



An annotated checklist of the genus *Tristagma* (Amaryllidaceae, Alliioideae)

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Abstract

Tristagma is a South American genus distributed in Argentina and Chile. Species circumscription in *Tristagma* has been a source of confusion for various reasons; e.g., generic concepts, nomenclatural inconsistencies, and doubtful species. As a first step towards a revision of *Tristagma*, the nomenclatural history is reviewed. Following an extensive review of specimens in various American and European herbaria, a generic description and a list of names and their types are here provided. Thirteen names are lectotypified, seven are synonymized, three holotypes are identified for the first time, one neotype is designated, a new combination is made, and 12 species are recognized: *T. ameghinoi*, *T. anemophilum*, *T. berteroi*, *T. bivalve*, *T. circinatum*, *T. gracile*, *T. graminifolium*, *T. nivale*, *T. patagonicum*, *T. poeppigianum*, *T. porrifolium*, and *T. violaceum*. A new record of the flora of Chile: *T. circinatum* is also reported. Additionally, five doubtful species are mentioned and three are excluded from *Tristagma*. Another five species names referred in the literature to *Tristagma* have already been transferred to other genera. We also provide conservation assessments, distribution maps and an identification key to species.

Key words: Argentina, Chile, conservation status, lectotype, Leucocoryneae, neotype, new combination, new record

Introduction

The tribe Leucocoryneae (Amaryllidaceae, Alliioideae) in its current circumscription (Sassone, Arroyo-Leuenberger & Giussani 2014a) includes 6 genera: *Beauverdia* Herter (1943: 507), *Ipheion* Rafinesque (1837: 12), *Latace Philippi* (1889: 369) (Sassone, Belgrano & Guaglianone 2015), *Leucocoryne* Lindley (1829: 1293), *Nothoscordum* Kunth (1843: 457) and *Tristagma* Poeppig (1833: 8).

The genus *Tristagma* was described on a single bulbous Chilean species: *Tristagma nivale* Poeppig (1833: 9), characterized by bibracteate spathe, cylindrical perigone, 6 stamens, and superior ovary. Subsequently various species of *Tristagma* were described in or transferred to other genera by several authors: *Triteleia* Douglas ex Lindley (1829: tab. 1293), *Milla* Cavanilles (1793:76) (Baker 1871), *Ipheion* (Traub 1963), *Brodiaea* Smith (1811: 2) (Meigen 1893, Baker 1896, Speggolini 1897, Killip 1926, Sandwith 1939). One species was treated as a separate monotypic genus: *Steinmannia* Philippi (1884: 64). Later it was transferred to *Garaventia* Looser (1944: 79), then to *Nothoscordum* Kunth (1843: 457) by Traub (1968). The circumscription of the genus and some of the species have also been changed by different authors, resulting in a total of approximately 45 names under *Tristagma* (Tropicos and WCSP). Furthermore, a few species names (e.g. “*Tristagma bivalve*”) have been used imprecisely without due reference to the original description or to the type material.

The aim of the present paper is to clarify the circumscription of the genus, to define the number of species, and to designate lecto and neotypes when appropriate. We provide an annotated list of accepted names, with their taxonomic synonyms and typification as a first step towards a revision of genus *Tristagma*.

Material & Methods

In order to understand the taxonomic history of the relevant taxa an exhaustive review of the literature was undertaken, involving a study of the protologues and types of a total of 74 *Tristagma* and its synonymous names. Field trips

throughout the distribution of the genus in Argentina and Chile were made, including the type localities of some of the species.

More than 300 specimens were studied in 41 herbaria: AGUCH, B, BA, BAA, BAB, BAF, BM, BR, BREM, C, CGE, CONC, CORD, CUZ, E, FI, GOET, HAL, GH, HBG, HSP, HUSA, JE, K, L, LP, LY, LZ, MO, MERL, P, SGO, SI, TO, W, WAG, U, UPS, US, USM, Z [herbarium acronyms according to Thiers (2016)]. Additionally, images of type specimens available from JSTOR (<http://plants.jstor.org/>) and at digital herbaria (e.g. Virtual Herbaria, <http://herbarium.univie.ac.at/database>) were examined.

Conservation status assessments of all species using the IUCN categories and criteria (IUCN 2012, 2014) were made by direct observation of plant populations and analysis of specimens in the above-mentioned herbaria. Distribution maps were assembled from coordinates reported on specimen labels and other georeferenced locality data, employing the package ‘raster’ (Hijmans & van Etten 2015) available in R 3.2.2 (R Development Core Team 2010).

Results

Thirteen names (twelve species and one form) are accepted based on material from Argentina and Chile. Thirteen names are lectotypified, one neotype is designated, and three holotypes are identified for the first time. Five species are mentioned as doubtful and three are excluded from *Tristagma*. A generic description, a list of names and their types, a diagnostic key, the conservation status and distribution maps of each species are provided.

Taxonomic treatment

Tristagma Poeppig (1833: 8). Type species:—*Tristagma nivale* Poepp.

= *Steinmannia* Phil (1884: 64) ≡ *Garaventia* Looser (1944: 79). Type species:—*Steinmannia graminifolia* Phil.

- *Gardinia* Bertero (1829: 643) nom. nud.

Perennial herbs, 10–31(–45) cm tall. Roots fibrous. Bulb indeterminate, tunicate, simple, without conspicuous alliaceous odour. Leaves few, eligulate, linear, green, glabrous; leaf sheaths forming a subterranean neck. Scapes 1–2(–4), lateral, subcylindric, glabrous. Inflorescence an umbellate cyme (1–)2 or multiflowered. Spathe formed by 2 bracts, fused at the base, cylindric, membranous-papery, plurinerved; pedicels cylindric, glabrous, not articulated, in some species it recurves after anthesis. Flowers bisexual, hypogynous, trimerous, actinomorphic, white, yellowish, greenish, purple, sometimes dark purple dark, grey or dark-brown. Perigone persistent, tepals 6, fused, forming a conspicuous tube around the ovary; free part of tepals patent or circinate. Stamens 6, always disposed in two series; staminal filaments free, linear sometimes slightly awl-shaped, always fused to the tepal tube; anthers linear, greenish-yellow, dorsifixed. Ovary sessile, oblong, 3-carpellate, septal nectaries present, ovules arranged in 2 rows, style subtrigonus, stigma capitate, 3-lobate to 3-fid. Capsule aerocarpic, globose, multiseeded. Seeds polyedric; tegument black. Chromosome number $x = 4$ (Crosa 1981, Souza 2012).

