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Orchidaceae Diversity in Southern Italy: New Hybrids, Floristic Records, and Implications for Biodiversity Conservation and Sustainability

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Abstract

The central Mediterranean is a hotspot of Orchidaceae diversity, characterized by taxonomic richness, endemism, and natural hybridization. This study updates orchid diversity and distribution in Basilicata, Calabria, Sicily, and surrounding islands, providing evidence to support biodiversity conservation and sustainable habitat management. Field surveys and historical records document six previously undescribed natural hybrids, new records of known hybrids, and typification of four previously described hybrid taxa. *Orchis pallens* and *Corallorhiza trifida* reach their southernmost Italian localities in Basilicata. *Ophrys cinnabarina* and *Orchis* × *pseudoanatolica* are newly recorded in Calabria, marking their southernmost peninsular occurrences. Populations of *Orchis anthropophora*, *Himantoglossum adriaticum*, *H. hircinum*, *Epipactis calabrica*, *E. robatschiana* and *Neottia ovata* define their current southern limits in peninsular Italy, while *Epipogium aphyllum* reaches its southernmost known locality in Italy and Europe. *Serapias nurrica*, previously known only from insular territories, is confirmed for peninsular Italy, and several new localities are documented in Sicily. In eastern Sicily, new findings involve *Ophrys bertolonii*, *O. laurensis*, *O. fusca* subsp. *pallida*, *Epipactis hyblaea*, *Neottia ovata*, and two natural hybrids. In the Aeolian Islands, four orchid species are newly recorded on Alicudi, Panarea, and Vulcano. These findings refine the Italian orchid taxonomic and distributional framework and provide baseline data for monitoring rare and range-edge populations, identifying conservation priorities, and informing sustainable land-use planning to support the long-term persistence of orchid diversity and its habitats.

Keywords: mediterranean orchids; natural hybridization; species monitoring; species distribution; biodiversity conservation; sustainable habitat management; sustainable land-use planning; Basilicata; Calabria; Sicily

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1. Introduction

Orchidaceae are one of the most diverse and evolutionarily distinctive angiosperm families, characterized by specialized reproductive strategies, complex interactions with pollinators and mycorrhizal fungi, and remarkable ecological diversification [1,2]. These

traits make many orchids sensitive to environmental changes and habitat alteration [2], and their dependence on specific interactions makes them a group of interest for monitoring and conservation research [1,2].

In Europe, Orchidaceae diversity increases southwards and is particularly high in the Mediterranean Basin [3], where environmental heterogeneity and a complex biogeographical history have driven the diversification of terrestrial orchid lineages [1]. Mediterranean orchids exhibit rewarding, food-deceptive, and sexually deceptive pollination strategies, the latter characteristic of *Ophrys* [1,4,5]. In southern Italy, food-deceptive *Orchis* and *Anacamptis* show high pollinator diversity and low interaction specificity [6].

These mechanisms influence reproductive isolation and natural hybridization [7], while the taxonomic delimitation of several Mediterranean complexes remains controversial, particularly in *Ophrys* [8–10]. Updated inventories and accurate regional distribution data are therefore essential for taxonomic knowledge and conservation strategies [2], especially for rare, isolated, or range-edge populations [11,12].

Italy is a center of orchid diversity in the Mediterranean, with high vascular plant richness, many endemics, and marked environmental heterogeneity [13,14]; Orchidaceae show considerable diversity, with differences among regions [15]. Richness is notable in southern Italy, where genera such as *Ophrys*, *Serapias*, *Anacamptis*, and *Epipactis* show considerable diversification [15], and the distributional framework continues to be updated by new records and revisions [15,16]. Nevertheless, knowledge remains uneven, particularly for rare taxa, natural hybrids, and peripheral populations.

In Basilicata, Fascetti et al. [17] recorded 49 taxa during the 2006 GIROS excursion, including four species new to the regional flora, four confirmations of doubtful records, and nine natural hybrids. *Ophrys marmorata* and *O. sipontensis* were subsequently reported for the first time, extending the known limits of these Italian endemics southwards [18]. Studies on floral volatile compounds have also investigated several Basilicata orchids, including *Orchis* and *Ophrys*, providing additional occurrence information [19,20]. Overall, 97 taxa have been reported for the region [15].

In Calabria, the study of Orchidaceae has a long tradition, although knowledge remains fragmented, particularly for the rarest taxa [16]. Main contributions include Lorenz & Künkele [21], who reviewed field and historical data reporting 68 reliably documented taxa, and the monograph "Le orchidee spontanee della Calabria" by Bernardo & Puntillo [22], the principal synthesis for over two decades. Calabria has also been important for the taxonomy of *Epipactis*: *E. aspromontana* was described from the Aspromonte Massif [23], and cytotaxonomic studies led to the description of *E. robatschiana* [24]. In the 21st century, studies have been limited and often restricted to specific sectors [16]; recent research in southern Calabria documented new regional records, new natural hybrids, and additional distributional data [16]. Its position at the southern end of the Peninsula also makes peripheral populations valuable for defining the southern range limits of several taxa [16].

In Sicily, the orchid flora is highly diverse, with a significant endemic component and a notable representation of *Ophrys* [25–28]. A fundamental reference is the checklist by Bartolo & Pulvirenti [25], later supplemented by phytogeographical considerations and an updated checklist [26,27].

In the Alcantara Valley and the Taormina Mountains, Cristaudo & Galesi [29] recorded 54 taxa (92% Mediterranean), many endemic, subendemic, or rare, and 22 nothotaxa, highlighting the relevance of natural hybridization.

For Mt Etna, the checklist by Grasso & Grillo [30] was supplemented by a chorological update reporting new localities [31]. Its geomorphological complexity and marked altitudinal zonation make Etna of particular orchidological interest, but knowledge remains partly fragmented, particularly for hybrids, poorly documented taxa, and historical records.

In the Erei Mountains, central Sicily, 53 entities in 10 genera and 52 hybrids were documented, confirming the importance of local-scale investigations [32].

For the Hyblaean area in southeastern Sicily, a comprehensive update of the taxa present, previous records, conservation status, and threats is still needed. Galesi [33] documented 50 taxa and 39 nothotaxa, over 75% of the Sicilian orchid flora known at that time. In the "Pantalica, Valle dell'Anapo e Torrente Cava Grande" Reserve, 40 taxa and 14 nothotaxa were documented [34]; the flora was subsequently enriched by *Epipactis hyblaea*, whose localized distribution was interpreted as probably relictual [35].

Mt Lauro is the *locus classicus* of *O. laurensis*, a member of the *O. fusca-lutea* complex [36]; its distribution on the northern slope (700–960 m a.s.l.) and in the Vizzini and Giarratana territories was outlined by Delforge [37], with additional localities provided by Giardina et al. [38]. In the southernmost Hyblaean sector, about 32 taxa and 17 nothotaxa were recorded in the "Pino d'Aleppo" Reserve [39], and 23 taxa and 2 nothotaxa in the "Oasi Faunistica di Vendicari" Reserve [40].

The recent typification of nine Sicilian orchid names (seven taxa, two hybrids) highlighted the nomenclatural complexity of the island's flora and the need to integrate the historical literature with modern taxonomy [41]. Endemic, rare, and localized taxa, frequent hybridization, and taxonomic complexity make new data in Sicily still particularly relevant [25–27,29,32,41].

The Aeolian Archipelago is of further biogeographical interest: area, isolation, and habitat diversity influence Orchidaceae richness and interact with reproductive strategies in determining colonization ability [42]. Orchidaceae of the islands were analysed by Pasta et al. [43] and Lorenz & Lorenz [44], but floristic knowledge remains uneven: recent work on Lipari and Panarea documented 386 vascular plant taxa [45]. These results emphasize the value of systematic surveys on smaller islands, where new orchid records help update checklists and understand distribution patterns in Mediterranean island systems [42].

Overall, the long tradition of botanical exploration in southern Italy has refined the taxonomic and distributional knowledge of Orchidaceae [16,18,41], but gaps persist for rare taxa, natural hybrids, historical records, and marginal populations. Natural hybridization is particularly relevant in Mediterranean Orchidaceae, where incomplete reproductive isolation may allow gene flow and contribute to diversification [1,7]. Documenting hybrids, rare species, and peripheral populations is therefore relevant for floristic knowledge, evolutionary interpretation, and conservation strategies [1,2].

In this framework, the present study aims to update knowledge of the diversity and distribution of Orchidaceae in Basilicata, Calabria, Sicily, and the surrounding islands by integrating recent field observations with historical and bibliographic data. Particular attention is given to the description of previously undescribed natural hybrids, new records of known hybrids, the typification of described hybrid taxa, new regional records, and the confirmation of rare or historical populations, including those that redefine the southern limits of some taxa. By integrating taxonomic, floristic, and biogeographical evidence, this study aims to define the current distributional framework of the Italian orchid flora and its main biogeographical and conservation implications. The resulting distributional baseline may also support biodiversity monitoring, the identification of conservation priorities, and the integration of orchid conservation into sustainable habitat management and land-use planning.

2. Materials and Methods

2.1. Study Area and Field Surveys

Field surveys were conducted in southern Italy, encompassing several localities in Basilicata, Calabria, Sicily, and the Aeolian Islands (Figure 1). The study area therefore includes both peninsular and insular sectors characterized by considerable geographical and eco-

logical heterogeneity, encompassing coastal and lowland environments, hill and mountain environments, with surveyed localities ranging in elevation from 25 to 1579 m a.s.l.

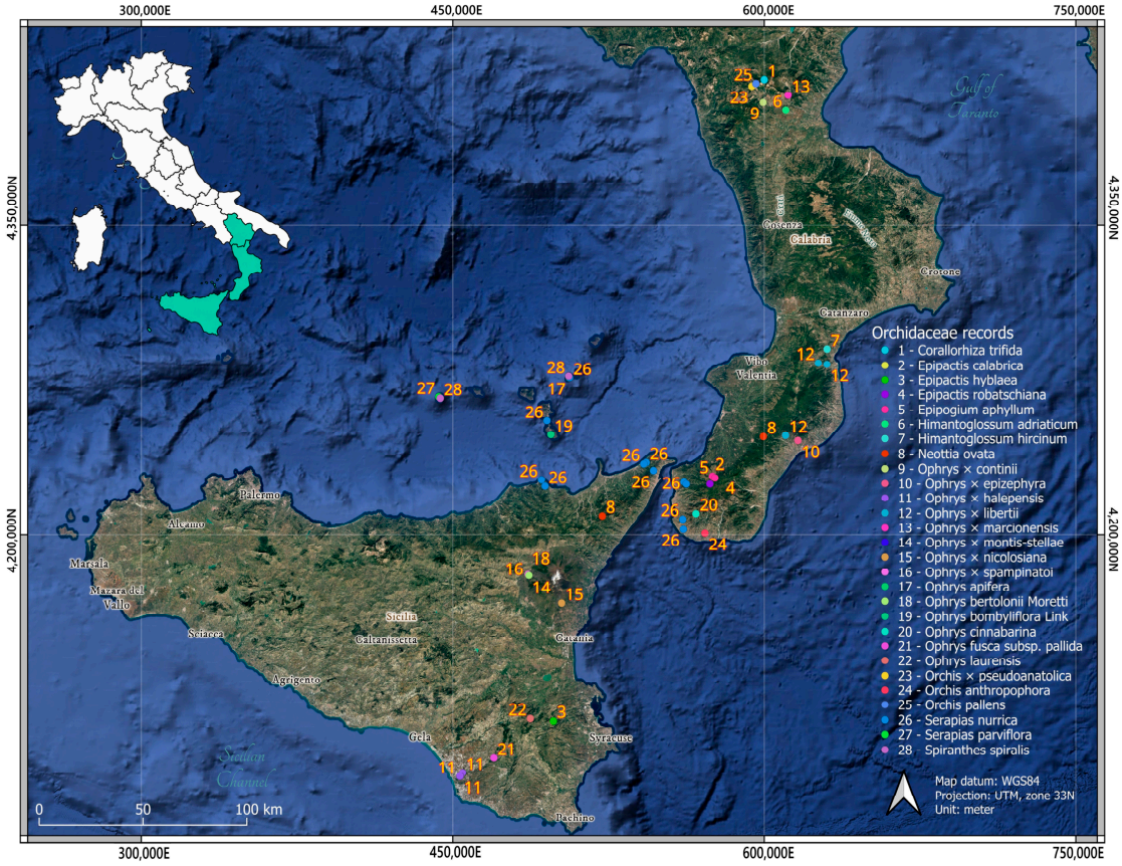

Figure 1. Distribution map of new records of Orchidaceae in southern Italy. The map was created using QGIS 3.26.3 [46]. Spatial data were overlaid on an Esri basemap [47] and Google Satellite imagery [48], accessed through XYZ Tiles in QGIS. Geographical coordinates were recorded in WGS 84 and subsequently projected to WGS 84/UTM zone 33N for cartographic representation. Point locations were generalized to protect sensitive taxa.

Field activities were carried out mainly during the flowering period of the taxa under study, between 2022 and 2026, through targeted surveys of both previously known localities and areas potentially suitable for the occurrence of rare or localized Orchidaceae or taxa of particular floristic and biogeographical interest. When necessary, localities were visited several times to confirm the presence of the populations, assess their phenology, and obtain adequate documentation of the main diagnostic characters.

For each locality (Table S1), the location, geographical coordinates, elevation, habitat characteristics, population size, and phenological stage were recorded. In the case of natural hybrids, the occurrence of the parental taxa at the same locality or in the immediately surrounding areas was also verified. Geographical coordinates were recorded using the WGS 84 reference system.

For populations of particular conservation interest, precise geographical coordinates are retained in the authors' archives, whereas coordinates reported in this study were generalized to protect sensitive localities. For publication, geographical coordinates were rounded to two decimal places (0.01°) and are reported with an uncertainty radius of ±2.2 km. This procedure was applied consistently to all occurrence records included in the study, following current recommendations for the generalization and documentation of sensitive species occurrence data [49].

2.2. Taxonomic Identification and Morphological Analysis

Taxonomic identification was based on direct observation of individuals in situ, examination of specimens and high-resolution photographic documentation, and comparison with the relevant taxonomic literature for the genera and systematic groups considered.

For each taxon, the main vegetative and floral characters of diagnostic value were examined in accordance with the criteria proposed by Vladimirov et al. [50] and Eccarius [51], with particular attention to plant habit, inflorescence structure, number and dimensions of flowers, shape and colour of the perianth elements, and labellum morphology. Depending on the genus considered, additional diagnostic characters were also evaluated, including the shape and dimensions of sepals and petals, macula, basal field, pseudo-eyes, stigmatic cavity, gynostemium, apiculum, spur, and other taxonomically informative floral structures.

In the case of natural hybrids, morphological analysis was primarily aimed at identifying characters intermediate between or combining those of the parental taxa. Hybrid individuals were examined together with the parental taxa occurring at the same locality or in the immediate vicinity. The attribution of hybrid origin was based on the concordance between intermediate morphological characters, the occurrence of the parental taxa, and comparison with descriptions and iconographic material available in the specialized literature.

Measurements of the main morphological characters were taken directly from fresh individuals and, when necessary, supplemented by standardized photographic documentation. In the case of hybrids, measurements were also taken from individuals of the respective parental taxa to allow direct comparison of diagnostic characters; identification and taxonomic comparison were further supported by the species classification proposed by GIROS [52]. For populations consisting of a particularly small number of individuals, a non-destructive approach was preferred.

Photographic images were processed using Adobe Photoshop 2026 (Adobe Inc., San Jose, CA, USA), whereas images obtained using the focus-stacking technique were processed with Helicon Focus, version 8.1.0 (Helicon Soft Ltd., Kharkiv, Ukraine). ImageJ 1.54g (National Institutes of Health, Bethesda, MD, USA) was used to calibrate the reference scale and perform measurements on digital images [53]. Photographic documentation, specimens, and associated geographical data are retained in the authors' archives and, where applicable, associated with the collections of the Herbarium of the Mediterranean University of Reggio Calabria (REGGIO), the Herbarium of the University of Messina (MS), and the Herbarium of the University of Catania (CAT) [54].

2.3. Floristic and Distributional Analysis

The floristic and chorological significance of the observations was assessed by comparison with historical and recent literature, national and regional checklists, and the principal floristic and taxonomic contributions available for the Orchidaceae of southern Italy [14,16,17,28,43].

The analysis was conducted separately for Basilicata, Calabria, Sicily, and the Aeolian Islands in order to reconstruct the previously known distributional framework and assess the significance of the new observations. Records were therefore classified, where applicable, as new regional or island records, confirmations of previously reported taxa, new localities of rare or localized taxa, and populations of biogeographical interest. Particular attention was given to populations occurring at the margins of their known ranges. For taxa whose newly documented localities were interpreted as representing their southern distribution limits, a critical review of the literature and available distributional data was conducted to verify the possible existence of previous reliable records from localities situated farther south.

2.4. Taxonomic and Nomenclatural Treatment

Given the taxonomic complexity of Orchidaceae and, in particular, of certain critical groups such as *Ophrys* [55,56], nomenclature was established according to Bartolucci et al. [14] and subsequently harmonized using Plants of the World Online [57] and the International Plant Names Index [58].

The nomenclatural treatment of hybrids followed the *International Code of Nomenclature for algae, fungi, and plants* (ICN, Madrid Code) [59], verifying, for each parental combination, the possible existence of previously published nothotaxonomic names applicable to the same parental combination.

For hybrids involving parental taxa differentiated at the subspecific rank, the nomenclatural approach followed here complies with the provisions of the ICN. Under Arts. H.10-H.12 of the Editorial Committee of the Madrid Code [59], crosses involving distinct subspecies can be treated as separate nothotaxa when the parental entities show morphological or geographical differentiation.

For six natural hybrid combinations for which no applicable previously published nothotaxonomic name was identified, six new nothotaxa are formally proposed here. For each new nothotaxon, the name, parental formula, diagnosis, morphological description, etymology, locus classicus, habitat, phenology, and main diagnostic characters are provided. Typification of the new names was carried out in accordance with the provisions of the ICN through designation of the corresponding nomenclatural type.

2.5. Typification of Previously Described Hybrids

For the hybrid names previously published by Laface and Torino [16], the nomenclatural treatment was reassessed in accordance with the provisions of the *International Code of Nomenclature for algae, fungi, and plants* (ICN, Madrid Code) [59]. Because photographic documentation had been designated as the nomenclatural type in the original publications, the names were not validly published under Art. 40.4 and 40.6 ICN. The plants illustrated in the original protologues were subsequently collected, preserved, and deposited in the Herbarium of the Mediterranean University of Reggio Calabria (REGGIO). These specimens are designated as holotypes in the present study, together with full and direct references to the previously published descriptions and diagnoses in accordance with Arts. 33.1 and 38.13 ICN, as specified in Art. 41.5 ICN. The valid publication of these names is particularly relevant in the present study because the same hybrid combinations were also recorded in Sicily. Their nomenclatural treatment is therefore formalized here to allow these new distributional records to be reported under validly published names.

For each nothotaxon, complete information on the nomenclatural type and the herbarium in which the material is deposited is provided. As part of this nomenclatural treatment, the epithet previously published as *spampinatii* is treated here in the corrected form *spampinatoi*.

3. Results

The floristic and taxonomic survey made it possible to document numerous novelties of taxonomic and chorological interest in southern Italy, involving Calabria, Basilicata, Sicily, and the circum-Sicilian islands (Table 1). Among the most significant results are six *Ophrys* hybrids proposed as new to science, two new records for the flora of Calabria, and two nothotaxa recorded for the first time in Sicily. The surveys also made it possible to confirm the presence of previously reported taxa, identify new localities, and document new local and insular records, particularly in Sicily and the Aeolian Islands. Further findings made it possible to confirm or rediscover taxa that had been poorly or historically documented in the investigated areas and to identify, for several taxa, the currently known

southernmost localities, thus contributing to a more precise definition of their geographical distribution in southern Italy. The main taxonomic and chorological novelties that emerged from the survey are summarized in Table 1.

Table 1. List of newly described orchid hybrids and noteworthy orchid records from Southern Italy. For each hybrid, the parental species are reported, as determined by morphological traits and field observations.

