L. Peruzzi, G. Gestri & B. Pierini

Distribution of the genus *Gagea* (*Liliaceae*) in Sardinia

Abstract

Peruzzi, L., Gestri, G. & Pierini, B.: Distribution of the genus *Gagea* (*Liliaceae*) in Sardinia. — Fl. Medit. 21: 261-272. 2011. — ISSN: 1120-4052 printed, 2240-4538 online.

An updated geographical distribution of the genus *Gagea* Salisb. in Sardinia with a grid map for each taxon is given. This study is based on literature, herbarium and field investigations. The examined species are *G. bohemica* (Zauschn.) Schult. & Schult. f., *G. dubia* A. Terracc., *G. foliosa* (C. Presl) Schult. & Schult. f., *G. fragifera* (Vill.) E. Bayer & G. López González, *G. granatellii* (Parl.) Parl., *G. lojaconoi* Peruzzi and *G. soleirolii* F. W. Schultz. The occurrence in Sardinia of the phytogeographically interesting *G. fragifera* is here confirmed in a single locality. Single new localities are reported for *G. dubia* and *G. granatellii.* Finally, an analytical key for the identification of the studied species is presented.

Key words: Gagea, Sardinia, Taxonomy.

Introduction

In the framework of a critical revision of *Gagea* phytogeography at Italian national level (Bartolucci & Peruzzi 2007; Peruzzi 2004, 2005; Peruzzi & Gargano 2005; Peruzzi & Bartolucci 2006; Peruzzi & Caparelli 2007; Carta & al. 2007; Peruzzi *&* al. 2008, 2009a-b, 2010), an update and verification on the distribution of the Sardinian species is here presented.

Materials and Methods

For the present study both selected literature and herbarium (B, CAG, CLU, FI, GE, NAP, PI, RO, SASSA, Herb. Tison) data were used, as well as field researches during the year 2011.

An UTM ED 50 100 × 100 Km grid map was used for mapping the data, together with an arbitrary secondary grid 10 × 10 Km. The stands were distinguished as not recently (last 30 years) confirmed (+), confirmed (•), new (*).

The taxa are arranged in alphabetical order, according to their current accepted name. Synonyms used at regional level were also reported.

Results & Discussion

Gagea bohemica (Zauschn.) Schult. & Schult. f. (Fig. 1a)
= *G. bohemica* subsp. *saxatilis* (Mert. & Koch) Asch. & Graebn.
= *G. busambarensis* (Tineo) Parl.
= *G. bohemica* subsp. *australis* var. *corsica* (Jord. & Fourr.) Rouy

This species is rather rare and elusive, and occurs all across the Mediterranean Basin and central-western Europe (Rix & Woods 1981). In Sardinia, *G. bohemica* grows on rocky substrate (calcareous, siliceous or lavic), at 730-1825 m a.s.l. and flowers from January to April.

Literature data – Sardinia (Terracciano 1906 sub *G. saxatilis* subsp. *australis* var. *corsica*); Sardegna (Pignatti 1982 sub *G. busambarensis*); Italy, Sardinia (Esterzili), 1,150 m a.s.l. (Peruzzi & al. 2008; Peterson & al. 2010).

Specimina visa – Osilo a Bonaria, 1/IV/1907, *A. Terracciano* (NAP); cima Monte Gonare, 21/IV/1908, *A. Terracciano* (NAP); Osilo, cima di Bonaria, 24/I/1912, *A. Terracciano* (NAP, sub *G. saxatilis* f. *sardoa* A. Terracc. *in schedis*); Monte Limbara, 27/III/1966, *B. Corrias* (SASSA, sub *G. busambarensis*); Monte Rasu, flora cacuminale, 1258 m, 5/II/1967, *B. Corrias* (SASSA); Passo Sa Fraigada, 20/IV/1970, *S. Diana* (SASSA sub *G. granatellii*); Sardinien, Monti del Gennargentu, auf den Grinsel Bruncu Spina (1829 m), 3/IV/1985, *Kilian* (B, sub *G. busambarensis*); Sardegna, Nuoro, Esterzili: sommet du Monte Santa Vittoria 1150 m, lappiaz calcaire sur versant sud, se développant dans les fentes exposées au nord, ab. 3, 8/IV/2000, *Tison* (Herb. Tison); Sardegna, Nuoro, Fonni: Monte Bruncu Spinu au terminus de la route v. 1650 m, pelouses rocailleuses et replats siliceux sur versant NE, ab. 2, 11/IV/2000, *Tison* (Herb. Tison); Sardegna Nuoro, Oliena: massif du Sopramonte au niveau du col entre le terminus de la route et la Punta Corrasi v. 1350 m, fentes de rochers et replats moussus sur calcaire, ab. 2, 10/IV/2000, *Tison* (Herb. Tison); Sardegna Sassari, Tempio Pausania: massif du Limbara près du hameau de Vallicciola v. 1200 m, fentes de rochers siliceux , ab. 1, 5/IV/2000, *Tison* (Herb. Tison); Bruncu Spina, Fonni (Nuoro) substr. metamorfiti – biocl.: supratemp. sup. / umido sup. coord. 40° 01' 942" N – 9° 17' 802" E, 1510-1600 m s.l.m., 25/V/2004, *Bacchetta, Casti, Jimenez* et *Navarro* (CAG); Monti del Gennargentu, tra Genna Petru Surdu e la cima del Bruncu Spina (UTM: 32T 525.4429-4431), pascoli rocciosi, 1550-1825 m s.l.m., 18/IV/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI).

Gagea dubia A. Terracc. (Fig. 1b)
= *G. ramulosa* A. Terracc.

