The genus *Aria* (*Sorbus* s. l., Rosaceae) in the Sicilian flora: taxonomic updating, re-evaluation, description of a new species and two new combinations for one Sicilian and one SW Asian species

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Abstract

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The genus-level taxonomy of the *Sorbus* s. l. taxa that occur in Sicily is reviewed. The subdivision of *Sorbus* s. l. into several genera (plus hybridogenous genera) is accepted. By consequence, three genera are added to the flora of the largest island of the Mediterranean Sea, which were previously treated at subordinate levels. Apart from *Sorbus* itself, with a single species, we accept *Aria* with five species (one of them new) as well as *Cormus* and *Torminalis* with one species each. The study of a population newly found on the Madonie Mountains made it necessary to clarify the so far overlooked or misunderstood name *Sorbus meridionalis* (≡ *Pyrus meridionalis*), previously included in the synonymy of either *S. graeca* (≡ *Aria graeca*) or *Sorbus umbellata* (≡ *Aria umbellata*). This name is here lectotypified and the corresponding taxon accepted as a separate species, *Aria meridionalis* **comb. nov.**, whereas the newly found population is described as a new species, *Aria phitosiana* **sp. nov.**, a very rare and vulnerable local endemic of dolomitic areas of the Madonie Mountains in Sicily. In addition, the combination *Aria orbiculata* **comb. nov.** is published for the SW Asian *Sorbus orbiculata*.

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Introduction

The modern trend of using molecular data in plant systematics often has unexpected, unwelcome consequences for the traditionally accepted taxonomy. A particular example relates to a group of wooden maloid Rosaceae*,* treated for a long time within the genus *Sorbus*: That genus itself, and several former genera usually included in it (such as *Aria* Medik. and *Lazarolus* Medik.), together with other

generally recognised genera such as *Crataegus* L. and *Mespilus* L., have been recently transferred to and included in *Pyrus* L. s. l. (Fay & Christenhusz 2018), which made "necessary" the publication of 850 new names at the specific rank alone. At the same time, new species continue to be added to *Sorbus* L. s. l., such as *Sorbus orbiculata,* recentely described from the Caucasus by the second author (GABRIELJAN 2018) many years after the publication of her monograph of *Sorbus* L. (GABRIELJAN 1978), important reference base for the revision of *Sorbus* subg. *Aria* by ALDASORO & al. (2004).

Such extreme lumping is not the obligatory consequence of recent molecular studies. SENNIKOV & KURTTO (2017) and KURTTO & al. (2018) have followed an opposite course, splitting the *Sorbus* component off the now huge and unwieldy *Pyrus* s. l. as a number of small, natural (i.e. monophyletic) segregate genera. In a recent contribution (RAIMONDO 2018), SENNIKOV & KURTTO's assessment was followed and applied to the taxa of *Sorbus* s. l. that occur in Italy (including Sicily).

Unsurprisingly, Sicily − with its high diversity of environmental systems and its central geographical position in the Mediterranean region, at the crossroads of north- to southbound and east-to-west migratory routes − houses a representative sample of *Sorbus* s. l. Several species have converged here; then, through gene exchange and geographical isolation, they differentiated into new species-level taxonomic entities.

Several authors (e.g. ALDASORO & al. 2004, SENNIKOV & KURTTO 2017), have interpreted most taxa of *Aria* (or *Sorbus* subg. *Aria*) as resulting from polyploidisation, hybridisation (intra- and interspecific as well as intergeneric), and apomixis, which, along with geographical isolation, are thought of as the main speciation mechanisms in this group. Most species are quite local and form very small populations. Examples in Sicily are *A. madoniensis* and *A. busambarensis* (RAIMONDO & al. 2012, CASTELLANO & al. 2012).

We here present an update of SENNIKOV & KURTTO'S (2017) inventory of *Sorbus* s. l. for the island of Sicily. Also, we describe a local population, newly discovered on the Madonie Mountains, as a new species, *Aria phitosiana.* Furthermore, some critical populations that had been variously referred to *S. umbellata* subsp. *meridionalis* (Guss.) Vălev, to *S. aria* subsp. *cretica* (Lindley) Holmboe, to and to *S. umbellata* are attributed to a newly circumscribed species, to be named *A. meridionalis* upon lectotypification of the basionym *Pyrus meridionalis* Guss. ex Tod.: a name, of which the correct date and authorship had so far been ignored and that had been treated by many authors (PIGNATTI 1982, 2017, GIARDINA & al. 2007, CASTELLANO 2012) as a synonym of *Aria graeca* (Spach) M. Roem., a species which also occurs in Italy and Sicily. The lectotype here designated maintains much of the traditional application of the name and, therefore, supports nomenclatural stability in the group, avoiding the displacement of one of the other recently proposed binomials (*Sorbus busambarensis* or *Sorbus madoniensis*).

The current inventory of *Sorbus* L. in Sicily

According to WARBURG & KÁRPÁTI (1968), as updated by the treatments in recent national and regional Floras and inventories (CONTI & al. 2005, GIARDINA & al. 2007, RAIMONDO & al. 2010, PIGNATTI 2017, BARTOLUCCI & al. 2018), the

following taxa of *Sorbus* s. l. occur in Sicily (for full nomenclatural source references, see SENNIKOV & KURTTO 2017):

Sorbus aucuparia L. subsp. ***praemorsa*** (Guss.) Nyman
Sorbus aria (L.) Crantz
Sorbus graeca (Spach) Kotschy
Sorbus busambarensis G. Castellano & al.
Sorbus madoniensis Raimondo & al.
Sorbus umbellata subsp. ***meridionalis*** (Guss. ex Tod.) Vălev
Sorbus domestica L.
Sorbus torminalis (L.) Crantz

Sorbus umbellata (Desf.) Fritsch subsp. *umbellata* has been omitted from the above list, because there is disagreement over its possible presence in Sicily (and therefore Italy). RAIMONDO & SPADARO (2009) and RAIMONDO & al. (2010) only accept the presence of a different taxon, *Sorbus umbellata* subsp. *meridionalis* (Guss. ex Tod.) Vălev, whereas WARBURG & KÁRPÁTI (1968), PIGNATTI (2012 and 2017) and BARTOLUCCI & al. (2018) consider its occurrence as doubtful; SENNIKOV & KURTTO (2017) and KURTTO & al. (2018) implicitly dismiss it. CASTELLANO (2012) remained uncommitted, attributing some Sicilian populations to "*S. umbellata* s. l.", while others were to be described as differennt species, *S. busambarensis* and *S. madoniensis* (see CASTELLANO & al. 2012, RAIMONDO & al. 2012).

Taxonomic conspectus of Sicilian *Sorbus* s. l., according to *Atlas florae europaeae*

Following the inventory of SENNIKOV & KURTTO (2017), and the chorological treatment in *Atlas florae europaeae* (KURTTO & al. 2018) based on it, an updated digest of *Sorbus* s. l. for the Italian Flora, including Sicily, has recently been prepared (RAIMONDO 2018). Under the narrow genus concept in *Sorbus* s. l. accepted by SENNIKOV & KURTTO (2017), six genera are now present in Sicily instead of the single, broadly defined genus *Sorbus* that was previously recognised: *Sorbus* s. str., *Aria, Cormus, Torminalis, Chamaemespilus,* and *Hedlundia*. The last-named has been described to accommodate taxa of intergenetic hybrid origin, derived from crosses between *Aria* and *Sorbus* species.