Hybrids Newly Proposed for Science	
Taxon	**Parental Species/Record Status**
Ophrys × *continii*	*O. exaltata* × *O. lutea*
Ophrys × *epizephyra*	*O. bombyliflora* × *O. incubacea* subsp. *brutia*
Ophrys × *halepensis*	*O. bertolonii* subsp. *explanata* × *O. passionis*
Ophrys × *libertii*	*O. bertolonii* × *O. gracilis*
Ophrys × *marcionensis*	*O. pinguis* × *O. tenthredinifera*
Ophrys × *nicolosiana*	*O. passionis* × *O. sphegodes* subsp. *grassoana*
New records for Calabria	
Ophrys cinnabarina Romolini & Soca	New for Calabria
Orchis × *pseudoanatolica* H.Fleischm.	*O. pauciflora* × *O. quadripunctata*
New records for Sicily	
Ophrys × *montis-stellae* V.L.A. Laface & L. Torino	*O. bertolonii* × *O. exaltata*
Ophrys × *spampinatoi* V.L.A. Laface & L. Torino	*O. exaltata* × *O. incubacea* subsp. *incubacea*
Confirmations and new stations	
Epipactis hyblaea Brullo & Zimmitti	Confirmation for southeastern Sicily
Ophrys fusca Link *subsp. pallida* (Raf.) E.G.Camus	Confirmation of a historical record from southeastern Sicily
Serapias nurrica Corrias	Confirmation and new stations for Calabria
New local and insular records	
Neottia ovata (L.) Bluff & Fingerh.	New local record in north-eastern Sicily
Ophrys apifera Huds.	New record for Panarea
Ophrys bombyliflora Link	New record for Vulcano
Serapias nurrica Corrias	New stations in north-eastern Sicily and the Aeolian Islands
Serapias parviflora Parl.	New record for Alicudi
Spiranthes spiralis (L.) Chevall.	New records for the Aeolian Islands
Ophrys laurensis Geniez & Melki	New record for the Monte Costerotte area
Rediscoveries and southernmost records	
Ophrys bertolonii Moretti	Confirmation for the flora of Eastern Sicily (Etnean district)
Epipogium aphyllum Sw.	Rediscovery and southernmost known stations
Corallorhiza trifida Châtel.	Southernmost known station
Epipactis calabrica U.Grabner, S.Hertel & Presser	Southernmost known station
Epipactis robatschiana Bartolo, D'emerico, Pulv., Terrasi & Stuto	Southernmost known station
Himantoglossum adriaticum H.Baumann	Southernmost known station
Himantoglossum hircinum (L.) Spreng.	Southernmost known station
Neottia ovata (L.) Bluff & Fingerh.	Southernmost known station
Orchis anthropophora (L.) All.	Southernmost known station
Orchis pallens L.	Southernmost known station

3.1. New Hybrids

1. ***Ophrys* × *continii* A. De Marco, V.L.A. Laface & L. Torino hybr. nov.**

Descriptio: Herba mediocris, 25–35 cm alta, habitu modice robusto. Inflorescentia satis densa, floribus 3–8 mediocribus vel magnis composita. Bracteae lanceolatae, virides, ovarium paulo superantes. Sepala ovato-lanceolata, 10–14 × 6–9 mm, flavido-viridia vel pallide viridia; sepala lateralia patentia vel leviter antrorsum incurva, sepalum medianum supra gynostemium incurvatum. Petala oblongo-lanceolata, 6–9 × 2–3 mm, flavido-viridia ad olivaceo-viridia, marginibus planis vel leviter undulatis. Labellum 12–16 × 12–17 mm, late ovatum ad ovoideo-rhomboideum, modice convexum, ambitu continuo et regulari, atro-brunneum vel brunneo-rubescens; marginibus pubescentibus fascia flava conspicua cinctis, quam in *Ophrys lutea* angustiore. Gibbae desunt. Macula media, nitida, griseo-caerulea, plerumque simplex, forma litterae H vel X aut ancorae similis, tertiam vel dimidiam partem labelli occupans. Campus basalis reductus, brunneus vel brunneo-rubescens, parti centrali labelli fere concolor. Cavitas stigmatica satis ampla, subcordata, paulo altior quam latior, brunnescens et campo basali moderate contrastans. Pseudo-oculi adsunt sed inconspicui, grisei vel viridescentes. Gynostemium breve, antrorsum inclinatum; rostrum breve vel nullum. Apiculus valde reductus aut fere nullus, si adest in incisura apicali levi insertus et deorsum directus. Floret Martio et Aprili (Figure 2b; Table 2).

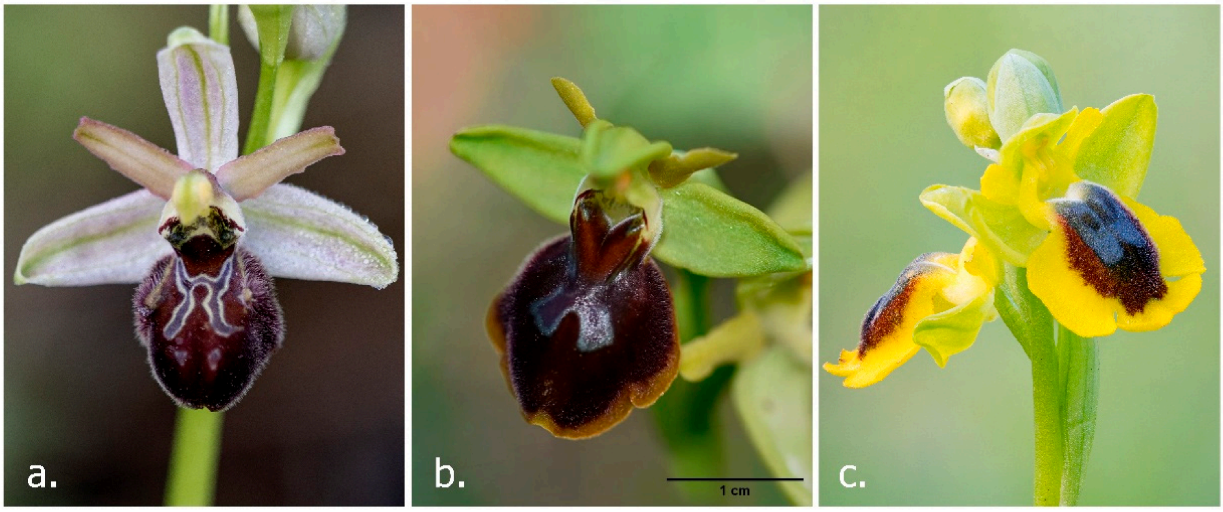

Figure 2. Comparison between the parental species and the hybrid: (**a**) *Ophrys exaltata*; (**b**) *Ophrys* × *continii* (*O. exaltata* × *O. lutea*); (**c**) *Ophrys lutea*.

Description (English): Plant small to medium-sized, usually 25–35 cm tall, with a moderately robust habit. Inflorescence rather dense, bearing 3–8 medium to large flowers, more numerous than in *Ophrys lutea*. Bracts lanceolate, green, slightly exceeding the ovary. Sepals ovate-lanceolate, 10–14 × 6–9 mm, yellowish-green to pale green; lateral sepals spreading or slightly incurved forwards, dorsal sepal bent over the gynostemium. Petals elongated-lanceolate, 6–9 × 2–3 mm, yellow-green to olive-green, with flat or slightly undulate margins. Labellum 12–16 × 12–17 mm, broadly ovate to ovate-rhombic, moderately convex, with a regular and uninterrupted outline, dark brown to reddish-brown; margins pubescent and bordered by a conspicuous yellow band, narrower than in *Ophrys lutea*. Gibbosities absent. Macula medium-sized, glossy, greyish-blue, usually simple and H-, X- or anchor-shaped, extending from approximately one-third to one-half of the labellum. Basal field reduced, brown to reddish-brown, largely concolorous with the central part of the labellum. Stigmatic cavity rather broad, subcordate, slightly higher than wide, brownish and moderately contrasting with the basal field. Pseudo-eyes present but inconspicuous,

grey to greenish. Gynostemium short and inclined forwards; rostrum short or absent. Apiculus extremely reduced or nearly absent, when present inserted in a shallow apical notch and directed downwards. Flowering from March to April (Figure 2b; Table 2).

Table 2. Comparative morphological traits of *Ophrys exaltata*, *O.* × *continii*, and *O. lutea*.

Morphological Character	*Ophrys exaltata*	*Ophrys* × *continii*	*Ophrys lutea*
Flowers	4–15, medium-large	3–8, medium to large	2–6, medium to large
Bracts	Longer than the ovary	Lanceolate, slightly exceeding the ovary, green	Lanceolate, usually as long as or slightly longer than the ovary, green to yellowish-green
Sepals	Ovate-lanceolate, 10–15 × 5.5–9 mm, whitish-green to lilac	**Ovate-lanceolate**, 10–14 × 6–9 mm, **yellowish-green to pale green**, the upper bent over the gynostemium	Lateral sepals curved forwards, 10–13 × 6–10 mm; dorsal sepal obovate and directed forwards; all yellowish-green
Petals *[1]	7–11.5 × 2–3.5 mm, dark, with straight or slightly undulate margins	Elongated-lanceolate, 6–9 × 2–3 mm, yellow-green to olive-green; **margins flat or slightly undulate**	Elongated, rounded at the apex, 6–8 × 2–3 mm; directed forwards together with the dorsal sepal
Labellum	Ovate-rhombic, 9–15 × 10–16 mm, brown to reddish-brown	**Broadly ovate** to **ovate-rhombic**, moderately convex, 12–16 × 12–17 mm, **dark brown to reddish-brown** with a **conspicuous yellow marginal band**	Broadly ovate, slightly convex and bent at the base, apparently entire and rounded due to the overlapping shallow lobes, median lobe slightly bilobed, 14–18 × 13–19 mm; brown central area with a very broad yellow marginal band
Lateral swellings (gibbosities) *[2]	Strongly attenuated	Nearly absent to weakly developed	Not present
Macula	H- or X-shaped, extending from the basal part to half or two-thirds of the labellum, sometimes white-bordered	**H- or X-shaped**, sometimes more elaborate or discontinuous	Medium-sized relative to the labellum; greyish-blue, shiny and velvety, with brownish tones at the margin
Basal field *[3]	Small, concolorous with the labellum	Small, brown to reddish-brown, largely concolorous with the central part of the labellum	Small and concolorous with the labellum
Stigmatic cavity	With a more or less constricted base, concolorous with the labellum	Heart-shaped, slightly **higher than wide**, moderately large; brownish and partially contrasting with the basal field	Elliptical, higher than wide
Pseudo-eyes *[4]	Large, green, often surrounded by a light ring	**Present** but less conspicuous than in *O. exaltata*; dark grey to grey-green	Not present
Gynostemium	Beak elongated, forming an obtuse angle with the labellum	Moderately elongated, beak short or absent, **inclined forwards**	Short and forwards-inclined, typical of the species group.
Apiculus *[5]	Very small, located in a deep notch and directed downwards	**Very small** or nearly absent; when present, inserted in a shallow notch and **directed downwards**	Not present
Flowering period	II-IV	III-IV	III-IV

Dimensions are expressed as length × width. Roman numerals indicate flowering months. Characters in bold derive specifically from *O. exaltata* and *O. lutea*. *[1–5] The proposed parentage was assessed using the combination of petal shape and margin undulation *[1], absence of lateral gibbosities *[2], basal field shape *[3], pseudo-eye appearance *[4] and apiculus morphology *[5]. Other sympatric taxa considered as alternative parents included *O. bertolonii*, *O. incubacea* and *O. tenthredinifera.*

Locus classicus: Italy, Calabria, Sassone, Morano Calabro (Cosenza Province), WGS84: 39.83° N-16.16° E ± 2.2 km, 600 m a.s.l., in garrigue at the margin of a *Quercus pubescens* woodland.

Holotype: Italy, Calabria, Sassone, Morano Calabro (Cosenza Province), 600 m a.s.l., 16 April 2025, leg. et det. A. De Marco, preserved in REGGIO.

Etymology: The nothospecific epithet *continii* is dedicated to Antonio Contin, Calabrian mycologist, nature photographer and expert on the wild orchids of Calabria, whose

work has significantly contributed to the documentation and knowledge of the regional orchid flora.

Parental species description

Ophrys exaltata Ten.

Habit and morphology: Vigorous plant with an erect and slender habit, reaching 50–60 cm in height. Inflorescence bearing 4–15 medium to large flowers; bracts longer than the ovary. Sepals ovate-lanceolate (10–15 × 5.5–9 mm), varying in colour from whitish green to pink or lilac, sometimes with more intense tones and greenish veins or suffusions; the dorsal sepal is nearly erect and forms an obtuse angle (>110°) with the lateral ones. Petals relatively long and narrow (7–11.5 × 2–3.5 mm), glabrous, darker than the sepals, occasionally with reddish tinges, with margins straight or slightly undulate. Labellum subentire, transversely convex, relatively small (9–15 × 10–16 mm), ovate to rhomboid in shape, reddish-brown; callosities weakly developed; surface densely hairy in a submarginal band, sometimes interrupted by a paler glabrous border. Macula is usually simple, basal, H- or X-shaped, occasionally with whitish ornamentation or more complex patterns, extending from the base to the middle or two-thirds of the labellum. Basal field small and concolorous with the labellum, as is the stigmatic cavity, which has a more or less constricted base. Pseudo-eyes large, grey, often surrounded by a pale halo. Apiculum very reduced, inserted into a deep notch and directed downwards (Figura 2a; Table 2).

Distribution: Southern Italian subendemic, mainly occurring in Sicily and Calabria; further north it is only sporadically reported as far as Abruzzo.

Etymology: *Ophrys* derives from the Greek ὀφρύς (*ophrýs*), meaning "eyebrow", traditionally referring to the hairy appearance of the labellum in several species of the genus. The epithet *exaltata* derives from the Latin *exaltatus*, "elevated" or "raised", referring to the erect and slender habit of the plant.

Ophrys lutea Cav.

Habit and morphology: Robust plant, seldom exceeding 30 cm in height, bearing 2–6 medium to large flowers. Tepals yellowish green; lateral sepals 10–13 × 6–10 mm, curved and directed forwards, dorsal sepal obovate and similarly forward-pointing. Petals elongated, 6–8 × 2–3 mm, rounded at the apex and oriented together with the dorsal sepal. Labellum large, 14–18 × 13–19 mm (length/width ratio 0.85–1.1), slightly convex and geniculate at the base; shallow lateral lobes overlapping and giving the lip an almost entire, broadly rounded outline. Disc dark brown, surrounded by a very broad yellow marginal band; underside yellowish to whitish. Median lobe weakly bilobed. Macula comparatively small, greyish-blue, glossy and velvety, often with brownish tinges. Stigmatic cavity elliptic, distinctly taller than wide. Angle between the labellar shoulders and the longitudinal axis of the labellum 60–70° (Figura 2c; Table 2).

Distribution: Circum-Mediterranean species with a mainly western range, extending from the Atlantic coasts to Israel and becoming progressively rarer eastwards. In Italy, the typical form occurs in southern regions.

Etymology: The epithet *lutea* derives from the Latin *luteus*, "yellow", referring to the predominant yellow coloration of the labellum.

Morphometric measurements based on the examined individuals (N = 2) showed limited variation in *Ophrys* × *continii*. Flower number (mean ± SD = 5.50 ± 0.71), sepal length (12.80 ± 0.57 mm), sepal width (7.40 ± 0.42 mm), petal length (7.60 ± 0.57 mm), petal width (2.60 ± 0.28 mm), labellum length (14.10 ± 0.85 mm), and labellum width (14.90 ± 0.99 mm) showed closely comparable values between the two examined individuals. These measurements fall within the morphological ranges observed for the hybrid and broadly overlap those of the parental species, *O. exaltata* and *O. lutea*. Although the limited sample size precludes conclusions regarding population-level variability, the morphometric

pattern, together with the combination of parental morphological characters, is consistent with the proposed hybrid origin of *O.* × *continii*. Further support for this hypothesis may be provided by future genetic investigations involving the putative parental taxa.

2. ***Ophrys* × *epizephyra* V.L.A. Laface & L. Torino hybr. nov.**

Descriptio: Herba mediocris vel parva, 20–30 cm alta, robusta sed compacta. Inflorescentia pauciflora, compacta, ex 3–6 floribus mediocribus inter parentes composita. Bracteae ovario aequilongae vel paulo longiores. Sepala late ovata, 8–12 × 5–7 mm, viridia pallida vel albicantia, nervis longitudinalibus paulo obscurioribus. Petala ovato-triangularia, 4–6 × 3–4 mm, viridia, ochracea vel brunnea, basi obscuriora, marginibus leviter undulatis. Labellum 9–12 × 11–13 mm, ovato-globosum, leviter trilobatum, valde convexum, atropurpureo-brunneum; gibbae bene evolutae, rotundatae, manifeste conspicuae. Pilositas in marginibus labelli et super gibbas moderate evoluta. Macula ampla et bene definita, griseo-caerulea, plerumque fascia transversa vel figura litterae H irregularis conformata. Campus basalis reliqua parte labelli paulo dilutior. Cavitas stigmatica ampla, subcordata. Pseudo-oculi atrovirides. Gynostemium rostro intermedio inter illa *Ophrys bombyliflora* et *Ophrys incubacea* subsp. *brutia*. Apiculus valde reductus, vix conspicuus, antrorsum et deorsum directus. Floret a Martio ad Aprilem (Figure 3b; Table 3).

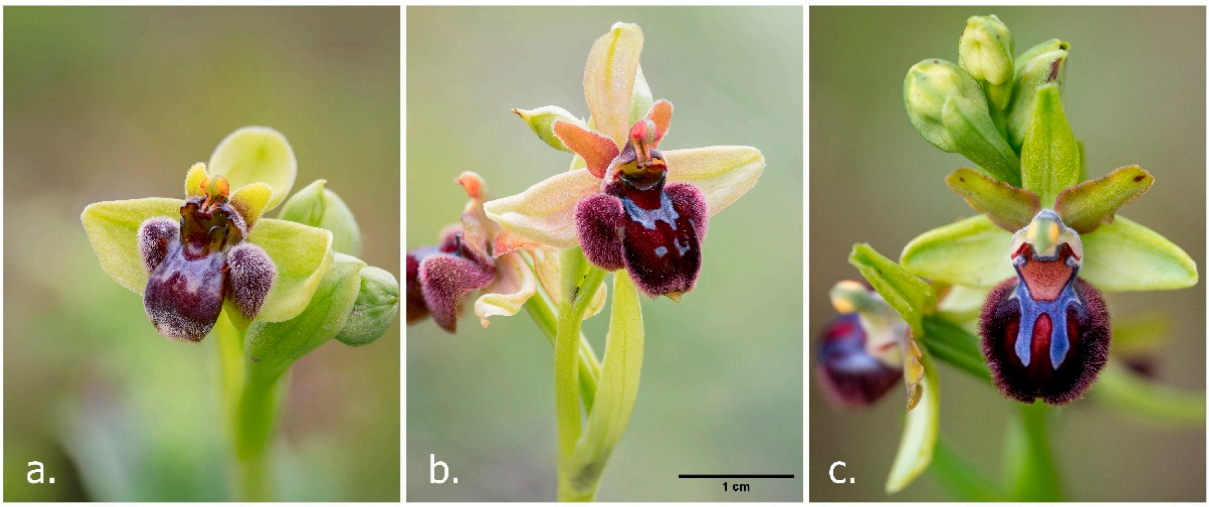

Figure 3. Comparison between the parental species and the hybrid: (**a**) *Ophrys bombyliflora*; (**b**) *Ophrys* × *epizephyra* (*O. bombyliflora* × *O. incubacea* subsp. *brutia*); (**c**) *Ophrys incubacea* subsp. *brutia*.

Description (English): Medium-small, robust yet compact plant, 20–30 cm tall. Inflorescence few-flowered and compact, bearing 3–6 flowers of intermediate size between the parental species. Bracts as long as or slightly longer than the ovary. Sepals broadly ovate, 8–12 × 5–7 mm, pale green to whitish, with slightly darker longitudinal veins. Petals ovate-triangular, 4–6 × 3–4 mm, greenish, ochre or brownish, darker at the base, with slightly undulate margins. Labellum 9–12 × 11–13 mm, ovate-globose, weakly trilobed, strongly convex, dark reddish-brown; lateral gibbosities well developed, rounded and clearly visible. Indumentum moderately developed along the labellum margins and on the gibbosities. Macula broad and well defined, grey-bluish, usually forming a transverse band or an irregular H-shaped figure. Basal field slightly paler than the remainder of the labellum. Stigmatic cavity broad and subcordate. Pseudo-eyes dark green. Gynostemium with a rostrum intermediate between those of *Ophrys bombyliflora* and *Ophrys incubacea* subsp. *brutia*. Apiculus strongly reduced, scarcely visible, directed forwards and downwards. Flowering from March to April (Figura 3b; Table 3).

Table 3. Comparative morphological traits of *Ophrys bombyliflora*, *O.* × *epizephyra*, and *O. incubacea* subsp. *brutia*.

