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Source: Willdenowia, 47(3) : 243-258

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.47.47308

Willdenowia
Annals of the Botanic Garden and Botanical Museum Berlin-Dahlem

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A botanical survey of Joseph Quer's *Flora española*

Version of record first published online on 15 November 2017 ahead of inclusion in December 2017 issue.

Abstract: We examine various aspects of Joseph Quer's *Flora española* (1762–1764, 1784), taking into consideration the contributions made by Casimiro Gómez Ortega and proposing that he be credited as a co-author on the last two volumes of the work. *Flora española* comprises 2602 species, 2493 of which are vascular plants, including both wild and cultivated species. When assigned to the currently accepted species of *Flora iberica*, we obtain 1690 native or naturalized plant species (28 % of the total Spanish species). Most of the reported species correspond to common plants, only 3 % are considered narrowly distributed species and no more than 5 % are endemic species. In *Flora española* only two species are proposed as new. The limited number of new taxa may be due to Quer's self-taught background, strongly influenced by Tournefort's work, and the unfavourable scientific environment, characterized by the lack of resources and supporting institutions. By far the weakest points of *Flora española* are the names listed in alphabetical order and the use of old polynomials instead of Linnaean binomials. In contrast, the study of dried plants then kept at herbaria constituted a suitable working methodology, which made this Flora a solid base for subsequent works in the Iberian Peninsula. We also address the extensive field work carried out by Quer: he visited 632 different localities spread over most of the Iberian Peninsula. The information provided in *Flora española*, together with a thorough review of Quer's herbarium vouchers, the labels of which do not include information on localities, allows us to gain valuable insights into some rare and potentially extinct species.

Resumen: Se analizan diversos aspectos de la *Flora española* de Joseph Quer (1762–64, 1784). Se revisa la aportación de Casimiro Gómez Ortega y se propone su coautoría en los dos últimos volúmenes de la obra. La *Flora española* comprende 2602 especies, 2493 de las cuales son plantas vasculares, que incluyen tanto especies silvestres como cultivadas. Cuando estas especies son asignadas a las actualmente aceptadas en *Flora iberica*, se obtienen 1690 especies nativas o naturalizadas (28 % del total de especies de España). La mayor parte de las especies citadas corresponden a plantas comunes, solo el 3 % tienen un área de distribución reducida y únicamente el 5 % son especies endémicas. En la *Flora española* solo se proponen 2 nuevas especies. La escasa originalidad de esta flora puede deberse a la formación autodidacta de Quer, fuertemente influenciado por la obra de Tournefort, y a un entorno científico poco propicio por la falta de instituciones y medios materiales. La ordenación alfabética de la *Flora española* y el uso de los antiguos polinomios en vez de los nombres binomiales linneanos son sus puntos más débiles. Por el contrario, la preparación de un herbario como base de su flora, hace de su trabajo un sólido precedente de las floras actuales. En el mismo sentido, se puede destacar el amplio trabajo de campo realizado por Quer, quien visitó 632 localidades distintas repartidas por casi toda la Península Ibérica. La información proporcionada por la *Flora española* junto con la revisión exhaustiva del material de herbario de Quer, cuyas etiquetas carecen de localidad, nos ha permitido obtener nuevos datos sobre algunas especies raras o posiblemente extintas.

Key words: *Flora española*, *Flora iberica*, history of botany, Iberian Peninsula, Joseph Quer, Spain, vascular plants

Article history: Received 12 June 2017; peer-review completed 23 August 2017; received in revised form 2 October 2017; accepted for publication 10 October 2017.

Citation: Aedo C., Fernández-Albert M., Barberá P., Buira A., Quintanar A., Medina L. & Morales R. 2017: A botanical survey of Joseph Quer's *Flora española*. – Willdenowia 47: 243–258. doi: https://doi.org/10.3372/wi.47.47308

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Introduction

Joseph Quer y Martínez was likely born in Perpignan, in what is now the Pyrénées-Orientales department of S France, on 26 January 1695, and died in Madrid on 19 March 1764. He was a surgeon in the Spanish Army and travelled with his regiment across the Iberian Peninsula. He also visited Oran once (in 1732) and Italy twice (1733–1737 and 1742–1745). According to Gómez Ortega (1784), Quer was stationed in Girona, Zaragoza, Valencia, Cardona, Berga, Tarragona and Alicante during his service in the army. During his first trip to Italy, he met Michelangelo Tilli in Pisa, the Director of the Orto Botanico di Pisa. Some years later, while his regiment was stationed in Bologna, Quer paid frequent visits to Giuseppe Monti, who directed the botanical garden there. Upon his return from Italy, Quer stopped in Montpellier to meet the French botanist François Boissier de Sauvages. In March 1746 he settled in Madrid. On 21 November 1755 he was appointed *Primer Profesor* of the recently founded Real Jardín Botánico of Madrid (Gómez Ortega 1784). During this time, Quer explored different regions of the Iberian Peninsula and started developing the initial contributions to his seminal work, *Flora española*. The first three volumes were published in 1762, while the fourth was published some months after his death in 1764. In 1773, the *Protomedicato* ordered the completion of *Flora española* by Casimiro Gómez Ortega using Quer's manuscripts as a basis.

In Quer's time, the Iberian Peninsula was still poorly known from a botanical point of view. The texts and plants of those few botanists from Central Europe who had travelled throughout Spain and Portugal were the only source of information available to Quer. Among these authors, Carolus Clusius (1526–1609) stands out. Between 1564 and 1565, he explored Andalusia, Aragon, Castile, Valencia and the central region of Portugal, collecting plants and seeds that were sent to Flanders. In 1576 he published his *Rariorum aliquot stirpium per Hispanias observatarum historia*, which contained information on 300 plants (225 from Spain and Portugal) and 233 original illustrations. Jacques Barrelier (1606–1673) travelled throughout Spain (Barcelona, Valencia, Córdoba, etc.) and collected plants in the mid-17th century. In *Plantae per Galliam*, *Hispaniam et Italiam observatae* (Barrelier 1714), published posthumously in 1714 by Antoine de Jussieu, Barrelier arranged plant observations in a very similar way to that found in Clusius's work, also including many illustrations. Unfortunately in both cases the associated plant collections seem to have been lost. However, the most important explorations were those of Joseph Pitton de Tournefort, who visited the Iberian Peninsula in 1687 and 1688–1689. Henriques (1890; 1898) made a list of plants collected and places visited by Tournefort based on some manuscripts discovered in the library of the Botanical Garden of the University of Coimbra. Tournefort's collection is undoubtedly the largest and most valuable antique plant collection from the Iberian Peninsula. Furthermore, its value is increased due to its location in such a major institution as the Muséum National d'Histoire Naturelle in Paris (P-TRF; herbarium codes according to Thiers 2017+). Antoine de Jussieu travelled throughout Spain and Portugal in 1716–1717 and also collected plants now kept in the Muséum National d'Histoire Naturelle in Paris (P-JU and P-LA) (Folch 1972). Both French botanists had a significant impact on the Spanish scientific environment due to their relationship with local naturalists like the Salvador family, a dynasty of pharmacists from Barcelona that built up a Natural History Cabinet between the 17th and 18th centuries. Jaume Salvador i Pedrol participated in one of Tournefort's expeditions and his son Joan Salvador i Riera accompanied Jussieu. The duplicates of these collections went to their Natural History Cabinet (Camarasa 1989; Ibañez 2006). Now they are conserved in the Institut Botànic de Barcelona (BC) and constitute the oldest Spanish herbarium that survives to our time.

Following in the footsteps of his illustrious predecessors, Quer proposed to carry out a synthetic work about the Spanish flora, in which he would combine and harmonize his own original data and the results of his travels throughout the Iberian Peninsula with those from the bibliographic sources indicated above. However, the environment for scientific research at the time was unfavourable to the success of his ambitious vision.

With the research project *Flora iberica* (Castroviejo 1986–2016) in its final stage, a large set of floristic and taxonomic information about the Iberian flora has already been gathered. All this information allows us to study the elaboration and content of *Flora española*. The aim of our work is thus to analyse the new contributions of this work and to evaluate the scientific results of *Flora española* in light of our current knowledge.

Material and methods

All species and localities cited in the original text of *Flora española* were compiled into a database, in which each cited species was linked to its corresponding locality. The spelling of archaic place names was adapted to the current spelling when necessary, although both forms were maintained in separate fields. Place names were then georeferenced in the database, when possible, using MGRS 10 km coordinates following geographical gazetteers, as well as other web tools, such as Google Earth (https://www.google.com/earth/) or GEOLocate (Rios & Bart 2010).

Quer generally used a Tournefortian polynomial as the accepted name for each species, preceded by an ordinal number. For each polynomial, he wrote the first word, which represented the genus, in capital letters. For example, "*II. CHENOPODIUM folio triangulo. T. Inst. R. H. 506*" (vol. 4: 219). We have used this generic name

and the number of the species (e.g. *Chenopodium II*) to unequivocally identify each polynomial cited by Quer, in the same way proposed by Colmeiro (1885–1889). A binomial was then attributed to each polynomial in the first four volumes, using the identifications recorded by Colmeiro (1885–1889). The information about the corresponding binomials in the remaining volumes was already provided by Gómez Ortega, when he completed the work. In every case, we made the necessary nomenclatural and taxonomic updates following the taxonomic treatments published in *Flora iberica* (Castroviejo 1986–2016). Additionally, we requested images of the rarest species from the herbarium of the Conservatoire et Jardin botaniques de la Ville de Genève (G).