This species is endemic to the Mediterranean (Peruzzi & Tison 2007). In Sardinia, this unit grows in rocky grasslands and meadows, at 800-1500 m a.s.l. and flowers from March to April. The population from Bruncu Spina was never reported before.

Literature data – "*Oliena: massif du Sopramonte entre le terminus de la piste et la Punta Corrasi au niveau du col v. 1350 m, rocailles calcaires, ab.2, 10.IV.2000*" (Tison, 2004); "*Parco Eolico di Ulassai*" (Mossa & al., 2008); Italy, Sardinia (Supramonte), 1,350 m a.s.l. (Peruzzi & al. 2008; Peterson & al. 2010).

Specimina visa – Sardegna Nuoro, Oliena: massif du Sopramonte entre le terminus de la piste et la Punta Corrasi au niveau du col v. 1350 m, rocailles calcaires, ab. 2, 10/IV/20000, *Tison* (Herb. Tison); Monti del Gennargentu, versante orientale di Genna Petru Surdu (UTM: 32T 525.4431), pascoli rocciosi, ca. 1500 m s.l.m., 18/IV/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI).

Gagea foliosa (C. Presl) Schult. & Schult. f. (Fig. 1c)

This species is W-Mediterranean (Tison 2004). In Sardinia, this unit grows in meadows and wood margins at (400)770-1730 m a.s.l. and flowers from April to May. *G. foliosa* is the most common species in Sardinia, at altitudes between 700-800 and 1500-1600 m a.s.l. Incidentally, the report of $2n = 36$ chromosomes (the only available for Sardinian *Gagea*) published for *G. soleirolii* by Martinoli (1950), is actually to refer to *G. foliosa*, after checking of herbarium specimen in CAG. Indeed, in the latter author's opinion, *G. foliosa* should have been absent from Sardinia, with *G. soleirolii* as vicariant.

Literature data – "*Herb. Moris : in monte Genargentu*" (Barbey 1884 sub *G. granatellii*, with notes); "*Genargentu, nelle montagne di Seui a Pirastu Trotu, Tacco di Seui, Monte novo, Oliena, Coor-è-boi, Tacco di Jersu, fra Ulassai e Tacquisara*" (Sommier 1897); Arcu d'Iscova (Martinoli 1950 sub *G. soleirolii*); Monte Albo (Camarda 1984a); "*Fonni: montée au Bruncu Spinu 1500-1600 m, pelouses fraiches et ouvertes, en mélange avec G. granatelliii ou à proximité, mais préférant en moyenne des emplacements plus humides, ab.3, 11.IV.2000; Oliena: montée au Supramonte v. 900 m, chenaie verte éclaircie autour d'une bergerie abandonnée, ab. 2, 10.IV.2000; Oliena: col Corrasi 1300 m, thalweg froid et moussu exposé au nord, ab. 2, 10.IV.2000; Orani: près de l'auberge du Monte Gonare v. 800 m, pelouses ensoleillés à mi-ombragées, en mélange avec G. granatelliii, ab. 2, 10.IV.2000; Buddusò: rive gauche du ruisseau Tirso dans les 300 m en amont du pont de la S389 v. 750 m, subéraies claires, ab. 3, 12/IV/2000*" (Tison 2004); Italy, Sardinia (Orani), 800 m a.s.l. (Peruzzi & al. 2008; Peterson & al. 2010).

Specimina visa – Gennargentu, V/1862, *Gennari* (NAP); Monte Moro, 29/IV/1872, *Gennari* (FI); M.te Gennargentu in Sardegna, 19/V/1890, *Fiori* (NAP); Monte Gennargentu, 29/V/1894, *Martelli* (FI); M.te Gennargentu a Druman, sopra Punta Paolina, 8/VI/1916, *A. Terracciano* (NAP); Oliena: Lo Prado, 9/IV/1916, *A. Terracciano* (NAP); Gennargentu, Arcu d'Iscova, 21/IV/1948, *Martinoli* (CAG); Monte Fumai, 18/IV/1966, *B. Corrias* (SASSA); Mularza Noa, 28/IV/1966, *F. Valsecchi* (SASSA); Monte Rasu, flora cacuminale, 1258 m, 5/II/1967, *B. Corrias* (SASSA sub *G. granatellii*); Passo Sa Fraigada, 20/IV/1970, *S. Diana* (SASSA sub *G. granatellii*); Sardegna, Nuoro, Fonni: montée au Bruncu Spinu 1500-1600 m, pelouses fraîches et ouvertes, en mélange avec *G. sardoa* ou à proximité, mais préférant en moyenne des emplacements plus humides, ab. 3, 11/IV/2000, *Tison* (Herb. Tison); Sardegna, Nuoro, Oliena: col Corrasi 1300 m, thalweg froid et moussu exposé au nord, ab. 2, 10/IV/2000, *Tison* (Herb. Tison); Sardegna, Nuoro, Oliena: montée au Sopramonte v. 900 m, chênaie verte éclaircie autour d'une bergerie abandonnée, ab. 2, 10/IV/2000, *Tison* (Herb. Tison); Sardegna, Nuoro, Orani: près de l'auberge du Monte Gonare v. 800 m, pelouses ensoleillées à mi-ombragées, en mélange avec *G. sardoa*, ab. 2, 10/IV/2000, *Tison*

(Herb. Tison); Sardegna, Sassari, Buddusò: rive gauche du ruisseau Tirso dans les 300 m en amont du pont de la S389 v. 750 m, subéraies claires, ab.3, 12/IV/2000, *Tison* (Herb. Tison); Monti del Gennargentu, tra Genna Petru Surdu e la sella tra la cima del Bruncu Spina e Genne Erbeghe (UTM: 32T 525.4429-4430), pascoli rocciosi, 1550-1730 m s.l.m., 18/IV/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI); Monti del Gennargentu, Genna Luddurrèo (UTM: 32T 525.4434), pascoli rocciosi, 1350 m s.l.m., 18/IV/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI); Monti del Gennargentu, Arcu Correboi (UTM: 32T 529.4437), pascoli rocciosi, 1150 m s.l.m., 19/IV/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI); Altopiano di Buddusò, sorgenti del fiume Tirso (UTM: 32T 528.4490), pascoli rocciosi, 770 m s.l.m., 19/IV/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI).

