

## **Revision of the genus *Ochagavia* (Bromeliaceae, Bromelioideae)**

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GEORG ZIZKA, KATJA TRUMPLER & OTTO ZÖLLNER

## Revision of the genus *Ochagavia* (*Bromeliaceae*, *Bromelioideae*)

### Abstract

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The genus *Ochagavia* is revised. Four species, *O. andina*, *O. carnea*, *O. elegans* and *O. litoralis*, are recognized, all are endemic to Chile. A key to the species, descriptions, illustrations, full synonymies and data on the distribution and ecology are given. The new combinations *O. litoralis* and *O. andina* are validated, and several names are typified. Relationships of the genus within the subfamily *Bromelioideae* are discussed.

### Introduction

The *Bromeliaceae* of Chile are characterized by high endemism, 20 of the 23 species reported for the country being endemic. Only among *Tillandsia* do we find two species (*T. marconae* W. Till & Vitek and *T. virescens* Ruiz & Pav.) with a wider distribution extending to the arid regions of adjacent Peru and Bolivia, and additionally the widespread *T. usneoides* (L.) L.

The genus *Ochagavia* has a limited distribution in central Chile, ranging from 31°33' to 38°14'S. The attractive plants have been introduced early into cultivation in Europe and appear to grow outdoors as escapes from cultivation in the western parts of Europe with oceanic, mild climate. The morphological similarity with the monospecific genus *Fascicularia* Mez, especially of sterile plants, has been the reason for some nomenclatural confusion.

The genus *Ochagavia* was described by Philippi (1856) originally as monospecific, comprising only *O. elegans* Phil. Little later Philippi (1858) described the new genus *Rhodostachys*, comprising *R. andina* Phil. (= *O. andina*) and, subsequently, *R. litoralis* Phil. (= *O. litoralis*). Nevertheless, delimitation between *Ochagavia* and *Rhodostachys* (and *Fascicularia*) remained unclear. Finally, Mez (1896) realized the close relationship of *O. elegans* and *Rhodostachys* and united the two genera, erroneously giving the later name *Rhodostachys* priority. Later, Smith & Looser (1934) and Mez (1935) corrected this mistake. For the nomenclature of *Fascicularia* see Nelson & Zizka (1997) and Zizka & al. (1999).

*Ochagavia* can best be distinguished from *Fascicularia* by the relative length of the style and stamens, by sepal shape, petal appendages, petal colour and pollen morphology. Although flowering plants of the two genera display striking differences, the relevant characters are difficult to study in herbarium specimens. Sterile specimens are sometimes hard to assign to one of the two genera.

Our studies are based on herbarium material (121 specimens, including duplicates), living collections (7 accessions, including *O. carnea*, *O. litoralis* and *O. elegans*) and observations in the natural habitat.

### Morphology, anatomy and cytology

The representatives of *Ochagavia* are caulescent, rosulate terrestrials. Although especially in *O. carnea* the inner leaves are more or less erect and grouped densely together, the plants do not form tanks that hold water. *O. elegans* and *O. litoralis*, in particular, have the noteworthy ability to form dense colonies through vigorous offset production. This enables the plants to cover considerable areas, especially on coastal rocks (Fig. 4, 6). The leaves are succulent (see below) with spinose-serrulate blades.

The simple, terminal inflorescence is shortly pedunculate (Fig. 5, 7). The sepals and petals (Fig. 10) are free, the latter not appendaged and rose-coloured. The stamens are exerted (except in *O. elegans*), an important character to distinguish the genus from *Fascicularia*. Another noteworthy character is the well developed epigynous tube, which reaches a length of up to 1.9 cm in *O. elegans*.

Reliable features to separate the *Ochagavia* species are the indumentum and the size of the leaf blade (Fig. 1). *O. carnea* is characterized by long leaves, while *O. elegans* has the shortest ones. *O. andina* and *O. litoralis* are more difficult to separate, but the leaves of the former are longer and narrower than those of the latter.

Various authors have used floral characters to distinguish the species of *Ochagavia*, but our morphological studies, based on herbarium material as well as living plants cultivated in the Palmengarten in Frankfurt am Main, revealed a high variability of these features. Examples are the sepal length, used, e.g., by Smith & Downs (1979), and the petal length; their variability is

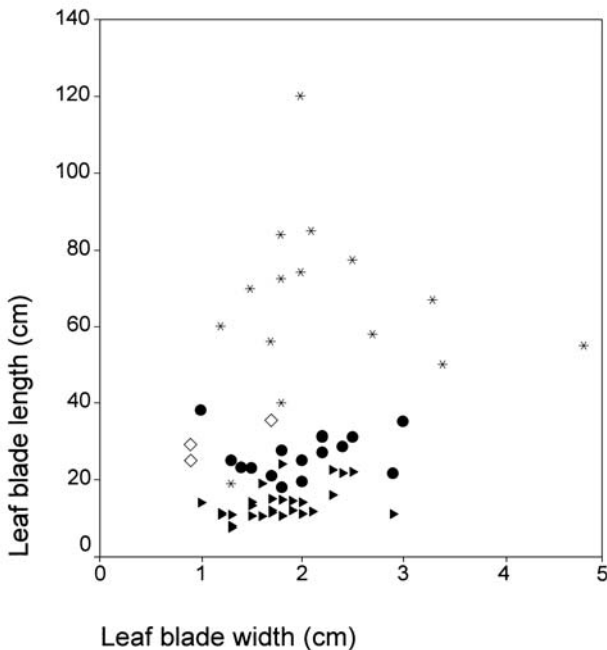


Fig. 1. Scatter plot of length and width of the leaf blade in *Ochagavia* – *O. andina* = ◇, *O. carnea* = \*, *O. elegans* = ▶, *O. litoralis* = ●; measurements taken from herbarium specimens.

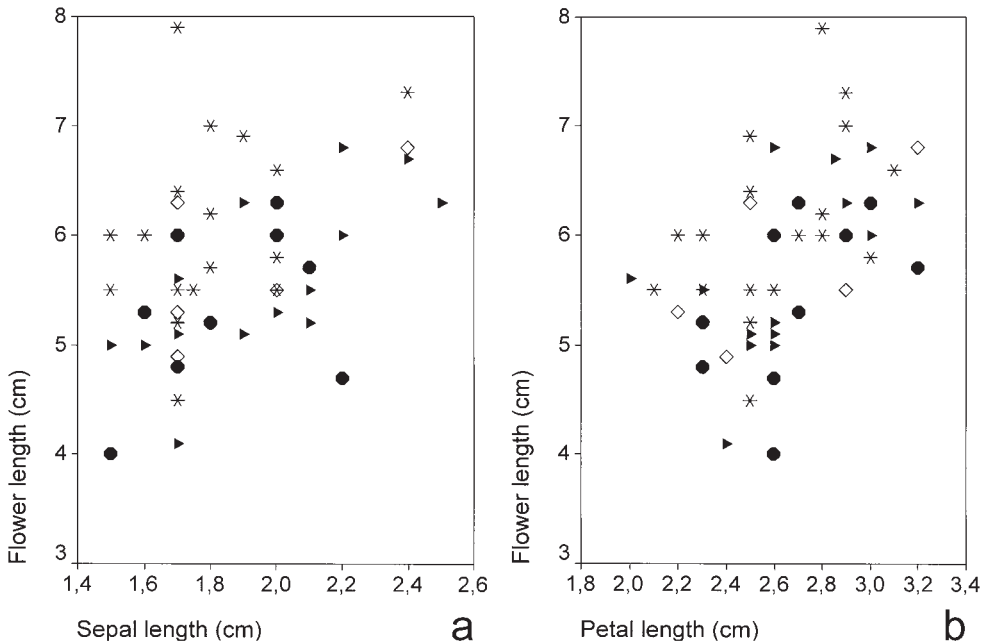


Fig. 2. Scatter plots of (a) flower length and sepal length and (b) flower length and petal length in *Ochagavia*, showing that these features have no taxonomic value – *O. andina* =  $\diamond$ , *O. carnea* = \*, *O. elegans* =  $\blacktriangleright$ , *O. litoralis* =  $\bullet$ ; measurements taken from herbarium specimens.

shown in Fig. 2. Exceptions are the extraordinary length of the epigynous tube and the stamens equalling the petals as most suitable features to characterize *O. elegans*. The petals of all *Ochagavia* species are, to our knowledge, rose-coloured; reports of yellow petals in *O. carnea* (e.g. Smith & Downs 1979, as *O. chamissonis*) are erroneous. Also the shape of the bracts, used by Mez (1896) to characterize species, has no taxonomic relevance.

The leaf blade anatomy of *Ochagavia litoralis* has been studied by Horres & Zizka (1995), there erroneously cited as *O. carnea*. The considerable water storage tissue comprises 66 % of the leaf (measured as percentage of area of transverse section), making that species one of the most succulent of the *Bromeliaceae*, comparable to species of the *Pitcairnioideae* such as *Puya roezlii* E. Morren (Peru) or *Hechtia glabra* Brandege (Mexico). The water storage tissue is well developed only adaxially, as typical for *Bromelioideae* and most *Pitcairnioideae*.

In *Ochagavia carnea* a chromosome number of  $2n = 50$  was counted (Benko-Iseppon & Horres, pers. comm.). The base number  $x = 25$  is predominant in *Bromelioideae* and in most of the investigated *Bromeliaceae* (Smith & Till 1998).