Results

The authorship of *Flora española*

Stafleu & Cowan (1983: 436) attributed the totality of *Flora española* to Quer, giving little importance to the work of Gómez Ortega (Stafleu & Cowan 1981: 847). In contrast, the authorship of the last two volumes has been attributed to Gómez Ortega in other works, for example, in the bibliographic appendices of *Flora iberica* (Castroviejo & al. 1990: 774).

Gómez Ortega explains in the foreword to the fifth volume (page v) that Quer left written materials to continue his work until the genus *Sium*, enough to complete the entire fifth volume and half of the sixth volume (the first 310 pages of 667). Gómez Ortega maintained the general structure of the work and respected the Tournefortian names of the species, although he added the Linnaean binomial as a synonym, which constitutes a relevant contribution to improve the quality of this Flora. To reduce the publication expenses of such a prolix work, he decreased the font size, suppressed the synonyms, synthesized the discussion about uses and virtues and eliminated the text corresponding to the *Analysis chymica*. He also added three plates of species that he had not treated at the end of the sixth volume (tab. XIV, XV and XIX). The second part of the sixth volume, for which Quer had left no manuscripts, is a work carried out entirely by Gómez Ortega, although he acknowledged the help of Isidoro de Saracha and Matías Villares as well as the influence of Asso's publication (Asso 1779). All these elements suggest that the contribution of Gómez Ortega was significant, and went far beyond the work of a mere compiler to the point that he would be recognized as co-author of the last two volumes. It is obvious that his intervention is more important in the sixth volume than in the fifth, but his contribution to the whole of the work must be valued. The most important aspect is probably the inclusion of the Linnaean names, but we must also consider the numerous footnotes making corrections and additions to Quer's text, as well as the botanical index (*Índice botánico*, *ó sistemático de todas las plantas contenidas en la Flora española*), which was added to the end of the sixth volume. In this index he organized the genera according to Tournefort's classes and sections, allowing the identification of the related groups and mitigating the impractical alphabetical order that distances, even in independent volumes, genera of the same family.

For all these reasons we propose the following bibliographical reference for *Flora española*:

J. Quer y Martínez, *Flora española*, *ó Historia de las plantas que se crían en España* […], Madrid, 1762–1784, 4 vols. [vol. 1 (1762); vol. 2 (1762); vol. 3 (Dec 1762 or early in 1763); vol. 4 (Apr–Dec 1764)].

J. Quer y Martínez & C. Gómez Ortega, *Continuación de la Flora española*, *ó Historia de las plantas de España*, *que escribía Don Joseph Quer* […], Madrid, 1784, vol. 5 and 6.

The *Elogio histórico de Don Joseph Quer*, written by Casimiro Gómez Ortega was published as separate work with independent pagination, probably at the same time as the *Continuación de la Flora española*. The same text was integrated into the fifth volume of this work, after the foreword, and with correlative pagination (pages xi–xxxii). In this case it seems obvious for reasons of clarity that it is preferable to cite the *Elogio histórico* as a separate work (Gómez Ortega 1784).

Quer's herbarium

One of the most relevant aspects of Quer's work is the collection and drying of the studied plants and the preparation of a herbarium as a basis for his *Flora española*, characteristic of a modern scientific approach. The references to his "herbario" or "herbario seco" are constant throughout *Flora española* (vol. 1: 3, 29, 41; vol. 3: 29, 136; vol. 4: 69, 195, 260, 279, 283, 309, 414, 426; vol. 5: 36, 40, 135, 194, 215, 218; vol. 6: 76, 287), demonstrating the importance that Quer placed on the conservation of specimens. However, his aim was to keep testimonies of the species rather than to provide chorological information, since no herbarium label includes information related to the locality. The number of herbarium specimens, around 2000 (Briquet 1919: 473), is close to the number of species recognized in *Flora española*.

In *Flora española*, the cases in which a date is associated with an observation or collection are very rare (up to 102 records over 6825). Early on (1721: *Absinthium I*; 1730: *Cistus XIV*) there was no explicit indication as to whether or not a plant was collected. It was only after 1739 (*Alsine XXIII*) that Quer claimed to have collected the plant in a few cases and included a date. Gómez Ortega (1784: iii, iv) stated that Quer began his herbarium during the expedition to Oran in 1732 and continued it during the first expedition to Italy in 1733. In any case, these first collections appear to have been lost in a storm when returning from the expedition to Italy in early 1737 on the warship San Isidro. Therefore, we must assume that the plants in Quer's herbarium were collected in

the Iberian Peninsula or Balearic Islands between 1737 and 1764, in Italy during the expedition of 1742–1745 (which also included a brief visit to the Hyères islands), or were the exchange acquisitions he made with his correspondents, particularly with Giuseppe Monti in Bologna (Gómez Ortega 1784: xi).

Quer's herbarium, which also included Cristóbal Vélez's herbarium, was acquired by Benjamin Delessert in 1833 under unknown circumstances. The collection is currently integrated in the general herbarium of the Conservatoire et Jardin botaniques de la Ville de Genève, apart from a small number of plants preserved in a bound volume in the library of that institution (Briquet 1919: 473). As Briquet (1919) pointed out, these herbarium specimens lack any indication of where they were collected. The only annotations are the Tournefortian polynomials and sometimes some synonyms. Stafleu & Cowan (1983: 436) stated that Quer's plants are also conserved in the Montin Herbarium at the Swedish Museum of Natural History in Stockholm (S) and at the Real Jardín Botánico of Madrid (MA). It has not been possible to confirm this first assertion (J. Klackenberg, in litt.) and the second one is an error since none of Quer's plants is held at MA.

The contents of *Flora española*

Although Quer (vol. 1: xxxvii) supposedly expected to publish at least eight volumes, finally and thanks to the intervention of Gómez Ortega, *Flora española* was concluded in six volumes. The first volume is essentially introductory with a historical section and a vehement defence of the superiority of Tournefort's method over that of Linnaeus. The second volume has an introductory chapter, with various catalogues of authors and botanical terms. It is not until page 129 that Quer begins to describe the species. One of the main criticisms of Quer's Flora is the alphabetical ordering by genera (Gómez Ortega 1784: viii; Colmeiro 1858: 72; Briquet 1919: 471). This impractical system, which does not allow the comparison of the closest groups, is somewhat attenuated in the pages 83–104 of the second volume, where Quer included a list of the genera recognized in the work grouped in Tournefort's 23 classes. Later, as we already mentioned, Gómez Ortega would add a complete "*Índice botánico, ó sistemático de todas las plantas contenidas en la Flora española*" at the end of the sixth volume.

After the name of each genus, the corresponding Tournefortian class is indicated. The descriptions of genera are translations of those of Tournefort (1700). The polynomial corresponding to each species is headed by the name of the genus indicated in capital letters after a number in running order. The vast majority of the polynomials are attributed either to Tournefort alone or to both Tournefort and C. Bahuin. The synonyms of Clusius and Barrelier are included as well as some others, usually in a more irregular way. Occasionally the Linnaean name is also included. Following the scientific names, the "medicinal" name and the Castilian name of the species are indicated, for a set of the species. In a paragraph under each species or, sometimes grouping several ones, the localities in which the species have been seen are indicated, and details such as the habitat and the flowering season are provided.

This is likely the most significant original contribution of the work. The description of each species also seems original, although in some cases fragments could have been translated from Clusius (1576). Similarly, the active principles, the medicinal uses, and other uses, as well as everything either found in the literature or observed during his field work are compiled in an independent section, titled *Analysis chymica*. This chapter only included selected species, and is sometimes found to be divided into several sub-chapters. The rest of the volumes have a similar structure. The fifth volume begins with a foreword and the *Elogio histórico*, written by Gómez Ortega, constituting the source of most of the known biographical information about Quer. In the item in which the authorship of *Flora española* is discussed, the modifications introduced by Gómez Ortega in the fifth and sixth volumes are mentioned.

Numerical data in *Flora española*

The *Flora española* comprises 2602 species distributed between 649 genera. This figure includes 109 species of animals, fungi, algae, lichens and bryophytes, and 2493 vascular plant species, 377 of which are useful plant species for agricultural and ornamental purposes. When they are assigned to the currently accepted species of *Flora iberica*, we obtain 1690 wild species across 771 genera (Table 1). The assignment has been difficult and uncertain in some cases and more than 100 species have been only tentatively identified.

This figure represents 28 % of the total number of Spanish species (5930) according to *Flora iberica* (Buira & al. 2017). Only 75 Iberian and Balearic endemic species are cited in *Flora española*, representing less than 5 % of all the listed species. Since endemic species represent over 20 % of the total Spanish flora (Table 1), this group is extremely under-represented in *Flora española*. Similarly, only 51 species cited by Quer (3.1 %) are

Table 1. Total number of Spanish plant species included in *Flora iberica* and *Flora española*. The species of *Flora española* have been assigned to the currently accepted species.

