



Typification of the Mediterranean endemic conifer *Juniperus turbinata* (Cupressaceae)

P. PABLO FERRER-GALLEGO^{1,2*}, ROBERTO NAZZARO³, INMACULADA FERRANDO-PARDO^{1,2} & EMILIO LAGUNA¹

¹Servicio de Vida Silvestre, Centro para la Investigación y Experimentación Forestal (CIEF). ²VAERSA, Generalitat Valenciana, Avda. Comarques del País Valencià 114, ES-46930 Quart de Poblet, Valencia, Spain; e-mail: flora.cief@gva.es

³Dipartimento di Biologia, Università degli Studi di Napoli Federico II, Via Foria 223, I-80139 Napoli, Italy.

*author for correspondence

The genus *Juniperus* Linnaeus (1753: 1038) (Cupressaceae Gray, *nom. cons.*) is a major component of arid and semi-arid tree/shrub ecosystems throughout the Northern Hemisphere (Thorne 1972, Adams 2004, 2008, 2014, Farjon 2005). The genus is monophyletic (Adams 2004, 2008, 2014, Little 2006, Mao *et al.* 2010), and three monophyletic sections are currently recognized: *J.* sect. *Caryocedrus* Endlicher (1847: 2), with one species in the Mediterranean; *J.* sect. *Juniperus*, with nine species in East Asia and the Mediterranean plus the circumboreal *J. communis* Linnaeus (1753: 1040); and *J.* sect. *Sabina* Spach (1841: 291), with 56 species distributed in southwestern North America, Asia and the Mediterranean region, with outliers in Africa and the Canary Islands.

Juniperus phoenicea Linnaeus (1753: 1040) belongs to *J.* sect. *Sabina*, and traditionally it is accepted to include two subspecies: *J. phoenicea* subsp. *phoenicea* and *J. phoenicea* subsp. *turbinata* (Gussone 1844: 634) Nyman (1881: 676). Recently, the Conifer Specialist Group of the IUCN (see <http://www.iucnredlist.org/details/16349692/0>) adopted the revisions proposed by Adams *et al.* (2015) and Mazur *et al.* (2016), from which *J. phoenicea* subsp. *turbinata* has been accepted at species rank, and *J. phoenicea* s.str. has been narrowed to the typical subspecies (Farjon 2015).

Juniperus turbinata Gussone (1844: 634) is an arborescent shrub or small tree, evergreen, monoecious or rarely dioecious, which can be distinguished by their leaves and branches more elongated than in *J. phoenicea*, with acute leaves, and seed cones subglobose to ovoid, 12–14 × 9–11 mm, rugose, ochraceous or yellowish-brown when full ripen (Farjon 2010, 2014, Farjon & Filer 2013, Adams 2004, 2008, 2014). It is distributed in the Mediterranean basin: France (Corse and mainland coasts), Greece, Italy (Sardinia, Sicily), Morocco, Portugal, Spain (Balearic Islands and mainland coast) and Tunisia, where it is restricted to littoral maritime habitats on rocks or sand dunes (Farjon 1998, 2005, 2010, 2014, Farjon & Filer 2013, Adams 2014).

The purpose of this paper is to contribute to the stability of the nomenclature of *J. turbinata* by its typification. The work is based on both the checking of herbaria in which the Gussone's material is deposited (CAT, NAP and PAV, according to Thiers 2016+) as well as the examination of relevant literature, including the protologue.

Gussone's protologue (1844: 634) of *J. turbinata* consists of a diagnosis "J. [*Juniperus*] foliis ovatis obtusiusculis omnibus quadrifariam arcte imbricatis dorso foveola oblonga notatis, junioribus acutiusculis approximatis, baccis ovato-turbinatis", followed by three references each one referred to an illustration: "Sabina baccifera, bacca turbinata" (Cupani 1713: t. 34, Bonanno 1719: t. 45, Rafinesque¹: t. 11. f. 1), and the *indicatio locotypica* "In arenosis, vel rupestribus maritimis; *Montallegro*; *Secciarà* (Gasparr.)". A description is also included in the protologue "*Habitus* omnino praecedentis [*J. phoenicea*]; sed *baccae* immaturae oblongae, inde turbinatae; tuberculis pluribus instructae, et color totius plantae laetius virens". The illustration by F. Cupani (reproduced and reprinted by A. Bonanno²) is part of the original material, and therefore eligible as lectotype (Art. 9.2, 9.3 and 9.12 of ICN, McNeill *et al.* 2012).

The Cupani's image (Cupani 1713³) displays a fragment of a plant with branches, leaves and two cones, and some excellent diagnostic characters, e.g. the branches more elongated than in *J. phoenicea*, and turbinated cones (Fig. 1).