Morphological Character	*Ophrys bombyliflora*	*Ophrys* × *epizephyra*	*Ophrys incubacea subsp. brutia*
Flowers	Up to 5, small	3–6, medium-small	3–8, large
Bracts	Shorter than the ovary	**As long as** or slightly longer than the ovary	Approximately as long as the ovary
Sepals	Broadly ovate, 9–12 × 6–8 mm, green	8–12 × 5–7 mm, pale green to whitish with slightly darker veins	7–12 × 3–6 mm, green, whitish or pinkish
Petals *[1]	Subtriangular, 3–4 × 3–4 mm, greenish-yellow with brown base	Ovate-triangular, 4–6 × 3–4 mm, greenish, **ochre** or brownish, **darker at the base**; margins slightly undulate	Ovate-elongated, 5–7 × 2.5–5 mm, green-ochre or reddish-brown
Labellum *[2]	Ovate-globose, trilobed with very prominent basal gibbosities, 8–10 × 11–13 mm; uniform brown; dense pilosity on the gibbosities and margins, shorter towards the apex.	**Ovate-globose**, weakly trilobed, with rounded but clearly perceptible gibbosities, 9–12 × 11–13 mm; **dark reddish-brown**; **pilosity evident along the margins and on the gibbosities**, moderately developed.	Subquadrate, without evident gibbosities, 10–14 × 11–15 mm; brown with reddish tones; evident reddish submarginal pilosity band.
Lateral swellings (gibbosities)	Very prominent, conical and hairy	Rounded, well-developed and clearly visible	Absent or scarcely visible
Macula *[3]	Poorly evident, grey-brown or violaceous	Clearly visible, **band-shaped** or irregular H-shaped, **grey-bluish**	Two parallel grey-violet or bluish bands
Basal field	Poorly distinct	Intermediate, **slightly lighter than the labellum**	Yellow-orange, lighter than the labellum
Stigmatic cavity	Heart-shaped, large	Subcordate, broad	Very narrow at the base
Pseudo-eyes *[4]	Poorly evident	**Dark green**	Dark green with a pale ring
Gynostemium	Short, rounded beak	Intermediate between *O. bombyliflora* and *O. incubacea* subsp. *brutia*	Robust, typical of the *incubacea* group
Apiculus *[5]	Very reduced and hidden	**Very reduced**, **directed forward and downward**, barely visible	Extremely reduced, directed forward or downward
Flowering period	III-IV	III-IV	III-IV

Dimensions are expressed as length × width. Roman numerals indicate flowering months. Characters in bold derive specifically from *O. bombyliflora* and *O. incubacea* subsp. *brutia*. *[1–5]. The proposed parentage was assessed using the combination of petal shape *[1], labellum shape *[2], macula appearance *[3], pseudo-eye appearance *[4] and apiculus morphology *[5]. Other sympatric taxa considered as alternative parents included *O. bertolonii*, *O. sicula* and *O. tenthredinifera*.

Locus classicus: Italy, Calabria, Contrada Prisdarello, Marina di Gioiosa Ionica (Reggio Calabria), WGS84: 38.35° N-16.33° E ± 2.2 km, 220 m a.s.l., in a meadow near *Eucalyptus* plantations.

Holotype: Italy, Calabria, Contrada Prisdarello, Marina di Gioiosa Ionica (Reggio Calabria), WGS84: 38.35° N-16.33° E ± 2.2 km, 220 m a.s.l., in a meadow near *Eucalyptus* plantations, 30 March 2026, leg. et det. V.L.A. Laface & L. Torino, preserved in REGGIO.

Etymology: The nothospecific epithet *epizephyra* refers to Locri Epizephyrii (Ancient Greek: Λοκροὶ Ἐπιζεφύριοι), the ancient name of the city of Locri, the principal historical centre of the Locride area where the taxon was discovered.

Parental species description

Ophrys bombyliflora Link

Habit and morphology: Small-sized plant, rarely exceeding 20 cm in height, usually bearing a few flowers, seldom more than five. Bracts shorter than the ovary. Sepals green, marked by darker longitudinal veins, distinctly concave and broadly ovate, measuring 9–12 × 6–8 mm. Petals small, subtriangular, 3–4 × 3–4 mm, ciliate and obtuse, yellowish-green with a dark brown basal portion. Labellum 8–10 × 11–13 mm, broadly ovate to rounded, uniformly brown in colour and clearly trilobed. The lateral lobes are reduced

to conspicuous basal gibbosities, conical in shape and densely hairy. The median lobe is strongly swollen and globose, with short, rather pale marginal hairs, mainly concentrated towards the apical region. The macula is generally inconspicuous, varying from brownish to grey or violaceous, sometimes bordered by a paler margin. Apiculus minute and scarcely visible, hidden beneath the labellum and surmounted by a small tuft of whitish hairs. Stigmatic cavity relatively large, distinctly heart-shaped and bordered by raised callosities. Gynostemium with a short, rounded beak; anther locules externally suffused with reddish tones (Figure 3a; Table 3).

Distribution: Steno-Mediterranean species distributed from the Canary Islands and North Africa through the Iberian Peninsula to the Aegean region. In Italy it is widespread in southern regions and on the major islands, extending northwards along the Tyrrhenian coast as far as Tuscany, while becoming progressively rarer inland.

Etymology: The epithet *bombyliflora* means "with flowers resembling a *Bombylius*", referring to insects characterized by a short, stout and densely hairy abdomen, whose appearance is recalled by the shape and indumentum of the flower.

***Ophrys incubacea* Bianca subsp. *brutia* (P.Delforge) Kreutz**

Habit and morphology: Medium-sized to tall member of the *Ophrys incubacea* complex, characterized by a slender yet sturdy habit and an erect stem reaching up to 50 cm in height. The inflorescence bears 3–8 relatively large flowers. Sepals ovate-lanceolate, 7–12 × 3–6 mm, varying from green to whitish or pale pink, occasionally suffused with reddish tones. Petals 5–7 × 2.5–5 mm, ovate-elongated, distinctly darker than the sepals, green-ochre to reddish-brown in colour, with noticeably undulate margins. Labellum 10–14 × 11–15 mm, broader than long or nearly subequal, projecting obliquely forwards and downwards. Surface brown to reddish-brown, with recurved margins and a conspicuous reddish-brown submarginal indumentum; lateral gibbosities absent or only faintly indicated. Basal field and stigmatic cavity contrasting with the surrounding labellar tissue, generally yellow-orange and distinctly paler than the remainder of the lip. Stigmatic cavity markedly constricted at its base. Macula simple and glossy, most often formed by two elongated parallel bands, grey-violet to bluish in colour and usually wider than long. Apiculus minute, strongly reduced and commonly recurved, inserted within a small but evident notch. Pseudo-eyes dark green, frequently surrounded by a pale ring (Figure 3c; Table 3).

Distribution: Southern Italian subendemic taxon, apparently centred in Calabria, where it represents one of the most characteristic members of the *Ophrys incubacea* group.

Etymology: The epithet *brutia* refers to the ancient Bruttii, the pre-Roman population that inhabited present-day Calabria.

Morphometric measurements based on the examined individuals (N = 6) showed limited variability in *Ophrys* × *epizephyra*. Flower number (mean ± SD = 4.50 ± 1.05), sepal length (10.27 ± 0.71 mm), sepal width (6.08 ± 0.40 mm), petal length (5.08 ± 0.40 mm), petal width (3.53 ± 0.22 mm), labellum length (10.63 ± 0.62 mm), and labellum width (12.08 ± 0.48 mm) all exhibited relatively narrow variation ranges. The reduced dispersion around values intermediate between or overlapping those of the parental species, *O. bombyliflora and O. incubacea* subsp. *brutia*, together with the combination of parental morphological characters, supports the proposed hybrid origin of *O.* × *epizephyra*. Further support for this hypothesis may be provided by future genetic investigations involving the putative parental taxa.

3. ***Ophrys* × *halepensis* G. Ardagna, A. Santanello & L. Strano hybr. nov.**

Descriptio: Inflorescentia robusta vel gracilis, mediocriter densa, floribus 5–10 mediocribus instructa. Bracteae ovario longiores. Sepala 10–14 × 5–8 mm, viridia, colore rubescente suffusa, interdum omnino viridia. Petala 7–10 × 3–6 mm, angusta, flavo-viridia, roseo vel atro-rubro varie suffusa, marginibus distincte undulatis. Labellum

11–15 × 13–16 mm, aspectu modice elongatum, complanatum, gibbis lateralibus fere absentibus. Macula litterae H vel X similis, e duabus fasciis, quae interruptae esse possunt, composita. Area basalis labello concolor. Cavitas stigmatica lata, magnitudine mediocris. Pseudo-oculi magni, nigri et nitidi, leviter griseo marginati. Gynostemium elongatum, angulum obtusum cum labello formans. Apiculus leviter exsertus, sursum curvatus, flavus vel rubescens. Floret mensibus Februario et Martio (Figure 4b; Table 4).

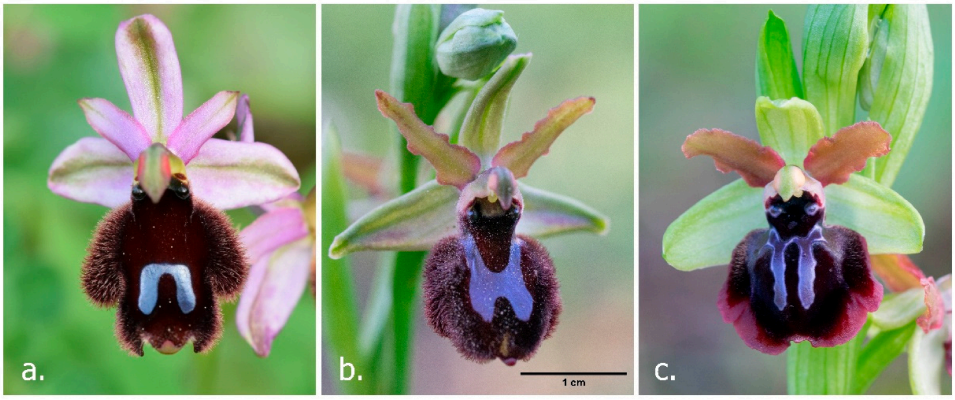

Figure 4. Comparison between the parental species and the hybrid observed at the "Pino d'Aleppo" Nature Reserve of Vittoria (SE Sicily): (**a**) *O. bertolonii* subsp. *explanata* (**b**) *Ophrys* × *halepensis* (*O. bertolonii* subsp. *explanata* × *O. passionis*); (**c**) *Ophrys passionis.*

Table 4. Comparative morphological traits of *Ophrys passionis*, *O.* × *halepensis*, and *O. bertolonii* subsp. *explanata*.

Morphological Character	*O. bertolonii* subsp. *explanata*	*Ophrys* × *halepensis*	*Ophrys passionis*
Flowers	2–7, medium-sized	5–10, medium-sized	10–15, medium-sized
Bracts	Shorter than the ovary	**Longer than the ovary**	Longer than the ovary
Sepals	11–15 × 5–9 mm, pink to purple, rarely green	10–14 × 5–8 mm, **green**, occasionally with reddish tinges	Lanceolate, 8–13 × 4–7 mm, green
Petals *[1]	Long and narrow, 6–10 × 3–5.5 mm, pinkish purple, glabrous to slightly ciliate, with weakly undulate margins	**Narrow**, 7–10 × 3–6 mm, yellowish green with pink to dark red tinges, **with undulate margins**	8–11 × 3–6 mm, green with darker reddish tinges and undulate margins
Labellum	Elongate and flattened, sometimes slightly saddle-shaped, frequently trilobed, 11–15 mm long	**Elongate and flattened**, 11–15 × 13–16 mm, **medium-sized**	Rounded to suborbicular, convex, 11–15 × 13–17 mm, medium-sized, dark brown
Lateral swellings *[2] **(gibbosities)**	Nearly absent	Nearly absent	Nearly absent
Macula	Shield-shaped to horseshoe-shaped, glossy	**H- or X-shaped**, with two bands that may be discontinuous	Simple, H- or X- shaped, sometimes more elaborate
Basal field	Concolorous with the labellum	Concolorous with the labellum	Small, concolorous with the labellum
Stigmatic cavity	Broader than high	**Broad**, medium-sized	Narrowed at the base, small
Pseudo-eyes *[3]	Large, glossy black	Large, **black and glossy**, **with a narrow pale border**	Large, grey, surrounded by a pale ring
Gynostemium	Elongated, forming an obtuse angle with the labellum	Elongated, forming an obtuse angle with the labellum	Elongated beak, forming an obtuse angle with the labellum
Apiculus *[4]	Exserted, curved upwards, reddish	**Slightly exserted and curved upwards**, yellowish to reddish	Strongly reduced to absent
Flowering period	II-III	II-III	II-III

Dimensions are expressed as length × width. Roman numerals indicate flowering months. Characters in bold derive specifically from *O. bertolonii* subsp. *explanata* and *O. passionis*. *[1–4] The proposed parentage was assessed using the combination of petal shape *[1] (long, narrow and undulate margins), nearly absent gibbosities *[2], the presence of black glossy pseudo-eyes *[3] and the slightly exserted and upward curved apiculus *[4]. Other sympatric taxa considered as alternative parents included *O. biancae*, *O. fusca*, *O. lunulata*, *O. lutea* and *O. tenthredinifera*.

Description (English): Inflorescence robust to slender, moderately dense, bearing 5–10 medium-sized flowers. Bracts longer than the ovary. Sepals 10–14 × 5–8 mm, green, occasionally suffused with reddish tones. Petals 7–10 × 3–6 mm, narrow, yellowish-green and variably suffused with pink to dark red, with distinctly undulate margins. Labellum 11–15 × 13–16 mm, medium-sized, moderately elongate in appearance and flattened, with lateral swellings nearly absent. Macula H- to X-shaped, formed by two bands that may be discontinuous. Basal field concolorous with the labellum. Stigmatic cavity broad and medium-sized. Pseudo-eyes large, black and glossy, with a narrow pale border. Gynostemium elongated, forming an obtuse angle with the labellum. Apiculus slightly exserted, curved upwards, yellowish to reddish. Flowering: February-March (Figure 4b; Table 4).

Locus classicus: Italy, Sicily, Ex Mulino Castelluccio, Vittoria (Ragusa), WGS84: 36.91° N-14.49° E ± 2.2 km, 29 m a.s.l., at the edge of a *Pinus halepensis* forest.

Holotype: Italy, Sicily, Ex Mulino Castelluccio, Vittoria (Ragusa), WGS84: 36.91° N-14.49° E ± 2.2 km, 29 m a.s.l., at the edge of a *Pinus halepensis* forest, 18 February 2025, leg. et det. G. Ardagna, preserved in REGGIO.

Etymology: The nothospecific epithet *halepensis* derives from the "Pino d'Aleppo" Nature Reserve (Vittoria, Sicily), the area in which the hybrid was discovered and where it has been recorded at several localities.

Additional specimens examined: Italy, Sicily, Casa Buffa, Vittoria (Ragusa), WGS84: 36.89° N-14.48° E ± 2.2 km, 34 m a.s.l., at the edge of a *Pinus halepensis* forest, 27 February 2026, leg. et det. G. Ardagna; Italy, Sicily, Casa Buffa, Vittoria (Ragusa), WGS84: 36.89° N-14.48° E ± 2.2 km, 25 m a.s.l., at the edge of a *Pinus halepensis* forest, 21 February 2026, leg. et det. G. Ardagna. Overall, *Ophrys* × *halepensis* was recorded at three distinct stations within the "Pino d'Aleppo" Nature Reserve of Vittoria (SE Sicily), each supporting 2–3 flowering individuals. The hybrid occurs at the margins of *Pinus halepensis* woodland, where both parental species occur sympatrically. Partial canopy cover may contribute to maintaining higher soil moisture levels. Its occurrence at multiple stations documents the presence of putative hybrids at several sites where the parental taxa coexist; however, genetic analyses are needed to determine whether these individuals originated from independent hybridization events. At Ex Mulino Castelluccio, an apochromatic form of *Ophrys passionis* was also observed.

Parental species description

***Ophrys bertolonii* Moretti subsp. *explanata* (Lojac.) Soca**

Habit and morphology: Plant with a dense, compact and few-flowered inflorescence, bearing 2–7 medium-sized flowers. Bracts shorter than the ovary. Sepals 11–15 × 5–9 mm, usually pink to purple and rarely green. Petals 6–10 × 3–5.5 mm, pinkish-purple, long and narrow, glabrous to slightly ciliate, with weakly undulate margins. Labellum approximately 11–15 mm long, elongate and flattened, sometimes slightly saddle-shaped and frequently trilobed. Lateral swellings nearly absent. Macula shield-shaped to horseshoe-shaped and glossy. Basal field concolorous with the labellum. Stigmatic cavity broader than high. Pseudo-eyes large, glossy and black. Gynostemium elongated, forming an obtuse angle with the labellum. Apiculus exserted, curved upwards and reddish. Flowering: February-March (Figure 4a; Table 4).

Distribution: Endemic to Sicily.

Etymology: The subspecific epithet *explanata* derives from the Latin *explanatus*, meaning "flattened" or "spread out".

***Ophrys passionis* Sennen**

Habit and morphology: Robust to slender plant, bearing 10–15 medium-sized flowers. Bracts longer than the ovary. Sepals 8–13 × 4–7 mm, green and lanceolate. Petals

8–11 × 3–6 mm, green with darker reddish tinges and distinctly undulate margins. Labellum 11–15 × 13–17 mm, medium-sized, rounded to suborbicular, convex and dark brown. Lateral swellings nearly absent. Macula generally simple, H- or X-shaped, although sometimes more elaborate. Basal field small and concolorous with the labellum. Stigmatic cavity small and narrowed at the base. Pseudo-eyes large and grey, surrounded by a pale ring. Gynostemium with an elongated beak, forming an obtuse angle with the labellum. Apiculus strongly reduced to absent. Flowering: February-March (Figure 4c; Table 4).

Distribution: Mediterranean taxon occurring in much of central and southern Italy and on the major islands.

Etymology: The specific epithet *passionis* refers to the Passion of Christ, in relation to the flowering period of the species, which often coincides with the Easter season.

Morphometric measurements: Based on the examined individuals (N = 2), there was limited variation in *Ophrys* × *halepensis*. Flower number (mean ± SD = 7.00 ± 1.00), sepal length (11.78 ± 0.59 mm), sepal width (5.42 ± 0.17 mm), petal length (8.70 ± 0.99 mm), petal width (3.73 ± 0.02 mm), labellum length (11.17 ± 1.33 mm), and labellum width (14.55 ± 1.55 mm) showed closely comparable values between the two examined individuals. Although the limited sample size precludes conclusions regarding population-level variability, the morphometric pattern, together with the combination of parental morphological characters, is consistent with the proposed hybrid origin of *O.* × *halepensis*. Further support for this hypothesis may be provided by future genetic investigations involving the putative parental taxa.

4. ***Ophrys* × *libertii* V.L.A. Laface & L. Torino hybr. nov.**

Descriptio: Planta mediocris, 25–35 cm alta, habitu gracili et eleganti. Inflorescentia modice laxa, pauciflora, 3–8 floribus mediocribus instructa. Bracteae ovario plerumque longiores. Sepala ovato-lanceolata, 11–16 × 5–7 mm, pallide rosea usque ad purpurea, nervis medianis obscurioribus conspicue percursa, ad anthesim saepe leviter recurvata. Petala 4–8 × 2–4 mm, triangulari-lanceolata, divergentia, purpurea, marginibus leviter ciliatis, inter petala elongata *Ophrydis bertolonii* et petala valde reducta *Ophrydis gracilis* intermedia. Labellum 10–15 × 9–12 mm, ovato-oblongum vel subglobosum, modice convexum, atrobrunneum reflexibus rubescentibus praesertim in parte centrali. Margines leviter revoluti vel fere plani, numquam valde incurvati. Pilositas mediocriter densa, brunnea, velutina, praecipue ad margines et in partibus lateralibus disposita. Gibbae laterales valde reductae, vix conspicuae. Macula ampla et nitida, griseo-caerulea vel cyaneo-violacea, simplex vel modice elaborata, a parte mediana usque ad dimidiam vel duas tertias partes labelli extensa. Campus basalis parum distinctus, regione maculari paulo obscurior. Cavitas stigmatica satis ampla, inter species parentales intermedia, lata sed in regione superiore adhuc modice contracta. Pseudo-oculi parvi vel mediocres, nitidi, viridinigrescentes. Gynostemium rostro mediocriter evoluto, minus elongato quam in *Ophrys bertolonii* sed manifestiore quam in *Ophrys gracilis*. Apiculus bene evolutus, pedunculatus, plerumque bi- vel pluridentatus, in incisura apicali distincta insertus atque antrorsum directus. Floret mensibus Aprili et Maio (Figure 5b; Table 5).

Description (English): Medium-sized plant, usually 25–35 cm tall, characterized by a slender and elegant habit. Inflorescence moderately lax and few-flowered, bearing 3–8 flowers of intermediate size. Bracts generally exceeding the ovary. Sepals ovate-lanceolate, 11–16 × 5–7 mm, varying from pale pink to deep purplish, with conspicuous and slightly darker median veins; typically weakly recurved at anthesis. Petals 4–8 × 2–4 mm, triangular-lanceolate, divergent, purplish, slightly ciliate along the margins, representing an intermediate condition between the elongate petals of *Ophrys bertolonii* and the strongly reduced petals of *Ophrys gracilis*. Labellum 10–15 × 9–12 mm, ovate-elongated to subglobose, moderately convex, dark brown with reddish reflections, particularly evident in the central

region. Margins weakly revolute or nearly flat, never strongly incurved. Indumentum moderately dense, composed of brown velvety pubescence concentrated mainly along the margins and lateral portions of the labellum. Lateral gibbosities extremely reduced and scarcely discernible. Macula broad and glossy, grey-blue to bluish-violet, usually simple or only moderately elaborate, extending from the median region to approximately one-half or two-thirds of the labellar surface. Basal field weakly differentiated, slightly darker than the surrounding macular area. Stigmatic cavity relatively broad, intermediate between those of the parental species, wide but still moderately constricted dorsally. Pseudo-eyes small to medium-sized, glossy, dark greenish-black. Gynostemium with a rostrum of intermediate development, less elongated than in *Ophrys bertolonii* but more evident than in *Ophrys gracilis*. Apiculus well developed, pedunculate, usually bi- or multi-dentate, inserted in a distinct apical notch and directed forwards. Flowering period from April to May (Figure 5b; Table 5).