Among Italian authors, BARTOLUCCI & al. (2018) dismissed SENNIKOV & KURTTO'S (2017) generic dismemberment as premature, continuing to adhere to the wide definition of *Sorbus* as a single (though paraphyletic) genus. We are therefore providing here a new digest of Sicilian taxa of *Sorbus* s. l., taking into account our own, new analysis of the taxonomy of *Aria* Spach in Sicily (for full nomenclatural source references, see SENNIKOV & KURTTO 2017):

Sorbus aucuparia subsp. ***praemorsa*** (Guss.) Nyman (≡ *Pyrus praemorsa* Guss. ≡ *Sorbus praemorsa* (Guss.) K. Koch) [Sicily (Etna and Madonie Mts: Fig. 1), Sardinia, southern Italian Peninsula].

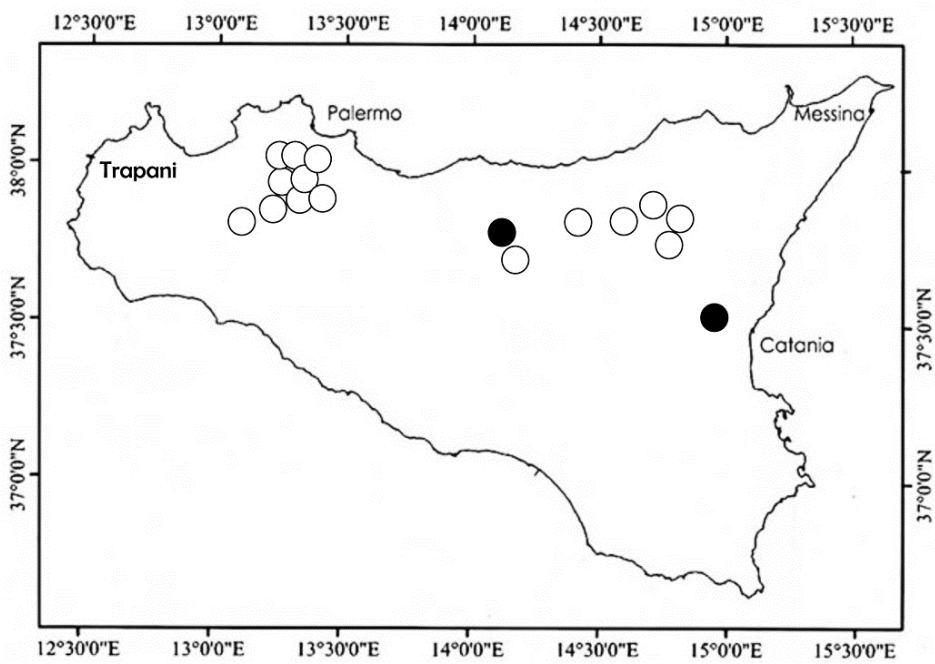

Fig. 1. Map of the Sicilian distribution of *Sorbus aucuparia* subsp. *praemorsa* (●) and of *Torminalis glaberrima* (○) (from specimens seen).

Aria edulis (Willd.) M. Roem. (≡ *Pyrus edulis* Willd. ≡ *Sorbus edulis* (Willd.) K. Koch) [= *Crataegus aria* L. (≡ *Sorbus aria* (L.) Medicus)] [Sicily (Fig. 2), Sardinia, Italian Peninsula, etc.].

Aria graeca (Spach) M. Roem. (≡ *Crataegus graeca* Spach, ≡ *Sorbus graeca* (Spach) Lodd. ex S. Schauer) [Sicily (Fig. 2), Central and southern Italian Peninsula, etc.].

Aria madoniensis (Raimondo & al.) Sennikov & Kurtto (≡ *Sorbus madoniensis* Raimondo & al.) [Sicily (Madonie Mts: Fig. 3)].

Aria busambarensis (G. Castellano & al.) Sennikov & Kurtto (≡ *Sorbus busambarensis* G. Castellano & al.) [Sicily (Rocca Busambra: Fig. 3)].

Cormus domestica (L.) Spach (≡ *Sorbus domestica* L.) [Sicily, other Italian islands, Italian Peninsula, etc.].

Torminalis glaberrima (Gand.) Sennikov & Kurtto (≡ *Sorbus glaberrima* Gand.) [= *Crataegus torminalis* L. (≡ *Sorbus torminalis* (L.) Crantz)] [Sicily (Fig. 1), Sardinia, Italian Peninsula, etc.)].

The Sicilian taxa of *Aria*

Treating the genus *Sorbus*, some Italian authors – among them, in the last 10 years, RAIMONDO & SPADARO (2009) and RAIMONDO & al. (2010) – refer to a distinct Sicilian taxon under the names *Sorbus aria* var. *meridionalis*, *Sorbus meridionalis*, or *S. umbellata* subsp. *meridionalis*. All these names derive from

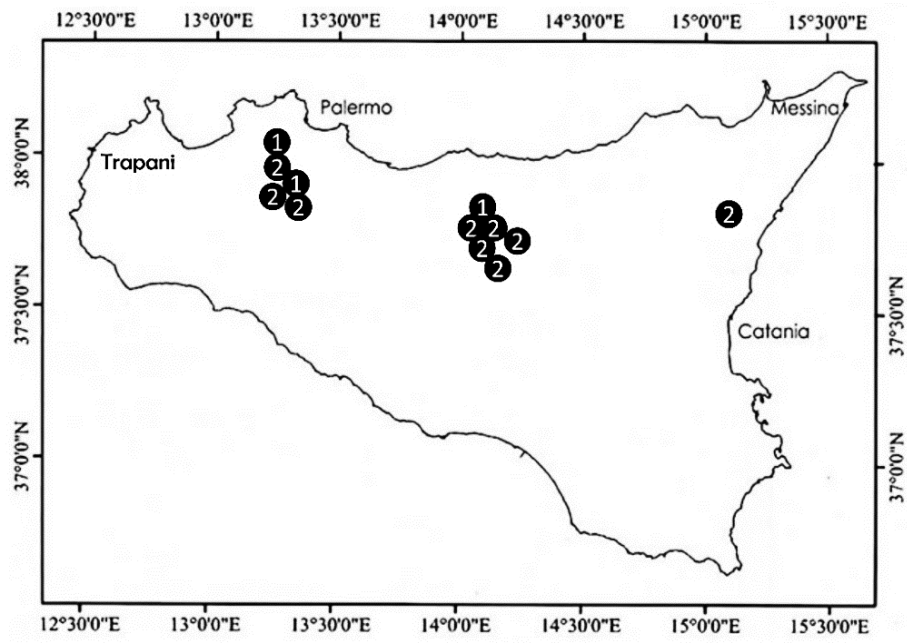

Fig. 2. Map of Sicilian locality of *Aria edulis* (**1**), and *A. graeca* (**2**) (from specimens seen).

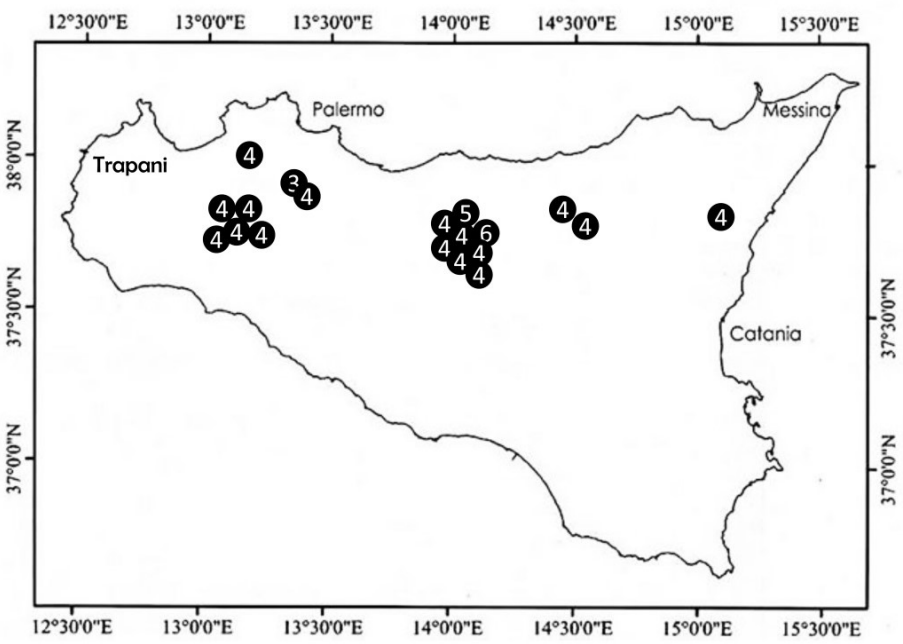

Fig. 3. Map of the Sicilian distribution of *Aria busambarensis* (**3**), *A. meridionalis* (**4**), *A. madoniensis* (**5**), and *A. phitosiana* (**6**) (from specimens seen).

