

Tetroncium and its only species, *T. magellanicum* (Juncaginaceae): distribution, ecology and lectotypification

Author: Mering, Sabine Von

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SABINE VON MERING¹

***Tetroncium* and its only species, *T. magellanicum* (Juncaginaceae): distribution, ecology and lectotypification**

Abstract

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Tetroncium magellanicum (Juncaginaceae) was described by Willdenow in 1808, based on material collected by Commerson at the Strait of Magellan during Bougainville's voyage around the world. Type material of this species was traced and a lectotype for the name is designated. A description of the species and notes on its ecology and conservation status are provided. For the first time, a detailed map showing the known distribution area of *T. magellanicum* is presented.

Additional key words: Gough Island, Herbarium Willdenow, lectotype, peatlands, southern South America, typification

Introduction

The monotypic genus *Tetroncium* Willd. belongs to the small monocot family Juncaginaceae (Alismatales) and is sister to the other two genera of the family, *Cycnogeiton* R. Br. and *Triglochin* L. (von Mering & Kadereit 2010). *Tetroncium magellanicum* Willd. is the only dioecious species in the family (Fig. 1B, 6). It is a perennial herb growing mainly in the peatlands of southern South America and some neighbouring islands (Fig. 1A, 4, 5).

Tetroncium magellanicum was described by Carl Ludwig Willdenow in 1808. In the protologue, Willdenow stated that the new genus and species are based on material collected by Commerson at the Strait of Magellan (Willdenow 1808). Philibert Commerson (sometimes spelled Commerçon) was a French naturalist who accompanied Louis Antoine de Bougainville during his voyage around the world from 1766 to 1769 (Bougainville 1772). The botanical collections of this voyage reached Paris in 1774, and duplicates were subsequently distrib-

uted to several botanists and botanical institutions in Europe (Stafleu & Cowan 1976–1988).

Tetroncium magellanicum was mentioned in several publications on the early botanical exploration of southern South America (e.g. Hooker 1847; Gay 1849; Alboff 1896; Reiche 1907) and also in later works covering the flora of the region (e.g. Correa 1969; Moore 1968, 1983; Marticorena & Quezada 1985; Zuloaga & al. 2008). Franz Buchenau, who contributed significantly to our knowledge of Juncaginaceae, also added to our knowledge of *Tetroncium* (e.g. Buchenau 1868, 1882, 1903). However, the species has never been studied in full detail and Tomlinson (1982) correctly stated that little is known about it. For example, embryological and karyological data are lacking, and details of flower and fruit development as well as the mode of fruit dispersal are only incompletely known.

In the course of taxonomic studies in Juncaginaceae I noted that the name *Tetroncium magellanicum* has not been typified. Apart from typifying the species, I will

¹ Institut für Spezielle Botanik und Botanischer Garten, Johannes Gutenberg-Universität Mainz, 55099 Mainz, Germany; present address: Botanischer Garten und Botanisches Museum Berlin-Dahlem, Freie Universität Berlin, Königin-Luise-Str. 6–8, 14195 Berlin, Germany; e-mail: s.vonmering@bgbm.org

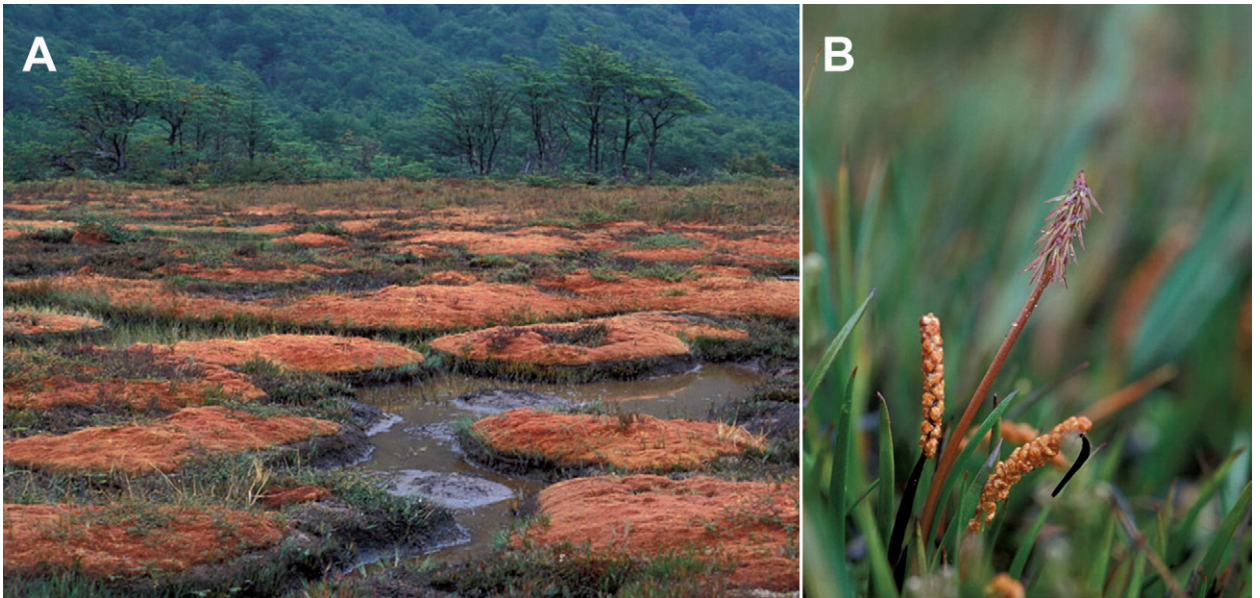


Fig. 1. *Tetroncium magellanicum* – A: typical habitat, continental bog dominated by *Sphagnum magellanicum*, near Ushuaia, Argentina; B: female (centre) and two male inflorescences. – Photos by R. Douzet, SAJF, University Grenoble.

also provide a description, information on its ecology, an assessment of its conservation status (according to the IUCN threat categories, IUCN 2001), and a distribution map based on data obtained from revised herbarium specimens and reliable literature sources.

Material and methods

Collections from Herbarium Willdenow (housed at the Botanic Garden and Botanical Museum Berlin-Dahlem, Freie Universität Berlin as the separate collection B-W; e.g. Hiepko 1972) and from several other major herbaria (see Acknowledgements for a full list) were revised to locate type material. Additionally, online databases of herbaria or virtual herbaria were reviewed, as well as the GBIF Data Portal (Global Biodiversity Information Facility 2007+), JSTOR Plant Science (2010+), Flora del Conosur (2009+), Flora Argentina (2012+), British Antarctic Survey (BAS) Higher Plants Herbarium (2009+), and UKOTs (UK Overseas Territories) Online Herbarium (2011+).