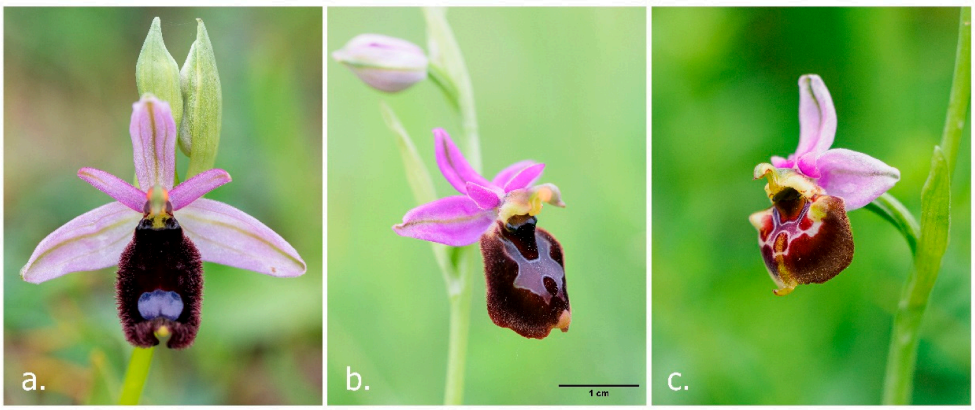

Figure 5. Comparison between the parental species and the hybrid: (**a**) *Ophrys bertolonii*; (**b**) *Ophrys* × *libertii* (*O. bertolonii* × *O. gracilis*); (**c**) *Ophrys gracilis*.

Table 5. Comparative morphological traits of *Ophrys bertolonii*, *O.* × *libertii*, and *O. gracilis*.

Morphological Character	*Ophrys bertolonii*	*Ophrys* × *libertii*	*Ophrys gracilis*
Flowers	2–8, relatively large	3–8, medium-sized	4–10, relatively small
Bracts	Usually shorter than or equal to the ovary	Longer than the ovary	Generally equalling or slightly exceeding the ovary
Sepals	Broadly ovate-lanceolate, 13–18 × 5–8 mm, whitish-pink to rose with green veins, usually recurved	**Ovate-lanceolate**, 11–16 × 5–7 mm, **pink to purplish**, **conspicuously veined, slightly recurved**	Broadly ovate to suborbicular, 9–13.5 mm long, pink to purplish, rarely white
Petals *[1]	Narrowly lanceolate, 8–12 × 2–4.5 mm, reddish-purple, subparallel	Triangular-lanceolate, 4–8 × 2–4 mm, purplish, slightly ciliate, **divergent**	Triangular, strongly reduced, 1.2–4 mm long, divergent
Labellum *[2]	Elongate, subrectangular, 13–19 mm, blackish to very dark brown; dense dark indumentum; margins strongly revolute	Ovate-elongated to subglobose, 10–15 × 9–12 mm, **dark brown with reddish reflections**; indumentum moderately dense; margins weakly revolute or almost flat	Globose, quadrangular-rounded, 7–11 mm, dark brown with reddish centre; margins flat or only slightly curved
Lateral swellings (gibbosities)	Absent	Very weakly developed, barely perceptible	Weakly developed or nearly absent
Macula *[3]	Scutiform or horseshoe-shaped, situated in the median-distal portion, blue to reddish-violet, glossy	Simple to moderately patterned, broad, **occupying about half to two-thirds of the labellum**, grey-blue to bluish-violet	Simple and not highly intricate, extensive, usually occupying up to two-thirds of the labellum
Basal field *[4]	Concolorous with the labellum, poorly delimited	Slightly darker than surrounding macular area, weakly delimited	Usually indistinct

Table 5. *Cont.*

Morphological Character	*Ophrys bertolonii*	*Ophrys* × *libertii*	*Ophrys gracilis*
Stigmatic cavity	Higher than wide, subquadrangular, constricted above pseudo-eyes	Intermediate; broad but still slightly constricted dorsally	Broad and relatively shallow
Pseudo-eyes	Globose, large, blackish	Small to medium-sized, dark greenish-black, glossy	Small, brownish-green, glossy
Gynostemium	Elongated, acute, distinctly rostrate, approximately at right angle to the labellum	**Rostrate**, of intermediate length, slightly less pronounced than in *O. bertolonii*	Shorter and less prominent
Apiculus	Robust, greenish-yellow, inserted in a deep notch, directed forwards or upwards	**Pedunculate, often bi- or pluridentate**, well developed, directed forwards	Usually multi-toothed, moderate-sized, borne on a short stalk
Flowering period	III-V	IV-V	IV-VI

Dimensions are expressed as length × width. Roman numerals indicate flowering months. Characters in bold derive specifically from *O. bertolonii* and *O. gracilis*. *1–4 The proposed parentage was assessed using the combination of long, triangular divergent petals *1, the short-haired labellum *2, the extended macula *3, and the dark basal field *4. Other sympatric taxa considered as alternative parents included *O. apulica*, *O. bombyliflora* and *O. sicula*.

Locus classicus: Italy, Calabria, C.da Pietà, Petrizzi (Catanzaro), WGS84: 38.68° N-16.50° E ± 2.2 km, 200 m a.s.l., in a meadow near the SS182 road.

Holotype: Italy, Calabria, C.da Pietà, Petrizzi (Catanzaro), WGS84: 38.68° N-16.50° E ± 2.2 km, 200 m a.s.l., in a meadow near the SS182 road, 30 April 2023, leg. et det. V.L.A. Laface & L. Torino, preserved in REGGIO.

Etymology: The nothospecific epithet *libertii* honours Giuseppe Liberti, mycologist and orchid researcher, in recognition of his valuable contribution to the study and promotion of the biodiversity and natural heritage of Calabria.

Additional specimens examined: Italy, Calabria, Melìa, Argusto (Catanzaro), WGS84: 38.69° N-16.45° E ± 2.2 km, 390 m a.s.l., in an olive grove, 18 April 2026, leg. et det. V.L.A. Laface & L. Torino; Italy, Calabria, Pannello, Grotteria (Reggio Calabria), WGS84: 38.37° N-16.26° E ± 2.2 km, 460 m a.s.l., in a meadow near a *Quercus pubescens* forest, 19 April 2026, leg. et det. V.L.A. Laface & L. Torino. Overall, *Ophrys* × *libertii* was recorded at three distinct localities in Calabria. Eleven individuals were observed at the locus classicus of C.da Pietà (Petrizzi), six at Melìa (Argusto), and seven at Pannello (Grotteria), for a total of 24 individuals.

Parental species description

***Ophrys bertolonii* Moretti**

Habit and morphology: Medium-sized, slender plant, usually 25–30 cm tall, with an erect habit. Inflorescence pauciflorous, bearing 2–8 relatively large flowers. Bracts generally shorter than or equalling the ovary. Sepals broadly ovate-lanceolate, 13–18 × 5–8 mm, whitish-pink to rose-coloured, occasionally suffused with greenish tones, almost invariably marked by distinct green veins; typically recurved at anthesis. Petals narrowly lanceolate, 8–12 × 2–4.5 mm, reddish-purple and usually darker than the sepals, acute, slightly ciliate, with straight or rarely weakly undulate margins, arranged subparallel to the gynostemium.

Labellum 13–19 mm long, entire, elongate and subrectangular, blackish to very dark brown, commonly displaying a shallow median depression at the level of the macula; margins strongly revolute. Indumentum dense and dark, occasionally tinged reddish. Macula glossy, situated in the median to distal portion of the labellum, typically scutiform or horseshoe-shaped, bright blue to reddish-violet. Basal field concolorous with the remainder of the labellum and poorly delimited.

Stigmatic cavity higher than wide, subquadrangular, markedly constricted above the pseudo-eyes. Pseudo-eyes globose, blackish, conspicuous, located near the base of the labellum rather than on the walls of the stigmatic cavity. Gynostemium elongated, acute, distinctly rostrate, disposed approximately at a right angle to the labellum. Apiculus

robust, greenish-yellow, obtuse, inserted within a deep apical notch and directed forwards or upwards (Figure 5a; Table 5).

Distribution: Italian endemic species distributed throughout the peninsula south of the Po Valley and extending to Sicily.

Etymology: The generic name *Ophrys* derives from the Greek ὀφρύς (*ophrýs*), meaning "eyebrow" or "eyelash", in reference to the dense indumentum of the labellum. The specific epithet *bertolonii* honours the Italian botanist Antonio Bertoloni (1775–1869).

***Ophrys gracilis* (Büel, O. Danesch & E. Danesch) Paulus**

Habit and morphology: Slender and graceful species, reaching 30–40 cm in height. Inflorescence lax, carrying 4–10 relatively small flowers. Perianth segments pink to purplish, only exceptionally white and almost never green. Sepals broadly ovate to suborbicular, 9–13.5 mm long. Petals markedly reduced, triangular, divergent, only 1.2–4 mm long, corresponding to approximately one fifth to one quarter of the sepal length. Labellum small in proportion to the perianth, 7–11 mm long, strongly convex and globose, quadrangular-rounded rather than trapeziform, dark brown with reddish shades towards the centre. Margins flat or only slightly curved, never markedly recurved. Surface velvety, with pale hairs concentrated near the basal portion. Lateral gibbosities weakly developed and often barely discernible. Macula extensive, usually occupying up to two-thirds of the labellum surface, generally simple and not highly intricate. Apiculus of moderate size, commonly multi-toothed, borne on a short stalk and sometimes surrounded by a small tuft of hairs. Stigmatic cavity broad and relatively shallow; pseudo-eyes small, glossy, and brownish-green (Figure 5c; Table 5).

Distribution: Submediterranean species occurring mainly in southern peninsular Italy, becoming progressively rarer towards the central regions of the country.

Etymology: The name alludes to the graceful and slender appearance that characterizes the species.

Morphometric measurements based on the examined individuals (N = 13) showed limited variability in Ophrys × libertii. Flower number (mean ± SD = 5.46 ± 1.39), sepal length (13.92 ± 1.16 mm), sepal width (6.12 ± 0.50 mm), petal length (6.21 ± 0.88 mm), petal width (3.07 ± 0.44 mm), labellum length (12.77 ± 1.25 mm), and labellum width (10.51 ± 0.84 mm) all exhibited relatively narrow variation ranges. The reduced dispersion around values intermediate between or overlapping those of the parental species, *O. bertolonii* and *O. gracilis*, together with the combination of parental morphological characters, supports the proposed hybrid origin of *O.* × *libertii.* Further support for this hypothesis may be provided by future genetic investigations involving the putative parental taxa.

5. ***Ophrys* × *marcionensis* A. De Marco, A. Contin & L. Torino hybr. nov.**

Descriptio: Herba mediocris, 25–40 cm alta, habitu satis robusto. Inflorescentia sublaxa, breviter elongata, floribus 3–7 mediocribus vel sat magnis instructa. Bracteae anguste lanceolatae, ovarium aequantes vel paululum superantes, apice saepe roseo suffusae. Sepala ovato-lanceolata, 10–12 × 6–8 mm, pallide rosea, costa mediana viridescente conspicua instructa; apice obtuso vel subacuto. Petala triangularia, leviter auriculata, 4–5 × 2.5–3.5 mm, flavido-rosea, sepalis pallidiora, marginibus minute ciliatis. Labellum 11–13 × 11–13 mm, late trapeziforme, modice convexum, atro brunneo-rubescens; marginibus dense pubescentibus et parte centrali pallidioribus. Gibbae basales adsunt sed parum evolutae, leviter prominentes atque antice paulum porrectae. Macula mediocris, basalis vel subcentralis, simplex, quam in *Ophrys tenthredinifera* extensior, lineis albido-caeruleis circumdata. Campus basalis brunneo-rubescens vel brunneo-aurantiacus, interdum lateraliter viridi vel aureo leviter suffusus. Cavitas stigmatica ampla, atro-brunnea, campo basali manifeste contrastans, sed minor quam in *Ophrys pinguis*. Pseudo-oculi obscuri, nitidi, leviter elongati et satis approximati. Gynostemium breve et robustum,

rostro parum evoluto. Apiculus parvus, triangularis, flavus, erectus vel leviter incurvus, in incisura apicali distincta insertus atque fasciculo pilorum coronatus. Floret ab Aprili usque ad Junium (Figure 6b; Table 6).



Figure 6. Comparison between the parental species and the hybrid observed at Colle Marcione, Civita (Calabria, southern Italy): (**a**) *Ophrys pinguis*; (**b**) *Ophrys* × *marcionensis* (*O. pinguis* × *O. tenthredinifera*); (**c**) *Ophrys tenthredinifera*.

Table 6. Comparative morphological traits of *O. pinguis*, *O.* × *marcionensis*, and *Ophrys tenthredinifera*.

Morphological Character	*Ophrys pinguis*	*Ophrys* × *marcionensis*	*Ophrys tenthredinifera*
Flowers	5–9, medium-large	3–7, **medium-large**	2–5, medium-small
Bracts *[1]	Longer than the ovary	Narrow and lanceolate, slightly longer than or equal to the ovary, with apical margins tinged pink	Slightly longer than the ovary
Sepals	8–13 × 4.5 mm; whitish to pinkish or reddish	Ovate-lanceolate, apex obtuse to subacute, 10–12 × 6–8 mm, **pale pink with a distinct greenish median vein**.	Ovate-elliptic, spoon-shaped, rounded at the apex, 10–11 × 7–9 mm; pinkish with a central longitudinal greenish line
Petals *[2]	Triangular, close together (almost fused) at the base, up to 5 × 3.5 mm, slightly more than 1/3 the length of the sepals; margins ciliate	Triangular, **weakly auriculate**, 4–5 × 2.5–3.5 mm, pinkish-yellow and less intensely coloured than the sepals; **margins finely ciliate**.	Triangular, often auriculate, 3–5 × 2–4 mm; similar in colour to the sepals or often more intensely coloured
Labellum *[3]	Trapeziform-rounded, convex and subglobose, 10–14 × 11–15 mm, reddish-brown	Broadly trapezoidal, **moderately convex**, 11–13 × 11–13 mm, dark reddish-brown with **densely pubescent margins of a paler shade**.	Sometimes trapezoidal, more or less convex, shoulders raised, generally ≤11 mm; dark brown in the centre, with denser pubescence along the margins and a broad yellow band towards the edge; lateral-distal margins often recurved
Lateral swellings (gibbosities)	Poorly developed, directed forwards	Present but **weakly developed, only slightly projecting forwards**.	Present at the base of the labellum; barely developed or sometimes more distinctly separated, glabrous
Macula	With a simple pattern, basal, bordered with yellow	**Relatively simple**, medium-sized, basal to subcentral, more extensive than in *O. tenthredinifera*; **bordered by whitish-bluish lines**.	Small, often bordered by a whitish line
Basal field *[4]	Broad, green-gold-orange	**Reddish-brown** to brownish-orange, with slight **greenish or golden tinges laterally**.	Reddish-brown
Stigmatic cavity	Broad and low, dark	**Rather broad, dark brown**, contrasting but not as extensive as in *O. pinguis*.	Reddish-brown, similar in colour to the basal field
Pseudo-eyes	Dark with a green hue	**Slightly elongated**, dark, glossy, **moderately close together**.	Often elongated, dark; closer together than in *O. tenthredinifera*
Gynostemium	Medium-sized, with a pointy rostrum	**Short** and robust, with a **poorly developed rostrum**.	Short, with a barely developed rostrum
Apiculus *[5]	Large, inserted into a deep notch	Triangular, small, yellow, **with a tuft of apical hairs, erect** or slightly curved forwards, **inserted into a distinct notch**.	Large, yellowish to reddish, topped by a conspicuous tuft of long, dense hairs, erect
Flowering period	IV-VI	IV-VI	III-V

Dimensions are expressed as length × width. Roman numerals indicate flowering months. Characters in bold are derived specifically from *O. pinguis* and *O. tenthredinifera*. *[1–5]. The proposed parentage was assessed using the combination of pinkish bracts *[1], petal shape *[2], labellum shape *[3], dark basal field *[4], and apiculus morphology *[5]. Other sympatric taxa considered as alternative parents included *O. biscutella*, *O. incubacea* and *O. lutea*.

Description (English): Plant of medium size, 25–40 cm tall, with a rather robust habit. Inflorescence sublax, relatively short, bearing 3–7 medium to large flowers, moderately spaced. Bracts narrowly lanceolate, equalling or slightly exceeding the ovary, frequently flushed pink towards the apex. Sepals ovate-lanceolate, 10–12 × 6–8 mm, pale pink with a conspicuous greenish median vein; apex obtuse to subacute. Petals triangular, weakly auriculate, 4–5 × 2.5–3.5 mm, pinkish-yellow, less intensely coloured than the sepals, with finely ciliate margins. Labellum 11–13 × 11–13 mm, broadly trapezoidal, moderately convex, dark reddish-brown; margins densely pubescent and paler than the central portion. Basal gibbosities present but weakly developed, only slightly prominent and faintly directed forwards. Macula of medium size, basal to subcentral, relatively simple, more extensive than in *Ophrys tenthredinifera*, bordered by whitish-bluish lines. Basal field reddish-brown to brownish-orange, occasionally with slight greenish or golden tinges laterally. Stigmatic cavity broad, dark brown, distinctly contrasting with the basal field, but less extensive than in *Ophrys pinguis*. Pseudo-eyes dark, glossy, slightly elongated, and moderately close together. Gynostemium short and robust, with a poorly developed rostrum. Apiculus small, triangular, yellow, erect or slightly curved forwards, inserted into a distinct apical notch and surmounted by a tuft of hairs. Flowering from April to June (Figure 6b; Table 6).

Locus classicus: Italy, Calabria, Colle Marcione, Civita (Cosenza), WGS84: 39.86° N-16.30° E ± 2.2 km, 950 m a.s.l., in a grassland with *Juniperus communis* and *Spartium junceum*.

Holotype: Italy, Calabria, Colle Marcione, Civita (Cosenza), WGS84: 39.86° N-16.30° E ± 2.2 km, 950 m a.s.l., in a grassland with *Juniperus communis* and *Spartium junceum*, 26 April 2024, leg. et det. A. De Marco, preserved in REGGIO.

Etymology: The nothospecific epithet *marcionensis* derives from Colle Marcione, the locality where the hybrid was first discovered.

Parental species description

***Ophrys pinguis* Romolini & Soca**

Habit and morphology: Robust plant, often exceeding 40 cm in height, bearing a lax inflorescence with 5–9 medium to large flowers. Perianth segments whitish, pinkish or reddish; sepals 8–13 × 4.5 mm. Petals triangular, up to 5 × 3.5 mm, slightly longer than one-third of the sepal length, closely approximated and almost connate at the base, with ciliate margins. Labellum 10–14 × 11–15 mm, trapeziform to broadly rounded, convex and subglobose, reddish-brown; basal gibbosities weakly developed and directed forwards. Macula basal, simple, bordered by yellow. Basal field broad, green-golden to orange. Stigmatic cavity broad, shallow and dark coloured. Apiculus large, inserted within a deep apical notch (Figure 6a; Table 6).

Distribution: Italian endemic of central and southern Italy, ranging from the Marche region southwards to Calabria.

Etymology: The epithet *pinguis* refers to the swollen, globose shape of the labellum.

***Ophrys tenthredinifera* Parl.**

Habit and morphology: Plant up to 30(40) cm tall, bearing 2–5 small to medium-sized flowers. Bracts slightly exceeding the ovary. Sepals ovate-elliptic, spoon-shaped, 10–11 × 7–9 mm, pink with a distinct green median vein, apex rounded. Petals triangular, often auriculate, 3–5 × 2–4 mm, concolorous with or more intensely coloured than the sepals. Labellum usually not exceeding 11 mm in length (occasionally 13–15 mm), moderately convex to subtrapezoidal, with raised shoulders and frequently recurved lateral-distal margins. Basal gibbosities glabrous, weakly developed or sometimes distinctly separated. Disc dark brown, with denser marginal pubescence, gradually merging into a broad yellow marginal band with a slightly velvety appearance. Macula small, often bordered by a thin whitish line. Apiculus large, erect, terminating in a conspicuous tuft of long, dense yellowish to reddish hairs, generally more developed than in the typical form.

Gynostemium short, with a weakly developed rostrum. Stigmatic cavity reddish-brown, concolorous with the basal field; pseudo-eyes dark and often elongate (Figure 6c; Table 6).

Distribution: Italian subendemic, widespread in Sardinia and throughout Peninsular Italy, especially in southern regions and along the Tyrrhenian coast. Absent from northern Italy and Sicily.

Etymology: from the Greek *tenthredon* (τενθρηδών), referring to a sawfly, a hymenopteran resembling a bee or wasp, and *phérō* (φέρω), meaning "to bear" or "to carry"; literally, "bearing a sawfly", in reference to the appearance of the labellum.

