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## *Beauverdia*, a Resurrected Genus of Amaryllidaceae (Allioideae, Gilliesieae)

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**Abstract**—Based on morphological evidence, we resurrect the genus *Beauverdia* to include species of *Ipheion* section *Hirtellum*. All species now included in *Beauverdia* were also treated as part of *Ipheion*, *Nothoscordum*, or *Tristagma*. As here circumscribed, *Beauverdia* (Amaryllidaceae, Allioideae, Gilliesieae) is a South American genus that is found in Argentina, southern Brazil, and Uruguay. Two new combinations, *Beauverdia dialystemon* (Guagl.) Sassone & Guagl., comb. nov. and *Beauverdia hirtella* var. *lorentzii* (Herter) Sassone & Guagl., comb. nov. are made, as well as descriptions, keys to related genera and species, lectotypes, and distribution maps.

**Keywords**—*Ipheion*, key to species, lectotype, morphology, *Nothoscordum*, unifloral inflorescences.

The tribe Gilliesieae (Amaryllidaceae, Allioideae), as now circumscribed by APG III (Chase et al. 2009), includes at least thirteen genera from South America. Of these, *Ipheion* Raf., *Leucocoryne* Lindl., *Nothoscordum* Kunth, *Tristagma* Poepp., and *Zoellnerallium* Crosa, are all related by their tunicate bulbs, inflorescences with unarticulated pedicels, and one or two bracts subtending the inflorescence (Guaglianone 1972). Among these genera, the circumscription of *Ipheion* has been controversial and the genus has been considered under different synonymies (Traub 1963; Ravenna 1967, 1968, 2001; Crosa 1972, 1975; Rodrigues Souza et al. 2010). Currently its circumscription is still questionable (Sassone et al. 2013).

*Beauverdia* Herter was created in 1943 to include species with unifloral inflorescences and to differentiate them from species with plurifloral inflorescences within *Nothoscordum*, *Brodiaea* Sm., *Milla* Cav., and *Triteleia* Douglas ex Lindl. The latter three part of Asparagaceae. As considered by Herter (1943, 1949–1956), *Beauverdia* accounted for ten species: *B. hirtella* (Kunth) Herter, *B. felipponei* (Beauverd) Herter, *B. lloydiflora* (Beauverd) Herter, *B. lorentzii* Herter, *B. recurvifolia* (Wright) Herter, *B. sellowiana* (Kunth) Herter, *B. subsessilis* (Beauverd) Herter, *B. tweediana* (Griseb.) Herter, *B. uniflora* (Lindl.) Herter, and *B. vittata* (Griseb.) Herter. Stearn (1943) accepted the criteria used by Herter in 1943 (not including *B. recurvifolia*), however he restored the name *Ipheion* used by Rafinesque (1836) placing *Beauverdia* in the synonymy with *Ipheion*. The species included in *Beauverdia* by Herter (1943, 1949–1956) or in *Ipheion* by Stearn (1943) were later transferred or accepted under different genera by other authors: *Ipheion* (Traub 1949; Traub and Moldenke 1955; Guaglianone 1972; Fay et al. 2006; Sassone et al. 2013), *Nothoscordum* (Ravenna 1967, 1968; Crosa 1972, 1975; Rodrigues Souza et al. 2010), or *Tristagma* (Traub 1963; Ravenna 2001).

In a comprehensive treatment of *Ipheion*, Guaglianone (1972) divided the genus in two sections: *Ipheion* sect. *Hirtellum* with a spathe and two bracts, staminal filaments awl-shaped and disposed in one series, free or connate at their bases, and included the following species: *I. hirtellum* (Kunth) Traub, *I. dialystemon* Guagl., *I. sellowianum* (Kunth) Traub, *I. setaceum* (Baker) Traub, and *I. vittatum* (Griseb.) Traub. *Ipheion* sect. *Ipheion* was characterized by one bifid bract, linear staminal filaments adnate to the perigonial tube and disposed in two series and never connate at their bases. The following species were considered part of the type sec-

tion: *I. sessile* (Phil.) Traub, *I. tweedeanum* (Baker) Traub, and *I. uniflorum* (Graham) Raf.

Although the monophyly of *Ipheion* could not be supported by a molecular study of tribe Gilliesieae (Fay et al. 2006), species of both sections, *Ipheion* and *Hirtellum*, were monophyletic and grouped as follows: two species of *I. sect. Ipheion*: *I. uniflorum* and *I. sessile* were sister to *Tristagma*, while another two species of *I. sect. Hirtellum*: *I. dialystemon* and *I. hirtellum* were related to *Nothoscordum*.

Sassone et al. (2013), in a morphometric analysis, evaluated the circumscription of *Ipheion*, and concluded that species of *I. sect. Hirtellum* were grouped together and clearly distinguished from *I. sect. Ipheion*, as much as from *Nothoscordum*, *Tristagma*, and *Zoellnerallium*. Previous papers, (Ravenna 1967, 1968; Crosa 1972, 1975; Rodrigues Souza et al. 2010) based on morphological and cytological evidence, had noted that species of *Ipheion* sect. *Hirtellum* were allied to *Nothoscordum* (Ravenna 1967, 1968; Crosa 1972, 1975; Rodrigues Souza et al. 2010). However, both groups were statistically significantly different by multi and univariate analyses (Sassone et al. 2013, Table 3). A total of 17 highly significant differences were found to distinguish *I. sect. Hirtellum* from *Nothoscordum* / *Zoellnerallium*, and from *Tristagma* / *I. sect. Ipheion*. Diagnostic characters to separate *I. sect. Hirtellum* from both groups were selected. *Ipheion* sect. *Hirtellum* is separated from *Nothoscordum* / *Zoellnerallium* by smaller vegetative parts, the length of pedicels, the length and width of tepals, as well as the presence of humifuse fruits and unifloral inflorescences. The presence of tepals fused only at their bases and not forming a tube, staminal filaments arranged in only one series, and the presence of yellow flowers (or white in *I. vittatum*) are characters used to separate *I. sect. Hirtellum* from *Tristagma* and *I. sect. Ipheion*. Based on the distinction of *Ipheion* sect. *Hirtellum* (Sassone et al. 2013) and the morphological phylogeny herein presented, we propose to raise this section to the generic rank. Therefore, we resurrect the genus *Beauverdia*; we give combinations, lectotypes, keys to genera and species, and distribution maps. Genus and species descriptions are updated.

### MATERIALS AND METHODS

The materials were selected from the following herbaria: BA, BAB, BAF, CONC, K, ICN, LIL, LP, MERL, MVM, MVFA, and SI (acronyms follow Holmgren et al. 1990) to represent the geographical and morphological range of the species. Preserved flowers and fruits were rehydrated