Altogether, more than 150 specimens of *Tetroncium magellanicum* were studied. Specimens that were only seen as a scan or photograph are marked with “[image!]” in the list of specimens seen below. A lectotype for the name of this species is designated here according to the International Code of Nomenclature for algae, fungi, and plants (ICN, McNeill & al. 2012; Fig. 3C).

Information given on labels of historic specimens is usually limited, and important specifications such as (exact) collection dates or localities are often missing. Primary literature such as original travelogues of expeditions and secondary literature was consulted to decipher,

verify and – wherever possible – complement available label information. Godley’s accounts of botanical exploration of the Southern hemisphere (Godley 1965, 1970) were especially valuable in this respect. Furthermore, the following online resources were used: Taxonomic Literature II (TL-2, Stafleu & Cowan 1976–1988 and supplements), JSTOR Plant Science Collection of Plant Collectors (JSTOR Plant Science 2010–) and the HUH Index of Botanists (Harvard University Herbaria 2011–).

The distribution map was created using georeferenced localities obtained from revised herbarium specimens and reliable literature sources. Georeferencing of localities was facilitated by the use of electronic gazetteers such as GEOnet Names Server (GNS 1994+), GeoNames (2012) or Google Earth (Google 2012), and the map was generated using the EDIT mapViewer (2012).

Results and discussion

Tetroncium Willd. in Mag. Neuesten Entdeck. Gesammten Naturk. Ges. Naturf. Freunde Berlin 2: 17. 1808. – Type: *Tetroncium magellanicum* Willd. = *Cathanthes* Rich. in Mém. Mus. Hist. Nat. 1: 365. 1815. – Type: not designated.

Notes — The material of *Tetroncium* that Willdenow had on hand at the time of writing the description was named “*Triglochin reflexum*” and sent to him by the late Professor Martin Vahl from Copenhagen (Willdenow 1808; Fig. 2). Willdenow noticed its distinctness from *Triglochin* and described the new genus (Willdenow 1808).

Little is known about the identity of *Cathanthes* Rich., a name established only seven years after *Tetroncium*

*) Durch die Güte des verstorbenen Herrn Professor Vahl, erhielt ich eine Pflanze mit der Benennung *Triglochis reflexum*, welche von Commerson in der Magellanischen Straße gesammelt seyn sollte. Bei genauerer Prüfung finde ich aber, daß diese eine eigene Gattung der Klasse Dioecia und Ordnung Hexandria ausmacht. Ich theile hier deren Beschreibung mit, und nenne sie:

TETRONCIUM.

Flores mascul.

CALYX triphyllus, foliolis obtusis.

COROLLA tripetala calyciformis parum calycis longior.

STAMINA Filamenta 6 brevissima capillacea Antheras subrotundas compressas.

Flores feminae.

CALYX et COROLLA maris persistentes.

STAMINA nulla.

PISTILLUM Germen oblongum superum Stylis quatuor subulatis Sigmoidata simplicia.

PERICARPIUM Capsula oblonga quadrilocularis stylis persistentibus instructa, loculis monospermis.

CHAR. ESSENT. ♂ Cal. 3 phyll. Cor. 3 petala. Stam. 6. ♀ Cal. et Cor. maris Styl. 4. Caps. 4-lo-

cul. stylis rostrata, loculis monospermis.

TETRONCIUM MAGELLANICUM.

Planta tripollicaris, Folia linearis-ensiformia margine membranacea, basi vaginantis pollicaria, Scapus bipollicaris teres. Spica densa fere pollicaris. Flores minuti. Capsula reflexo-adpressae.

Fig. 2. Protologue of *Tetroncium magellanicum* Willd. (Willdenow 1808; from microfiche, library of the BGBM).

by Richard (1815). Richard's brief description of *Cathanthes* in his listing of genera of "*Juncaginaceae*" reads as follows: "[*Lilaea*.] *Cathanthes*, floribus dioici, reclinatiss, etc., a sequente diversa. [*Triglochis*. *Scheuchzeria*.]" (Richard 1815). Kunth (1841) and Hooker (1843) cite *Cathanthes* as a synonym of *Tetroncium*. This statement seems well supported by the few characters noted in the protologue as *Tetroncium* is the only dioecious taxon in the group, and possesses reflexed female flowers and fruits. No *Cathanthes* species were described later and no specimens bearing this name were found. Buchenau (1868, 1903) and Micheli (1881) mention "*Catanthes*" as a synonym of *Tetroncium*. This is most probably the result of a spelling error.

Tetroncium magellanicum Willd. in Mag. Neuesten Entdeck. Gesammten Naturk. Ges. Naturf. Freunde Berlin 2: 17. 1808. – **Lectotype (designated here):** "Habitat ad Fretum Magellanicum" [Strait of Magellan], [December 1767], *Commerson s.n.* (B-W 17531-02 0! <http://data.bgbm.org/herbarium/BW17531020> Fig. 3C; isolectotypes: B-W 17531-01 0! <http://data.bgbm.org/herbarium/BW17531010>, BM 000820840!, C!, G 00098732 [image!], P 01759004!, P 01759005!).

– *Triglochis magellanica* Vahl ex Kunth, Enum. Pl. 3: 142. 1841, "*magellanicum*", nom. inval. (ICN Art. 36.1(c)).

– *Triglochis reflexa* Vahl ex Kunth, Enum. Pl. 3: 142. 1841, "*reflexum*", nom. inval. (ICN Art. 36.1(c)).

Notes — Material of *Tetroncium magellanicum* located in Herbarium Willdenow comprises two sheets placed in one of the typical blue folders of this historic collection. They are labelled "*T. magellanicum* 1" and "*T. magellanicum* 2" (B-W 17531-01 0 and B-W 17531-02 0). This material clearly matches the details of the protologue, the label attached to the folder gives the locality as cited above and the designation "*Triglochis reflexum*" written in Willdenow's hand (Fig. 3A). The name "*Tetroncium magellanicum*" and the literature reference written on this label on the folder was later added by D. F.

