

## The Alstroemeriaceae in Peru and neighbouring areas

### Alstroemeriaceae en Perú y áreas vecinas

Anton Hofreiter<sup>1</sup> and Eric F. Rodríguez<sup>2</sup>

<sup>1</sup> Ludwig-Maximilians-Universität, Department Biologie I, Bereich Biodiversitätsforschung, Abteilung Systematische Botanik, Menzingerstraße 67, D-80638 München, Germany.

Anton Hofreiter e-mail: [hofreiter@freenet.de](mailto:hofreiter@freenet.de)

<sup>2</sup> Herbarium Truxillense (HUT), Universidad Nacional de Trujillo, Jr. San Martín 392, Trujillo, Perú,

Eric F. Rodríguez e-mail: [efrr@unitru.edu.pe](mailto:efrr@unitru.edu.pe)

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#### Abstract

The family Alstroemeriaceae with special emphasis in Peru is revised using morphological and distributional data. Species in this family were reinvestigated on the basis of all types, material housed in several herbaria and five field trips, each of which lasted several weeks, were undertaken to South America to study the plants in the field. The taxonomic and collection history of the genus is described and for each species the typical growth forms and their variability, habitat preferences and general distribution are discussed. A key to determine the species of Peru in English and Spanish is provided. The study area comprise five geographic units recognised: Amotape-Huancabamba-region (Ecuador, Peru), Cordillera Occidental (Peru), Cordillera Central (Peru), Cordillera Oriental (Bolivia, Peru) and the Altiplano (Bolivia, Peru). The family as here circumscribed comprises two species of *Alstroemeria* and 68 species of *Bomarea*, of these 68 species 43 species are members of subgenus *Bomarea*, 9 species of subgenus *Sphaerine* and 16 of the subgenus *Wichurea*. The fourth and last subgenus into *Bomarea* genus denominated *Baccata* cannot be found in the area of this study. Six new species to science of *Bomarea* are described: *B. amazonica*, *B. libertadensis*, *B. lopezii*, *B. macusanii*, *B. pseudopurpurea*, *B. weigendii*.

**Key words:** *Bomarea*, *Alstroemeria*, Andes, revision, Peru, distribution.

#### Resumen

Las Alstroemeriaceae peruanas fueron revisadas por última vez por Killip (1936). Es necesaria una nueva revisión. Cinco viajes de campo de varias semanas cada uno fueron emprendidos a Sudamérica con el fin de estudiar las plantas *in situ*. En el presente trabajo se describe la historia taxonómica y colección de los géneros con especial énfasis en el Perú. El área descrita no considera fronteras políticas sino unidades geográficas de acuerdo a Baumann (1988), Berry (1982), Duellman (1979), Simpson (1975, 1979) y Weigend (2002). Se reconocen cinco unidades geográficas: Región Amotape-Huancabamba (Ecuador, Perú), Cordillera Occidental (Perú), Cordillera Central (Perú), Cordillera Oriental (Bolivia, Perú) y el Altiplano (Bolivia, Perú). Se brinda una clave taxonómica en inglés y español para determinar las especies del Perú. Para cada una de las especies se discute la forma típica de crecimiento y su variabilidad, preferencias de hábitat y distribución general. Se identifican las especies de Ruiz & Pavón (1802). Ellos describieron en su *Flora de Chile y Perú* 23 especies de *Alstroemeria*, 18 fueron de Perú, ahora 17 son incluidas en *Bomarea*, todas proceden de Perú. El género *Bomarea* está subdividido en 4 subgéneros: *Baccata*, *Bomarea* s. str., *Sphaerine* y *Winchurea* (Hofreiter & Tillich, 2002). *Alstroemeria* no es dividido en subgéneros, pero existen dos grupos reconocidos, *Alstroemeria* de Chile y Brasil. En el área de estudio se encuentran dos especies de *Alstroemeria* y 68 de *Bomarea*, de ellas 43 especies pertenecen al subgénero *Bomarea*, 9 especies al subgénero *Sphaerine* y 16 especies al subgénero *Wichurea*. El subgénero *Baccata* no se encuentra en el área de estudio. Seis de las especies del género *Bomarea* son nuevas para la ciencia: *B. amazonica*, *B. libertadensis*, *B. lopezii*, *B. macusanii*, *B. pseudopurpurea*, *B. weigendii*.

**Key words:** *Bomarea*, *Alstroemeria*, Andes, revisión, Perú, distribución.

#### Introduction

The Alstroemeriaceae recently comprise two genera: *Alstroemeria* L. (ca. 75 species) (Bayer 1987; Aker & Healy 1990, Muñoz & Moreira 2003) and *Bomarea* Mirb. (ca. 120). Dumortier (1829) established the family Alstroemeriaceae as part of his Iridaridae.

*Alstroemeria* occurs from Central Peru to Patagonia at the western side of the continent and from Venezuela to Argentina on the eastern side, see table 1. They mostly prefer drier habitats to those of *Bomarea*, but in Brazil at least one species grows in swamps. The centres of diversity are the Mediterranean zone of

Central Chile and the mountains of south eastern Brazil. *Alstroemeria* species are found between sea level and 4000 m.

The genus can be divided into two groups the Brazilian and the Chilean group. The flowers of the Chilean group are more open than the Brazilian species, but there are several exceptions. Both of the Peruvian species fit into the Chilean group.

*Bomarea* is distributed from Mexico in the north to Argentina/Chile in the south, see table 1. The genus is nearly restricted to the American cordillera. The centre of diversity is in the Andes of Ecuador and Peru. *Bomarea* occurs from the foot of the Andes up to 5200 m altitude. With the exception of swamps

one can find *Bomareas* in nearly all types of habitats (Fig 7a). They grow in rain forests, cloud forests, hedges, deserts, between rocks, in moss cushions, even epiphytic and they have twining as well as erect growth types.

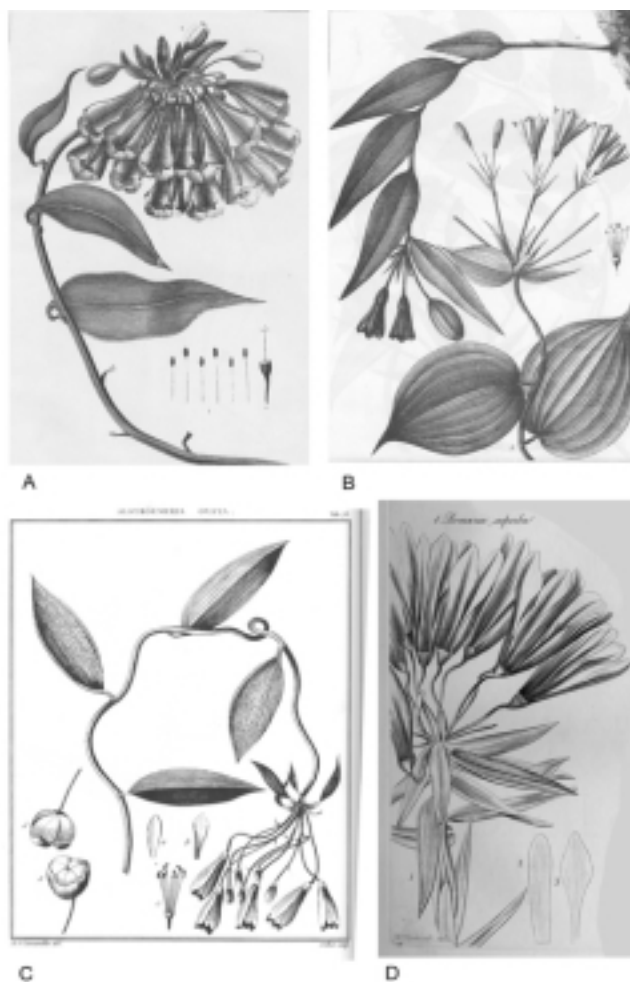
The genus *Bomarea* is divided into four subgenera (Hofreiter & Tillich, 2002): *Baccata*, *Bomarea* s.str., *Sphaerine* and *Wichuraea*. The subgen. *Wichuraea* and *Sphaerine* have been revised (Hofreiter & Tillich, 2003; Hofreiter, 2005).

The Cordilleras of Peru and adjacent areas are divided into 5 geographic regions according to Baumann (1988), Berry (1982), Duellman (1979), Simpson (1975, 1979) and Weigend (2002). The two regions with the most *Bomarea* species are the Amotape-Huancabamba-region (33 species) in southern Ecuador and northern Peru and the Cordillera Central (35) of Peru.

**Taxonomic and collection history of Alstroemeriaceae especially in Peru**

Feuillée (1714) discovered the first species of *Bomarea* and *Alstroemeria* in Chile. He described them as *Hemerocallis*. Linné (1762) described them formally in the *Planta Alströmeria* and named them *Alstroemeria ligtu*, *A. pelegrina* and *A. salsilla*. The first Peruvian species was described by Cavanilles (1791) as *Alstroemeria ovata* (Fig 1C).

Mirbel (1804) introduced the genus *Bomarea* with the species *B. salsilla* (L.) Mirb., *B. ovata* (Cav.) Mirb. and *B. multiflora* (L. f.) Mirb. Dombey, Ruiz & Pavón made the first extensive collection of Peruvian Alstroemeriaceae during their voyage from 1777 – 1788. The two French scientists Anne Robert Jacques Turgot and Joseph Dombey initiated the expedition. Ruiz & Pavón (1802) described in their *Flora of Chile and Peru* 23 *Alstroemeria* species, 18 are from Peru, 17 are now included in *Bomarea*. Dombey, Ruiz & Pavón collected 16 of the 18 species in Central Peru (Fig 1A, B). The other two species grow in the Department Arequipa in the south of Peru. They spent altogether two years in Peru. Important collection sites are Huassa-Huassi (Depto. Junin), Muna (Depto. Huánuco) and Pillao (Huánuco). All these



**Figure 1.** (A) *B. formosissima* in Ruiz & Pavón (1802); (B) left side *B. secundifolia*, right side *B. cordifolia* in Ruiz & Pavón (1802); (C) *B. ovata* in Cavanilles (1791); (D) *B. superba* in Herbert (1837).

**Table 1.** Countries and species number. The dates are based on our examinations and Bayer (1987), Aker & Healy (1990), Gereau (1994), Sanso & Xifreda (1995), Sanso (1996), Garbisco & Estrada (2001), Assis (2002), Harling & Neuendorf (2003), Muñoz & Moreira (2003) and Hofreiter (2005a).

	<i>Alstroemeria</i>	<i>Bomarea</i>
Argentina	10	5
Bolivia	1	18
Brazil	39	1
Chile	33	4
Colombia	0	25
Costa Rica	0	6
Ecuador	0	38
Greater Antilles	0	1
Guatemala	0	2
Guianas	1	1
Honduras	0	2
Mexico	0	2
Nicaragua	0	3
Panama	0	4
Paraguay	1	0
Peru	2	64
Uruguay	1	0
Venezuela	1	9

collection sites are in the Cordillera Central. From Huassa-Huassi Ruiz & Pavón described 4 different species, two of them are know in *Bomarea* s.str. (*B. anceps* and *B. rosea*) one in *Sphaerine* (*B. coccinea*) and one in *Wichuraea* (*B. bracteata*). *Bomarea bracteata* is the only *Wichuraea* species described by Ruiz & Pavón. They collected a second species but never described it. It bears in the collection of the Madrid Herbarium the name *B. crocea*. The type collection contains an erect and a climbing species. Ruiz & Pavón described *B. crocea* as a climbing plant. From Muña they described 4 species: two *Bomarea* s.str. species (*B. formosissima* and *B. tomentosa*) and two *Sphaerine* species (*B. distichifolia* and *B. secundifolia*). *Bomarea secundifolia* has only been collected 3 times since. A. Humboldt and J. Bonpland also made collections of *Bomarea* in northern Peru on their voyage from 1799 – 1804. The next important collector for Peru was A. Matthews, however his collections are often not labelled very exactly. He collected between 1831 and 1841. Because of his letters we know he reached the Rio Apurimac in the south, in central Peru he was in Ayacucho, Huánuco, Pasco and Huancayo. In the north he was in Moyobamba and Chachapoyas where he died in 1841. Herbert (1837) made the first monograph of the genus (Fig. 1D). He described 19 new species in *Bomarea*, 12 because of the Matthew's specimens. Herbert (1837) added two new genera to the family: *Collania* (5 species) and *Sphaerine* (5 species). Herbert also described the second *Alstroemeria* species for Peru (*A. pygmaea*).