	Total species	**Alien species**	**Endemic species**
Flora iberica	5930	470 (7.9 %)	1280 (21.6 %)
Flora española	1690	120 (7.1 %)	75 (4.4 %)

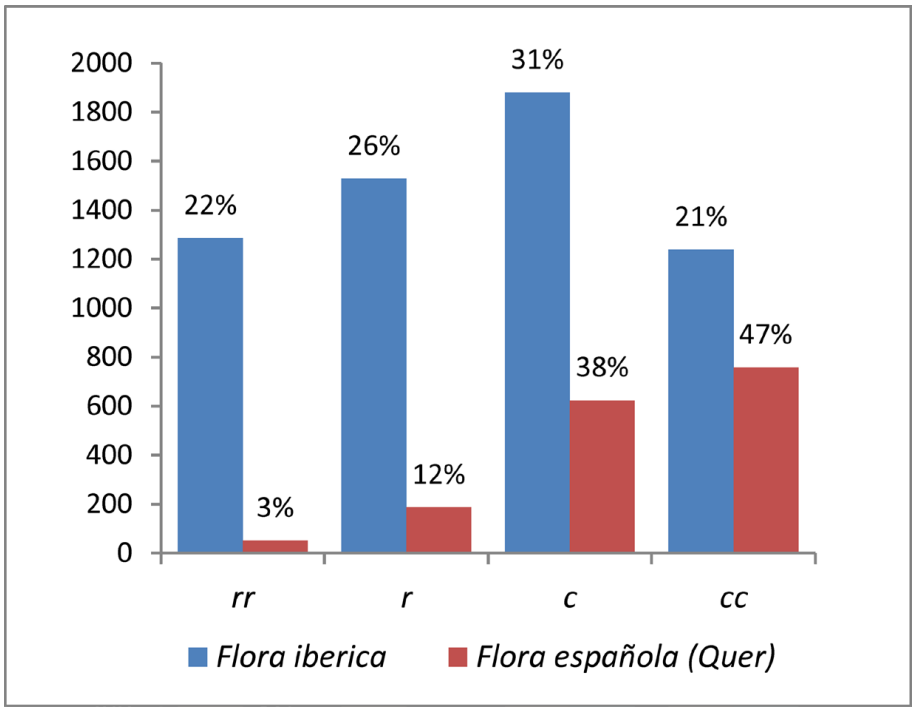

Fig. 1. Number of species by category of abundance in *Flora iberica* and *Flora española*. – Abbreviations: *rr* = narrowly distributed; *r* = rare; *c* = common; *cc* = common and widespread.

considered very rare or narrowly distributed, while this group represents 22 % of the total Spanish flora (Fig. 1). In fact, the species included in *Flora española* are mostly widely distributed plants: over 85 % (1382 species) are considered common or very common species according to the current distributional data (Fig. 1). In contrast, the proportion of alien species (7 %) is roughly the same as that in *Flora iberica* (Table 1).

The geographical distribution of citations

In *Flora española* plants from 632 different localities are mentioned. This figure has been obtained after unifying the different orthographic variants. From all of these, we have been able to locate 577 with 10 km precision (Fig. 2). The remaining 55 are either very general (i.e. "reino de Valencia") or could not be located. The map of Fig. 2 shows that Quer visited almost all of the Iberian Peninsula, from Girona to Cádiz and from La Coruña to Almería. The island of Mallorca is mentioned in several species but it can only once be clearly deduced (under *Capparis spinosa* L., *Capparis II*, vol. 3: 399) that Quer went to the island, since he stated: "[…] *y la he visto tambien en muchas partes de Extremadura; pero con mas particularidad en la Isla de Mallorca* […]" (and I have also seen it in many parts of Extremadura, but more specifically on the island of Mallorca). Quer focused his study on the current province of Madrid (mentioned in 1840 citations), and its neighbours, such as the provinces of Ávila (265 citations), Guadalajara (103) and Segovia (106). These provinces account for a third of the 6825 total citations in *Flora española*. Quer prospected the drier areas near the capital quite intensely as well as the mountains of the Central System. Other areas studied in some depth were the provinces of Barcelona and Girona, with 298 and 104 citations, respectively. Although many of the citations are concentrated in the city of Barcelona and its surroundings, it is important to note the exploration of the mountain ranges of the Montseny, Montserrat and various localities of the E Pyrenees. Two other provinces with a number of citations are Zaragoza and Valencia, with 151 and 201, respectively. In the first case a good part of them are due to the exploration of Moncayo, while in the second case they are concentrated in the city of Valencia and its surroundings. Although one of the most valuable characteristics of Quer's work is the high degree of geographical precision of his citations, it is also true that in about 35 % of them the localities are vaguely identified (i.e. Catalonian Pyrenees, Kingdom of Granada, Spain, etc.).

Quer's work is limited to the vicinity of the main cities in which he resided and the routes connecting them, through the royal roads. Limited mobility and the scarcity of resources made other options difficult. Nevertheless, a certain degree of exploration of the peninsular mountains with much more difficult access can be verified. For example, according to Gómez Ortega (1784: xvi), Quer was at Gredos lagoon in the spring of 1752. Citations from other relatively high points in the Central System are relatively frequent. Years earlier, in 1740, Quer told us that he was in Montseny (vol. 3: 249), in "[…] *una Ermita*, *llamada Santa Susanna*, *la que destinamos para nuestro quartèl nocturno en los veinte dias*, *que ocupamos en explorarle* […]" (a hermitage, called Santa Susanna, which we used as nocturnal quarters during the twenty days we spent exploring it). The exploration of Moncayo seems to have taken place in 1728, when Quer was stationed with his regiment in Zaragoza, thanks to the support of master Rodríguez from the monastery at the foot of the mountain, as reported by Gómez Ortega (1784: ii). The number of citations coming from these mountainous areas is minimal compared to the total number.

Although most of Quer's work is original, he also visited some of his predecessors' localities, which he usually indicated. For example, in *Atractylis humilis* L. [*Carlina V*, vol. 4: 47] he stated "[…] *la he hallado*, *y visto en el mismo sitio en que la hallò el insigne Padre Barrelier*, *en*

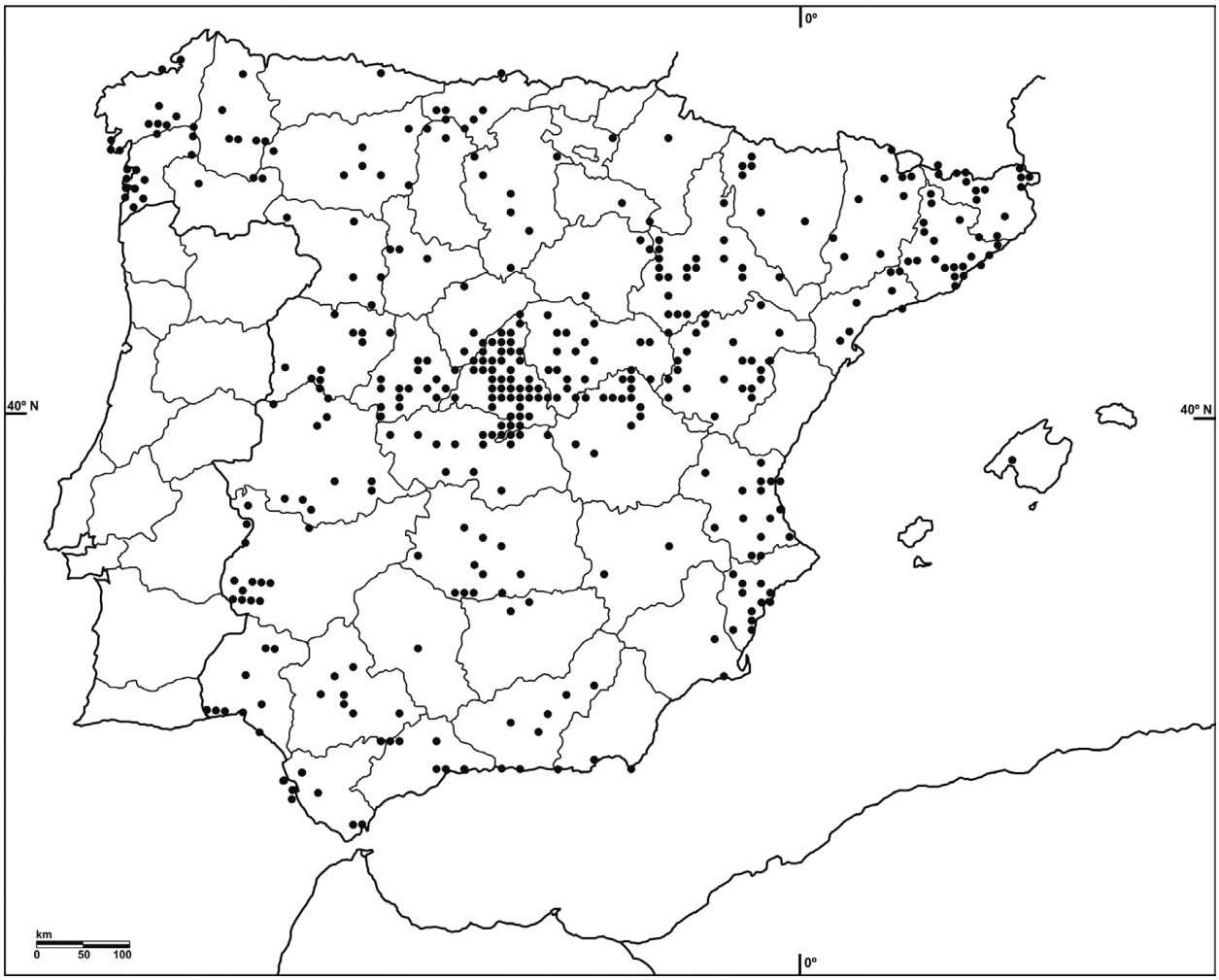

Fig. 2. Located localities mentioned by Quer in *Flora española*.

el Reyno de Valencia en el Desierto de la Murtha […]" (I have found and seen it in the same place where it was found by the great Father Barrelier, in the Kingdom of Valencia in the Murtha Desert); in *Cistus clusii* Dunal [*Cistus XIV*, vol. 4: 326] he said "*Esta especie la he visto en el mismo terreno*, *que cita Clusio*, *en el año 1730. antes de embarcarme para la Expedicion de Oràn*, *en las cercanias de Xativa* […]" (I have seen this species in the same land, which Clusius cites in 1730, before embarking for the Expedition of Oran, near Xativa). In other cases, as *Juno planiflora* (Mill.) Asch. [*Xiphion I*, vol. 6: 500], there is no mention of the source, but both the localities and the description of the species seem to be translated from Clusius (1576: 273). A few similar cases have been detected, generally relating to the last part of the work, for which Gómez Ortega no longer had Quer's manuscripts.