K. Schlechtendal, as explained by the note "Schlechtendal p.", i.e. Schlechtendal pater (Latin for father), written by his son D. F. L. Schlechtendal. Another, smaller label on the folder, reading "Vahl. W.", was also written by D. F. L. Schlechtendal and indicates that the material originated from Vahl and Willdenow (Fig. 3B).

It seems certain that both specimens were in the hands of Willdenow. Therefore, a lectotype has to be designated. The first of the two sheets in Herbarium Willdenow consists of a female and a male plant. In contrast, only a male

plant is mounted on the second sheet. However, the latter bears an additional label reading "*Triglochis magellanicum*" written by Willdenow himself (P. Hiepko, pers. comm.; Fig. 3C) and it is therefore chosen here as lectotype (B-W 17531-02 0). The other specimen is an isolectotype.

The lectotype and isolectotype at B are available online as high-resolution images through the Digital Herbarium (Röpert 2000+). Duplicates of Commerson's collection of *Tetroncium magellanicum* (representing isolectotypes) were found in BM, C, G and P. Most of these isolectotypes (and further historic material mentioned below) are accessible online via JSTOR Plant Science or the collection databases of the herbaria, respectively.

Label information of the type material in B does not include a collection date or a locality apart from Fretum Magellanicum. However, labels attached to one of the isolectotypes present in Paris (P01759004) give further information on the date and locality where it was collected. The inscription "Xbri 1767" indicates that the material was collected in December 1767. This is confirmed by the fact that the passage of the Strait of Magellan lasted from December 1767 to January 1768 (Bougainville 1772). Several labels list localities where the species was found in the Strait of Magellan: "Baye française, Baye Bougainville, Port Galant & in Sylvis Commersonianis", "In albis Commersonianis, Port Bougainville". However, it remains unclear in which of these precise localities the material was collected.

The label on the isolectotype of *Tetroncium magellanicum* in C was written by M. Vahl (information from P. Wagner via O. Seberg/G. Petersen, pers. comm.), the botanist who sent the material to Willdenow. A specimen located in the Herbarium Genève (G00098732) and another in the Herbarium HAL (HAL0109729), both annotated as type material (by R. R. Haynes & L. B. Holm-Nielsen in 1985 and by N. Tkach in 2010, respectively) could represent further isolectotypes. However, in both cases the source could not be identified with certainty and the spec-



Fig. 3. *Tetroncium magellanicum* in Herbarium Willdenow – A: folder with label; B: additional label; C: specimen designated as lectotype (barcode B-W 17531-02 0 / ImageId: 267191), see text for details. – Photographs: Herbarium, Botanic Garden and Botanical Museum Berlin-Dahlem (Röpert 2000–). – [Published at <http://data.bgbl.org/herbarium/BW17531020>].

imens are therefore not listed as isolectotypes until further evidence becomes available. Further sets of material collected during Bougainville’s circumnavigation were distributed to several other herbaria (Stafleu & Cowan 1976–1988) which accordingly might house further type material of *Tetroncium*.

“*Triglochin reflexum*” was used as a provisional name by Vahl and was not validated by later publication.

Willdenow (1808) referred to this name in the protologue of *Tetroncium magellanicum*. The name “*Triglochin magellanicum*” was used by Willdenow on the herbarium sheet (see small label on lectotype, Fig. 3C). Both names were cited by Kunth (1841) as synonyms under *Tetroncium magellanicum*, but this did not result in the valid publication of these names (see ICN Art. 36.1(c), McNeill & al. 2012).

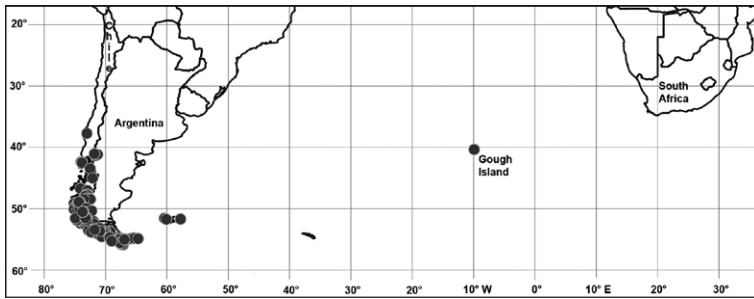


Fig. 4. Distribution of *Tetroncium magellanicum* – southern South America including Falkland Islands and Gough Island in the South Atlantic (c. 2800 km from Cape Town, South Africa and 3300 km from the South American mainland); map created using the online tool EDIT mapViewer (2012).

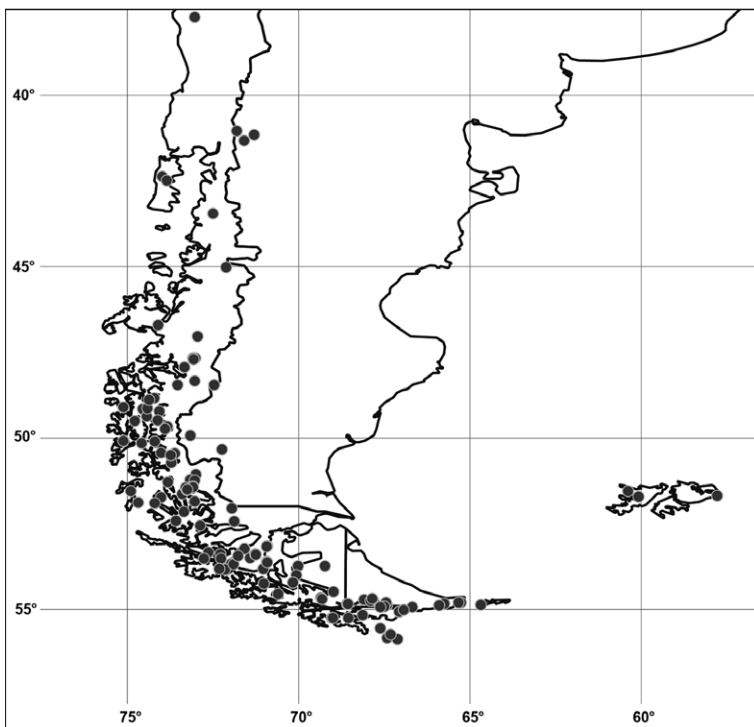


Fig. 5. Distribution of *Tetroncium magellanicum* – Chile and Argentina – map created using the online tool EDIT mapViewer (2012).

Illustrations — Hooker (1843: t. 534; 1847: t. 128, fig. 6); Correa (1969: 36, fig. 15).