GUSSONE'S (1844-1845) provisional, hence invalid name *Pyrus meridionalis* (see below).

When the first author revised the plant material he had assembled during the preparation of his doctoral thesis (RAIMONDO 1971), he came across a young and incomplete specimen he had collected in the Madonie Mountains in 1970. He dubiously assigned it to *Sorbus aria,* with the annotation "? *Sorbus meridionalis*" (*Pyrus meridionalis* Guss., nom. provis.). He felt justified, in so doing, by the fact that it is the very same taxon that *Todaro* had collected and distributed in his "Flora sicula exsiccata" as *P. meridionalis*, mixed with other taxa. TODARO did not mention the collecting locality on the label (probably because his material came from more than one locality and, judging from two different label kinds associated with it, was collected partly by *Todaro* himself but for the other part by *Citarda*): he gave its origin as "Valdemone", i.e., the Madonie Mountains (see below). When the taxonomy of Sicilian *Sorbus* sect. *Aria* had been disentangled by the description of two endemic species (by RAIMONDO & al. 2012 and CASTELLANO & al. 2012), the Monte Daino population remained unassessed, being tacitly left in *Sorbus meridionalis.* Recent visits to the Monte Daino locality allowed the in-depth study of that population, confirming its identity with part of the *Todaro 671* material. It is noteworthy that the Madonie Mountains, where 5 of the 6 Sicilian *Aria* species occur (all except *A. busambarensis*), is the unrivalled centre of diversity of *Aria* in Sicily and Italy.

On the basis of the sizeable population found on Monte Daino in the Madonie Mountains in 1970, outside of the known area of *Aria madoniensis*, and considering that it is impossible to typify the name *Pyrus meridionalis* with a specimen from that same population (see below), we are describing that population as a new species of *Aria,* that we are naming *A. phitosiana* in honour of professor Dimitrios Phitos, excellent Greek botanist and esteemed friend, on the occasion of his 90th birthday.

At the same time, the study of the Sicilian material kept in FI, along with a review of the data generated by CASTELLANO (2012), in particular those related to a population he had referred to "*Sorbus umbellata* s. l.", has led us to to confirm the occurrence, in Sicily, of a species similar to yet distinct from *Aria umbellata* (sensu SENNIKOV & KURTTO 2017). That species is now *Aria meridionalis* (≡ *Pyrus meridionalis*), here presented as a new combination (see below). A drawing by the famous Sicilian naturalist Francesco MINÀ PALUMBO for his "Iconography of Natural History of the Madonie" (MAZZOLA & RAIMONDO 2011) also belongs here, lending further support to our conclusion on the re-evaluation of *Aria meridionalis* and on its occurrence in the Madonie Mountains.

The genus *Aria* in Sicily

On the basis of literature, and after careful study of a wide range of relevant Sicilian herbarium material (FI, NAP, PAL) as well as *in situ* studies of some natural populations, *Aria* is represented in Sicily by 6 species: two are widely distributed in Europe and parts of the Mediterranean Basin (*Aria edulis* and *A. graeca*); one is Sicilian, being widespread in various mountain areas of the island (*A. meridionalis*),

and 3 are stenochorous, locally endemic microspecies (*A. busambarensis*, *A. madoniensis* and our new *A. phitosiana*).

Key for species identification

1 *Leaf blade* with 8-13 pairs of secondary veins, its margin serrate or biserrate **2**

1* *Leaf blade* with 4-8 pairs of secondary veins, or less; its margin distinctly incised-lobate... **3**

2 *Leaf blade* elliptic or lanceolate, white-felted abaxially, with 10-13 pairs of secondary veins; *fruit* globular or subglobose, bright red to crimson, lenticellate proximally .... 1. ***A. edulis***

2* *Leaf blade* obovate or suborbicular, densely greyish-white-felted abaxially, with 8-11 pairs of secondary veins; *fruit* globular, crimson, with but few conspicuous lenticels all over its surface ..... 2. ***A. graeca***

3 *Leaf blade* with 6-8 pairs of secondary veins, its margin biserrate or incised-serrate; *fruit* smooth or costulate, orange red or bright red **4**

3* *Leaf blade* ovate to suborbicular, with 4-7 pairs of secondary veins; *fruit* ovoid to subglobose, orange or orange red, smooth, with few or no lenticels **5**

4 *Leaf blade* orbicular or broadly elliptic, with 7-8 pairs of secondary veins, its margin biserrate with long, acute to acuminate teeth; *Inflorescence* with few (4-8) flowers; *fruit* globular, costolate, pically truncate, orange red and with many superficial lenticels .... 3. ***A. busambarensis***

4* *Leaf blade* obovate, acuminate, with 5-8 pairs of secondary veins, its margin inciso-serrato; *inflorescence* with many (9-16) flowers; *fruit* ovoid, smooth, bright red and with few superficial lenticels ..... 4. ***A. meridionalis***

5 *Leaf blade* with 5-7 pairs of secondary veins, slightly, dark green adaxially, greyish-white-felted abaxially; *fruit* subglobose, orange, with no or but few superficial lenticels .... 5. ***A. madoniensis***

5* *Leaf blade* with 4-6 pairs of secondary veins, glabrous and light green adaxially, white-felted abaxially; *fruit* ± ovoid, orange red, truncate at both ends, with scarce superficial lenticels ..... 6. ***A. phitosiana***

1. ***Aria edulis*** (Willd.) M. Roem., Fam. Nat. Syn. Monogr. 3: 124. 1847 ≡ *Pyrus edulis* Willd., Enum. Pl. Hort. Berol. 1: 527. 1809 ≡ *Sorbus edulis* (Willd.) K. Koch, Hort. Dendrol.: 176. 1853. − Holotype: herb. Willdenow (B-W09688-01 [photo!]).

Up to 30 m tall tree, rarely a shrub. Branches glabrous, ± smooth, with few lenticels. *Leaf blade* 7-10 cm × 4.5-7.5 cm, ovate or orbicular, with acute apex and biserrate margin, cuneate or truncate and sometimes feebly lobed at the base, glabrous adaxially, white-felted abaxially, with 8-9 pairs of straight, unbranched lateral veins; *petiole* 12-16 mm long, tomentose. *Corymb* tomentose. *Fruit* subglobose, 8.5-13 × 8- 9 mm, red at maturity and with numerous small to medium-sized, evenly distributed lenticels.

Sicilian specimens seen (Fig. 2). − [Madonie]: Passo della Botte, 17 junio 1847, [*Minà-Palumbo*] (Herb. Mus. Minà-Palumbo, Castelbuono); Palermo alla Pizzuta, *s.d.*, *Parlatore* (mixed with *A. graeca*) (FI, as *Pyrus aria*); Rocca Busambra: cliffs and slopes, 37°51'N – 13°23'S, calcareous soil, 1100 m a.s.l. 02.06.1990 *Raimondo & al. 827* (PAL).