TABLE 1. List of characters examined and their coding states

Vegetative characters
0. Type of bulb: (1) simple (2) prolific (with several small bulbs around the principal bulb). 1. Color of cataphyll bulb: (0) whitish (1) reddish. 2. Alliaceous smell: (0) absent (1) present. 3. Rhizome: (0) absent (1) present. 4. Leaf blade length: (0) less than 10 cm (1) 10 cm or more. 5. Leaf blade indumentum: (1) absent (2) present. 6. Ligule (0) absent (1) present. 7. Scape indument: (1) glabrous (2) papillose. 8. Neck length: (0) less than 2 cm (1) 2 cm or more. 9. Bract length: (0) less than 1.5 cm (1) 1.5 cm or more. 10. Number of bracts: (1) one bifid bract (2) two lanceolate bracts fused only at the base. 11. Length of the fused region of bracts: (0) less than 0.5 cm (1) between 0.5–1 cm (2) 1 cm or more. 12. Pedicel length: (0) less than 0.5 cm (1) more than 0.5 cm
Reproductive characters
13. Type of inflorescence: (1) unifloral (2) bifloral (3) plurifloral, more than two flowers. 14. Color of tepals: (1) yellow-yellowish (2) white-cream (3) blue-light blue (4) pink (5) green. 15. Degree of tepal fusion: (1) fused only at the base (2) fused up to the middle forming a tube around the ovary. 16. Number of tepals: (1) six (2) eight. 17. Length of tepals at the fused region: (0) less than 0.3 cm (1) between 0.3–1 cm (2) more than 1 cm. 18. Outer tepal length: (0) less than 0.8 cm (1) 0.8 cm or more. 19. Inner tepal width: (0) less than 2 mm (1) between 2–4 mm (2) 4 mm or more. 20. Arrangement of staminal filament: (0) one series (1) two series. 21. Staminal filament fusion: (1) all fused together at the same level (2) all free and fused to the perigon in two series (3) all free and fused to the perigon at different levels. 22. Number of stamens: (1) six (2) three fertile stamens and three staminodes (3) eight. 23. Shape of the staminal filaments: (1) linear (2) awl-shaped. 24. Length of the fused region of the staminal filaments: (0) not fused (1) less than 1.5 mm (2) 1.5 mm or more. 25. Maximum length of the staminal filaments: (0) less than 6 mm (1) 6 mm or more. 26. Minimum length of the staminal filaments: (0) less than 2.5 mm (1) between 2.5 and 3.5 mm (2) 3.5 mm or more. 27. Style length including the stigma: (0) less than 0.8 mm (1) 0.8 mm or more. 28. Type of style: (0) single (1) trifid. 29. Number of ovules per locule. 30. Number of carpels: (1) three (2) four. 31. Type of fruit: (0) aerocarpic (1) humifuse.

by soaking them in hot water. Fresh material collected in the field was preserved in 70% ethanol. When the type material was not available in local herbaria, it was studied from online images using digital tools available at JSTOR (<http://plants.jstor.org/>).

All diagnostic characters used to distinguish species of *Ipheion* (Guaglianone 1972), and a list of 51 characters used in the morphometric analyses (Sassone et al. 2013) were taken into account to describe species and to provide the keys to species and related genera. Maps were generated from coordinates reported on specimen labels or using georeferenced localities when coordinates were not reported on labels.

To test the monophyly of *Beauverdia*, we performed a morphological phylogenetic analysis, including all species of *Ipheion* s. l., and representatives of *Nothoscordum* and *Tristagma*. *Leucocoryne* was used to root the trees. Thirty-two characters were selected from Sassone et al. 2013 (Table 1) and adapted for phylogenetic analysis. All quantitative characters were transformed to binary or multi-state and all characters were coded considering homology. Parsimony-based analysis was conducted using an exact search. Support was estimated by two different methods of resampling: Bootstrap (Felsenstein 1985) and Jackknife (Farris et al. 1996). Both were calculated by resampling 1,000 times with TBR searching; for Jackknife a removal probability of 30% was used. All uninformative characters were deactivated prior to the analyses that were performed in TNT ver. 1.1 (Goloboff et al. 2008).

The complete data matrix used for phylogenetic analyses is available upon request from the senior author.

RESULTS

Figure 1 shows one of the two most parsimonious trees (L = 67 steps, CI = 0.52, RI = 0.74) with synapomorphies optimized on the tree. Three major clades were distinguished: *Ipheion* s. s. (JK: 75/BS:74) / *Tristagma* (JK: 63/56), *Beauverdia* (JK:56/-), and *Nothoscordum* /*Zoellnerallium*. *Beauverdia* resolved as monophyletic in both trees, supported by three synapomorphies (see Taxonomic treatment for *Beauverdia*): a short pedicel and two homoplastic character states (unifloral inflorescences and humifuse fruits), shared with species of *Ipheion* s. s. Species of *Nothoscordum* are closely related to *Beauverdia*, while the species of *Ipheion* s. s. are sister to *Tristagma*.

TAXONOMIC TREATMENT

*Beauverdia*, as here circumscribed, is a small genus of Amaryllidaceae, subfamily Allioideae, tribe Gilliesieae (Chase et al. 2009). This genus comprises four species from South America, restricted to the Pampean and Mesopotamic regions in Argentina, southern Brazil, and Uruguay (Figs. 2–5).

KEY TO RELATED GENERA

- 1. Fertile stamens 3, and staminodes 3. Chile ..... *Leucocoryne*
- 1. Fertile stamens 6(–8) ..... 2
- 2. Flowers white, light-blue, greenish, purple or black, never yellow. Spathe bracts 1–2. Tepals fused forming a tube, ½ or more of their length. Stamen filaments disposed in two series, generally linear, free, never connate at their bases, adnate to the perigonal tube. Argentina, Chile, and Uruguay ..... 3
- 3. Inflorescence 1- multiflowered, flowers white, greenish, black or purple. Spathe bracts 2, fused only at their bases. Fruits aerocarpic ..... *Tristagma*
- 3. Inflorescence 1-flowered, flowers white or light-blue. Spathe bract 1, bifid. Fruits humifuse ..... *Ipheion*
- 2. Flowers yellow or white. Spathe bracts 2, fused only at their bases. Tepals free or fused only at their bases, if fused, less than ½ of their length. Stamen filaments disposed in one series, linear or awl-shaped, free or connate at their bases ..... 4
- 4. Inflorescence 1(-2)-flowered. Pedicel short, 0.15–1.3 cm long included into bracts. Flowers trimerous or tetramerous; tepals 8–24 mm long × 8–10 mm. Stamen filaments awl-shaped. Fruits humifuse. Argentina (Pampean and Mesopotamic regions), Brazil, and Uruguay ..... *Beauverdia*
- 4. Inflorescence 2-multiflowered. Pedicels long or short and long, (0.4-)0.7–7 cm long, exerted, not included in bracts. Flowers trimerous, never tetramerous; tepals 5–15 mm long × 1.5–5 mm. Stamen filaments linear or awl-shaped. Fruits aerocarpic ..... 5
- 5. Inner bulb cataphylls white. Tepal apices not involute after anthesis. From S and NE of North America through South America ..... *Nothoscordum*
- 5. Inner bulb cataphylls red-purple. Tepal apices slightly involute after anthesis. Argentina (Mendoza and Neuquén provinces), Bolivia, and Chile ..... *Zoellnerallium*

