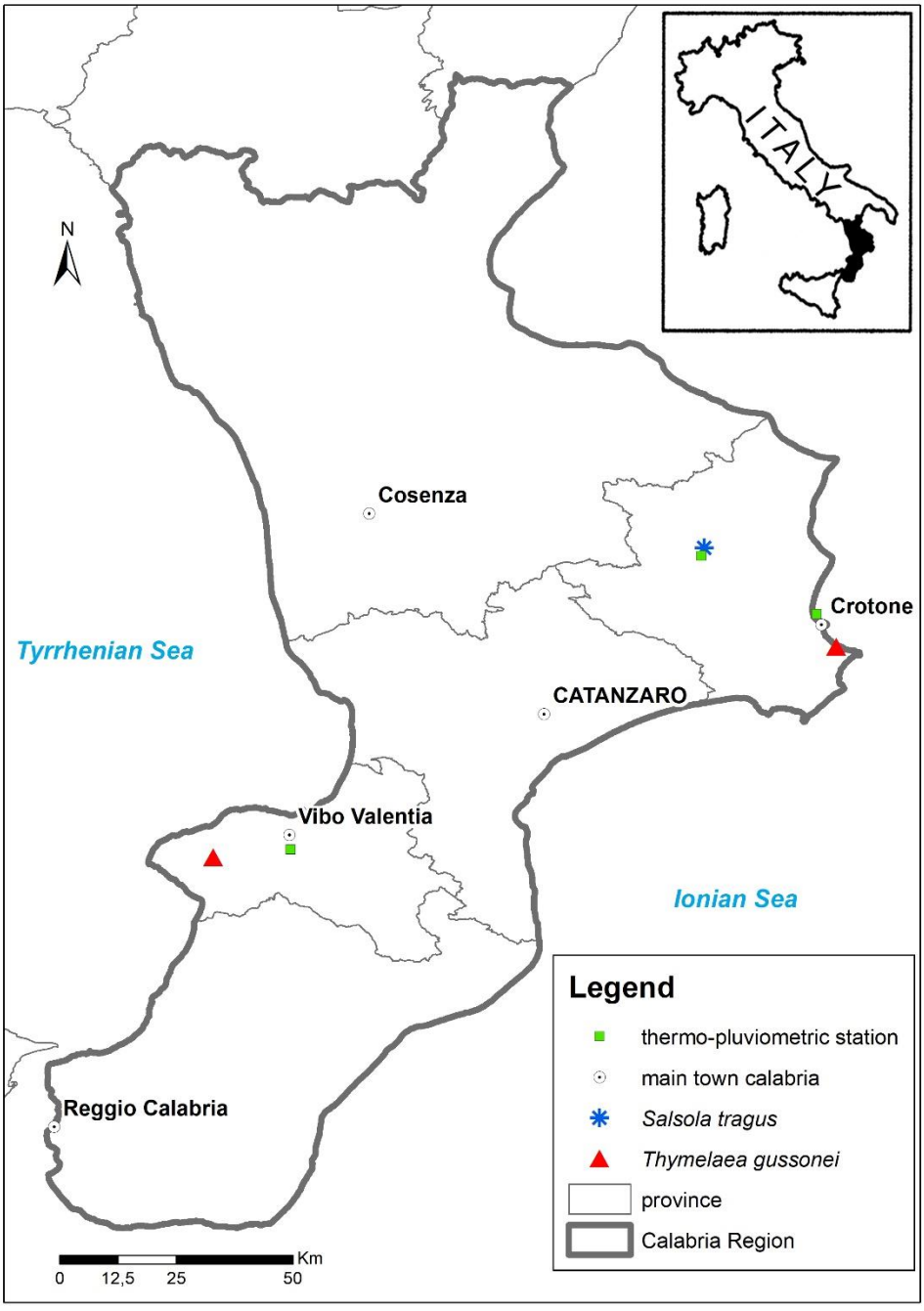

Figure 1. Map of Calabria: seas, main ranges, administrative provinces (and capitals) and location of both thermo-pluviometric stations and plant stands.