### Geographical distribution and ecology

*Ochagavia* occurs from  $31^{\circ}33'$  to  $38^{\circ}14'S$ , being principally restricted to central Chile with a more or less Mediterranean type of climate. Grau (1995), following Schmithüsen (1956), discerns two principal vegetation zones in this area: the “región de bosque esclerófilo” (sclerophyllous forest) in the north and “región del bosque caducifolio templado” (temperate deciduous forest) in the south. In contrast to *Fascicularia* (occurring from  $34^{\circ}$  to  $42^{\circ}24'S$ ), *Ochagavia* does not reach the Valdivian forest zone (Fig. 3), contrary reports are in our opinion erroneous (see a corresponding note by Zizka & al. 1999 regarding a specimen of ‘*Fascicularia pitcairniifolia*’ = *O. litoralis*, leg. Fricke, which is probably referable to *F. bicolor*).

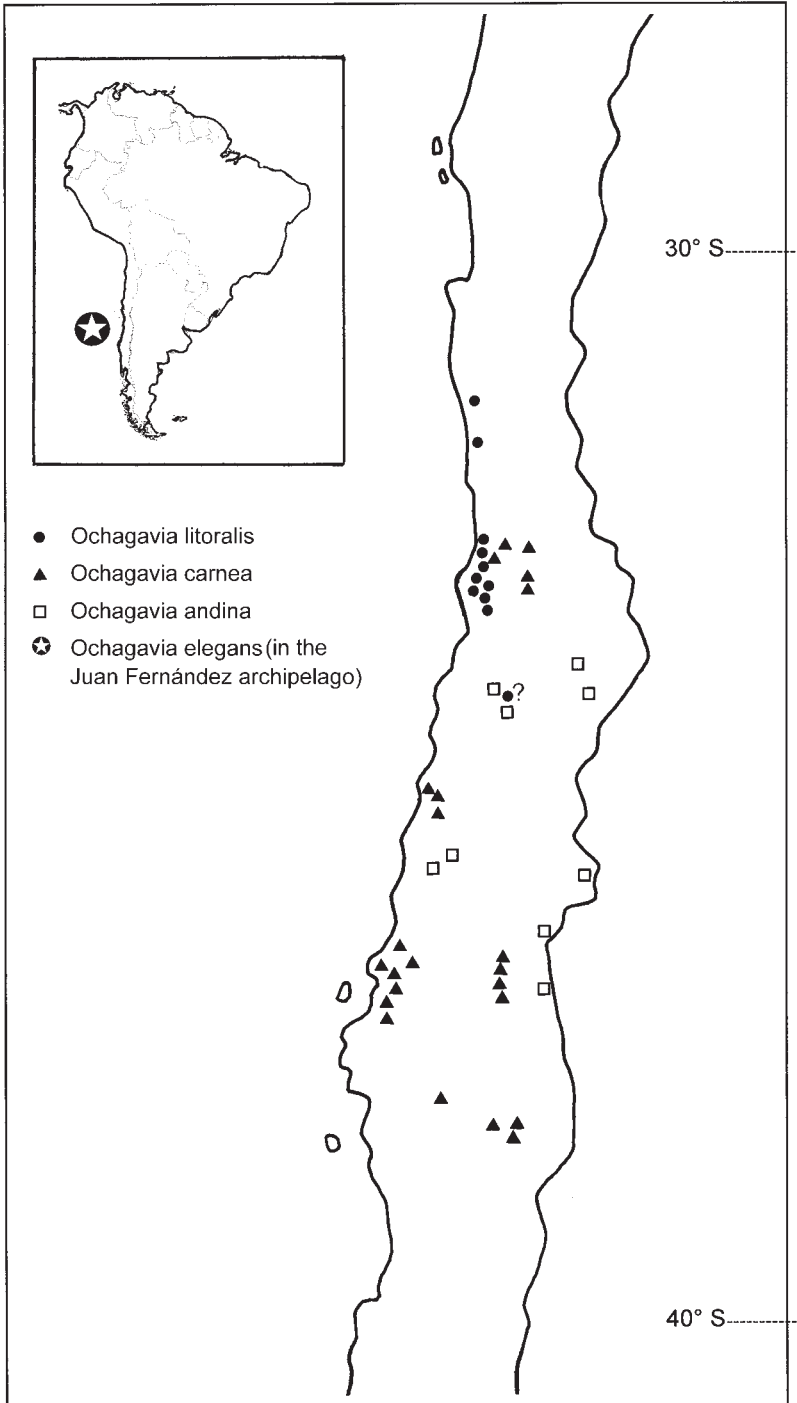


Fig. 3. Distribution of the four species of *Ochagavia*.

The four *Ochagavia* species differ with respect to habitat and ecology. *O. elegans* from Isla Robinson Crusoe of the Juan Fernández archipelago typically grows at elevations of 200-600 m on exposed rocks and steep cliffs, forming large stands there. *O. litoralis* from continental Chile is also saxicolous but grows close to the sea, at elevations of 10-250 m. Knowledge about the habitat and distribution of *O. andina* is scarce; obviously, the species occurs further inland, extending from 700-2500 m elevation. The remarkable, large plants of *O. carnea* are found from Valparaíso to Malleco between (60-)200 and 900 m elevation. Specimens have been collected from moist understorey of woodlands and in ravines, especially near river banks. Apparently, the latter species is the one in the genus that prefers the most humid habitats.

While Chilean *Greigia* species (*G. pearcei* Mez and *G. berteroi* Skotts.) appear to have become very rare, and the latter being possibly in danger of extinction (Will & Zizka 1999, Danton 2002), the situation in *Ochagavia* and *Fascicularia* is different. In contrast to *G. berteroi*, the only other bromeliad in the Juan Fernández archipelago, *O. elegans* is still quite abundant on rocky cliffs of Isla Robinson Crusoe. Nevertheless, because of the various threats for this unique island flora, Hoffmann & Flores (1989) regard this species as “vulnerable”. *O. litoralis* is in continental Chile comparatively abundant too. No information about population size and possible endangerment is at hand for the two other species that occur further inland. The fact that the known specimens of *O. andina* were collected many decades ago indicates that this species may have become very rare.

### Systematic relationships and phytogeography

The morphological similarity between *Ochagavia* and *Fascicularia* points toward a close relationship, which is supported by investigations using molecular markers (Horres & al. 2000, Horres & al. in prep.). While RAPD studies revealed also a close relationship with *Greigia sphacelata* (Ruiz & Pav.) Regel (Zizka & al. 1999), this could not be supported by sequence data from trnL intron (Horres & al. 2000, Horres & al. in prep.). The latter study included 16 genera of *Bromelioideae* and revealed interesting outcomes: despite their close geographical association, *Greigia* and *Fascicularia/Ochagavia* occupy quite different positions in the phylogenies obtained. Whereas *Ochagavia* and *Fascicularia* form a clade together with the monospecific *Androlepis skinneri* Brongn. ex Houliet, which grows epiphytically in Central American and Peruvian forests, *Greigia* groups together with *Wittrockia* and *Lymania*, both being endemic to southeastern Brazil.

The systematic affinities of *Ochagavia*, *Fascicularia* and *Greigia* are still not clear. This holds true for the entire *Bromelioideae*. Due to the low genetic variability observed in the markers studied up to now, further evidence is needed to produce more reliable phylogenetic reconstructions. Nevertheless, monophyly of this subfamily has been confirmed by all molecular studies at hand.

The southern border of the distribution area of the *Bromeliaceae* west of the Andes is situated at 42°24'S (the record of *Fascicularia bicolor* (Ruiz & Pav.) Mez from 45°17'S could not be confirmed by us, see also Zizka & al. 1999) and east of the Andes at 44°46'S. On either side of the Andes, species and genera of different subfamilies form the southern limit. In the east, the southernmost bromeliads are representatives of the *Tillandsioideae*, these are *Tillandsia pedicellata* (Mez) A. Cast., *T. retorta* Griseb. ex Baker and *T. andicola* Gillies ex Baker, the first being reported as far south as 44°46'S in the province Chubut, southern Argentina. All three species have a comparatively large distribution area in semidesert and steppe climates, extending to northwestern Argentina or, in the case of *T. pedicellata*, even to western Bolivia (Till 1984, Till, pers. comm.). West of the Andes, in the area of the Valdivian rain forest, the southernmost bromeliads are represented by *Greigia*, *Fascicularia* and, further north, *Ochagavia*, all belonging to the *Bromelioideae*. The species occurring there are endemics, in the case of *Fascicularia* and *Ochagavia* even restricted to this comparatively small area.

## Cultivation

Plants of *Ochagavia* are capable of being cultivated outdoors in (north)western Europe. According to Clement & Foster (1994) and Stace (1997: 922), *O. carnea* has become naturalized on Tresco, Isles of Scilly (“Tresco Rhodostachys”, “... well established where planted on dunes in Tresco, Scillies”). *O. carnea* and *O. litoralis*, recently also *O. elegans* (Wilkin 1996), are cultivated in botanical gardens, usually together with succulents. As observed in the Palmengarten, Frankfurt am Main, *O. carnea* plants very rarely flower, less often than the *Fascicularia* plants grown under similar conditions. Nevertheless, *Ochagavia* species are attractive plants and can be recommended for cultivation, especially the smaller ones, *O. litoralis* and *O. elegans*. The latter species, up to now rarely in cultivation, might even prove to be hardy outside in western Europe, but, as reported by Wilkin (1996), is not frost hardy.

