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Lectotype designation of Desfontaines's name *Cistus heterophyllus* and its hybrid *C. ×clausonii* (Cistaceae)

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Abstract

The Desfontaines's name *Cistus heterophyllus* is discussed and lectotypified on a specimen preserved at P (Muséum national d'Histoire naturelle, Paris). In addition, the lectotype of its hybrid *C. ×clausonii* (*C. heterophyllus* × *C. albidus*) is designated from the original material preserved at MPU (Institut de Botanique, Université de Montpellier II).

Keywords: *Cistus*, Desfontaines, hybrid plants, lectotype, nomenclature, typification

Introduction

Cistus Linnaeus (1753: 523) (Cistaceae) includes about 20 species of shrubs from the Mediterranean basin, reaching the Caucasus Mountains to the east and the Canary Islands to the west (Arrington & Kubitzki 2003). However, its highest diversity is found in the western Mediterranean, with about 14 species occurring in the Iberian Peninsula and northwestern Africa (Guzmán & Vargas 2005). This genus exhibits a dominant role in woodland understory and evergreen scrub of the Mediterranean region (Médail & Quézel 1997). Species of *Cistus* have been in cultivation for centuries in renowned collections (see Sweet 1825–1830), due to their spectacular blooming and wide variation of hybrid forms that are grown successfully (see Demoly 1996).

The taxonomy of *Cistus* has traditionally been based on vegetative (i.e., vein number, shape, hairiness of leaves, etc.) and reproductive characters (i.e., sepal number, petal colour, style length, and number of fruit valves). Several works based on plastid (*trnL-trnF*, *matK*) and nuclear (ITS) DNA sequence data, phylogenetic relationships reveal that two major lineages of purple-flowered and white-flowered species are defined in the genus *Cistus* (Guzmán & Vargas 2005, 2009a, b, 2010, Guzmán *et al.* 2009, Fernández-Mazuecos & Vargas, 2010, 2011, Civeyrel *et al.* 2011, Totta *et al.* 2017). In addition, several important evolutionary patterns and processes have been revealed for *Cistus* including colonization and asymmetric diversification of insular oceanic lineages, synchronous evolutionary histories in Mediterranean and Macaronesian species, adaptative radiation in non-insular lineages, and long-distance colonization events despite the absence of effective dispersal mechanisms (e.g. Guzmán & Vargas 2009b, 2010, Guzmán *et al.* 2009).

Cistus heterophyllus Desfontaines (1798: 411) is a compact bush up to ca. 100 cm, erect, much-branched; leaves 5–20 mm, elliptical, with 1(–3) prominent veins; petioles 1–2 mm, cymes 1 to 5-flowered, pedicels 15–45 mm; sepals 5, conspicuously pubescent, with stellate hairs and long, simple hairs; flowers (3–)4–6 cm in diameter, purplish-pink. This is a narrowly distributed western Mediterranean plant occurring in Northern Africa (Morocco, Algeria) and the Iberian Peninsula (Battandier & Trabut 1888, Jahandiez & Maire 1932, Sauvage & Vindt 1952, Quézel & Santa 1963, Raynaud 1999). The populations of the Iberian Peninsula are differentiated as *C. heterophyllus* subsp. *carthaginensis* (Pau) M.B. Crespo & Mateo (1988: 168) [= *C. carthaginensis* Pau (1904: 260)], which is one of the most seriously

threatened plants in Europe (Demoly & Montserrat 1993, López González 2001, Laguna *et al.* 2016, Vicente-Colomer & Martínez-Sánchez 2018).



FIGURE 1. Original illustration of *Cistus heterophyllus* published by Desfontaines in his *Flora atlantica* (Desfontaines 1798).

From the taxonomic point of view, although these two taxa are very closely related, subsp. *carthaginensis* is characterized by the stems and inflorescences (cymes) without or with very few long hairs (lesser and often shorter than in subsp. *heterophyllus*) and external sepals not apiculate (all the sepals are apiculate in subsp. *heterophyllus*) and shorter petals (flower diameter is broader in subsp. *heterophyllus*). However, an artificial (and vigorous) hybrid has been created from the crossing between these two subspecies, *C. heterophyllus* nothosubsp. *marzoi* Ferrer-Gallego *et al.* (2013a). Regarding the nomenclature, the lectotype of the name *Cistus carthaginensis* was designated by Crespo (1990) from the plant mounted in the upper part of the sheet MA79275-1 (the specimen includes three plants, and is mounted on two sheets: MA79275-1 and MA79275-2).