Etymology:—From Greek *tri* = three; *stagma* = that which drips, hence nectary (Stearn 1973). Poeppig (1833) and Muñoz-Schick *et al.* (2012) described three nectar drops exuded from the ovary.

Distribution:—In Argentina the genus is distributed from Mendoza to the Patagonian region and more widely in Chile, from Patagonian area to Coquimbo region, in the Andes and Cordillera de La Costa, and also inhabits the coast from Bio Bio to Coquimbo (Figs. 1, 2). According to Ravenna (2005a), *Tristagma* reaches Cuzco (Peru) but no material was found for this area (see: Doubtful species).

Habitat:—*Tristagma* species occur in open areas, grassland, Patagonian Andean forest, lowlands, gentle slopes or mountain areas (Cordillera de los Andes) with rocky or sandy soil. Some species grow at sea level [e.g. *T. gracile* (Fig. 1E), *T. porrifolium* (Fig. 2D)] and others in high mountain areas [e.g. *T. bivalve* (Fig. 1C), *T. circinatum* (Fig. 1D)]. Three species are distributed from sea level up to 2500 m.a.s.l.: *T. ameghinoi* (Fig. 1A), *T. nivale* (Fig. 2B) and *T. patagonicum* (Fig. 2C).

Phenology:—*Tristagma* species flower from July to February.

Note:—Ravenna (2001) divided *Tristagma* into three sections: *T. sect. Tristagma*, *T. sect. Ipheion* (Raf.) Ravenna (2001: 31) and *T. sect. Nivella* Ravenna (2001: 31). Until more phylogenetic studies are available we prefer not to recognize any subgeneric division.

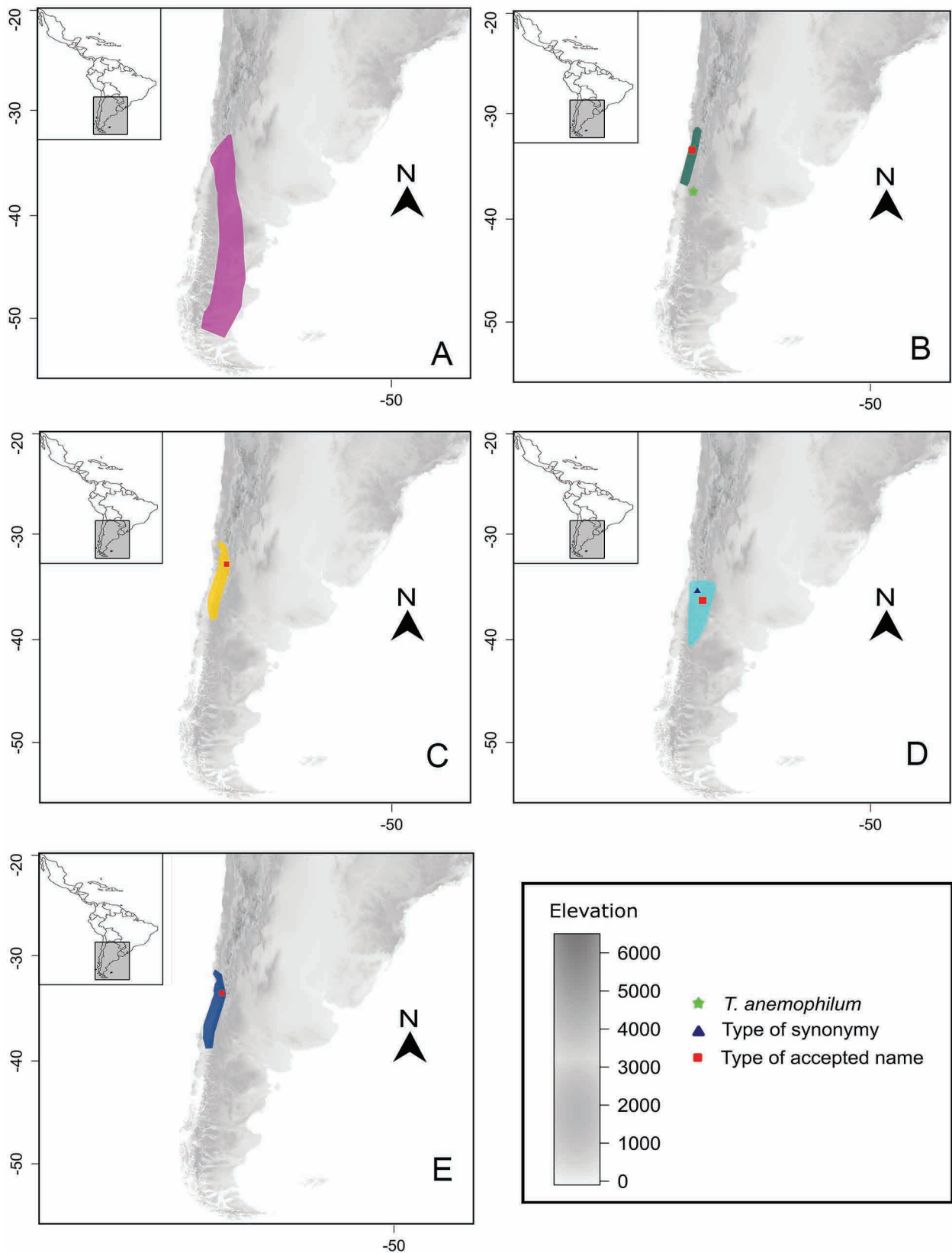


FIGURE 1. Area of distribution of: A, *T. ameghinoi*. B, *T. berteroi*. C, *T. bivalve*. D, *T. circinatum*. E, *T. gracile*.