## Taxonomy

### *Ochagavia* Phil.

*Ochagavia* Phil. in *Anales Univ. Chile* 13: 168. May 1856. – Type: *O. elegans* Phil.

= *Rhodostachys* Phil. in *Linnaea* 29: 57. 1858. – Type: *Rhodostachys andina* Phil.

= *Ruckia* Regel in *Index Sem. Hort. Petropol.* 1866, suppl.: 28. 1868 [“1867”]. – Type: *Ruckia ellemeti* Regel

= *Placseptalia* Espinosa in *Bol. Mus. Nac. Hist. Nat.* 23: 5. 1947. – Type: *Placseptalia rebecca* Espinosa

*Terrestrial*, caulescent herbs. *Stems* to over 60 cm long and 1.1-5 cm wide. *Leaves* numerous, rosulate, not forming a distinct cup; *leaf sheaths* (1.3-)2-9(-11.7) × 0.9-6.8 cm, ovate to orbicular, merging with the blades, coriaceous and ± succulent with membranous margin, conspicuously nerved; ± densely lepidote and green toward apex, glabrescent and colourless toward base; margin spinose toward apex, ± entire toward base; *leaf blades* (7.5-)10-80(-120) × (0.5-)0.9-3.4(-4.8) cm, narrowly triangular to linear, gradually attenuate toward a pungent apex, rigid, coriaceous, ± recurving, channelled to ± plane above; margin spinose-serrate, spines 0.1-0.45 cm long, antrorsely curved to ± spreading at base; densely whitish lepidote with coarse spreading scales or sparsely lepidote to glabrescent below, glabrate to very sparsely lepidote or ± lepidote at base above; finely longitudinally striate below. *Inner leaves* ± green, the blades gradually reduced, attenuate at base, widening again into the elongate, membranous sheath; innermost leaves ± rose, with reduced blades. *Outer bracts* ovate to obovate, without blades, acuminate to acute, about as long or shorter than the flowers, membranous, rose, conspicuously nerved; margin spinose-laciniate apically, ± entire basally, densely lepidote in upper half, lepidote to glabrescent toward base. *Inflorescence* 4.5-10 × (2-)3.5-11 cm, capitate, terminal, globose to ovoid or subcorymbose, simple, (7-)10->50-flowered, dense; pedunculate, the scape 1.5-17.5 cm long. *Floral bracts* ovate to obovate, not keeled, shorter than the developed flowers, acute with pungent apex, membranous, rose to white; margin spinose-laciniate in apical half, spinulose to entire toward base, conspicuously nerved; densely lepidote below and lepidote above apically, sparsely lepidote to glabrescent toward base. *Flowers* (3.5-)4-7.9 cm long, bisexual, actinomorphic, sessile, perfect, with conspicuous epigynous tube 0.3-1.9 cm long. *Sepals* 3, free, erect, narrowly triangular to ± obovate, ± symmetric, overlapping only at base, chartaceous with membranous margin, whitish to slightly rose, inconspicuously keeled, ± lepidote apically, glabrescent at base; margin entire or apically inconspicuously spinose-laciniate. *Petals* 3, free, erect, obovate to spatulate, not appendaged, rounded with inconspicuous mucro, membranous, rose. *Stamens* 6, ± conspicuously exceeding corolla, filaments free or basally united with the sepals (only in *O. elegans*) flattened and broadened at base; anthers 0.3-0.6 × 0.1-0.2 cm, linear, elongate, dorsifix. *Pollen* monocolpate, sexine reticulate, 46-59.1 × 27-31.4 μm (Ehler & Schill 1973, Erdtmann & Praglowski 1974, Zöllner & Oyanedel 1991). *Ovary* inferior, 3-locular, dor-

sally compressed, triangular to narrowly bialate, obovate to elliptical in outline; style elongate, exceeding corolla and stamens, the former for 0.3-1.4 cm; stigma with 3 lobes, these 0.2-0.4(-0.6) cm long, conduplicate, hardly contorted; placentae central, extending the whole length of the locule; ovules anatropous, numerous, not or inconspicuously appendaged. *Fruit* a berry, (1.5-)2-4.5 × 0.4-1.7 cm (excluding persistent sepals, including epigynous tube), dorsally compressed, ± bialate, obovate to elliptical in outline, brown to black, conspicuously nerved when dry. *Seeds* numerous, 0.12-0.35 × 0.1-0.13 cm, obovate to obconical in outline, flattened, glabrous, without appendages, surface rugose, dark brown to black.

*Chromosome number.* –  $2n = 50$  (Benko-Iseppon & Horres, pers. comm.).

*Distribution.* – Three species endemic to continental central Chile, one endemic to Isla Robinson Crusoe, Juan Fernández archipelago (Fig. 3).

*Remarks.* – The genus is best distinguished from the vegetatively similar, monospecific genus *Fascicularia* by the following features:

- relative length of style and stamina (*Ochagavia*: exerted, *Fascicularia*: included in the flower);
- shape of sepals (*Ochagavia*: acute with pungent apex, *Fascicularia*: retuse or premorse, with short inconspicuous mucro);
- colour and appendages of petals (*Ochagavia*: petals rose, appendages absent, *Fascicularia*: petals blue to violet, appendages present);
- pollen characters (*Ochagavia*: monocolpate, *Fascicularia*: irregularly monocolpate) (see also Zizka & al. 1999).

Morphological and molecular studies (Horres & al. 2000, Horres & al. in prep.) revealed a very closely relationship of the two genera.

*Eponymy.* – Philippi (1856a) stated about the origin of the name: “Dixi in memoriam cl. Sylvestris Ochagavia, Instructionis publicae in Republica Chilensis annis 1853 et 1854 ministri.” According to Wilkin (1996), Sylvestre Ochagavia was Chilean minister of education in 1853-1854.

*Further references.* – *Ochagavia*: Philippi in Bot. Z. 14: 647. 1856; F. Philippi in Anales Univ. Chile 59: 278. 1881; Bentham in Bentham & Hooker, Gen. Pl. 3,2: 661. 1883; Wittmack in Engler & Prantl, Nat. Pflanzenfam. 2(4): 45. 1887-88; Harms in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 159. 1930; Mez in Engler, Pflanzenr. 100: 203. 1935; Muñoz, Espec. Pl. Descr. Philippi: 35. 1960; Smith & Downs in Fl. Neotrop. Monogr. 14,3: 1527. 1979; Rauh & Groß, Bromelien: 398. 1990; Grant & Zijlstra in Selbyana 19: 105. 1998; Smith & Till in Kubitzki, Fam. Gen. Vasc. Pl. 4: 93. 1998. — *Rhodostachys*: Philippi in Anales Univ. Chile 91: 607. 1895; Baker, Handb. Bromel.: 27. 1889; Mez in C. Candolle., Monogr. Phan. 9: 335. 1896; Reiche, Grundz. Pfl.-Verbr. Chile: 67. 1907; Harms in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 132, 159. 1930; Muñoz, Espec. Pl. Descr. Philippi: 35. 1960; Grant & Zijlstra in Selbyana 19: 109. 1998. — *Ruckia*: Regel in Gartenfl. 17: 65, t. 571. 1868; Grant & Zijlstra in Selbyana 19: 109. 1998. — *Placseptalia*: Grant & Zijlstra in Selbyana 19: 106. 1998.

### Key to the species of *Ochagavia*

1. Epigynous tube more than 10 mm long, stamens not or barely exceeding the petals (style distinctly exceeding); endemic to Isla Robinson Crusoe . . . . . 1. *O. elegans*
- Epigynous tube up to 5(-7) mm long, stamens (as well as style) exceeding the petals; endemic to continental Chile . . . . . 2
2. Leaf blades 15-45 cm long, densely whitish lepidote below . . . . . 3
- Leaf blades (40-)50-80(-120) cm long, sparsely lepidote to glabrescent below . . . . . 4. *O. carnea*
3. Leaf blade 15-40 × 1-3 cm . . . . . 2. *O. litoralis*
- Leaf blade 30-45 × 0.9-1.7 cm . . . . . 3. *O. andina*



### 1. *Ochagavia elegans*

*Ochagavia elegans* Phil. in Anales Univ. Chile 13: 168. May 1856 ≡ *Rhodostachys elegans* (Phil.) Mez in Candolle, Monogr. Phan. 9: 336. 1896. – Holotype: Chile, Juan Fernández, *Philippi 941* (B!; isotypes: F, GH [photo!], W [lost]).