Description — (based on own observations and measurements of herbarium material and partly on Hooker 1847; Buchenau 1903; Moore 1968, 1983; see also Fig. 6) – Perennial, rhizomatous, glabrous herb, 5–25(–35) cm tall. *Rhizome* ascending, up to 20 cm long, 2–4(–6) mm in diameter, producing aboveground stems towards the apex. *Stems* ascending or erect, branching near base, densely covered with brown leaf remains at base and with leaves towards apex. *Leaves* distichous, equitant, simple, linear-ensiform (sword-shaped), acute, (15–)20–100(–120) × 1.5–3 mm, rigid, coriaceous, with basal sheath but without ligule or auricles. Plants dioecious, scapose; *scapes* erect, 25–200(–250) mm long. *Inflorescences* terminal,

dense, c. 10–50 mm long, ebracteate spikes of up to 30 flowers; *pedicels* very short (c. 0.5 mm) or absent. *Male flowers*: tepals 4, yellowish with reddish brown spots, concave or conchiform, broadly ovate, acute or subobtusate, 1.2–2 × 0.5–1.5 mm. *Stamens* 4, inserted opposite tepals and at their base, (sub)sessile; *anthers* yellowish, extrorse. *Female flowers*: *tepals* 4, as in male flowers but narrower, ovate to ovate-lanceolate. *Carpels* 4, subulate, fused from base to about ½ their length, with 1 basal anatropous ovule per carpel; *styles* divergent. *Fruits* 4-locular (or possibly unilocular with incomplete septa), dry, indehiscent, reflexed, reddish brown, narrowly conical, with long persistent beaklike styles, 4–8(–10) × c. 1 mm, smooth, usually 1-seeded through abortion of 3 ovules. *Seeds* anatropous, brown, narrowly ovate, endospermic (Hooker 1847; Shaffer-Fehre 1987). *Pollen* dispersed in monads, subspheroidal, inaperturate, medium-sized, exine reticulate (Kupriyanova 1948; Grayum 1992). *Chromosome number* unknown.

Tetroncium differs from the other genera of *Juncaginaceae* mainly in its dioecy and flower merosity (dimerous vs. trimerous in *Triglochin* and *Cycnogeton*). Further differences include seeds with endosperm, the general habit, as well as leaf form and structure (ensiform, rigid and coriaceous in *Tetroncium* vs. semiterete, ± succulent in *Triglochin* and flattened, strap-shaped, ± spongy in *Cycnogeton*).

Note — Willdenow (1808; Fig. 2) as well as Hooker (1843) erroneously described the flowers apart from the gynoeceum as trimerous instead of dimerous. This was clarified by Hooker (1847; see also Fig. 6) and later discussed by Buchenau (1882). Further morphological and developmental studies are needed to examine flower and fruit structure in more detail.

Distribution — The distribution area of *Tetroncium magellanicum* comprises mainly southern South America (Patagonia and Tierra del Fuego) northwards to c. 40° S in western Argentina and to c. 37° S in Chile (Fig. 4, 5). Collections from Parque Nacional Nahuel Huapi in the Andes (Argentina) as well as Parque Nacional Nahuelbuta and Parque Nacional Chiloé in the Chilean Coastal Range represent the northern limits of the distribution of the species. It is also distributed in the Falkland Islands (East and West Falkland) but is absent from the Lafonia region of East Falkland probably due to summer drought there (Broughton & McAdams 2005). Furthermore, *Tet-*

roncium is found on Gough Island in the South Atlantic Ocean (Wace 1961; Groves 1981) but is not known from the other islands of the Tristan da Cunha group (N. Gremmen, pers. comm.).

Fig. 4 and 5 give the first detailed maps of localities representing the known distribution area of the species. Previously, only a map showing a rough outline of the distribution area (without Gough Island, Camp 1947) and a map limited to Tierra del Fuego (Moore 1983) had been published.

Habitat and ecology — *Tetroncium magellanicum* is found in different peatland types, especially *Sphagnum* bogs and cushion bogs. These peatlands are part of the characteristic vegetation sometimes termed Magellanic moorland (e.g. Moore 1983; Arroyo & al. 2005 and references within). *T.* is common in continental bogs dominated by *Sphagnum magellanicum* Brid., where the moss forms orange or reddish carpets or hummocks (Fig. 1A). *Tetroncium magellanicum* predominantly occurs in wetter parts of the peatlands and is frequently found accompanied by, e.g. *Carex magellanica* Lam. (e.g. Kleinebecker & al. 2007). In Pacific bogs dominated by cushion-forming vascular plants *Tetroncium* is associated with cushion plants such as *Astelia pumila* (J. R. Forst.) Gaudich. and *Donatia fascicularis* J. R. Forst. & G. Forst. or *Drosera uniflora* Willd. (e.g. Dusén 1900; Moore 1983; Kleinebecker & al. 2007; A. Vogel, pers. comm.; B. Ruthsatz, pers. comm.). In a transition zone both peatland types intermingle or occur mosaic-like side by side (Kleinebecker & al. 2007). *Tetroncium* is also frequent in this *S. magellanicum* cushion plant mixed type and along a moisture gradient in all three types (Kleinebecker & al. 2007). Highest frequencies were, however, recorded from *S. cuspidatum* Ehrh. ex Hoffm. hollows (exclusively found in continental *Sphagnum* bogs and *Sphagnum*-cushion mixed bogs) and wet *S. magellanicum* carpets often surrounding hollows of continental bogs (Kleinebecker & al. 2007).

Habitats belonging to the Magellanic moorland are continuously distributed from the extreme south of the continent to around 43° S in Chile and from sea level to above treeline (Pisano 1983). *Tetroncium magellanicum* is not only known from most parts of this region but also from outlying areas of moorland vegetation occurring further north, e.g. in the Cordillera de Piuchué (Chiloé Island) and the Cordillera de Nahuelbuta, both in the Chilean coastal range (Ruthsatz & Villagrán 1991;



Fig. 6. *Tetroncium magellanicum* – Plate from Flora Antarctica illustrating male and female plants, flowers and fruits (Hooker 1847). – [Published at <http://biodiversitylibrary.org/page/13448638>].

Arroyo & al. 2005; see Fig. 4, 5).