2.2. Specimen, data collection and mapping

The surveyed stands and the specimens collected have been georeferenced using a GPS device (Garmin Montana 650t). Each plant has been collected and dried in at least two voucher copies applying the standard herbarium techniques. *Exsiccata* have been stored in the herbarium of the Department of Agraria, Mediterranean University of Reggio Calabria (coded REGGIO, according to Thiers [40]). A voucher copy of each specimen has also been stored in the private Herbarium Capuano (Catanzaro).

Maps have been drawn using QGIS software [41] and data have been tabled using Microsoft Excel software [42].

Nomenclature, taxa delimitation, and regional distribution are reported according to Bartolucci *et al.* [1]. *Salsola tragus* has been identified mainly following Mosyakin [43] and Rilke [44], but also on the basis of original observations. The identification of *Thymelaea gussonei* follows Tan [36] and Pedrol [25]. Life forms and native ranges have been provided according to Pignatti [17], Pignatti [27], POWO [28], Portal to the Flora of Italy [45] and the database of the Acta Plantarum website [46].

For the surveyed areas, climate features and thermopluviometric charts have been provided by Zepner *et al.* [47], while bioclimatic classification has been provided according to Rivas-Martinez & Rivas-Saenz [48].

For each taxon, the following information has been reported: accepted scientific name and most relevant synonyms (homotypic and heterotypic, according to POWO [28]), plant family and native range; life form; collection date and discovery localities (municipality, administrative province); exsiccata with details on the location according to the information reported on the specimen label; decimal degrees geographic coordinates (datum WGS84), altitude (m a.s.l.), habitat features, climate and bioclimate; *legit* and *determinavit*; herbaria where the specimens are stored, and the new status for Calabria.

Appendix A provides a photographic repertory showing the morphological peculiarities of the specimens and the ecological conditions of the surveyed sites.

3. Results

Two taxa, new to the native vascular flora of Calabria, have been found and here reported.

3.1. Salsola tragus L., in Cent. Pl. II: 13 (1756)

Homotypic synonyms: *Kali tragus* (L.) Scop., in Fl. Carniol., ed. 2, 1: 175 (1771); *Salsola kali* L. subsp. *tragus* (L.) Čelak., in Prodr. Fl. Böhmen: 155 (1871).

Heterotypic synonyms: *Salsola kali* L. var. *tenuifolia* Tausch, in Flora 11: 326 (1828); *Salsola pestifer* A. Nelson, in J.M.Coulter & A.Nelson, Man. Bot. Rocky Mt., ed. 2: 169 (1909); *Salsola kali* L. subsp. *ruthenica* Soó, in B.A.Keller & al., in Weeds USSR 2: 137 (1934); *Salsola iberica* (Sennen & Pau) Botschantzev ex Czerepanov, in Svod Dopolneniĭ i izmeneniĭ k Flore SSSR: 192 (1973); *Kali basalticum* C. Brullo, Brullo, Gaskin, Giusso, Hrusa & Salmeri, in Phytotaxa 201: 259 (2015).

Amaranthaceae – Mediterranean-Euro-Asiatic Temperate – Scapose therophyte – First record for Calabria.

Specimen: 18th November 2023, Ogliastretto Locality, Belvedere di Spinello (Crotone Province), olive grove, 16.901028°E-39.228028°N, 392 m a.s.l., *leg.* G. Caruso, A. Capuano, G. Montepaone, *det.* V. Lazzeri, A. Capuano, G. Caruso, G. Montepaone (REGGIO, Herbarium Capuano).