*Stem* to over 72 cm long and 1.1–2.5 cm in diameter; forming dense colonies through vigorous offset production. *Leaf sheaths* (1.3–)2–3.5(–4.1) × (1–)1.8–4 cm, broadly ovate to orbicular, margin entire to inconspicuously serrate apically, glabrous above, ± sparsely lepidote to glabrous below; *leaf blades* (7.5–)10–22(–24) × (1–)1.2–2.5(–2.9) cm, narrowly triangular, not or inconspicuously channelled; densely whitish lepidote below, glabrous to ± lepidote (especially toward base) above. *Inflorescence* (4.5–)5–9 × (2–)3.5–6(–10) cm with (7–)10–20 flowers, subcorymbose to globose, scape c. 1.5–2.5 cm long. *Outer bracts* 5–6 × 1.1 cm, obovate, acuminate. *Floral bracts* (2.7–)3.5–6 × 0.7–1.4 cm. *Flowers* 5–7 cm long, epigynous tube 1–1.9 cm long. *Sepals* 1.5–2.8 × 0.25–0.5 cm. *Petals* (2–)2.5–3.2 × 0.5–0.8 cm. *Stamens* not or partly exceeding corolla, filaments united with petals basally. *Style* exceeding corolla, 0.4–0.6 cm long. *Fruit* (1.5–)2–4 × 0.4–0.8 cm. *Seeds* 0.12–0.35 × 0.1–0.12 cm.

*Figures*. – Fig. 4–5; Skottsberg, Nat. Hist. Juan Fernández 2(7): 110, fig. 5. 1922, id. 6(29): 868, fig. 27, pl. 97. 1953; Smith & Downs 1979: fig. 490; Zizka in Palmengarten 2/1992: 103, fig. 10. 1992; Wilkin 1996: pl. 287; Danton 2002: fig. 4.

*Distribution*. – Chile, Juan Fernández archipelago, endemic to Isla Robinson Crusoe (Fig. 3).

*Habitat*. – Rocky, exposed cliffs; 200–600 m elevation. Reported by Skottsberg (1953) to grow exceptionally also epiphytic. Gajardo (1995) lists *Ochagavia elegans* as one of the “especies acompañantes” of the *Cuminia fernandeziana*-*Azara fernandeziana* and the *Stipa neesiana*-*Polyogon chilense* communities.

*Vernacular name*. – Ajo dulce, ajo verde, chupón.

*Remarks*. – Forming extensive colonies on steep ridges. The flowers appear to be typically ornithophilous. Skottsberg (1928) gives a detailed description of the flowers (flowering time: October to May) and reports the hummingbird *Sephanoides fernandensis* visiting the flowers. He also discusses the seed dispersal of the species and suggests endozoic distribution by the only frugivorous bird native to the island, *Turdus falcklandii*.

*Further references*. – Philippi in Bot. Z. 14: 647. Sept. 1856; F. Philippi in Anales Univ. Chile 59: 278. 1881; Baker, Handb. Bromel.: 19. 1889; Johow, Estud. Fl. Juan Fernandez: 149. 1896; Reiche, Grundz. Pfl.-Verbr. Chile: 67. 1907; Skottsberg, Nat. Hist. Juan Fernandez 2(7): 110. 1922, id. 4(18): 526. 1928; Harms in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 159. 1930; Smith & Looser in Rev. Univ. (Santiago) 18: 1077. 1934; Mez in Engler, Pflanzenz. 100: 204. 1935; Skottsberg, Nat. Hist. Juan Fernandez 6(28): 774. 1951, 6(29): 867. 1953; Muñoz, Espec. Pl. Descr. Philippi: 35. 1960; Smith & Downs in Fl. Neotrop. Monogr. 14(3): 1529. 1979; Marticorena & Quezada in Gayana 42: 81. 1985; Hoffmann & Flores in Benoit, Red List Chilean Terrest. Pl.: 119. 1989; Zöllner & Oyanedel in J. Bromeliad Soc. 41: 169. 1991; Wilkin in Bot. Mag. 13: 24. 1996; Danton in Bull. Mens. Soc. Linn. Lyon 68(5): 107. 1999.

*Specimens seen*. – CHILE: V REGIÓN, JUAN FERNÁNDEZ ARCHIPIÉLAGO, ISLA ROBINSON CRUSOE: Camote, 600 m, 2.2.1980, *C. Marticorena* & *E. Ugarte 9096* (CONC); *ibid.*, 1800 ft, 25.12.1965, *F. G. Meyer 9680* (K, MO, S); *ibid.*, near base, 380 m, 5.2.1980, *T. Stuessy* & *R. Sanders 5089* (CONC); *ibid.*, east side, 525 m, 20.1.1984, *H. Valdebenito*, *E. Ruiz* & *A. Landeros 6331* (CONC); *ibid.*, 400–550 m, 28.1.1991, *G. Zizka 1444* (FRP); c. 100 m unterhalb El Camote, 29.1.1991, *G. Zizka 1450* (FRP); Corrales de Molina, 20.1.1935, *C. Bock 48* (CONC, HBG); Damajuana, Portezuelo, 400 m, 11.1934, *C. Bock 48* (GH, NY, US); *ibid.*, 600 m, *C. & I. Skottsberg 21* (HBG); Portezuelo de Villagra, 100 m below the pass, 1954–55, *C. & I. Skottsberg*



Fig. 4. *Ochagavia elegans* – dense stand on rock, El Camote, Isla Robinson Crusoe. – Photograph by G. Zizka, 1991.

104 (S); *ibid.*, 600 m, 1916-17, C. & I. Skottsberg 21 (HBG); *ibid.*, 7500 m, 10.1934, C. Bock 20199 (CONC); *ibid.*, 10.1934, C. Bock (CONC); English Bay, 18.3.1920, W. A. Bryan 89 (MO); Mirador Selkirk, Villagra side, 600 m, 27.1.1984, A. Landeros 6475 (CONC); Q. Frances, 21.11.1955, I. Planella 213 (S); Pangal, 11.12.1965, O. T. Solbrig, H. E. Moore, J. & J. R. Walker 3838 (GH); Pico Central, 400 m, 8.12.1937, H. Weber (SGO 46395); Carbonera de Torres, 580 m, 28.1.1991, T. Stuessy 12066 (FRP); Puerto Inglés, Cerro Alto, south side, 14.12.1965, F. G. Meyer 9572 (K, MO); Cerro Agudo, 470 m, 25.11.1980, T. Stuessy, O. Matthei, R. Sanders & H. Valdebenito 5413 (CONC); Salsipuedes, 400 m, 5.2.1980, C. Marticorena, R. Rodríguez, E. Ugarte & J. Arriagada 9112 (CONC); *ibid.*, 465 m, 20.12.1916, C. & I. Skottsberg 175 (GH, K, NY, O, S); *ibid.*, 200 m, 1954-55, C. & I. Skottsberg 337b (S); 250 m, 10.-25.2.1955, B. Sparre 47 (K, S); *ibid.*, 220 m, 1954-55, B. Sparre 337 (CONC, S); Valle Inglés, 400 m, 4.2.1984, T. Stuessy, D. Crawford, H. Valdebenito & A. Landeros 6552 (CONC); *ibid.*, 5.2.1984, H. Valdebenito & A. Landeros 6597 (CONC); La Vaquería, 500 m, 11.1991, F. Billiet & B. Jadin 5683 (BR). — WITHOUT PRECISE LOCALITY: 10.-14.1.1901, G. T. Hastings 260 (US); 2.2.1892, F.



Fig. 5. *Ochagavia elegans* – fruiting plant, El Camote, Isla Robinson Crusoe. – Photograph by G. Zizka, 1991.

*Johow* (SGO 69653); *A. Philippi* 29961 (GH); *A. Philippi* 941 (B, GH); 400 m, 2.1968, *G. Revuelta* & *W. G. Mann* 47870 (CONC); Rabanal(?), 2.1968, *G. Revuelta* (SGO 78901).

## 2. *Ochagavia litoralis*

*Ochagavia litoralis* (Phil.) Zizka, Trumpler & Zoellner, **comb. nova**

≡ *Rhodostachys litoralis* Phil. in *Linnaea* 30: 201. 1859 ≡ *Fascicularia litoralis* (Phil.) Mez in *Candolle, Monogr. Phan.* 9: 8. 1896. – Holotype: Chile, Colchagua (“in regione litorali prov. Colchaguae”), *H. Volckmann* (SGO [apparently destroyed]). – Neotype (hic designatus): Chile, region V, Valparaiso, Playa Ancha, coastal cliffs near road, 8.1.1991, *G. Zizka* 1301a (FRP).

= *Hechtia pitcairniifolia* B. Verl. in *Rev. Hort.* 40: 211-212, t. 1-2. 1868 ≡ *Bromelia pitcairniifolia* (B. Verl.) K. Koch in *Wochenschr. Vereines Beförd. Gartenbaues Königl. Preuss. Staaten* 11: 325. 1868 [“*pitcairniifolia*”] ≡ *Rhodostachys pitcairniifolia* (B. Verl.) Benth. in *Bentham & Hooker, Gen. Pl.* 3,2: 662. 1883 ≡ *Fascicularia pitcairniifolia* (B. Verl.) Mez in *Candolle, Monogr. Phan.* 9: 10. 1896. – Lectotype (designated by Smith & Downs 1979): [icon] t. 1 & 2 of the protologue.

= *Ochagavia lindleyana* Mez in *Engler, Pflanzenr.* 100: 204. 1935. – Lectotype (hic designatus): Chile, Colchagua, *Gay* 155 (P!). – Paralectotypes: Valparaiso, *Maximowicz* 113 (?); *ibid.*, *D’Orbigny* (P!); *ibid.*, *Poeppig* [if *Poeppig* 1845?, G!]; Cueva de Pincheira, *Philippi* (?); Cordillere von Linares, *Philippi* 938 (?); Cordillere von Maule, *Germain* (?); s. loc., *Bertero* 114 (P! = *O. andina*).