In southern Chile, Magellanic moorland occurs together with subantarctic evergreen forest dominated by *Nothofagus betuloides* (Mirb.) Oerst. (e.g. Dusén 1903; Ruthsatz & Villagrán 1991). Further east such peatlands can also be found in the transition zone to deciduous forest dominated by *N. pumilio* (Poepp. & Endl.) Krasser and *N. antarctica* (G. Forst.) Oerst. *Tetroncium* grows in clearings or open parts of these *Nothofagus* woodlands.

Habitats on the Falkland Islands are bogs, dwarf shrub heath and acid grassland (Moore 1968, 1983). On Gough Island *Tetroncium magellanicum* is one of the few

abundant flowering plants found in high-altitude bogs, i.e. *Sphagnum*-dominated peat bogs above 600 m (Wace 1961; N. Gremmen, pers. comm.).

The species is usually found from sea level to about 500 m. Higher altitudes of up to 1300 m are only recorded from the northernmost part of the distribution area (e.g. Parque Nacional de Nahuelbuta, *Ricardi 5697* & *Marticoarena*, CONC; Zuloaga & al. 2008).

Tetroncium is predominantly found in wetter sites and tolerates frequent and prolonged periods of inundation. Sometimes only upper leaves and inflorescences emerge from the water.

Patagonian bog ecosystems are characterized by extremely nutrient-poor conditions and *Tetroncium magellanicum* appears to be highly efficient in nutrient acquisition (Schmidt & al. 2010).

Phenology — Flowering and fruiting in summer, mainly from December to January (sometimes to April). The species is probably wind-pollinated as are most other species of the family. Fruits of *Tetroncium magellanicum* are indehiscent (pers. obs.). Their long, rigid appendages formed by the persistent styles might serve dispersal by animals such as birds. However, pollination as well dispersal mechanisms have not been directly observed. Male and female plants can grow intermingled (see, e.g. specimen *James 1500*, BM, SI) but unisexual populations can be also separated by some distance (R. W. Woods, pers. comm.). This implies that *T. magellanicum* is able to reproduce vegetatively, probably through regeneration from rhizome fragments.

Proposed IUCN conservation status — Least Concern (LC). *Tetroncium magellanicum* is relatively widespread in southern South America, locally abundant, and not under immediate threat. However, as in the Northern Hemisphere, peatlands in the Southern Hemisphere are increasingly threatened by drainage (e.g. for urban development or road construction) and other land use changes, in particular peat mining. In recent decades, the number of peat extraction sites has risen continuously especially in Tierra del Fuego, and further extraction permits have been issued (e.g. Blanco & de la Balze 2004, Iturraspe & Urciuolo 2004; Grootjans & al. 2010; A. Vogel, pers. comm.).

Tetroncium magellanicum is not confined to continental *Sphagnum* bogs, which are most affected by this growing trend in peat extraction, but also occurs in oceanic cushion bogs, which are protected to a higher degree. Nevertheless, conservation assessments might become more important in the future, especially on a regional scale.

Fortunately, a relatively high proportion of southern South American wetlands are protected as part of National Parks or National Reserves (e.g. Parque Nacional Tierra del Fuego in Argentina, Bernardo O'Higgins National Park and Cabo de Hornos National Park in Chile). However, protection of different peatland types is unbal-

anced, and *Nothofagus* forests further north in the coastal range containing disjunct areas of peatlands have been reported to be under threat (Arroyo & al. 2005). Further threats to fragile wetland ecosystems include the introduction of non-native species and tourism.

Gough Island is recognized as a nature reserve and an ordinance entitled “Conservation of Native Organisms and Natural Habitats (Tristan da Cunha) Ordinance 2006” which replaced the previous conservation ordinance from 1976 gives protection to all native plants including *Tetroncium magellanicum*. The island was also inscribed to the UNESCO World Heritage List in 1995 (modified in 2004) as part of the Gough and Inaccessible Islands World Heritage Site. Nevertheless, threats to the island's ecosystems are not to be underestimated and include (further) introduction of non-native species and climate change (e.g. Jones & al. 2003; Middleton & Kleinebecker 2012).

Additional specimens seen — ARGENTINA: PROVINCIA DEL NEUQUÉN: Departamento Bariloche: Parque Nacional Nahuel Huapi, Laguna [Lago] Ortiz Basualdo, terreno pantanoso, 7 Jan 1952, *O. Boelcke 5366* & *M. N. Correa* (SI [image!]); Parque Nacional Nahuel Huapi, Pampa Linda, mállin Amer, high raised bog above Lago Mascardi, alt. 1000 m, 8 Dec 1973, *V. Markgraf s.n.* (P); Parque Nacional Nahuel Huapi, between Puerto Blest and Lago Frías, alt. 750 m, 18–19 Dec 1978, *S. Laegaard 12533* (K). — PROVINCIA SANTA CRUZ: Dpto. Lago Argentino: Brazo Norte, valle de la Cristina, ac de los Cipreses, al este lago Pearson, alt. 450 m, 17 Feb 1953, *F. B. Vervoorst 4496* (NY, P); Brazo Onelli, mállin al NW del puesto abandonado Neumann, alt. 350 m, 26.2.1953, *F. B. Vervoorst 4564* (NY); Mayo Glacier, Shipton Expedition to Patagonia (Lago Argentino) 1958–59, in small bog in clearing in *Nothofagus betuloides* wood, near the front of the glacier, 49°80'–51°S, 72°–73°30'W, alt. c. 400 ft., 30 Jan 1959, *P. W. James 1500* (BM, SI [image!]). — PROVINCIA DE TIERRA DEL FUEGO, ANTÁRTIDA E ISLAS DEL ATLÁNTICO SUR: Departamento Río Grande: Source grande de Río Grande, alt. 400–450 m, 6 Mar 1896, *N. Alboff s.n.* (SI [image!]), nahe Lago Verde an Ruta B, 9 Jan 1989, *J. Poelt s.n.* (M); Departamento Ushuaia: St. Vincent's Bay [Buen Thetis or Thetis Bay], Captain Cook's first voyage, H.M.S. Endeavour, 1768–1771, in collibus subalpinus, 14 Jan 1769, *J. Banks* & *D. Solander s.n.* (BM); Ushuaia, in a bog in the *Nothofagus pumilio* forest, above the town, alt. c. 300 m, 1 Feb 1940, *R. Santesson 396* (K, P); Lago Victoria, turbera, 7 Nov 1965, *Luis Mendonza s.n.* (BAB [image!]); Estancia Harberton, Moat Bay, alt. c. 60–100 ft., hill behind lake, growing in *Astelia* bog, 1 Jan 1966, *R. N. P. Goodall 247* (RNG); Estancia Harberton, Harberton swamp, alt. c. 60–100 ft., in *Sphagnum*, deeply buried, only 2–3 ins. Showing, 1 Feb 1966, *R. N. P. Goodall 300* (RNG); Estancia Harberton, Harberton swamp, NW end near fence, elev. 0–60 m, plants growing in green and reddish *Sphagnum*, *Sphag-*