**Table 2.** Taxonomic history of the genera and subgenera description of Alstroemeriaceae

Year of publication	Author	Genera/subgenera description	Valid status of group
1762	Linné, C.	Genus <i>Alstroemeria</i> ; type: <i>A. pelegrina</i> L.	Genus <i>Alstroemeria</i>
1804	Mirbel, C. F. B.	Genus <i>Bomarea</i> ; type: <i>B. ovata</i> (Cav.) Mirb.	Genus <i>Bomarea</i>
1812	Salisbury, G.	Genus <i>Vandesia</i> ; type: <i>B. edulis</i> (Tussac.) Herb.	Synonym of <i>Bomarea</i>
1836	Adanson, M.	Genus <i>Ligtu</i> ; type: <i>A. ligtu</i> L.	Synonym of <i>Alstroemeria</i>
1837	Herbert, W.	Genus <i>Sphaerine</i> ; type: <i>B. distichifolia</i> (Herb.) Baker	Subgenera <i>Sphaerine</i> of <i>Bomarea</i>
1837	Herbert, W.	Genus <i>Collania</i> ; type: <i>B. involucrosa</i> (Herb.) Baker	Subgenera <i>Wichuraea</i> of <i>Bomarea</i>
1838	Rafinesque, C. S.	Genus <i>Piriopetalum</i> ; type: <i>A. pallida</i> Grah.	Synonym of <i>Alstroemeria</i>
1838	Rafinesque, C. S.	Genus <i>Lilavia</i> ; type: <i>A. psittacina</i> Lehm.	Synonym of <i>Alstroemeria</i>
1838	Rafinesque, C. S.	<i>Dodecasperma</i> ; type: <i>B. acutifolia</i> (Link & Otto) Herb.	Synonym of <i>Bomarea</i>
1847	Roemer, M.	Genus <i>Wichuraea</i> ; type: <i>B. involucrosa</i> (Herb.) Baker	Subgenera <i>Wichuraea</i> of <i>Bomarea</i>
1866	Salisbury, G.	<i>Danbya</i> ; type: <i>B. distichifolia</i>	Synonym of <i>Bomarea</i>
2002	Hofreiter, A.	Subgenera <i>Baccata</i> of <i>Bomarea</i> ; type: <i>B. allenii</i> Killip	Subgenera <i>Baccata</i> of <i>Bomarea</i>

The genus *Sphaerine* was only known from Peru. In *Bomarea* he recognised 40 species, 22 species were based on Peruvian specimen. Roemer (1847) noticed that the name *Collania* had been used earlier by Schultes & Schultes (1830) for another genus (now in the synonymy of *Urceolina* Rchb.), and he introduced the new name *Wichuraea*. For the taxonomic history of the genera and subgenera description of Alstroemeriaceae see table 2. Baker (1888) wrote the next important and last monograph of the genus so far. He recognised 75 species: 52 (17 in Peru) in *Bomarea* s.str., 20 (8) in *Sphaerine* and 3 (2) in *Wichuraea*. In his regional monograph for the Flora of Peru, Killip (1936) subdivided *Bomarea* into three subgenera: *Eubomarea*, *Sphaerine* and *Wichuraea*, the latter he named incorrectly *Wichauraea*. He accepted 64 species for Peru: 39 in *Eubomarea*, 7 in *Sphaerine* and 12 in *Wichuraea*, in *Alstroemeria* 6 species. The next important botanist for *Bomarea* was Vargas. Vargas described 10 new species from Peru especially around Cusco. For the history of species description of Peruvian Alstroemeriaceae see table 3.

Altogether, recently 86 names of *Bomarea* species and three names of *Alstroemeria* species are based on Peruvian specimen.

### ***Alstroemeria* and *Bomarea***

In the study area the two genera can be easily distinguished. Only two species of *Alstroemeria* occur (Fig. 19). One species (*A. lineatiflora*), is a typical member of the Chilean group of *Alstroemeria*, the second species (*A. pygmaea*) is a very small, high Andean plant. Both cannot be confused with any *Bomarea* species (Fig. 2, 3, 4, 5). The differences between the two genera are: in *Alstroemeria* the fruit is a dry explosive capsule and the seed coat is dry, in *Bomarea* the seeds are always adapted to animal

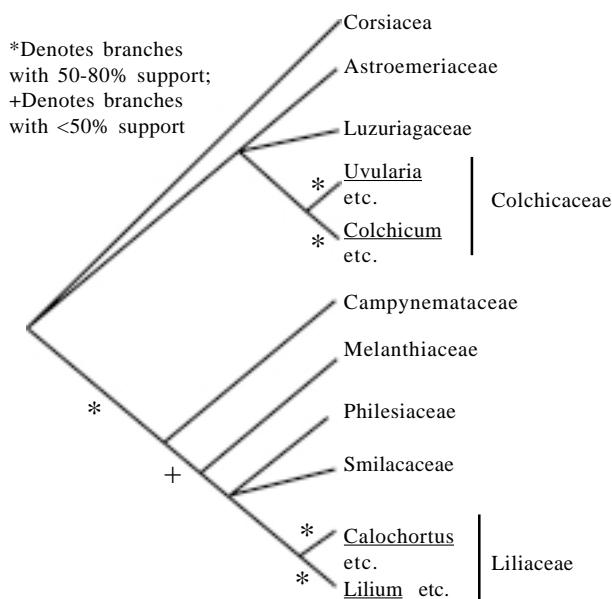
distribution. *Bomareas* have a dehiscent leathery capsule, their seeds have a fleshy red, orange or yellow sarcotesta or an indehiscent berry, these seeds have a thin whitish-grey sarcotesta. The outer tepals of *Bomarea* are always firmer in texture than the inner ones. In *Alstroemeria* the outer and inner tepals are equally tender and petaloid. This gives the flowers a different appearance and with some experience it is easy to distinguish between *Alstroemeria* and *Bomarea*. But there exist some less obvious differences as well. The basic chromosome number in *Alstroemeria* is  $x=8$  and in *Bomarea* s.str.  $x=9$  (Whyte, 1929; Sato, 1938; Bayer, 1988; Hunziker & Xifreda, 1990; Meerow et al., 1999). Some examinations in subgenus *Wichuraea* (*B. dulcis*, *B. glaucescens*) and in subgenus *Sphaerine* (*B. distichifolia*, *B. brevis*) have confirmed this number, so that  $x=9$  is likely to be the basic number for the entire genus. Only the subgenus *Baccata* has not been investigated yet due to lack of fresh material. *Alstroemeria* has much larger chromosomes and seems to have much more DNA than *Bomarea* (Sato, 1938; Hunziker & Xifreda, 1990). Schulze (1978) found the pollen surface of *Alstroemeria* to be striate-reticulate and that of *Bomarea* to be foveolate-reticulate. Buxbaum (1951) found in *A. aurea* Graham that the central cylinder of the root tubers are not enlarged compared to central cylinder of the slender nutritive roots. This has been observed in five further species of *Alstroemeria* (*A. lineatiflora* Ruiz & Pav., *A. psittacina* Lehmann, *A. pelegrina* L., *A. ligtu* L. and *A. pygmaea* Herb. In *Bomarea* generally the central cylinder is enlarged, so that its diameter is more or less half of the tuber diameter. See Hofreiter & Tillich (2002) for further discussion on the differences between *Alstroemeria* and *Bomarea*.

**Table 3.** History of species description of Peruvian Alstroemeriaceae

Year of publication	Author of species	Accepted species
1791	Cavánilles, A. J.	<i>B. ovata</i>
1802	Ruiz, H. and Pavón, J.	<i>A. lineatiflora</i> , <i>B. bracteata</i> , <i>B. coccinea</i> , <i>B. cordifolia</i> , <i>B. crocea</i> , <i>B. denticulata</i> , <i>B. distichifolia</i> , <i>B. formosissima</i> , <i>B. latifolia</i> , <i>B. purpurea</i> , <i>B. rosea</i> , <i>B. secundifolia</i> , <i>B. setacea</i>
1815	Kunth, C. S.	<i>B. glaucescens</i> , <i>B. torta</i>
1831	Hooker, W. J.	<i>B. dulcis</i>
1837	Herbert, W.	<i>A. pygmaea</i> , <i>B. andimarcana</i> , <i>B. aurantiaca</i> , <i>B. brevis</i> , <i>B. cornigera</i> , <i>B. cornuta</i> , <i>B. crinita</i> , <i>B. densiflora</i> , <i>B. dispar</i> , <i>B. involucrosa</i> , <i>B. nervosa</i> , <i>B. obovata</i> , <i>B. pardina</i> , <i>B. superba</i>
1842	Herbert, W.	<i>B. uncifolia</i>
1845	Bentham, G.	<i>B. angulata</i> , <i>B. brachsepala</i> , <i>B. multipes</i>
1882	Baker, J. G.	<i>B. dissitifolia</i> , <i>B. goniocaulon</i> , <i>B. hartwegii</i>
1888	Baker, J. G.	<i>B. crassifolia</i> , <i>B. parvifolia</i> , <i>B. pumila</i>
1902	Baker, J. G.	<i>B. boliviensis</i>
1908	Kränzlin, F.	<i>B. endotrachys</i> , <i>B. engleriana</i> , <i>B. tarmensis</i> , <i>B. tribrachiata</i>
1932	Killip, E. P.	<i>B. angustissima</i> , <i>B. nematocaulon</i> , <i>B. speciosa</i>
1935	Killip, E. P.	<i>B. campylophylla</i> , <i>B. dolichocarpa</i>
1936	Killip, E. P.	<i>B. porrecta</i>
1943	Vargas, C.	<i>B. ampayesana</i> , <i>B. velascoana</i>
1945	Vargas, C.	<i>B. herrerae</i>
1965	Vargas, C.	<i>B. longistyla</i>
1991	Smith, N. D. and Gereau, E. R.	<i>B. albimontana</i>
2003	Hofreiter, A.	<i>B. vargasii</i>
2003	Harling, G and Neuendorf, M	<i>B. campanuliflora</i>
2004	Hofreiter, A.	<i>B. peruviana</i>
2004	Hofreiter, A. and Rodríguez, E.	<i>B. alstroemeroides</i>
2005	Hofreiter, A	<i>B. chaparensis</i> , <i>B. foertheriana</i> , <i>B. huanuco</i>
This publication	Hofreiter, A and Rodríguez, E	<i>B. amazonica</i> , <i>B. libertadensis</i> , <i>B. lopezii</i> , <i>B. macusanii</i> , <i>B. pseudopurpurea</i> , <i>B. weigendii</i>

### Phylogeny of the Alstroemeriaceae

The genera of the Alstroemeriaceae have been summarized traditionally in the Amaryllidaceae, because of their inferior ovary (Herbert, 1837; Kunth, 1850; Baker, 1888; Pax, 1888; Pax & Hoffmann, 1930; Killip, 1936). Buxbaum (1954) examined the rhizome structure of *Bomarea* because of these examinations, he thought they were related to a group of North American *Lilium* species. Hutchinson (1964) placed them together with the Petermanniaceae and the Philesiaceae in his order Alstroemeriales. Huber (1969) was the first who brought them together with the Colchicaceae; because of his examinations of the *Liliflorae* seeds he placed them basal to the Colchicaceae and Liliaceae. It was widely accepted that the subdivision in Amaryllidaceae and Iridaceae with epigyn flowers and Liliaceae with hypogyn flowers is not a natural one after the work of Huber. Dahlgren & Clifford (1982) placed the genera, which were traditional in the Amaryllidaceae and Liliaceae in two orders: Asparagales and Liliales. The Amaryllidaceae became part of the Asparagales the Alstroemeriaceae were put together with the Iridaceae, Geosiridaceae, Colchicaceae, Tricyrtidaceae, Calochortaceae, Liliaceae and Melanthiaceae in the Liliales. They also speculated about possible relations between the



<http://www.mobot.org/MOBOT/Research/APweb/orders/lilialesweb.htm>

**Figure 18.** Tree from the homepage of the Missouri Botanical Garden, showing the next relatives of Alstroemeriaceae



**Figure 2.** (A) *B. pardina* (photo G. Lewis); (B) *B. superba* (photo H. Förther); (C) *B. weigendii*; (D) *B. formosissima*; (E) *B. macusanii*.



**Figure 3.** (A) *B. amazonica*; (B) *B. nematocaulon*; (C) *B. setacea*; (D) *B. purpurea*; (E) *B. purpurea*; (F) *B. pseudopurpurea*.



**Figure 4.** (A) *B. secundifolia*; (B) *B. nervosa*; (C) *B. distichifolia*; (D) *B. distichifolia*; (E) *B. foertheriana*; (F) left side *B. foertheriana*, right side *B. huanuco*.



**Figure 5.** (A) *B. dulcis*; (B) *B. andimarcana* ssp. *andimarcana*; (C) *B. andimarcana* ssp. *densifolia*; (D) *B. velascoana*.

Alstroemeriaceae and Philesiaceae. The Philesiaceae were part of their Asparagales. Their Philesiaceae contain beside the *Lapageria* and *Philesia*, *Behnia* and *Luzuriaga*, with some doubts they add *Drymophila*, *Eustrephus* and *Geitonoplesium*. Dahlgren et al. (1985) placed the Alstroemeriaceae again near the Liliales. Goldblatt (1995) placed in his cladistic analysis the orders Liliales and Melanthiales sensu Dahlgren near his Liliaceae/Colchicaceae, his Uvulariaceae and the Campynemataceae. Rudall et al. (1997, 2000) placed them in their analyses besides the *Luzuriaga* and the Colchicaceae/Uvulariaceae. The Colchicaceae also contains in their work the genera *Uvularia* and *Petermannia*. It was a combined analysis of morphologic and molecular dates. For the molecular dates they used *trnL-F* and *rbL*. In the work of Chase et al. (2000) about the phylogeny of the Monocots are the Alstroemeriaceae sister group to the Colchicaceae, no *Luzuriaga* or *Drymophila* species were examined. The Alstroemeriaceae and the Luzuriagaceae are sister groups in the work of Vinnersten & Bremer (2001) about the Liliales. Luzuriagaceae contains the genera *Luzuriaga* and *Drymophila*. Vinnersten & Bremer (2001) examined 40 genera. Their Colchicaceae-, Luzuriagaceae-, Alstroemeriaceae-clade is the sister group to all the other families of the Liliales. This second clade contains the 4 families Campynemataceae, Liliaceae, Melanthiaceae and Smilacaceae. The next relatives of Alstroemeriaceae are the Luzuriagaceae and the Colchicaceae (Fig. 18).

### Alstroemeria L.

Pl. Alstroemeria... Distertationes 114, 6 in Amoenitas Academicae: 247-262. 1762.

Type *Alstroemeria pelegrina* L., Sp. Pl. (ed. 2) 1: 461. 1762

=*Piriopetalum* Raf., Fl. telluriana 4: 34-35. 1838.

Type *P. pallidum* (Grah.) Raf. = *Alstroemeria pallida* Grah.

=*Lilavia* Raf., Fl. telluriana 4: 35. 1838.