A wild hybrid between *C. heterophyllus* and *C. albidus* Linnaeus (1753: 524), *C. ×clausonii* Font Quer & Maire (1930: 59) was described as a rare sterile plant living in sympatry with its parents in NW Africa. Nevertheless, fertile hybrids have been recorded in Spain and Morocco (Boscaiu & Güemes 2001, Navarro-Cano *et al.* 2009, Ferrer-Gallego & Laguna 2012). Molecular evidence of the hybridization and backcrossing has also been reported (Jiménez *et al.* 2007, Pawluczyk *et al.* 2012).

The present paper, is a new contribution to the nomenclature in the genus *Cistus* (see, e.g., Crespo & Mateo 1988, Crespo 1990, Ferrer-Gallego & Laguna 2012, Ferrer-Gallego *et al.* 2013a, 2013b, 2013c, Ferrer-Gallego 2015a, 2015b, 2021, Ferrer-Gallego & Boisset 2015, Ferrer-Gallego *et al.* 2015, Alonso *et al.* 2016). Two names in the

genus: *C. heterophyllus* and *C. ×clausonii* Font Quer & Maire (1930: 59) are typified to contribute to the stability of its nomenclature. In this sense, hybridization is an important threat to the conservation of *C. heterophyllus* in the Iberian flora, and the detection and recognition of hybrids is essential for an effective conservation strategy. The hybrid between *C. heterophyllus* subsp. *carthaginensis* and *C. albidus* is different from the taxonomic point of view to the hybrid between *C. heterophyllus* subsp. *heterophyllus* and *C. albidus*, but both look very similar in morphological grounds. It is necessary to clearly and unambiguously set the type of the name of the hybrid between *C. heterophyllus* subsp. *heterophyllus* and *C. albidus* to know exactly this entity.

On the other hand, an ongoing study on the phylogeny of this group will study herbarium material for DNA extraction, and a sample of great value for the work is the type reference specimen (i.e. the lectotype in this case) of the hybrid, hitherto unpublished, and which we intend to designate in the present contribution.

The designation of the corresponding types is based on the consultation of original material and the literature cited in the respective protologues.

Typification of the names

Cistus heterophyllus Desfontaines (1798: 411, t. 104) subsp. *heterophyllus*

Type (lectotype, designated here):—[ALGERIA]. In collibus incultis Algeriae, *Desfontaines s.n.*, P (2-D code P00320360) (Figure 2).

Desfontaines's protologue (1798: 411–412, tab. 104) of *Cistus heterophyllus* consists of a brief diagnosis “CISTUS exstipulatus; foliis ovato-lanceolatis, basi vaginantibus, margine revolutis; calycibus pedunculisque hirsutis, subunifloris” followed by a complete morphological description in Latin, a taxonomical comment “VARIETATEM possideo distinctam foliis rotundatis. Eadem planta saepe folia inferiora rotunda aut subrotunda, superiora lanceolata profert, unde nomine *C. heterophylli* dicta. Affinis *C. incano* Lin.”, and the geographical locality “HABITAT in collibus incultis Algeriae”. The protologue also includes an excellent illustration (Tab. 104), that is original material and could be selected as the lectotype of the name (see Figure 1).

René Louiche Desfontaines (1750–1833) was a French naturalist and professor of Botany at the Jardin des Plantes in Paris, who travelled through Tunisia and Algeria by the end of the 18th Century, and gathered a remarkable plant collection which was the basis for his *Flora atlantica* (2 volumes, 1798–1799). Parts of his personal herbarium are now preserved at BM, C, CGE, FI (acquired via Webb), LIV, MPU and P (incl. PC, P-DESF, P-JU and P-LA). As Stafleu & Cowan (1976: 627–628) mentioned, the *Flora atlantica* herbarium (1480 specimens) was left to P herbarium, and is now kept separately as an historical herbarium. The labels of this type herbarium are the Desfontaines's original manuscript slips for the *Flora atlantica*. Furthermore, a second series of 600 *Flora atlantica* sheets was given by Desfontaines to Lemonnier and was acquired by Delessert together with Lemonnier's herbarium, and it is now preserved at G.

We have found several relevant herbarium sheets preserved at P and G including Desfontaines's original material of *C. heterophyllus*. In the collection at P (herbarium Desfontaines), there is a sheet (P00320360) that bears four flowering and a sterile branchlet and a separate flower (Figure 2). This sheet contains two labels, a label is annotated as: “Herbier de la Flore Atlantique donné au Muséum, par M. Desfontaines / *Cistus heterophyllus*”, and the second one is the original manuscript slips for the *Flora atlantica*, and includes all the information mentioned in the protologue (Figure 3).