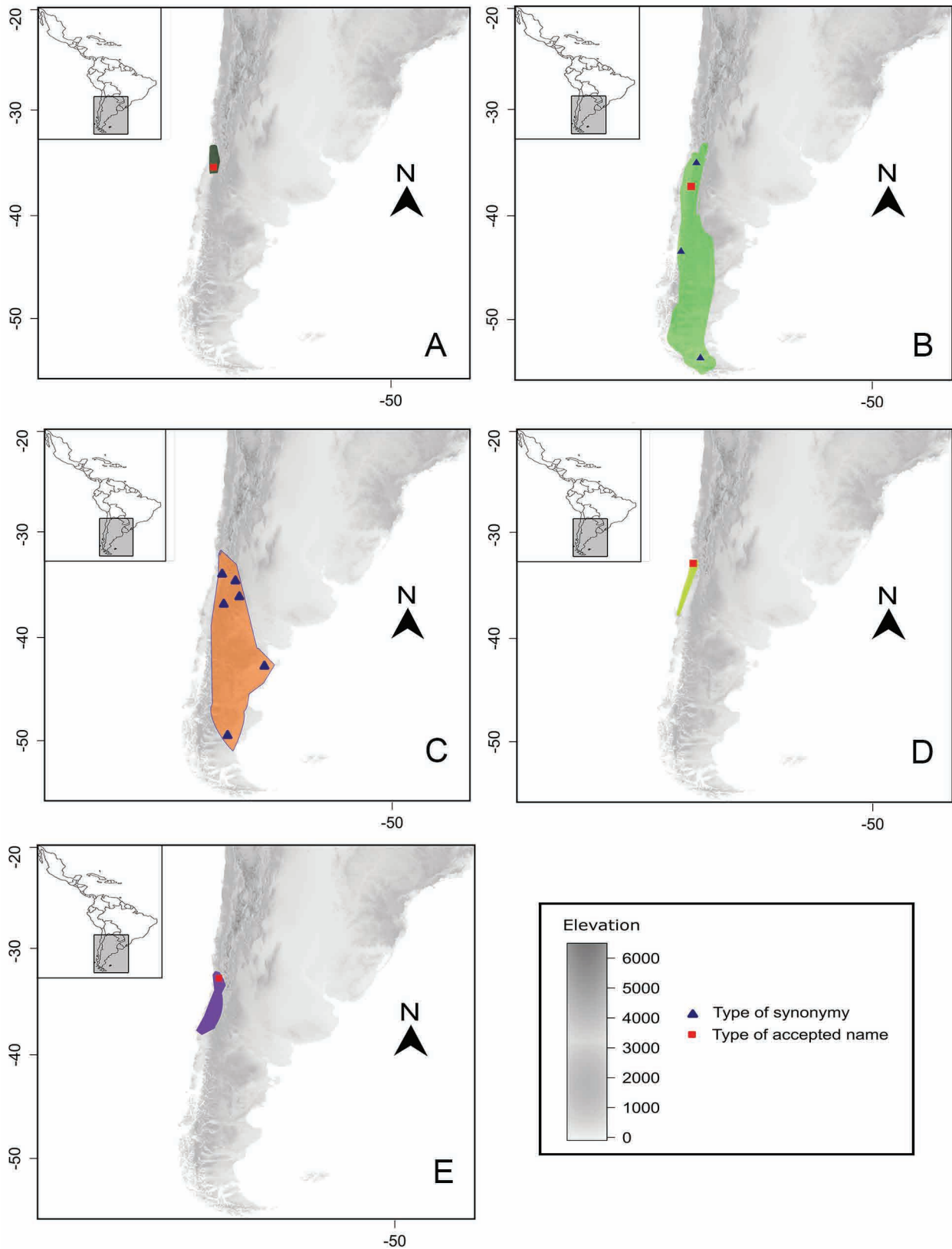


FIGURE 2. Area of distribution of: A, *T. graminifolium*. B, *T. nivale*. C, *T. patagonicum*. D, *T. porrifolium*. E, *T. violaceum*.

Identification key to *Tristagma* species

1. Flowers white, yellowish-white or greenish-white, marked with purple or green veins on underside of tepals. Tepals connate, forming a tube surrounding the ovary, never longer than 1/2 of their length.....2
- Flowers green, purple or dark-purple to dark-grey, without a marked vein on underside of tepals. Tepals connate, forming a tube surrounding the ovary longer than 1/2 of their length, always shorter than 1 cm.....10
2. Bulb usually elongated forming a rhizome. Leaf lanceolate, usually circinate. Spathe bracts oblanceolate, wider than 4 mm lat. Flowers sessile or short pedicellate.....5. *T. circinatum*
- Bulb without rhizome. Leaf lanceolate or filiform, never circinate. Spathe bracts narrower than 3 mm lat. Flowers always pedicellate.....3
3. Tepals fused 1/3 of their length or more.....4
- Tepals fused 1/5 or 1/6 of their length.....7
4. Tepals fused 1/2 of their length or more. Tepal apices obtuse.....5
- Tepals fused 1/3 of their length. Tepal apices acute or apiculate.....6
5. Inflorescence 1-3-flowered. Style length \geq stamen high. Stigma capitate or trilobed.....9. *T. patagonicum*
- Inflorescence 5-7-flora. Style length $<$ stamen. Stigma trifid.....10. *T. poeppigianum*
6. Leaf lanceolate, $>$ 1 mm wide. Pedicels usually shorter than flowers. Chilean Andes over 1800 m.a.s.l.4. *T. bivalve*
- Leaf filiform, 0, 5–1 mm wide. Pedicels longer than flowers. At sea level reaching 1100 m.a.s.l.11. *T. porrifolium*
7. Plant until 10 cm long. Spathe longer than pedicels. Pedicels 4–6 mm long.....8
- Plant longer than 10 cm long. Spathe usually shorter than pedicels. Pedicels usually $>$ 10 mm long.....9
8. Flowers 1.5 cm long. Tepal apices acute. Staminal filament awl-shape. Style very short, 1–1.5 mm. Argentina.....2. *T. anemophilum*
- Flowers 1 cm long. Tepal apices obtuse. Staminal filament linear. Style longer than 2 mm. Chile.....3. *T. berteroi*
9. Tepals 2–3 cm long. Style \geq stamens.....12. *T. violaceum*
- Tepals 1–1.5 cm long. Style $<$ stamens.....6. *T. gracile*
10. Flowers campanulate, green; tepals $<$ 1 cm.....7. *T. graminifolium*
- Flowers tubular to infundibuliform, green, purple or dark-purple to dark-grey, tepals longer than 1 cm de long.....11
11. Leaves linear or lanceolate, sometimes circinate, 2–4 mm broad. Tepals thickish with thickened apex. Filaments of the shorter stamens not longer than 2 mm.....8. *T. nivale*
- Leaf linear, never circinate, 0.5–1(–1.5) mm broad. Tepals and tepal apices not thickened. Filaments of the shorter stamens usually $<$ than 1 mm long.....1. *T. ameghinoi*