Type *L. psittacina* (Lehm.) Raf. = *Alstroemeria psittacina* Lehm.

=*Ligtu* Adanson, Famille des plantes 2, Errata. 1836.

Type *L. pelegrina* (L.) Adans. = *Alstroemeria ligtu* L.

Fig. 19; distribution Fig. 6.

Plants herbaceous, rhizomatous, mostly glabrous, erect perennials with root tubers, terrestrial. The vegetative part of the epigeal shoots never branching. Leaves persistent, narrowed

at base or sessile, the adaxial side bears the stomata or both sides but the adaxial side always more frequent, at the lower part of the stem reduced to scales. The inflorescence is a condensed always-erect thyrses, but may be reduced to an umbel. Flowers erect or horizontally orientated weak to very strong zygomorphic, funnel-shaped or open. Tepals free, petaloid, brightly coloured, mostly with red, orange or yellow, rarely greenish. Outer tepals oblong or unguiculate, sometimes with broad wings, inner tepals unguiculate rarely spatulate often spotted, with nectaries at their base, mostly the lower inner tepal without a functional nectary. The base of the unguiculate inner tepals is canaliculate; the spatulate tepals have a flat base. The stamens are free, the filaments straight or curved, the anthers yellow or grey-blue. The ovary is inferior, trilobular with axial placentation, without septal nectaries. The fruit is a dehiscent explosive capsule.

### Bomarea Mirbel

Hist. Nat. Pl. 9: 71. 1804.

Type *Alstroemeria ovata* Cav. = *Bomarea ovata* (Cav.) Mirbel. designatus SANSO & XIFREDA Darwiniana 33: 323. 1995.

=*Vandesia* Salisb. G., Trans. Hort. Soc. London 1: 332. 1812.

Type *V. edulis* (Tuss.) Salisb. = *Alstroemeria edulis* Tuss. = *Bomarea edulis* (Tuss.) Herb.

=*Dodecasperma* Raf. Fl. telluriana 4: 35. 1838.

Type *D. acutifolia* (Link & Otto) Raf. = *Alstroemeria acutifolia* Link & Otto = *Bomarea acutifolia* (Link & Otto) Herb.

–*Collania* Herb., Amaryllidaceae 67 & 103, 1837 not J. A. & J. H. Schultes, 1830.

Type *C. involucrosa* Herb. = *Bomarea involucrosa* (Herb.) Baker designatus SANSO & XIFREDA Darwiniana 33: 328. 1995.

=*Sphaerine*, Herb., Amaryllidaceae 67 & 106, 1837.

Type *S. distichifolia* (Ruiz & Pavón) Herb. = *Alstroemeria distichifolia* Ruiz & Pavón = *Bomarea distichifolia* (Ruiz & Pavón) Baker designatus SANSO & XIFREDA Darwiniana 33: 330. 1995.

=*Wichuraea* M. Roemer, Fam. Nat. Syn. Ensatz. 4: 277. 1847.

Type *W. involucrosa* (Herb.) M. Roemer = *B. involucrosa* (Herb.) Baker designatus SANSO & XIFREDA Darwiniana 33: 328. 1995.

–*Danbya* Salisb. G., Gen. Pl. Fragm.: 57. 1866.

Type *D. distichifolia* (Ruiz & Pavón) Salisb. = *Bomarea distichifolia* (Ruiz & Pavón) Baker designatus SANSO & XIFREDA Darwiniana 33: 323. 1995.

Fig. 2, 3, 4, 5; distribution Fig. 6.



**Figure 6.** Distribution of *Alstroemeria* and *Bomarea*, grey shaded *Alstroemeria*, spotted *Bomarea*, spotted with disrupted line *B. edulis* only. (a) Distribution of *Bomarea* subgenus *Sphaerine*. (b) Distribution of *Bomarea* subgenus *Wichuraea*.

Plants herbaceous, rhizomatous; erect or twining perennials with root tubers, terrestrial, occasionally epiphytic. The vegetative part of the epigeal shoots never branching. Leaves persistent, narrowed at base or sessile, at the lower part of the stem reduced to scales, the adaxial side bears the stomata. The inflorescence is a condensed thyrse, but may be reduced to an umbel. Flowers erect, horizontally orientated or pendulous, actinomorphic or zygomorphic, funnel-shaped. Tepals free, petaloid, brightly coloured, mostly with red, orange or yellow, rarely greenish. Outer tepals oblong, inner tepals unguiculate or spatulate often spotted, with nectaries at their base. The base of the unguiculate inner tepals is canalliculate; the spatulate tepals have a flat base. The stamens are free, the filaments straight or curved, the anthers yellow or grey-blue. The ovary is inferior or semi-inferior, trilobular or rare unilocular with axial placentation, without septal nectaries. The fruit is a dehiscent capsule or an indehiscent berry or amphisarca.

### Short description of the subgenera of *Bomarea*

#### Subgenus *Baccata* Hofreiter (3 spp.)

Feddes Repert. 113 (7-8): 534.

Type *B. allenii* Killip, Ann. Missouri Bot. Gard. xxxii: 16. 1945 [sub *B. allenii*].

No species of the subgenus *Baccata* occurs in Peru. Fig. 7b A.

#### Subgenus *Bomarea* s.str. Baker (ca. 70 spp.)

J. Bot. 20: 202. 1882.

Type *B. ovata* (Cav.) Mirb. designatus SANSO & XIFREDA Darwiniana 33: 324. 1995.

Subgenus *Eubomarea* (Pax) Killip, Flora of Peru 1936.

Section *Eubomarea* Pax In: ENGLER & PRANTL (Hrsg.): Nat. Pflanzenfam. II. 5. 120. Berlin 1888.

Fig. 2; 3; 7A-H; 7b B; 9A, B; 11A, B; 13, 14; 17D, F and Fig. 20-41.

Prevailing twining, rarely erect plants with actinomorphic or slightly zygomorphic flowers. Ovary always inferior. Fruit dehiscent (loculicidal), seeds with a fleshy, red or rarely a yellow sarcotesta. The tepals are shed after blooming, when they are still fresh and coloured. Inner tepals differentiated in blade and claw. Inflorescence an umbel or a thyrse. The species of subgenus *Bomarea* are found from Mexico to Chile at altitudes between 100 m and 4000 m. They grow predominantly in more or less fertile hedges and woods (Fig. 7a A).

The species *B. alstroemeroides*, *B. amazonica* spec. nov., *B. angulata*, *B. campanularia*, *B. crinita*, *B. cornigera*, *B. cornuta*, *B. crassifolia*, *B. densiflora*, *B. dispar*, *B. dissitifolia*, *B. dolichocarpa*, *B. endotrachys*, *B. goniocaulon*, *B. hartwegii*, *B. lopezii* spec. nov., *B. multipes*, *B. obovata*, *B. ovata*, *B. pardina*, *B. purpurea*, *B. setacea*, *B. speciosa*, *B. superba*, *B. tribrachiata* and *B. unciifolia* can be found in the Amotape-Huancabamba-region

The species *B. angulata*, *B. angustissima*, *B. aurantiaca*, *B. cordifolia*, *B. cornigera*, *B. cornuta*, *B. crocea*, *B. denticulata*, *B. dispar*, *B. dolichocarpa*, *B. endotrachys*, *B. formosissima*, *B. goniocaulon*, *B. nematocaulon*, *B. ovata*, *B. pardina*, *B. purpurea*, *B. pseudopurpurea* spec. nov., *B. rosea*, *B. setacea*, *B. speciosa*, *B. tarmensis* and *B. weigendii* spec. nov. can be found in Central Peru.

The species *B. aurantiaca*, *B. boliviensis*, *B. campylophylla*, *B. chaparensis*, *B. cornuta*, *B. dolichocarpa*, *B. edulis*, *B. purpurea*, *B. formosissima*, *B. macusanii* spec. nov., *B. ovata*, *B. pardina*, *B. rosea*, *B. setacea*, *B. speciosa*, *B. tarmensis* and *B. weigendii* spec. nov. can be found in the Cordillera Oriental and the Altiplano.

#### Subgenus *Sphaerine* (Herb.) Baker (12 spp.)

J. Bot. 20: 201. 1882.

Type *Bomarea distichifolia* (Ruiz & Pavón) Baker designatus Sanso & Xifreda Darwiniana 33: 330. 1995.

Genus *Sphaerine* Herb., Amaryllidaceae 67 & 106. 1837.

Section *Sphaerine* Pax In: ENGLER & PRANTL (Hrsg.): Nat. Pflanzenfam. II. 5. 121. Berlin 1888.

Fig. 4; 7I-L; 7b C; 9C, D; 12A, B, C; 15; 17A, B and Fig. 42-46; distribution Fig. 6a.

Always not twining plants with the exception of *B. coccinea* with actinomorphic or zygomorphic flowers. Ovary inferior. Fruit indehiscent and often strikingly coloured, mostly orange, seeds with a poorly developed whitish-grey sarcotesta. Inner tepals differentiated into blade and claw. The species of this subgenus can be arranged into 3 groups:

**Pauciflora-group:** The only species of this group, *B. pauciflora*, which do not occur in Peru.

**Linifolia-group:** inflorescence a thyrse rarely reduced to an umbel. Bracts similar to the normal foliar leaves. The tepals dry up after blooming and are retained at the ripe fruit. Of the 5 species of this group occur *B. coccinea* and *B. pumila* in central Peru, in the Cordillera Oriental only *B. pumila*, in northern Peru additional *B. brachysepala*.

**Distichifolia-group:** the inflorescence is an umbel. The bracts are small, awl-shaped, pale to reddish, mostly deciduous. The tepals are shed after blooming, when they are fresh and still have their colour. All species of this group are found in Central Peru. All species of this group are found in Central Peru. The species are *B. brevis*, *B. distichifolia*, *B. foertheriana*, *B. huanuco*, *B. nervosa* and *B. secundifolia*, in the Cordillera Oriental *B. brevis* and *B. distichifolia*

The species of this subgenus are found in central Peru at altitudes of between 1800 and 4000 m. They grow in fog forests, mostly in moss cushions but sometimes epiphytic. *B. pumila* grow in the wet Puna above sandstone.

The Pauciflora-group and the Linifolia-group corresponds with a part of the northern-group, the Distichifolia-group with the southern-group in Hofreiter & Tillich (2002). The subgenus was revised by Hofreiter (2005b).

#### Subgenus *Wichuraea* (M. Roemer) Baker (18 spp.)

J. Bot. 20: 201 1882.

Type *Bomarea involucrosa* (Herb.) Baker designatus SANSO & XIFREDA Darwiniana 33: 328. 1995.

Genus *Wichuraea* M. Roemer, Fam. Nat. Syn. Ens. 4: 277. 1847.

Genus *Collania* Herb., Amaryllidaceae 67 & 103. 1837 not J. A. & J. H. Schultes, 1830.

Section *Wichuraea* Pax In: ENGLER & PRANTL (Hrsg.): Nat. Pflanzenfam. II. 5. 120. Berlin 1888.

Fig. 5; 7M-P; 7b D; 10; 11C; 12D, E, F; 16; 17C, E and Fig. 47-55; distribution Fig. 6b.

Erect or twining plants with actinomorphic, pendulous flowers. Ovary always semi-inferior. Fruit dehiscent (loculicidal), seeds with a fleshy, red or orange sarcotesta. The tepals dry up after blooming and are retained on the ripe fruit. Inflorescence a thyrse, or in weak, few flowered specimen it may be impoverished to an umbel. The species of this subgenus can be arranged in two groups:

**Glaucescens-group:** inner tepals differentiated into blade and claw. The centre of distribution is northern and central Peru. In central Peru grow *B. albimontana*, *B. engleriana*, *B. porrecta*, *B. peruviana* and *B. vargasii*, in the Cordillera Oriental no species of this group occur. In northern Peru also *B. glaucescens*, *B. libertadensis* spec. nov. and *B. torta* can be found.

**Dulcis-group:** inner tepals cuneately tapered to the base. The centre of distribution is central and southern Peru. In central Peru *B. andimarcana*, *B. bracteata*, *B. dulcis*, *B. involucrosa*, *B. parvifolia* and *B. longistyla* are found, in the Cordillera Oriental *B. ampayesana*, *B. andimarcana*, *B. dulcis*, *B. involucrosa* and *B. velascoana*.

The species of subgenus *Wichuraea* are found in the Andes from Ecuador to Chile/Argentina at altitudes between 2500

and 5200 m. The twining species grow in woods and shrubs, the erect species mostly between rocks and on steep slopes.

The Glaucescens-group corresponds with the northern-group, the Dulcis-group with the southern-group in Hofreiter & Tillich (2002). The subgenus was revised by Hofreiter & Tillich (2003).

For detailed discussion of the subgenera see Hofreiter & Tillich (2002), for comparison of the groups and their characters see table 4.