2. *Aria graeca* (Spach) M. Roem.Fam. Nat. Syn. Monogr. 3: 127. 1847 ≡ *Crataegus graeca* Spach, Hist. Nat. Vég. 2: 102. 1834 ≡ *Sorbus aria* var. *graeca* (Spach) Griseb., Spic. Fl. Rumel. 1: 93. 1843 ≡ *Sorbus graeca* (Spach) Schauer in Arbeiten Veränd. Schles. Ges. Vaterl. Cult. 1847: 292. 1848 ≡ *Sorbus aria* subsp. *graeca* (Spach) Nyman, Consp. Fl. Eur. Suppl. 2: 118. 1889. − Lectotype (ALDASORO & al. 2004: 106): [Crete], ex monte Ida, [*Tournefort*], Herb. Tournefort 6150 (P P00680357 [photo!]).

Shrubs or treelets. *Leaf blade* 5-9 × 4-7 cm, obovate to suborbicular, entire (not lobed), broadest in the distal half, somewhat leathery, with 8-11 pairs of lateral veins, abaxially usually with a greenish-white tomentum, biserrate with symmetrical, patent teeth. *Fruits* subglobose, usually < 12 mm in diameter, crimson red, with few large lenticels.

Flowering in May-June and ripening its fruits in October-November. Widespread in Central and SE Europe.

Sicilian specimens seen (Fig. 2). − Monte Gibilmesi, 2.X.1993, Troia (PAL [6825]); La Pizzuta, 20.V.1997, *Maniscalco* (PAL [67506]); Madonie: Quacella, 6.VI.1990, *Raimondo & al. 946* (PAL [68541]); Madonie: Monte Catarineci, 6.VI.1990, *Raimondo & al. 1494* (PAL [68542]); Sicani: Monte Rose, 1.VI.1990, *Raimondo & al. 511* (PAL [68543]); Rocca Busambra, 2.VI.1990, *Raimondo & al. 817* (PAL [68544]); Madonie, Vallone Madonna degli Angeli, 19.V.2001, *Schicchi & Certa* (PAL [72454]); Peloritani, Monte Scuderi, 13.VI.1990, *Raimondo & al. 2063* (PAL [68829], as *Sorbus aria*); Madonie, Sciara di Fiasconaro, VI.1880, *Lojacono* (FI); [Madonie]: In valle, quae discendit a Isnello supra Polizzi, ad rupes, Passo del Vadile, 500 m, 29.VII.1874, *Strobl* (FI, 2 sheets as *Sorbus meridionalis*); Valdemone, in saxosis calcareis montosis, Majo, *Todaro 671* (p. p., mixed with *A. madoniensis*) (FI, as *Pyrus aria*); Valdemone, in sylvaticis montosis, Majo, *Citarda* -Todaro Flora Sicula Exiccata 671 (mixed with *A. meridionalis*) (FI, as *Pyrus aria*); [Madonie]: Ai Monticelli [Castelbuono], *Minà-Palumbo* (mixed with *A. madoniensis*) (PAL); Palermo alla Pizzuta, s.d., *Parlatore* (mixed with *A. graeca*) (FI, as *Pyrus aria*).

3. *Aria busambarensis* (G. Castellano & al.) Sennikov & Kurtto in Memoranda Soc. Fauna Fl. Fenn. 93: 29. 2017 ≡ *Sorbus busambarensis* G. Castellano & al. in Pl. Biosyst. 146(Suppl.): 339. 2012. − Holotype: Sicily: Rocca Busambra (Prov. Palermo), Godrano territory, carbonatic scree above Piano della Tramontana, 1315 m, 17.10.2009, *Castellano & Raimondo* (PAL!; isotype: FI!) Fig. 3.

3.5-7 m tall treelets or shrubs, with erect habit and spreading branches in mature individuals. Trunk with smooth, shiny, brownish-gray bark; bark of young branches reddish-gray, glabrous, smooth or slightly wrinkled, with few, 0.4-0.7 mm long, strictly ovate lenticels. *Leaf petiole* gray-tomentose, (4.5-)6-9(-13.5) × (0.9-)1.2-1.4(-1.5) mm. *Leaf blade* (3.5-)6.5-7(-9) × (2.5-)5.5-6.5(-8) cm, slightly leathery, ± broadly elliptical or orbicular, rarely obovate, apex acute or sometimes acuminate, base broadly cuneate or rounded, margin biserrate with long, thin somewhat pointed teeth typically directed outward, adaxially glabrous or sparsely tomentose along the veins, abaxially light-grey felted, with (5-)7-8(-10) pairs of straight lateral veins. *Inflorescence* corymbose, tomentose, 4-8 flowered. *Fruit* (9-)11-12(-12.5) × (12.5-)13-14(-15.5) mm, subglobose to obovate in side view, apically truncate, conspicuously or sometimes slightly costulate by 10 raised lines most obvious distally, red or reddish orange, with 7-20 small lenticels, distally densely tomentose, calyx deciduous or rarely persistent.

Sicilian specimens seen (Fig. 3) – Only the holotype (PAL).

4. *Aria meridionalis* (Guss. ex Tod.) Raimondo & Greuter, **comb. nov.** (Fig. 4) .≡ *Pyrus meridionalis* Guss. [Fl. Sicul. Syn. 2: 831. Jul 1844-Sep 1845, nom. inval.] ex Tod., Fl. Sicul. Exs. [Centuria 7]: num. 671. 1886 ≡ *Sorbus aria* f. *meridionalis* (Guss.ex Tod.) Strobl in Oesterr. Bot. Z. 36: 238. 1886 ≡ *Sorbus meridionalis* (Guss.ex Tod.) Simonk., Enum. Fl. Transsilv.: 7. 1887 ≡ *Sorbus aria*

Fig. 4. Coloured drawing of Minà-Palumbo's *Aria meridionalis* from his unpublished XVIII Century "Iconografia della Storia Naturale delle Madonie", tome 2, 154.

var. *meridionalis* (Guss. ex Tod.) Nyman, Consp. Fl. Eur. Suppl. 2: 118. 1889 ≡ *Sorbus aria* subsp. *meridionalis* (Guss.ex Tod.) Murb. in Acta Univ. Lund., sect. 2, ser. 2, 2(1): 45. 1905 ≡ *Sorbus umbellata* subsp. *meridionalis* (Guss.ex Tod.) Vălev in Jordanov, Fl. Nar. Rep. Bălgarija 5: 365. 1973, comb. inval. (Art. 41.5). − Lectotype (designated here): *Pyrus aria,* Monte Gebbia presso Palazzo Adriano, 1824, [*Gasparrini*] in Herb. Gussone siculum (NAP [photo!]). – Fig. 5.

2.5-6 m tall treelet or shrub; bark smooth, grey. Branches glabrous, reddish, with few lenticels. *Leaves* medium-sized to large; *lamina* (9.5-)8-5 x 4.5-6 (-7) cm, generally obovate, or also ovate to elliptical, green and glabrous adaxially, greyish-white felted abaxially, with 6-8 pairs of lateral veins; base ± cuneate, margin incised-serrate or biserrate, sometimes feebly lobed, apex acute and often acuminate. *Fruit* ovoidal, 11.5-12.5 × 11-12 mm, scarlet, covered with numerous lenticels.

Flowering April to May and ripening its fruits in September to October.

Affinities. – A. meridionalis [≡ *Pyrus meridionalis*] is similar to some forms of *A. umbellata* (Desf.) Sennikov & Kurtto. It is, for now, endemic in Sicily, but further studies might well reveal its presence in other regions of eastern Europe and Caucasia. A specimen from Hungary, as mentioned by CASTELLANO (2012), is closely similar to the Sicilian material.