According to Marchetti *et al.* [49], the geology of this area is characterized by the dominance of sandstone and sands, which is the only geological formation identified during our field investigations in Calabria. The climate of the area (referred to the close thermo-pluviometric station of Belvedere di Spinello, erroneously named as San Giovanni in Fiore; Figure 2) is warm temperate with dry and hot summers, according to the Köppen-

Geiger Climate Classification [50] and to Zepner *et al.* [47]. According to the bioclimatic classification provided by Rivas-Martinez & Rivas-Saenz [48], the area has a Mediterranean macrobioclimate, Transitional Oceanic-Mediterranean bioclimate, Mesomediterranean thermotype and Subhumid ombrotype. The stand counts about 50 plants and is located in a rural context among extensive olive groves, approximately 18 km as the crow flies from the Ionian Sea coast. The natural vegetation surrounding the crops includes species such as *Smilax aspera* L., *Cistus creticus* L., *Euphorbia spinosa* L., *Euphorbia rigida* M.Bieb., *Artemisia campestris* L. subsp. *variabilis* (Ten.) Greuter, *Cytisus infestus* (C.Presl) Guss. subsp. *infestus*, *Dasypyrum villosum* (L.) P.Candargy, *Erysimum crassistylum* C.Presl subsp. *crassistylum*, *Convolvulus elegantissimus* Mill., *Glebionis segetum* (L.) Fourr., *Raphanus raphanistrum* L. subsp. *raphanistrum*, *Foeniculum vulgare* Mill., *Hyparrhenia hirta* (L.) Stapf subsp. *hirta*, *Bituminaria bituminosa* (L.) C.H.Stirt.