### Morphology

#### Vegetative Morphology

**Growth form.** Two principal growth forms occur in the Astromeriaceae: erect and twining. The erect growth form is found in the genus *Alstroemeria* and the subgenera *Wichuraea* and *Sphaerine*. Eight of the around 70 *Bomarea* s.str. species can grow erectly. In the study area 3 *Bomarea* s.str. species occur which can also grow erectly. The twining ones are mostly found on the edges of fog forests and in woodlands. The vegetative part of the shoot is always non-branched. The size of the plants in

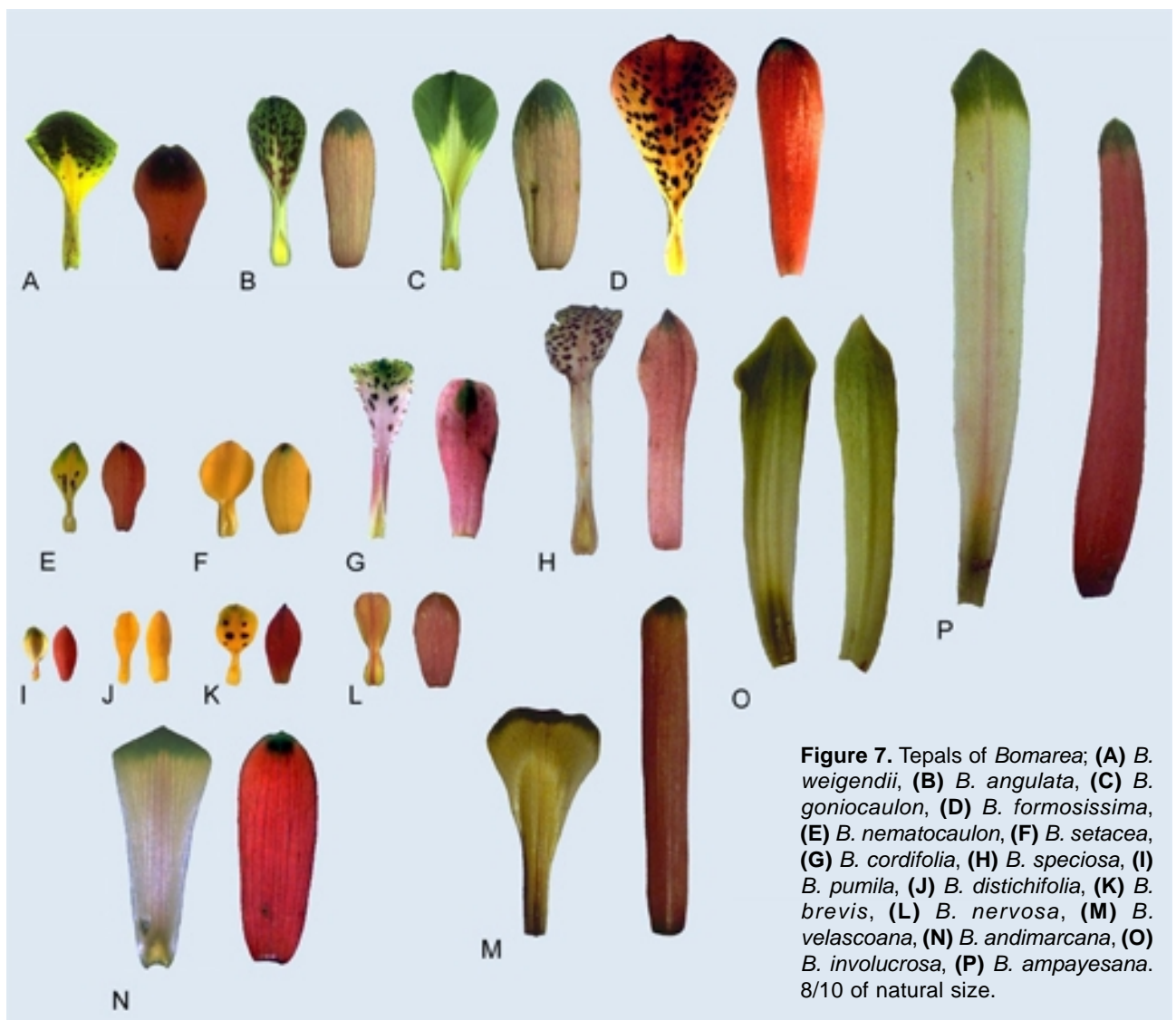
**Table 4.** Groups and their characters

Character / group	<i>Alstroemeria</i>	<i>Bomarea</i> s.str.	<i>Sphaerine</i>	<i>Wichuraea</i>
Ovary position	Inferior	Inferior	Inferior	Semi-inferior
Fruit	Dry, explosive capsule	Leathery, slowly opening capsule	Indehiscent berry	Leathery, slowly opening capsule
Seed coat	Dry, brown	Fleshy red or orange sarcotesta	Thin, whitish-grey sarcotesta	Fleshy red sarcotesta
Tepals	Deciduous	Mostly deciduous	Deciduous	Not deciduous, retained at the ripe fruit
Nectaries	Lower inner tepal without functional nectary	Lower inner tepal without functional nectary	Lower inner tepal with functional nectary	Lower inner tepal mostly with functional nectary
Growth form	Erect	Mostly twining	Mostly erect	Mostly erect
Pollination	Mostly insect	Mostly humming bird	Humming bird / insect	Humming bird
Habitat	Open landscape	Mostly hedges and forest edges	In fog forests	Puna / Jalca

**Tabla 4.** Los Grupos y sus caracteres

Caracter / grupo	<i>Alstroemeria</i>	<i>Bomarea</i> s.str.	<i>Sphaerine</i>	<i>Wichuraea</i>
Posición del ovario	Infero	Infero	Infero	Semi-infero
Fruto	Seco, cápsula explosiva.	Coriáceo, cápsula con dehiscencia lenta.	Baya indehiscente.	Coriáceo, cápsula con dehiscencia lenta.
Tegumento de la semilla	Seco, marrón	Sarcotesta carnosa, roja o anaranjada.	Sarcotesta delgada, gris-blanquecina.	Sarcotesta carnosa, roja.
Tépalos	Deciduos	Generalmente deciduos	Deciduos	Persistentes en el fruto maduro.
Nectarios	Tépalo interno más bajo sin nectario funcional	Tépalo interno mas bajo sin nectario funcional	Tépalo interno mas bajo con nectario funcional	Tépalo interno mas bajo generalmente con nectario funcional
Forma de	Erguida crecimiento	Generalmente voluble (enredadera)	Generalmente erguido.	Generalmente erguido.
Polinización	Generalmente insectos	Generalmente colibríes	Colibríes / insectos	Colibríes
Hábitat	En terrenos abiertos.	Mayormente en bosques y sus márgenes.	En bosque de neblina.	Puna / Jalca

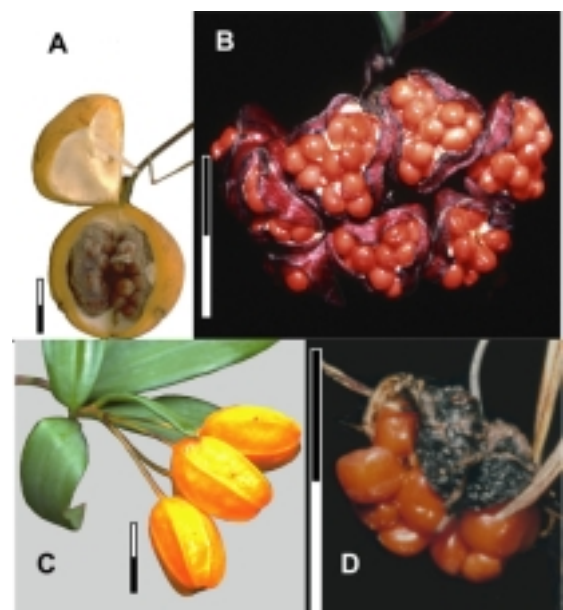




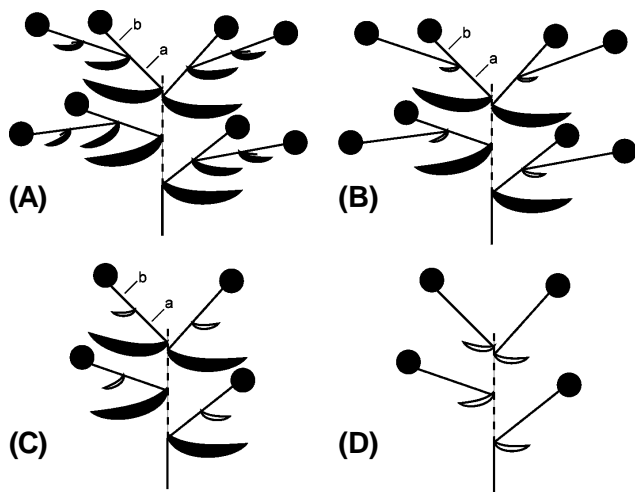
**Figure 7.** Tepals of *Bomarea*; (A) *B. weigendii*, (B) *B. angulata*, (C) *B. goniocaulon*, (D) *B. formosissima*, (E) *B. nematocaulon*, (F) *B. setacea*, (G) *B. cordifolia*, (H) *B. speciosa*, (I) *B. pumila*, (J) *B. distichifolia*, (K) *B. brevis*, (L) *B. nervosa*, (M) *B. velascoana*, (N) *B. andimarcana*, (O) *B. involucrosa*, (P) *B. ampayesana*. 8/10 of natural size.



**Figure 7a.** Habitats; (A) Cloud forest near Machu Pichu, typical habitat of *Bomarea* s.str. species; (B) inside of cloud forest, habitat of *Sphaerine* species; (C) high Puna, habitat of *Wichuraea* and *A. pygmaea*.



**Figure 7b.** Fruit types of the subgenera; (A) *Baccata*, indehiscent large fleshy berry; (B) *Bomarea* s.str., dehiscent capsule with many seeds with red fleshy sarcotesta, (C) *Sphaerine*, indehiscent berry, (D) *Wichuraea*, dehiscent capsule. Scale bars: A, B, C, D = 2 cm.



**Figure 8.** Inflorescences types of Alstroemeriaceae. (A) thyrse with foliage subtending leaves; (B) thyrse with small bracts; (C) umbel with prophylls; (D) umbel. a= Hypopodium, b= epipodium.

Peru varies from 5 cm (*A. pygmaea*, *B. pumila*) to 10 m and more (*B. speciosa*, *B. dolichocarpa*). Two types of the erect growth form exist: the very hard shoots of the in open landscapes living species of *Wichuraea* and *Alstroemeria* (e. g. *B. andimarcana*, *B. dulcis*, *B. involucrosa* or also *A. lineatiflora*) and the in the shadow of the fog forests growing species of the subgenera *Sphaerine* (e. g. *B. brevis*, *B. foertheriana*, *B. distichifolia*). Within the twining and the erect species we have species with erect and pendent inflorescences. The leaves are arranged dispersed, distich or monostich. *Wichuraea* and *Alstroemeria* have always a dispersed leaf arrangement, *Sphaerine* always a monostich or a distich one. In the subgenus *Bomarea* s.str. the young and small shoots grow erectly up to 50 cm with a monostich leaf arrangement. The twining shoots have disperse arranged leaves.

**Leaf morphology.** Fig. 13-16. The adaxiale surface of the leaf means always the side facing the shoot in normal orientation. This surface is still called adaxiale when the leaf is resupinated. The leaves are always simple. In most species only the adaxiale surface bears stomata, but in both genera species occur where also the abaxiale surface bears stomata. In *Bomarea* only very few species are known with stomata on both leaf surfaces and the stomata are less dense (e. g. *B. tarmensis*). In *Alstroemeria* a lot of species occur with stomata on both leaf surfaces and some species even have more or less aequifacial leaves (Lyshede, 2002). The leaves can be resupinated at the short petiole (*Bomarea* s.str. and *Sphaerine*) or at the lower 1/3 of the leaf (*Alstroemeria* and *Wichuraea*). It depends on the ecological conditions if they are really resupinated and if they are growing upwards or downwards. *Sphaerine* always resupinates the leaves, *Alstroemeria* and *Bomarea* s.str. mostly, in *Wichuraea* it depends on the amount of sun and wind and in *Alstroemeria pygmaea* never in the natural habitat. The leaves vary a lot in size and shape between the species, also within one population. They can be 1–2 x 0,2–0,4 cm (*B. dulcis*) to 10–30 x 5–15 cm (*B. dispar*). The shape varies from linealic to wide elliptic. The leaves are always parallel nerved, the number of primary nerves varies in most *Sphaerine* species only between 7 or 9 independent of the leaf size, in *Wichuraea* the number of primary nerves can be more than 18. They are always dense compared to *Sphaerine*, in *Bomarea* s.str. and *Alstroemeria* the leaves

can be densely or loosely nerved.

**Indumenta.** In most species the adaxiale surface is the pubescent one. *Sphaerine* species and some lowland rainforest *Bomarea* s.str. species seem to be less pubescent, completely glabrous *Bomarea* species do not seem to exist in Peru. The trichoms can be one to many celled, they occur more densely above the nerves. In some species both leaf surfaces are pubescent, this is a very variable character, in some species it varies within one population (*B. andimarcana*, *B. dulcis*). In two Peruvian species all organs above the surface are pubescent, even the tepals are covered with hairs (*B. bracteata* und *B. pumila*). The pubescence is most noted in the high Andean *Wichuraeas*, but sometimes the ecological explanation does not comply. *Bomarea aurantiaca* is a twining species in the fog forests; the species is easily recognised even in vegetative state because of its dense pubescence. Other in the same habitat occurring species do not show this character. The pubescence is one of the most variable characters. Both *Alstroemeria* species seem to be always glabrous.

**Epicuticular wax.** Fig 17C-E. In a lot of species the surface is covered with regularly and parallel ordered wax platelets (Convallaria type). At the adaxiale surface the wax platelets are mostly denser. The trichoms are also covered with wax pallets. *Sphaerine* species are not covered with epicuticular wax, some species have irregular and looser ordered larger wax pieces.

**Rhizomes and roots.** The surface shoot grows out of a creeping rhizome. The rhizome is sympodial and covered with cataphylls (Buxbaum, 1951). Its´ diameter is at least 3-4 times the size of the surface shoot. The surface shoots can rise up in a very dense order or each shoot can be some centimetres apart. Root tubers occur in all examined *Bomarea* species. In *Alstroemeria* some species without root tubers are known. In *Bomarea* the root tubers are globose or ovoid; they are distal at the end of normal roots. In *Alstroemeria* the storage roots are spindle shaped and rise directly at the rhizome. The roots have a diameter of between 0,5 cm (*B. pumila*) and 6 cm (*B. formosissima*). The rhizomes of *Bomarea* s.str. species are mostly very deep beneath the surface, around 50 cm, *Sphaerine* species are mostly near the surface and *Wichuraea* between rocks. The non-thickened part of the roots varies in different groups. The *Bomarea* s.str., the *Distichifolia* group of the *Sphaerine* and the *Wichuraea* have around 10–20 cm long non-thickened parts. All examined species (*B. hieronymi*, *B. linifolia*, *B. pauciflora* and *B. pumila*.) of the *Linifolia* and *Pauciflora* group of the *Sphaerine* have very small root tubers with very short, (around 1–3 cm long) non thickened root parts.