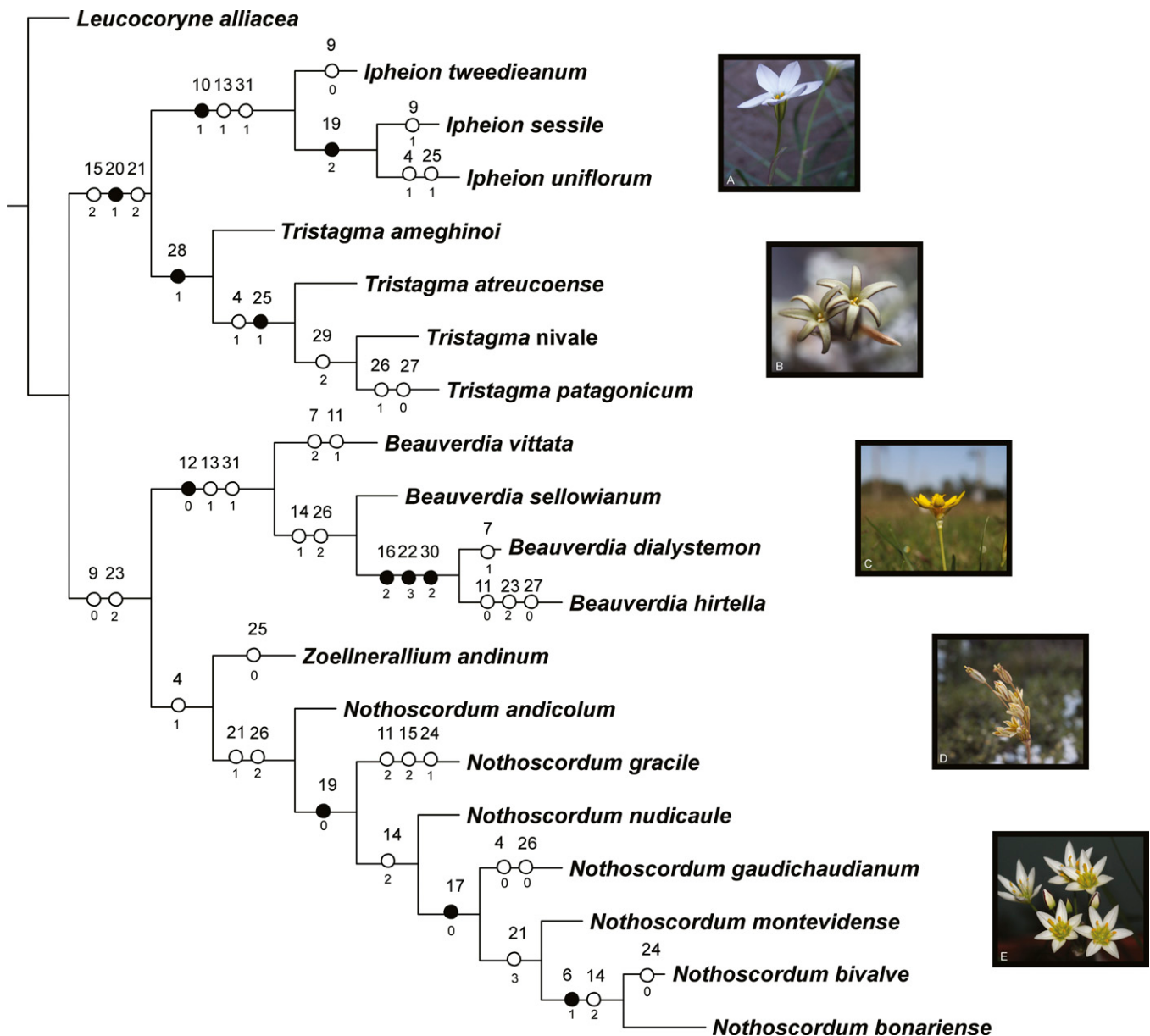


FIG. 1. One of the most parsimonious trees from the morphological phylogenetic analysis. Characters optimized on the tree with *Leucocoryne* as outgroup. Full circles indicate synapomorphies, and open circles are characters with homoplasy. For characters (numbers above branches) and character states (numbers below branches) see Table 1. Photos representing ingroup genera: A. *Ipheion uniflorum*. B. *Tristagma ameghinoi* (Speg.) Speg. (by Zuloaga). C. *Beauverdia hirtella* subsp. *lorentzii*. D. *Zoellnerallium andinum* (Poepp.) Crosa (by Zuloaga). E. *Nothoscordum bonariense* (Pers.) Beauverd.

BEAUVERDIA Herter, Boissiera 7: 507. 1943.—LECTOTYPE species: *Beauverdia hirtella* (Kunth) Herter (here designated). *Ipheion* section *Hirtellum* Guagl. Darwiniana 17: 178. 1972.

*Nothoscordum* section *Uniflorum* Beauverd, Bull. Herb. Boissier. ser. 2, 8: 1007. 1908.

Perennial herbs. Bulb indeterminate, rarely with lateral rhizomes; simple or prolific; tunicate; the outer cataphylls, papery; with or without conspicuous alliaceous smell; with starch-like reserve substances in inner sheaths: starch grains simple and semi-compound. Leaves few; leaf sheaths usually forming a subterranean neck, membranous; leaf blades rarely ligulate, plane or plane-convex, glabrous or papillose, green or glaucous, slightly patent, with laticiferous vessels with

colorless content. Scapes lateral, cylindrical, or semicylindrical, solid, glabrous or papillose. Inflorescences 1-flowered, rarely bi-flowered. Spathe with two bracts fused at their bases, cylindrical, membranous-papery, plurinerved; pedicels cylindrical, glabrous or papillose, not articulate, generally included into the spathe. Flowers bisexual, hypogynous, trimerous or tetramerous, actinomorphic, yellow or white. Perigone persistent, tepals 6(-7) or 8 disposed in two series: 3-4 plus 3-4, imbricate, usually fused at their bases, less than  $\frac{1}{2}$  their length, fused 1-6(-9) mm long; the outer ones slightly larger, 8-23 mm long. Stamens the same number of tepals, shorter than tepals, free or connate at their bases, and adnate to tepals; awl-shaped; anthers dorsifixed, introrse, oblong, yellow. Ovary sessile, 3-4 carpellate, septal nectaries present, ovules 8-24 per locule, arranged in

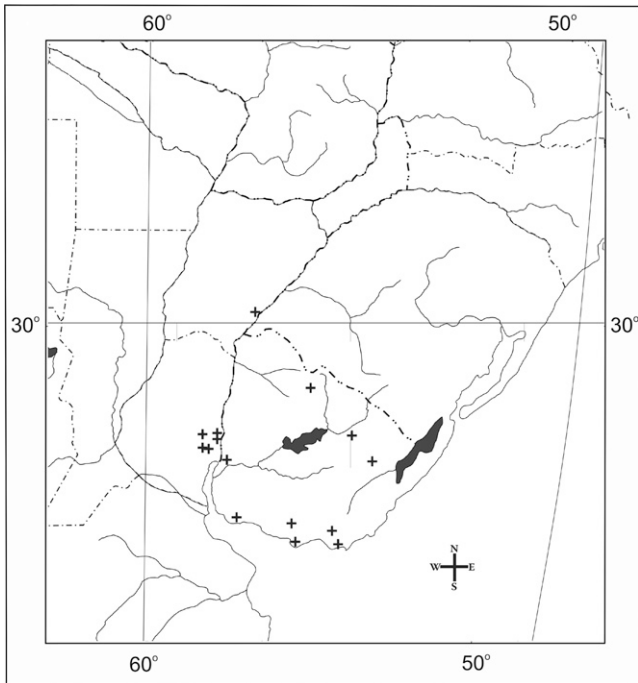


FIG. 2. Distribution area of *Beauverdia vittata*.

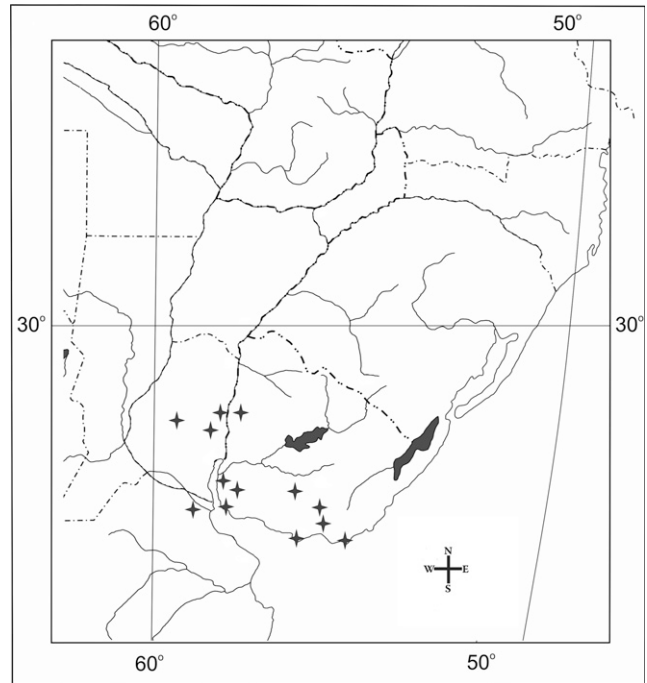


FIG. 4. Distribution area of *Beauverdia sellowiana*.

two rows, apotropous; style apical, stigma 3–4-lobed, papillose, persistent. Capsule humifuse, loculicidal, clavate, 3–4-locular, pluri-seeded. Seeds irregular, polyedric; tegument black, endosperm cartilaginous. Embryos small, cylindrical, straight, subapical. Chromosome number  $x = 5$ ,  $2n = 10$ , and FN = 16 (Ravenna 1967; Crosa 1972, 1975; Rodrigues Souza et al. 2010). Table 2.