1. *Tristagma ameghinoi* (Speg.) Spegazzini. (1902: 7)

Bas.: *Brodiaea ameghinoi* Spegazzini (1897: 575). Type (lectotype, designated here):—s.l., s.d., s.coll., s.n. (LPS 11739! stored at LP 004243!). Fig. 4D.

Note:—In the protologue, Spegazzini (1897) mentioned: “Hab. In pratis sabulosis secus Golfo de San Jorge, Febr. 1896 (C. A.) [Carlos Ameghino]”. No Ameghino herbarium material was found except in Spegazzini’s personal herbarium where we found a sheet (digital image LP 004243) annotated “*Tristagma ameghinoi* Speg.” and “*Brodiaea (Triteleia) ameghinoi* Speg.” in Spegazzini’s handwriting. Even though the label does not indicate when, where, or by whom the material was collected, we can assume that it was studied by Spegazzini when he was describing this species.

Iconographies:—Ravenna in Correa, *Liliaceae, Flora Patagónica. Colecc. Ci. Inst. Nac. Tecnol. Agropecu.* 8 (2): 148. 1969. fig. 136; Guaglianone in Kiesling, *Alliaceae, Flora de San Juan IV*: 37. 2009. fig. 336.

Conservation status:—Least Concern (LC).

2. *Tristagma anemophilum* Ravenna (1967: 147). Type:—ARGENTINA. Neuquén: Dpto. Minas, Valle superior del Arroyo Atreuco, alt. 2200 m.a.s.l., 2 February 1964, *Boelcke et. al. 11523* (holotype BAB00000030!; isotypes BAA 00001205!, SI 000447!).

Note:—The area where *T. anemophilum* was collected, was apparently not visited again during its flowering time, and seems to be an endemic species of that zone; so far it is represented only by type material.

Iconography:—Ravenna, *Bol. Soc. Argent. Bot.* 11(2–3): 148. 1967. fig. 1.

Conservation status:—Data Deficient (DD). We did not have enough information to make a proper assessment of conservation status.

3. *Tristagma berteroi* (Kunth) S.Arroyo & Sassone, *comb. nov.*

Bas.: *Triteleia berteroi* Kunth (1843: 467) ≡ *Brodiaea berteroi* (Kunth) Fuentes (1929: 110). Type (lectotype, designated here):—CHILE. In pascuis sabulosis, loco dicto: “Las Tablas”, Valparaíso, August 1830, in herb Bertero 1802 (GH 00029945!, isolectotype BM!) [*Tristagma berteroi* Phil.” Marticorena & Quezada (1985: 94), nom. nud.]

Notes:—Kunth (1843) named *Triteleia berter[oi]* to honour the Italian botanist Carlo Giuseppe Bertero. Fuentes (1929) made the new combination and cited the name as *Brodiaea berteroi*. Kunth (1843) mentioned “Bert. In herb. Un. Itin. No. 1802.- Valparaíso”. Bertero’s materials are distributed in several European herbaria (Delprete *et al.* 2002, Baldini & Guglielmone 2012). There is also a specimen at GH, with the handwritten number 1802 (apparently written by Bertero).

= *Triteleia gaudichaudiana* Kunth (1843: 467) syn. nov. ≡ *Brodiaea gaudichaudiana* (Kunth) Fuentes (1929:110). Type:—CHILE. Valparaíso. 1835, *Gaudichaud 61* [holotype: B (destroyed); photo: Ser. Field Museum at Chicago n° 10.018, neotype designated here: digital image available at JSTOR F0BN010018!].

Note:—Kunth (1843) described for this species “Chili nisi Valparaíso”, we chose as neotype, a photograph of material from B [possible destroyed during the war 1939-1945 (Hiepko 1987)], with a handwriting of Kunth, which agrees with the protologue of *Triteleia gaudichaudiana*.

Conservation status:—Data Deficient (DD). We did not have enough information to make a proper assessment of conservation status.

4. *Tristagma bivalve* (Hook. ex Lindl.) Traub (1963: 61)

Bas.: *Triteleia bivalvis* Hook. ex Lindley (1829: t. 1293) ≡ *Milla bivalvis* (Lindl.) Baker (1871: 386) ≡ *Hookera bivalvis* (Hook. ex Lindl.) Kuntze (1891: 712) ≡ *Brodiaea bivalvis* (Hook. ex Lindl.) Meigen (1893: 225) ≡ *Ipheion bivalve* (Hook. ex Lindl.) Traub (1953: 69). Type (lectotype designated here):—CHILE. [Región Metropolitana], Bath of Collina, near St Jago [Santiago] at the limit of the snow, 1825, *McRae s.n.* (CGE 06865!, syntype K!). Figs. 4A, 4E.