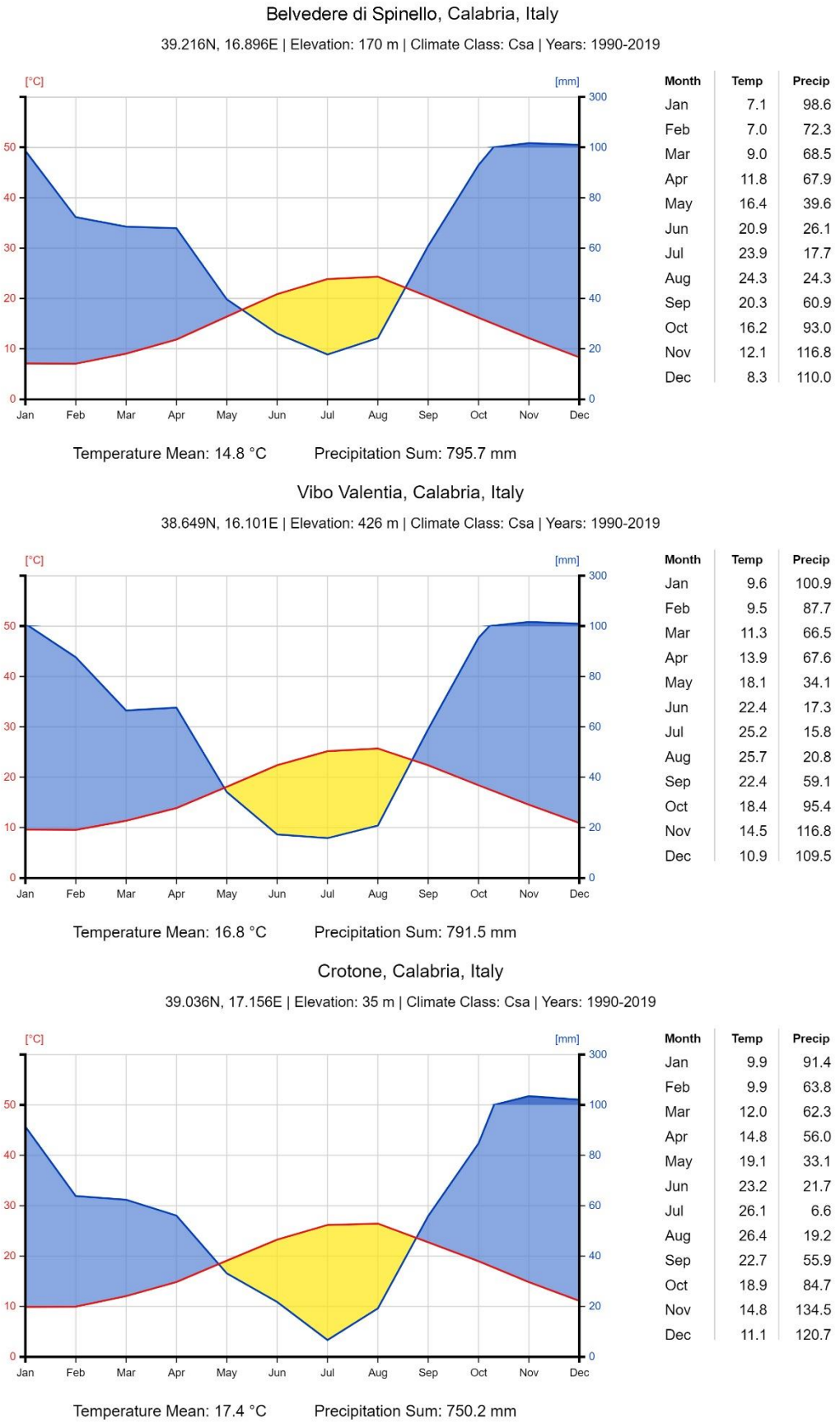

Figure 2. Climatic charts of the thermo-pluviometric stations involved in this survey.

3.2. Thymelaea gussonei Boreau, in Mém. Soc. Acad. Maine Loire 4: 121 (1858)

Homotypic synonyms: *Stellera pubescens* Guss., in Fl. Sicul. Prodr. 1: 466 (1827); *Thymelaea arvensis* Lam. subsp. *pubescens* (Guss.) Arcang., in Comp. Fl. Ital.: 604 (1882); *Thymelaea passerina* (L.) Coss. et Germ. subsp. *pubescens* (Guss.) Meikle, in Fl. Cyprus 2: 1897 (1985).

Heterotypic synonyms: *Ligia pubescens* C.A.Mey., in Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 1: 358 (1843); *Thymelaea puberula* Hand.-Mazz. in Ann. K. K. Naturhist. Hofmus. 27: 86 (1913).

Thymelaeaceae – Steno-Mediterranean – Scapose therophyte – First record for Calabria.

Specimina: 16th September 2023, Scoglio Locality, Zungri (Vibo Valentia Province), semi-natural vegetation at the margin of an olive grove, 38.630965°N-15.952938°E, 592 m a.s.l., *leg.* A. Capuano, G. Montepaone, G. Caruso, *det.* V. Lazzeri, A. Capuano, G. Caruso, G. Montepaone (REGGIO, Herbarium Capuano); 9th December 2023, Contrada Donato, badlands between Crotone and Capo Colonna (Crotone Province), slope of the impluvium, 39.037365°N-17.156057°E, 16 m a.s.l., *leg.* A. Capuano, G. Caruso, G. Montepaone, *det.* V. Lazzeri, A. Capuano, G. Caruso, G. Montepaone (REGGIO, Herbarium Capuano).

According to Marchetti *et al.* [51], the Vibo Valentia stand is situated between two distinct geological formations, granite and ancient river terraces. The climate of the area (referred to the close thermo-pluviometric station of Vibo Valentia; Figure 2) is warm temperate with dry and hot summers according to the Köppen-Geiger Climate Classification [50] and to Zepner *et al.* [47]. According to the bioclimatic classification provided by Rivas-Martinez & Rivas-Saenz [48], the area has a Temperate macrobioclimate, Transitional Oceanic-Temperate bioclimate, Mesomediterranean thermotype and Subhumid ombrotype. The station counts less than 10 plants, and includes species such as *Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman, *Rubus ulmifolius* Schott, *Clematis vitalba* L., *Achillea ligustica* All., *Origanum vulgare* L. subsp. *viridulum* (Martrin-Donos) Nyman, *Eupatorium cannabinum* L. subsp. *cannabinum*, *Pentanema squarrosum* (L.) D.Gut.Larr., Santos-Vicente, Anderb., E.Rico & M.M.Mart.Ort., *Odontites vernus* (Bellardi) Dumort. subsp. *serotinus* Corb., *Cynosurus echinatus* L. and *Macrobriza maxima* (L.) Tzvelev.