On the other hand, in the collection at G, concretely in the Candolle's *Prodromus* herbarium at G-DC, there is a sheet, with barcode G00207588 (image available at <http://www.ville-ge.ch/musinfo/bd/cjb/chg/adetail.php?id=183907>) that bears three well preserved fragments of this species, with leaves and flowers. This sheet contains four labels, one of these is handwritten by Desfontaines, and is annotated as: “*Cistus* / flores purpurei / Barbarie Desfont.”, and another label is handwritten by Candolle and is annotated as: “*Cistus heterophyllus* Desf. w.”. The term “Barbarie” corresponds to the Barbary Coast (also Barbary, Berbery or Berber Coast), and was used by Europeans from the 16th century to the early 19th century to refer to the coastal regions of North Africa inhabited by Berber people. Today this land is part of the modern nations of Morocco, Algeria, Tunisia and Libya, though historically it mostly comprised the territories from central Algeria to Tunisia.

There is another herbarium sheet at G-DC that contains probable original material of this name (image available at <http://www.ville-ge.ch/musinfo/bd/cjb/chg/adetail.php?id=183926>). This sheet bears several specimens of two different species, one of these belonging to *C. heterophyllus*, with barcode G00207567, and the other fragments (with

barcodes G00207568, G00207586, G00207565, G00207566) are labelled as belonging (handwritten by Desfontaines and Candolle) to *C. villosus* Linnaeus (1764); however this material can be identified as belonging to *C. creticus* Linnaeus (1762: 738). We have been unable to locate any further original material (e.g., at BM, C, CGE, FI, LIV or MPU).