Notes:—Lindley (1829) based *Triteleia bivalve* on material collected for the Horticultural Society of London by James McRae, of which there is a specimen at Cambridge (where much of Lindley’s herbarium is located) annotated in Lindley’s own hand “Mc Rae 1825”. There is also a specimen at Kew (K, Hb. Benthamianum 1854, as yet unnumbered) with a printed label: “Herb. Soc. Hort. Lond. /Collina. Chili/ Macrae 1825.” that we regard as a syntype. Different authors have treated *Tristagma bivalve* under other genera and considered different diagnostic features to differentiate this species. After the original description, Poeppig (1833) described *Triteleia bivalvis* with the following characters: “perianthii ad basin usque sexpartiti laciniis erectis, planis, obtusatis”, in the description “...tuvo vix ullo... oblongis, obtusis...” and this author also stated that *T. bivalvis* is distributed in “Chile bor. Graminos. ad Concon”. In MO there is a Poeppig’s material (number 107) collected in Concon identified as *Triteleia bivalvis* Hook. Meanwhile, Kunth (1843) mentioned similar characteristics to Poeppig’s description (perigone forming a tube, obtuse segments) and he added: “inflorescence 5-6-flora”, and he also referred to Poeppig 107. Gay (1854) cited Lindley and Poeppig, following Kunth’s description. Baker (1871), transferred *Triteleia* species to *Milla*, and cited *M. bivalvis* in Chile without locality details, and material at K collected by Beechey, Cuming 651 and Bridges. All this material (and Poeppig 107, BM!, MO!, P!) is identifiable as *Tristagma gracile*.

= *Tristagma brevipes* (Kuntze) Traub (1963:61), syn. nov.

Bas.: *Triteleia brevipes* Kuntze (1847: 9) ≡ *Milla brevipes* (Kuntze) Baker (1871: 386) ≡ *Brodiaea brevipes* (Kuntze) Baker (1896: 459) ≡ *Hookera brevipes* (Kuntze) Kuntze (1891: 712) ≡ *Ipheion brevipes* (Kuntze) Traub (1953:69). Type:—not designated.

Note:—*Triteleia brevipes* was stated by Kuntze (1847) to come from the Andes of Chile, but without more precise locality and so far as is known, no original material is known.

Conservation status:—Least Concern (LC).



FIGURE 3. A, Holotype of *Tristagma philippii* Gand. (LY0015019). B, holotype of *Tristagma chubutense* Gand. (LY 0015018). C, lectotype of *Tristagma nivale* Poep. (HAL 0109624). D, copy of the original iconography of *Tristagma nivale* [Poep. & Endlicher, vol. 2: t. 140. 1838].

5. *Tristagma circinatum* (Sandw.) Traub (1963: 61).

Bas.: *Brodiaea circinata* Sandwith (1939: tab. 3350). Type:—ARGENTINA. Neuquén: Cerro Colohuincul, near San Martín de los Andes, 1800-2100 m.a.s.l., 17 December 1926, *Comber 879* (holotype K 000098751!; isotype E 00282483!).

Note:—The holotype bears a label in the author’s handwriting. The isotype at Edinburgh does not.

= *Tristagma sociale* Ravenna (2001: 28), syn. nov. Type:—ARGENTINA. Mendoza, Malargüe, Portezuelo del Ancho, 30 km al oeste de los Molles, 2800 m.a.s.l., 19 January 1972, *Fabris & Zuloaga 8501* (holotype LP not found; isotype digital imagine SI 000453!).

New record for the flora of Chile:—CHILE. VI Region: Prov. Colchagua, Termas del Flaco, sector huellas de Dinosaurio, hacia la cumbre. 2000-2440 (34°57’S-70°24’W), 27 December 1994, *C. Baeza 298* (CONC 134185!).

Iconography:—Sandwith, *Hooker’s Icon. Pl.* (ser. 5) 4: tab. 3350. 1939.

Conservation status:—Vulnerable (VU) under criterion D2. Although *T. circinatum* is locally abundant in Mendoza, only four populations are known.



FIGURE 4. A, Lectotype of *Triteleia bivalvis* Hook. ex Lindl CGE 06865. B, lectotype of *Triteleia patagonica* (LPS 11668, LP 004240). C, Photograph of *T. gracile* (by Giussani). D, Photograph of *T. ameghinoi* (by Zuloaga, F.). E, Photograph of *T. bivalve* (by Sassone).

6. *Tristagma gracile* (Phil.) Traub (1963: 61)

Bas.: *Triteleia gracilis* Philippi (1873: 550) ≡ *Brodiaea philippiana* Baker (1896: 459) ≡ *Ipheion gracile* (Phil.) Traub (1953: 69). Type:—CHILE. [Region Araucania] Pinales de Nahuelbuta, *H. Volcksmann* (holotype SGO 000001125! Fig. 4C.)

Note:—Philippi (1873) described this species as similar to *Triteleia bivalvis*, probably based on *Poeppig 107* [specimen cited by Poeppig (1833)], but Volcksmann's material is clearly distinct from *Tristagma bivalve* (McRae's material) by the presence of obtuse tepal apices, the shape of the perigone, the short tepal tube and allopatric distribution (Fig. 1E).

Conservation status:—Least Concern (LC).

7. *Tristagma graminifolium* (Phil.) Ravenna (1978: 133)

Bas.: *Steinmannia graminifolia* Philippi (1884: 64) ≡ *Garaventia graminifolia* (Phil.) Looser (1944: 79) ≡ *Nothoscordum graminifolium* (Phil.) Traub (1968: 49). Type (lectotype, designated here):—CHILE. Cerro Renca, 1883/8, *F. Philippi s.n.* (SGO 000001119!; isolectotype: SGO 000001120!).