Gagea fragifera (Vill.) E. Bayer & G. López González (Fig. 1d)

= *G. fistulosa* (Ram.) Ker Gawl. ≡ *Ornithogalum fistulosum* Ram.

= *G. liotardii* (Sternberg) Schult. & Schult. f.

This species is widespread on mountains of Europe and Asia (Pignatti 1982). In Sardinia, this unit grows on rich meadows at 1732-1825 m a.s.l. and flowers from April to May. Singularly, this was the first *Gagea* species reported for Sardinia (Bertoloni 1839), but despite this the historical occurrence in the region was subsequently quoted only by Conti & al. (2007). We confirm here the current presence in the Gennargentu area. The quotation for Sassari, Baddimanna (Macchiati 1882 sub *G. liotardii*) is clearly wrong and to refer to *G. granatellii*, the only species occurring there (see beyond). Indeed, L. Macchiati is not new to macroscopic errors in the identification of *Gagea* species (see Peruzzi & Gargano 2005). The occurrence of *G. fragifera* in Sardinia is of particular phytogeographical interest, since it is the only non-Mediterranean (i.e. Eurasiatic) species of this genus occurring in the region.

Literature data – in monte Gennargentu ab Eq. Prof. Morisio (Bertoloni 1839 sub *Ornithogalum fistulosum*).

Specimina visa – Monte Genargentu, pascoli delle vette tra Serra Seuii e Girgini, 29/V/1894, *Martelli* (FI); Monti del Gennargentu, tra la cima del Bruncu Spina e Genne Erbeghe (UTM: 32T 525.4429-4430), pascoli rocciosi, 1732-1825 m s.l.m., 18/IV/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI).

Gagea granatellii (Parl.) Parl. (Fig. 2a)

This species is endemic of western Mediterranean (Tison 1998). In Sardinia, this unit grows on rocky substrate at 0-1150 m a.s.l. and flowers from January to April. *G. granatellii* is the most common species in Sardinia, at altitudes under 700-800 m a.s.l. The population from Arcu Correboi was never reported before.

Literature data – "*A Baddimanna soltanto*" (Macchiati 1882 sub *G. liotardii*; Barbey 1884); "*Baddimanna prope Sassari in petrosis 200 m. et nonnullis locis demissioribus, presso Terranova, Capo S. Elia, nei campi di S. Bartolomeo presso Cagliari, Arcipelago della Maddalena*" (Sommier 1897); Monte Gonare (Camarda 1984b); Monte Santo (Ballero & al. 1988); Asinara: Elighe Mannu e Punta Scomunica (Bocchieri 1988); Punta Su