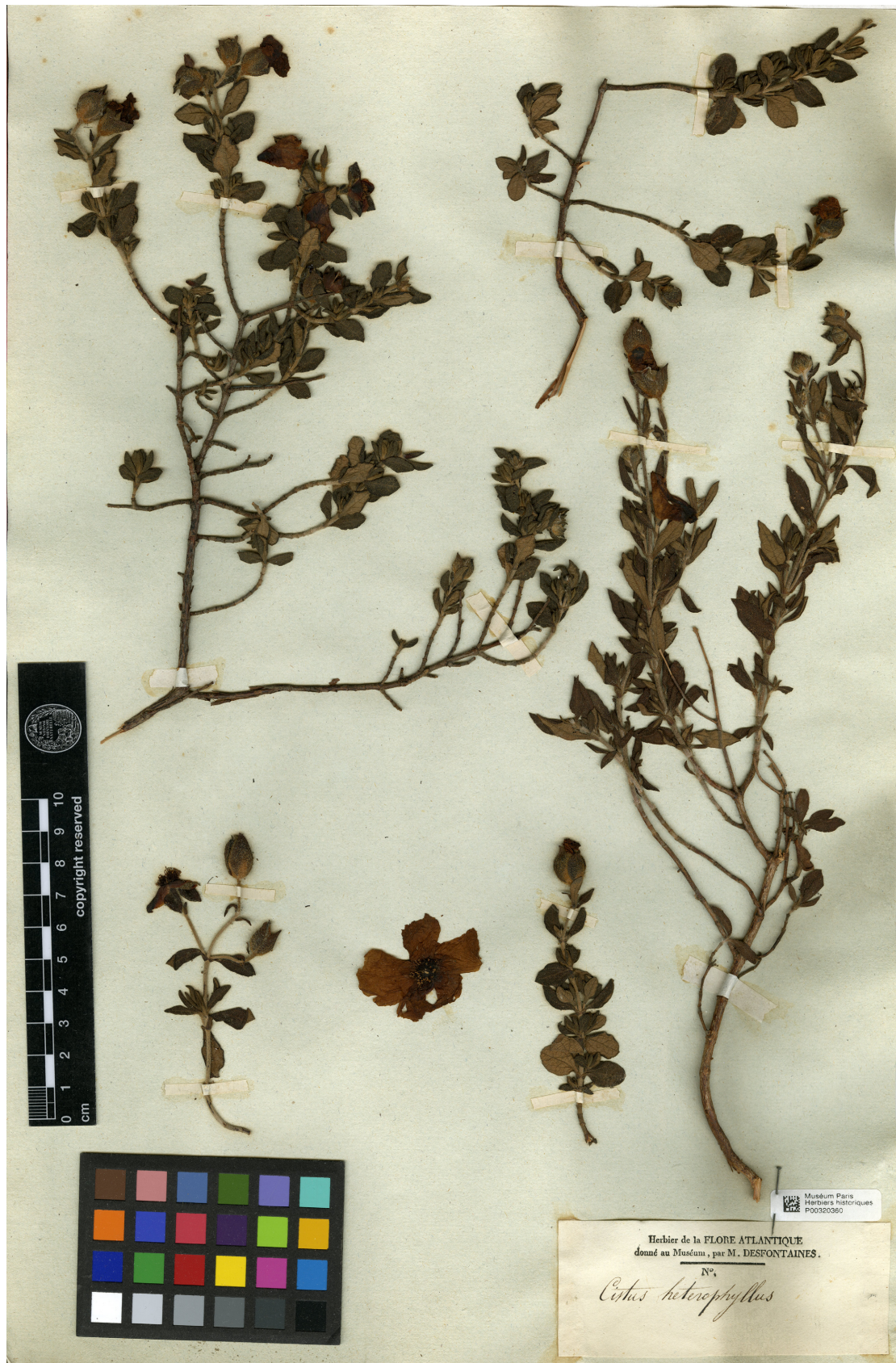


FIGURE 2. Lectotype of *Cistus heterophyllus* Desf., P (2-D code P00320360). Image by courtesy of the herbarium P (MNHN, Paris), reproduced with permission.

polyandria monogynia
tab. 104
966.

Cistus heterophyllus. Ciste a feuilles variables

Cistus ~~eristipulatus~~; foliis ovato-oblongatis, basi vaginantibus, margine reflexis, ^{calycibus} pedunculis ^{quo} subsessilibus, hirsutis, subsessilibus.

obs. frutex ^{Specimen} ~~erectus~~, erectus, ramifissimus. rami juniores villosi, incani, teretes. stipulae nulla. folia opposita, ovato-oblonga seu elliptica ^{13-16 millimet. longa, 7-9 lato} ~~longa, 7-9 lato~~, ~~superne hirsuta, inferne pallidiora~~, ^{marginibus ~~repleta~~ nervosa}, nervis transversis, villosis; villis brevissimis. petioli breves, connati, basi vaginantes. flores terminales solitarii ~~binii~~ terni aut quaterni pedunculati. pedunculi hirsuti, foliosi, plerumque uni flori, axillulo interjecti, foliola ^{duo} lanceolata mittente. calyx villosus persistens, pentaphyllus, foliis ovato-oblongis, ^{tribus} subaequalibus, ^{acutiusculis} interioribus acutis. corolla magna, rosea, diametro fere ^{centimetrali} ~~limbata~~. petals obovata. capsula

subrotunda, villosa ^{quinquelocularis, quinquevalvis} ~~Stocataris, rotunda~~, polysperma.

varietatem possideo distinctam foliis rotundatis. eadem planta saepe folio inferiora rotunda aut ovato-rotunda, superioribus lanceolatis profert unde nomine *Cistus heterophyllus* dictus. affinis *C. inuano* Lin. ~~in collibus incultis prope algiers~~

Habitat in collibus incultis algeriae. 5

FIGURE 3. Original manuscript slips for *Flora atlantica* included in the sheet at P (2-D code P00320360). Images by courtesy of the herbarium P (MNHN, Paris), reproduced with permission.

In conclusion, among the candidate elements, the illustration included in the protologue and the specimens preserved at G-DC (see below) and P, we designate as lectotype of the name *Cistus heterophyllus* the specimen preserved at P, with 2-D code P00320360. This specimen is the most complete and informative original material

available, and it matches well with the current usage and concept of *C. heterophyllus* subsp. *heterophyllus* (see e.g., Battandier & Trabut 1888, Jahandiez & Maire 1932, Dansereau 1939, Martín Bolaños & Guinea 1949, Sauvage & Vindt 1952, Quézel & Santa 1963, Warburg 1968, Crespo & Mateo 1988, Crespo 1990, Raynaud 1999).

Cistus × *clausonii* Font Quer & Maire (1930: 59)

Type (lectotype, designated here):—[MOROCCO]. In Atlante rifano, in dumeti infra Targuist, solo siliceo, 1000 m, 13 Jun 1929, R.C.J.E. Maire s.n., MPU (barcode MPU003405) (images available at <https://herbier.umontpellier.fr/zoomify/zoomify.php?fichier=MPU003405>). Isolectotypes: MPU (barcode MPU003406), P (barcode P05375267).

The protologue of *Cistus* × *clausonii*, numbered “101” consists of a complete diagnosis (including the phrase “*Planta sterilis*”), followed by the geographical provenance “*Hab. inter parentes: in Algeria prope Kolea (Clauson), in Imperio Maroccano pr. Targuist, juxta Hax-Bu-Lahar, in callitrietis degradatis, ad 1000 m. alt.* (F. Q., Emberger et Maire)”.