Nomenclatural notes. – Pyrus meridionalis is reported as a synonym of *Sorbus aria* by LOJACONO (1891), and of *P. aria* var. *graeca* by FIORI (1924). GIARDINA & al. (2007), CASTELLANO (2012), PIGNATTI (1982, 2017) and SENNIKOV & KURTTO (2017) likewise reported it among the synonyms of *S. graeca* (Spach) Kotschy.

Under the provisional, hence invalid designation *Pyrus meridionalis*, GUSSONE (1844-1845) included the entire Sicilian material of the genus *Aria* known to him at that time, which he had previously described under the name *"P. aria"* [s. l.] (GUSSONE 1843: 560). The material seen and referred to by GUSSONE (1843), from among which the nomenclatural type must be designated (TURLAND & al. 2018: Art. 7.8), is kept in the herbaria at Florence and Naples and includes at least two of the currently recognised Sicilian *Aria* species (*A. graeca* and *A. madoniensis*). Even though Gussone failed to validate *P. meridionalis,* the issue of the identity of that name is of practical nomenclatural importance, because of the so far overlooked fact that subsequently it has been validated on the printed labels of TODARO's Flora sicula exsiccata (Fig. 6 and 7). On these labels the name *P. meridionalis* is unquestionably accepted, with a full and direct reference to GUSSONE'S (1844-1845) publication, where it is made clear that the description of *P. aria* in GUSSONE (1843: 560) applies. It is that description which validates TODARO'S use of the name; therefore, the type must be chosen from its context, which means that TODARO'S own specimens are not original material for the name: only specimens used by GUSSONE prior to 1843 are eligible as a type.

The newly discovered place of validation of *Pyrus meridionalis* poses the tricky question of its date. According to Todaro (1864), his series of exsiccata was published in centuriae available for sale. Two centuriae were due to be published each year, of which the two first were distributed in 1864. Todaro Flora sicula exsiccata No. 671, where the name *Pyrus meridionalis* was validated, belongs to the seventh Centuria; it should therefore, according to schedule, have been published in 1867. No collecting date is mentioned on the specimen label of No. 671, to corroborate or contradict that

assumption; but in the PAL herbarium we spotted a specimen of *Salvia triloba* L. f. (i.e., *Salvia fruticosa* Mill.), Flora sicula exsiccata No. 676, that belongs to the same centuria and is stated to have been collected at Mondello in April 1868. This makes us accept 1868 as the likely year of publication of Centuria 7 of the Todaro Flora Sicula Exsiccata.

Fig. 5. Lectotype specimen of *Pyrus meridionalis,* labelled in Gasparrini's handwriting (see CUCCUINI & NEPI 1999).

Fig. 6. Specimen of Todaro's Flora sicula exiccata n° 671: "Valdemone", *Todaro* (FI, as *Pyrus meridionalis*). There are three twigs belonging to two different species: two of *Aria graeca* and one of *A. madoniensis* (righthand, above).

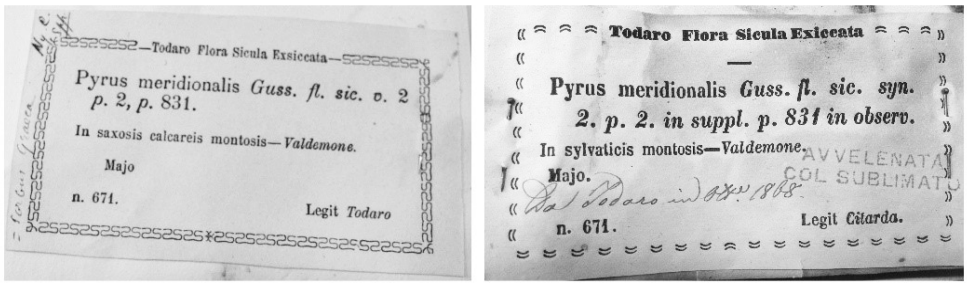

Fig. 7. Detail of the labels of the specimen in fig. 6 (protologue of *Pyrus meridionalis* Guss. ex Tod.) and in Fig. 9 Todaro's Flora sicula exiccata n° 671, *Citarda*.

GUSSONE (1843: 560) records his erstwhile *"Pyrus aria"* from "Monte Gebbia presso Palazzo Adriano (*Gasparrini*), Pizzuta (*Parlatore*): Madonie, Busambra, Mistretta, Boschi di Caronia". These are the "elements from the context of the validating description" of *Pyrus meridionalis* Guss. ex Tod., from among which the type must be selected (TURLAND & al. 2018: Art. Art. 7.7). The original material, therefore, consists of two (in fact, three: see below) cited gatherings (l.c.: Art. 8.2), the specimens of which are syntypes (l.c.: Art. 9.5); plus Gussone's original but uncited specimens gathered at the other cited localities (see l.c.: Art. 40 Note 2). For lectotypification purposes, the syntypes take precedence over the uncited specimens (l.c.: Art. 9.12). Most of the original material is to be found in GUSSONE's Herbarium siculum in Naples (NAP), where 13 sheets are kept under the original denomination of *Pyrus aria*. With few exceptions representing *Aria edulis* and *A. graeca,* all of GUSSONE'S plants belong to *A. meridionalis.* All are loose and unmounted, but have apparently not been consulted and rearranged by later students. Seven of the sheets are unlabelled, and one bears two labels: one by Gussone with a composite locality ("Maio, Junio / Madonie, Busambra, Mistretta, Caronia", the second in Minà's handwriting with the locality Roccazzo del Lupo, not mentioned by Gussone (1843) and therefore not belonging to the original material. As it is impossible to associate any of the fragments on that sheet, or on the unlabelled sheets, with a given locality, they are unsuited for lectotypification purposes. There are three sheets bearing a general Gussone label, "Madonie", and one with one of the cited localities, "Boschi di Caronia". The thirteenth and last sheet is labelled "Monte Gebbia near Palazzo Adriano" in Gasparrini's hand and bears the year of collecting, 1824. It is therefore safe to conclude that it is one of the syntypes.

The other syntype, "Pizzuta (Parlatore)", is not present in GUSSONE's own herbarium but in Florence (FI 55217; Fig. 8); according to a note by an amanuensis, it was donated by PARLATORE to Florence in August 1842, together with his herbarium (Fig. 9); it is not annotated by GUSSONE. It consists of two fragments representing two different species, *Aria edulis* in fruit (to the right) and *A. graeca* in flower (to the left). We consider both as syntypes and, therefore, as eligible for lectotypification purposes, but in our opinion they are less suited than Gasparrini's specimen.

The next to use (and validate) GUSSONE's *Pyrus meridionalis,* Todaro in his Flora sicula exsiccata*,* also accepted the wide species circumscription of GUSSONE,

Fig. 8. Original specimens (syntypes) of *Pyrus meridionalis* Guss. ex Tod., collected by Parlatore from "Panormi [Palermo] alla Pizzuta" (FI 55217), with two different samples corresponding to *Aria graeca* (in flower, to the left) and to *A. edulis* (in fruit, to the right).

Fig. 9. Specimen of Todaro's Flora sicula exiccata n° 671: "Valdemone", *Citarda* [as *Pyrus aria*] (FI), with three different twigs, one corresponding to *Aria meridionalis* (to the left) and two to *A. graeca* (to the right).

as documented by the fact that one of the sheets bearing the *Todaro 671* label, at FI, bears three twigs pertaining to two different species (*A. graeca* and *A. madoniensis*) (Fig. 6). A different specimen of the "Todaro Flora sicula exsiccata", with collector *Citarda*, preserved at FI, comes from "Valdemone"; it also contains three twigs: one corresponds to *A. meridionalis* and two to *A. graeca*. As the label has it (Fig. 9), *Aria meridionalis* would occur in unspecified areas of "Valdemone" that correspond to the Nebrodi area (incl. the Madonie mountains).