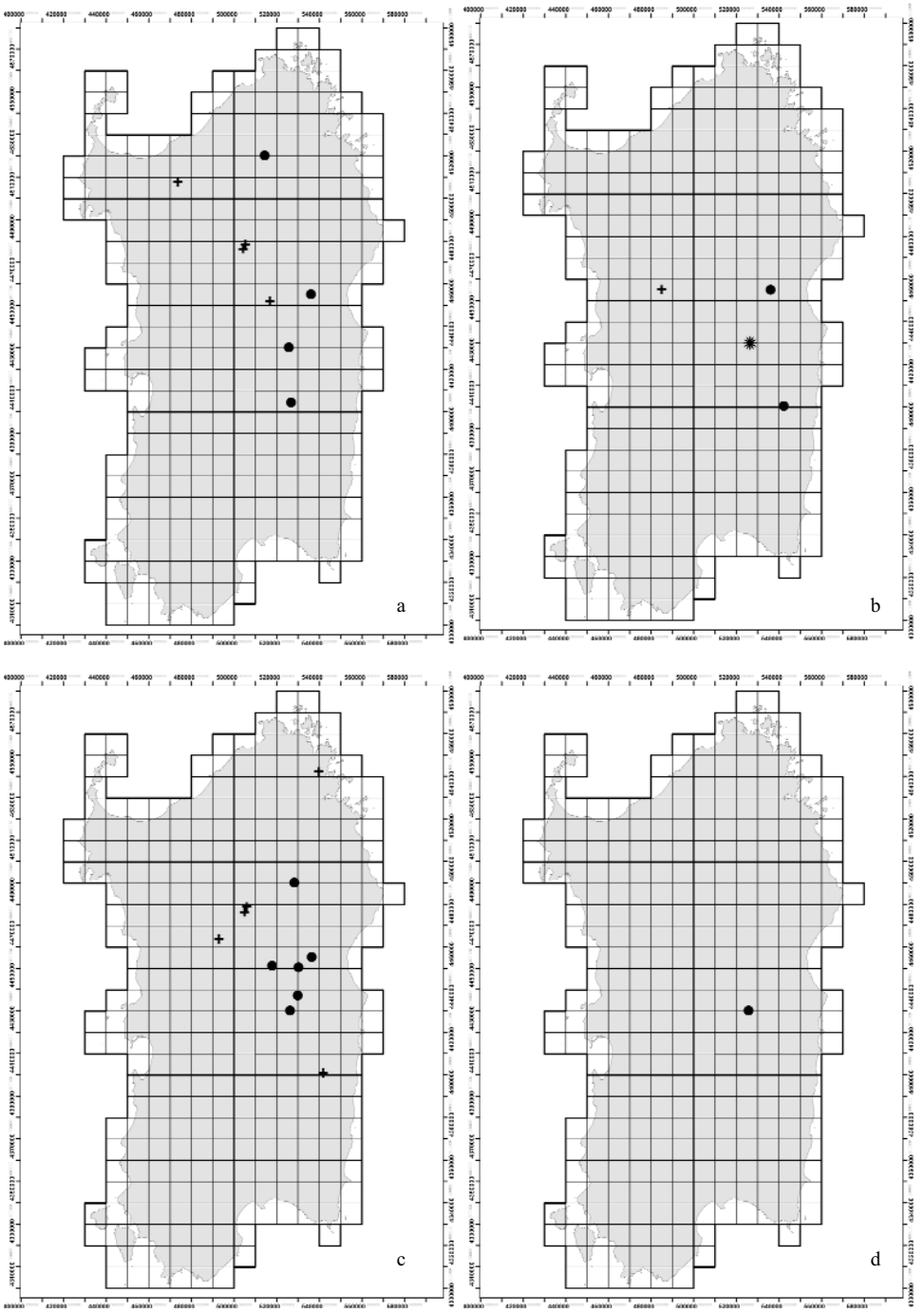

Fig. 1. Distribution in Sardinia of: a. *G. bohemica*; b. *G. dubia;* c. *G. foliosa*; d. *G. fragifera*.

Corru Mannu (Ballero & Angiolino 1991); M.te Arcosu (Mossa & al. 1996); Monte Lattias and Monte Arcosu (Mossa & Bacchetta 1998); Fluminese (Ballero & al. 2000); Monte Perda 'e Liana (Loi & al. 2004); "*prati aridi e pendii sassosi al passo tra M. Maiori e Cuccuru Pirastu*" (Bacchetta & al. 2007); Italy, Sardinia (Orani), 800 m a.s.l. (Peruzzi & al. 2008; Peterson & al. 2010).

Specimina visa – campi incolti Cagliari, s.d., *s.c.* (NAP); Baddimanna, s.d., *Nicotra* (B); Monte Cresia presso Aritzi, Sardegna, 23/V/1879, *s.c.* (FI); *ibidem* (PI); Presso Terranova, 11/III/1885, *Forsyth Major* (FI); Nel sassarese, 25/III/1885, *Forsyth Major* (FI); Orani, IV/1899, *Barsali* (GE); Orani, IV/1899, *Martelli* (B); Lamusei, 19/III/1905, *Falqui* (NAP); Ruju a dintorni di Nuraghe, 19/IV/1908, *A. Terracciano* (NAP); *ibidem*, 10/III/1907, *A. Terracciano* (NAP); Sassari a Baddimanna, 22-23/III/1907, *A. Terracciano* (NAP, sub *G. granatellii* subsp. *eugranatellii* A. Terracc. var. *angustifolia* A. Terracc.); Osilo a Bonaria, 1/IV/1907, *A. Terracciano* (NAP); (Macomer), m. 650, 17/IV/1908, *A. Terracciano* (NAP); *ibidem*, 21/III/1910, *A. Terracciano* (NAP sub *G. granatellii* subsp. *eugranatellii* A. Terracc. var. *angustifolia* A. Terracc.); Osilo, cima di Bonaria, 24/I/1912, *A. Terracciano* (NAP, sub *G. saxatilis* f. *sardoa* A. Terracc. *in schedis*); Monte dintorni di Tempio, 600 m, 13/III/1912, *Fiori* (NAP); Sardegna, Sassari a Baddimanna, calcare 240 m, 16/III/1912, *Fiori* (FI); Sardegna, dintorni di Tempio graniti 600 m c., 13/III/1912, *Fiori* (FI); Osilo, M.te S. Antonio, 25/III/1912, *A. Terracciano* (NAP, sub *G. granatellii* subsp. *eugranatellii* A. Terracc. var. *angustifolia* A. Terracc.); Loc. Sardinia – Prov. di Cagliari: in herbosis silvaticis prope Macomer, alt. 550 m, solo siliceo-vulcanico, 31/III/1912, *Fiori* (FI, GE, PI); Asinara a Bara, 18/III/1916, *Mola* (NAP); M. Cittarda, 25/III/1916, *Mola* (NAP); Sardegna, circondario di Aritzo, 1935, *Porri* (FI); Bara alla base di P.ta Scomunica, Is. Asinara, Porto Torres (Sassari), 8/III/1984, *E. Bocchieri* (CAG); Sardinien, Barbagia, am Paso no. R. Flumendosa v. Rio Nuletta (von abway nach Esterzili), neben N 198, 2/IV/1985, *Kilian* (B); Sardegna, Esterzili: sommet du Monte Santa Vittoria 1150 m, pelouses calcicoles et fruticées, se réfugiant dans les buissons où il échappe au surpâturage, ab. 3, 08/IV/2000, *Tison* (Herb. Tison); Sardegna Nuoro, Fonni: montée au Bruncu Spinu 1500-1600 m, pelouses ouvertes et fruticées naines sur silice, en mélange avec *G. foliosa* ou à proximité, mais préférant en moyenne des emplacements plus secs, ab. 3, 11/IV/2000, *Tison* (Herb. Tison); Sardegna, Nuoro: plateau du Monte Ortobene, à la partie NNW du circuit sommital, localisé, 950 m, pelouses calcicoles ombragées, ab. 2, 10/IV/2000, *Tison* (Herb. Tison); Sardegna, Nuoro, Orani: près de l'auberge du Monte Gonare v. 800 m, pelouses ensoleillées à mi-ombragées, en mélange avec *G. foliosa*, ab. 2, 10/IV/2000, *Tison* (Herb. Tison); Sardegna, Nuoro, Siniscola: versant ouest de la Punta Cupetti v. 700 m, pelouses entremêlées de fruticées naines, ab. 3, 12/IV/2000, *Tison* (Herb. Tison); Sardegna, Sassari, Buddusò: rive gauche du ruisseau Tirso dans les 300 m en amont du pont de la S389 v. 750 m, subéraies claires, ab.3, 12/IV/2000, *Tison* (Herb. Tison); Sardegna, Sassari, Tempio Pausania: versant ouest du Monte Limbara v. 800 m, biotopes secondaires fréquemment bouleversés par les sangliers, à dominante de prairie rocailleuse siliceuse plus ou moins embroussaillée, ab. 2, 05/IV/2000, *Tison* (Herb. Tison); Mazzanni, Vallermosa (Cagliari) substr. calcari paleoz. – esp. ne WSW 250° - incl. ne 40-60° Bioclima: mesomedit. sup. / subumido sup. – 755 m s.l.m., 24/III/2002, *Bacchetta* et *Soddu* (CAG); M.te Majore, Guspini (Cagliari) substr. vulca-