The geology of the Crotone area is predominantly clay-based, according to Marchetti *et al.* [52], and the climate (referred to the close thermo-pluviometric station of Crotone; Figure 2) is warm temperate with dry and hot summers, according to the Köppen-Geiger Climate Classification [50] and to Zepner *et al.* [47]. According to the bioclimatic classification provided by Rivas-Martinez & Rivas-Saenz [48], the area has a Mediterranean macrobioclimate, Mediterranean Oceanic bioclimate, Thermomediterranean thermotype and Subhumid ombrotype. The investigated taxon in this stand is represented by about 20 plants, accompanied by species such as *Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman, *Leontodon tuberosus* L., *Bellis sylvestris* Cirillo, *Crepis vesicaria* L. s.l., *Daucus carota* L., *Arisarum vulgare* O.Targ.Tozz. subsp. *vulgare* and *Galatella linosyris* (L.) Rchb.f. subsp. *linosyris*.

4. Discussion

The tangled, controversial and sometimes contradictory interpretation of the ecology and of the characters considered to have some diagnostic value may certainly have contributed to the taxonomic confusion on *Salsola tragus*. In this regard, a selected review of interpretations is reported.

Savi [53] documented the presence of both species in the coastal area near Pisa, as well as along the Arno and the Serchio rivers, underlining that *S. tragus* exhibited hairy stems, while *S. kali* had broader leaves. Moricand [54] reported both *S. kali* and *S. tragus*, distinguishing the latter as lacking the "membranaceous appendices" in fruits.

Additionally, he noted that the two taxa share the same ecology and flowering period. Shortly later, Tenore [55] employed a primarily hair-based differentiation between *S. tragus* and *S. kali*, asserting that the former was glabrous. Gussone [30] recorded for Sicily only *S. tragus*, as a glabrous plant growing in sandy coastal habitats. Bertoloni [56] reported both *S. kali* and *S. tragus* but referred to the latter as being distinct for the absence of hairs, the longer and slightly erose tepals, and the larger fruiting perianth wings, as well as mentioning just coastal localities. Steven [57] provided an extremely succinct description of the new species *S. squarrosa* Steven ex Moq. from Naxos (Greece). Moris [58], on the basis of a specimen of *S. tragus* in the Linnaean Herbarium (LINN), claimed that it differed from *S. kali* just for the narrower and glabrous leaves, limiting the occurrence of *S. kali* s.l. in Sardinia to coastal sandy habitats. Caruel [59] reported *S. tragus* for Tuscany as a synonym of *S. kali*, listing only coastal localities. Cesati *et al.* [33] distinguished *S. tragus*, as a variety of *S. kali*, as displaying an erect and reddish stem instead of being prostrate and green as the type. Arcangeli [34] reported *S. tragus*, as a variety of *S. kali*, also in inland localities and, interestingly, describing it as having slender leaves. Fiori & Paoletti [35], and later Fiori [16], referred to *S. tragus*, again as a variety of *S. kali*, as a plant almost glabrous with nearly wingless fruiting perianth. Sommier, first for the Pelagie Islands [60] and later for Pantelleria [61], reported only *S. tragus* and included *S. controversa* in its variability. Baroni [62] mentioned only *S. kali* for the whole Italian territory. Pignatti [17] attributed to *S. tragus*, as a subspecies of *S. kali*, glabrous plants with wingless fruiting perianth, also highlighting this name should probably be applied to individuals not growing along the coast. Giardina *et al.* [63] reported *S. tragus* for Sicily as unconfirmed. More recently, Brullo *et al.* [64] distinguished *S. tragus* from *S. squarrosa* subsp. *controversa* [as *Kali pontica* (Pallas) Sukhorukov] on the basis of the tepals, lacerate in the first and entire in the latter; and the fruiting perianth, well-developed and caducous in the first, nearly absent or poorly-developed and persistent in the latter. Plants growing in non-coastal habitats of Mount Etna (Sicily) were described as *Kali basalticum* C. Brullo, Brullo, Gaskin, Giusso, Hrusa & Salmeri [65], but shortly after synonymized as *S. tragus* in Bartolucci *et al.* [66]. Regarding *K. basalticum*, on a preliminary basis, it is possible to underline the strong morphological similarities with *S. tragus* and the possibility that the proposed diagnostic characters could actually fall within the extreme variability of the latter species. Pignatti [27] reported the two taxa as subspecies of *S. tragus* [as *S. tragus* L. subsp. *tragus* and subsp. *pontica* (Pall.) Rilke] and distinguished them on the basis of the habitus, hairiness, stem color, fruiting tepals wings length and fruiting bracts and bracteoles. The same author proposed that *S. tragus* L. subsp. *tragus* should have been bristly, often red stripped and linked to riparian habitats; conversely, *S. tragus* L. subsp. *pontica* Auct. non (Pall.) Rilke (= *S. squarrosa* subsp. *controversa*) should have been sub-glabrous, green (or yellow-greenish) colored, occurring on rocky sea coast or sub-halophitic environments, and extremely rare in Italy where it has only been confirmed in Sicily, near Palermo, and along the Adriatic coast near Cervia.