Notes:—First Traub (1968) treated this species under *Nothoscordum*, and then Guaglianone (1972) placed it as a doubtful species of *Nothoscordum*. However, as stated by Ravenna (1978), *Tristagma graminifolium* has fused tepals forming a tube and the base chromosome number is $2n = 2x = 8$ (metacentric chromosomes), as in the rest of the studied species of *Tristagma*, whereas in *Nothoscordum* the basic chromosome number is $x = 5$ (3 metacentric + 2 acrocentric chromosome pairs) or $x = 4$ (3 metacentric + 1 acrocentric chromosome pairs) (Crosa 1981). In a preliminary phylogenetic study of *Tristagma*, this species also resolved as part of *Tristagma* (A.B. Sassone, L.M. Giussani in prep.).

Conservation status:—Endangered (EN), under criterion B1ab(iii) ([a: severely fragmented or Number of locations; b(iii): continuing decline observed of the area, extent and/or quality of habitat]). The species was found in five hills near Santiago, that are severely fragmented with disturbed vegetation affected by human activity (Fig. 2A). Following the proposal made by the Ministerio de Ambiente de Chile this species is considered Vulnerable (VU, http://www.mma.gob.cl/clasificacionespecies/fichas8proceso/fichas_finales/Tristagma_graminifolium_P08_propuesta.pdf). According to Ravenna *et al.* (1998), this species also occurs in Valparaiso, for which we do not have records. However, the conservation status proposal includes a photo of a plant which is misidentified—the plant is part of a herbarium sheet of *T. graminifolium* (*Grandjot 146276*, CONC!).

8. *Tristagma nivale* Poeppig (1833: 9)

≡ *Milla nivalis* (Poepp.) Baker (1871: 383). Type (lectotype, designated here):—CHILE. Pico de Pilque, Antuco, December 1828, *Poeppig 742* (HAL 0109624!; isolectotype G 00098935). Fig. 3C.

= *Tristagma nivale* var. *angustifolia* Neger in Dusén (1900: 208). Type (lectotype, designated here):—CHILE. Region Magallanes, [Fuegia orientalis] Río Cullen, 1891, *B. Ansonge 474* (UPS V-714212!).

= *Tristagma eremophilum* Spegazzini (1902: 171). Type:—ARGENTINA. Chubut. Carrenleufú (Non rara in collinis saxosis secus Carrenleofu, aest.), 1890–1899, *N. Illin s.n.* (holotype LP004259!).

= *Tristagma chubutense* Gandoger (1919: 292). Type:—ARGENTINA. Chubut. Carrenleufú [ad fluvium Carrenlenfii], 15 December 1908, *Skottsberg 541* (holotype LY 0015018!; isotype UPSV-714132!). Fig. 3B.

= *Tristagma philippii* Gandoger (1919: 292), syn. nov. Type:—CHILE. s.l., 1893, *Herbarii R. A. & F. Philippi s.n.* (holotype LY0015019!). Fig. 3A.

= *Tristagma fragrans* Ravenna (2001: 24) syn. nov. Type:—CHILE. Región Metropolitana. Culta in Santiago, ex Andes La Parva, October 1998, *Ravenna 3070* (holotype Herb. Ravenna, not seen; isotypes: BA, BM, not found).

Notes:—Neger (in Dusén 1900), Spegazzini (1902) and Gandoger (1919) published a number of new species and forms from Chile, Tierra del Fuego and the Argentine provinces of Chubut and Santa Cruz, with short and incomplete descriptions from single collections. We regard all these as synonymous with *T. nivale*. The only material from Neger we could find with relevant data is at UPS. Illin's material (LP 004259) bears a label with the handwriting of Spegazzini: "*Tristagma eremophilum* nov. sp. Speg.", here considered the holotype. Gandoger, working at Lyon, received material from other botanists, which explains the fact that some of his type specimens, including that of *T. chubutense*, is at

Lyon (LY). There is no material of *T. chubutense* at Skottsberg's institution (GB) but there is an isotype at UPSV. The type of *T. philippii* is also at LY. Up to now, Gandoger's specimens have not been mentioned in *Tristagma* literature, as is the case with other species from Tierra del Fuego (Gandoger 1912). Ravenna (2001) described *Tristagma fragrans* from a collection made in the Cordillera of Santiago. We studied paratypes cited by Ravenna from the same area, and another from further north (Illapel, Choapa) at the northern limit of the distribution of this species (Fig. 2B). All this material is identifiable as *T. nivale*.

Iconography:—Poeppig, *E., Nov. Gen. Sp. Pl.*, vol. 2: t. 140. 1838; Ravenna, *Bol. Soc. Argent. Bot.* 11(2-3):150.1967, fig. 2A (Fig. 3D)

Conservation status:—Least Concern (LC).

Tristagma nivale f. *australe* (Neger in Dusén) Ravenna (1967: 151)

Bas.: *Tristagma australis* Neger in Dusén (1900: 207). Type (lectotype, designated here):—ARGENTINA. Santa Cruz [Patagonia australis]: Río Guillermo, 6 December 1896, *O. Nordeskjöld's* (UPSV-714213!).

= *Tristagma pulchella* Spegazzini (1902: 172). Type:—CHILE? Secus Río Aysen, 1900, *O. Mauri 17388* (holotype LP 004256!).

= *Tristagma inflatum* Rendle (1904: 325). Type:—CHILE. South Patagonia, Top of Gullies, Mt. Frias, 1900-1901, *H. H. Prichard s.n.* (holotype BM000938068!).

Notes:—Nordeskjöld's material (*Tristagma australis*), stored at UPS-V, is a similar case of *T. nivale* var. *angustifolia*, so we proceed in similar way as the name of Ansoerge's material, designating a lectotype. Mauri's material (*Tristagma pulchella*) stored at LP (004256), as Illin's material, is the only one with Spegazzini's dates, therefore it is treated as the holotype.

Iconography:—Ravenna, *Bol. Soc. Argent. Bot.* 11(2-3): 150. 1967, fig. 2B.