= *Placseptalia rebecae* Espinosa in *Bol. Mus. Nac. Hist. Nat.* 23: 8. 1947. – Lectotype (hic designatus): Chile, region V, Valparaiso, Laguna Verde, 3.1947, *M. Espinosa* (SGO 084893!). – Paralectotype: Chile, Curauma, 6.3.1947, *M. Espinosa* (SGO 070803; FR [photo]).

[– *Ochagavia litoralis* Zoellner & Oyanedel in *J. Bromeliad Soc.* 41: 169. 1991, nom. nud.].





Fig. 6. *Ochagavia litoralis* – extensive stands covering coastal cliffs, near Valparaiso. – Photograph by G. Zizka, 1991.

*Stem* to over 20 cm long and c. 1.7(-4?) cm in diameter, forming dense colonies through vigorous offset production. *Leaf sheaths* (2.7-) $3.8-6(-7.5) \times 1.5-4.4$  cm, broadly ovate to orbicular, densely lepidote to  $\pm$  glabrous toward base; *leaf blades* 17-38  $\times 1-3$  cm, narrowly triangular, not or inconspicuously channelled, firmly coriaceous, densely whitish lepidote below, glabrous to sparsely lepidote (especially toward base) above. *Inflorescence* 4.5-8.3  $\times 3.5-8$  cm with 15-35 flowers, globose to ovoid, scape 8-12 cm long. *Outer bracts* (2.6-) $3.4-6.7(-7.7) \times 1.6-2.4$  cm, oblong to  $\pm$  obovate. *Floral bracts* (2.3-) $3.5-6.5 \times 0.6-1.4(-2.2)$  cm. *Flowers* 4-6.3 cm long, epigynous tube 0.3-0.6 cm long. *Sepals* 1.5-2.4  $\times 0.3-0.5$  cm. *Petals* 2.3-3.2  $\times 0.3-0.8$  cm. *Stamens*  $\pm$  exerted, filaments free. *Style* exceeding corolla, (0.35-) $0.5-0.8$  cm long. *Fruit* 2-3.2  $\times 1-1.7$  cm, sparsely lepidote. *Seeds* 0.15-0.21  $\times 0.1-0.13$  cm.

*Figures.* – Fig. 6-7; Muñoz, Fl. Silvestr. Chile: t. 19. 1966; Zizka in Palmengarten Sonderheft 19: 105, fig. 100. 1992, under *O. carnea*. – Note: (1) The plant depicted and described by C. H. Wright in Bot. Mag.: t. 8087. 1906 under the name *Rhodostachys pitcairniifolia* is not a member of the genus *Ochagavia* but represents *Fascicularia bicolor* (Ruiz & Pav.) Mez. (2) Identification is doubtful of: Hoffmann 1979: 139, fig. 3, under *O. carnea*.



Fig. 7. *Ochagavia litoralis* – flowering plant, near Valparaiso. – Photograph by G. Zizka, 1991.

*Distribution.* – From Illapel (Coquimbo región, IV) to Colchagua (O’Higgins región, VI). The species is principally part of the coastal vegetation (“Bosque esclerófilo costero”, Gajardo 1995) of central Chile.

*Habitat.* – On rocks and steep cliffs, mainly near the sea; among sclerophyllous vegetation; 10–250 m elevation. On coastal cliffs near Valparaiso the species was observed to form dense, extensive stands (Fig. 6).

*Vernacular name.* – Calilla, chupón.

*Remarks.* – The combination *Fascicularia litoralis* by Mez in Martius (Fl. Bras. 3,3: 627. 1894) is not validly published because the basionym was cited without author.

*Ochagavia lindleyana* was intended by Mez as a new combination of the basionym *Bromelia lindleyana*. Actually, the latter name was not validly published (not accepted by the describer himself) and therefore not available as a basionym. Nevertheless, Mez fulfilled all requirements for a valid publication of a new species, thus the name is regarded as published by Mez, not as a new combination.

The illustration in the protologue of *Hechtia pitcairniifolia* ( $\equiv$  *Fascicularia pitcairniifolia*), designated as the lectotype of that name by Smith & Downs (1979), makes clear that the species belongs to the genus *Ochagavia*. Both the dimension of the leaves given in the protologue and the lectotype indicate that *F. pitcairniifolia* is with some certainty conspecific with *O. litoralis*.

*Further references.* – *Rhodostachys litoralis*: Philippi in Linnaea 33: 246. 1864; F. Philippi in Anales Univ. Chile 59: 279. 1881; Philippi in Anales Univ. Chile 91: 609. 1895; Baker, Handb. Bromel.: 29. 1889 [“*litoralis*”]; Muñoz, Espec. Pl. Descr. Philippi: 35. 1960. — *Fascicularia litoralis*: Mez in Engler, Pflanzenr. 100: 7. 1934; Smith & Downs in Fl. Neotrop. Monogr. 14,3: 1714. 1979; McClintock in Watsonia 10: 289. 1974–75; Marticorena & Quezada in Gayana 42:

81. 1985; Rauh in J. Bromeliad Soc. 35: 213. 1984; Hoffmann & Flores in Benoit, Red List Chilean Terrest. Fl.: 119. 1989; Nelson & Zizka in New Plantsman 4: 234. 1997; Zizka & al. in J. Linn. Soc. Bot. 129: 329. 1999. — *Hechtia pitcairniifolia*: Morren in Belg. Hort. 26: 161. 1876 [“*pitcairniaefolia*”]; Wittmack in Gartenflora 39: 345. 1890 [“*pitcairniaefolia*”]. — *Bromelia pitcairniifolia*: Morren in Belg. Hort. 26: 161. 1876 [“*pitcairniifolia*”]; Wittmack in Gartenflora 39: 345. 1890 [“*pitcairniaefolia*”]. — *Rhodostachys pitcairniifolia*: Baker, Handb. Bromel.: 28. 1889 [“*pitcairniaefolia*”]. — *Fascicularia pitcairniifolia*: Harms in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 132. 1930; Mez in Engler, Pflanzenr. 100: 5. 1934; Smith & Downs in Fl. Neotrop. Monogr. 14,3: 1711. 1979; McClintock in Watsonia 10: 289, 290. 1974-75; Rauh in J. Bromeliad Soc. 35: 213. 1984; Marticorena & Quezada in Gayana 42: 81. 1985; Rauh & Groß, Bromelien: 382. 1990; Hoffmann & Flores in Benoit, Red List Chilean Terrest. Fl.: 119. 1989. — *Ochagavia lindleyana*: Muñoz, Fl. Silvestr. Chile: 111-112, lam. 19. 1966.

*Specimens seen.* — CHILE: IV REGIÓN: Coquimbo, Illapel, Choapa, quebrada Buitre, 50 m, 14.10.1948, *G. Looser 5497* (US); 31°39'S, 71°18'W, 250 m, 2.6.1956, *C. Jiles 3017* (CONC). — V REGIÓN: Valparaíso, *Pilippi* (BM); *ibid.*, 1827, *Poeppig 1845* (G); Petorca, Las Docas, 33°08'S, 71°42'W, 27.3.1975, *O. Zöllner 8187* (MO); San Antonio, Playa Mirasol, c. 36 km N of San Antonio, 33°20'S, 71°40'W, 1.3.1982, *L. R. Landrum 4333* (MO, NY, SGO 103360); Aconcagua, Palo Colorado, 32°04'S, 71°31'W, 20.7.1938, *C. Grandjot 3325* (CONC); Laguna Verde, 33°03'S, 71°42'W, 120 m, 11.3.1934, *R. Milner 9560* (CONC); *ibid.*, 3.1947, *M. R. Espinosa* (SGO 84893); am Wasserwege nach Laguna Verde, 33°03'S, 71°42'W, 120 m, 28.2.1926, *K. Behn* (CONC 20626); *ibid.*, 33°02'S, 71°38'W, 20 m, 11.3.1934, *R. Milner* (CONC 24449); Quintay, 33°13'S, 71°40'W, *O. Zöllner 20817* (HBG); El Tabo, 33°27'S, 71°41'W, 15.3.1937, *J. Ibanez 3459* (GH); Quebrada del Lúcumo, 10 m, 28.2.1937, *G. Looser 3457, 3458* (GH); Algarrobo, 1860(?), *C. L. Landbeck* (SGO 67439); Küstenklippen Playa ancha, 33°01'S, 71°36'W, 8.1.1991, *G. Zizka 1301a* (FRP). — VI REGIÓN: Bernardo O'Higgins, Colchagua; prope San Fernando, 34°20'S, 71°28'W, *C. Gay 155* (P); Colchagua, *C. Gay 155(?)* (B, GH, NY); *ibid.*, *coll. ignot.* (SGO 67441). — WITHOUT PRECISE LOCALITY: Montevideo?, 4.1836, *M. Gaudichaud* (P); 1838-42, *C. Wilkes* (GH); ?Valparaíso, ?*D'Orbigny 113?* (P, LE?). — CULTIVATED MATERIAL: USA, Orlando, Florida, 7.1949, *M. B. Foster* (US).