Morphometric measurements based on the examined individuals (N = 4) showed limited variability in *Ophrys* × *marcionensis*. Flower number (mean ± SD = 5.00 ± 0.82), sepal length (11.00 ± 0.55 mm), sepal width (7.00 ± 0.51 mm), petal length (4.53 ± 0.30 mm), petal width (2.98 ± 0.25 mm), labellum length (12.00 ± 0.55 mm), and labellum width (12.10 ± 0.55 mm) all exhibited relatively narrow variation ranges. The reduced dispersion around values intermediate between or overlapping those of the parental species, *O. tenthredinifera* and *O. pinguis*, together with the combination of parental morphological characters, supports the proposed hybrid origin of *O.* × *marcionensis*. Further support for this hypothesis may be provided by future genetic investigations involving the putative parental taxa.

6. ***Ophrys* × *nicolosiana* A. Santanello, L. Strano & G. Ardagna hybr. nov.**

Descriptio: Inflorescentia robusta vel gracilis, modice densa, floribus 9–11 mediocribus instructa. Bracteae ovario breviores sed latiores. Sepala 11–14 × 6.5–7 mm, viridia, lanceolata, nervis medianis viridibus obscurioribus. Petala 11–12 × 4–5 mm, oblonga, a basi ad apicem latitudine fere constanti, non attenuata, viridi-flavescentia, marginibus leviter undulatis, colore a flavo pallido ad flavum intensum usque ad rubrum pallidum vel roseum variabili, colore rubescente praecipue ad tertiam inferiorem et regionem basalem limitato. Labellum 8–10 × 8–10 mm, suborbiculare, versus apicem sensim attenuatum, atro-rubro-brunneum; gibbae vix conspicuae; margines concavi vel expansi, undulati, glabri, pallide rubescentes; pilositas submarginalis usque ad medium labelli extensa. Macula grisea, violaceo-caeruleo suffusa, valde intricata, maximam partem superficiei labelli occupans. Campus basalis purpureo-ruber, colore nitidiore et vividiore quam pars rubro-brunnea labelli. Cavitas stigmatica 4 × 3 mm, purpureo-rubra, labello obscurior. Pseudo-oculi mediocres, griseo-nitentes, albo marginati. Gynostemium elongatum, angulum obtusum cum labello formans. Apiculus parvus, acuminatus, saepe retrorsum directus, viridi-flavescens. Floret ab Aprili (Figure 7b; Table 7).

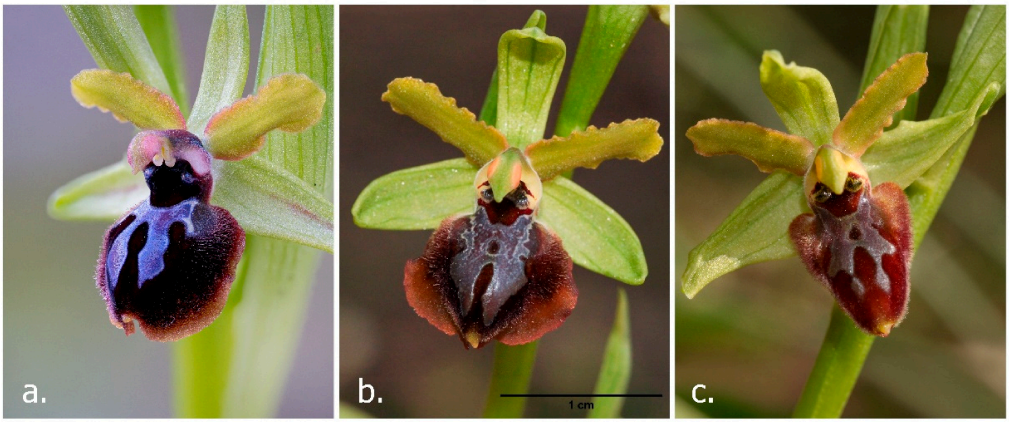

Figure 7. Comparison between the parental species and the hybrid observed at Renatura, Nicolosi (Catania, Sicily): (**a**) *O. passionis*; (**b**) *Ophrys* × *nicolosiana* (*O. passionis* × *Ophrys sphegodes* subsp. *grassoana*); (**c**) *Ophrys sphegodes* subsp. *grassoana.*

Table 7. Comparative morphological traits of *O. passionis*, *O.* × *nicolosiana* and *Ophrys sphegodes* subsp. *grassoana*.

Morphological Character	*Ophrys passionis*	*Ophrys* × *nicolosiana*	*Ophrys sphegodes* **subsp. *grassoana***
Flowers	4–8, relatively large	9–11, medium-sized	4–12, small to medium-sized
Bracts	Longer than the ovary	Shorter but broader than the ovary	Lowermost reaching or exceeding the dorsal sepal
Sepals	Ovate-lanceolate, proportionally broader than in *Ophrys sphegodes* subsp. *grassoana*, green	Lanceolate, 11–14 × 6.5–7.0 mm, green, with darker green central veins	Subtriangular and subacute, green
Petals *[1]	Broad and elongated, with truncate apex, almost as long as the sepals, greenish-brown to reddish, with undulate margins	**Elongated**, 11–12 × 4–5 mm, greenish-yellow with a slight reddish tinge at the base, with undulate margins	Ovate-lanceolate, uninerved, with more or less obtuse apex, green, glabrous, with undulate margins
Labellum *[2]	Entire, rounded and markedly convex; dark brown to blackish, with dense and long submarginal pilosity and paler, spreading yellowish-orange margins	Suborbicular, **progressively tapering towards the apex**, 8–10 × 8–10 mm; dark reddish-brown centrally, with **moderately dense submarginal pilosity and paler yellowish-reddish margins**	Elongate, entire or subtrilobed, ranging from expanded and rounded to strongly laterally convex; wine-red to blackish-brown; ciliation mainly confined to the lateral lobes; upper surface and margins glabrous
Lateral swellings (gibbosities)	Barely perceptible	Barely perceptible	Absent
Macula *[3]	Simple H- or X-shaped, sometimes incomplete, bluish to brownish-violet	**Highly complex, covering most of the labellum**, grey with **violet-bluish tinges**	With complex patterns, large
Basal field	Reddish-brown, slightly paler than the centre of the labellum	Purple-red, with a sharper and brighter chromatic component than the reddish-brown labellum	Trapezoidal and dark brown, distinctly darker than the remaining labellum surface
Stigmatic cavity	Dark	4 × 3 mm, purple-red and darker than the labellum	Dark
Pseudo-eyes *[4]	Very small, blackish and weakly prominent	Medium-sized, with grey reflections and rimmed with white	Large, blackish with green tinges, distinctly separated by ca. 1.5 mm
Gynostemium	Elongated beak; obtuse angle to the labellum	Elongated; **obtuse angle to the labellum**	Broad, obtuse, duckbill-shaped beak
Apiculus	Very small/reduced	Acuminate, small, greenish-yellow, often pointing backwards	Reduced to a slight greenish prominence
Flowering period	III-IV	III-IV	III-IV

Dimensions are expressed as length × width. Roman numerals indicate flowering months. Characters in bold derive specifically from *O. passionis* and *O. sphegodes* subsp. *grassoana*. *[1–4] The proposed parentage was assessed using the combination of petal shape *[1], labellum shape *[2], macula appearance *[3], and pseudo-eye appearance *[4]. No other sympatric taxa were present at the discovery site.

Description (English): Inflorescence robust to slender, moderately dense, bearing 9–11 medium-sized flowers. Bracts shorter but broader than the ovary. Sepals 11–14 × 6.5–7 mm, green, lanceolate, with darker green central veins. Petals 11–12 × 4–5 mm, elongated, maintaining a constant width from base to apex without tapering, yellowish-green, with margins ranging from light yellow to intense yellow and up to light red, almost pinkish, the latter restricted at most to the lower third, mainly in the basal zone. Labellum 8–10 × 8–10 mm, suborbicular, tapering towards the apex; gibbosities barely perceptible; labellum margins ranging from concave to spreading, undulate, glabrous, paler reddish in colour; submarginal pilosity extending to the middle of the labellum. Macula grey with violet-bluish tinges, highly complex, covering most of the labellum surface. Basal field purple-red in colour, with a sharper and brighter chromatic component compared to the reddish-brown of the labellum. Stigmatic cavity 4 × 3 mm, purple-red and darker than the labellum. Pseudo-eyes medium-sized, with grey reflections and rimmed with white. Gynostemium elongated, forming an obtuse angle with the labellum. Apiculus small,

acuminate, often pointing backwards, greenish-yellow. Flowering from April (Figure 7b; Table 7).

Locus classicus: Italy, Sicily, Renatura, Nicolosi (Catania), WGS84: 37.65° N-15.03° E ± 2.2 km, 970 m a.s.l., along the edge of a woodland dominated by *Quercus ilex*, with *Rubus ulmifolius* and *Ferula communis*.

Holotype: Italy, Sicily, Renatura, Nicolosi (Catania), WGS84: 37.65° N-15.03° E ± 2.2 km, 970 m a.s.l., along the edge of a woodland dominated by *Quercus ilex*, with *Rubus ulmifolius* and *Ferula communis*, 18 April 2023, leg. et det. A. Santanello & L. Strano, preserved in REGGIO.

Etymology: The nothospecific epithet *nicolosiana* refers to Nicolosi, the municipality on the slopes of Mount Etna (Catania, Sicily) where the hybrid was discovered.

Field observations: *Ophrys* × *nicolosiana* was observed at Renatura, within the municipality of Nicolosi, along the edge of a woodland dominated by *Quercus ilex*, with *Rubus ulmifolius* and *Ferula communis*. The hybrid exhibits morphological characters intermediate between the parental taxa, *Ophrys sphegodes* subsp. *grassoana* and *O. passionis*. These include green, lanceolate sepals of intermediate width, yellowish-green petals with a reddish tinge towards the basal portion, and a suborbicular labellum bearing a complex grey-violet macula. The pseudo-eyes are intermediate in size between those of the parental species, while the stigmatic cavity is dark.

Parental species description

***Ophrys passionis* Sennen:** See above (Section 3.1; Figure 7a; Table 7).

***Ophrys sphegodes* Mill. subsp. *grassoana* Cristaudo, Galesi, R.Lorenz & Zelesny**

Habit and morphology: Plant characterized by consistently green, subtriangular and subacute sepals. Petals green, ovate-lanceolate, uninerved and glabrous, with undulate margins. Labellum elongate, entire or subtrilobed, varying from expanded and rounded to strongly convex laterally, wine-red to blackish-brown, without basal gibbosities. Ciliation mainly confined to the lateral lobes, whereas the upper surface and the entire margin are glabrous. Labellum retuse-bilobed towards the apex; apiculum reduced to a slight greenish prominence. Macula large, with complex patterns. Basal field trapezoidal and dark brown, distinctly darker than the remaining surface of the labellum. Stigmatic cavity dark. Pseudo-eyes large, blackish with green tinges and distinctly separated from each other by approximately 1.5 mm. Flowering occurs from March to April (Figure 7c; Table 7).

Distribution: Sicilian endemic, with a restricted distribution in the Mt Etna area, particularly on its northern slopes, where it occurs mainly on old volcanic substrates.

Etymology: The specific epithet *grassoana* is dedicated to the Sicilian botanist Maria Pia Grasso, in recognition of her contribution to the study of Sicilian orchids.

Morphometric measurements: Based on the examined individuals (N = 2), there was limited variation in *Ophrys* × *nicolosiana*. Flower number (mean ± SD = 10.00 ± 1.41), sepal length (12.55 ± 1.63 mm), sepal width (6.75 ± 0.35 mm), petal length (11.55 ± 1.06 mm), petal width (4.70 ± 0.85 mm), labellum length (9.15 ± 1.48 mm), and labellum width (9.35 ± 1.34 mm) showed closely comparable values between the two examined individuals. Although the limited sample size precludes conclusions regarding population-level variability, the morphometric pattern, together with the combination of parental morphological characters, is consistent with the proposed hybrid origin of *O.* × *nicolosiana* from *O. sphegodes* subsp. *grassoana* and *O. passionis*. Further support for this hypothesis may be provided by future genetic investigations involving the putative parental taxa.

3.2. New Records, Rare Species, New Confirmations

3.2.1. New Records for Calabria

Ophrys cinnabarina Romolini & Soca

+ CAL: Piano del Prete, Montebello Jonico (Reggio Calabria), (WGS84: 38.04° N-15.76° E ± 2.2 km), garigue, 952 m a.s.l., 23 May 2025, 11 specimens, det. V.L.A. Laface, L. Torino (REGGIO)-Species new for the flora of Calabria.

Note: Ophrys cinnabarina was described from southern Italy and is currently regarded as an Italian endemic taxon mainly distributed in Apulia and Basilicata [14,60]. The population discovered at Piano del Prete represents the first documented record for Calabria and significantly enlarges the known distribution range of the species towards the southern extremity of the Italian Peninsula [61,62]. The habitat is consistent with the xerophilous Mediterranean environments reported for the species elsewhere in its range [60].

Orchis* × *pseudoanatolica H.Fleischm.

+ CAL: Cozzo Vardo, Morano Calabro (Cosenza), (WGS84: 39.90° N-16.10° E ± 2.2 km), small meadow next to the road within a Fagus sylvatica forest, 1505 m a.s.l., 22 May 2026, det. A. De Marco, L. Torino, V.L.A. Laface (REGGIO)-Hybrid new for the flora of Calabria.

Note: Orchis × *pseudoanatolica* is a hybrid taxon reported only sporadically within southern Europe. Hybridization in the genus *Orchis* is relatively frequent where closely related taxa occur in sympatry and share pollinators and flowering periods [63,64]. The population observed at Cozzo Vardo occurred in a small montane meadow embedded within a beech-forest matrix, a habitat known to favour contact among several orchid species. This record represents the first documented occurrence of the hybrid in Calabria and further highlights the importance of the Pollino Massif as a centre of orchid diversity and evolutionary processes [21,22].

3.2.2. New Records for Sicily

Ophrys* × *montis-stellae V.L.A. Laface & L. Torino

+ SIC: Ciappazzo di Dragofora, Bronte (Catania), (WGS84: 37.77° N-14.85° E ± 2.2 km), 897 m a.s.l., lava field ("dagala") characterized by *Ferula communis*, *Rubus ulmifolius*, *Euphorbia rigida* and *Centranthus ruber*, with *Pistacia terebinthus* and locally *Quercus ilex*, 1 April 2024, obs. et det. A. Santanello & L. Strano.- - New record for Sicily.

Note: The record from Ciappazzo di Dragofora documents the occurrence of *Ophrys* × *montis-stellae* in Sicily, extending the known geographical occurrence of this hybrid beyond its original locality in Calabria. The nothotaxon, resulting from hybridization between *O. bertolonii* and *O. exaltata*, was originally reported from the Sanctuary of Monte Stella near Pazzano (Reggio Calabria), where it was found in a meadow near pine plantations [16]. The Sicilian plants were observed at Ciappazzo di Dragofora on the slopes of Mt Etna, at 897 m a.s.l., within the characteristic vegetation of an Etnean lava field ("dagala"). This record is therefore of particular chorological interest, documenting the occurrence of the hybrid in a markedly different ecological context from that of the original Calabrian population and providing further evidence of hybridization between the two parental taxa in southern Italy.

Ophrys* × *spampinatoi V.L.A. Laface & L. Torino

+ SIC: Ciappazzo di Dragofora, Bronte (Catania), (WGS84: 37.77° N-14.85° E ± 2.2 km), 897 m a.s.l., lava field ("dagala") characterized by *Ferula communis*, *Rubus ulmifolius*, *Euphorbia rigida* and *Centranthus ruber*, with *Pistacia terebinthus* and locally *Quercus ilex*, 1 April 2024, obs. et det. A. Santanello & L. Strano-New record for Sicily.

Note: The record from Ciappazzo di Dragofora documents the occurrence of *Ophrys* × *spampinatoi* in Sicily, extending the known geographical occurrence of this hybrid

beyond its original locality in southern Calabria. The nothotaxon, resulting from hybridization between *O. exaltata* and *O. incubacea* subsp. *incubacea*, was originally reported from Scariglione, Motta San Giovanni (Reggio Calabria), at 839 m a.s.l., where it was found at the edge of a pine forest [16]. The Sicilian plants were observed at Ciappazzo di Dragofora, on Mt Etna, at 897 m a.s.l., within the characteristic vegetation of an Etnean lava field ("dagala"), characterized by *Ferula communis*, *Rubus ulmifolius*, *Euphorbia rigida* and *Centranthus ruber*, with *Pistacia terebinthus* and locally *Quercus ilex*. The occurrence of the hybrid in this markedly different ecological context broadens the available information on its habitat and geographical distribution and provides further evidence of natural hybridization between the two parental taxa in southern Italy.

3.2.3. Confirmations and New Stations

Epipactis hyblaea Brullo & Zimmitti

+ SIC: Riserva Naturale Orientata "Pantalica, Valle dell'Anapo e Torrente Cava Grande", Ferla (Syracuse), (WGS84: 37.14° N-14.99° E ± 2.2 km), 563 m a.s.l., deciduous oak forest dominated by *Quercus pubescens*, 26 May 2024, 13 flowering individuals, obs. et det. G. Ardagna. - Confirmation of the occurrence of *Epipactis hyblaea* in southeastern Sicily.

Note: The record confirms the presence of *Epipactis hyblaea* within the Riserva Naturale Orientata "Pantalica, Valle dell'Anapo e Torrente Cava Grande", where the species was originally described by Brullo and Zimmitti [35]. *Epipactis hyblaea* is a narrow-range Sicilian endemic associated with cool and shaded woodland habitats of southeastern Sicily [35,65]. Thirteen flowering individuals were observed in the understory of a mesic holm oak woodland developed on Miocene marly limestone. The plants occurred beneath a well-developed tree canopy, which provides deep shade and contributes to maintaining the cool and humid microclimatic conditions characteristic of the habitat of this sciaphilous and mesophilous orchid. The associated orchid flora included *Epipactis microphylla* and *Cephalanthera damasonium*, consistent with the mesic woodland community previously described for the area [35]. The habitat was in an overall good state of conservation. Given the restricted distribution and specialized ecological requirements of the species, the persistence of suitable cool and humid woodland microhabitats is particularly relevant for its conservation. Precise geographical coordinates are withheld for conservation reasons.

Ophrys fusca Link subsp. ***pallida*** (Raf.) E.G.Camus

+ SIC: Sorgente Coste, Ragusa (Ragusa), (WGS84: 36.97° N-14.66° E ± 2.2 km), open Mediterranean garrigue on a north-facing coastal slope, 608 m a.s.l., 12 April 2021, 16 April 2023 and 22 April 2024, obs. et det. G. Ardagna. - Confirmation of the occurrence of the taxon in Sicily.

Note: The present record confirms the occurrence of *Ophrys fusca* subsp. *pallida* in southeastern Sicily, considerably extending the documented occurrence of this rare orchid beyond the main Sicilian distribution area reported in the literature, which is largely concentrated in the northwestern sector of the island [38]. The population at sorgente Coste (Ragusa) consists of two individuals growing at 608 m a.s.l. in open Mediterranean garrigue on a north-facing slope, an ecological setting consistent with the xerophilous open habitats reported for the taxon, including garrigues, dry grasslands, shrublands and open woodlands. The population was documented and monitored in 2021, 2023 and 2024, confirming its persistence at the site. Nevertheless, its very small population size makes this local occurrence potentially vulnerable to habitat alteration and stochastic disturbance. Livestock grazing and recurrent fires represent the main direct pressures observed in the area, while increasing temperatures associated with climate change may progressively modify the local environmental conditions suitable for the persistence of the taxon. Given the limited number of individuals and the biogeographical relevance of this southeastern

Sicilian population, continued monitoring and preservation of the surrounding habitat are particularly important for its long-term conservation. Precise geographical coordinates are withheld for conservation reasons.

Serapias nurrica Corrias

+ CAL: S. Lucia, Motta San Giovanni (Reggio Calabria), (WGS84: 37.97° N-15.69° E ± 2.2 km), garrigue near pine plantations, 315 m a.s.l., 22 April 2023, obs. et det.V.L.A. Laface & L. Torino (REGGIO); C. Baldassarri, Motta San Giovanni (Reggio Calabria), (WGS84: 38.01° N-15.69° E ± 2.2 km), garrigue, 420 m a.s.l., 11 May 2025, obs. et det. V.L.A. Laface & L. Torino (REGGIO); Diminniti, Reggio Calabria (Reggio Calabria), (WGS84: 38.18° N-15.70° E ± 2.2 km), garrigue, 390 m a.s.l., 27 April 2025, obs. et det. V.L.A. Laface & L. Torino (REGGIO); Castagnarazza, Reggio Calabria (Reggio Calabria), (WGS84: 38.17° N-15.71° E ± 2.2 km), secondary vegetation with *Cistus monspeliensis* within pine plantations, 610 m a.s.l., 6 May 2026, leg. et det. V.L.A. Laface & L. Torino (REGGIO). - Confirmation and new stations for Calabria.