Regarding the dates on which the localities were visited, little can be added to what has been said in relation to the herbarium. In *Flora española*, the date on which a locality was visited is mentioned only 102 times (Fig. 3). Some of the dates indicated are questionable. It is said that *Corema album* (L.) D. Don [*Empetrum I*, vol. 5: 70] was collected in 1760, but this is in all probability an error, since Quer's visit to Galicia took place during the summer of 1761. It seems difficult, likewise, that Quer travelled to the E Pyrenees in 1761 [*Menynathes trifoliata* L., *Menyanthes I*, vol. 5: 431], since his trip to Galicia began on 8 August of that same year. This information is insufficient to outline itineraries or to allow other types of generalizations. As Gómez Ortega (1784: xviii) remarked: "*El deseo de que semejante Obra saliese completa*, *le obligó á emprender*, *estando ya empezada la impresión de los tres primeros Tomos en el verano de 1761*, *una dilatada excursión por las Montañas de Burgos y Reyno de Galicia* […]" (The desire that such a work was complete, forced him to undertake, having already begun the publication of the first three volumes in the summer of 1761, a long excursion through the mountains of Burgos and the Kingdom of Galicia), it could be inferred that Quer was aware that he needed to complete his work with a more extensive and targeted trip. García Guardia (1986) located and transcribed a letter from Quer to King Carlos III, preserved in the Spanish National Historical Archive (bundle 2630, document no. 93), in which Quer outlined his trip to the northwest. In Fig. 4 we reproduce the maps prepared by García Guardia where he drew Quer's itinerary. The small number of cita-

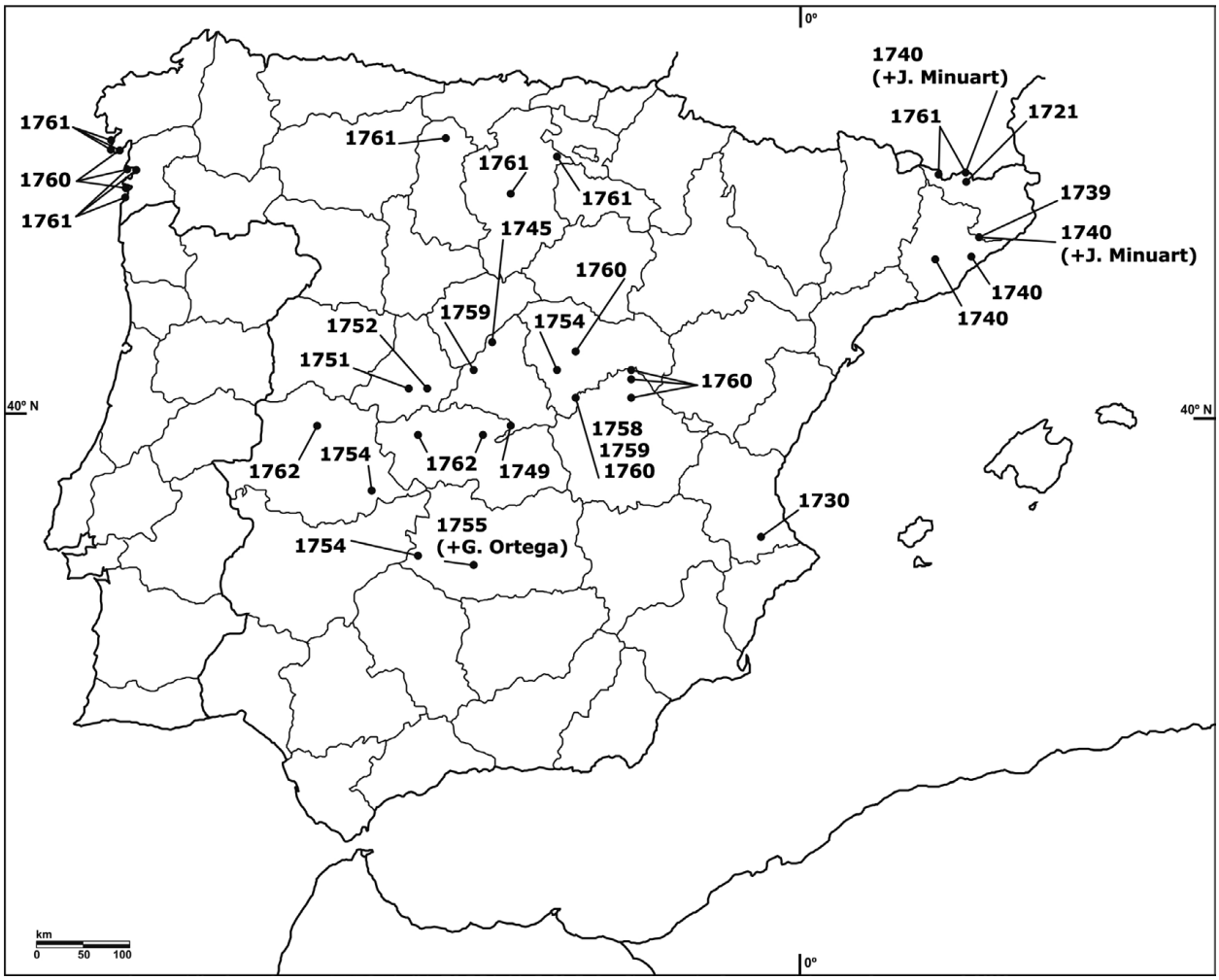

Fig. 3. Collection dates recorded in Quer's *Flora española*.

tions that Quer collected from the northwestern provinces in *Flora española* is worth noting, especially considering that he made a specific trip there to fill this gap in his knowledge. Specifically Quer compiled 88 citations from Galicia, eight from Zamora province and 71 from León province, to mention a few of the areas he toured.

Illustrations

Flora española contains a total of 213 printed plant illustrations, which are placed at the end of each volume, unpaginated, and with a new numbering at the beginning of volumes III, IV and V. This figure has been taken from a copy kept at the library of the Real Jardín Botánico of Madrid. Briquet (1919: 470) pointed out that there are some differences in the number of printed plant illustrations counted for each volume between the books preserved in different libraries. The distribution by volumes is indicated in Table 2.

A total of 130 printed plant illustrations lack printed annotations giving the name of the plant illustrator. Of the remaining 83, 79 are signed by Lorenzo Marín Menor, two by Chozas, one by Ricarte and another by Rodríguez. We have found reference to an engraver named Manuel de Chozas, who was active between 1736 and 1752, and another named Hipólito Ricarte, active from 1750 to 1794 (Barrena & al. 2004), who could be the artists previously mentioned. Both had some experience in natural history drawings [Pluche (1753–1755), Quer (1764)]. Unfortunately, there is no additional information in *Flora española* to confirm this hypothesis.