**Habitat and Distribution**—The species are endemic to Argentina (Pampean and Mesopotamia regions), Brazil, and

Uruguay (Figs. 2–5), where they occur in open areas, usually in fields modified by livestock or human uses, in lowland or in gentle slopes with rocky and/or exposed soil (Fig. 6E).

**Phylogeny**—*Beauverdia* was recovered as monophyletic. Characters that define the genus are: pedicel length, which is shorter than in the other groups (*Nothoscordum*/*Zoellnerallium* and *Ipheion* s. s./*Tristagma*) and the presence of two homoplastic character states: unifloral inflorescence and humifuse fruit.

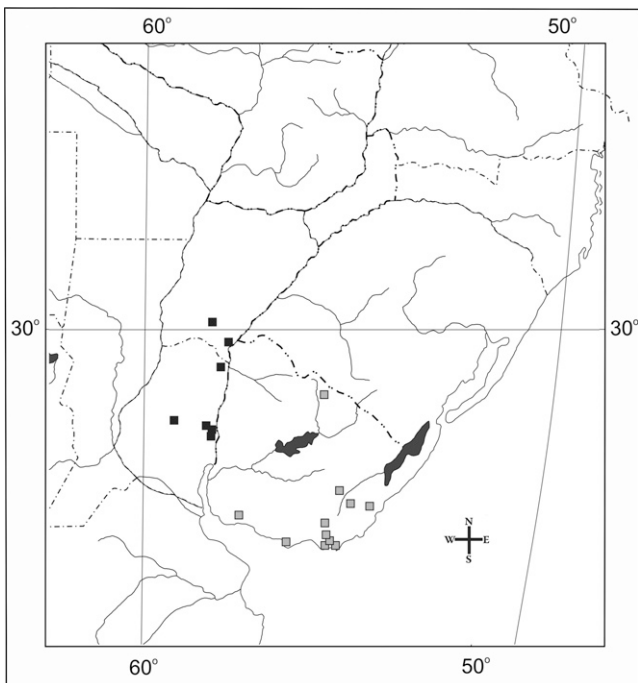


FIG. 3. Distribution area of *Beauverdia hirtella* (black square) subsp. *hirtella* and *B. hirtella* subsp. *lorentzii* (grey square).

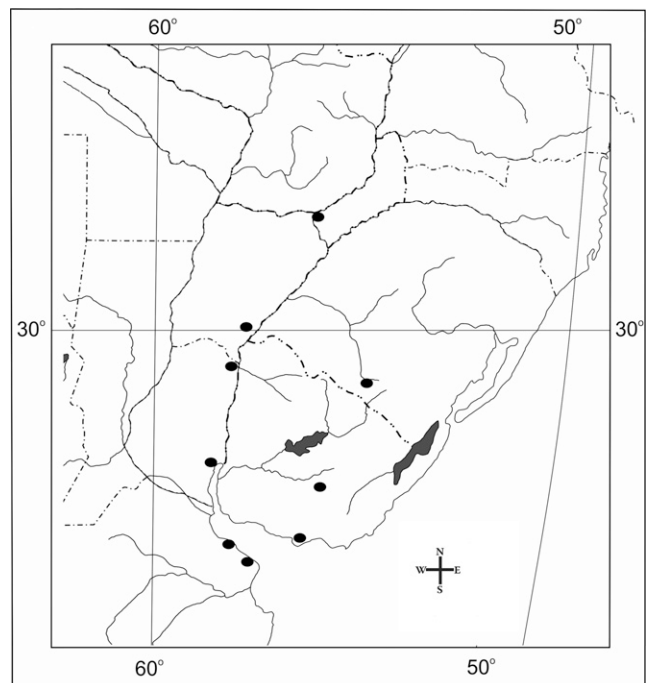


FIG. 5. Distribution area of *Beauverdia dialystemon*.

TABLE 2. Comparison of morphological diagnostic characters of *Beauverdia* species.

Species	<i>B. hirtella</i> subsp. <i>hirtella</i>	<i>B. hirtella</i> subsp. <i>lorentzii</i>	<i>B. vittata</i>	<i>B. sellowiana</i>	<i>B. dialystemon</i>
<b>Tepal color</b>	Yellow-orange	Yellow-orange	White	Yellow-orange	Yellow-orange
<b>Alliaceous smell</b>	Yes	Yes	No	No	No
<b>Indument of scapes, pedicels, and/or leaves</b>	Papillose-pubescent	Papillose-pubescent	Generally papillose-pubescent	Glabrous	Glabrous
<b>Flowers</b>	Trimerous	Tetramerous	Trimerous	Trimerous	Tetramerous
<b>Ligulate leaves</b>	No	No	Sometimes	No	No
<b>Type of bulb</b>	Simple	Simple	Generally simple	Simple	Prolific
<b>Stamen filament fusion</b>	Connate at their bases	Connate at their bases	Free	Connate at their bases	Free
<b>Flowering time (month)</b>	IV–VI	IV–VI	IV–VI	VI–IX	VII–X

KEY TO THE SPECIES OF *BEAUVERDIA*

1. Flowers white, trimerous. Leaves, sometimes ligulate. Staminal filaments free, never connate at their bases ..... 1. *B. vittata*
1. Flowers yellow, trimerous or tetramerous. Leaves eligulate. Staminal filaments free or connate at their bases ..... 2
  2. Bulb simple, with or without alliaceous smell. Flowers trimerous or tetramerous. Staminal filaments connate at their bases ..... 3
    3. Bulbs, leaves, and scapes with strong alliaceous smell. Scape, leaves and/or pedicels papillose-pubescent. Scape (2.5-) 3.5–13 cm long. Flowers trimerous or tetramerous ..... 2. *B. hirtella*
    3. Bulbs, leaves, and scapes without alliaceous smell. Scape, leaves, and pedicels glabrous. Scape 0.5–3(-5) cm long. Flowers trimerous, rarely tetramerous ..... 3. *B. sellowiana*
  2. Bulb prolific (with several small bulbs around the principal bulb), without alliaceous smell. Flowers tetramerous, rarely more (-11). Staminal filaments never connate at their bases ..... 4. *B. dialystemon*