Earlier authors, as already highlighted by Rilke [44], Desfontaines [67], Reichenbach [68] and Ascherson & Graebner [69], referred to *S. tragus* as a plant with slender leaves, in contrast to those of *S. kali* and more in accordance with its protologue and its type [70]. Moreover, Clinton [71], comparing the coastal and the inland plants of North America, when citing some morphological differences of *S. tragus* and *S. kali*, stated the latter is a coarser plant, with a less bushy and less rigid habitus, with less colored and more coriaceous fruiting perianth wings. More recently, Aellen & Akeroyd [72] lowered *S. tragus* to the subspecific rank of *S. kali* and described it as having swollen bracts and being a coastal plant. The first modern author who made a thorough distinction between *S. tragus* and *S. kali* s.l. [including both subsp. *kali* and subsp. *pontica* (Pallas) Mosyakin] with regard to their morphology and ecology, was Mosyakin [43], who provided a diagnostic key highlighting the narrow and slightly succulent leaves characterizing *S. tragus*, in comparison with those more succulent of *S. kali*. Shortly after, Rilke [44], working on what

was formerly known as *Salsola* section *Salsola*, separated *S. tragus* subsp. *tragus* from the coastal Pontic-Mediterranean subsp. *pontica* on the basis of the more branched habitus, the less succulent leaves and the mostly winged fruiting perianth in the first, together with different ecology. According to the quoted literature, the distinction of *S. tragus* from the typically coastal plants must be performed considering the characters of leaves (width and succulence), habitus, frequency, position along branches of broadly winged fruiting perianth (color and wings), fruiting structure (if at least some of the bracts are markedly swollen at fructification), and ecological adaptations. On the other hand, it must be highlighted that *S. squarrosa* subsp. *controversa* shows a huge morphological variability, especially depending on the growing conditions. Plants developing in sites sheltered from the direct influence of the sea often tend to be less succulent and erect, thus somehow resembling *S. tragus*. On the contrary, plants observed in the most forward parts of the dunes are usually prostrate-ascending and markedly succulent. According to the literature and on the basis of the observations performed on the examined material, leaves are the most reliable morphological character to distinguish the two taxa, being slightly succulent and comparatively much narrower in *S. tragus*, along with the less stinging apical spines on leaves, bracts and bracteoles. Also, the fruiting bracts are a useful character, since in *S. squarrosa* subsp. *controversa* they are manifestly swollen below the flowers, while in *S. tragus* they are comparatively much less swollen. From an ecological point of view, *S. tragus* does not behave like a typical psammophyte. Although it can grow by the sea, it usually prefers inland localities, often in ruderal habitats, but also in natural environments such as steppes and mountains. Conversely, *S. squarrosa* subsp. *controversa* commonly chooses sandy dunes or, less frequently, rocky coast habitats [44]. Extremely rare are the recorded ephemeral stands of this taxon in inland areas. According to Bartolucci *et al.* [1] and other literature [18,73,74], *Salsola tragus* occurs in Italy in all the Northern regions (sometimes locally reported as introduced), while in the South of the country this taxon has been recorded in the two main Italian islands (Sardinia, Sicily) and in most of the continental regions except Molise and Calabria. As far as its conservation status in Italy is concerned, because of the long-lasting misconception on its identity, at the present not enough data are available to make any hypothesis. Rilke [44] hypothesized that its westward expansion from Eastern Europe could have occurred in the first half of the XX century, with all the expected consequences for the native status of *S. tragus* in Italy.