### 3. *Ochagavia andina*

*Ochagavia andina* (Phil.) Zizka, Trumpler & Zoellner, **comb. nova**

≡ *Rhodostachys andina* Phil. in Linnaea 29: 58. 1858. — Holotype: Chile, Linares [“An Andibus depart. Linares invenit ...”], *Germain* (SGO 46378; FR [photo!]). — Epitype (hic designatus): Baños Cauquenes, 1873, *Reed* (CONC 93288!).

*Leaf sheaths* 3.2-6.5 × 0.9-2.6 cm, ovate to orbicular, densely lepidote to ± glabrous toward base; margin inconspicuously spinose to entire near base; *leaf blades* (14.3-)30-39.6 × (0.5-)0.9-1.7 cm, linear, inconspicuously channelled; densely whitish lepidote below, glabrous to lepidote toward base above. *Inflorescence* 4.9-7.8 × (4-)5.5-10 cm with c. 30 flowers, globose to ovoid, scape 6-15 cm long. *Outer bracts* 3.7-5 × 2-3 cm, oblong to ± obovate. *Floral bracts* 4-5 × 0.8-1.8 cm. *Flowers* 5.3-6.8 cm long, epigynous tube 0.5-0.7 cm long. *Sepals* 1.5-2.4 × 0.35-0.6 cm, ± spinose-laciniate apically, ± densely lepidote (near apex, especially below), ± glabrous toward base. *Petals* 2.2-3.2 × 0.35-0.7 cm. *Stamens* exerted, filaments free. *Style* exceeding corolla, 0.4-0.9 cm long. *Fruit* 2.4-3.8 × 1.2 cm, sparsely lepidote. *Seeds* 0.15-0.2 × 0.1-0.12 cm.

*Figures.* — Baker in Bot. Mag.: t. 7148. 1890.

*Distribution.* — From Cachapoal (O'Higgins region, VI) to Biobío (Biobío region, VIII). 700-2500 m elevation.

*Habitat.* — The species is the least collected and characterized of *Ochagavia*. Some specimens are not easy to discriminate from *O. litoralis*, but in our opinion distribution and altitudinal range jus-

tify maintainance of *O. andina* as a separate species. Nevertheless, additional collections and observations in the field are badly needed for this taxon. Keeping the collecting dates of the specimens in mind, *O. andina* may well have become very rare today.

*Remarks.* – A previous typification of the basionym *Rhodostachys andina* by Smith & Downs (1979: 1531) is in serious conflict with the protologue and has therefore to be rejected. These authors selected a specimen among the holdings at BM that is not from the locality “Linares” given in the protologue, but from “Cordilleres de Monte” or “Hacienda Cauquenes” respectively. In contrast, there is a specimen at SGO (where the types of names published by R. Philippi used to be deposited), with the locality “Linares”. This specimen has to be regarded as the holotype of the basionym. Because the holotype is fragmentary, as far as important characters are concerned, an additional epitype is selected here.

*Vernacular name.* – Cardoncillo.

*Further references.* – *Rhodostachys andina*: F. Philippi in *Anales Univ. Chile* 59: 279. 1881; André in *Rev. Hort.* 57: 540. 1885; Baker, *Handb. Bromel.*: 28. 1889, in *Bot. Mag.*: ad t. 7148. 1890; Philippi in *Anales Univ. Chile* 91: 608. 1895; Muñoz, *Espec. Pl. Descr. Philippi*: 35. 1960.

*Specimens seen.* – CHILE: VI REGIÓN: Bernardo O’Higgins, Cachapoal, Rancagua, Monte La Leona, 34°03’S, 70°39’W, 22.12.1804, *Bertero 114* (P); Baños de Cauquenes, 34°15’S, 70°34’W, *J. Elwes* (GH); *ibid.*, 3.1875, *Philippi* (SGO 46375); *ibid.*, 34°15’S, 70°34’W, 700 m, 15.2.1905, *E. Reed 183* (CONC); Colchagua, 34°35’S, 71°24’W, 1899, *C. Gay 56* (CONC, G). — VII REGIÓN: Maule, Cauquenes, Cord. Cauquenes, 35°53’S, 72°03’W, 5.1892, *Philippi* (SGO 75708); *ibid.*, 10.1904, *Reiche* (SGO 61209); Hac. Cauquenes, 35°58’S, 72°21’W, *Philippi* (SGO 75706); Talca, Cordillera de Maule, 35°59’S, 70°24’W, 2500 m, 1885, *P. Germain* (CONC 29530). — VIII REGIÓN: Biobío, Cueva de Pincheira, 36°54’S, 71°33’W, 1.1878, *Philippi* (SGO 75710). — WITHOUT PRECISE LOCALITY: Valleyres?, 12.11.1885, *W. Barbey* (G); 29.11.1885, *W. Barbey* (G); 1890, *J. Elwes 171* (E). — CULTIVATED MATERIAL: *E. F. André 350?* (NY).

#### 4. *Ochagavia carnea* (Beer) L. B. Smith & Looser

*Ochagavia carnea* (Beer) L. B. Sm. & Looser in *Rev. Univ. (Santiago)* 18(8): 1078. 1934 ≡ *Bromelia carnea* Beer, *Bromel.*: 31. 1856 ≡ *Rhodostachys carnea* (Beer) Mez in *Candolle, Monogr. Phan.* 9: 338. 1896 [“*carneus*”]. – Lectotype (designated by Smith & Downs 1979: 1533): [icon] t. 65 in Paxton’s *Fl. Gard.* 2. 1851.

= *Bromelia longifolia* Lindl. in *Paxton’s Fl. Gard.* 2: t. 65. 1851, nom. illeg., non Rudge 1805.

= *Bromelia lindleyana* Lem., *Jard. Fleur.* 3, t. 223. 1853, nomen prov. illeg.

= *Ruckia ellemeti* Regel in *Index Sem. Hort. Petrop.*: 28. 1867. – Type: [icon] t. 571 in *Gartenfl.* 17. 1868.

*Rhodostachys chamissonis* Mez in *Candolle, Monogr. Phan.* 9: 337. 1896 ≡ *Ochagavia chamissonis* (Mez) L. B. Sm. & Looser in *Rev. Univ. (Santiago)* 18(8): 1078. 1934. – Lectotype (designated by Smith & Downs 1979: 1531): Chile, Concepción, 2.-3.1816, *Chamisso 89* (B!). – Paralectotypes: Concepción, *D’Urville* (B!); Hualqui, *O. Kuntze* (B!, NY!); without locality, *Eschscholtz* (LE, FR [photo!]).

= *Rhodostachys grandiflora* Phil. in *Linnaea* 30: 202. 1859 ≡ *Ochagavia grandiflora* (R. Phil.) Mez in *Engler, Pflanzenr.* 100: 206. 1935. – Holotype: Chile, Andes of Colchagua, *Volckman* (B [destroyed]).

[– *Hechtia ellemeti* Hort. *Rhenotraj.* (“Miq.”) in *Cat. Hort. Bogor* “1866”: 41. 1866?, nom. nud.]

[– *Pourretia argentea* Hort. ex Wittm. in *Gartenfl.* 44: 556. 1895, nom. nud.]

*Stem* 16 to over 25 cm long and 2.5-5 cm in diameter. *Leaf sheaths* (3.5-)-4.5-9(-11.7) × 2.2-6.8 cm, broadly ovate; margin spinose-laciniate, ± entire toward base; ± lepidote to glabres-





Fig. 8. *Ochagavia carnea* – habit. – Photograph by G. Zizka, 1991.



Fig. 9. *Ochagavia carnea* – inflorescence. – Photograph by G. Zizka, 1991.



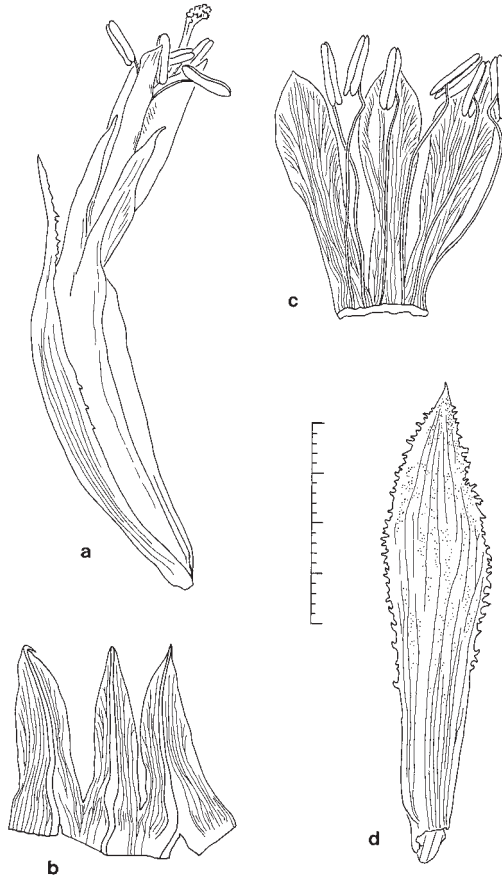


Fig. 10. *Ochagavia carnea* – a: floral bract and flower; b: sepals; c: petals and stamens; d: floral bract. – Scale bar = 2 cm; drawn from Zizka & Zöllner 1300 (FRP) by Ralph Mangelsdorff and Micheline Middeke.

cent toward base; *leaf blades* (38-)50-80(-120) × 1.2-3.4(-4.8) cm, conspicuously channelled, linear, spines 0.12-0.35 cm long, sparsely lepidote to glabrescent, only at base rarely ± densely lepidote below. *Inflorescence* 5-10 × 4-11 cm, with up to over 50 flowers, subcorymbose to globose, scape 5-17.5 cm long. *Outer bracts* (3.2-)4-10.6 × 1.5-4 cm. *Floral bracts* (3-)4.3-5.9(-6.7) × 0.6-1.5 cm. *Flowers* (3.5-)4.5-7.9 cm long, epigynous tube 0.3-0.7 cm long. *Sepals* 1.4-2.1(-2.4) × 0.3-0.5 cm, entire to inconspicuously spinose near apex. *Petals* 2.1-3.1 × 0.4-1 cm. *Stamens* exserted, filaments free. *Style* exceeding corolla 0.3-1.2 cm. *Fruit* 3-4.5 × 0.7-1 cm. *Seeds* 0.2 × 0.1-0.12 cm.