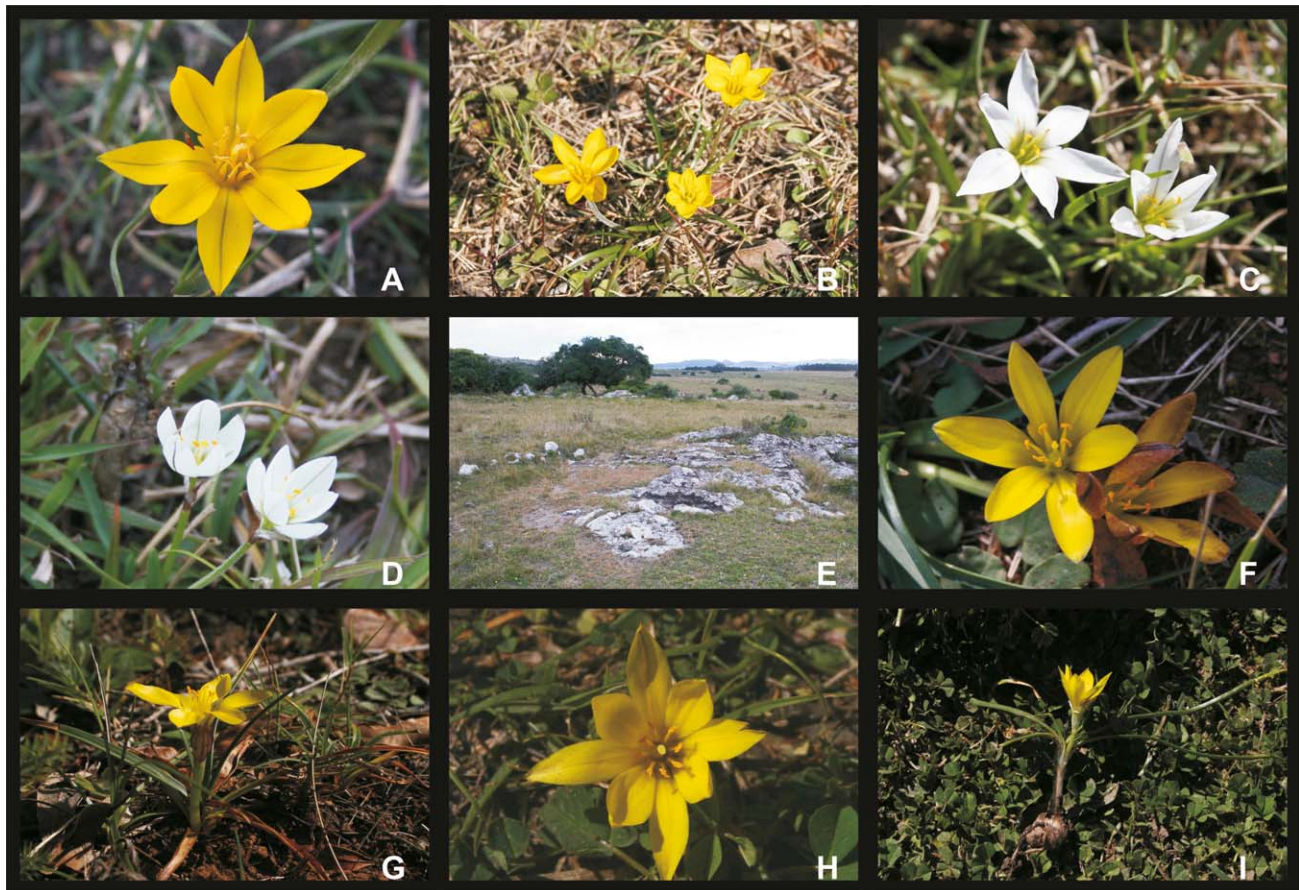


FIG. 6. Plate depicting the morphological variation among species of *Beauverdia*. A. *B. hirtella* subsp. *lorentzii* (Giussani, L. M. & Morrone, O. 438). B. *B. hirtella* subsp. *hirtella* (Giussani, L. M. et al. 468). C. *B. vittata* from Uruguay (Giussani, L. M. et al. 481). D. *B. vittata* from Argentina (Giussani, L. M. & Morrone, O. 429). E. Habitat where *B. hirtella* subsp. *hirtella*, *B. vittata*, and *Ipheion sessile* grow in sympatry in Cerro Arequita, Uruguay. F–G. *B. sellowiana* from Uruguay (Giussani, L. M. et al. 466). H–I. *B. dialystemon* from La Plata, Argentina (Giussani, L. M. et al. 500).

1. *BEAUVERDIA VITTATA* (Griseb.) Herter, Boissiera 7: 511, Fig. 55. 1943. *Milla vittata* Griseb. Symb. ad. Fl. Argent. 318. 1879. *Brodiaea vittata* (Griseb.) Baker, Gard. Chon. ser 3. 20: 459. 1896. *Ipheion vittatum* (Griseb.) Traub; Pl. Life (Stanford) 5:50.1949. *Tristagma vittatum* (Griseb.) Traub, Pl. Life (Stanford) 19: 61. 1963. *Nothoscordum vittatum* (Griseb.) Ravenna, Pl. Life (Stanford) 24: 57.1968.—TYPE: URUGUAY. Concepción del Uruguay, 1 May 1877, Lorentz 968 (holotype: GOET!, Photo: Ser. Field Museum at Chicago n° 10.028; isotype: BAF!).

*Nothoscordum uniflorum* Baker, Bull. Misc. Inform. Kew 1898: 227. 1898.—TYPE: URUGUAY. Campos, cercanías de Montevideo. Flor alba, Jun, *Cantera s. n.* (Herb. Arechavaleta 20) (holotype: K!).

*Nothoscordum lloydiflorum* Beauverd, Bull. Herb. Boissier ser. 2, 8: 998, Fig. 2. 1908. *Beauverdia lloydiflora* (Beauverd) Herter, Boissiera 7: 510. 1943. *Ipheion lloydiflorum* (Beauverd) Traub, Pl. Life (Stanford) 5: 50.1949. *Tristagma lloydiflorum* (Beauverd) Traub, Pl. Life (Stanford) 19: 61. 1963.—TYPE: URUGUAY. Canelones, Independencia, in campis, 3 May 1908, *Osten 5222* (holotype: G!; isotypes: SI!, MVM!).

Bulb spherical, 7–21 mm diam, generally simple. Leaf sheaths 0.5–7 cm long, subterranean; leaf blades generally papillose, sometimes ligulate, 2.6–26 cm long × 0.5–3 mm. Scapes 1–7, generally papillose, 2.3–12.4 cm long. Bracts 2, ovate-acuminate, 7–14 mm long × 1.8–5 mm, fused at their bases forming a short tube 2–5 mm long. Pedicels generally papillose, 2.4–13 mm long. Inflorescence 1(-2)-flowered, if bifloral, with abnormal pedicels. Tepals 6, sometimes 7–8, white, elliptical or lanceolate, slightly fused at their bases, fused 1–5 mm long; the outer ones 8–15 mm long × 1.8–6 mm; the inner ones, slightly smaller, tepal middle nerves purple. Staminal filaments 6.5–10 mm long; free, lanceolate-awl shaped; anthers 2.7–3.5 mm long. Ovary 3- carpellate, oblong, sometimes obovoid, 2.2–6 mm long; ovules 8–21 per locule. Capsule 7–9 mm long × 4–5 mm. Seeds 2 mm long. Chromosomes:  $x = 5, 2n=10$  (Crosa 1972, 1975). Figure 6 C–D.

**Iconography**—Guaglianone, Darwiniana 17:180; 182. Figures 7, 8 a–h. 1972.

**Habitat and Distribution**—*Beauverdia vittata* is distributed in Southern Brazil, Uruguay, and frequently found in the southeastern region of Entre Ríos, rarely found in Buenos Aires, Argentina (Fig. 2). It is usually sympatric with *Nothoscordum gaudichaudianum* Kunth or *B. hirtella*.

**Phenology**—It is flowering and fruiting from April to June.

**Representative Specimens Examined**—ARGENTINA. Buenos Aires: No data, 1944, *Preioni s. n.* (BAF); Entre Ríos: Gualaguaychú. Aeroclub, camino al Ao. Gualayán, 17 Apr 1965, A. Burkart, et al. 25696 (SI). Uruguay. Al N. de Colonia Elia, 7 Apr 1967, A. Burkart, et al. 26920 (SI); Colonia Elia a Campichuelo, 10 May 1963, A. Burkart, et al. 24134 (SI); Camino de Colonia Elia a Puerto Campichuelo, 8 km pasando Cnia Elia, 02 Jun 2010, L. M. Giussani et O. Morrone O. 431 (SI); Colonia Elia, 24 May 1967, A. M. Ragonese et E. R. Guaglianone s. n. (SI 26103); Col. Perfección, 23 May 1968, A. M.

*Ragonese et E. R. Guaglianone s. n.* (SI 26099); Ruta Nac. 14. Complejo Termas Concepción, 31 May 2012, L. M. Giussani et O. Morrone O. 425 (SI); Ruta Nac. 14. Complejo Termas de Concepción, 22 May 2012, L. M. Giussani et al. 491 (SI); Concepción del Uruguay, INTA potrero, S. B. Sorarú, 412 (SI); Est. Exp. INTA, arrocera, 23 May 1967, A. M. Ragonese et E. R. Guaglianone s. n. (SI 26096, 26097 and 26101).