num very wet and easily broken apart, showing above moss, 28 Dec 1966, *R. N. P. Goodall 443* (BAB [image!], NY, RNG, SI [image!]); Estancia Harberton, Harberton swamp, elev. 0–60 m, growing in *Sphagnum* roots, have haustoria of *Nanodea mucosa*, 29 Apr 1967, *R. N. P. Goodall 795* (P); Bahía Aguirre, c. 5 km E of Puerto Espagnol, 54°53'S 65°54'W, 30–80 m, boggy ground with *Astelia*, 14 Feb 1968, *D. M. Moore 1831* (K, RNG); Río Lashifashaj valley, c. 1 km N of Laguna Victoria, 54°48'S, 67°27'W, *Sphagnum* swamp, 1 Mar 1968, *D. M. Moore 2082* (BAB [image!], RNG); Estancia Harberton, Cambaceres Bay, in swamp, 3 Dec 1968, *R. N. P. Goodall 1882* (RNG); Loma Larga Forte, 900 ft., in open burned woods, not grazed, 22 Jan 1968, *R. N. P. Goodall 1309* (B <http://data.bgbm.org/herbarium/B100089525>); hill to the North of abandoned settlement at Bahía Thetis, top of hill is *Astelia* formation with numerous small pools, each edged with *Tetroncium*, sterile at this time, 20 Nov 1969, *R. N. P. Goodall 2311* (RNG, SI [image!]); Tierra del Fuego australis, Rancho Hambre, 54°45'S, 67°54'W, turbal sphagnoso, abierto, copiosamente, 140 m, 16 Jan 1970; *H. Roivainen s.n.* (RNG); Lapataia, growing in *Sphagnum* swamp surrounding Laguna Negra, to the West of Río Lapataia, 2 Mar 1970, *R. N. P. Goodall 2424* (BAB [image!], SI [image!]); Lapataia, Laguna Negra, in wet *Sphagnum* swamp, 6 Dec 1970, *R. N. P. Goodall 2634* (RNG); Pink Mountain, edge of mountain torrent at SE edge of mountain and in *Sphagnum* swamp at base of mountain, 2000 to 1500 ft., 11 Mar 1971, *R. N. P. Goodall 3700* (SGO); Mitre Península of Isla Grande, Bahía Buen Suceso, 54°48'S 65°20'W, 14 Oct 1971, *T. R. Dudley, R. N. P. Goodall & G. Crow 272* (BAB [image!]); Tra Lapataia ed il lago Roca (ovest di Ushuaia), torbiera nella parte orientale della Laguna Negra, sui cuscinetti di *Sphagnum*, Spedizione Scientifica Italiana Mares AMF in Patagonia, Terra del Fuoco ed Antartide organizzata dal Gruppo Ricerche Scientifiche Tecniche Subacqueo di Firenze, 23 Jan 1974, *R. E. G. Pichi Sermolli & P. Bizzarri 7539* (K, P, SI [image!]); Ushuaia, Weg zum Nationalpark /camino al Parque Nacional, 27 Dec 1976, *P. Seibert 183 & al. / T.B.P.A. 2213* (BAB [image!], M); at Passo Garibaldi, alt. 750–800 m, 26–31 Jan 1979, *S. Laegaard 13296* (K); Cordon del Toro at Host. Alakush, W of Ushuaia, alt. 600 m, 1–4 Feb 1979, *S. Laegaard 13338* (K); Isla de los Estados, Bahía Franklin, entre Caleta Le Croix y lago Gaona, 54°52'S 64°41'W, abundante localmente en charcos en turbera dominada por *Astelia*, 10 Dec 1999, *F. Biganzoli 699* (SI [image!]).

CHILE: IX REGIÓN DE LA ARAUCANÍA: Provincia de Malleco: Parque Nacional de Nahuelbuta, centro del parque, 37°43'S, 73°02'W, 1250 m, 28 Dec 1968, *M. Riccardi 5697 & C. Marticorena 1858* (CONC [image!], SI [image!]). — X REGIÓN DE LOS LAGOS: PROVINCIA DE CHILOÉ: Isla Grande de Chiloé, altiplanicie central (campanos), Jan 1902, *M. Espinosa s.n.* (SGO); Cordillera San Pedro, wet hollow in campaña, 15 Nov 1958, *E. J. Godley 474a* (BM); Cordillera San Pedro, wet hollows in