Note: The four records confirm the occurrence of *Serapias nurrica* in southern Calabria and considerably improve knowledge of its local distribution. Three, five, three and sixteen individuals were recorded, respectively, at S. Lucia, C. Baldassarri, Diminniti and Castagnarazza, for a total of 27 individuals. *Serapias nurrica* is a western-central Mediterranean orchid occurring in Italy in Sardinia, Sicily and Calabria, where its distribution appears to be rather localized [22,66]. The species is typically associated with open Mediterranean habitats, particularly garrigues, shrublands and grasslands on relatively dry soils. The ecological conditions observed at the four Calabrian stations are therefore consistent with the known habitat preferences of the species, although some populations occur in secondary vegetation associated with pine plantations. These new stations contribute to a more detailed definition of the distribution of *S. nurrica* in the southernmost sector of the Italian Peninsula.

3.2.4. New Local and Insular Records

Neottia ovata (L.) Bluff & Fingerh.

SIC: Vallone Taliana, Castroreale (Messina), (WGS84: 38.03° N-15.25° E ± 2.2 km), deciduous oak woodland, 793 m a.s.l., 15 May 2022, obs. F. Anania et det. A. Crisafulli. - New local record.

Note: The record from Vallone Taliana represents a new local station of *Neottia ovata* in north-eastern Sicily, where the species was observed at 793 m a.s.l. within deciduous oak woodland. *Neottia ovata* is a widespread Eurasian orchid, but in Sicily it is comparatively rare and characterized by a scattered distribution, with generally small and localized populations [29]. Previous records from north-eastern Sicily are mainly associated with cool and mesic woodland habitats, consistent with the ecological requirements of the species and with the habitat observed at Vallone Taliana [29,66]. The new station therefore contributes to a more detailed definition of the regional distribution of the species and confirms its association with mesic deciduous woodland habitats in the north-eastern sector of the island. Nomadic grazing represents a potential local pressure, particularly through trampling and alteration of the herbaceous layer.

Ophrys apifera Huds.

SIC: C.da La Fossa, Panarea, Lipari (Messina), (WGS84: 38.63° N-15.07° E ± 2.2 km), uncultivated vegetation along a trail, 148 m a.s.l., 27 April 2015, obs. et det. A. Crisafulli. - New record for Panarea.

Note: The record from C.da La Fossa documents the occurrence of *Ophrys apifera* on Panarea and contributes to improving the knowledge of the orchid flora of the Aeolian Archipelago. *Ophrys apifera* is a widespread Euro-Mediterranean orchid, also occurring

in Sicily, and is characterized by considerable ecological plasticity, being associated with a variety of open and semi-open habitats, including grasslands, garrigues, woodland margins and secondary or disturbed vegetation [57]. The Panarea plants were observed at 148 m a.s.l. in uncultivated vegetation along a trail, an ecological setting consistent with the known habitat preferences of the species. Considering the fragmented nature of orchid distribution across the circum-Sicilian islands [44], this record provides additional chorological information for the orchid flora of the Aeolian Archipelago.

Ophrys bombyliflora Link

SIC: S.co dell'Arpa, Vulcano (Messina), (WGS84: 38.38° N-14.97° E ± 2.2 km), uncultivated garden within a pine plantation, 331 m a.s.l., 11 March 2026, obs. et det. A. Santanello. - New record for Vulcano.

Note: The record from S.co dell'Arpa documents the occurrence of *Ophrys bombyliflora* on Vulcano and contributes to improving knowledge of the orchid flora of the Aeolian Archipelago. *Ophrys bombyliflora* is a widespread Mediterranean orchid, also native to Sicily, occurring in a variety of open and semi-open habitats, including garrigues, grasslands and open woodlands [57]. The Vulcano population was recorded at 331 m a.s.l. in an uncultivated garden within a pine plantation, an ecological setting consistent with the known habitat preferences of the species. The occurrence is of particular chorological interest in the context of the orchid flora of the circum-Sicilian islands [44]. Urbanization represents a potential local pressure through the alteration and progressive reduction in suitable open and semi-natural habitats.

Serapias nurrica Corrias

SIC: C.se Pileci, Gioiosa Marea (Messina), (WGS84: 38.16° N-14.94° E ± 2.2 km), margins of a cork-oak woodland, 414 m a.s.l., 2 May 2023, leg. et det. A. Crisafulli (MS); M.te Serrazzo above S. Jachiddu, Messina (Messina), (WGS84: 38.23° N-15.53° E ± 2.2 km), margins of a cork-oak woodland, 400 m a.s.l., 9 May 2009, obs et det. A. Crisafulli; Monte Campanò, Messina (Messina), (WGS84: 38.26° N-15.49° E ± 2.2 km), clearings in Mediterranean scrub, 266 m a.s.l., 6 May 2014, leg. et det. A. Crisafulli (MS); Piano Comi, Messina (Messina), (WGS84: 38.26° N-5.48° E ± 2.2 km), clearings in *Erica arborea* scrub, 160 m a.s.l., 26 April 2014, leg. et det. A. Crisafulli (MS); C.da La Fossa, Panarea, Lipari (Messina), (WGS84: 38.63° N-15.07° E ± 2.2 km), along a trail at the base of dry-stone walls, 122 m a.s.l., 24 April 2018, leg. et det. A. Crisafulli (MS); Contrada Falcone, Lipari (Messina), (WGS84: 38.45° N-14.95° E ± 2.2 km), clearings in *Erica arborea* scrub, 198 m a.s.l., 22 April 2022, leg. P. Lo Cascio, det. A. Crisafulli (MS); Capo Calavà, Gioiosa Marea (Messina), (WGS84: 38.19° N-14.92° E ± 2.2 km), clearings in *Erica arborea* scrub, 130 m a.s.l., 22 April 2010, leg. et det. A. Crisafulli (MS). - New stations in north-eastern Sicily and the Aeolian Islands.

Note: These records substantially improve the knowledge of the distribution and ecological range of *Serapias nurrica* in north-eastern Sicily and provide additional chorological data for the Aeolian Archipelago. In Sicily, the species has historically been considered rare and localized, with records mainly concentrated in the northern and north-eastern sectors of the island, including the Peloritani Mountains and the Cefalù area [29,38]. The seven stations reported here extend the available local distributional dataset and document the species between 122 and 414 m a.s.l., both on the Sicilian mainland and on the Aeolian Islands of Panarea and Lipari. The populations occur in a relatively broad range of open and semi-open Mediterranean habitats, including cork-oak woodland margins, clearings within Mediterranean scrub and *Erica arborea* communities, and secondary vegetation along trails bordered by dry-stone walls. This ecological variability is consistent with the habitat preferences previously reported for *S. nurrica*, which in Sicily occurs in garrigues, dry grasslands, scrublands and different types of open or partially wooded vegetation [29,38]. The occurrence of the species in *Erica arborea* scrub and at the margins of

cork-oak woodland further indicates its ability to persist under different degrees of shrub and tree cover, provided that sufficiently open conditions are maintained. The records from Panarea and Lipari are particularly relevant in the context of the fragmented orchid flora of the circum-Sicilian islands and contribute to a more detailed understanding of the distribution of *S. nurrica* within the Aeolian Archipelago. Nomadic grazing, recorded at several of the mainland stations, represents a potential local pressure through trampling and modification of the herbaceous layer and should therefore be considered in the future monitoring of these populations.

Serapias parviflora Parl.

SIC: Dirittusu, Alicudi (Messina), (WGS84: 38.55° N-14.35° E ± 2.2 km), 505 m a.s.l., grassland dominated by *Brachypodium* associated with the narrow endemic of the Aeolian Islands *Silene hicesiae*, 20 April 2026, obs. et det. A. Santanello. - New record for Alicudi.

Note: The record from Dirittusu represents a new contribution to the knowledge of the orchid flora of Alicudi and documents the occurrence of *Serapias parviflora* at 505 m a.s.l. *Serapias parviflora* is a widespread Mediterranean orchid, native to Sicily and other Mediterranean regions [57]. The Alicudi population was found in *Brachypodium*-dominated grassland, an open Mediterranean habitat consistent with the ecological requirements generally reported for the species. Of particular floristic and conservation interest is the occurrence of *S. parviflora* in a plant community associated with *Silene hicesiae*, a narrow endemic restricted to the Aeolian Islands of Alicudi and Panarea [67–69]. *Silene hicesiae* represents one of the most remarkable elements of the Aeolian flora and is closely associated with volcanic environments, occurring on steep rocky slopes, volcanic debris and locally in dry grassland communities. The coexistence of these taxa at Dirittusu therefore emphasizes the floristic value of the site and the importance of maintaining the structural and ecological integrity of its open Mediterranean vegetation. The record also provides additional chorological information on the distribution of *S. parviflora* within the circum-Sicilian islands, whose orchid flora is characterized by considerable differences in species composition among individual islands [44]. Recurrent fires and grazing, recorded as the principal pressures at the site, may influence vegetation structure and the persistence of suitable grassland microhabitats; consequently, the station deserves particular attention in future monitoring of the orchid flora of Alicudi.

Spiranthes spiralis (L.) Chevall.

SIC: Montagna, Alicudi (Messina), (WGS84: 38.54° N-14.36° E ± 2.2 km), 414 m a.s.l., rock-crevice microhabitat within stone steps along a trail, 18 March 2026, obs. et det. A. Santanello; Contrada Salvamento, Panarea, Lipari (Messina), (WGS84: 38.64° N-15.07° E ± 2.2 km), garrigue and rocky grasslands, 323 m a.s.l., 20 October 2023, obs. et det. A. Crisafulli. - New records for the Aeolian Islands.

Note: These records provide new chorological and ecological data on *Spiranthes spiralis* in the Aeolian Archipelago, documenting its occurrence on Alicudi and Panarea. *Spiranthes spiralis* is a widely distributed tuberous geophyte occurring from Europe and the Mediterranean region to western and central Asia and is native to Sicily [57]. The species is typically associated with open, relatively low-growing vegetation, including dry grasslands, grazed meadows, garrigues and other open Mediterranean habitats, whereas dense shading is generally unfavourable [38,70]. The two Aeolian records are therefore particularly interesting from an ecological perspective. On Panarea, the species was recorded at 323 m a.s.l. in garrigue and rocky grassland, a habitat consistent with the ecological conditions commonly reported for the species in Sicily and elsewhere in the Mediterranean. In contrast, the Alicudi station, at 414 m a.s.l., is characterized by a highly localized anthropogenic microhabitat, with plants growing in narrow crevices between stone steps along a trail. This occurrence suggests that small pockets of suitable substrate within traditional stone

structures may locally provide microsites capable of supporting the species even in strongly spatially constrained conditions. The marked ecological contrast between the two stations highlights the capacity of *S. spiralis* to occupy different types of open habitats, provided that competition and canopy cover remain limited. The records also contribute to refining knowledge of the distribution of the species within the circum-Sicilian islands, whose orchid flora shows considerable spatial heterogeneity among individual islands [44]. At the Alicudi station, trampling along the trail and recurrent fires represent potential pressures, particularly because of the restricted extent of the occupied microhabitat. Consequently, preservation of the small open microsites supporting the population should be considered in future monitoring of the species.

Ophrys laurensis Geniez & Melki

SIC: M. Costerotte, Buccheri (Syracuse), (WGS84: 37.15° N-14.86° E ± 2.2 km), open shrubland on volcanic substrates, with scattered *Prunus* spp. and dry-stone walls, 800–850 m a.s.l., 5 June 2024, more than 300 individuals, obs. et det. G. Ardagna. - New station for Sicily.

Note: A large population of *Ophrys laurensis*, comprising more than 300 individuals, was recorded at M. Costerotte, in the municipality of Buccheri, at 800–850 m a.s.l. This finding is of chorological interest because *O. laurensis* is a Sicilian endemic taxon originally described from the Monte Lauro area near Buccheri, with the locus classicus at approximately 900 m a.s.l. [36,65]. The taxon has subsequently been reported from a limited number of localities in Sicily and has been regarded as very rare in the regional flora [38]. The population at M. Costerotte occurs in open shrubland developed on volcanic substrates, characterized by scattered *Prunus* spp. and traditional dry-stone walls. These ecological conditions are consistent with previous observations of the taxon on basaltic substrates in the Hyblaean area [38]. The heterogeneous structure of the vegetation, with open areas interspersed with shrubs and rocky microsites, may provide suitable conditions for the persistence of the population. Despite its considerable size, the population is exposed to several potential pressures. Livestock grazing may affect individuals through trampling and browsing and may modify the structure of the herbaceous and shrub layers, whereas recurrent fires can alter vegetation structure and the availability of suitable microsites. Increasing temperatures associated with climate change represent an additional potential pressure through progressive modification of local environmental conditions. Given the restricted distribution of the taxon and the presence of more than 300 individuals at M. Costerotte, this population represents an important component of the known local occurrence of *O. laurensis* and should be considered in future monitoring aimed at assessing population dynamics and changes in habitat conditions.

3.2.5. Southernmost Records

Ophrys bertolonii Moretti

SIC: Ciappazzo di Dragofora, Bronte (Catania), (WGS84: 37.77° N-14.85° E ± 2.2 km), Etnean lava field ("dagala") characterized by *Ferula communis*, *Euphorbia rigida* and *Centranthus ruber*, with *Pistacia terebinthus* and locally deciduous oaks (*Quercus* sp.), 897 m a.s.l., 1 April 2024, leg. det. A. Santanello & L. Strano (CAT). - Rediscovery for the Etnean district.

Note: Floristic investigations conducted in the Etnean district led to the rediscovery of *Ophrys bertolonii* at Ciappazzo di Dragofora, on the western slopes of Mt Etna. The species was recorded at 897 m a.s.l. within the characteristic vegetation of an Etnean lava field ("dagala"), characterized by *Ferula communis*, *Rubus ulmifolius*, *Euphorbia rigida* and *Centranthus ruber*, with *Pistacia terebinthus* and locally occurring deciduous oaks (*Quercus* sp.). *Ophrys bertolonii* is a Central Mediterranean taxon occurring in Italy, including Sicily [57]. Its occurrence in the Etnean district was historically documented by Strobl in his *Flora des*

Aetna [71]. Despite subsequent detailed investigations of the orchid flora of Mt Etna [30,31], no recent confirmation of the historical occurrence was available. The present finding therefore provides important evidence for the persistence of *O. bertolonii* in the Etnean district, approximately 140 years after the historical record reported by Strobl. A photograph attributable to *O. bertolonii* from Mt Etna was subsequently uploaded to iNaturalist in 2025; however, the population reported here had already been documented during the present investigations, as demonstrated by the original RAW-image metadata associated with the field observations. The population occurs in a habitat exposed to several anthropogenic pressures, particularly trampling, illegal waste dumping, recurrent fires and urbanization, which may contribute to the alteration and progressive fragmentation of the surrounding lava-field vegetation. The rediscovery is therefore of considerable chorological interest and provides updated evidence for the persistence of *O. bertolonii* in the Etnean district.

Epipogium aphyllum Sw.

CAL: Serra di Muro, Sant'Eufemia d'Aspromonte (Reggio Calabria), (WGS84: 38.20° N-15.86° E ± 2.2 km), beech forest, 1250 m a.s.l., 29 June 2024, leg. et det. V.L.A. Laface, L. Torino (REGGIO); Tabaccari, Sinopoli (Reggio Calabria), (WGS84: 38.20° N-15.87° E ± 2.2 km), beech forest, 1350 m a.s.l., 29 June 2024, obs. et det. V.L.A. Laface, L. Torino (REGGIO). - Rediscovery in the Aspromonte National Park and southernmost known stations in Italy and Europe.

Note: Epipogium aphyllum is an achlorophyllous, fully mycoheterotrophic rhizomatous geophyte with a broad temperate Eurasian distribution [57]. Its ecology is strongly dependent on below-ground interactions with mycorrhizal fungi, particularly ectomycorrhizal Basidiomycota associated with surrounding forest trees, which provide the carbon required by the orchid [72]. This highly specialized trophic strategy, together with its predominantly subterranean life cycle and irregular emergence of flowering shoots, makes populations particularly difficult to detect and may result in long intervals between above-ground observations. In Calabria, *E. aphyllum* is a rare component of the regional orchid flora and is associated with montane forest environments [22]. In the Aspromonte massif, the earliest documented findings date to July 1994, when the species was independently discovered near Gambarie and Rifugio Canovai [73]. The observations reported here were made in 2024, 30 years after those initial findings. The two populations recorded at Serra di Muro and Tabaccari confirm the persistence of the species in the Aspromonte massif, where it occurs in montane beech forests between 1250 and 1350 m a.s.l. The population recorded at Serra di Muro is particularly remarkable, with more than 300 individuals observed during the 2024 flowering season, whereas only three individuals were recorded at Tabaccari. These findings considerably improve current knowledge of the distribution and local abundance of *E. aphyllum* in southern Calabria and document the southernmost currently known stations in Italy and Europe [57]. The occurrence of such a large population within the Aspromonte beech forests also emphasizes the importance of maintaining the ecological integrity and microclimatic stability of mature forest habitats supporting the complex plant-fungus-tree interactions required by this mycoheterotrophic orchid. Despite the large number of individuals observed at Serra di Muro, both populations may be vulnerable to changes affecting forest microclimate and substrate conditions. Increasing drought and heat stress associated with climate change may modify the cool and humid conditions of montane beech forests, while recreational trampling can directly damage the short-lived above-ground flowering shoots. Occasional collection of flowering individuals represents an additional potential pressure. The confirmation of *E. aphyllum* in the Aspromonte massif, together with the documentation of additional localities, is therefore of considerable chorological and conservation interest and highlights the need for long-term monitoring of population emergence, abundance and habitat conditions.

Corallorhiza trifida Châtel.

BAS: Vacquarro, Viggianello (Potenza), (WGS84: 39.93° N-16.17° E ± 2.2 km), calcareous soil within a Fagus sylvatica forest, 1515 m a.s.l., 7 June 2020, obs. et det. A. De Marco (REGGIO). - Southernmost station of Italy.

Note: Corallorhiza trifida is a circumboreal orchid with a specialized trophic strategy based on associations with ectomycorrhizal fungi and is currently regarded as partially mycoheterotrophic [57,74]. In Italy, the species is mainly associated with cool and humid montane forests and becomes increasingly rare and localized towards the southern part of the Peninsula. The population recorded at Vacquarro, at 1515 m a.s.l. within a *Fagus sylvatica* forest on calcareous soil, represents the southernmost currently documented station in continental Italy. This isolated occurrence in the Pollino massif is therefore of particular biogeographical interest, documenting the persistence of a boreal-temperate element at the southern limit of its Italian distribution. Its dependence on suitable forest microclimatic conditions and fungal associations highlights the importance of preserving the ecological integrity of the surrounding beech forest [74,75].

Epipactis calabrica **U. Grabner, S. Hertel & Presser**

CAL: Serra di Muro, Sant'Eufemia d'Aspromonte (Reggio Calabria), (WGS84: 38.20° N-15.86° E ± 2.2 km), mixed forest with beech and white fir, 1300 m a.s.l., 26 July 2026, obs. et det. V.L.A. Laface, L. Torino. - Southernmost station for Italy.

Note: Epipactis calabrica is a rare Italian endemic orchid originally described from Calabria and subsequently recognized in the Italian vascular flora [14,76]. The species is known from the Serre and Aspromonte massifs, where it occurs mainly between 1000 and 1500 m a.s.l., particularly in montane beech forests with *Abies alba* and, more rarely, in pure *Fagus sylvatica* stands [76]. The newly discovered population at Serra di Muro comprises 31 individuals growing at 1300 m a.s.l. in a mixed *F. sylvatica-A. alba* forest, thus closely matching the ecological conditions reported for the species. This record represents the southernmost currently known station attributable to *E. calabrica* and further emphasizes the importance of conservation of the montane beech-fir forests of the Aspromonte massif.

Epipactis robatschiana **Bartolo, D'Emerico, Pulvirenti, Terrasi & Stuto**

CAL: Bosco di Gambarie, Santo Stefano in Aspromonte (Reggio Calabria), (WGS84: 38.17° N-15.84° E ± 2.2 km), mixed forest with beech, black pine and white fir, 1340 m a.s.l., 26 July 2026, obs. et det. V.L.A. Laface, L. Torino. - Southernmost station for Italy.

Note: Epipactis robatschiana was described from Calabria on the basis of morphological and cytotaxonomic evidence and remains a taxon of considerable phytogeographical interest within the Epipactis muelleri complex [24]. The Aspromonte population documented here extends its confirmed distribution southwards and constitutes the southernmost currently known occurrence attributable to the species.

Himantoglossum hircinum **(L.) Spreng.**

CAL: Monte Paladino, Gasperina (Catanzaro), (WGS84: 38.75° N-16.50° E ± 2 km), open meadows near Quercus pubescens woodland, 660 m a.s.l., 18 May 2025, obs. et det. L. Torino & V.L.A. Laface. - Southernmost station currently known in peninsular Italy.

Note: Himantoglossum hircinum is a Euro-Mediterranean orchid with a scattered distribution in southern Italy [14,77]. The population discovered at Monte Paladino represents the southernmost currently documented occurrence in Calabria and extends the known regional distribution toward the Ionian sector. It occurs in open mesophilous grasslands bordering thermophilous deciduous woodlands dominated by *Quercus pubescens*, within an ecological setting consistent with the open grassland and woodland-margin habitats typically occupied by the species [78]. Given the small size of the population and the local pressures observed, including grazing, trampling and habitat alteration, continued monitoring is recommended to assess its persistence and temporal dynamics.