BRAZIL. Rio Grande do Sul: Uruguayana, camino a Itauí, 17 May 1963, Rosengurt et al. 9465 (MVFA).

URUGUAY. No data (MVM 359); No data, *F. Felippone 3160* (SI); *F. Felippone 5940* (SI). Canelones: Canelones, 30 May 1925, *Osten et al. 19555* (MVM). Lavalleja: Co. Verdún, 24 May 1959, *O. Crosa s. n.* (MVFA 2153). Maldonado: Punta Ballena, 12 Apr 1945, *Legrand 3933* (MVM); 23 Apr 1964, *Del Puerto et al. s. n.* (MVM); Sauce de Maldonado, May 1870 or 1873, *F. Gilbert s. n.* (MVM 363); Cerro Arequita. Ruta 8, 20 May 2012, L. M. Giussani et al. 481 (SI). Montevideo: Cerrito, May 1925, *G. Herter 50A* (SI); Cerro Montevideo. *F. Felippone 3447a* (SI); Montevideo, en el campo, Jun 1874 (Herb. Arechavaleta 2583; MVFQ); Montevideo in campis, May 1881, *Gibert 1900* (MVM); Montevideo: La Colorada, 26 Apr 1947, *Legrand 1212* (MVM); Montevideo: Pque Rodó, 3 May 1959, *O. Crosa s. n.* (MVFA 2156); 10 May 1947, *Legrand 867* (MVM). Río Negro: Aduana de Fray Bentos. 19 May 2012, L. M. Giussani s. n. et al. (SI). Tacuarembó: Río Negro, 2 May 1960, *Rosengurt B-8161* (MVFA).

2. *BEAUVERDIA HIRTELLA* (Kunth) Herter, Boissiera 7:509.1943. *Triteleia hirtella* Kunth. Enum. Pl. [Kunth] 4: 465.1843. *Milla hirtella* (Kunth) Baker, J. Linn. Soc., Bot.11: 385. 1871. *Brodiaea hirtella* (Kunth) Baker, Gard. Chron. ser 3, 20: 459. 1896. *Nothoscordum hirtellum* (Kunth) Herter, Index Sem. (Montevideo) 1928–29. *Ipheion hirtellum* (Kunth) Traub, Pl. Life (Stanford) 5: 50. 1949. *Tristagma hirtellum* (Kunth) Traub, Pl. Life (Stanford) 19: 61.1963.—TYPE: URUGUAY. Montevideo, 1841, *Gaudichaud s. n.* (holotype: B!, Photo: Ser. Field Museum at Chicago n° 10020).

Bulb subglobose (5-)11–25 mm diam, with strong alliaceous smell, generally simple, with buds included in the axils of the fleshy cataphylls. Leaf sheaths 0.5–9 cm long, subterranean; leaf blades green, patent, papillose-pubescent (2-)4–21 cm long × 1–8 mm. Scapes 1–5, subcylindrical, papillose-pubescent, (2.5-) 3.5–13 cm long. Bracts 2, ovate-acuminate 8–19 mm long × 4–6.5 mm, fused at their bases forming a short tube 1.8–4 mm long. Pedicels papillose-pubescent, 1.5–2.6 mm long. Inflorescences 1-flowered. Tepals 6(-7), yellow-orange, the outer ones elliptical-lanceolate, 12–23 mm long × 8–10 mm, the inner ones elliptical, 11–21 mm long × (2.3) 3.5–6.5 mm; fused from their bases, fused 1–4 mm long; tepal middle nerves green. Staminal filaments connate at their bases, awl-shaped, yellow; anthers 2.1–5 mm long. Ovary 2.7–5 mm long; ovules (9-) 13–18 per locule, style yellow, 5–6 mm long. Capsule 7–11 mm long × 4–6 mm diam. Seeds black, 1.8–2.5 mm diam. Chromosome number  $x = 5, 2n = 10$ , and  $FN = 16$  (Crosa 1972, 1975; Rodrigues Souza et al. 2010). Figure 6B.

**Phenology**—It is flowering and fruiting from April to June.

We consider two subspecies of *Beauverdia hirtella*, according to the number of flower parts, and geographic distribution (Ravenna 1978); hence we propose here, the necessary combinations to subspecies.

KEY TO THE SUBSPECIES OF *BEAUVERDIA HIRTELLA*

- 1. Tepals and stamens 6. Ovary 3-locular. Uruguay ..... *B. hirtella* subsp. *hirtella*
- 1. Tepals and stamens 8. Ovary 4-locular. Argentina ..... *B. hirtella* subsp. *lorentzii*

*BEAUVERDIA HIRTELLA* (Kunth) Herter subsp. *HIRTELLA*.  
*Nothoscordum hirtellum* (Kunth) Herter subsp. *hirtellum*,  
Pl. Life (Stanford) 34:144.1978.

*Nothoscordum canescens* Beauverd, Bull. Herb. Boiss. ser. 2, 8: 998, Fig. 1 A–D.1908.—TYPE: URUGUAY. Minas in summo Monte Arequita, locis humidis,

18 Apr 1908, *Osten 5195* (holotype: G!; isotype: MVM!).

*Nothoscordum subsessile* Beauverd, Bull. Herb. Boiss. ser. 2, 8: 997. Fig. A–D, 1908. *Beauverdia subsessilis* (Beauverd) Herter, Boissiera 7: 510. 1943. *Ipheion subsessilis* (Beauverd) Traub, Pl. Life (Stanford) 5:50.1949.—TYPE: URUGUAY. Minas, in summo Monte Arequita, locis humidis, 18 Apr 1908, *Osten 5195 bis* (holotype: G!).

**Representative Specimens Examined**—URUGUAY. Lavalleja: Sierra de las Animas, 5 Jun 1968, *Izaguirre et al. s. n.* (MVFA N° 2736); Balneario Cuchilla Alta, May 1944, *Legrand 3818* (MVM); 1944, *Osorio 261* (MVM); Cerro Pan de Azúcar, 18 May 1973, *Rosengurti 1845* (LP, MVFA, SI); Cerro Arequita. Ruta 8, 20 May 2012, *L. M. Giussani et al. 482* (SI); Co. Arequita, 4 May 1964, *Del Puerto et al. 3479* (MVM); Minas. Co. Verdún, 18 May 1960, *Izaguirre 1340* (MVFA); 24 May 1959, *O. Crosa s. n.* (MVFA N° 2154); 25 May 1968, *O. Crosa 59* (MVFA); Co. Verdún, 20 May 2012, *L. M. Giussani et al. 468* (SI); *L. M. Giussani et al. 470* (SI). Co. Lorencita, *Legrand 2899* (MVM). Maldonado: Piriápolis, Cerro Inglés inter saxa, flor aureis. *C. Osten 5499* (SI, MVM); Piriápolis, Oct, (MVM 360); Punta Ballena, 14 Jun 1959, *O. Crosa s. n.* (MVFA N°2155); 12 Jun 1945, *Legrand 3926* (MVM). Montevideo: Floresta, May 1926, *Herter 49A* (SI and Herb. *Osten 19676* in MVM); Montevideo, en campos, 25 May 1955, *Rimbach 25*(SI); Montevideo, Cerro, 10 May 1967, *Legrand 869* (MVM); 25 May 1945, *Legrand 4005* (MVM); Montevideo, Cerro Melones, 24 Apr 1900, *Berro 1852* (MVM). Rivera: Cerro junto al Miriñaque, 3 May 1960, *Rosengurti B-8180* (MVFA). Rocha: *F. Felippone 3491* (SI).

**Iconography**—Guaglianone, Darwiniana 17:187, Fig. 11. 1972.

**Habitat and Distribution**—This subspecies is frequently found in prairies and rocky soils on the hills of Uruguay (Fig. 3). Sometimes sympatric with *B. vittata* and *Oxalis* species. (Fig. 6E).