Conservation status:—Least Concern (LC).

9. *Tristagma patagonicum* (Baker) Traub (1963: 61)

Bas.: *Milla patagonica* Baker (1871: 382) ≡ *Brodiaea patagonica* (Baker) Baker (1896: 459). Type (lectotype designated here):—Patagonia. Capt. Middleton (K 000098750!).

= *Brodiaea patagonica* Spegazzini (1897: 576) comb. inval. = *Triteleia patagonica* Spegazzini (1902: 173). ≡ *Brodiaea spegazzinii* Macloskie (1904:304) ≡ *Ipheion spegazzinii* (Macloskie) Traub, (1953: 69) ≡ *Tristagma spegazzinii* (Macloskie) Traub (1963: 61). Type (lectotype, designated here):—ARGENTINA. Santa Cruz. Río Santa Cruz, 1882, *Spegazzini s.n.* (LPS 11668!; isolecotype LP 004240!). Fig. 4B.

= *Triteleia patagonica* Sp. var. *angustiloba* Sp. (1902: 173). Type (lectotype, designated here):—ARGENTINA. Chubut, Trelew, *Basaldua s.n.* (LPS 11742!; isolecotype LP 004242!).

= *Tristagma viridior* (Killip) Traub (1963: 61). Bas.: *Brodiaea viridior* Killip (1926: 566) = *Ipheion viridius* (Killip) Traub (1953: 69). Type:—ARGENTINA. Río Negro. Vecinity of General Roca, Río Negro valley: altitude 250 to 360 m, 28 September 1914, *W. Fischer 22* (holotype US 704305!; isotype SI 000452!).

= *Tristagma atreucoense* Ravenna (2001: 27) syn. nov. Type:—ARGENTINA. Neuquén: Dto: Minas, Laguna del Atreuco, lomadas, 2300-2400 m.s.m., 2 February 1964, *Boelcke et al. 11542* (holotype BAB; isotypes BAA!, SI 00448!).

= *Tristagma malalhuense* Ravenna (2001: 29) syn. nov. Type:—ARGENTINA. Mendoza: Laguna Diamante, 15 January 1952, *L. Serra 87* (holotype LP 004257!).

= *Tristagma nahuelhuapinum* Ravenna (2001: 28) syn. nov. Type:—ARGENTINA. Río Negro: Parque Nacional Nahuel Huapi, Lago Gutiérrez, costa N, 11 October 1974, *C. Richencq 184* (holotype SI 000451!).

Notes:—The prologue and types of the species treated as synonyms are indistinguishable from *T. patagonicum*. In the original description, Ravenna stated that *T. nahuelhuapinum* can be characterized by the number of ovules per locule (23). After studying more than 300 specimens of *Tristagma* we conclude that this feature is too variable within species to be used as a diagnostic character. Furthermore, one of the specimens cited as paratype (*Hicken 13539*) was identified by Ravenna (in 2003) as *T. malalhuense* (= *T. patagonicum*), reinforcing our view that it is synonymous with *T. patagonicum*. According to Ravenna (2001), *T. patagonicum* is distributed in eastern Patagonia (Argentina), while *Tristagma spegazzinii* inhabits border areas between Argentina and Chile (Andean region). This author argued that *T. patagonicum* and *T. spegazzinii* have to be treated as different species. However, Ravenna (2001) based his argument on the type of *B. patagonica* Sp., quoting "Río Aysen" (Chile) as the type locality, but the type specimen

of *B. patagonica* Speg., according to the protologue, was collected in Rio Santa Cruz and Golfo San Jorge (Argentina), invalidating his argument. Spegazzini also mentioned three syntypes in the label: “Rio Santa Cruz, anno 1874 (leg. C. Berg.) et anno 1882 (C.S.) in Golfo de San Jorge, Febr. 1896 (C.A.)”. From the cited material, we only find one of them (stored at LP, number of LPS 11668), which bears a label with the handwriting of Spegazzini, as “*Brodiaea (Triteleia) patagonica*, Habitat Santa Cruz”. The only material identified as *T. atreucoense* and *T. malalhuense* grow at high elevations (2000–2500 m.a.s.l.) and present minimum morphological variation. The former species is smaller than the type material of *T. patagonica*, and the latter shows thinner tepals in contrast with the protologue and type specimen of *Tristagma patagonicum*. We believe that this morphological variation is not enough to separate them as different species. Other studies are being performed to corroborate this argument.

Iconography:—Ravenna, *Bol. Soc. Argent. Bot.* 11(2–3): 152. 1967. fig.3.; Guaglianone, *Alliaceae*, Flora de San Juan IV: 371. 2009. fig. 337.

Conservation status:—Least Concern (LC).

Uses:—*Tristagma patagonicum* has been used as a medicinal and edible species (Molares & Ladio 2015).

10. *Tristagma poeppigianum* (Gay) Traub (1963: 61)

Bas.: *Triteleia poeppigiana* Gay (1854: 117). Type (lectotype, designated here):—CHILE, *Gay 1209?* (P00852548!; isolectotype P 00852549!).

Notes:—This species is considered as a different unit based on the protologue and specimens studied from Gay collection. Nevertheless, neither in the original description, nor the herbarium’s label written by Gay mentions locality, therefore the distribution and habitat of this species remain uncertain due the lack of material.

Conservation status:—Only known from the type collection, collected in 1854; therefore, probably a very rare or even extinct taxon.

11. *Tristagma porrifolium* (Poepp.) Traub (1963: 61)

Bas.: *Triteleia porrifolia* Poeppig (1833: 10) ≡ *Milla porrifolia* (Poepp.) Baker (1871: 386) ≡ *Brodiaea porrifolia* (Poepp.) Meigen (1893: 225) ≡ *Hookera porrifolia* (Poepp.) Kuntze (1891: 712) ≡ *Ipheion porrifolium* (Poepp.) Traub (1953: 69). Type (lectotype, designated here):—CHILE. Region Valparaíso: Valparaíso [In collib. ex arena mobili litt. oceani pacif. prope Concon], August 1827, *Poeppig Col. Pl. chilenas CVI, Diar. 1. 192* (HAL 0092771!, isolectotype BM 001122331!).