1 The work by Rafinesque remains unpublished (see Lentini 2012).

2 The work of Bonanno (1719) is an incomplete second edition of the Cupani's *Panphyton Siculum*, and the images published are the same (see e.g., Pastena *et al.* 2003, Costa *et al.* 2016).

3 The *Panphyton Siculum* is an unpublished, incomplete iconographic catalogue, drawn up by the Franciscan naturalist Francesco Cupani (1657–1710) and published posthumously in 1713.



FIGURE 1. Cupani's (1713: t. 34) illustration "Sabina baccifera, bacca turbinata".

The Cupani's herbarium is preserved at CAT (see Brullo & Pavone, 1993, Pulvirenti *et al.* 2015a, 2015b; specimens available at <http://dipbot.unict.it/Erbario/cupani/index.html>). Cupani indicated brief descriptions of the plants he had studied. However, those descriptions cannot be equated with Linnaean binomials (genus, species). Cupani (l.c.) called his descriptions "polilogus", i.e. sentences of a few words (Brullo & Pavone 1993, Mazzola & Raimondo 1995). His technique matched a simple requirement of synthesis. The Cupani's collections are presented as two volumes of exsiccata of different size and structure, without any information about their origin. The hypothesis of attributing these herbaria to Cupani derives both from the explicit reference in the title page, as well as the reconstruction of the several transfers of ownership. In the literature, the citations regarding these "Horti Sicci" are rather scant. Scinà (1824), albeit speaking more generally of Cupani, simply states that Giovanbattista Caruso "took the trouble to collect all Cupani's

papers and kept only the herbarium for himself; for this reason it is nowadays stored in Catania along with Caruso's books" (Scinà, 1824).

In this collection at CAT, Pulvirenti *et al.* (2015b) identified two specimens belonging to the genus *Juniperus*. These two specimens are preserved in a sheet numbered as 46, the specimen labelled "Sabina cupresso similis" has been identified as *Juniperus cf. sabina*, while those labelled "Cupressus" as *J. phoenicea*. A further specimen (sheet no. 46) is labelled "Sabina Tamarici similis Hist: Lug:", but it was lost (image available at http://dipbot.unict.it/Erbario/cupani/3055_046.jpg).

Based on our research, the specimen which was voucher for Cupani's illustration "Sabina baccifera, bacca turbinata", is not currently preserved in the Cupani's herbarium at CAT. Nonetheless, that material was not cited by Gussone in the protologue and it probably was not studied by him, so that it could not be considered part of the original material for the name *J. turbinata*, and therefore could not be eligible as lectotype. However, herbarium material such as this could be of assistance in interpreting Cupani's illustrations (which were used by Gussone) and may be considered as "typotype or voucher specimen" material, if it is clear that the illustration was originally prepared from it (see e.g., Jarvis 2007, Iamónico 2013).

Adams (2014: 147) indicated that the type of the name *J. turbinata* is unknown, with a question mark "Type:?". Farjon (2005: 339) cited as "type" two herbarium sheets (at FI and PAV), and added a question mark after the sheet at FI, and also indicated that this material had not been seen by him "n.v." [= *non vidi*]. Unfortunately, this indication is not an effective designation of the type according to Art. 7.10 since the author did not report the phrase "designated here" or an equivalent, and to Art. 9.23 (no term as "lectotypus", "neotypus" or their equivalent in a modern language was indicated). Furthermore, Farjon (l.c.) indicated two sheets as type, while a lectotype must be a single element (see Art. 9.2).

In the protologue, it was cited as *indicatio locotypica* "In arenosis, vel rupestribus maritimis; *Montallegro*; *Secciara* (Gasparr.)". As indicated by Stafleu & Cowan (1976: 919), Guglielmo Gasparrini (1804–1866) was an Italian botanist, director of the Pavia Botanic Garden (1857–1861), and his herbarium is preserved at PAV (University of Pavia, Italy), with duplicates at BM, BP, CGE, FI, K, P, PC, and W (acronyms according to Thiers 2016+). The Gasparrini's Herbarium was acquired during the Austrian rule; this collection included at least originally, nearly 8000 specimens. Currently there are 217 sheets in rigid wooden boxes. The plants come from Europe, North America, Asia, Africa and Australia, often as the result of exchanges with botanists, and most of the specimens still come from centre and southern Italy (Garovaglio 1862, Pasquale 1866, Ferraresi & Pirola 2001, Rossi & Tamburin, 2005).