BEAUVERDIA HIRTELLA (Kunth) Herter subsp. **lorentzii** (Herter) Sassone & Guagl., comb. nov. *B. lorentzii* Herter, Boissiera, 7: 509, Fig. 54. 1943. *Ipheion lorentzii* (Herter) Traub, Pl. Life (Stanford) 5: 50.1949. *T. lorentzii* (Herter) Traub, Pl. Life (Stanford) 19: 61. 1963. *Nothoscordum lorentzii* (Herter) Ravenna, Pl. Life (Stanford) 23: 50. 1967. *N. felipponei* Beauverd subsp. *lorentzii* (Herter) Ravenna, Pl. Life (Stanford) 25: 74–75, Fig. 21. 1969. *Nothoscordum hirtellum* (Kunth) Herter subsp. *lorentzii* (Herter) Ravenna, Pl. Life (Stanford) 34: 144.1978.—TYPE: ARGENTINA. Entre Ríos, Concepción del Uruguay, en suelo arenoso al Norte del pueblo, flor anaranjado-amarilla, May 1877, *Lorentz 967* (lectotype: BAF!, here designated).

This subspecies differs from *B. hirtella* subsp. *hirtella* by tetramerous flowers, 4-locular capsules and, up to now, a restricted distribution to Argentina. Figure 6A.

**Iconography**—Guaglianone, Darwiniana 17:184–185, Figs. 9, 10.1972.

**Habitat and Distribution**—This subspecies is frequently found in prairies, and in soils of modified environments in Corrientes and Entre Ríos in Argentina. Sometimes sympatric with *B. vittata* y *Oxalis* species. (Fig. 3).

**Notes**—*Beauverdia lorentzii* was described by Herter with six or eight tepals; in the description, he cited specimens from Concepción del Uruguay, Entre Ríos province, Argentina: *Lorentz 967*, and *P. Lorentz 1024* and presented an illustration (Fig. 54) that represents a trimerous form; its voucher was supposed to be stored at GOET and B. However, when the type material (*Lorentz 967*) was requested from both herbaria, it was reported as unfound. The isotype (*P. Lorentz 967*, BAF!) and the paratype (*P. Lorentz 1024*, BAF!; CORD!) represent

the tetramerous form, that corresponds with the variation found in Argentina. As stated by Guaglianone (1972), Ravenna (1978), and investigated in this paper, all plants of *B. hirtella* collected in Argentina always have tetramerous flowers, while the material from Uruguay always has trimerous flowers. We proposed to lectotypify the subspecies *Beauverdia hirtella* subsp. *lorentzii* with the specimen stored at BAF: *Lorentz 967*, which represents the tetramerous form, restricted to Argentina.

**Representative Specimens Examined**—ARGENTINA. Corrientes: Monte Caseros, 19 May 1952, *Nicora 6247* (SI); *E. G. Nicora 5360* (SI). Entre Ríos: Curuzú Cuatiá, *T. M. Pedersen 14553* (SI); Federación. Ruta Nac 14, rotonda de entrada a Chajari, 2 Jun 2010, *L. M. Giussani et O. Morrone 438* (SI); Uruguay. Camino de Colonia Elía a Puerto Campichuelo, 8 km pasando Cnia Elía, 1 Jun 2010, *L. M. Giussani et O. Morrone 428* (SI); Concepción del Uruguay, en suelo arenoso, May 1877, *P. Lorentz 1024* (paratype of *Beauverdia lorentzii*: BAF, CORD); Estac. Exp. INTA, arrocera, 23 May 1967, *A. M. Ragonese et E. R. Guaglianone s. n.* (SI 26094); Concepción del Uruguay. INTA, arrocera. *S. B. Sorarú 424* (SI); Concepción del Uruguay, colonia Perfección, 23 May 1967, *A. M. Ragonese et E. R. Guaglianone s. n.* (SI 26100); Ruta Nac. 14. Complejo Termas Concepción, 31 May 2010, *L. M. Giussani et O. Morrone 424* (SI); Ruta Nac. 14. Complejo Termas de Concepción, 22 May 2012, *L. M. Giussani et al. 490* (SI); Campichuelo, orilla del río Uruguay, 10 Apr 1963, *A. Burkart et al. 24138* (SI); Tala. Rosario del Tala, 22 May 1967, *S. B. Sorarú A-16*. (SI).

3. BEAUVERDIA SELLOWIANA (Kunth) Herter. Boissiera 7: 510. 1943. *Triteleia sellowiana* Kunth, Enum. Pl. [Kunth] 4: 4.66. 1843. *Milla sellowiana* (Kunth) Baker, J. Linn. Soc. Bot. 11: 383. 1871. *Brodiaea sellowiana* (Kunth) Baker, Gard. Chron. ser. 3, 20: 459. 1896. *Ipheion sellowianum* (Kunth) Traub, Pl. Life (Stanford) 5: 50. 1949. *Tristagma sellowianum* (Kunth) Traub, Pl. Life (Stanford) 19: 61. 1963.—TYPE: Brasilia meridionalis: *Sellow 3664* (holotype: B, Photo: Ser. Field Museum at Chicago n°10.022; isotype: K!).

*Nothoscordum felipponei* Beauverd, Bull. Soc. Bot. Genève, ser. 2, 13: 267, 1 Fig. 1921–22. *Brodiaea felipponei* (Beauverd) Herter, Flórlula Uruguay 2: 47. 1930. *Beauverdia felipponei* (Beauverd) Herter, Boissiera, 7: 510. 1943. *Ipheion felipponei* (Beauverd) Traub, Pl. Life (Stanford) 5: 50. 1949. *Tristagma felipponei* (Beauverd) Traub, Pl. Life (Stanford) 19: 61. 1963.—TYPE: URUGUAY. Montevideo: Cerro in saxosis. Perigonio flavo nitidis dorso atropurpureo-vittatis vel pictis; tepala basi connata folia canaliculata dorso haud carinata, 31 Aug 1898, *Osten 3620* (syntype: G!, MVM!).

Bulb subglobose, 10–25 mm diam, without alliaceous smell, simple, sometimes with buds included in the axils of the fleshy cataphylls. Leaf sheaths 0.4–2.5 cm long, subterranean; leaf blades lanceolate, patent, glabrous, 3–10 cm long × 1–5 mm. Scapes 0.5–3(-5) cm long. Bracts 2, with a remarkable marginal nerve, and from there, the margin is involute and hyaline. Pedicels (0.3-)0.4–11 cm long. Inflorescence 1-flowered. Tepals, 6 or, infrequently 8(-9), yellow, all tepals 16–20 mm long × 7–10 mm, fused only at their bases, fused 1–9 mm long, tepal middle nerves green or brownish. Staminal filaments connate at their bases, yellow, straight; anthers 1.2–4 mm long. Ovary 3- carpellate, oblong-elliptical 2.3–5.6 mm long; ovules 12–24 per locule, style 5–7 mm long. Chromosomes:  $2n = 10$  (Ravenna 1967; Crosa 1975; Rodrigues Souza et al. 2010). Figure 6 F–G.

**Iconography**—Guaglianone, Darwiniana 17:189, Fig. 12. 1972.

**Habitat and Distribution**—*Beauverdia sellowiana* is frequently found on the hills of Uruguay, rarely in Argentina (Fig. 4).



**Phenology**—It is flowering and fruiting from June to September. Tepals, when mature, turn orange (Fig. 6F).

**Remark**—*Brasilica meridionalis*, the area assigned to the holotype specimen, may correspond to the itinerary V made by Sellow between 1821–1829, who explored Uruguay, Rio Grande do Sul, Santa Catharina, Paraná, and São Paulo (Urban 1906), but the presence of this species in Brazil is certainly dubious.