Therefore, two gatherings are included in the protologue, a gathering from “*Algeria prope Kolea*” collected by Clauson, and a second one from “*Imperio Maroccano pr. Targuist, juxta Hax-Bu-Lahar, in callitrietis degradatis, ad 1000 m. alt.*” collected by Font Quer, Emberger and Maire. These two collections therefore represent syntypes (*ICN* Art. 9.6 and Art. 40 Note 1, see Turland *et al.* 2018), from which a lectotype may be designated (*ICN* Art. 9.12).

Unfortunately, we have been unable to locate any material from the first gathering collected by Clauson (1817–1860). The herbarium of this French botanist and colonial settler in Algeria, is kept at P, but no original material from “*Algeria prope Kolea*” collected by Clauson has been found. However, we traced several specimens preserved at MPU (Maire herbarium) and P herbaria. belonging to the second gathering cited in the protologue, namely the material belonging to the exsiccata “*Iter Maroccanum XVIII*”, collected in Targuist in June 1929.

In the collections at MPU there are two relevant sheets. The sheet with barcode MPU003405 bears two fragments with leaves, flowers, and an original label from Maire’s exsiccata “*Iter Maroccanum XVIII*”, annotated as: “× *Cistus Clausonis* n. hybr. / = *C. albidus* L. × *heterophyllus* Desf. (handwritten by Maire) / In Atlante rifano: in dumeti infra / Targuist, solo siliceo, 1000 m / die 13 junii”. The sheet also contains a printed label with the protologue of this species (image available at <https://herbier.umontpellier.fr/zoomify/zoomify.php?fichier=MPU003405>). The sheet with barcode MPU003406 bears a fragment with leaves and flowers, and the same printed label with the protologue (image available at <https://herbier.umontpellier.fr/zoomify/zoomify.php?fichier=MPU003406>).

On the other hand, there is a sheet of this hybrid belonging to the Maire’s gathering at P, with barcode P05375267. This sheet bears two plant fragments well preserved, and a label handwritten by Maire with the same information that the sheet at MPU003405: (image available at <http://mediaphoto.mnhn.fr/media/1441388868095fyf0iEk797GT0f4c>).

We have been unable to locate any further original material belonging to this gathering (e.g., in the Font Quer herbarium at BC). However, in the herbarium MA, with barcode MA 79272, a sheet bears material identified as *C. heterophyllus* and belonging to Font Quer’s exsiccata “*Iter Maroccanum 1929*” from Targuist (image available at <http://161.111.171.57/herbarioV/visorVCat.php?img=MA-01-00079272>). However, this sheet is heterogeneous, since it contains three fragments of *C. heterophyllus* plus two fragments that can be identified as *C. ×clausonii* (mounted in the lower left and the upper right parts of the sheet). This sheet bears a label annotated “*Hab. in callitrietis, inter Targuist et Sok-et-Tnin de Beni Hadifa (Beni Uriaguel), ad 1100 m. alt.; 22 majii*”. This is the only material of *C. ×clausonii* that has been found in a Spanish herbarium from the “*Iter Maroccanum 1929*”, but clearly is not original material of *C. ×clausonii* because the collection data on the label do not match the protologue.

In fact, the third expedition of the *Iter Maroccanum* took place in 1929. In this expedition, Pius Font i Quer (1888–1964) collected together with Louis Emberger (1897–1969) and René Maire (1878–1949), and they visited the birch forests of Ketama and Tidiguin during the month of June. Concretely, on June 5–7 and June 12, 1929, Font Quer visited Tidiguin (González Bueno 1988), at which time material of *C. ×clausonii* in Hax-Bu-Lahar [Haj Boulahar] had to be collected. However, this hybrid was not distributed in Font Quer’s exsiccata “*Iter Maroccanum*” (González Bueno 1988), so it seems that the only material from the gathering cited in the protologue, in which Emberger, Maire and Font Quer participated, was distributed in Maire’s exsiccata of “*Iter Maroccanum*”.

In conclusion, among the original material of *C. ×clausonii*, specimens preserved at MPU and P, we designate the specimen preserved at MPU, with barcode MPU003405 as lectotype of this name. This specimen fully matches with the current usage of the name *Cistus* × *clausonii* (see e.g., Navarro-Cano 2002, Demoly 2005, Navarro-Cano *et al.* 2009, 2017, Ferrer-Gallego & Laguna 2012).

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