niti – esp. ne 270° - incl. 10° - 560 m s.l.m. Bioclima: mesomedit. inf./ subumido sup., 14/III/2003, *Bacchetta, De Murtas, Piras* et *Pitzalis* (CAG); Monti del Gennargentu, Genna Luddurrèo (UTM: 32T 525.4434), pascoli rocciosi, 1350 m s.l.m., 18/IV/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI); Monti del Gennargentu, Arcu Correboi (UTM: 32T 529.4437), pascoli rocciosi, 1150 m s.l.m., 19/IV/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI); Altopiano di Buddusò, sorgenti del fiume Tirso (UTM: 32T 528.4490), pascoli rocciosi, 770 m s.l.m., 19/IV/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI); Monte Limbara, versante occidentale (UTM: 32T 511.4522), pascoli rocciosi, ca. 850 m s.l.m., 20/04/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI).

Gagea lojaconoi Peruzzi (Fig. 2b)

≡ *G. longifolia* Lojac. *nom. illeg.* non Gand.

= *G. chrysantha* Auct., non Schult. & Schult. f.

This species is endemic of central Mediterranean (Peruzzi & Tison 2005), and belongs to the group of *G. chrysantha* (Peruzzi & Tison 2007). For further information about the distinctiveness between *G. lojaconoi* and the E Mediterranean *G. heldreichii* (A. Terracc.) Stroh see Peruzzi & Tison (2005). In Sardinia, this unit grows in wood margins at 700-800 m a.s.l., flowers in April and it is currently known for a single locality.

Literature data – Italy, Sardinia (Buddusò) (Peruzzi & al. 2008).

Specimina visa – Sardinia, Sassari, Buddusò: rive gauche du ruisseau Tirso dans les 300 m en amont du pont de la S389 v. 750 m; espèce nouvelle pour la Sardaigne, subéraies claires, ab.2, 12/IV/2000, *Tison* (Herb. Tison).

Gagea soleirolii F.W. Schultz (Fig. 2c)

This species is endemic of western Mediterranean, and in Italy occurs only in Sardinia (Pignatti 1982; Conti & al. 2005). In the region, this unit grows in meadows at 1000-1600 m a.s.l. and flowers from April to July. The citation of Martinoli (1950) is actually to refer to *G. foliosa* (see over), while the citation of *G. sicula* Lojac. made generically for Sardinia by Peruzzi & Tison (2004) is to refer to *G. soleirolii*.

Literature data – Sardegna al M. Gennargentu (Fiori 1923 sub *G. foliosa* var. *soleirolii*); Gennargentu e Limbara (Pignatti, 1982); Italy, Sardinia (M. Limbara), 1,300 m a.s.l.; Italy, Sardinia (M. Bruncu Spina), 1,500 m a.s.l. (Peruzzi & al. 2008; Peterson & al. 2010).

Specimina visa – M.te Limbara (Sassari, Sardegna), alt. 1000-1300 m s.l.m., 15/V/1994, *Bernardo* et *Cesca* (CLU, n. 9257); Gennargentu, IV/1862, *Gennari* (RO); M.te Gennargentu a Punta Paolina, 8/VI/1916, *A. Terracciano* (NAP); M.te Gennargentu, ad nives deliquescentes sub Bruncu Spina, 8/VI/1916, *A. Terracciano* (NAP); M.te Gennargentu, Punta Paolina, 17/VI/1908, *Cavara* et *Cossu* (NAP); Monte Gennargentu, pascoli delle vette tra Serra Seui e Girgini, 29/V/1910, *Martelli* (B, FI); Monte Rasu, flora cacuminale, 1258 m, VI/1966, *F. Valsecchi, B. Corrias* (SASSA); Gennargentu, Bruncu Spina, 07/VII/1972, *F. Valsecchi, S. Diana, B. Corrias* (SASSA sub *G. busambarensis*); Bruncu Spina, Fonni (Nuoro) substr. metamorfiti – biocl.: supratemp. sup. / umido sup. coord. 40° 01’ 942” N – 9° 17’ 802” E, 1510-1600 m s.l.m., 25/V/2004, *Bacchetta, Casti, Jimenez* et *Navarro* (CAG); Sardegna, Nuoro, Fonni: montée au