After consulting those herbaria, four relevant herbarium sheets were found including good candidates for typification of *Juniperus turbinata*. At FI there are two herbarium sheets with material of *J. turbinata* (images available at <http://parlatore.msn.unifi.it/types/search.php>). The specimen FI-007390 bears three fragments, of which only one with cones, an envelope, and a label annotated "*Juniperus oblongata* Guss. [handwritten by Gasparrini] / *J. phoenicea* Parl. Conif. [...] [handwritten by Parlatore] / *Montallegro* [handwritten by Gasparrini] / Da Gussone in [...] 1858 [handwritten by Gussone]". The second sheet at FI (numbered 007389) bears two fragments, both with cones, and the following label: "Sicilia / *Juniperus turbinata* Guss. / syn. 2. p. 633 [handwritten by Gasparrini] / *J. phoenicea* var. β Parl. Conif. [handwritten by Parlatore] / Marina di Secciara [handwritten by Gasparrini] / Da Gussone in [...] 1862 [handwritten by Gussone]". In addition, on the left side of the label of FI-007389 there is an abbreviated name that might be "Gugl." (= Guglielmo Gasparrini) [handwritten by Gasparrini] the author that also appears in the protologue (as Gasparr.). The localities of these two sheets ("Montallegro" in FI-007390, "Secciara" in FI-007389) correspond to those reported in the protologue. These two sheets bear specimens identifiable with *J. turbinata*. However, because the dates indicated on the labels (1858 in FI-007390, and 1862 in FI-007389), they are post-1844 additions to the collection and therefore they are not part of the original material for the name *J. turbinata*.

We found two herbarium sheets among Gussone's original material at PAV (both not coded and so here indicated as "PAV_1", and "PAV_2"). Both these sheets bear very well preserved and excellent fragments with cones, which correspond to *J. turbinata*. The sheet PAV_1 (Fig. 2) bears a label: "*Juniperus Lycia* verus? In Siciliae fruticetis maritimis (Secciara)" handwritten by Gasparrini, plus the sentence "est *J. turbinata* Guss." handwritten by Gussone. The sheet PAV_2 (Fig. 2) bears two labels: i) "*Juniperus turbinata* Guss. Differt a *J. phoenicea* strobilis fere turbinatis. Sed sui [?] strobili immaturi sunt et [...] illius speciei [?] [...] status junior. In fruticetis maritimis Siciliae prope Secciara" handwritten by Gasparrini, and ii) "*Juniperus* sp. nova. Diff. a *J. phoenicea* fructibus sui [?] turbinatis. In fruticetis maritimis Siciliae alla Secciara" handwritten by Gasparrini.



Guaiacum Lycia var.?
est *G. turbinata* Guss.
fa. *Schneid. frutescens* Moench
(*Sesuvium* var.)

... continued on the next page



FIGURE 2. Gussone's original material of *Juniperus turbinata* (Herb. PAV, s.n. [in this paper indicated as PAV_1 (with two fragments) and PAV_2 (with a fragment)]). Photograph courtesy of Herbarium PAV; reproduced with permission.

fragments and a well developed seed cone, and three labels, the biggest one is annotated “2. *Juniperus turbinata* Guss / Novembri, Dicembri / In arenosis, vel ~~saxos~~ rupestribus maritimis / Montallegro, Secciarà” handwritten by Gasparrini, and the smaller labels “Aprile / Montallegro”, one of these handwritten by Gasparrini. NAP_3 bears two fragments but no mature seed cones. NAP_4 bears two fragments and seed cones, however both sheets without labels. Finally, NAP_5 bears two good fragments with seed cones, and a small label annotated “Anno 1829 Secciarà”, and the sheet NAP_6 bears a fragment with well developed seed cones, but no labels. In Gussone’s herbarium a sheet lacks label when the specimen was collected at the same location of the previous sheet, therefore the sheets NAP_3 and 4 are probably duplicates of NAP_2.

All things stated, Gussone’s original elements, which are eligible as lectotypes of *Juniperus turbinata* are: both Cupani’s (= Bonanni’s) and Rafinesque’s illustrations, the Gasparrini’s specimens at PAV, and one Gussone’s specimen at NAP (NAP_2). We here designate the specimen at NAP as lectotype of the name *J. turbinata*, concretely the larger fragment, on the left of the sheet (Fig. 3). The specimen at NAP is the most complete and informative original material available, it matches well the Gussone’s protologue, and corresponds to the current concept and use of the name (e.g., Farjon 2010, 2014, Adams 2004, 2008, 2014).

Juniperus turbinata Gussone (1844: 634) ≡ *Sabina turbinata* (Gussone 1844: 634) Antoine (1857: 41) ≡ *J. phoenicea* var. *turbinata* (Gussone 1844: 634) Parlatore (1868: 487) ≡ *J. phoenicea* Linnaeus (1753: 1040) subsp. *turbinata* (Gussone 1844: 634) Nyman (1881: 676).

Type (lectotype, designated here):—ITALY. [Sicily]: In arenosis vel rupestris maritimis Montallegro, Secciarà (NAP [in this paper indicated as NAP_2]; the lectotype is the larger fragment, on the left of the sheet) (Fig. 3).

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