### Flower and inflorescence morphology

**Inflorescence morphology.** Fig. 8. The inflorescence is a polytele thyrse with a mostly shortened main axis, which can be reduced to an umbel. The partial florescences are monochoasic cymes. The branching occurs at the prophyll. The Multiflora group in *Bomarea* s.str. and the *Distichifolia* group in *Sphaerine* have always an umbel, even in very strong specimens. In some species an umbel can contain more than 80 flowers (*B. superba*, *B. formosissima*). In the groups where normal strong specimens have a thyrse they can be reduced to an umbel. *Alstroemerias* have a thyrse or some species have a single flowered. In very small sized species like *B. pumila* this occurs regularly. The number of flowers can vary greatly, *B. dulcis* bears from one to 20 flowers, in

*B. formosissima* the number of flowers can vary from 4–80. The differences in the length of the hypopodia are significant. In the Goniocaulon group and in *Wichuraea* some species show sizes with 0,2–0,3 cm, while in *B. dolichocarpa* up to 20 cm.

The main axis can be elongated in some species, so no sharp limit exists between an umbel and a botrobs, this character can vary within one population (*B. setacea*).

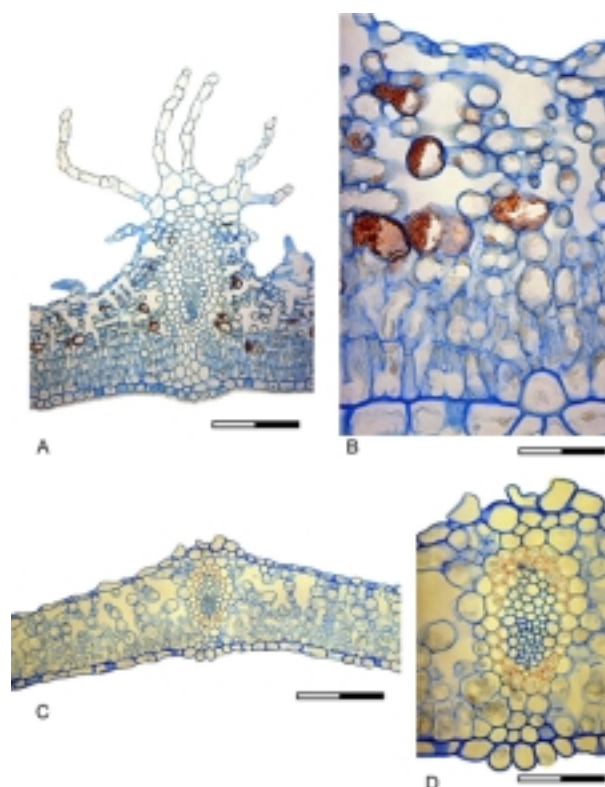
The base internode can be elongated and significantly longer than the other internodes along the shoot, the base internode for example is in *B. tarmensis* 10 – 35 cm long, and all the other internodes vary only between 0,5–3 cm. In most species the base internodes is not longer from the other internodes. The bracts can be leaf like (*Wichuraea*) or small and reduced (most species of *Bomarea* s.str.).

**Flower morphology.** The flowers can be actinomorphic or zygomorphic; the actinomorphic flowers are pendent and seem to be restricted to the subgenera *Wichuraea* and *Sphaerine*. The only sign of the least zygomorphic flowers for their zygomorphy is only the nectary of the lower one inner tepal is not functional. This occurs also in pendent in all other aspects actinomorphic flowers. The next stage is horizontally orientated flowers with curved stigma and anthers. The most zygomorphic flowers in *Bomarea* have a lower inner tepal, which is strongly curved (*B. boliviensis*, *B. huanuco*). The pendent flowers are always funnel shaped, the non-pedant flowers are more open, but wide-open flowers are rare in *Bomarea* (*B. alstroemeroides*, *B. huanuco*). The most zygomorphic flowers occur in *Alstroemeria* with the lower inner tepal which is very different in shape and colour to the other inner tepals. The size of the flowers varies between 1 cm (*A. pygmaea*, *B. pumila*) and 11 cm (*B. ampayesana*). The inner and outer tepals can be of the same colour or completely different with all transitions in between.

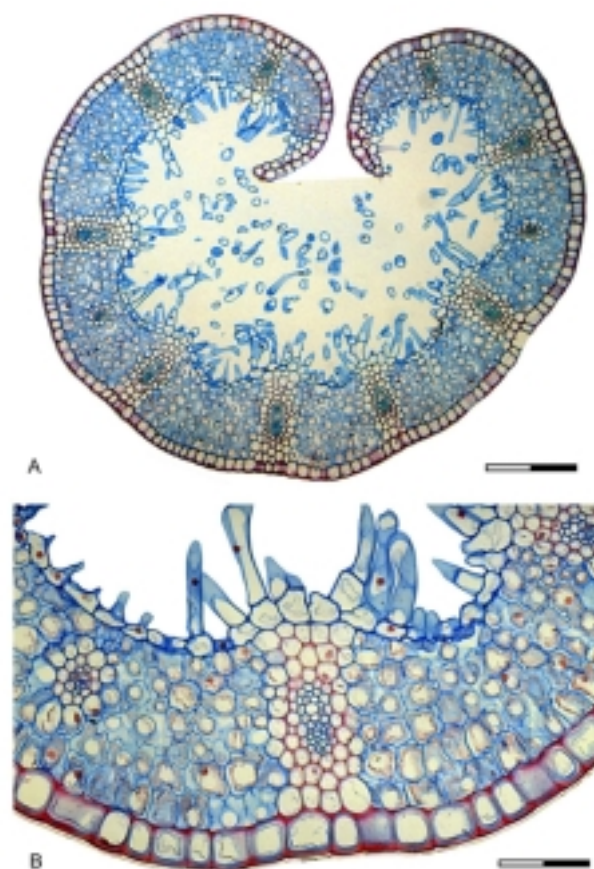
**Outertepals.** Fig. 7. In *Bomarea* the outer tepals vary not very much in shape and are equal to each other, they are mostly oblong; some species have cornute outer tepals (e. g. *B. brevis*, *B. cornuta*). In *B. brevis* this character varies within one population. The outer tepals are shorter or of equal length to the inner tepals. In two species they are longer (*B. tribrachiata* and *B. velascoana*). They never bear nectaries. In *Alstroemeria* the outer tepals vary more in shape, the two Peruvian species have different outer tepals, *A. lineatiflora* is heterotepal, and all tepals of *A. pygmaea* are similarly shaped.

**Inner tepals.** Fig. 7. In most species the inner circle of tepals is heterotepal, the lower inner tepal is smaller without a functional nectary. In many species the differences are only slight; in *Alstroemeria lineatiflora* the lower inner tepal has a different shape, colour and no functional nectaries. In *B. boliviensis* and *B. huanuco* the lower most inner tepal is Also different shaped. Most species have unguiculate inner tepals with a tube formed base; the Dulcis group of *Wichuraea* and *A. pygmaea* have spatulate inner tepals with a flat base.

**Androeceum.** The anthers are always 6 in two circles; the anthers of the inner circle are fused with the inner tepals for 1–3 mm on the base. The filaments are straight in the pendant and erect species or curved in the horizontal orientated species, the anthers open laterally, the filaments are pseudobasifix, and the connective has a bag which is pointing to the inner side where at



**Figure 9.** Leaf anatomy of subgenera *Bomarea* and *Sphaerine*, adaxiale surface above; (A) *B. crassifolia*; (B) detail; (C) *B. foertheriana*; (D) detail. Scale bars: (A)= 550 m; (B), (D)= 90 m; (C)= 200 m.



**Figure 10.** Leaf anatomy of subgenus *Wichuraea*, adaxiale surface above; (A) *B. dulcis*; (B) detail. Scale bars: (A)= 200 m; (B)= 90 m.

its base the filaments are fixed. The depth of the bag can be one third of the connective length. Buxbaum (1954) already made this observation in the genus *Alstroemeria*. The length of the filaments is variable within one flower in some species (z. *B. andimarcana*). The anthers are blue, grey, or yellow. The pollen have a reticulate surface in *Bomarea* (Schulze, 1978; Sanso & Xifreda, 2001), some species have an auriculate pollen surface *B. ceratophora* (Neuendorf 1977) and *B. pardina* (Schulze, 1978)). The *Alstroemeria* species have a striate reticulate pollen surface (Sanso & Xifreda, 2001).

**Gynoeceum.** The ovary is coenokarb, trilocular, unilocular in *B. ovallei*, inferior or semi-inferior in the subgenera *Wichuraea*. The other *Bomarea* species and the *Alstroemeria* species have an inferior ovary. The ovary has very prominent nerves in *Alstroemeria*. No species has nectaries on the ovary.

**Fruits.** Fig 7b. All *Alstroemeria* species have dry explosive fruits. The ripe fruit opens explosively and the seeds are catapulted away. The *Bomarea* species have dehiscent (subgenera *Bomarea* s.str. and *Wichuraea*) or indehiscent fruits (subgenera *Baccata* and *Sphaerine*). The dehiscent fruits open slowly and contain several seeds in each of the three valves. There are 2 rows of seeds along the three placentas. The indehiscent fruits are trilocular berries of oval to globose shape. The fruit wall is orange, red, or violet, in some species it is an amphisarca (*Sphaerine*).

**Seeds.** One fruit may contain up to 80 seeds. They are ovoid or globose ones. The dehiscent *Bomarea* species have a multi-layered, yellow, orange or red, sweet sarcotesta. *Alstroemeria* species have a dry seed coat. The indehiscent *Bomarea* species have a weakly developed, whitish grey sarcotesta. All species have a very hard endosperm, the cell walls are thickened. The cell in *Wichuraea* are regularly ordered in circles and radial rows, in *Sphaerine* they are irregularly ordered and in *Bomarea* s.str. in between.

## Anatomy

**Leaf anatomy.** Figs. 9, 10. The leaves of all the examined species are inverted. The stomas are all or nearly all on the adaxial side of the leaves, the spongy mesophyll parenchyma is always on the adaxiale side, of those examined so far. The abaxiale epidermis is more strongly developed in most species. In most species the adaxiale side is the pubescent one and the leaves are mostly resupinated. The hairs are often multi cellular. Some species are completely glabrous or pubescent on both leaf surfaces, but no species is known where the abaxial surface is pubescent and the adaxial one glabrous. The cuticula on the abaxiale side often is clearly more strongly developed than on the adaxiale side. Epicuticular wax can be found on both sides of the leaf, but if present it is denser on the adaxiale side. So the adaxiale side is the functional lower leaf side. The epidermal cells are on the adaxiale side of the leaves and have sigmoid cell walls between the vascular bundles. The epidermal cells above the vascular bundles are longitudinally stretched. The stomata only lay between the vascular bundles. The epidermal cells of the abaxial side are always longitudinally stretched with non-waved cell walls. The vascular bundles are not inverted; the phloem is on the abaxial side. A layer of intercellular free cells always surrounds the vascular bundles. Often all cells of this sheath are lignified, mostly at least some of them. Idioblasts with raphid bundles occur often; in some species tannin cells are present.

**Stem anatomy.** Fig. 11. The stem anatomy is slightly different in the subgenera. All species have an atactostelic stem with a single-layered epidermis and a multi-layered fibre sheath. The collateral vascular bundles are dispersed in rough rings over the stelar area. In the centre of the stem is a ring of 3–7 vascular bundles containing larger xylem vessels. A cellular free sheath always surrounds the vascular bundles, often all these cells are lignified. The species of the subgenera *Bomarea* s.str. and *Sphaerine* have 3–5 layered cortex, beneath the cortex is the 2–8 layered fibre sheath. The *Wichuraea* species have only a single layered cortex and beneath it a very strong fibre sheath containing small nearly complete lignified cells.

**Root anatomy.** Fig. 12. The fibre roots have a single-layered rizoderms followed by a single-layered exoderms. The cortex contains irregularly arranged cells with starch grains. The cortex cells of the innermost layers have thick lignified cell walls. The endoderms is also lignified, but significantly weaker in most species. The phloem and xylem bundles are in a circle in the centre is a parenchyma of large cells. In *Bomarea* nearly half of the root tubers' diameter contains the enlarged central cylinder, in *Alstroemeria* only the cortex is enlarged. The central parenchyma as well as the cortex contain starch grain. The only lignified cells in the tubers are the xylem vessels.

## Kariology

The chromosome number is  $x=9$  in all *Bomarea* species and  $x=8$  in all *Alstroemeria* species (Whyte, 1929; Sato, 1938; Bayer, 1988; Hunziker & Xifreda, 1990; Meerow et al., 1999). Own examinations in the subgenera *Wichuraea* (*B. dulcis* und *B. glaucescens*) and *Sphaerine* (*B. brevis* und *B. distichifolia*) confirmed  $x=9$  for *Bomarea*.