***Himantoglossum adriaticum* H.Baumann**

CAL: Costa di Gioia, Cassano all'Ionio (Cosenza), (WGS84: 39.79° N-16.29° E ± 2.2 km), Pinus pinea plantation, 630 m a.s.l., 18 May 2026, obs. et det. A. De Marco. - Southernmost station of Italy.

Note: Himantoglossum adriaticum is a Central European and north-Adriatic orchid whose Italian distribution is concentrated mainly in northern and central regions, becoming progressively rarer southwards [14,79]. The occurrence at Costa di Gioia considerably extends the currently documented range of the species in peninsular Italy. The species was found within an open sector of a *Pinus pinea* plantation, confirming its ability to colonise semi-natural habitats derived from anthropogenic forest environments. This locality presently represents the southernmost known station in continental Italy. From a conservation perspective, *H. adriaticum* is assessed as Least Concern (LC) in the IUCN Red List and is subject to strict regional protection in Calabria. The occurrence of this peripheral population therefore deserves particular attention, especially considering the highly localized distribution of the species in the region [80].

***Neottia ovata* (L.) Bluff & Fingerh.**

CAL: Stallette, San Giorgio Morgeto (Reggio Calabria), (WGS84: 38.37° N-16.14° E ± 2.2 km), margin of a beech forest, 860 m a.s.l., 18 June 2025, 6 specimens, obs. et det. V.L.A. Laface, L. Torino. - Southernmost station of continental Italy.

Note: Neottia ovata is a widely distributed Eurasian orchid, but it becomes increasingly uncommon towards the Mediterranean sector of its range [21,52,66]. In Calabria, the species is mainly associated with humid montane habitats and remains locally rare [22]. The population discovered inside Aspromonte National Park represents the southernmost currently documented occurrence in continental Italy.

***Orchis anthropophora* (L.) All.**

CAL: M.te Rotta di Scano, Melito di Porto Salvo (Reggio Calabria), (WGS84: 37.95° N-15.81° E ± 2.2 km), dry and rocky slopes of a hill, 310 m a.s.l., 12 April 2026, 15 specimens, obs. et det. V.L.A. Laface, L. Torino (REGGIO). - Southernmost station of continental Italy.

Note: Orchis anthropophora is a Mediterranean-European species occurring mainly in dry grasslands, scrublands and open woodland habitats [21,52,66]. Although broadly distributed in Italy, its occurrence becomes increasingly sporadic towards the southernmost regions of the Peninsula [18]. The population documented at M.te Rotta di Scano currently represents the southernmost known station in continental Italy.

***Orchis pallens* L.**

BAS: Piano Ruggio, Viggianello (Potenza), (WGS84: 39.91° N-16.12° E ± 2.2 km), calcareous soil in a *Fagus sylvatica* forest and mountain prairie near stands of *Pinus heldreichii* subsp. *leucodermis*, 1579 m a.s.l., 22 May 2026, obs. et det. A. De Marco, L. Torino, V.L.A. Laface-Southernmost station of Italy.

Note: Orchis pallens is a European montane orchid with a distribution centred in central and southeastern Europe and only scattered populations in southern Italy [14,79]. The species generally inhabits cool grasslands, forest margins and montane clearings on calcareous substrates. The population discovered at Piano Ruggio occurs within one of the most biogeographically significant sectors of the Pollino Massif, an area known for hosting numerous relict and montane taxa [22,81]. This finding represents the southernmost currently documented station of the species in continental Italy.

3.3. Validation of Previously Invalidly Published Hybrid Names

During a nomenclatural review of orchid hybrids described from southern Calabria, four names published by Laface & Torino [16] were found not to have been validly published under the provisions of the International Code of Nomenclature for algae, fungi, and

plants [59]. In each case, photographic documentation was designated as the nomenclatural type, whereas a preserved specimen is required for the valid publication of a name of a new taxon at the rank of species or below (Arts. 8.1, 40.1,40.4 and 40.6 ICN). The plants illustrated in the original protologues were subsequently collected, preserved, and deposited in the Herbarium REGGIO, where they are permanently conserved and available for study. The names are validated below through the designation of these specimens as holotypes. In accordance with Arts. 33.1 and 38.13 ICN, full and direct references, as specified in Art. 41.5 ICN, are provided below to the descriptions and diagnoses published in the original protologues.

3.3.1. *Dactylorhiza* × *aspromontana* V.L.A. Laface & L. Torino

Type: ITALY. Calabria, Metropolitan City of Reggio Calabria, Municipality of Roccaforte del Greco, Tre Limiti, Aspromonte Massif, beech forest, 1588 m a.s.l., 21 Jun 2026, V.L.A. Laface & L. Torino (holotype: REGGIO).

Hybrid formula: *Dactylorhiza gervasiana* (Tod.) H.Baumann & Künkele × *Dactylorhiza sambucina* (L.) Soó.

Description and diagnosis: As published in the protologue of *Dactylorhiza* × *aspromontana* V.L.A. Laface & L. Torino, Conservation 5(4), Article 85, pp. 6–8 (2025), here cited by full and direct reference in accordance with Art. 38.13, as specified in Art. 41.5 ICN.

Etymology: The epithet refers to the Aspromonte Massif (Calabria, southern Italy), where the hybrid was discovered.

Nomenclatural note: Published as *Dactylorhiza* × *aspromontana* V.L.A. Laface & L. Torino in Conservation 5(4), Article 85, pp. 6–8 (2025), nom. inval., because the designated type consisted of photographic documentation rather than a preserved specimen, contrary to Art. 40.4 and 40.6 ICN. Designation of the holotype cited above, together with the full and direct reference to the previously published description and diagnosis, validates the name.

IPNI LSID: urn:lsid:ipni.org:names:77377599-1

3.3.2. *Ophrys* × *montis-stellae* V.L.A. Laface & L. Torino

Type: ITALY. Calabria, Metropolitan City of Reggio Calabria, Municipality of Pazzano, Santuario Madonna della Stella, meadow near pine plantations, 726 m a.s.l., 29 March 2026, V.L.A. Laface & L. Torino (holotype: REGGIO).

Hybrid formula: *Ophrys bertolonii* Moretti × *Ophrys exaltata* Ten.

Description and diagnosis: As published in the protologue of *Ophrys* × *montis-stellae* V.L.A. Laface & L. Torino, Conservation 5(4), Article 85, pp. 9–11 (2025), here cited by full and direct reference in accordance with Art. 38.13, as specified in Art. 41.5 ICN.

Etymology: The epithet refers to Monte Stella and the Sanctuary of Madonna della Stella near Pazzano, where the hybrid was discovered.

Nomenclatural note: Published as *Ophrys* × *montis-stellae* V.L.A. Laface & L. Torino in Conservation 5(4), Article 85, pp. 9–11 (2025), nom. inval., because the designated type consisted of photographic documentation rather than a preserved specimen, contrary to Art. 40.4 and 40.6 ICN. Designation of the holotype cited above, together with the full and direct reference to the previously published description and diagnosis, validates the name.

IPNI LSID: urn:lsid:ipni.org:names:77377598-1

3.3.3. *Ophrys* × *spampinatoi* V.L.A. Laface & L. Torino

≡ *Ophrys* × *spampinatii* V.L.A. Laface & L. Torino, Conservation 5(4), Article 85, pp. 12–14 (2025), nom. inval.

Type: ITALY. Calabria, Metropolitan City of Reggio Calabria, Municipality of Motta San Giovanni, Scariglione, edge of a pine forest, 839 m a.s.l., 23 March 2026, V.L.A. Laface & L. Torino (holotype: REGGIO).

Hybrid formula: *Ophrys exaltata* Ten. × *Ophrys incubacea* Bianca ex Tod.

Description and diagnosis: As published in the protologue of *Ophrys* × *spampinatii* V.L.A. Laface & L. Torino, Conservation 5(4), Article 85, pp. 12–14 (2025), here cited by full and direct reference in accordance with Art. 38.13, as specified in Art. 41.5 ICN.

Etymology: Named in honour of Professor Giovanni Spampinato, botanist and Full Professor at the Mediterranea University of Reggio Calabria, in recognition of his contributions to the knowledge of the flora and vegetation of southern Italy.

Nomenclatural note: The name was originally published as *Ophrys* × *spampinatii* V.L.A. Laface & L. Torino in Conservation 5(4), Article 85, pp. 12–14 (2025), nom. inval., because the designated type consisted of photographic documentation rather than a preserved specimen, contrary to Art. 40.4 and 40.6 ICN. The personal epithet commemorating Giovanni Spampinato is correctly formed as *spampinatoi* in accordance with the provisions of the ICN concerning epithets derived from personal names. Designation of the holotype cited above, together with the full and direct reference to the previously published description and diagnosis, validates the name.

IPNI LSID: urn:lsid:ipni.org:names:77377596-1

3.3.4. *Ophrys* × *stilarensis* V.L.A. Laface & L. Torino

Type: ITALY. Calabria, Metropolitan City of Reggio Calabria, Municipality of Camini, Bavigliardo, garrigue vegetation, Habitat 5330 "Thermo-Mediterranean and predesert scrub", 137 m a.s.l., 30 March 2026, V.L.A. Laface & L. Torino (holotype: REGGIO).

Hybrid formula: *Ophrys exaltata* Ten. × *Ophrys incubacea* Bianca subsp. *brutia* (P.Delforge) Kreutz.

Description and diagnosis: As published in the protologue of *Ophrys* × *stilarensis* V.L.A. Laface & L. Torino, Conservation 5(4), Article 85, pp. 15–18 (2025), here cited by full and direct reference in accordance with Art. 38.13, as specified in Art. 41.5 ICN.

Etymology: The epithet derives from the Stilaro Valley and the surrounding territory of Stilo and Bivongi in southern Calabria, where the hybrid was discovered.

Nomenclatural note: Published as *Ophrys* × *stilarensis* V.L.A. Laface & L. Torino in Conservation 5(4), Article 85, pp. 15–18 (2025), nom. inval., because the designated type consisted of photographic documentation rather than a preserved specimen, contrary to Art. 40.4 and 40.6 ICN. Designation of the holotype cited above, together with the full and direct reference to the previously published description and diagnosis, validates the name.

IPNI LSID: urn:lsid:ipni.org:names:77377597-1

4. Discussion

The results of the present study expand current knowledge of the taxonomic diversity and distribution of Orchidaceae in southern Italy, documenting six *Ophrys* nothotaxa proposed as new to science, new regional records for Calabria and Sicily, confirmations of previously reported taxa, new local and insular records, confirmations of historical occurrences, and several populations located at the southern limit of their currently known Italian distribution. The data concern Calabria, Basilicata, Sicily, and the circum-Sicilian islands and encompass a broad ecological gradient, ranging from open Mediterranean habitats, such as grasslands and garrigues, to volcanic substrates and montane forest formations. The diversity of the results obtained appears to reflect not a single process, but the combined effects of natural hybridization, incomplete floristic knowledge, the extension of previously known distributional limits, and the persistence of geographically

isolated populations. The continuous updating of the checklist of the Italian vascular flora further confirms that distributional knowledge can still be refined even in territories with a long tradition of botanical exploration [14]. Beyond their taxonomic and biogeographical relevance, these findings provide baseline information for integrating orchid conservation into sustainable land-use planning. Updated knowledge of species occurrence can help identify sites requiring attention, inform the assessment of proposed land-use changes, and guide monitoring efforts. The contribution to sustainability therefore lies in improving the evidence available for decisions affecting the long-term persistence of orchid populations and their habitats.

4.1. Natural Hybridization and Diversification in Ophrys

A result of particular taxonomic interest is represented by the recognition of six *Ophrys* nothotaxa proposed as new to science: *O.* × *continii* (*O. exaltata* × *O. lutea*), *O.* × *epizephyra* (*O. bombyliflora* × *Ophrys incubacea* subsp. *brutia*), *O.* × *halepensis* (*O. bertolonii* subsp. *explanata* × *O. passionis*), *O.* × *libertii* (*O. bertolonii* × *O. gracilis*), *O.* × *marcionensis* (*O. pinguis* × *O. tenthredinifera*), and *O.* × *nicolosiana* (*O. passionis* × *Ophrys sphegodes* subsp. *grassoana*). The finding of these entities is consistent with the particular reproductive biology of the genus *Ophrys*, in which reproductive isolation is strongly associated with prezygotic mechanisms mediated by pollinators. Sexual deception is based on the production of signals, especially chemical signals, that mimic those of female pollinating insects, inducing pseudocopulatory behaviour in males; the composition of olfactory signals may therefore play a fundamental role in pollinator specificity and reproductive isolation among taxa [7,82,83].

The existence of natural hybrids does not contradict the high reproductive specialization characteristic of the genus. Studies on Mediterranean orchids with deceptive pollination have in fact shown that, in sexually deceptive *Ophrys*, prezygotic barriers associated with pollinator specificity can be particularly effective, whereas post-pollination isolation may be comparatively less pronounced. When pollinator-mediated isolation is not complete, interspecific pollen transfer therefore remains possible. The nothotaxa documented in the present study can thus be interpreted within this biological framework, as the result of events in which normally effective reproductive barriers did not completely prevent crossing between sympatric taxa [7,83–85].

The interpretation of the hybrid origin of the new nothotaxa is supported by the combination of morphological characters attributable to the respective parental taxa, involving, depending on the taxon, the shape and dimensions of the labellum, macula, basal field, stigmatic cavity, pseudo-eyes, lateral gibbosities, petals, and apiculus. However, morphological intermediacy must be evaluated with caution in the genus *Ophrys*, in which phylogenetic studies have highlighted a relationship that is not always straightforward between morphological differentiation and molecular divergence. The convergence of multiple intermediate characters, associated with the local coexistence of the putative parental taxa, therefore constitutes a coherent body of field evidence in support of a hybrid origin, which may be further verified through independent molecular and reproductive approaches [9]. For example, Cortis et al. [84] demonstrated the value of integrating AFLP markers with controlled crosses and assessments of fruit and seed set to investigate hybridization and reproductive barriers between sympatric *Ophrys* taxa.

Particularly significant is the case of *O.* × *halepensis*, which was recorded at three distinct localities within the "Pino d'Aleppo" Nature Reserve, with small groups of flowering individuals occurring where the parental taxa *O. bertolonii* subsp. *explanata* and *O. passionis* coexist. This spatial pattern suggests that conditions suitable for hybrid formation may occur repeatedly within the area, although morphological and distributional evidence alone

cannot determine whether the observed individuals result from independent F1 formation events, reproduction among hybrids, or backcrossing with parental taxa. Genetic studies of Mediterranean orchid hybrid zones have shown that hybrid populations may consist predominantly of F1 individuals, highlighting the need for genetic analyses to clarify their structure [7,64]. Individuals were observed mainly along the margins of *Pinus halepensis* formations under partial tree cover, which may provide less exposed microenvironmental conditions; however, without specific microclimatic measurements, this remains an ecological hypothesis. The occurrence of the hybrid where the parental taxa come into contact is nevertheless consistent with the role of sympatry and the occasional breakdown of prezygotic barriers in natural orchid hybridization [1,7,83–85]. Given the small and spatially restricted populations, together with local pressures including recurrent fires, drought, high temperatures, motocross activities, soil disturbance, and illegal waste dumping, long-term monitoring appears appropriate, particularly because orchid conservation depends on maintaining both populations and the ecological and biotic conditions required for recruitment and reproduction [2,86].

From a conservation perspective as well, natural hybridization must therefore be interpreted in the context of the parental populations and the environment in which it occurs. Studies on hybrid zones of Mediterranean orchids have shown that the presence of hybrids does not necessarily imply widespread introgression or genetic erosion of the parental populations [64]. Although concerning reproductive systems that are not completely comparable to the *Ophrys* considered in the present study, these studies highlight the importance of conserving the natural processes of interaction among populations rather than considering exclusively individual hybrid plants. The protection of the sites should therefore include the maintenance of the parental populations and the ecological conditions that allow their coexistence [2,64]. In this context, sustainable habitat management should aim to maintain the ecological conditions supporting parental populations, pollinator interactions, and opportunities for natural hybridization, while limiting avoidable habitat degradation. This perspective extends conservation attention from individual plants to the ecological processes occurring within the sites.

4.2. New Regional Records and Chorological Significance

The new records of *Ophrys cinnabarina* and *Orchis* × *pseudoanatolica* for Calabria highlight how knowledge of the regional orchid flora can be further expanded. This result is consistent with the continuous updating of knowledge on the Italian vascular flora, for which new taxonomic and chorological acquisitions continue to modify the regional distributional framework [14].

The finding of *O. cinnabarina* in Calabria is of particular interest because it extends towards the southern end of the Italian Peninsula the documented distribution of a taxon described from southern Italy. This record should be interpreted primarily as an extension of the known distribution: in the absence of specific genetic, demographic, or historical information, it is not possible to establish whether the Calabrian population represents a previously undetected population, a presence of ancient origin, or the result of more recent distributional dynamics. Nevertheless, the new finding highlights the incompleteness of current knowledge of the species' distribution and confirms the usefulness of further surveys in the Mediterranean areas of southern Calabria [14,15,60].

The significance of the Sicilian records of *O.* × *montis-stellae* and *O.* × *spampinatoi*, nothotaxa previously documented in southern Calabria [16], is different. Their finding on Mt. Etna extends the known geographical range of both hybrids and documents the occurrence of the same hybrid combinations also outside the previously known Calabrian localities. Considering the predominant role of pollinator-mediated prezygotic barriers

in the genus *Ophrys*, it is biologically plausible that the same hybrid combinations may arise independently in different areas where the parental taxa coexist; however, the actual independent origin of the Sicilian populations can only be demonstrated through genetic analyses [1,7,83].

4.3. Sicily and the Aeolian Islands

The new local and insular records obtained in Sicily constitute a further significant component of the study. The finding of *Neottia ovata* in northeastern Sicily, *Ophrys apifera* on Panarea, *O. bombyliflora* on Vulcano, and *Serapias parviflora* on Alicudi, together with the new localities of *S. nurrica* and *Spiranthes spiralis*, highlights how the distribution of Orchidaceae in the circum-Sicilian islands can be further refined through targeted field surveys. Previous studies had already highlighted the orchidological interest of the circum-Sicilian islands, while the new data contribute to their floristic composition in greater detail at the scale of individual islands [29,38,44].

The biogeographical significance of these findings is supported by recent quantitative analyses of the distribution of Orchidaceae on small Mediterranean islands. Lussu et al. [42], analysing 112 islands in the central-western Mediterranean, highlighted how orchid richness and distribution are associated with multiple geographical and ecological factors, including island area, isolation, habitat diversity, and pollination strategy, with different responses among functional groups. The new data from Panarea, Vulcano, and Alicudi therefore expand the available information on the distribution of Orchidaceae in the Aeolian archipelago, an insular system in which geographical factors, habitat availability, and reproductive biology jointly contribute to determining species occurrence [42].

The Aeolian localities identified in the present study occur in different ecological contexts, including garrigues, rocky grasslands, *Erica arborea* shrublands, uncultivated vegetation, path margins, and small microhabitats embedded within landscapes traditionally modified by humans. This observation does not imply that anthropogenic disturbance generally favours Orchidaceae, but highlights that insular populations may occupy a diverse mosaic of natural and semi-natural habitats. This finding is consistent with the importance attributed to habitat diversity in determining orchid distribution on small Mediterranean islands and suggests the importance of preserving environmental heterogeneity for maintaining insular orchid diversity [42,44]. From a sustainability perspective, these records can inform local planning by identifying orchid-bearing habitats within landscapes that also accommodate human activities. Incorporating this information into decisions concerning trail maintenance, vegetation clearance, and changes in land use could help retain small habitat patches and reduce avoidable disturbance. Management measures should nevertheless be tailored to the ecological requirements of the taxa present, rather than assuming that a single approach is suitable across all islands and habitats.

Of particular interest is the locality of *Serapias parviflora* on Alicudi, located in a *Brachypodium*-dominated grassland associated with *Silene hicesiae*. The latter, originally described from Panarea, is a narrow endemic of the Aeolian Islands, with populations known from Panarea and Alicudi, and is included as a priority species in Annexes II and IV of Directive 92/43/EEC [67,68]. The species is also of high conservation interest and is currently reported as Vulnerable (VU) on the IUCN Red List [87]. Its conservation has been the subject of specific interventions within the LIFE EOLIFE99 project, including in situ and ex situ actions aimed at protecting and reinforcing the Aeolian populations [68]. The coexistence of *S. parviflora* with an Aeolian endemic of high conservation interest therefore confers additional floristic value on the identified locality and highlights the importance of the small habitat mosaics present in the Aeolian Islands for the conservation of insular plant diversity [44,68].

4.4. Confirmations, Rediscoveries, and Population Persistence

The confirmations of *Epipactis hyblaea* and *Ophrys fusca* subsp. *pallida*, together with the additional localities documented for other taxa, highlight how the reassessment of historical records represents an essential complement to the documentation of new entities and new distributional data. Herbarium collections play a particularly important role in this context, as they make it possible to verify the historical occurrence of a taxon, critically reassess its identification, and compare past distributional data with those derived from contemporary surveys [88,89]. This approach is particularly useful in Orchidaceae, in which nomenclatural changes and different taxonomic interpretations can make the evaluation of historical records complex [14,90].