Distributional notes. – Some Sicilian specimens labelled *Pyrus meridionalis* by later authors, stored in FI, only have the generic geographical indication "Valdemone". The name "Valdemone" was once used to designate the entire north-eastern part of Sicily, including – from east to west – the Peloritani, Nebrodi and Madonie mountains, whereas "Valdemone" is nowadays used in a sense that corresponds only to the Peloritani and Nebrodi mountains, in Messina province. One of Minà-Palumbo's herbarium sheets from the Madonie mountains (in PAL, identified as *Pyrus meridionalis*) contains twigs of two different *Aria* species: *A. meridionalis* and *A. madoniensis,* occurring in the same mountain massif. Another Minà-Palumbo specimen is in the Museum Minà-Palumbo in Castelbuono. It was used as the basis of MINÀ's illustration (Fig. 4) and had, before, been erroneously identified as *Sorbus aria* subsp. *cretica* (MAZZOLA & RAIMONDO 2011). From the Gussone, Parlatore, Lojacono, Strobl, Ross and Senni materials that we saw in FI it follows that *A. meridionalis* is found both in Ficuzza (near the type locality in the Sicani mountains), and in the Madonie mountains, but it also occurs in the Nebrodi mountains ("Boschi di Caronia", *Guss.* !). The recent specimens from Monte Scuderi (E Sicily), Monte Rose (W Sicily) and the photos by G. Castellano and S. Cambria (Fig. 10 *a* and *b*) from Ficuzza (*a*) and Madonie (*b*), demostrate the current presence of *A. meridionalis* in many areas of the insland.

Sicilian specimens seen. − Palermo: Ficuzza, in silvaticis montosis 5.VII.1907, *Ross 629* [as *Sorbus aria* var. *umbellata* = *S. flabellifolia* (*Pyrus meridionalis*)] (FI, 3 sheets); Sotto Busambra, VIII.1876, *Lojacono* [as *Pyrus meridionalis*] (FI); Madonie a Quacedda, luglio 1840, *Parlatore* (FI 55218, as *Pyrus aria*); Madonie al Piano della Battaglia …., ? 1840, *Parlatore* (FI, as *Pyrus aria*); Madonie, 22 sett. 1832, *Minà-Palumbo* (FI, as *Sorbus aria*); Madonie, Sicilia, *Parlatore* (FI, as *Pyrus aria*); Madonie, Sicilia, 1841, *Parlatore* (FI-W, as *Pyrus aria*, 2 sheets); Madonie, Busambra, Mistretta, Caronia, in saxosis montosis, Majo-Junio [*Gussone*] (NAP, as *Pyrus aria*, 3 sheets); [Nebrodi]: Boschi di Caronia, giugno 1830, [*Gussone*] (NAP); "Madonie, Busambra, Mistretta, Caronia, Majo-Junio" [*Gussone*] and "Madonie al Roccazzo del lupo, junio" [manu ignota posterior] (NAP, 2 sheets with 2 labels as *Pyrus aria* and *Sorbus aria* respectevely); no label [*Gussone*] (NAP, 7 sheets): Madonie, julio, [*Gussone*] (NAP); Madonie, s.d. [*Gussone*] (NAP); Monte Gebbia presso Palazzo Adriano [*Gasparrini*] (NAP); Valdemone, In sylvaticis montosis, Majo, *Citarda* [Todaro Flora sicula exiccata 671] (FI, p.p.); Sicilia: Valdemone, s.d., *Todaro* (p.p. mixed with *A. graeca*) (FI, as *Pyrus meridionalis*) [Madonie]: Serra di Cavallo, 17 junio 1847, [*Minà-Palumbo*] (Herb. Mus. Minà-Palumbo, Castelbuono); [Madonie]: Pomieri, Passo della Botte nel balzo, Julio 1849 [*Minà-Palumbo*] (Herb. Minà-Palumbo, Castelbuono, as *Pyrus aria*); M. Busambra, Ciacca di Bifarera, 5.6.1904, *Senni* (PAL, as *Sorbus graeca*); Peloritani: Monte Scuderi, 13.6.1990, *Raimondo & al. 2063* (PAL as *Sorbus aria*); Monti Sicani: Monte Rose, *Raimondo & al. 511* (PAL as *Sorbus graeca*).

5. *Aria madoniensis* (Raimondo & al.) Sennikov & Kurtto in Memoranda Soc. Fauna Fl. Fenn. 93: 28. 2017 ≡ *Sorbus madoniensis* Raimondo & al. in Pl. Biosyst.

Fig. 10. *Aria meridionalis* in fruit: (**a**) from the Madonie population (photo S. Cambria); (**b**) and (**c**) from the Sicani mountains population [Monte Gebbia (*locus classicus*) and Piano delle Fontane, respectively]; photos from CASTELLANO (2012).

146(Suppl.): 347. 2012. − Holotype: Sicily: Monti Madonie, in Località Macchia dell'Inferno sopra Castelbuono, su litosuolo calcareo, 1385 m, 5.6.2010, *Raimondo & Castellano* (PAL!; isotypes: B!, FI!, G!).

1.5-3 m tall, erect shrub with spreading branches. Trunk with smooth, glossy, greyish-red bark, young branches reddish, glabrous, smooth, with few ovate, 0.6-0.8 mm long, lenticels. *Leaf petiole* tomentose, (6-)9-13(-16.5) mm long. *Leaf blade* (2.5-)4.0-5.5(-6.4)×(1.9-)3.5-4.5(-5.5) cm, slightly longitudinally incurved, leathery, rhombic or suborbicular, acute, base broadly cuneate or rounded, margin biserrate or shallowly lobed, glabrous or thinly tomentose adaxially, with a snow-white tomentum abaxially, with 5-7 pairs of straight, unbranched lateral veins. *Inflorescence* corymbose, tomentose. *Fruit* 6.6-8.5 × 7-9 mm, orange or yellowish orange, with 0-10 small lenticels, with dense tomentum that persists to maturity distally.

Sicilian specimens seen (Fig. 3).− Monti Madonie, in località Macchia dell'Inferno sopra Castelbuono, su litosuolo calcareo, 1385 m a.s.l., 37°54'12.90''N, 14°03'40.30''E, 05 VI 2010,

(fl.), *Raimondo & Castellano* (holotype: PAL; isotypes: B, FI, G). Valdemone, *Todaro 671* (FI p.p., mixed with *A. graeca*) *Todaro & Citarda* p.p.; Valdemone, *Citarda* in Todaro 671 (FI); Valdemone, *Minà-Palumbo* (PAL p.p., mixed with *A. graeca*); Madonie: Gonato, 8.VI.1847 (Herb. Mus. Minà-Palumbo, Castelbuono, as *Sorbus umbellata*, det. Dull 1990); Timpi di Monticelli, bosco serre di Quacedda, 2.VII.1846 (Survuna), [*Minà-Palumbo*] (Herb. Mus. Minà-Palumbo, Castelbuono, as *Pyrus aria*); no label [*Minà-Palumbo*] [Herb. Mus. Minà-Palumbo, Castelbuono, as *Pyrus meridionalis*).

6. *Aria phitosiana* Raimondo & Greuter, **sp. nov.** (Fig. 11).

Holotype: Sicily, Madonie, northern slope of Monte Daino, dolomitic rocky ground, c. 1550 m a.s.l., 7 VI 2018, *Raimondo* (PAL; isotypes: PAL-Gr, FI). – Figs. 12,13 & 14.