*Figures.* – Fig. 8-10; Lindley in Paxton's Fl. Gard. 2: t. 65. 1851; Lemaire, Jard. Fleur. 3: t. 223. 1853; Regel in Gartenfl. 17: t. 571. 1868; Smith & Downs 1979: fig. 491.

*Distribution.* – From Valparaiso (Valparaiso region, V) to Malleco (Araucanía region, IX). (60-)200-1080 m elevation.

*Habitat.* – In the moist understorey of woodlands and in ravines, especially near riverbanks.

*Remarks.* – This species is easily identified by the leaves being  $\pm$  glabrous below and the size of the plants, being usually distinctly larger than the other species.

*Further references.* – *Rhodostachys carnea*: Reiche, Grundz. Pfl.-Verbr. Chile: 67. 1907. — *Ochagavia carnea*: Muñoz, Syn. Fl. Chil.: 211. 1959; McClintock in Watsonia 10: 290. 1974-75; Rauh & Groß, Bromelien: 398. 1990; Zöllner & Oyanedel in J. Bromeliad Soc. 41: 169. 1991. — *Ruckia ellemeti*: Regel in Gartenfl. 17: 65, t. 571. 1868; Gard. Chron. 1: 243. 1874. — *Rhodostachys grandiflora*: Baker, Handb. Bromel.: 29. 1889; F. Philippi in Anales Univ. Chile 59: 279. 1881; Philippi in Anales Univ. Chile. 91: 610. 1895; Mez in C. Candolle, Monogr. Phan. 9: 337. 1896; Muñoz, Espec. Pl. Descr. Philippi: 35. 1960. — *Ochagavia grandiflora*: Zöllner & Oyanedel in J. Bromeliad Soc. 41: 169. 1991. — *Ochagavia chamissonis*: Mez in Engler, Pflanzenr. 100: 204. 1935; Zöllner & Oyanedel in J. Bromeliad Soc. 41: 169. 1991.

*Specimens seen.* – CHILE: V REGIÓN: VALPARAÍSO: Limache, 32°57'S, 71°20'W, 100 m, 14.2. 1960, A. Garaventa 4666 (CONC); Quilpué, Alvarado, 33°03'S, 71°07'W, 8.1.1991, G. Zizka & O. Zöllner 1300 (FR!, FRP!); Valle Marga-Marga, Las Piedras, 33°01'S, 71°34'W, 230 m, 3.1945, M. Grisar (CONC 20627); Quillota, Quebrada Castro, 33°03'S, 71°07'W, 800 m, 6.2.1993, O. Zöllner 20260 (HBG); Cerro Marga-Marga, Coliguay-El Molino, 33°04'S, 71°08'W, 700 m, 23.5.1987, G. S. U. Varadarajan, A. Penaloza & A. Flores 1489 (GH); Colliguay, 33°10'S, 71°09'W, 470 m, 3.1971, O. Zöllner 4685 (CONC); *ibid.*, 25.1.1981, O. Zöllner 11129 (MO). — VII REGIÓN: MAULE: Talca, Constitución, 7.1891, Reiche (SGO 67442); Cordillera de Maule, 35°59'S, 72°25'W, P. Germain (BM,G, P). — VIII REGIÓN: BIOBÍO: Concepción, A. von Chamisso 89 (B, GH); *ibid.*, 36°49'S, 73°03'W, D'Urville 295 (P); *ibid.*, D'Urville (B); Hualqui, 20.2.1892, O. Kuntze (B, NY); 23.2.1946, C. Junge 5095A (GH); Hualpén, 36°47'S, 73°09'W, 60 m, 7.3.1981, E. Ugarte & R. Rodríguez (CONC 105336); Coronel, Santa Juana, Río Lías, Fundo Papal, 37°14'S, 73°02'W, 490 m, 16.2.1969, R. Rodríguez 9 (CONC); Quebrada Honda, Puentes Mellizos, 37°07'S, 73°07'W, 175 m, 21.4.1976, C. Marticorena, M. Quezada & R. Rodríguez 1081 (CONC); Ñuble, Fundo Atacalco, 36°48'S, 71°44'W, 800-900 m, 13.9.1945, A. Pfister 5074 (GH); orillas del Diquín, 36°53'S, 71°38'W, 600 m, 14.3.1951, A. Pfister (CONC 10625); *ibid.*, 36°50'S, 71°47'W, 800-900 m, 23.2.1946, O. Heck 5085, 5085A, 5085B (GH); Los Lleuques, Río Renegado, 36°51'S, 71°38'W, 850 m, 30.1.1990, M. F. Gardner 4668 (E). — IX REGIÓN: ARAUCANÍA: Malleco, Termas de Tolhuaca, 38°13'S, 71°44'W, 1080 m, 20.3.1933, G. Looser 2665 (GH); alrededores de Pidima, 38°03'S, 72°29'W, 30.12.1946, P. Loosli 5220 (GH); Curacautin, Casa de Fundo Tolhuaca, 38°14'S, 71°58'W, 800 m, 29.4.1977, G. Montero 10445 (CONC).

## Nomina dubia

### *Ochagavia leiboldiana*

*Rhodostachys leiboldiana* Mez in Candolle, Monogr. Phan. 9: 338. 1896 [*“leiboldianus”*].

Holotype: Chile, without locality (“in Exp. Donau”), *Leibold* 2960 (W, destroyed)  $\equiv$  *Ochagavia leiboldiana* (Mez) L. B. Sm. & Looser in Rev. Univ. (Santiago) 18(8): 1078. 1934.

*Remarks.* – The type specimen deposited in the collections of the Natural History Museum in Vienna (W) was destroyed in a fire shortly after World War II (Till 1994). No collecting data (coastal or Andean habitat) are given in the protologue, thus it remains doubtful from the description, whether *Rhodostachys leiboldiana* must be regarded conspecific with *Ochagavia litoralis* or *O. andina*. For this reason, we did not select a neotype. The information given about leaf size (length:  $\pm$  0.4 m, width: up to 8 mm) and indumentum of the abaxial leaf blade surface clearly points toward one of the above mentioned *Ochagavia* species.

*Further references.* – Mez in Engler, Pflanzenr. 100: 204. 1935.

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Palmengarten der Stadt Frankfurt am Main, to Dr Walter Till (WU), Melica Muñoz S. (SGO), Prof. Dr Clodomiro Marticorena (CONC), Harry E. Luther (SEL), Dr Stefan Dressler (FR) and Dr Julio Schneider (FR) for information, corrections and comments. We are grateful to the Deutsche Forschungsgemeinschaft (DFG ZI 557/2) for financial support.

### List of studied specimens

*Ochagavia elegans* = 1, *O. litoralis* = 2, *O. andina* = 3, *O. carnea* = 4

André, E. F. 350? (NY) = 3;

Barbey, W. s.n. (G) = 3; s.n. (G) = 3; Behn, K. s.n. (CONC 20626) = 2; Bertero, C. 114 (P) = 3;

Billiet, F. & Jadin, B. 5683 (BR) = 1; Bock, C. 48 (CONC, GH, HBG, NY, US) = 1; Bock, C. 20199 (CONC) = 1; Bock, C. s.n. (CONC) = 1; Bryan, W. A. 89 (MO) = 1;

Chamisso, A. von 89 (B, GH, photo) = 4;

D'Orbigny 113? (P, LE?) = 2;

D'Urville 295 (P) = 4; D'Urville s.n. (B) = 4;

Elwes, J. 171 (E) = 3; Elwes, J. s.n. (GH) = 3; Espinosa, M. R. s.n. (SGO 84893) = 2;

Foster, M. B. s.n. (US) = 2;

Garaventa, A. 4666 (CONC) = 4; Gardner, M. F. 4668 (E) = 4; Gaudichaud, M. s.n. (P) = 2;

Gay, C. 56 (CONC, G) = 3; Gay, C. 155 (P) = 2; Gay, C. 155(?) (B, GH, NY) = 2; Germain, P. s.n. (CONC 29530) = 3; Germain, P. s.n. (G, P) = 4; Germain, P. s.n. (BM) = 4; Grandjot, C. 3325 (CONC) = 2; Grisar, M. s.n. (CONC 20627) = 4;