## Description of the study areas

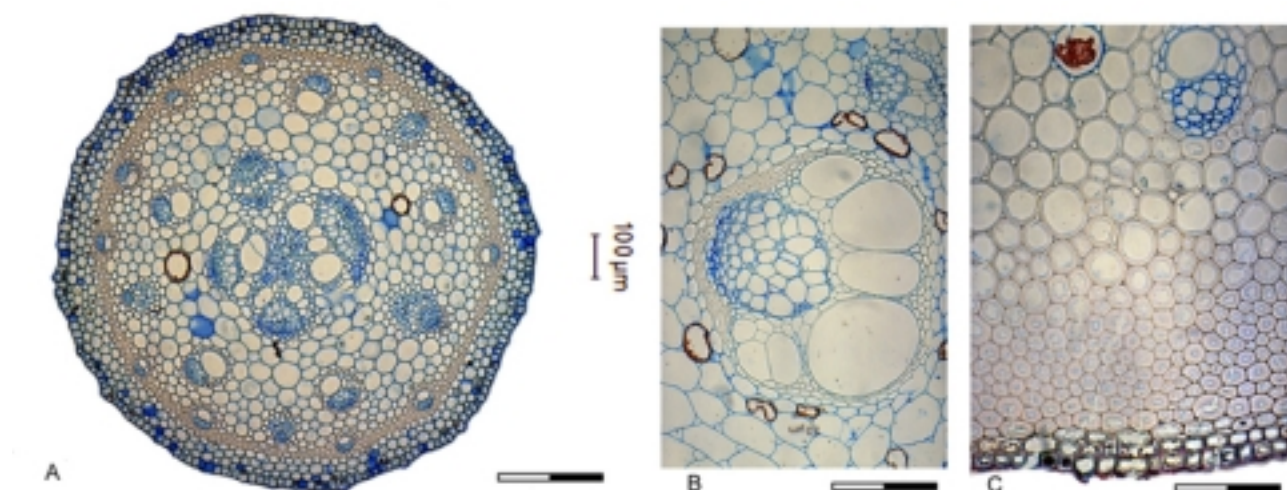
The circumscription of the areas corresponds partially with Baumann (1988), Berry (1982) and Weigend (2002).

**1. Amotape-Huancabamba-region.** The low mountains are covered with dense fog forest, and a very wet Puna called Jalca in the more eastern parts, the western area contains some relict fog forests with many endemic species. Deep, dry valleys like the Marañon or the Huancabamba subdivide the whole area. The area is a centre of old and new endemics (Weigend, 2002).

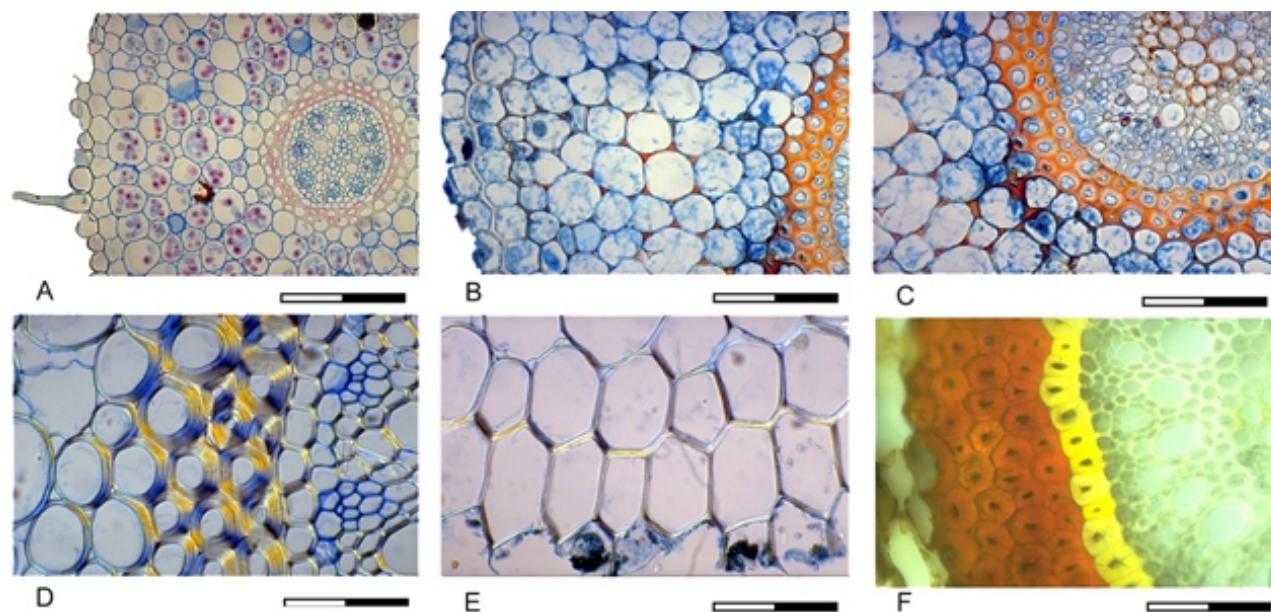
The circumscription of the two areas corresponds with Baumann (1988) and Berry (1982).

**2. Cordillera Central.** The Cordillera Central is a relative low mountain chain compared to the west cordillera. The highest peaks are around 5800 m. The cordillera is limited to the south by the deep Apurimac valley, to the west by the dry Marañon valley and to the east by the valley of the Rio Huallaga. In the north the Cordillera Central ends at the latitude of the Rio Chama. The Cordillera Central is covered with dense forest at its windward (mostly eastern) side. The forest changes from lower mountain rain forest over cloud to fog forest depending on the altitude. A very wet grass puna grows at the windward side of the highest parts. The slopes facing to the Marañon valley become fast drier. The Marañon valley is populated and cultivated. The natural vegetation at the bottom of the valley is a dry forest with lots of cacti.

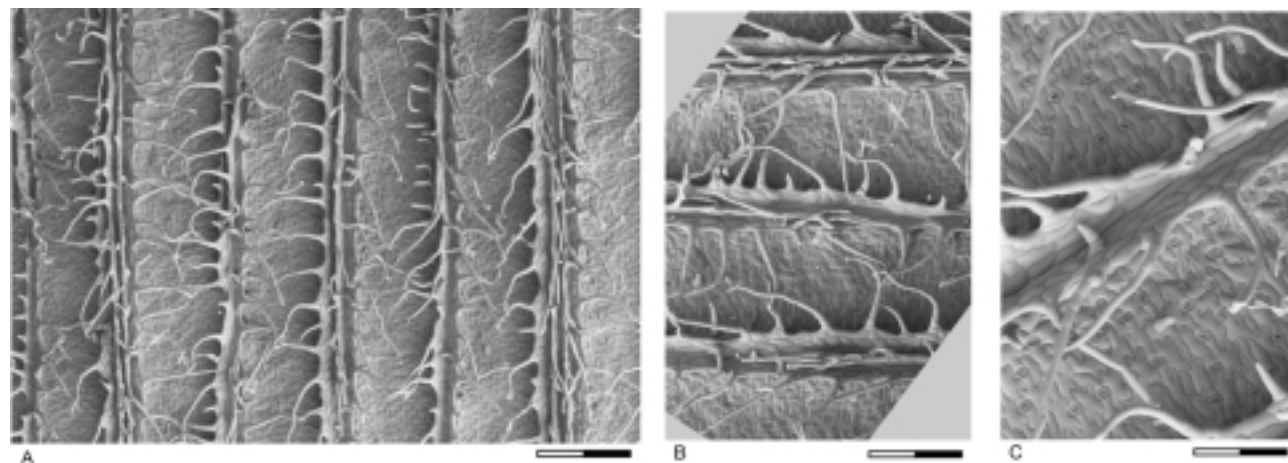
**3. Cordillera Occidental North.** The most remarkable part



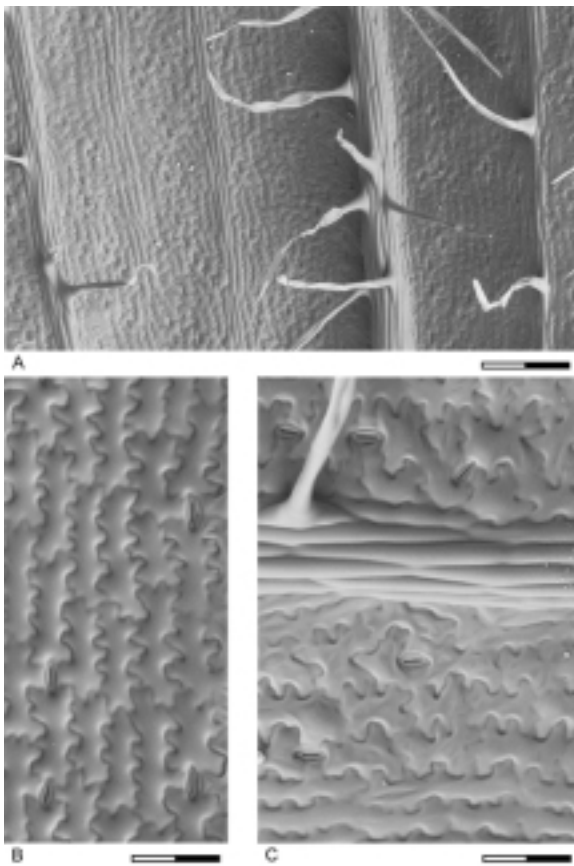
**Figure 11.** Stem anatomy; (A) *B. amazonica*; (B) *B. tarmensis*; (C) *B. andimarcana*. Scale bars: (A), (B)= 200  $\mu$ m; (C)= 100  $\mu$ m.



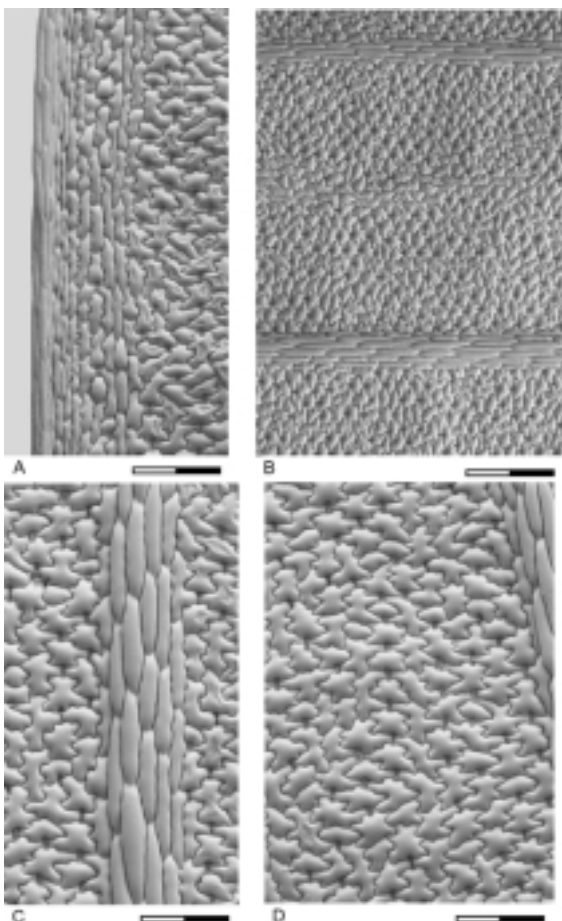
**Figure 12.** Root anatomy; (A) *B. distichifolia*; (B) *B. nervosa*; (C) *B. nervosa*, endodermis; (D) *B. torta*, endodermis; (E) *B. torta*, exodermis; (F) *B. involucrosa*, endodermis (yellow). Scale bars: (A)= 200  $\mu$ m; (B), (C), (F)= 100  $\mu$ m; (D), (E)= 50  $\mu$ m.



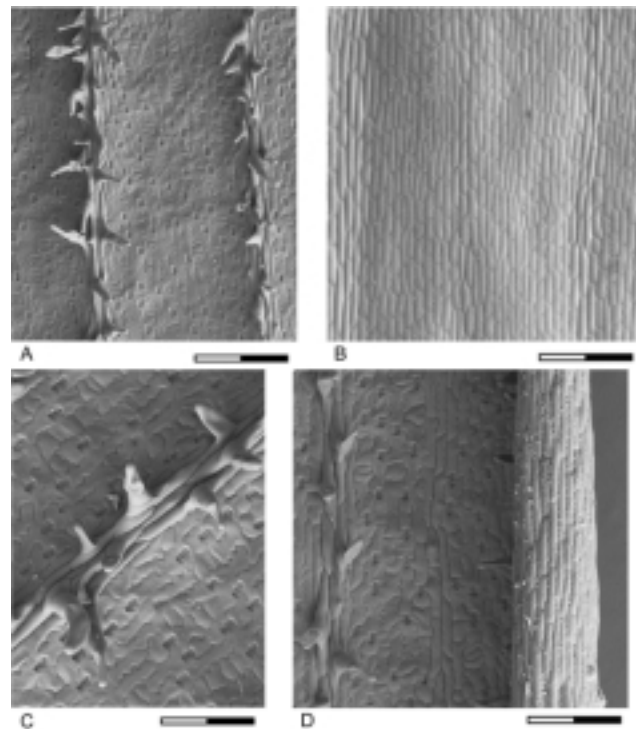
**Figure 13.** Leaf surface of subgenus *Bomarea* (*B. setacea*), adaxial side. Scale bars: (A)= 600  $\mu$ m; (B)= 200  $\mu$ m; (C)= 100  $\mu$ m.