**Representative Specimens Examined**—ARGENTINA. Entre Ríos: Uruguay. Conc. del Urug. Estac. Exp. INTA, arrocera, Jun 1967, S. B. Sorarú s. n. (SI 20066); En cultivo jardín botánico de Ezeiza. J. A. Castillo s. n. (SI).

URUGUAY. No data. F. Felippone 5763 (SI); Montevideo: Montevideo. F. Felippone 3471 (SI); Oct 1890 or 1870, Gibert 512 (MVM); Flores: Yi, 30 Aug 1899, Osten 3656 (MVM); Florida: A° Mansavillagra, Est. Rincón sierra de Minas, 1 Sep 1940, Legrand 2241(MVM); 20 Sep 1920, Osten 15249 (BAF and MVM); Lavalleja. Minas. Cerro Verdún, 20 May 2012, L. M. Giussani et al. 466 (SI); L. M. Giussani et al. 462 (SI); Fuente Salus, Legrand 4828 (MVM). Maldonado: Punta Ballanena, 31 Aug 1963, Izaguirre, et al. 248 (MVFA); Sierras de las Ánimas, 25 Aug 1963, Albott s. n. (LP); Montevideo: Cuchilla Pereyra, Sep 1920, F. Felippone 3493 (syntype of *Nothoscordum felipponei*: SI!, G!); May 1926, Herter 434 (80842) (SI); San José: 14 Sep 1898, Osten 3550 (MVM); Soriano: Gallinal 4397 (SI); Juan Jackson, Monzón-Heber, 15 Sep 1940, Gallinal 4397 (MVFA and MVM); Corralito, 22 Sep 1895, Osten 3187 (MVM).

4. *Beauverdia dialystemon* (Guagl.) Sassone & Guagl., comb. nov. *Ipheion dialystemon* Guagl. Darwiniana 16: 800. 1971. *Nothoscordum dialystemon* (Guagl.) Crosa, Darwiniana 19: 334.1975.—TYPE: ARGENTINA. Buenos Aires. La Plata: Gonnet. Flor amarilla, 17 Aug 1967, A. M. Ragonese et E. R. Guaglianone s. n. (holotype: SI! 26130; isotypes: BAA!, K!).

Bulb globose, 7–15 mm diam, without alliaceous smell, outer cataphyll cartilaginous, frequently prolific, with several small subglobose bulbs, 3–5 mm diam covered by external cataphylls. Leaf sheaths (0.2–)0.4–3.5 cm long, subterranean; leaf blades linear falciform, patent, eligulate, glabrous, acute, 3.5–13 cm long × 1–4 mm. Scapes 1–4, compressed, longitudinally striate, glabrous, rarely papillose, 0.3–4 cm long. Bracts 2, fused at their bases, plurinerved, 12–18 mm long × 5–6.5 mm. Pedicels glabrous, 2.3–11 mm long, completely covered by the spathe, spathe margins slightly involute. Inflorescences 1-flowered. Tepals 8(–11), yellow, subtrinate, 12.3–23 mm long × 4.5–7.5 mm, the inner ones slightly wider than the outer ones, fused at their bases, fused 1.7–6.5 mm long, straight at their bases, then patent, lanceolate, slightly purple in the abaxial surface. Staminal filaments 8(–11), fused to the perigone independently from their bases, generally at different levels, filaments slightly awl-shaped, the taller ones 13–15 mm long, the shorter ones 7.6–11 mm long; anthers 1.2–4 mm long. Ovary 4-carpellate, 2.2–3.7 mm long, ovules 8–12 per locule, style 3.6–10.5 mm long. Capsule subglobose, 4 mm diam. Seeds irregularly tetraedric, black, 2 mm diam, tegument slightly punctate. Figure 6 H–I.

**Iconography**—Guaglianone, Darwiniana 17:190, Fig. 13. 1972.

**Habitat and Distribution**—The species grows in prairies of the Pampean region of Argentina (provinces of Misiones, Corrientes, Entre Ríos, and Buenos Aires), Brazil, and Uruguay, sometimes in human-disturbed habitats (Fig. 5).

**Phenology**—It is flowering and fruiting from July to October.

**Representative Specimens Examined**—ARGENTINA. Buenos Aires: General Pueyrredón, Sierra de los Padres, a 200 m del Mirador. M. O. Díaz s. n. (SI 26783); La Plata, alrededores, 20 Aug 1907, A. C. Scala s. n. (SI 20065); A. C. Scala s. n. (SI 20067); Gonnet, calle 31 entre 47 y 48, Sep 1907, A. C. Scala s. n. (BAF); Gonnet, campito frente al arroyo Rodríguez, D. Añón Suarez 53 (LP); Gonnet, frente al Centro Comunal de Gonnet, 10 Sep 2012, L. M. Giussani, et al. 500 (SI); Gonnet, Ciudad de los Niños, 10 Sep

2012, L. M. Giussani, et al. 501 (SI); La Plata, in pratis, Jul 1901, C. Spegazzini s. n. (LP 11730); Alrededores de La Plata, C. Spegazzini s. n. 188 (LP 11731); La Plata, praderas vírgenes al SE de la ciudad, 8 Sep 1930, A. L. Cabrera 1459 (LP); La Plata, en campos, 21 Sep 1966, Cullen 48 (LP); Corrientes: Paso de los Libres. Parada Pucheta, vías del F.C., A. C. Scala s. n. 44 (LIL); Entre Ríos: Federación. Ruta 14, Chajarí, 1 Aug 1952, E. G. Nicora 6254 (SI). Misiones. Establecimiento Santa Inés, Jul 1926, A. C. Scala 155 (LP).

BRAZIL. Rio Grande do Sul: BR-153, km 84, Bage, RS, 6 Aug 1985, M. Sobral 3952 (ICN).

URUGUAY. No data (MVM 350); Montevideo, in petrosis, Oct 1890 or 1870, Gibert 512 (MVM). Florida: Est. Rincón Sta. Elena, Picada Castro, Ao. Mausavillagra, Aug 1946, Rosengurt et Gallinal 5680 (MVFA; MVM 14190).

**Doubtful Species**—*Nothoscordum marchesii* Crosa and *N. izaguirreae* Crosa from Uruguay were recently described species (Crosa 2005, 2006, respectively); the morphology of these species resembles that of *Beauverdia* based on unifloral inflorescences, the color or size of flowers, the humifuse fruits, and the flowering time. Currently, the only known materials are those of the type specimens; to confirm their pertinence in *Beauverdia*, it is necessary to study the morphological variation of populations of both species, and the distribution areas.

*Nothoscordum ostenii* Beauverd was described by Beauverd (1908) as a unifloral species, although the isotype (*Osten 3611*, SI!) has bifloral plants. In this species, this character varies from one to two flowers per scape. *Nothoscordum ostenii* is similar to *Beauverdia sellowiana*, and some authors treated these species as synonyms (Herter 1943; Ravenna 1967). It is a controversial taxon (Sassone et al. 2013), and in this paper, it is considered as a doubtful synonymy until further studies reveal its identity and the relationship with species of *Beauverdia* or *Nothoscordum*.

*Ipheion setaceum* (Baker) Traub resembles *Beauverdia vittata* (Guaglianone 1972). The only material available for study is the holotype specimen (*Tweedie s. n.*), collected in the province of Tucumán, Argentina and stored at K. Ravenna (1968) suggested that the locality of the holotype may be erroneous; apart from this citation, no *Ipheion/Beauverdia* species have ever been collected in Tucumán. Although Tweedie travelled in the Tucumán region in 1835, he also made a previous trip in 1832, where he collected along the Uruguay river in Argentina, Uruguay, and Brazil (Stafleu and Cowan 1986), where *B. vittata* grows.

It is probable that *Ipheion setaceum* would be a previous name for *Beauverdia vittata*; nevertheless, the fact that the two plants of the holotype are glabrous (*B. vittata* is generally papillose; Guaglianone 1972) and the locality of the type collection is probably wrong, *I. setaceum* is here considered a doubtful species.

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