In general the signature is very brief and the surname of the artist is accompanied by an abbreviation, e.g. "*Marin f.t*" (vol. 3, tab. LXXIX), in which "*f.t*" means "fecit". On occasion, the artist's work is described in further detail. For example, Tab. XXXX (vol. 4) reads "*Ricarte del.t et sculp.t*", Tab. XXXXI (vol. 4) "*Marin del. et sculp.t*", Tab. VII (vol. 5) "*Lorenzo Marin. menor sculpt.*" and Tab. XV (vol. 6) "*Rodríguez la Grabo*". In the case of Marín, who is the best known of the artists, it can be assumed that he worked as a draftsman and as an engraver. That some or all of the unsigned printed plant illustrations were the work of these artists cannot be ruled out. According to Gloria Pérez de Rada (in litt.), everything suggests that they are chalcographic prints, both be-

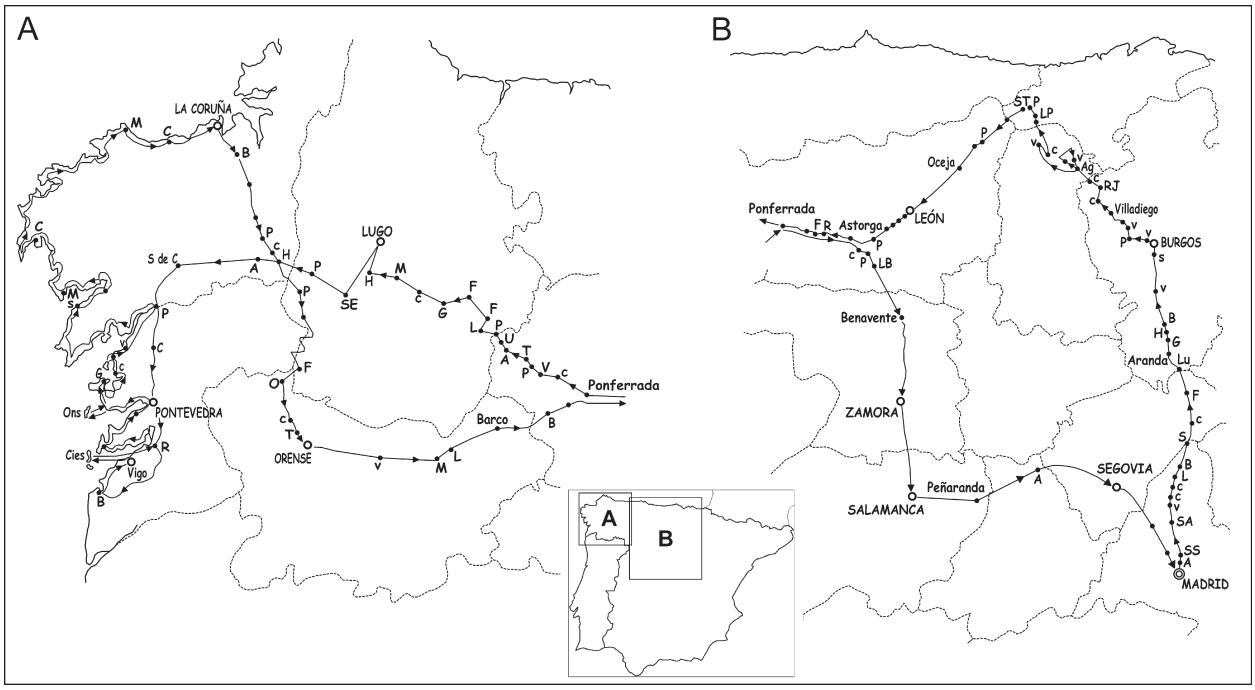

Fig. 4. Quer's trip across the northwest of the Iberian Peninsula in the summer of 1761, modified from García Guardia (1986).

cause of the line engraving and the copper plate footprint. Unfortunately, none of these elements has been preserved in the archives of the Real Jardín Botánico of Madrid.

At least some of the illustrations are based on others already published, with more or fewer modifications probably produced in the preparation of the new plates. The 11 drawings in the first volume, which describe characters and various types of flowers, are based on the first 11 drawings published by Tournefort (1700) in the second volume of *Institutiones rei herbariae*.

In the subsequent volumes, correlations were detected, as is shown in Table 3. It is likely that an exhaustive search of the works used by Quer will result in the discovery of the original versions of most of the remaining drawings.

On the other hand, Tab. XXV (vol. 4), which represents *Rochelia disperma* (L. f.) K. Koch [*Cerinthe V*], proposed by Quer as a new species, can be considered original. The little importance that was attributed to signing the printed plant illustrations is indicated in the case of this species, whose plate is not signed. Curiously, the other newly proposed species, *Moehringia muscosa* L. (*Alsine XXIII*, vol. 2: 262), was not drawn. Tab. XV (vol. 6) representing *Statice caespitosa* described by Gómez Ortega, is also an original contribution.

There is almost no reference to the draftsmen in Quer's work. For instance, Gómez Ortega (1784: ix) mentioned that Quer went to the Pyrenees in 1741 accompanied by a draftsman, but no name was provided. Also, when Quer

Table 2. Number of drawings in *Flora española* and names of the artists. Information from the volumes in the library of the Real Jardín Botánico of Madrid.

Volume	Number of drawings	Signature	Numbering	Observations
I	11	all without signature	numbering is started	
II	32	three signed by Marín	numbering of previous volume is continued	
III	79	58 signed by Marín	new numbering is started	
IV	66	15 signed by Marín, one by Ricarte	new numbering is started	The numbering is altered in the drawing that would have to be no. 40, which carries no. 24 repeated. Drawing no. 42 does not exist.
V	11	one signed by Marín, one by Chozas	new numbering is started; two drawings are unnumbered	
VI	14	two signed by Marín, one by Chozas, one by Rodríguez	numbering of previous volume is continued, but beginning with drawing X	According to Briquet (1919: 470), the copy of the library of Genève has 23 drawings.

Table 3. Some examples of Quer's drawings in *Flora española* based on previous illustrations.

Volume	Table number	Scientific name	Quer's name	Source of illustration	Name in source
II	XXXVI	*Stratiotes aloides* L.	*Aloides I*	Parkinson (1640: 1249)	*Stratiotes I*
II	XXVI	*Rhamnus alaternus* L.	*Alaternus I*	Clusius (1576: 57)	*Alaternus I*
II	XL	*Aurinia sinuata* (L.) Cav.	*Alyssoides I*	Clusius (1756: 421)	*Eruca I*
III	IX	*Anemone coronaria* L.	*Anemone I*	Clusius (1576: 310)	*Anemone III*
III	XXIV	*Arisarum vulgare* O. Targ.-Tozz.	*Arisarum I*	Clusius (1576: 303)	*Arisarum I*
III	XXV	*Aristolochia paucinervis* Pomel	*Aristolochia I*	Clusius (1576: 320)	*Aristolochia II*
III	XL	*Erophaca baetica* (L.) Boiss.	*Astragaloides I*	Clusius (1576: 467)	*Astragalus I*
IV	XXIV	*Cerinthe major* L.	*Cerinthe I*	Clusius (1576: 411)	*Cerinthe I*
IV	XXIX	*Cneorum triccocon* L.	*Chamaelea I*	Clusius (1576: 170)	*Chamaelea I*

described the discovery of the *Betula* (vol. 2: 249) during that same trip, he did not mention a draftsman. One might speculate that perhaps Tab. LV (vol. 3), which represents this finding, was prepared on that occasion.

Taxonomic novelties

Quer proposed only two taxonomic novelties in *Flora española*. The first of these was *Alsine XXIII* (vol. 2: 262), which had been described by Linnaeus as *Moehringia muscosa* L., Sp. Pl.: 359. 1753. In this case, Quer defended its priority as follows: "*En la herborizacion*, *que hice en el Monte de Monsein en Cataluña*, *año de 1739. descubrì esta nueva*, *y rara Planta; por lo que creo merecer la gloria de su primer descubrimiento*, *aunque FRANCISCO BALTHASAR*, *Autor del H. Alsaticus*, *la expone; porque la impression de esta Obra fuè el año de 1747. y mi observación fuè ocho años antes*" (I discovered this new, rare plant in the collection that I made on Mount Monsein in Catalonia in 1739. I think I deserve the glory of its first discovery, although FRANCISCO BALTHASAR, author of the H. Alsaticus, describes it; because the printing of this work was in the year 1747, and my observation took place eight years before). Quer mentioned Lindern (1747: 111–113), who included 13 species of *Alsine* in his work. Linnaeus (1753: 359) did not mention Lindern when he described this species.

The other taxonomic novelty proposed by Quer was *Cerinthe V* (vol. 4: 145), which had already been described as *Lithospermum dispermum* L. f., Dec. Pl. Horti Upsal.: 13, tab. VII. 1762 and is currently accepted as *Rochelia disperma* (L. f.) K. Koch in Linnaea 22: 649. 1849. In this case Quer said "[…] *y por su fructificacion se declarò ser una especie de Cerinthe; pero en realidad nueva*" (and because of its fructification it was declared to be a species of Cerinthe, but in reality it was new).

To these two species we must add the *Statice caespitosa* described by Gómez Ortega in the sixth volume (page 334, plate 15 no. 1), nowadays accepted as *Armeria caespitosa* (Ortega) Boiss. in Candolle, Prodr. 12: 679. 1848.

Rare and extinct species

As previously mentioned, the proportion of rare or endemic species collected by Quer is far below what might be expected in such a rich flora. An analysis of some of these species may shed some light on interpretations of Quer's work and the importance of his contributions.

Today some of Quer's findings can easily be assigned to very rare species. This is the case for *Senecio leucophyllus* DC. [*Jacobea VI*, vol. 5: 255] and *Paradisea liliastrum* (L.) Bertol. [*Liliastrum I*, vol. 5: 344]. With these cases the interpretation of the polynomial leaves no room for doubt, the description contains significant characters, and the locality is accurate and within the currently known range. In both cases there are testimonies in Quer's herbarium and the plants are correctly identified. Something similar occurs with *Cerinthe minor* L. [*Cerinthe IV*, vol. 4: 145], about which Quer remarked "*Esta especie la he hallado en el circuito del Lugar de Candalera en la Extremadura*, *junto à el Puente*" (I found this species on the trail of the Place of Candalera in Extremadura, near the bridge). It is a very rare species, probably an archaeophyte, currently known from only two localities in the N half of the Iberian Peninsula. However, considering that it grows in cultivated or disturbed fields, it seems very likely that it was present in the past in other localities such as Extremadura.