Prior to the present finding, *Thymelaea gussonei* was known to occur in Italy only in Sicily, Sardinia, Marche [66] and Tuscany [38]. However, the occurrence of *Th. gussonei* in the Italian peninsula may have been underestimated, because the species was not included in Pignatti [17], since *T. passerina* is the only annual species of *Thymelaea* recorded in this flora, and because the ecology of the taxon is not fully understood. According to Pedrol [25] and Pignatti [27], open habitats (meadows, fields, ruderal communities) with low level of competition from woody plants, seem to be preferred by *Th. gussonei*, while Gussone [30] and Pignatti [27] consider the species to be mostly a clay-specialist. Conversely, *Th. passerina* could be more calciphilous [27]. Concerning its conservation at national level, we only have available data for Tuscany where, as already pointed out, *Th. gussonei* is not rare, although it is not common either. Nevertheless, we hypothesize that these data could indicate a favorable state of conservation for Italy even though a thorough revision of the herbarium material and in-depth floristic researches seem to be necessary.

5. Conclusions

Due to the small number of stands and individuals of *Salsola tragus* and *Thymelaea gussonei* found in the present survey, it is certainly desirable that further field investigations would be carried out in Calabria, in order to ascertain the real consistency and distribution of the two taxa at a regional level. At the same time, it appears essential that, within the framework of the actions undertaken by the Regione Calabria on

biodiversity conservation, the populations found within the regional territory would be carefully monitored.

While it is certainly possible that the inconspicuous biological and growth form (scapose therophytes), the phenology (late summer-autumn-winter) and even the synanthropic or semi-natural environments shared by the two taxa reported here have contributed to the so far missed finding of these species, it is not possible to exclude erroneous identifications in the past, also due to the somewhat confusing and sometimes contradictory taxonomic frameworks and literature. Therefore, in order to better define the distribution of the two taxa in the national territory, a careful review of the herbarium specimens preserved in the main national herbaria could be very useful.

In the last few decades, the size of the vascular flora of Calabria has increased thanks to the description of new species, the discovery of species already known to science, and the confirmation of species reported in the past and no longer found. The discovery of the two native species reported here, new to the vascular flora of Calabria, confirms the floristic richness of the region, even though this area remains one of the least studied in Italy.

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Appendix A

Photographic repertory

Photo 1. *Salsola tragus*: erect habitus, plants developing in not-psammophilous stand.

Photo 2. *Salsola tragus*: leaves slightly succulent, not stout.

Photo 3. *Salsola tragus*: fruiting bracts not swollen.

Photo 4. *Salsola tragus*: all flowers with well-developed winged perianth.

Photo 5. *Salsola tragus*: part of stem showing leaves, bracts and perianths.

Photo 6. *Salsola tragus*: close-up of winged perianth.

Photo 7. *Thymelaea gussonei*: plants in habitat, showing their typical thin and slender habit.

Photo 8. *Thymelaea gussonei*: plants in habitat, showing their typical thin and slender habit.

Photo 9. *Thymelaea gussonei*: dense hairiness on the upper part of the stem.

Photo 10. *Thymelaea gussonei*: flowers with swollen ovary.

Photo 11.*Thymelaea gussonei*: stem showing both male, female and hermaphrodite flowers.

Photo 12. *Thymelaea gussonei*: stem showing swollen ovaries and bracts length.