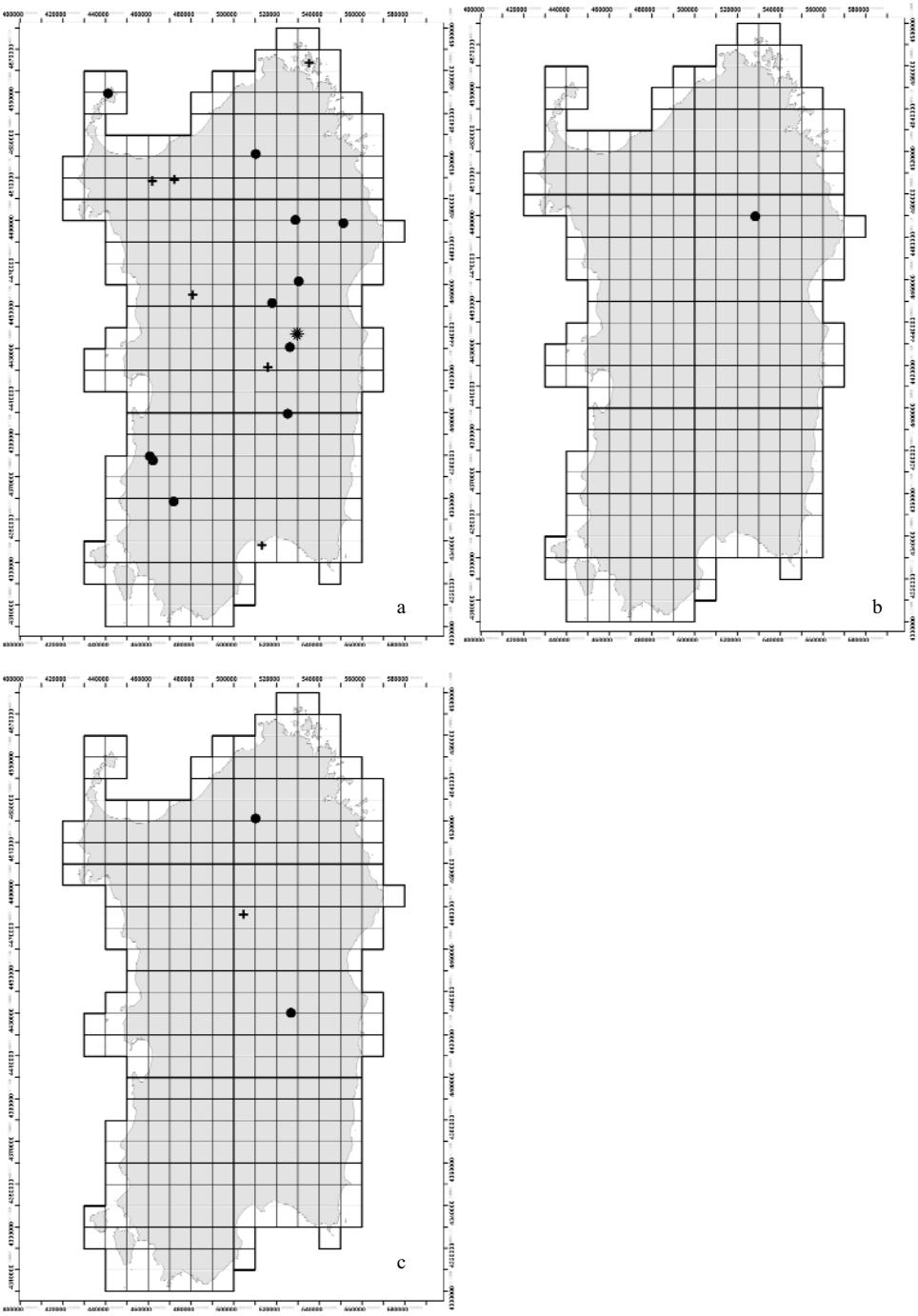

Fig. 2. Distribution in Sardinia of: a. *G. granatellii*; b. *G. lojaconoi;* c. *G. G. soleirolii*.

Bruncu Spinu 1500-1600 m, pelouses fraîches et ouvertes, ab. 3, 11/IV/2000, *Tison* (Herb. Tison); Sardinia, Sassari, Tempio Pausania: sommet du Monte Limbara, de Notre-Dame-des-Neiges à l'émetteur de la Punta Balestrieri, 1250-1350 m, fruticées naines rocailleuses, souvent en emplacements humides, ab. 3, 05/IV/2000, *Tison* (Herb. Tison); Monte Limbara, tra il Santuario della Madonna della Neve e Punta Balestrieri (UTM: 32T 514.4521-4522), pascoli rocciosi, 1250-1280 m s.l.m., 20/04/2011, *L. Peruzzi, G. Gestri, B. Pierini* (PI).

Analitical key for the identification of the studied species (for further information about the sectional setting of the genus *Gagea*, cfr. Peruzzi & Tison 2004)

(an identification on complete and preferably fresh samples is recommended)

1. Basal leaves one.....**G. fragifera**
1. Basal leaves two.....2
2. Basal leaves hollow (section!), semicylindric.....3
2. Basal leaves not as above.....4
3. Basal leaves less than 1.5 mm wide, slightly hollow.....**G. lojaconoi**
3. Basal leaves more than 1.5 mm wide, strongly hollow.....(immature plants of) **G. fragifera**
4. Massive presence of thickened (up to 1 mm) ageotropic roots surrounding the bulb.....5
4. Thickened ageotropic roots absent.....6
5. Basal leaves flat, (2)3-4(7) mm wide; mature plants (3.5)4.5-8.5(12) cm tall, inflorescence often at the ground level.....**G. granatellii**
5. Basal leaves "v" shaped, 2-3 mm wide; mature plants 11-17 cm tall, inflorescence always well above the ground level.....**G. dubia**
6. Basal leaves filiform-cylindric, with 3 vascular bundles "v" arranged, at most 1 mm wide.....7
6. Basal leaves linear, with 5 vascular bundles, 1-3(4) mm wide.....8
7. Basal leaves not hollow.....**G. bohemica**
7. Basal leaves slightly hollow.....**G. lojaconoi**
8. Basal leaves 1-1.5 mm wide, tepals 1.5-2(2.5) × 10-12 mm.....**G. soleirolii**
8. Basal leaves (1.5)2-3(4) mm wide, tepals 3-4 × (11)12-14(15) mm.....**G. foliosa**