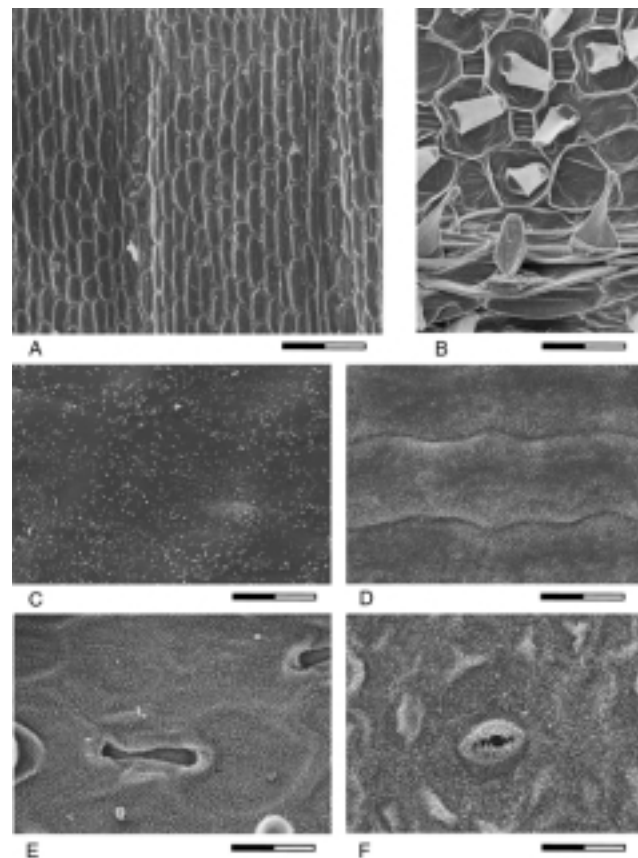
**Figure 14.** Leaf surface of subgenus *Bomarea* (*B. ovata*), adaxiale side. Scale bars: (A)= 400  $\mu$ m; (B), (C)= 100  $\mu$ m.



**Figure 15.** Leaf surface of subgenus *Sphaerine* (*B. brevis*), adaxiale side. Scale bars: (A), (C), (D)= 200  $\mu$ m; (B)= 300  $\mu$ m.



**Figure 16.** Leaf surface of subgenus *Wichuraea* (*B. andimarcana*); (A), (C) and (D) adaxiale side; (B) abaxiale side. Scale bars: (A), (B)= 400  $\mu$ m; (C)= 200  $\mu$ m; (D)= 270  $\mu$ m.



**Figure 17.** Leaf surface, microhairs and epicuticular wax; (A) abaxiale side of *B. distichifolia*; (B) adaxiale side with microhairs; (C) abaxiale side of *B. andimarcana* with wax platelets; (D) abaxiale side of *B. formosissima*; (E) adaxiale side of *B. andimarcana*; (F) adaxiale side of *B. cordifolia*. Scale bars: (A)= 180  $\mu$ m; (B)= 75  $\mu$ m; (C), (D), (E), (F)= 40  $\mu$ m.

of the West Cordillera is the 400 km long Cordillera Blanca with several peaks of above 6000 m. The highest pike is the Nevado Huascarán with 6745 m. The west cordillera is much drier than the Cordillera Central; it becomes drier from east to west. In the west the dry Peruvian coastal desert borders it. The frequent fog enables a vegetation called «Loma» to grow in the coastal desert. *Polylepis*-woods grow in the Cordillera Blanca on the windward side at altitudes of around 4000 m.

The circumscription of these two areas corresponds with Baumann (1988), Berry (1982), Duellman (1979) and Simpson (1975, 1979).

**4. Cordillera Oriental.** The Cordillera Oriental North contains several mountain chains with summits of above 6000 m. In Peru and north Bolivia the most striking mountain chains are the Cordillera de Vilcabamba, the Cordillera de Urubamba, the Cordillera de Vilcanota, the Cordillera de Carabaya, the Cordillera de Apolobamba and the Cordillera Real. 2000–3000 m deep valleys separate the single Cordilleras from each other. On their windward side they are covered with dense cloud and fog forests above the timberline with wet puna. The lee side is much drier and the slopes descend to the dry inner Andean valleys. The northern border is the deep valley of the Apurimac River in southern Peru, the southern border the Andean bend at the latitude of Santa Cruz.

**5. The Altiplano** is a plateau between the east and the west cordillera in southern Peru, Bolivia and northern Argentina/Chile with an average altitude of 3800–3900 m, within the plain single mountains, partly Vulcan's loom up 1000–1500 m. The whole area is much drier than the Cordillera Oriental. From north east to southwest the region becomes drier. Troll (1968) recognizes three puna types, wet puna, dry puna and thorn puna.

*Bomarea* species grow on the edges of low mountain, cloud and fog forests, in the shadow of fog forests, epiphytic in fog forests, in wet and dry puna, in hedges between fields, in dry shrubland and in lomas of the coastal desert.

In the western part of the Amotape-Huancabamba-region only one *Sphaerine* species, *B. distichifolia* occurs, associated to relict fog forests in the most northern parts.

No *Alstroemeria* species is found in the Amotape-Huancabamba-region.

No *Bomarea* and *Alstroemeria* species are found on the dry and hot bed of the Marañón valley and on the very dry western mountainside of the Cordillera Occidental between 800 and 2000 m. The subgenera are differently distributed over both areas (Cordillera Occidental North and Cordillera Central). The species of the subgenus *Sphaerine* are restricted to the wet windward side of the Cordillera Central. In the Cordillera Central four of the 8 *Sphaerine* species are endemic. The species of the subgenus *Bomarea* s.str. also have their centre of distribution on the wet windward side of the Cordillera Central. In the Cordillera Central six *Bomarea* s.str. species are endemic. In the Cordillera Occidental only one species of *Bomarea* s.str (*B. ovata*) occurs. The subgenus *Wichurea* shows a different picture. In the Cordillera Occidental seven species occur compared to 4 in the Cordillera Central. In the Cordillera Occidental four species are endemic compared to one in the Cordillera Central. The

two regions have only 4 species (*A. pygmaea*, *B. andimarcana*, *B. dulcis* and *B. ovata*) in common, in spite of the long common border. In the lomas two species can be found: *A. lineatiflora* and *B. ovata*. Both can be found again above 2000 m in the cordillera.

In the wet Cordillera Central most species occur between 2000 and 3500 m. In the drier west cordillera only two species occur beneath 2800 m (*A. lineatiflora* and *B. ovata*). The endemic species are concentrated at the altitude of the fog forests. The species of the low land and premountain forest have always a more or less wide distribution area. *B. ovata* occurs from Central Peru to Argentina, *B. pardina* from southern Colombia to Central Peru, *B. dolichocarpa* from Colombia to southern Peru and *B. dispar* from Colombia to Central Peru. In the fog forest zone, 10 of 24 species are endemic in the Cordillera Central. The population structure is different between the lowland and the mountains. In the lowland the species occur dispersed, in the fog forest when occurring then mostly in large concentrated populations.

On the plains of the Altiplano no *Bomarea* species are found. They occur in this region only on very steep slopes and in boulder fields. The subgenera are differently distributed over the two areas (Cordillera Oriental and Altiplano) similar to Central Peru. The species of the subgenus *Sphaerine* are completely restricted to the wet windward side of the Cordillera Oriental. The species of the subgenus *Bomarea* s.str. also have their centre of distribution on the wet windward side of the Cordillera Central. 3 *Bomarea* s.str. species are endemic in the Cordillera Oriental compared to 6 endemic *Bomarea* s.str. species in the Cordillera Central. In the Altiplano only two species of *Bomarea* s.str (*B. boliviensis* and *B. ovata*) occur. *B. boliviensis* is a small erect plant that in its general habit is similar to *B. dulcis*. *B. ovata* is a very wide distributed variable species. It occurs in the Altiplano only in the northern most edge of the Altiplano, but also in the dry regions of Central Peru, eastern Bolivia and northern Argentina. The subgenus *Wichurea* has also its centre of distribution in the Cordillera Oriental and not in the Altiplano. 2 species are endemic in the Cordillera Oriental compared to none in the Cordillera Central. The Cordillera Oriental (19 species) and the more northern Cordillera Central (34) have 10 species in common. In the wet Cordillera Oriental most species occur between 2000 and 3500 m.

#### Key to the genera (for Peru)

- 1 Fruit a dry explosive capsule, plant erect and flowers strong zygomorph or plant small and flowers actinomorphic *Alstroemeria*  
 1' Fruit a leathery slowly dehiscent capsule or a berry, plants erect or twining, flowers weakly zygomorphic or actinomorphic *Bomarea*

#### Clave para los géneros (para Perú)

- 1 Fruto una cápsula seca, dehiscente, explosiva; plantas erectas y flores muy zigomorfas o planta pequeñas y plantas actinomorfas *Alstroemeria*  
 1' Fruto una cápsula coriácea, lentamente dehiscente o una baya (carnoso); plantas erectas o trepadoras, flores zigomorfas o actinomorfas *Bomarea*

For an alphabetic list of all *Alstroemeria* and *Bomarea* species of Peru and their synonyms see Appendix 1.

## Alstroemeria

### Key to the species

- 1 Plant erect and flowers strong zygomorph; central and southern Peru  
*A. lineatiflora*
- 1' Plant small and flowers actinomorphic; from central Peru to Argentina  
*A. pygmaea*

### Clave para las especies

- 1 Plantas erectas y flores muy zigomórfas; centro y sur de Perú  
*A. lineatiflora*
- 1' Plantas pequeñas y flores actinomórfas; desde el centro de Perú hasta Argentina  
*A. pygmaea*

### 1. *Alstroemeria lineatiflora* Ruiz & Pav.

Fl. Peruv. Chil. 3: 1802.

Type: Peru, Depto. Arequipa, Pongo near Camaná, Ruiz & Pavón s.n. (MA!).

=? *A. chorillensis* Herb. Bot. Reg. 29: 1843.

Type: Peru, cultivated specimen, Mclean s.n. (?K).

Fig 19A, E; distribution 19D.

Plant erect, up to 80 cm high. Stem rigid, glabrous. Leaves lanceolate, 2–10 x 0.5–1.5 cm, at the middle of the stem longest and widest. Inflorescence an erect thyrse with 2–10 flowers. Pedicel 1.5–4 cm, subtending leaves frondose similar to the foliage leaves. Flowers 4–5 cm in diameter and horizontally orientated, inner tepals not exceeding outer ones, outer tepals bright violet, upper two inner tepals violet with a yellow spot surrounded with a white margin and in the centre with thin brown stripes. The lower inner tepals smaller, completely violet. Flowers conspicuous zygomorphic. Tepals are shed, when they are still fresh and coloured. Ovary glabrous, fruit and seeds globose. Distributed in central and southern Peru at altitudes between 50 and 3000 m.

Taxonomic note: In the Flora of Peru, Killip (1936) recognized six *Alstroemeria* (*A. chorillensis*, *A. ligu*, *A. pelegrina*, *A. pygmaea*, *A. recumbens* and *A. violacia*) species for Peru. *Alstroemeria lineatiflora* Ruiz & Pavón is erroneously only mentioned as a synonym of *A. chorillensis* Herb., but *Alstroemeria lineatiflora* is described 1802 and therefore the older name. *Alstroemeria chorillensis* has a type from Peru according to Killip (1936). Mclean sent a rhizome from Lima to London; probably *Alstroemeria chorillensis* is a synonym of *A. lineatiflora* R&P. *Alstroemeria violacia* Philippi is a synonym of *A. paupercula* Philippi and occurs only in Chile, according to Bayer 1987. According to Muñoz & Moreira (2003) *A. paupercula* Philippi is a synonym of *A. violacia* Phil. 1860. *Alstroemeria violacia* Knight & Perry from 1850 is a nomen nudum. Probably *A. violacia* Phil. 1860 (synonym *A. paupercula* Phil.) is a synonym of *A. lineatiflora*.

In the herbarium of Ruiz & Pavón are two *Alstroemeria* species, which are said to be from Peru, *A. lineatiflora* and *A. pelegrina*. But *A. ligu* L. and *A. pelegrina* L. are endemic Chilean species, according to Bayer (1987). Maybe *A. pelegrina* was not correctly labelled because it was never found again in Peru. *Alstroemeria recumbens* Herb. is based on a specimen of Cuming 384 probably this means the 394 from Valparaiso. It is also a Chilean species, according to Bayer (1987).

For Peru remain three names *A. lineatiflora*, *A. pygmaea* and *A. chorillensis* as synonym of *A. lineatiflora*. *A. lineatiflora* is a typical member of the Chilean group, erect, and wide-open zygomorphic flowers. The fertile shoots bear normal foliage leaves.

In Peru the northern distribution limit is in Depto. La Libertad between Viru (Prov. Viru) and Calipuy (Prov. Santiago de Chuco) about 1200–1700 m.

Additional material examined: PERU: Depto. **Ancash**: Prov. Bolognesi, Chasqui y Conococha, 3000 – 3200 m, *Ferreyra 14461* (USM); Raquia (Pativilca – Conococha), 2,050 m, 20.06.1991, *Mostacero et al 2240* (HUT); Prov. Recuay, carretera Pativilca – Conococha, 3,200 m, 27.05.1970, *López et al 7611* (HUT); Prov. Santa, cerro Chimbote, 620 m, 26.09.1986, *Mostacero & Mejía 1469* (HUT); Prov. Casma, Lomas de Mongón Km 350 (Huarmey-Casma), 430 m, 27.11.2001, *Leiva et al 2604* (HUT, HAO, F); Prov. Huaylas, Distr. Pamparomas, road Karka to Pamparomas, 9°03'03" S–77°58'30" W, 2850 m, 5.05.2000, *Weigend & Salas 2000/622* (HUSA, HUT, M, NY, USM, WU). Depto. **Arequipa**: Prov. Caravelí, Lomas, ca. 15 m, *Ferreyra 6370* (USM); Atico, 100 – 150 m, *Ferreyra 12002* (USM). Depto. **Lima**, Barranca, Cerro Paccae, 350 m, *Carpio 507* (USM); Prov. Chancay, Lomas de San Jeronimo, 250 – 300 m, *Ferreyra 16556* (USM); Prov. Canta, La Florida, 2100 – 2200 m, *Ferreyra 18430* (USM), Huaura, Lomas de Lachay, 200 m, 15.11.2003, *N. Melgarejo S. s.n.* (40360, HUT). Depto. **Moquegua**, Lomas de Ilo, 200 – 300 m, *Ferreyra 11607* (USM). Depto. **Tacna**, Prov. Tacna, Morro Sama, 600 m, *Ferreyra 12566* (USM).