We have found other cases in which Quer indicated two localities, one of which is fully coincident with those known for the species nowadays and another highly improbable. This is the case for *Rhaponticum centauroides* (L.) O. Bolòs [*Centaurium I*, vol. 4: 108], about which Quer stated "*Esta especie de Centaurea mayor se cria en la Alcarria en el termino del Lugar de Jabajera*, *y en el de Olot*, *situado en las faldas de los Pyrinèos de Cataluña*" (This species of Centaurea mayor lives in the Alcarria in the place of Lugar de Jabajera, and in Olot, located in the hillsides of the Pyrenees of Catalonia). The first locality is very unbelievable since this species lives in megaphorbic plant communities in mountains, and requires climatic conditions uncommon in Alcarria (a shire in the SC Ibe-

rian Peninsula) in the 18th century. Something similar can be said about *Tephroseris coincyi* (Rouy) Holub [*Jacobea XIII*, vol. 5: 257], a species for which Quer indicated a pair of localities in the Central System, where the species is indeed found, and one additional "[…] *y en los montes Pyrineos de Cataluña*" (and in the Pyrenees mountains of Catalonia), which is highly unlikely. In both cases no material could be found in Quer's herbarium.

In other, now extremely rare species, the locality indicated by Quer is relatively vague, sometimes including several species in a single location. This is the case, for example, with *Anthericum ramosum* L. [*Phalangium II*, vol. 6: 88], about which he said "*Todas las especies de Phalangio vegetan en terrenos montañosos*, *y húmedos*, *cerca de rios y acequias de agua*, *y son muy comunes en España*" (All Phalangio species grow in mountainous and humid lands, near rivers and water ditches, and are very common in Spain). He also referred to *Anthericum liliago* L. (*Phalangium I*) and *Tofieldia calyculata* (L.) Wahlenb. (*Phalangium III*). The plant that appears in his herbarium as *Phalangium II* is, however, *Anthericum ramosum*. A similar uncertainty is introduced in species such as *Primula auricula* L. [*Auricula I*, vol. 3: 191], recently located in the Pyrenees (Aymerich & al. 2012), about which Quer said "*Estas dos especies [Auricula I*, *Auricula II] de Plantas habitan*, *y crecen en los Montes Pyrineos de Cataluña* […] *en el año 1740. llevando por compañero à Don Juan Minuart*, *experto Pharmaceutico*, *y Botanico*, *las encontramos en el monte Pyrineo del Lugar de Set Casas*, *à el rededor de la fuente*, *donde toma su origen el Rio llamado Ter*, *que los del Païs llaman el Ull del Ter*" (These two species of plants inhabit and grow in the Pyrenean Mountains of Catalonia […] in the year 1740 accompanied by Don Juan Minuart, pharmaceutical expert, and botanist, we found them in the Pyrenees at Set Casas, around the water source, where the river called Ter is born, the same river which the peasants call the Ull of the Ter). He also referred to *Primula hirsuta* All. (*Auricula II*). In his herbarium there are several correctly identified vouchers of *P. auricula*, but some of them seem to correspond to garden forms of doubtful wild origin. It would be more interesting to find out if Quer really found *Rhododendron hirsutum* L. [*Chamaerhododendros II*, vol. 4: 195], about which he said "*Estas dos especies [Chamaerododendron I*, *Chamaerhododendros II] de Arbusculos las he hallado en los montes Pyrinèos de Cataluña*, *y en los del Santuario de la Virgen de Nuria* […] *acia la parte del Lugar de Queralt*, *à la ladera del cerro*, *que llaman de San Gil*, *que es en donde hallè estas dos plantas*, *que subsisten en mi Herbario Seco*" (I have found these two species of shrubs in the Pyrenees Mountains of Catalonia, and in the Sanctuary of the Virgin of Nuria […] towards the Place of Queralt, on the slope of the hill, which is called San Gil, where I found these two plants which subsist in my dry herbarium). He also referred to *R. ferrugineum* L. (*Chamaerododendron I*). Although Quer's herbarium material is correctly identified (Fig. 5), the mixture of these two species in the same locality makes one fear there has been some kind of confusion. *Rhododendron hirsutum*, whose closest localities are in the Savoy Alps, has otherwise never been mentioned in the Pyrenees.

It is more difficult to admit the presence of *Asarum europaeum* L. [*Asarum I*, vol. 3: 116], about which Quer said "*Jamàs he hallado esta Planta en quantas peregrinaciones he hecho. El Doctor Don Miguel Bernades* […] *me ha hecho el gusto de comunicarmela*, *la que se cria en abundancia en su patria Puigçerdà en Cataluña*, *y la tiene observado en muchos terrenos de España*, *como es en las faldas de aquellos Pyrineos*, […] *singularmente de los lugares de Pì*, *y de las Escaldas*, *encima de sus celebradas Aguas Thermales*, *donde cubre esta Planta las faldas de las peñas*" (I have never found this plant on any of the pilgrimages I have performed. Dr Miguel Bernades […] has kindly communicated this to me, that it lives in abundance in his country Puigçerdà in Catalonia, and he has observed it in many lands of Spain, as it is in the foothills of those Pyrenees, […] singularly in the localities of Pì, and Las Escaldas, above its celebrated hot springs, where this plant covers the sides of the rocks). Paradoxically, Quer's herbarium material is correctly identified, but the indirect reference, based on Barnades, suggests some kind of confusion, perhaps with *Petasites hybridus* (L.) G. Gaertn. & al., a common species in the area and with a somewhat similar leaf. Another interesting case is that of *Leucojum vernum* L. [*Narcisso-Leucoium I*, vol. 5: 476], about which Quer said "*Vegeta naturalmente en los prados húmedos de nuestras montañas*, *y en los bosques sombríos. La he visto en los de los Pyrineos de Cataluña*, *y en los de la Villa de Olot de mismo Principado*" (It lives naturally in the humid meadows of our mountains, and in the shady forests. I have seen it in those of the Pyrenees of Catalonia, and in those of the Villa of Olot in the same princedom). The description of the plant and the flowering period and the specimen conserved in Quer's herbarium (Fig. 6) support the correct interpretation of this species by the author. Some additional references to this species have been found in Iberian literature. Palau (1785: 33) indicated its presence in Asturias and Burgos without specifying localities. Colmeiro (1889: 74) added a Catalonian locality, Montserrat, attributed to E. Boutelou. This last citation lacks support in the herbarium of the Boutelou family held at the Universidad de Sevilla (SEV) (Salgueiro 1998). Willkomm (1861–1862: 148) referenced these previous citations but gave the species as unseen. The lack of herbarium evidence means these other citations are taken with additional caution. The plant is currently known in C France, but not in the Pyrenees. Although the presence of *L. vernum* in Quer's locality may be considered feasible, confusion with *Galanthus nivalis* L. cannot be discounted, since the latter species is quite similar and was also recorded by Quer in the same locality (Olot). Another hypothesis to be considered is that the plants to which Quer referred were of cultivated origin, since *L. vernum* is grown and naturalized in several areas of Europe (Webb 1980: 77).