Particularly significant is the documentation of *O. fusca* subsp. *pallida* in southeastern Sicily. The historical occurrence of the taxon in the present-day territory of Ragusa is documented by specimens from the Tornabene Herbarium of the University of Catania collected in Modica at the end of the nineteenth century [90]. The revision of the Orchidaceae preserved in the collection confirmed the existence of historical material referred to as *O. pallida*, thus providing an important reference for evaluating contemporary findings. The new documentation therefore does not constitute a first regional occurrence, but rather represents the contemporary confirmation of a taxon historically documented in southeastern Sicily [90].

The finding of a flowering plant in 2016 in the Vallone delle Coste area is particularly significant in light of this historical documentation. Subsequent monitoring between 2021 and 2024 confirmed the flowering of the taxon during the years of observation and also made it possible to observe two closely spaced shoots apparently referable to the same vegetative unit. Rather than interpreting the finding as a recent colonization, the presence of historical specimens and of the contemporary population is compatible with the persistence, at least at the regional scale, of the taxon in southeastern Sicily and shows how extremely small populations may remain undocumented for long periods of time [86,90].

The current situation of the population, however, requires particular caution. The area has been affected by works for the widening of the Ragusa-Catania road, and the persistence of the plant after the interventions has not yet been verified. It is therefore not possible to state either that the population has been destroyed or that it has survived. New targeted surveys during the flowering period will be necessary, especially considering the very small size of the previously observed population. Indeed, in extremely small populations, failure to observe the taxon in a single season cannot automatically be interpreted as evidence of local extinction, particularly in the absence of an adequate search effort repeated over time [86,91]. This case illustrates the relevance of updated floristic information to sustainable infrastructure planning. Where populations of conservation concern are documented, surveys conducted before works, consideration of alternatives that avoid occupied habitat, and subsequent monitoring could help reduce the risk of biodiversity loss. These are prospective management recommendations; the available observations do not establish whether such measures were implemented or whether they would have ensured the persistence of this population.

4.5. Ophrys laurensis: Refinement of the Known Distribution Range

The new finding of *Ophrys laurensis* makes it possible to refine the distribution of a taxon that is highly localized in southeastern Sicily. The species was described by Geniez & Melki on the basis of material from Monte Lauro, near Buccheri, and the subsequent literature has documented a distribution predominantly concentrated in the Hyblaean sector, with particular reference to the Monte Lauro area and neighbouring localities [36–38].

The new locality at Monte Costerotte is therefore of interest mainly because it contributes to defining more accurately the spatial extent of the taxon's occurrence in this sector.

The new population should not, however, be interpreted as indicative of a marked geographical expansion of the range, considering its relative proximity to the *locus classicus*. Rather, the record has chorological value, as it documents an additional locality of the taxon outside the previously better-known core area and contributes to refining its local distribution. In taxa characterized by extremely restricted distributions, the documentation of new localities, even when geographically close to those already known, can provide relevant information for a more accurate definition of the distribution and population size [36–38].

The number of individuals observed at the new locality, with several hundred individuals, represents a positive element in terms of population documentation, but does not eliminate the need to consider local pressures. Grazing and subsequent fire events were recorded in the area; the former may cause direct damage to the inflorescences through consumption or trampling, whereas sufficient data are not currently available to quantify the effects of fire on the population. Multi-year post-fire monitoring will therefore be useful, allowing temporary variations in the emergence or flowering of individuals to be distinguished from persistent demographic changes. Indeed, in terrestrial orchids, interannual variability in emergence and the possibility of periods of underground dormancy may make the observation of above-ground individuals alone insufficient to assess actual population dynamics; it is therefore appropriate to avoid inferring a decline on the basis of single seasons of observation, favouring comparable time series and repeated monitoring over time [86,92,93].

4.6. Epipactis hyblaea: Confirmation of an Extremely Localized Population

The confirmation of *Epipactis hyblaea* is of particular relevance. The species was described by Brullo & Zimmitti [35] from southeastern Sicily on the basis of a geographically isolated population consisting of a small number of individuals. The contemporary verification of its presence therefore contributes to updating knowledge on the persistence of the taxon at the known locality and is of particular value considering the small size of the population reported since the original description [35].

In the present study, 13 flowering individuals were recorded. However, this value should not be interpreted in isolation as indicative of the overall population size or demographic trend: differences in sampling effort, seasonal conditions, and the probability of emergence and flowering may influence the number of individuals observable in a given season. Indeed, in terrestrial orchids, interannual variability in emergence and flowering, together with the possibility of periods of underground dormancy, can make the interpretation of surveys conducted in single seasons complex [92,93]. The most significant result is therefore the confirmation of the persistence of the population, whereas any demographic trend can only be established through standardized surveys repeated over time [86,93].

The strong geographical localization of *E. hyblaea*, currently assessed as Vulnerable (VU) under criterion D2 in the Red List of Italian Flora, makes the conservation of the forest habitat in which the species occurs particularly important. Among the potential pressures observed in the area is the risk of fire, which could directly modify the conditions of the locality and, indirectly, the tree cover and the understory microclimate. In the absence of specific experimental data on the response of the species to fire, however, it is not possible to quantify this effect. The conservation of the forest habitat and demographic monitoring of the population therefore constitute important elements for assessing its conservation status over time [35,86,94].

4.7. Epipogium aphyllum: Rediscovery and Ecological Specialization

The populations of *Epipogium aphyllum* identified in Aspromonte represent one of the most ecologically distinctive results of the present study. The species is an achlorophyllous mycoheterotrophic orchid, entirely dependent on its fungal symbionts for carbon acquisition. Roy et al. [72] highlighted a predominant association with ectomycorrhizal species of the genus *Inocybe* and indicated the surrounding trees as the probable ultimate source of the carbon transferred to the orchid through the fungal symbiont. The conservation of *E. aphyllum* should therefore be considered within the ecological system comprising the orchid, its fungal symbionts, and the tree component, and should not be limited solely to the protection of above-ground individuals [72,95].

The marked difference between the population of Serra di Muro, where more than 300 individuals were counted, and that of Tabaccari, represented by only three individuals during the survey, must be interpreted in light of the particular biology of the species. *Epipogium aphyllum* spends most of its life cycle underground, and the emergence and flowering of above-ground structures can be highly irregular; moreover, the rhizome can persist underground without being detected for several years. Consequently, the number of above-ground individuals observed during a single season cannot automatically be equated with the overall population size, nor can it be used in isolation to infer its demographic trend. Nevertheless, the abundant emergence recorded at Serra di Muro represents an important reference datum for the future monitoring of the Aspromonte populations [95].

Mycorrhizal specialization further reinforces the need to consider the forest habitat as a whole. Roy et al. [72], studying Eurasian populations of the species, identified *Inocybe* as the main genus of fungal symbionts, with other ectomycorrhizal Basidiomycota recorded more rarely. The ecology of *E. aphyllum* therefore depends on below-ground interactions that cannot be assessed solely through surveys of above-ground individuals. Any alterations to forest structure, substrate, or fungal communities could therefore be relevant to the persistence of the populations, although the effects of individual pressures on the Aspromonte localities will require specific investigations and long-term monitoring [72,95]. These ecological dependencies are also relevant to sustainable forest management. At occupied sites, management decisions should consider soil integrity, the surrounding tree component, and local microenvironmental conditions, rather than focusing solely on visible orchid shoots. The present records can help identify localities where forestry operations should be preceded by site-specific ecological assessment and accompanied by monitoring.

4.8. Southern Distribution Limits and Montane Forest Habitats

A further element of interest is represented by the identification of localities situated near the southern limit of the currently known Italian distribution of several taxa. The concentration of some of these findings in the Pollino and Aspromonte massifs highlights the chorological importance of the mountain systems of southern Italy for Orchidaceae diversity. However, based on the available data, these populations should be regarded as peripheral populations with respect to the known Italian distribution: their geographical position alone does not allow them to be interpreted as glacial relicts or refugial populations, interpretations that would require specific phylogeographical, genetic, or palaeoecological evidence [14].

The finding of *Himantoglossum hircinum* at Monte Paladino contributes to refining the regional distribution towards the Ionian sector of a species that, although widely distributed in Europe, becomes more localized in southern Italy [14,77]. The locality represents the currently southernmost documented occurrence in Calabria and should be interpreted primarily as a refinement of knowledge of the regional distribution rather than, in the absence of historical or demographic information, as evidence of a recent range expansion.

The small size of the observed population also makes the locality a useful reference for future monitoring aimed at verifying its persistence over time.

Among forest taxa, *Corallorhiza trifida* represents a case of particular interest also because of its trophic strategy, which differs from that of *Epipogium aphyllum*. Although strongly dependent on fungal associations, adult individuals of *C. trifida* are not completely mycoheterotrophic. Through isotopic analyses, Zimmer et al. [74] estimated that, in flowering adult individuals, approximately 77 ± 10% of carbon and 52 ± 5% of nitrogen are of fungal origin, while simultaneously documenting the presence of chlorophyll and an autotrophic component. Adult individuals of the species are therefore considered partially mycoheterotrophic. The locality identified in the Pollino thus has a dual interest, both chorological and ecological, documenting, in the extreme southern sector of its Italian distribution, the occurrence of a circumboreal forest orchid, rare and localized in southern Italy [14,96,97], and characterized by a highly specialized nutritional strategy [74].

The records of *Epipactis calabrica* and *E. robatschiana* complete the picture concerning montane forest orchids. *Epipactis calabrica*, described on the basis of material from Calabria, was subsequently included in treatments of the Italian vascular flora [14,76]. *Epipactis robatschiana* is also historically documented in Calabria, including the Serre Calabre and Aspromonte, and the new locality contributes to further refining its regional distribution [77]. These findings highlight the floristic value of montane forest formations characterized by *Fagus sylvatica*, *Abies alba* and, locally, other conifers, which in the extreme southern sector of the Italian Peninsula may host peripheral populations of taxa with different biogeographical distributions.

The findings of *Himantoglossum adriaticum*, *Neottia ovata*, *Orchis anthropophora*, and *O. pallens*, taxa characterized by different ecological requirements and distributions, can also be added to this framework. *Himantoglossum adriaticum*, predominantly distributed in central Europe and the northern Adriatic sector, becomes progressively rarer towards southern Italy [14,79]. *Neottia ovata*, a species with a wide Eurasian distribution, becomes progressively less common towards the Mediterranean sector and in Calabria is mainly associated with humid montane environments [21,22,52,66]. *Orchis anthropophora*, mainly associated with dry grasslands, shrublands, and open woodlands, shows a progressively more sporadic occurrence towards the southern regions of the Italian Peninsula [18,21,52,66], whereas *O. pallens* represents a European montane element with more fragmented populations in southern Italy [14,79].

Taken together, these findings, along with the localities of *Epipogium aphyllum* discussed in the previous section, show that the southern distributional limits documented in the present study involve taxa with different biogeographical and ecological characteristics and include forest habitats, montane grasslands, forest margins, and more open environments.

4.9. Ecological Interactions and Implications for Conservation

The results show that the conservation requirements of the documented taxa differ according to their biology. In sexually deceptive *Ophrys*, the persistence of populations depends not exclusively on the maintenance of vegetation, but also on the continuity of interactions with pollinating insects. The chemical mimicry of female sexual signals is in fact a fundamental mechanism of sexual deception, while pollinator specificity contributes to reproductive isolation. The conservation of *Ophrys* populations should therefore also consider the ecological conditions necessary for maintaining plant-pollinator interactions [7,82,83].

Forest orchids require a different perspective. All Orchidaceae depend on fungal symbionts at least during the early stages of their life cycle, but this dependence reaches

particularly high levels in mycoheterotrophic species. In *Epipogium aphyllum*, ectomycorrhizal fungi mediate the acquisition of carbon derived from surrounding trees, whereas *Corallorhiza trifida* combines photosynthetic activity with a substantial fungal contribution of carbon and nitrogen. These two models show how the simple conservation of the area occupied by adult individuals may not be sufficient if the below-ground interactions necessary for completion of the life cycle are altered [72,74,86].

The pressures recorded at the studied localities include urbanization, trampling, grazing, recurrent fires, waste dumping and, at several sites, conditions of drought and high temperatures. However, these factors must be interpreted in relation to the ecological characteristics of the individual populations and not attributed to a single generalized model of threat. Field observations document the presence of these pressures in the areas concerned, but do not automatically demonstrate a causal relationship with any demographic changes. Establishing such a relationship requires multi-year monitoring, which is particularly important in Orchidaceae, in which dormancy, interannual variability in emergence and flowering, pollination specialization, and dependence on fungal symbionts can make the interpretation of changes observed in individual seasons complex [86,93].

Similar caution must be maintained when interpreting the effects of climate change. Several montane populations documented in the present study occur in environments potentially exposed to variations in temperature and water availability, but the data collected do not allow any demographic changes to be attributed to climate change. Rather, the new localities constitute important reference data for future monitoring programmes, through which it will be possible to assess over time any changes in emergence, flowering, individual abundance, and habitat characteristics [86,93]. Taken together, these findings support an approach to sustainability in which the conservation of orchid populations is integrated into the management of the habitats and ecological interactions on which they depend. The documented localities provide a spatial baseline for identifying potential conflicts between biodiversity conservation and land-use activities. Repeated observations could then inform the adjustment of management practices, including the timing and intensity of grazing, vegetation clearance, recreational access, or forestry operations, according to site-specific evidence. The effectiveness of any such measures would need to be evaluated through monitoring, since the present study did not experimentally test management interventions.

4.10. Methodological Implications and Future Perspectives

The high number and diversity of taxonomic and chorological novelties that emerged during the survey highlight the importance of field campaigns repeated across different years, seasons, and territories. The detectability of Orchidaceae can be strongly influenced by phenology, population size, and the biological characteristics of individual species and, in extreme cases such as *Epipogium aphyllum*, by the irregular emergence of aboveground structures. Surveys limited to a single season may therefore underestimate the local occurrence of some taxa, whereas repeated monitoring allows the persistence of populations to be documented more accurately and chorological knowledge to be progressively refined [86,93,95].

For the new *Ophrys* nothotaxa, future investigations should integrate morphological evidence with genetic and reproductive information. In particular, analyses of nuclear markers, such as microsatellites or genome-wide SNPs, including reference samples of the putative parental taxa, would be needed to test and potentially confirm the hypothesized hybrid origin [98,99]. Complementary chloroplast DNA analyses could help identify the maternal lineage, provided that the parental taxa possess distinguishable chloroplast haplotypes and that maternal inheritance is established [100]. Molecular markers could verify the contribution of the parental taxa and make it possible to distinguish F1 individuals

from subsequent hybrid generations or possible backcrosses, whereas the analysis of floral volatile compounds and direct observation of pollinators could contribute to clarifying the mechanisms that allow interspecific pollen transfer. This approach is particularly appropriate in *Ophrys*, considering the central role of olfactory signals in pollinator attraction and the complexity of the relationships among phenotypic differentiation, reproductive isolation, and genetic divergence [9,83,101].

Documentation through voucher specimens, adopted for most of the records, represents a further relevant methodological element. Herbarium specimens constitute permanent and re-examinable evidence, allowing taxonomic identifications to be verified in light of subsequent revisions, while the associated geographical data enable the reconstruction of historical distributions and the reassessment of documented populations over time [88,89]. At the same time, specimen collection was conducted conservatively, particularly in the case of rare, localized, or conservation-relevant taxa, by limiting sampling to the minimum amount of material required for taxonomic or nomenclatural purposes [102]. When fresh material was necessary, sampling was limited to a single flower from the selected individual, without removing or otherwise compromising the whole plant, thereby minimizing the potential impact on the population. The case of *Ophrys fusca* subsp. *pallida*, for which historical material from the Tornabene Herbarium allows comparison with contemporary observations, provides a concrete example of the value of botanical collections in verifying historical records and reconstructing changes in known distribution [90].

The results obtained also highlight the need to differentiate monitoring and conservation strategies according to the biological and ecological characteristics of the taxa. Natural hybridization zones should be considered together with the parental populations and the reproductive processes that allow their formation; on small islands, the maintenance of habitat heterogeneity is particularly important; and in mycoheterotrophic or partially mycoheterotrophic forest orchids, interactions with fungal symbionts and the overall ecological conditions of the forest ecosystem must also be considered. For extremely localized taxa, such as *Epipactis hyblaea* and *Ophrys laurensis*, monitoring individual populations and assessing habitat transformations over time are particularly important [42,64,72,74,86].

The integration of floristic field surveys, documentation through voucher specimens, georeferencing, re-examination of historical sources, and morphological, molecular, ecological, and reproductive approaches therefore represents a useful perspective for investigating the origin of the nothotaxa in greater depth, refining distributional knowledge, and assessing the persistence of populations over time. The localities documented in the present study constitute reference points for future monitoring programmes, in which comparable time series may allow interannual fluctuations to be distinguished from possible persistent demographic changes [86,93]. To translate these findings into practical sustainability outcomes, a useful next step would be to make the validated records available to protected-area managers and land-use authorities, while applying appropriate safeguards to sensitive locality information. Linking these records with repeated population surveys and assessments of habitat change could help prioritize conservation actions and evaluate their outcomes. Although the study does not directly measure improvements in sustainability, it provides a taxonomic and distributional foundation for more informed biodiversity conservation and sustainable habitat management in southern Italy.

5. Conclusions

The present study significantly expands taxonomic, chorological, and conservation knowledge of Orchidaceae in southern Italy. Surveys conducted in Calabria, Basilicata, Sicily, and the circum-Sicilian islands made it possible to document six new *Ophrys* nothotaxa, new regional and insular records, confirmations and rediscoveries of rare or poorly

documented taxa, as well as new localities situated at the southern limits of the currently known ranges. Overall, these results highlight how the orchid diversity of southern Italy is still only partially known and how systematic and repeated field surveys can provide relevant contributions even in historically explored territories. The frequency and diversity of the hybridization phenomena observed in *Ophrys* also underline the importance of southern Italy for the study of natural hybridization processes and the reproductive dynamics of the genus. At the same time, the new data concerning the Aeolian Islands and the montane forest populations of the Pollino and Aspromonte contribute to defining more precisely the distribution of rare, localized taxa or taxa occurring at the southern margins of their ranges. The documented populations are associated with very different habitats and, in several cases, are affected by pressures such as habitat transformation, fires, grazing, trampling, and other forms of anthropogenic disturbance. The new data therefore constitute an important knowledge base for future monitoring and conservation programmes. By identifying localities and populations of conservation interest, these findings can also inform sustainable land-use planning and help integrate biodiversity considerations into decisions concerning infrastructure, forestry, agricultural practices, and recreational activities. In particular, the protection of Orchidaceae should not be limited to individual plants or individual localities, but should also consider habitat integrity and ecological interactions with pollinators and fungal symbionts. Sustainable habitat management should therefore account for the ecological requirements of the taxa present, with management measures adjusted through repeated monitoring and assessment of local pressures. Finally, the integration of field observations, documentation through voucher specimens, review of historical sources, and precise geographical information is confirmed as essential for improving knowledge of the orchid flora. Future molecular, ecological, and reproductive analyses may further investigate the origin of the new nothotaxa, verify relationships among populations, and assess over time the dynamics of the rarest and most vulnerable populations. The present study therefore provides an updated basis for further research on the taxonomy, biogeography, and conservation of Orchidaceae in southern Italy. Its contribution to sustainability lies in providing evidence that can support conservation priorities and guide habitat management towards the long-term persistence of orchid diversity alongside human land use.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/su182111219/s1, Figure S1: Orchid taxa corresponding to new records, confirmations, rediscoveries, and southernmost known stations in southern Italy: (a) *Corallorhiza trifida* Châtel.; (b) *Epipactis calabrica* U.Grabner, S.Hertel & Presser; (c) *Epipactis hyblaea* Brullo & Zimmitti; (d) *Epipactis robatschiana* Bartolo, D'Emerico, Pulv., Terrasi & Stuto; (e) *Epipogium aphyllum* Sw.; (f) *Himantoglossum adriaticum* H.Baumann; (g) *Himantoglossum hircinum* (L.) Spreng.; (h) *Neottia ovata* (L.) Bluff & Fingerh.; (i) *Ophrys apifera* Huds.; (j) *Ophrys bertolonii* Moretti; (k) *Ophrys bombyliflora* Link; (l) *Ophrys cinnabarina* Romolini & Soca; (m) *Ophrys laurensis* Geniez & Melki; (n) *Ophrys fusca* Link subsp. *pallida* (Raf.) E.G.Camus; (o) *Orchis anthropophora* (L.) All.; (p) *Orchis pallens* L.; (q) *Orchis* × *pseudoanatolica* H.Fleischm.; (r) *Serapias nurrica* Corrias; (s) *Serapias parviflora* Parl.; (t) *Spiranthes spiralis* (L.) Chevall.; Table S1: Geographic, ecological, and collection data for Orchidaceae records from southern Italy. Records include newly described hybrids, new regional, local, and insular occurrences, confirmations and rediscoveries of previously reported taxa, and southernmost known stations. For each record, taxon name, record status, administrative and locality data, geographic coordinates (WGS84), altitude, habitat, observation or collection date, and collectors and/or determiners are provided. Geographic coordinates are intentionally generalized to protect sensitive taxa and populations.

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