Conclusions

Thanks to our study, it was possible to confirm the presence in Sardinia of the phytogeographically interesting *G. fragifera*, the only non-Mediterranean species occurring in the region, in Bruncu Spina (Gennargentu). This species was collected in Sardinia last time more than 110 years ago. Moreover, single new localities were reported for *G. dubia* and *G. granatellii* in Gennargentu, Bruncu Spina and Arcu Correboi, respectively. The most rare *Gagea* species in Sardinian flora is certainly *G. lojaconoi*, known to present only in a single locality near Buddusò.

Sardinia has a lower number of *Gagea* taxa (7) respect with the other two major central Mediterranean islands, since for Sicily 9 taxa (Peruzzi & al. 2009) and for Corse 8 taxa (Jeanmonod & Gamisans 2007) are documented. This is true also considering the section-

al classification: 3 sections occur in Sicily, 2 in Corse and just the single sect. *Didymobulbos* in Sardinia. Both in Sicily and Corse non-Mediterranean taxa are represented by *G. fragifera*, *G. lutea* (L.) Ker Gawl., *G. pratensis* (Pers.) Dumort. and *G. villosa* (M. Bieb.) Sweet. Three taxa are shared by all the areas: *G. bohemica*, *G. fragifera* and *G. granatellii*. On the contrary, *G. lojaconoi* occurs only in Sardinia and Sicily and *G. soleirolii* occurs only in Sardinia and Corse.

The relatively low diversity in Sardinian *Gagea* is probably due to lower environmental variation respect with other two islands.

Acknowledgements

This work was carried out thanks to Fondi di Ateneo (EX60%) of the University of Pisa. The authors wish to thank the Curators of Herbaria of Catania (CAT), University of Calabria (CLU), Firenze (FI), Genova (GE), Kew (K), Napoli (NAP), Pisa (PI), Roma (RO) for their kind help, together with Cristiana Adamo, Gianluigi Bacchetta (Cagliari) and Simonetta Bagella (Sassari) for precious help and information about NAP, CAG and SASSA herbaria, respectively. Domenico Gargano is gratefully acknowledged for help in drawing maps.

References

Bacchetta, G., Pontecorvo, C. & Vacca, R. 2007: La flora del Monte Arcuentu (Sardegna sud occidentale). – Webbia **62(2):** 175-204.

Barbey, W. 1884: Florae Sardoae Compendium. – Lausanne.

Ballero, M. & Angiolino, C. 1991: La flora del massiccio del Marganai (Sardegna sud-occidentale). – Webbia **46(1):** 81-106.

—, Chiappini, M. & Sechi, P. 1988: Ricerche sulla flora del Monte Santo (Sardegna settentrionale). – Webbia **42(1):** 55-75.

—, Cara, S., Marras, G. & Loi, M. C. 2000: La flora del Fluminese (Sardegna sud-occidentale). – Webbia **55(1):** 65-105.

Bartolucci, F. & Peruzzi, L., 2007: Distribuzione del genere *Gagea* Salisb. (*Liliaceae*) nell'Appennino centro-settentrionale. – Biogeographia, n.s., **28:** 205-238.

Bertoloni, A. 1839: *Ornithogalum* – Pp. 89-93 in: Flora Italica, **4.** – Bologna.

Bocchieri, E. 1988: L'Isola Asinara (Sardegna nord-occidentale) e la sua flora. – Webbia **42(2):** 227-268.

Camarda, I. 1984a: Studi sulla flora e sulla vegetazione del Monte Albo (Sardegna centro-orientale). I. La flora. – Webbia **37(2):** 283-327.

— 1984b: Studi sulla flora e sulla vegetazione del Monte Gonare (Sardegna centrale). I: La flora. – Boll. Soc. Sarda Sci. Nat. **23:** 173-211.

Carta, A., Forbicioni, L., Frangini, G. & Peruzzi, L. 2007: Notulae alla Checklist della flora italiana: 4: 1369. – Inform. Bot. Ital. **39(2):** 421-422.

Conti, F., Abbate, G., Alessandrini, A. & Blasi, C. (Eds.) 2005: An annotated checklist of the Italian vascular flora. – Roma.

—, Alessandrini, A., Bacchetta, G., Banfi, E., Barberis, G., Bartolucci, F., Bernardo, L., Bonacquisti, S., Bouvet, D., Bovio, M., Brusa, G., Del Guacchio, E., Foggi, B., Frattini, S., Galasso, G., Gallo, L., Gangale, C., Gottschlich, G., Grünanger, P., Gubellini, L., Iiriti, G., Lucarini, D., Marchetti, D., Moraldo, B., Peruzzi, L., Poldini, L., Prosser, F., Raffaelli, M., Santangelo, A., Scassellati, E., Scortegagna, S., Selvi, F., Soldano, A., Tinti, D., Ubaldi, D., Uzunov, D. & Vidali, M. 2007: Integrazioni alla checklist della flora vascolare italiana. – Nat. Vicentina **10(2006):** 5-74.