?= *Sorbus aria* var. *incisa* Lojac., Fl. Sicul. 1(2): 200. 1891, nom. illeg. [non Mutel 1834]. Holotype: Sicily, "alle serre di Quacedda" [Quacella], *Lojacono* (not extant in PAL and FI, not seen).

Treelet with upright trunk and drooping branches; bark smooth, brown, ferrugineous, in young branches with plentiful ovate lenticels. *Leaves* medium-sized; *petiole* tomentose, 3-10 mm long; *leaf lamina* flat, glabrous and dark green adaxially, white-tomentose abaxially, ovate to suborbicular or elliptic, 3.5-7(-8) × 2.5-5.5(-6) cm, with 4-6 pairs of lateral veins; base sub-cuneate, margin incised-serrate or lobulate distally; apex mucronate, lobes acute, irregularly serrate. *Leaves* of young plants similar but smaller, suborbicular to subtriangular. *Flowers* white, scented, (4-)5-16(-18) per raceme; pedicels woolly. *Fruit* subovoid to obovoid 8-10 × 4-5 mm, glabrous except distally, reddish, with with few scattered lenticels.

Flowering May to June and ripening its fruits in October-November.

Distributional notes. − A rare species, endemic to Sicily, very local and threatened. IUCN Category: Vulnerable. Lojacono (1891) reports his *Sorbus aria* var. *incisa* from the "Serre di Quacedda", a dolomitic relief immediately adjacent to Mount Daino, the type locality of *A. phitosiana.* The last named, contrary to other *Aria* species in the montane or submontane phytoclimatic belt of the same area, prefers dolomitic ground.

Affinities. – *Aria phitosiana* is similar to *Aria umbellata*. From that polymorphic species it differs – apart from its occurrence west of the distributional range of *A. umbellata* – in the shape and colour of its fruits (reddish rather than yellowish or red, and with but rare lenticels). *Aria phitosiana* is also similar to *A. baldaccii* (C. K. Schneid.) Sennikov & Kurtto (≡ *Sorbus umbellata* var. *baldaccii* C. K. Schneid. ≡ *Sorbus meridionalis* subsp. *baldaccii* (C. K. Schneid.) Bordz.), but it is well distinct from it, and also from the Sicilian *A. madoniensis,* described from the northern slopes of the of the calcareous Mt. Carbonara massif in the same mountain system, by its arborescent rather than shrubby (pleiocormic) growth. *A. phitosana* is similar to *A. madoniensis* in leaf dimensions and shape as well as in the number of lateral veins, but differs in growth habit (Fig. 12 *a* and *b*) and in the colour of the adaxial leaf surface (Fig. 13 *a* and *b*) and of its mature fruits (reddish rather than orange) (Fig. 14 *a* and *b*). *Aria phitosiana* also differs from *A. baldaccii* (from Bosnia, Croatia, Herzegovina, Montenegro, Albania, and Greece) by its obovate leaves with acute, not obtuse lobes.

Specimens seen. – Sicily: Madonie, slopes of Mount Daino, on dolomitic grounds, 1450 m a.s.l., June 1970, *Raimondo* (PAL).

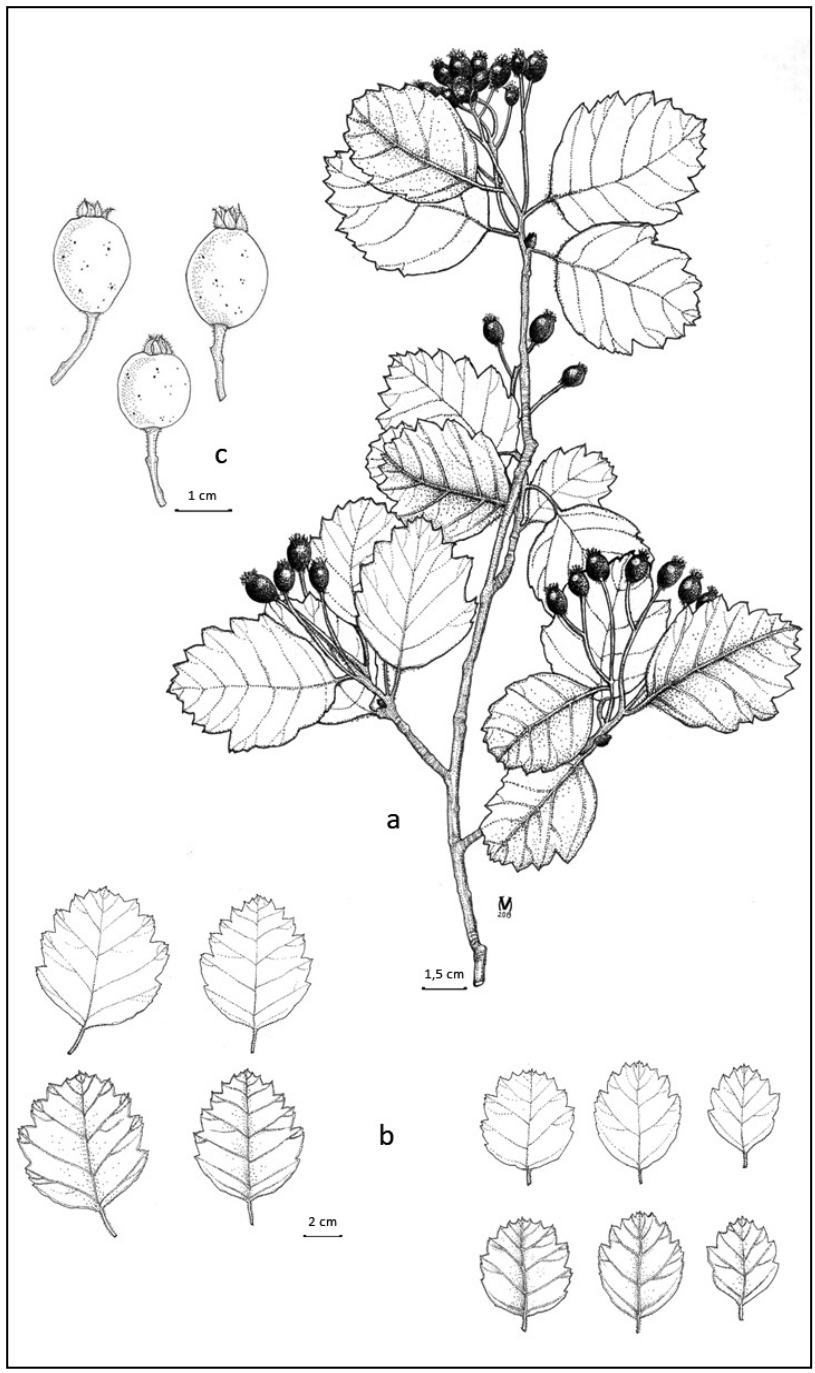

Fig. 11. Iconography of *Aria phitosiana*: (**a**) habitus (from holotype), (**b**) leaves (top row: adaxially; bottom row: abaxially), (**c**) fruits (drawing by V. Magro).

Fig. 12. Individuals of *Aria phitosiana* (**a**) and of *A. madoniensis* (**b**) in their respective natural habitat [photos F.M. Raimondo].

Fig. 13. Fruiting branches and leaves of: (**a**) *Aria phitosiana* (photo F. M. Raimondo); (**b**) *A. madoniensis* (from RAIMONDO & al. 2012); (**c**) leaf of a young plant of *A. phitosiana* (photo F. M. Raimondo).

Fig. 14. Fruits, from the respective locus classicus, of: (**a**) *Aria phitosiana* (photo F. M. Raimondo) and (**b**) *A. madoniensis* (photo from RAIMONDO & al. 2012).