open campaña, 18 Nov 1958, *E. J. Godley 503* (SGO); Isla Grande de Chiloé, Cordillera de Piuchén, 42°22'S, 73°59'W, 640 m, 12 Feb 1983, *C. Villagrán 4907* (CONC [image!]); Llicaldad, en turbera esfagnosa, 42°29'S, 73°50'38"W, 495 m, 18 Feb 2010, *S. Pfanzelt 455* (CONC [image!]). — PROVINCIA DE PALENA: 5.9 km N jct. rds. to Palena and Chaitén, Villa Sta. Lucia, bog in *Nothofagus* forest, 560 m, March 1985, *T. F. Stuessy & al. 7170* (CONC [image!]). — XI REGIÓN AYSÉN DEL GENERAL CARLOS IBÁÑEZ DEL CAMPO: PROVINCIA DE CAPITÁN PRAT: [Messier Channel], Halt Bay [Bahía Halt], 21 Mar 1868, *R. O. Cunningham s.n.* (K); [Sarmiento Channel], Puerto Bueno, 8 Dec 1868, *R. O. Cunningham s.n.* (K); Glaciar “Hammick”, 48°50'S, 74°13'W, común en pantanos, ± 30 m, 28 Dec 1967, *S. F. Anliot 6033* (SGO); Villa O'Higgins, Cuenca del Río Mosco, turbera, sub-cuenca del Río Claro, 48°27'S, 72°28'W, 785 m, 20 Mar 2003, *N. García 21* (CONC [image!]). — XII REGIÓN DE MAGALLANES Y DE LA ANTÁRTICA CHILENA: PROVINCIA DE ÚLTIMA ESPERANZA: [Sarmiento Channel], Puerto Bueno (Puerto bono), Expédition de la Magicienne, 1876–1879, lieux humides et tourbeux, 15 Feb 1877, *L. Savatier s.n.* (P 2 sheets). [Wellington Island], Eden [Puerto Edén], Expédition de la Magicienne 1876–1879, 24 Jan 1879, *L. Savatier s.n.* (K, P 3 sheets); Canal Smith, February 1900, *R. [s.c., s.n.]* (SGO). Canal Smith [Canal Smyth, Smyth Channel], January 1924, *M. Gusinde s.n.* (M); Puerto Eden, Wellington Is., lowland bog, near sea, 6 Dec 1958, *E. J. Godley 631a, 632b* (BM); Bahía del Indio, Lote San Isidro, Río Yumbel, interior, en turbales herbaceous, 25 Feb 1973, *E. Pisano V. 3968* (RNG); Seno Unión, N side, Ancón Sin Salida, 95 m, 52°9'S, 73°21'W, Y201, bog with scattered trees, 10 Jan 1976, *O. Dollenz, D. M. Moore, E. Pisano V. & A. A. Sáenz / T.B.P.A. 876* (RNG); Seno Unión, 52°25'S, 73°35'W, 13 Jan 1976, *Ulrich Eskuche / T.B.P.A. 695* (BAB [image!]); Isla Piazzzi, Caleta Ocasión, Abra Leackey's Retreat, 150 m, 51°44'S 74°1'W, S231, rocky hill summit, wet seepage area, 16 Jan 1976, *O. Dollenz, D. M. Moore, E. Pisano V. & A. A. Sáenz / T.B.P.A. 1003* (BAB [image!], RNG); Isla Piazzzi, Caleta Ocasión, Abra Leackey's Retreat, 80m, 51°44'S, 74°1'W, S231, coastal bog, *Donatia/Tetroncium* dominant, 18 Jan 1976, *O. Dollenz, D. M. Moore, E. Pisano V. & A. A. Sáenz / T.B.P.A. 1069* (BAB [image!], RNG); Isla Rennel Norte, Canal Smyth, 51°54'S, 74°12'W, W231, bog, 24 Jan 1976, *O. Dollenz, D. M. Moore, E. Pisano V. & A. A. Sáenz / T.B.P.A. 1152* (BAB [image!], RNG); Isla Vidal Gormaz, Seno Nantuel, Bahía María Angélica, 30 m, 51°53'S, 74°41'W, W251, *Donatia* bog, 1 Feb 1976, *O. Dollenz, D. M. Moore, E. Pisano V. & A. A. Sáenz / T.B.P.A. 1237* (BAB [image!], RNG); Isla Vidal Gormaz, Seno Nantuel, Estero Lobos, 51°53'S, 74°41'W, W251, *Donatia* bog, 4 Feb 1976, *O. Dollenz, D. M. Moore, E. Pisano V. & A. A. Sáenz / T.B.P.A. 1395* (RNG); Isla Virtudes, Canal Eliás, Puerto Virtudes, 51°33'S, 74°54'W, P261, bog, pool with organic bottom material,

10 Feb 1976, *O. Dollenz, D. M. Moore, E. Pisano V. & A. A. Sáenz / T.B.P.A. 1477* (BAB [image!], RNG); Seno Última Esperanza, Lago Azul, E side, 51°27'S, 73°18'W, N201, dryish bog, hummocks with some water between, 10 Jan 1977, *D. M. Moore & E. Pisano V. / T.B.P.A. 1541* (RNG); Seno Última Esperanza, Puerto Bella Vista, S shore, 51°31'S, 73°16'W, P201, bog above coastal forest, higher ground at margin of bog, 11 Jan 1977, *D. M. Moore & E. Pisano V. / T.B.P.A. 1599* (RNG); Seno Última Esperanza, Puerto Toro, Río Serrano, penin, W side estuary, 51°25'S, 73°5'W, N191, *Sphagnum* bog with scattered trees of *Pilgerodendron*, *N. antarctica* & *N. betuloides*, 16 Jan 1977, *D. M. Moore & E. Pisano V. / T.B.P.A. 1733* (RNG); Seno Última Esperanza, Lote Sanchez, costa E Río Serrano, 51°26'S, 73°5'W, N192, turbal esfagnoso, en cojines de *Sphagnum magellanicum*, 26 Jan 1977, *E. Pisano V. / T.B.P.A. 2039* (RNG); Península Roca, Seno Resi, c. 175 m, 51°51'S, 73°2'W, W191, urbal interior, común, 22 Jan 1978, *E. Pisano V. / T.B.P.A. 2811* (BAB [image!], RNG); Puerto Bella Vista, 51°30'S, 73°15'W, 6 Dec 1979, *F. Roig, O. Dollenz & E. Méndez / T.B.P.A. 5139 Censo 38* (BAB [image!]); Puerto Bella Vista, 51°30'S, 73°15'W, 9 Dec 1979, *F. Roig, O. Dollenz & E. Méndez / T.B.P.A. 5300 Censo 77* (BAB [image!]), W coast of Brunswick Peninsula, where Puerto Prat / Los Canellos road meets, 5 Apr 1985, *B. J. Wallace 089/85* (SGO); Fiordo Peel, Río Murtillar, 50°27'S, 73°37'W, en turbales musgosos en afloramientos rocosos, 18 Nov 1985, *E. Pisano V. 5925* (RNG); Fiordo Peel, Río Murtillar, 50°27'S, 73°37'W, forma tapices extensos en sitios muy húmedos en turbales esfagnosos, 19 Nov 1985, *E. Pisano V. 5948* (RNG); Fiordo Peel, Río al E del cerro Aguilera, 50°30'S, 73°44'W, en turbales esfagnosos sobre afloramientos rocosos, sitios inundados, 15 Dec 1985, *E. Pisano V. 6070* (RNG). — PROVINCIA DE MAGALLANES: Détroit de Magellan, s.loc., s.d., *Léman s.n.* (P); Port Famine [Puerto (del) Hambre], Capt. King's Voyage to South America in *H.M.S. Adventure* (King's Voyage) 1826–1830, [*J. Anderson s.n.* (BM, K)]; Détroit de Magellan, Port Gallant (Ports Gallant, Famine, etc.), Voyage de l'Astrolabe et de la Zélée 1838–1840, *H. Jacquinet & [J.] Hombron s.n.* (P); Détroit de Magellan, Port Famine, Voyage de l'Astrolabe et de la Zélée, 1838–1840, [*E. Le Guillou s.n.* (P)]; Détroit de Magellan, Baie St. Nicholas et Bougainville [St. Nicholas Bay], Voyage de l'Astrolabe et de la Zélée, 1838–1840, [*E. Le Guillou s.n.* (P)]; Port Gallant [Puerto Gallant], Extra-Tropical South America Survey of H. M. S. Nassau 1866–1869, 19 Apr 1869, *R. O. Cunningham s.n.* (K, NY); Isla Dawson, Laguna Buen Pastor, 23 Dec 1910, *A. Benove s.n.* (SI [image!]); Isla Dawson, Bahía Lomas, 23 Dec 1910, *A. Benove s.n.* (SI [image!]); Punta Arenas, turberas, 1 Mar 1917, *G. Bonarelli 38* (SI [image!] 2 sheets, ZT); [Punta Arenas], Laguna Lynch, turbera, 1 Mar 1917, [*G. Bonarelli 38a* (SI [image!])]; S from Punta Arenas along W side of Straits, c. 4 km N of Fuerte Bulnes, wet boggy depression among *Nothofagus antarcticus* woodland, abundant on bare peat