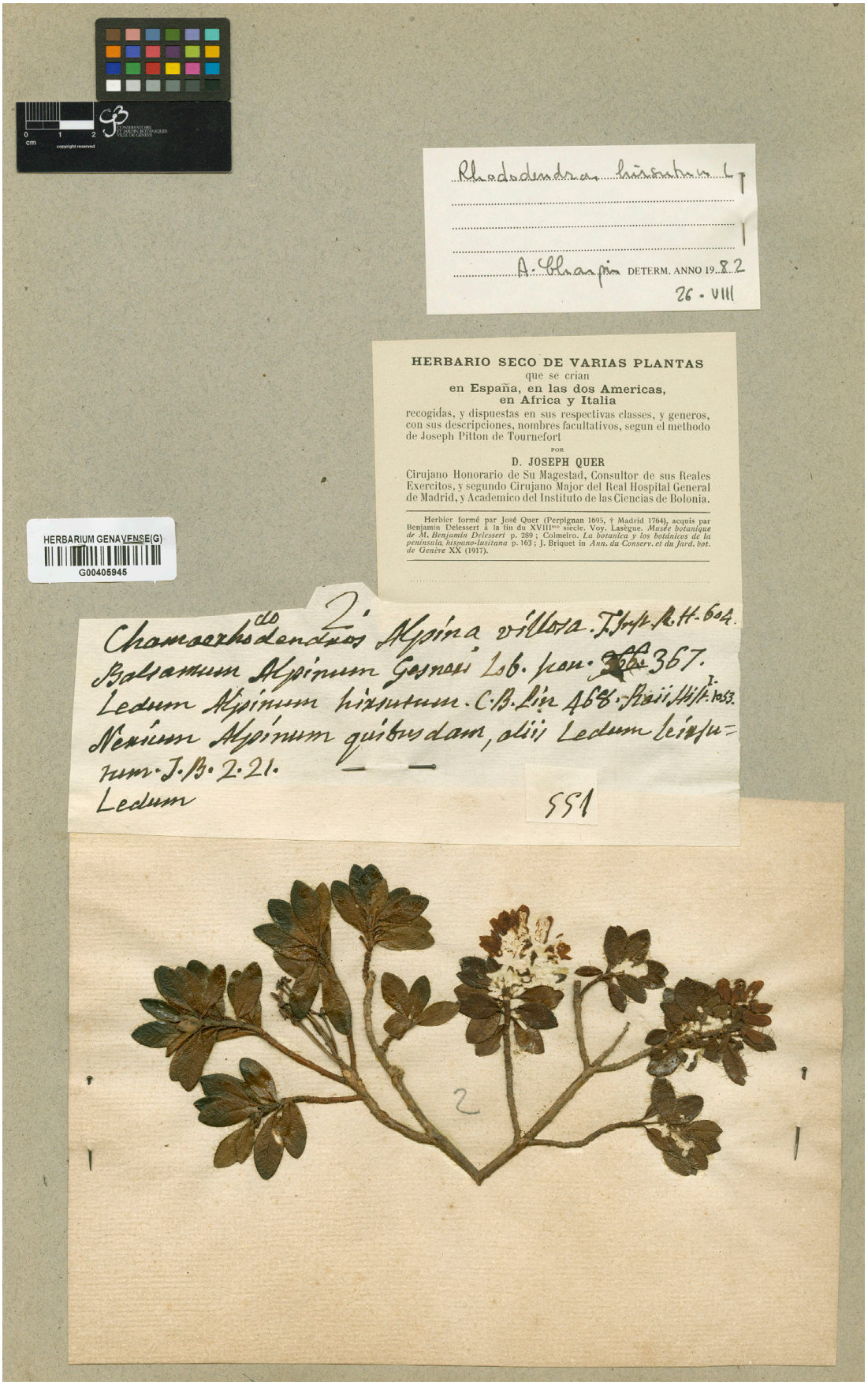

Fig. 5. Voucher of *Rhododendron hirsutum* L. [*Chamaerhododendros II*] from Quer's herbarium (G). – Image courtesy of Conservatoire et Jardin botaniques de la Ville de Genève.

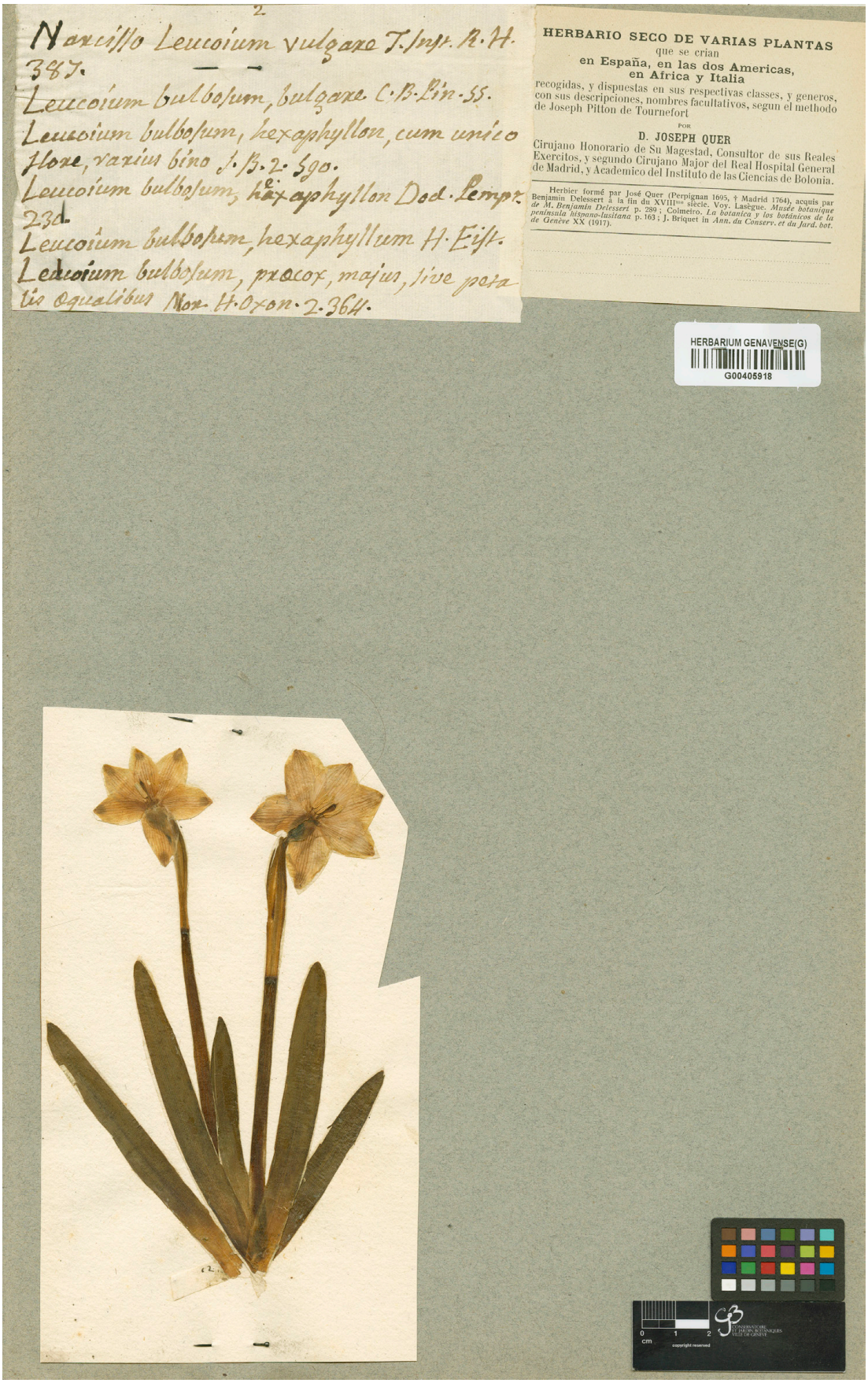

Fig. 6. Voucher of *Leucojum vernum* L. [*Narcisso-Leucoium I*] from Quer's herbarium (G). – Image courtesy of Conservatoire et Jardin botaniques de la Ville de Genève.

Conclusive evidence has been found to suggest that some species have disappeared from the Iberian Peninsula. In Aedo & al. (2014) the extinction status of four species is based totally or partially on the information provided by *Flora española*: *Aurinia sinuata* (L.) Griseb. [*Alyssoides I*, vol. 2: 281]; *Securigera securidaca* (L.) Degen & Dörfl. [*Securidaca I*, vol. 6: 278]; *Stratiotes aloides* L. [*Aloides I*, vol. 2: 256] and *Cyclamen purpurascens* Mill. [*Cyclamen II*, vol. 5: 28]. The identification of the *Cyclamen II* must now be corrected because it was mistakenly credited as *C. purpurascens* when in fact it is *C. hederifolium* Aiton. A detailed review of *Flora española* would allow us to cautiously add the following species to this list.

Cichorium spinosum L. [*Cichorium II*, vol. 4: 251]. Quer wrote: "*Hallè esta especie junto à las celebradas Aguas Termales de Trillo en unos arenales de la ribera del Tajo.*, *de donde la traje al Real Jardin Botanico: tambien se halla en los de la Marina de Valencia*, *y Andalucia*" (I found this species next to the celebrated hot springs of Trillo on sandy banks of the river Tagus, from where I brought it to the Royal Botanic Garden: it is also found in those of the Marina de Valencia and Andalusia). The descriptive details given by the author reinforce the idea that his identification was correct although in the Conservatoire et Jardin botaniques de la Ville de Genève no sample was found in Quer's herbarium. On the other hand, in the historic herbarium of the Universidad de Sevilla a specimen has been found that was collected in Aranjuez (Toledo), where it was probably cultivated. It is not unreasonable to think that this material comes from a donation by Quer to his contemporary Esteban Boutelou who was in charge of the Royal Gardens of Aranjuez. There are some later references by Willkomm (Willkomm & Lange 1865-1870: 205) and Colmeiro (1887: 399). Both authors cited it in some places on the Portuguese, Andalusian (Gibraltar, Guadix, Cabo de Gata) and Balearic coasts.

Mandragora officinarum L. [*Mandragora I*, vol. 5: 400]. It seems that this species has been cultivated in various parts of Europe because of its medicinal interest. In *Flora española* it is mentioned as cultivated in some gardens, but diverse localities are indicated as wild in Catalonia "[…] *y la he cogido en el monte que llaman Monseny*, *y faldas de los Pyrineos de Cataluña* […]" (and I have collected it on the mountain called Monseny, and the foothills of the Pyrenees of Catalonia), Castile and Extremadura. The morphological characters that Quer used to differentiate this species from *M. autumnalis* Bertol. are the colour of the flower and the shape of the fruit, which coincide with those currently used. Curiously, he attributed to both species a flowering period between February and March, which is more consistent with *M. officinarum*. No specimen of this plant has been located in Quer's herbarium either. It has subsequently been cited by Boissier (1839–1842: 438) and Lange (1863: 30) for Andalusia, where it is not currently known to be. The citation in Bolòs & Vigo (1995: 375) for Teruel seems to refer to a cultivated plant. On the other hand, Ungricht & al. (1998), in their taxonomic revision of the genus, considered a single Mediterranean mandrake species, reducing *M. autumnalis* to the synonymy of *M. officinarum*. These authors supported that there is a period of continuous flowering from the beginning of autumn until spring – with a peak in October and another from February to May – and the morphological characters usually used to distinguish species vary even within the same individual. It may be interesting to note that the Andalusian, Balearic and Extremaduran plants that are kept at MA have been collected mainly between September and November and only in some cases in February. If the interpretation of Ungricht & al. (1998) is correct, the information in *Flora española* would support this species having had a much wider distribution area during the 18th century. If both species are recognized (Hawkes 1972: 199), Quer's writing would support the presence of *M. officinarum* in different localities in the Iberian Peninsula, although an anthropic origin of such populations cannot be ruled out.