Fiori, A. 1923: *Gagea*. – Pp. 251-254 in: Nuova Flora Analitica d'Italia, **1.** – Firenze.
Jeanmonod, D. & Gamisans, J., 2007: Flora Corsica. – Aix-en-Provence.
Loi, M. C., Marras, G. & Maxia, A. 2004: The flora of Monte Perda 'e Liana (CE-Sardinia). – Fl. Medit. **14:** 153-172.
Macchiati, L. 1882: Contributo alla flora sarda. – Boll. Soc. Bot. Italiana **1882:** 143-146.
Martinoli, G. 1950: Studio cariologico della *Gagea soleirolii* F. Schultz. – Caryologia **3(1):** 72-78.
Mossa, L., Bacchetta, G., Angiolino, C. & Ballero, M., 1996: A contribution to the floristic knowledge of the Monti del Sulcis: Monte Arcosu (S-W Sardinia). – Fl. Medit. **6:** 157-190.
— & Bacchetta, G. 1998: The flora of the catchment basin of Rio Santa Lucia (Sulcis, SW Sardinia). – Fl. Medit. **8:** 135-195.
—, Aru, A., Fogu, M. C., Guarino, R. & Zavattero, L. 2008: Studio geobotanico del Parco Eolico di Ulassai. – Catania.
Peruzzi, L. 2004: Segnalazioni Floristiche Italiane: 1100. – Inform. Bot. Ital. **36(1):** 78-79.
— 2005: Notulae alla Checklist della flora italiana, 1: 1152. – Inform. Bot. Ital. **37(2):** 1173.
— & Bartolucci, F., 2006: *Gagea luberonensis* J.-M. Tison (*Liliaceae*) new for the Italian flora. – Webbia **61(1):** 1-12.
—, Caparelli, K. F., 2007: *Gagea peduncularis* (J. & C. Presl) Pascher (*Liliaceae*) new for the Italian flora. – Webbia **62(2)**: 261-268.
— & Gargano, D., 2005: Distribuzione del genere *Gagea* Salisb. (*Liliaceae*) in Calabria. – Inform. Bot. Ital. **37(2):** 1117-1124.
— & Tison, J.-M. 2004: Verso una revisione biosistematica del genere *Gagea* Salisb. (*Liliaceae*) in Italia. Un nuovo tipo di approccio. – Inform. Bot. Ital. **36(2):** 470-475.
—, — 2005: Typification and taxonomic status of six taxa of *Gagea* Salisb. (*Liliaceae*) described from Sicily and conserved at Palermo (PAL). – Candollea **60(2):** 289-298.
—, — 2007: Typification of six critical Mediterranean *Gagea* Salisb. (*Liliaceae*) taxa. – Candollea **62(2):** 173-188.
—, Gestri, G. & Pierini, B. 2009a: Notulae alla Checklist della flora italiana, 8: 1570. – Inform. Bot. Ital. **41(2):** 345-346.
—, —, — 2010: Notulae alla Checklist della flora italiana, 10: 1707. – Inform. Bot. Ital. **42(2)**: 518.
—, Scuderi, L. & Raimondo, F. M., 2009b: Distribution of the genus *Gagea* Salisb. (*Liliaceae*) in Sicily. – Fl. Medit. **19:** 25-47.
—, Carta, A., Gestri, G. & Pierini, P. 2008: Aggiornamenti e novità sulla distribuzione del genere *Gagea* (*Liliaceae*) in Toscana. – Atti Soc. Tosc. Sci. Nat., Mem., Ser. B., **115:** 95-98.
—, Peterson, A., Tison, J.-M., Peterson, J., 2008: Phylogenetic relationships of *Gagea* Salisb. (*Liliaceae*) in Italy, inferred from molecular and morphological data matrices. – Pl. Syst. Evol. **276(3-4):** 219-234.
Peterson, A., Harpke, D., Peruzzi, L., Tison, J.-M., John, H. & Peterson, J. 2009a: *Gagea bohemica* (*Liliaceae*), a highly variable monotypic species within sect. *Didymobulbos*. – Pl. Biosyst. **144(2):** 308-322.
Pignatti, S. 1982: *Gagea*. – Pp. 352-356 in: Flora d'Italia, **3.** – Bologna.
Rix, E. M. & Woods, R. G. 1981: *Gagea bohemica* (Zauschner) J. A., J. H. Schultes in the British Isles, and a general review of the *G. bohemica* species complex. – Watsonia **13:** 265-270.
Sommier, S. 1897: Due Gagee nuove per la Toscana ed alcune osservazioni sulle Gagee di Sardegna. – Boll. Soc. Bot. Ital. **1897:** 246-256.
Terracciano, A. 1906: *Gagearum* species florae orientalis. – Bull. Herb. Boiss., ser. 2, **6:** 105-120.
Tison, J.-M. 1998: *Gagea granatellii* (Parl.) Parl. en France. – Le Monde des Plantes **462:** 1-6.

— 2004: Contribution a la connaissance du genre *Gagea* Salisb. (*Liliaceae*) en Afrique du Nord. – Lagascalia **24:** 67-87.

Addresses of the authors:
Lorenzo Peruzzi,
Dipartimento di Biologia, Orto e Museo Botanico, Università di Pisa, via Luca Ghini 5, 56126 Pisa, Italy, e-mail: lperuzzi@biologia.unipi.it
Giovanni Gestri,
via Bonfiglioli 30, 59100, Prato, Italy, e-mail: ggestri@alice.it
Brunello Pierini,
via Zamenhof 2, 56127 Pisa, Italy, e-mail: brunellopierini1@virgilio.it