Transfer of *Sorbus orbiculata* to *Aria*

The second author recently published the combination *Sorbus orbiculata* for a species of *Sorbus* subg. *Aria* Spach from Transcaucasia and adjacent countries (Turkey and Iran) (GABRIELJAN 1978, 2018). With the generic status of *Aria* accepted here, following SENNIKOV & KURTTO (2017), that species lacks a correct name. We take the opportunity to provide it here by publishing the following new combination.

Aria orbiculata (Gabrieljan) Gabrieljan, **comb. nov.** ≡ *Sorbus umbellata* var. *orbiculata* Gabrieljan, Ryabiny Zapadnoi Azii Gimala'ev: 175. 1978 ≡ *Sorbus orbiculata* (Gabrieljan) Gabrieljan in Novosti Sist. Vyss. Rast. 49: 88. 2018.

Conclusion

Summarizing the results of this study, the genus *Aria* is enriched by three more specific taxa. Furthermore, it is shown that Sicily is an active centre of diversity for the genus *Aria*. The Madonie Mountains represent, both in Sicily and in the whole Mediterranean area, the smallest area with a strong concentration of species. In fact almost all species present in Italian territory (5 of 7) and 5 of 6 of those present in Sicily are represented here.

In conclusion, we note that an in-depth study of the *Aria* populations related to the *Aria umbellata* group, on a geographical scale that transcends a single island, also

encompassing southern Europe and Caucasia – might lead to a different assessment of the units here proposed for Sicily.

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References

ALDASORO, J. J., AEDO, C., GARMENDIA, F. M., HOZ, F. P. DE LA & NAVARRO, C. 2004: Revision of *Sorbus* subgenera *Aria* and *Torminaria (*Rosaceae-Maloideae).− Syst. Bot. Monogr. 69: 1-148.

BARTOLUCCI, F., PERUZZI, L., GALASSO, G., ALBANO, A., ALESSANDRINI, A., ARDENGHI, M. G., ASTUTI, G., BACCHETTA, G., BALLELLI, S., BANFI, E., BARBERIS, G., BERNARDO, L., BOUVET, D., BOVIO, M., CECCHI, L., DI PIETRO, R., DOMINA, G., FASCETTI, S., FENU, G., FESTI, F., FOGGI, B., GALLO, L., GOTTSCHLICH, G., GUBELLINI, L., IAMONICO, D., IBERITE, M., JIMÉNEZ-MEJÍAS, P., LATTANZI, E., MARCHETTI, D., MARTINETTO, E., MASIN, R. R., MEDAGLI, P., PASSALACQUA, N. G., PECCENINI, S., PENNESI, R., PIERINI, B., POLDINI, L., PROSSER, F., RAIMONDO, F. M., ROMA-MARZIO, F., ROSATI, L, SANTANGELO, A., SCOPPOLA, A., SCORTEGAGNA, S., SELVAGGI, A., SELVI, F., SOLDANO, A., STINCA, A., WAGENSOMMER, R. WILHALM, T. & CONTI, F. 2018: An updated checklist of the vascular flora native to Italy. − Pl. Biosyst. 152: 179-303.

CASTELLANO, G. 2012: Il genere *Sorbus* (Rosaceae, Maloideae) subg. *Aria* in Sicilia. − Università di Palermo, Dipartimento di Biologia Ambientale e Biodiversità, Pp. 238 [unpublished PhD thesis].

— G., MARINO, P., RAIMONDO, F. M. & SPADARO, V. 2012: *Sorbus busambarensis* (Rosaceae), a new endemic species of Sicily.− Pl. Biosyst. 146(suppl.1): 338-344.

CONTI, F., ABBATE, G., ALESSANDRINI, A. & BLASI C. (eds) 2005: An annotated checklist of vascular flora of Italy. – Roma.

CUCCUINI, P. & NEPI, C. 1999: Herbarium Centrale Italicum (Phanerogamic Section): the genesis and structure of a herbarium. The main collections, the collectors, the handwriting samples and the personnel in its 150-year history. – Firenze.

FAY, M. F. & CHRISTENHUSZ, M. J. M. 2018: *Pyrus* L. Pp. 94-126. In: CHRISTENHUSZ, M. J. M., FAY, M. F. & BYNG, J. W. (eds.), Plant Gateway's the global flora: a practical flora to vascular plant species of the world. Special Edition, GLOVAP Nomenclature, Part 1. − Bradford.

FIORI, A. 1923-1925: Nuova flora analitica d'Italia, 1. – Firenze.

GABRIELJAN, E. T. 1978: Rjabin'i (*Sorbus* L.) Zapadnoj Azii i Gimalaev [Rowans (*Sorbus* L.) of Western Asia and the Himalayas]. – Erevan.

— 2018: *Sorbus orbiculata* (Rosaceae), a new species from Caucasus, North-East Anatolia and North-West Iran. − Novosti Sist. Vyssš. Rast. 49: 87-92.

GIARDINA, G., RAIMONDO, F. M. & SPADARO, V. 2007: A catalogue of plants growing in Sicily. – Bocconea 20: 5-552.

GUSSONE, G. 1843: Florae siculae synopsis, 1. – Napoli.

— 1844-1845: Florae siculae synopsis, 2. – Napoli.
KURTTO, A., SENNIKOV, A. N. & LAMPINEN, R. (eds.) 2018: Atlas florae europaeae. Distribution of vascular plants in Europe. 17. Rosaceae (*Sorbus* s. lato). – Helsinki.
LOJACONO POJERO, M. 1891: Flora sicula, 1(2). – Palermo.
MAZZOLA, P. & RAIMONDO, F. M. 2011: Plants. Pp. 3-387. In: MINÀ PALUMBO, F., Iconography of the natural history of the Madonie, 2. – Palermo.
PIGNATTI, S. 1982: Flora d'Italia, 2. – Bologna.
— 2017: Flora d'Italia, ed. 2, 2. – Milano.
RAIMONDO, F. M. 1971: La flora forestale delle Madonie. – Università di Palermo [unpublished PhD thesis].
— 2018: Acquisizioni filogenetiche e variazioni tassonomiche in alcune rosacee legnose della flora Italiana. – Notiziario Soc. Bot. Ital. 2: 35-36.
—, CASTELLANO, G., BAZAN, G. & SCHICCHI, R., 2012: *Sorbus madoniensis* (*Rosaceae*), a new species from Sicily. – Pl. Biosyst. 146(suppl.1): 345-351.
—, DOMINA, G. & SPADARO, V. 2010: Checklist of the vascular flora of Sicily. – Quad. Bot. Ambient. Appl. 21: 189-252.
— & SPADARO, V. 2009: Addenda et emendanda to the "A catalogue of the plants growing in Sicily". – Fl. Medit. 19: 303-312.
SENNIKOV, A. N. & KURTTO, A. 2017: A phylogenetic cheklist of *Sorbus* s. l.(*Rosaceae*) in Europe. – Memoranda Soc. Fauna Fl. Fenn. 93: 1-78.
TODARO, A. 1864: Flora sicula exsiccata. − Bot. Zeitung (Berlin) 22: 54-56.
TURLAND, N., WIERSEMA, J., BARRIE, F. R., GREUTER, W., HAWKSWORTH, D., HERENDEEN, P., KNAPP, S., KUSBER, W.-H., LI, D.-Z., MARHOLD, K., MAY, T. W., MCNEILL, J., MONRO, A. M., PRADO, J., PRICE, M. J. & SMITH, G. F. 2018: International code of nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. – Regnum Veg. 154.
WARBURG, E. F. & KÁRPÁTI, Z. E. 1968: 28. *Sorbus* L. Pp. 67-71. In: TUTIN, T. G., HEYWOOD, V. H., BURGES, N. A., MOORE, D. M., VALENTINE, D. H. & WALTERS, S. M. (eds), Flora Europaea, 2. – Cambridge.