Cornus mas L. [*Cornus II*, vol. 4: 438]. Quer wrote: "*Esta especie de Cornus se cria en los Montes del Lugar*, *que llaman San Lorenzo de Piteus en Cataluña*, *distante una corta jornada de la Ciudad de Solsona*" (This species of Cornus lives in the Montes del Lugar, which is called San Lorenzo de Piteus in Catalonia, a short journey away from the city of Solsona). No supporting material was found in Quer's herbarium. It is a species that reaches the N slopes of the Pyrenees. It has recently been mentioned in Avià, a town very close to Quer's locality, by Aymerich (2013: 222), who indicated, however, that they are naturalized individuals coming from nearby abandoned gardens. Cuní Martorell (1880: 214) brings another citation for Barcelona near Castellterçol, and Pau (1896: 150) for Teruel, both without further details and without supporting material in MA.

Discussion

In the first half of the 18th century, there were no botanical institutions in Spain that would have been able to train individuals interested in the discipline. This means that Quer's botanical education must have been largely self-taught. The time Quer spent in Italy was likely crucial in improving his botanical knowledge as well as his understanding of research methods and the functioning of botanical gardens, due to the access he had there to books, herbaria and living plants (Pascual 1970; Camarasa 1989). However, we should not underestimate the influence that the scientific environment generated around the pharmacy of Salvador in Barcelona may have had on Quer's education. The Natural History Cabinet of the Salvador family had a magnificent library and the only worthy herbarium that existed at that time in Spain. Although Quer expressed his appreciation to the Salvador family, there is little mention of their herbaria and living

plant collections in *Flora española*. Therefore, it seems that Quer's relationship with the Salvadors was limited.

The alphabetical organization of *Flora española* reflects the influence of publications such as *Botanicum monspeliense* by Magnol (1676), *Flora noribergensis* by Volckamer (1700) and particularly *Catalogus plantarum Angliae* by Ray (1677), which was frequently cited by Quer. These works are also arranged alphabetically, including fungi, lichens or algae together with vascular plants, and seem designed to catalogue the plants of a territory rather than facilitate their identification. By the second half of the 18th century, when *Flora española* was published, there had already been a change in the trend of publications describing the plants of a territory. In many Floras, such as *Flora suecica* by Linnaeus (1745), *Flora sibirica* by Gmelin (1747–1769), *Flora Lipsiae indigena* by Boehmer (1750), *Flora carniolica* by Scopoli (1760), *Flora gallo-provincialis* by Gérard (1761), *Historia stirpium indigenarum Helvetiae inchoata* by Haller (1768), *Flora monspeliaca* by Gouan (1764) and *Stirpium austriacarum* by Crantz (1769), plants were organized according to a system that grouped the related species and facilitated their comparison. In the last two, Linnaeus's binomial nomenclature was incorporated. Quer's work was not as significant as it could have been, mainly due to its alphabetical ordering that made identification difficult. Its stubborn defence of the Tournefortian system and more specifically the use of the old polynomials in front of the Linnaean binomials were also factors in the limited impact of the work. It was a time of transition, having been hardly nine years since the appearance of *Species plantarum* (Linnaeus 1753) when the first volumes of *Flora española* were published, and Quer was not aware of how important and useful it would be to adapt to the new trends.

Flora española contains an extensive compilation of the previous information regarding peninsular flora and numerous original field data as its fundamental contribution. In a way, Quer's work has been safeguarded through the detailed compilation by Colmeiro (1885–1889), who recorded Quer's chorological contributions, and also thanks to the *Prodromus* of Willkomm & Lange (1861–1880), who selectively mentioned Quer's most relevant citations. The effort in the exploration of the territory seems one of the strengths of *Flora española*. Quer visited almost the whole Iberian Peninsula, although the sampling effort in Galicia, the Cantabrian Mountains and Andalusia was relatively low. In this sense, he obtained an overview of the Iberian flora that his peers had not yet been able to access. It is therefore striking that he decided to propose only two new species and to mention few endemic species in a territory that was yet to be fully explored, with so many species to catalogue and rich in endemics. While it is true that his journeys did not include the Baetic Mountains (the richest areas in endemics), this hardly explains the scarce originality of his taxonomic proposals. Most of the species of *Flora española* are common plants with wide distributions. It may be suggested that perhaps Quer's self-led education did not provide him with sufficient confidence to depart from or disagree with the species previously recognized by Tournefort. It must be taken into account that the prestige and moral authority of Tournefort was considerable at that time (Greene 1983).

The study of a small selection of the plants that are conserved in Quer's herbarium, through the images kindly sent by the Conservatoire et Jardin botaniques de la Ville de Genève, has shown their identifications to be generally reliable. It is obvious that with his extensive field activity throughout the Iberian Peninsula, Quer had many plants on his hands that he could not identify, since they were not described in prior literature. From his trip to the northwest in 1761, little more than 200 records were included in *Flora española*. Although his activity also included the collection of seeds and perhaps of living plants, it is likely that he collected many more than these. What Quer eventually did with those plants is not known since no traces of them have been preserved. As already pointed out, the number of plants in his herbarium approximately matches that of species in *Flora española*.

Difficulties with connecting the citations from *Flora española* with Quer's herbarium created some uncertainty about the interpretations that can be done *a posteriori*, since the specimens of his herbarium could come from cultivation or extra-Iberian localities. In the case of other pre-Linnaean authors who studied the Iberian flora, such as Clusius and Barrelier, the problem is magnified, since, as far as is known, their plants have not been conserved. In contrast, Tournefort's herbarium was conserved in the Muséum National d'Histoire Naturelle of Paris and some Iberian duplicates in the Institut Botànic de Barcelona, whose identifications have been updated by Ibáñez (2006). An effort to compare these works with each other, and with the current *Flora iberica*, would allow for temporal monitoring and perhaps documenting local or regional extinctions. These sources, although delicate to handle because of the stated reasons, are useful tools to learn about the history of our flora, given the absence of alternatives. Thanks to the analysis of Quer's work, the extinction of a few species of vascular plants has been documented with some degree of verisimilitude. A more complete study of these works would probably allow us to gain more accurate information with obvious consequences in a scenario of global change.

Quer's challenge, covering such a vast and mountainous territory and such a rich flora, was certainly hard, even by today's standards. Gómez Ortega pointed out in the foreword to the fifth volume (page vii) that he could not conclude his work because of "[…] *haber elegido un asunto tan vasto y superior á las fuerzas de qualquiera particular*" (having chosen a subject so vast and superior to the forces of anyone). In addition to these difficulties, the scientific context in which work was carried out in Spain in the mid-18th century, without herbaria or spe-

cialized libraries, and non-homologous institutions with which to contrast the findings, was very inauspicious. Therefore, we must say that the results obtained were successful beyond all expectations.

To end this paper on a lighter note, we turn to a quote by Quer (vol. 4: 198; tab. xxxiii) where he introduces, as one more species the chamois: "*Yà que los vegetales de estos terrenos nos han detenido tan largo tiempo*, *seanos licito divertir la pluma en la investigacion de los animales*, *que se alimentan de estas plantas. Entre todos sobresale la ligereza de la Cervi-Cabra* […]" (Since the plants of these lands have detained us such a long time, let us to entertain our quill on the investigation of the animals, which feed on these plants. Among them the lightness of the Cervi-Cabra stands out). After a detailed analysis of its synonymy, habitat, close species, opinions of various authors, etc., he returns from his diversion with no less elegance: "*Perdona este desvìo de mi pluma*, *que vuelve à seguir su destino*, *teniendole*, *no por rodéo*, *sino por parenthesis util de mi FLORA*, *que passa a describir el* […]" (Forgive this deviation of my quill, which returns to follow its destiny, having it, not by any detour, but by a useful parenthesis of my FLORA, which goes on to describe the […]).

Acknowledgements

We would like to thank J. Alejandre, F. Alonso, G. Blanca, J. Capelo, Á. Charpin, J. Güemes, J. Klackenberg, J. Martínez-Abaigar, G. Mateo, G. Moreno, J. Pedrol, G. Pérez de Rada, A. Prunell, E. Rico, L. Serra and F. M. Vázquez for providing geographical and herbaria data. L. Gautier and the staff of the Genève herbarium kindly spent a lot of time searching for and digitizing our request for Quer's specimens. We thank Antonio González Bueno and Hans Walter Lack for their critical reviews of the manuscript and for their helpful suggestions. We are grateful to Helen Álvaro for correcting the English version of the manuscript. This work has been supported and funded by the Spanish Government through the *Flora iberica* project (CGL2014-52787-C3-1-P).

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Online ISSN 1868-6397 · Print ISSN 0511-9618 · Impact factor 0.680

Published by the Botanic Garden and Botanical Museum Berlin, Freie Universität Berlin