in *Sphagnum* bog, assoc. *Drosera uniflora*, 23 Mar 1964, *D. M. Moore 1132* (AAS [image!], K, RNG, SGO); Fiordo Silva Palma, Angostura Titus, costa opuesta a ex aserradero, en turbales esfagnosos, 8 Jan 1973, *E. Pisano V. 3771* (RNG); Laguna Parrillar, costa E, en turbales esfagnosos, 1 Feb 1973, *E. Pisano V. 3934* (RNG); Estancia Skyring, Punkt 046, 52°25'S, 71°52'W, 25 Feb 2001, *A. Vogel s.n.* (MJG). — PROVINCIA DE TIERRA DEL FUEGO: Pantanos cerca del Río Fontaine, Expedicio suecia 1907–1909, 1 Mar 1908, *C. Skottsberg s.n.* (SGO). — PROVINCIA DE LA ANTÁRTICA CHILENA: Tierra del Fuego, Orange Harbor, U.S. Exploring Expedition (Wilkes Expedition) 1838–1842, [January–April 1839], s.coll., s.n. (K, US [image!]); Hermite Island [Isla Hermite], Cape Horn, Antarctic Expedition 1839–1843, [20 Sep–7 Nov 1842], *J. D. Hooker s.n.* (K, P 2 sheets); Terre de feu, Île Hoste [= Isla Hoste], Baie Orange, Mission du Cape Horn, 28(?) Jul 1883, *P. Hariot s.n.* (P); Terre de Feu, s.loc., 1890–1891, *Rousson & Willems s.n.* (P); Terre de Feu, s.loc., 1892, *Willems & Rousson s.n.* (LY [image!]). Canal Beagle [Beagle Channel], Rimolino-Sumpf, February 1922, *M. Gusinde s.n.* (BR, K, M); Puerto Williams, Navarino Is., lowland *Sphagnum* bog, 8 Jan 1959, *E. J. Godley 924* (SGO), *E. J. Godley 924a* (BM), *E. J. Godley 924b* (SGO); Puerto Toro, Isla Navarino, en turbales, 17 Jan 1972, *E. Pisano V. 3460* (RNG); Isla Wollaston, Caleta Lientur, 55°44'S, 67°19'W, en turbal musgoso, escaso, 17 Feb 1980, *E. Pisano V. 5006* (RNG); Arch. Cabo de Hornos, Isla Grevy, Rada Norte, Ba. Gretton, en sitios pantanosos de turbales pulvinados, 16 Jan 1982, *E. Pisano V. 5385* (RNG); Isla Hoste, Caleta Awaiakirrh, en sitios inundados de turbales esfagnosos, 23 Jan 1982, *E. Pisano V. 5446* (RNG); Île Picton [Picton Island], Caleta Banner, 55°01'S, 66°56'W, 500 m au S du hameau, à mi-chemin du lac, alt. 20 m, 30 Dec 1998, *L. Gautier 3414* (M).

FALKLAND ISLANDS (ISLAS MALVINAS): EAST FALKLAND: s.loc., s.d. [1842], *J. D. Hooker s.n.* (K); Canopus Hill, East of Stanley, 51°41'S, 57°47'W, assoc. *Juncus scheuchzerioides* and *Cortaderia pilosa*, male and female plants growing about 25 m apart, 14 Dec 2006, *R. W. Woods s.n. & M. Morrison* (MJG); Cape Pembroke, close to Stanley airport, acid grassland, associated with grass, *Gunnera*, *Carex fuscata*, small fern & christmas bush, 30 Jan 2009, *Millenium Seed Bank (T. Heller & L. Taylor) MSB-FI 25* (K [image!]). — WEST FALKLAND: s.loc., s.d., [*W. Wright s.n.* (K)], between Teal River and Goring House, Chartres, just N of Rocky inlet, 19(17?) Dec 1949, *W. J. L. Sladen* Fa125/49 (AAS [image!], BM); Roy Cove, Sharp Peak, N side of flat ground by sea, wet patch of ground, assoc. *Ucinia brevicaulis*, *Cortaderia*, *Oreobolus*, 13 Feb 1964, *D. M. Moore 866* (K, RNG).

GOUGH ISLAND: Crest of ridge between Glen & 1st Guleh, frequent on wet places and in high level bogs from 1200 ft. upwards, alt. 1500 ft., 1 Dec 1955, *N. M. Wace 22* (BM); base of Hag's Tooth, alt. 1500 ft., frequent especially in wet places, on shallow peat overlying rocks,

7 Jan 1956, *N. M. Wace* 76 (BM, BOL); X St. Gonydale Raised Bog, alt. 1500 ft, 18 Jan 1956, *N. M. Wace* 99 (BM); Tafelkop, in wet high altitude mire/grassland, 40° 20'S, 9°54'W, 500 m asl, 21 Sep 2006, *R. M. Wanless s.n.* (MJG).

Note — Specimens with the abbreviation “T.B.P.A.” and a number were collected during the project *Transecta Botánica de Patagonia Austral* (Boelcke & al. 1985).

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