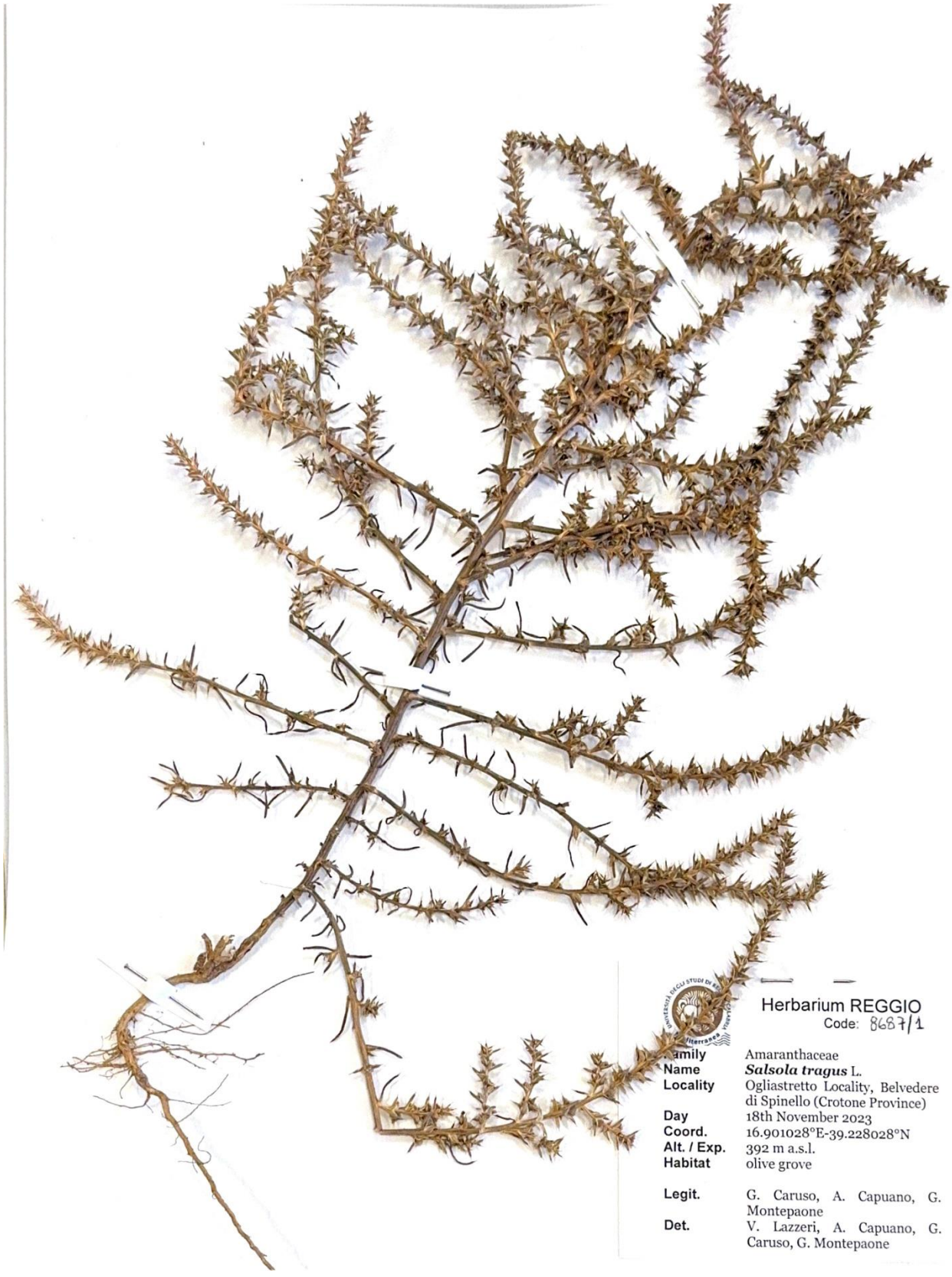

Photo 13. *Salsola tragus*: one of the specimens stored in the REGGIO herbarium.

Photo 14. *Thymelaea gussonei*: one of the specimens stored in the REGGIO herbarium.

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