Notes:—The specimen at HAL bears a label in Poeppig’s handwriting, but following McNeill (2014) we prefer to designate it as lectotype, since we cannot be sure that the holotype was not at Leipzig prior to the wartime destruction of herbarium LZ.

Iconography:—Poeppig, *Nov. Gen. Sp. Pl. (Poeppig & Endlicher)* vol. 2: t. 139. 1838; Hooker, *Curtis Bot. Mag.* t. 5977: 1872.

Conservation status:—Data Deficient (DD). This species is rare in herbaria, probably restricted to a small area, but there is not enough information to make a proper assessment of conservation status.

12. *Tristagma violaceum* (Kunth) Traub (1963: 61)

Bas.: *Triteleia violacea* Kunth (1843: 468) ≡ *Milla violacea* (Kunth) Baker (1874: 5) ≡ *Brodiaea violacea* (Kunth) Baker (1896: 459) ≡ *Ipheion violaceum* (Kunth) Traub (1953: 69). Type (lectotype, designated here):—CHILE. Región Metropolitana. Santiago [Santiago. Prope La Quinta], 1828, *Bertero s.n.* (SGO 000001127!).

- *Gardinia purpurascens* Bertero (1829: 643) nom. illeg.

- *Gardinia violacea* (Kunth) Bertero ex Steudel (1840: 664) nom. nud.

Note:—Kunth (1843: 469) mentioned “*Gardinia violacea* Bertero” and cited it as a plant from Chile. Bertero (1829) merely mentioned “*Gardinia pupurascens*” (but not validly published) as a plant related to *Allium* and *Ornithogalum*, which grew near the “Quinta”.

Conservation status:—Least Concern (LC).

Doubtful species

Several species were described or transferred to *Tristagma* by Ravenna who, in several occasions and as it has been previously stated by other authors (Goldblatt & Henrich 1987, Karst & Wilson 2012), cited specimens of his own collection which are unavailable, and/or referred to materials which had never been distributed to the cited herbaria in his own publications.

Tristagma lineatum Ravenna (2001: 25). Type:—CHILE. In herbis summo Cuesta Barriga, prov. Santiago Chiliae, September 1971, *Ravenna* 2262 (holotype Herb. Ravenna not seen; isotype BA not found).

Tristagma staminosum Ravenna (2001: 26). Type:—CHILE. Region Metropolitana. La Correana pr. Termas del Flaco, November 1976, *Ravenna* 2871 (holotype BA, not found; isotype: Herb. Ravenna, not seen).

Tristagma leichtlinii (Baker) Ravenna (1971: 85) ≡ *Milla leichtlinii* Baker (1875: 234). Type:—CHILE. Region Andina, *s.coll. s.n.* (holotype K).

Note:—The characters described in the protologue, the illustration in Curtis's Botanical Magazine, vol. 102 [ser. 3, vol. 32]: t. 6236 and the type material of this species are not enough to identify it with confidence. In our opinion, *Tristagma leichtlinii* is similar to *Ipheion sessile* (Philippi) (1858: 72) Traub (1953: 69) but the name is applied incorrectly by some Chilean botanists for *Tristagma bivalve*.

Tristagma lomarum Ravenna (2005: 25). Type:—PERU. Culta in Santiago Chiliae ex bulbis in arenosis pr. fodina, ad Cachendo prov. Islay, civit. Arequipae, November 1978, *Ravenna* 2009 (holotype Herb. Ravenna, not seen).

Note:—We searched for specimens with similar characters in Peruvian collections and herbaria without success. The locality is outside the distribution area of *Tristagma* as currently understood.

Tristagma yauriense Ravenna (2005: 24). Type:—PERU. Culta in Santiago ex bulbis ad Puente Kero Yauri, viyit. Puno prov. Espinar collectis, November 1977, *Ravenna* 1905. (holotype Herb. Ravenna, not seen; isotype BA not found).

Note:—Type material could not be located and similar material was searched in Peruvian collections and herbaria without any success. As for *T. lomarum*, this species is out of the distribution area of *Tristagma*.

Excluded taxa

It should be mentioned that three species names considered under *Tristagma* by Traub (1963) and Ravenna (2001), actually are species of the related genera *Ipheion* (Sassone *et al.* 2014a, 2014b): *Ipheion sessile*, *Ipheion tweedeanum* (Baker) (1871: 382) Traub (1949: 50) and *Ipheion uniflorum* (Graham) (1833: 174) Rafinesque (1837: 12).

Tristagma mirabile Ravenna (2005: 46). Type:—ARGENTINA. Neuquén: Dpto. Añelo, 15 km SE de Mina Escondida, 11 October 1982, *Boelcke & Correa* 8607 (holotype BAB 00000031!).

Note:—After studying the protologue and the type specimen (we could not find another herbarium specimen which fixed with its diagnostic characters) we cannot conclude that this species is part of genus *Tristagma*. This species can be an atypical form of *Zephyranthes filifolia* Herbert ex Kraenzlin (1913: 190).

Tristagma peregrinans Ravenna (1978: 175). Type:—URUGUAY. Cuchilla Negra: 8 km de ad occidentem vel septentriono occidentem. Tranqueras uruguayas. *Ravenna* 541 (holotype Herb. Ravenna, not seen).

Note:—Not referable to *Tristagma*, rather to *Ipheion* (A.B. Sassone and collaborators, in preparation).

Tristagma subbiflora (Colla) Ravenna (1978: 135) ≡ *Allium subbiflorum* Colla (1836: 388). Type:—not designated.

Note:—Drawing 52 in Colla (1836), shows characters contradictory to those of *Tristagma*. For instance, there is no tepal tube, the stamens are disposed in one series, etc.

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