Hastings, G. T. 260 (US) = 1; Heck, O. 5085 (NY) = 4; Heck, O. 5085A (GH) = 4; Heck, O. 5085B (GH) = 4;

Ibanez, J. 3459 (GH) = 2;

Jiles, C. 3017 (CONC) = 2; Johow, F. s.n. (SGO) = 1; Junge, C. 5095A (GH) = 4; Junge, C. 5095B (GH) = 4;

Kuntze, O. s.n. (B, NY) = 4;

Landbeck, C. L. s.n. (SGO 67439) = 2; Landeros, A. 6475 (CONC) = 1; Landrum, L. R. 4333 (MO, NY, SGO) = 2; Looser, G. 2665 (GH) = 4; Looser, G. 3457 (GH) = 2; Looser, G. 3458 (GH) = 2; Looser, G. 5497 (US) = 2; Loosli, P. 5220 (GH) = 4;

Marticorena, C. & Ugarte, E. 9096 (CONC) = 1; Marticorena, C., Quezada, M. & Rodríguez, R. 1081 (CONC) = 4; Marticorena, C., Rodríguez, R., Ugarte, E. & Arriagada, J. 9112 (CONC) = 1; Meyer, F. G. 9572 (K, MO) = 1; Meyer, F. G. 9680 (MO, K, S) = 1; Milner, R. 9560 (CONC) = 2; Milner, R. s.n. (CONC 24449) = 2; Montero, G. 10445 (CONC) = 4; N. N. s.n. (SGO 67441) = 2;

Pfister, A. 5074 (GH) = 4; Pfister, A. s.n. (CONC 10625) = 4; Philippi, R. A. 941 (B, GH) = 1; Philippi, R. A. 29961 (GH) = 1; Philippi, R. A. s.n. (SGO 46375) = 3; Philippi, R. A. s.n. (SGO 75706) = 3; Philippi, R. A. s.n. (SGO 75708) = 3; Philippi, R. A. s.n. (SGO 75710) = 3; Philippi, R. A. s.n. (BM) = 3; Philippi, R. A. s.n. (BM) = 2; Planella, I. 213 (S) = 1; Poeppig, E. 1845 (G) = 2;

Reed, E. 183 (CONC) = 3; Reiche, K. s.n. (SGO 61209) = 3; Reiche, K. s.n. (SGO 67442) = 4; Revuelta, G. s.n. (SGO 78901) = 1; Revuelta, G. & Mann, W. G. 47870 (CONC) = 1; Rodríguez, R. 9 (CONC) = 4;

Skottsberg, C. & I. 21 (HBG) = 1; Skottsberg, C. & I. 104 (S) = 1; Skottsberg, C. & I. 175 (BM, GH, K, NY, O, S) = 1; Skottsberg, C. & I. 337b (S) = 1; Solbrig, O. T., Moore, H. E., Walker, J. & J. R. 3838 (GH) = 1; Sparre, B. 47 (K, S) = 1; Sparre, B. 337 (CONC, S) = 1; Stuessy, T. 12066 (FRP) = 1; Stuessy, T. & Sanders, R. 5089 (CONC) = 1; Stuessy, T., Crawford, D., Valdebenito, H. & Landeros, A. 6552 (CONC) = 1; Stuessy, T., Matthei, O., Sanders, R. & Valdebenito, H. 5413 (CONC) = 1;

Ugarte, E. & Rodríguez, R. s.n. (CONC 105336) = 4;

*Valdebenito, H. & Landeros, A. 6597 (CONC) = 1; Valdebenito, H., Ruiz, E. & Landeros, A. 6331 (CONC) = 1; Varadarajan, G. S., Penaloza, A. & Flores A. 1489 (GH) = 4; Weber, H. s.n. (SGO 46395) = 1; Wilkes, C. s.n. (GH) = 2; Zizka, G. 1301a (FRP) = 2; Zizka, G. 1444 (FRP) = 2; Zizka, G. 1450 (FRP) = 2; Zizka, G. & Zöllner, O. 1300 (FRP) = 4; Zöllner, O. 4685 (CONC) = 4; Zöllner, O. 8187 (MO) = 2; Zöllner, O. 11129 (MO) = 4; Zöllner, O. 20260 (HBG) = 4; Zöllner, O. 20817 (HBG) = 2.*

## References

- Clement, E. J. & Foster, M. C. 1994: Alien plants of the British Isles. – London.
- Danton, P. 2002: *Bromeliaceae* et *Orchidaceae* de l'archipel Juan Fernández (Chili). – *Richardiana* **2(3)**: 93-110.
- Ehler, N. & Schill, R. 1973: Die Pollenmorphologie der *Bromeliaceae*. – *Pollen & Spores* **15**: 13-45.
- Erdtmann, G. & Praglowski, J. 1974: A note on pollen morphology. – In: Smith, L. B. & Downs, R. J. (ed.), *Pitcairnioideae (Bromeliaceae)*. – *Fl. Neotrop. Monogr.* **14,3**: 28-33.
- Gajardo, R. 1995: La vegetación natural de Chile. Clasificación y distribución geográfica, ed. 2. – Santiago de Chile.
- Grau, J. 1995: Aspectos geográficos de la flora de Chile. – Pp. 63-118 in: Marticorena, C. & Rodríguez, R. (ed.), *Flora de Chile* **1**. – Concepción.
- Hoffmann, A. E. 1979: Flora silvestre de Chile. Zona central, ed. 2. – Santiago de Chile.
- & Flores, A. R. 1989: The conservation status of Chilean succulent plants: a preliminary assessment. – Pp. 107-121 in: Benoit, I. (ed.), *Red List of Chilean terrestrial flora*. – Santiago de Chile.
- Horres, R. & Zizka, G. 1995: Untersuchungen zur Blattsukkulenz bei *Bromeliaceae*. – *Beitr. Biol. Pfl.* **69**: 43-76.
- , Zizka, G., Kahl, G. & Weising, K. 2000: Molecular phylogenetics of *Bromeliaceae*: evidence from trnL(UAA) intron sequences of the chloroplast genome. – *Pl. Biol.* **2**: 306-315.
- Mez, C. 1896: *Rhodostachys, Bromeliaceae*. – Pp. 335-339 in: Candolle, C. (ed.), *Monographiae phanerogamarum* **9**. – Paris.
- 1934-35: *Ochagavia, Bromeliaceae*. – Pp. 203-206 in: Engler, A. (ed.), *Das Pflanzenreich* **100**. – Leipzig.
- Nelson, E. C. & Zizka, G. 1997: *Fascicularia (Bromeliaceae)*: which species are cultivated and naturalized in northwestern Europe? – *New Plantsman* **4**: 232-239.
- Philippi, R. A. 1856: Observaciones sobre la flora de Juan Fernández. – *Anales Univ. Chile* **13**: 157-169.
- 1856a: Bemerkungen über die Flora der Insel Juan Fernandez. – *Bot. Z.* **14**: 641-650.
- 1857-58: *Plantarum novarum Chilensium. Centuria quinta*. – *Linnaea* **29**: 48-95.
- Rauh, W. & Groß, E. 1990: *Bromelien*. – Stuttgart.
- Schmithüsen, J. 1956: Die räumliche Ordnung der chilenischen Vegetation. – *Bonner Geogr. Abh.* **17**.
- Skottsberg, C. 1928: Pollinationsbiologie und Samenverbreitung auf den Juan Fernández-Inseln. – *Nat. Hist. Juan Fernandez* **4(18)**: 503-547. – Uppsala.
- 1953: Notas sobre la vegetación de las Islas de Juan Fernández. – *Anales J. Bot. Madrid* **11**: 515-544.
- Smith, L. B. & Downs, R. J. 1979: *Ochagavia (Bromelioideae, Bromeliaceae)*. – *Fl. Neotrop. Monogr.* **14,3**: 1527-1533.
- & Looser, G. 1934: Notas sobre las Bromeliáceas Chilenas. – *Rev. Univ. (Santiago)* **18(8)**: 1075-1081.
- & Till, W. 1998: *Bromeliaceae*. – Pp. 74-99 in: Kubitzki, K. (ed.), *The families and genera of vascular plants* **4**. – Berlin, etc.
- Stace, C. 1997: *New flora of the British Isles*, ed. 2. – Cambridge.

- Till, W. 1984: Sippendifferenzierung innerhalb von *Tillandsia* subgenus *Diaphoranthema* in Südamerika mit besonderer Berücksichtigung des Andenostandes und der angrenzenden Gebiete. – Diss. Bot. Inst. Univ. Wien.
- 1994: The type specimens of *Bromeliaceae* in the herbarium of the Museum of Natural History in Vienna, Austria. – *Selbyana* **15**: 94-111.
- Wilkin, P. 1996: *Ochagavia elegans*. – *Curtis's Bot. Mag.* **13,1**: 22-26.
- Will, B. & Zizka, G. 1999: The genus *Greigia* Regel in Chile. – *Harvard Pap. Bot.* **4**: 225-240.
- Zizka, G., Horres, R., Nelson, C. & Weising, K. 1999: Revision of the genus *Fascicularia* Mez (*Bromeliaceae*). – *Bot. J. Linn. Soc.* **129**: 315-332.
- Zöllner, O. & Oyanedel, E. 1991: A Chilean bromeliad genus of the temperate zone. – *J. Bromeliad Soc.* **41**: 169-171.

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