### 2. *Alstroemeria pygmaea* Herb.

Amaryllidaceae 100, 397. 1837.

Type: Peru, Pasco, *Mathews 865* (K!).

Fig 19B, C; distribution 19D.

Plant erect, up to 10 cm high. Stem rigid, glabrous. Leaves lanceolate, 2–5 x 0.5–1 cm, at the middle of the stem longest and widest, glabrous. Inflorescence an erect umbel with 1–2 flowers. Pedicel 1.5–2 cm, subtending leaves similar to the normal foliage leaves. Flowers 1–2 cm, erect, inner tepals not exceeding outer ones, outer tepals yellow, inner tepals, spatulate yellow with brown spots at the inner side. The inner tepals are slightly dissimilar to each other, the lower inner tepal is slightly smaller with fewer brown spots. Flowers nearly actinomorphic. Tepals are shed, when they are still fresh and coloured. Ovary glabrous, fruit and seeds globose. Distributed from central Peru to Argentina at altitudes around 3500 m.

Taxonomic note: The next relative is the very similar *A. patagonica*, this *Alstroemeria* species grows most southern of all; also see note at *A. lineatiflora*.

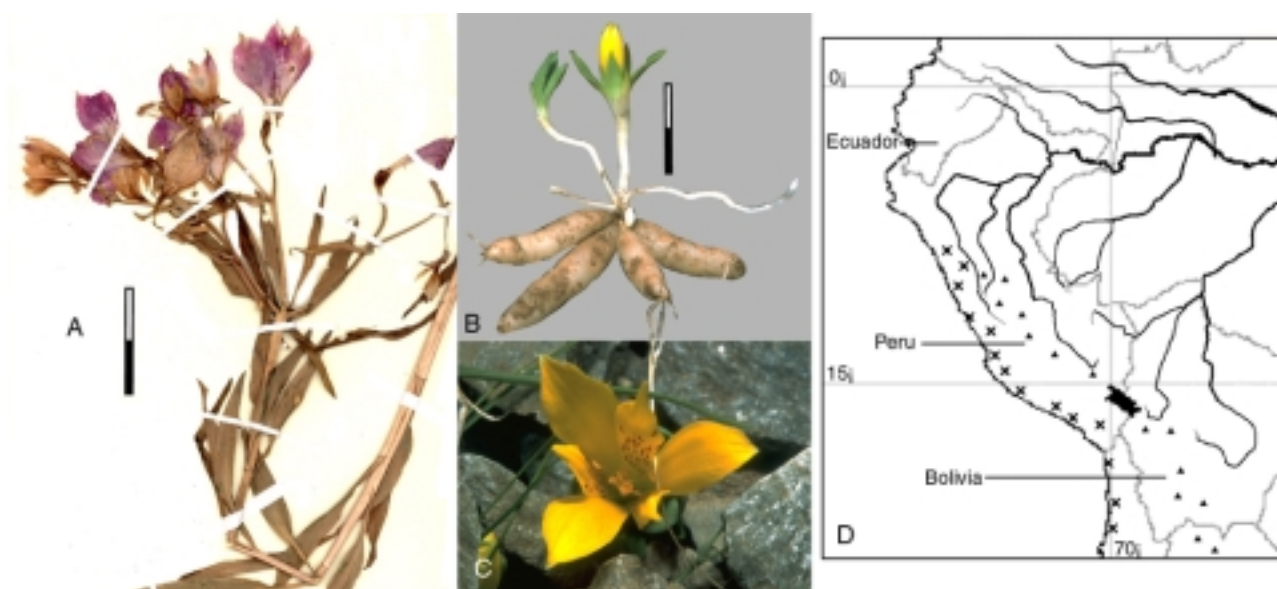
Additional material examined: PERU, Depto. **Ancash**: Prov. Huaylas, near Auquispuquio, 3900 – 4000 m, *Smith et al 12076* (MO, USM); Parque Nacional del Huascarán, 4300 – 4835 m, 15.01.1985, *Smith et al 9244* (HUT, MO). Depto. **Lima**: Prov. Yauyos, Huacracocho, 16 km de Tupe, 4250–4300 m, *Tovar 656* (USM); Depto. **Junín**: Prov. Junín, Ondores, 4150 m, *Pertersson 165* (USM); Prov. Tarma, road Tarma to Jauja, 4100 m, *Illis et al. 180* (USM); Depto. **Puno**: road to Macusani, *Weigend & Weigend 2000/68* (M, USM).

## Bomarea

### Key to the subgenera (for Peru)

- 1 Ovary semi-inferior *Wichuraea*
- 1' Ovary inferior 2





**Figure 19.** (A) Habit of *A. lineatiflora* (Weigend 2000/622 (M)); (B & C) *A. pygmaea*; (D) distribution, triangle *A. pygmaea*, cross *A. lineatiflora*; (E) *A. lineatiflora* (Peru, Ancash, photo M. Weigend). Scale bars: (A)= 6 cm; (B)= 3 cm.

2 Fruit dehiscent, leathery

2' Fruit indehiscent, fleshy

### Clave para los subgéneros (para Perú)

1 Ovario semiinfero

1' Ovario ínfero

2 Fruto dehiscente, coriáceo

2' Fruto indehiscente, carnosu

### Subgenus *Bomarea*

#### Key to the species:

1 Outer tepals cornate

1' Outer tepals not cornate

2 Adaxially densely pubescent; in central Peru

2' Adaxially weakly pubescent or glabrous

3 Leaves broadly ovate, outer tepals pink

3' Leaves lanceolate, outer tepals red with a green tip

4 Horn 3 – 6 mm, outer tepals narrow oblong; from Ecuador to Peru

4' Horn 1 – 2 mm, outer tepals broad oblong; northern to central Peru

5 Inflorescence a thyse

5' Inflorescence an umbel

6 Inner tepals exciding outer ones at least 0,5 cm

6' Inner and outer tepals equal to

*Bomarea* s.str.

*Sphaerine*

*Wichuraea*

2

*Bomarea* s.str.

*Sphaerine*

*B. cordifolia*

*B. lopezii*

*B. cornuta*

*B. cornigera*

7 Flowers 4-5 cm, pedicels 10-15 cm, north Peru

*B. crinita*

7' Flowers 2-3,5 cm, pedicels 4-12 cm

8

8 Pedicels more than 8 cm long; distributed in Peru, Depto. Ayacucho

*B. weigendii*

8' Pedicels not longer than 6 cm, Bolivia

*B. chaparensis*

9 Outer tepals pink, inner tepals with a green tip

10

9' Outer tepals red, orange or yellow, inner tepals without a green tip

11

10 Inner tepals with linear dark spots, inflorescence always an umbel; central Peru

*B. rosea*

10' Inner tepals with round dark spots, inflorescence only in weak, few flowered plants an umbel

*B. ovata*

11 Flowers wide open, Amotape-Huancabamba-region

*B. alstroemeroides*

11' Flowers funnel shaped

12

12 Flowers large 3,5 – 5 cm

13

12' Flowers small 1,5 – 3 cm

15

13 Inner tepals with dark spots, outer tepals red; from central Peru to Bolivia

*B. formosissima*

13' Inner tepals without dark spots, outer tepals yellow

14

14 Plant conspicuous pubescent, flowers 3,5-4 cm; from central Peru to Bolivia

*B. aurantiaca*

14' Plant nearly glabrous, flowers 5 cm; north Peru

*B. superba*

15 Lower most bracts large up to 3 x 1,5 cm, forming a conspicuous involucrem

*B. macusanii*

15' All bracts small up to 2,5 x 0,3 cm, sometimes one or two larger, but never forming a involucrem

16

16 Leaves completely glabrous and nerves loose, Ecuador and northern Peru

*B. dissitifolia*

16' Leaves pubescent, or with very prominet hairs

17

17 Flowers and inflorescence pendant, red with dark spots, northern Peru

*B. amazonica*

17' Flowers nodding, inflorescence erect or nodding, yellow to orange with dark spots or other colours without dark spots, Peru

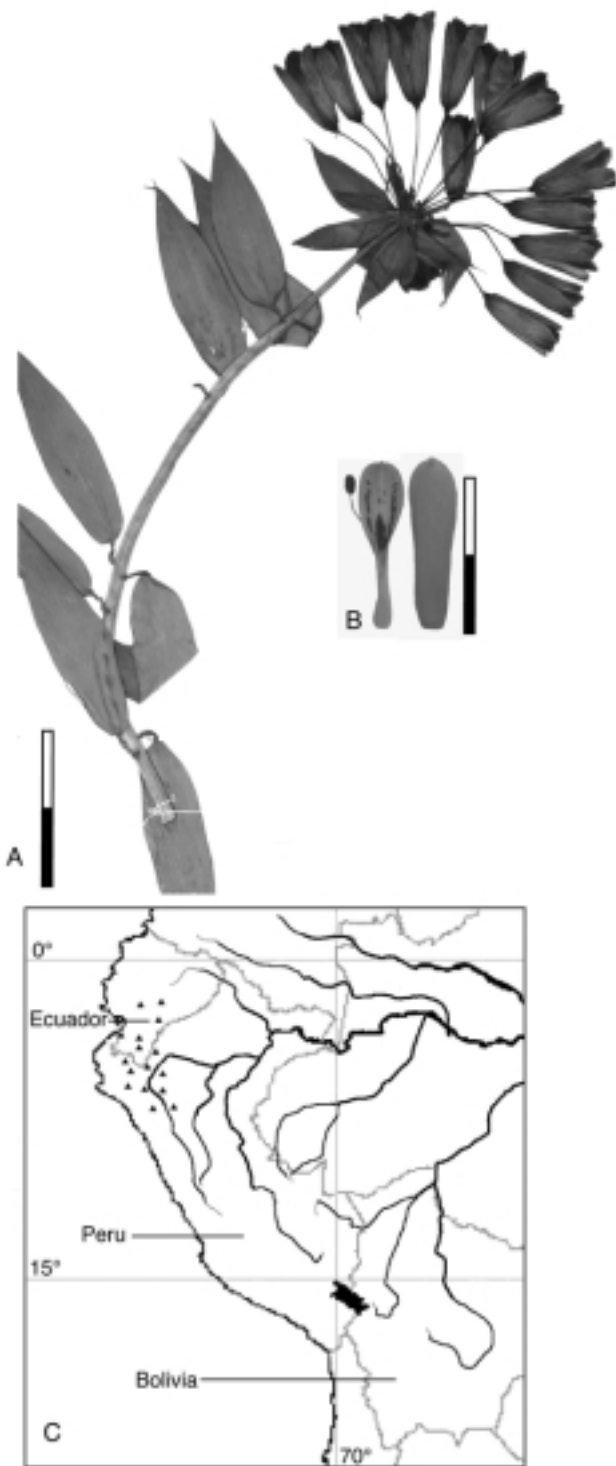
18



**Figure 20.** *Bomarea* s.str. from Carpish, Depto. Huánuco, Peru. **(A & B)** *B. denticulata*, flower preparation inner tepal on the right side; **(C)** *B. purpurea*; **(D)** *B. nematocaulon*; **(E)** *B. crocea*. Scale bars: (A), (B), (D)= 8 cm; (C)= 10; (E)= 1 cm.

- |   |                          |   |                         |
|---|--------------------------|---|-------------------------|
| 18 Leaves adaxially with very prominent and dense nerves, without hairs or very short ones or pubescent | <i>B. setacea</i>        | 29 Inner tepals spotted, weakly pubescent   | <i>B. herrerae</i>      |
| <b>complex</b> (5 species see additional key)   |                          | 29' Inner tepals not spotted, conspicuous dense pubescent   | <i>B. aurantiaca</i>    |
| 18' leaves adaxially without very prominent nerves, densely pubescent                                   | 19                       | 30 Leaves large up to 20 x 8 cm, restricted to the lomas of southern Peru   | <i>B. latifolia</i>     |
| 19 Flowers very dark purple, inner tepals without dark spots  | 22                       | 30 Leaves smaller up to 16 x 4 cm   | 31                      |
| 19' Flowers orange or yellow, inner tepals with dark spots  | 23                       | 31 Flowers small 2 -3,5 cm long   | 32                      |
| 22 Flowers red, tepal plate round, growing suberect, Ecuador, north Peru                                | <i>B. hartwegii</i>      | 31' Flowers large 4-5 cm long; Ecuador to central Peru  | <i>B. goniocaulon</i>   |
| 22' Flowers dark purple, twining, Central Peru, Depto. Huanuco  | <i>B. pseudopurpurea</i> | 32 Outer tepals broad oblong, flowers 2-2,5 cm, Ecuador   | <i>B. unciifolia</i>    |
| 23 Leaves denticulate, flowers yellow with short pedicels; central Peru                                 | <i>B. denticulata</i>    | 32' Outer tepals oblong, flowers 2,5-3,5 cm; Ecuador to north Peru  | <i>B. angulata</i>      |
| 23' Leaves not denticulate, flowers orange with longer pedicels; Amotape-Huancabamba-region             | <i>B. densiflora</i>     | 33 Flowers campanulate, outer tepals cuculate   | <i>B. obovata</i>       |
| 24 Lower inner tepal, significant smaller than other two ones, Altiplano                                | <i>B. boliviensis</i>    | 33 Flowers funnel shaped, outer tepals oblong   | 34                      |
| 24' Inner tepals nearly equal, the lower one sometimes slightly smaller                                 | 25                       | 34 Bracts green, similar to the foliage leaves  | 35                      |
| 25 Inflorescence dense, hypopodium 0,1 – 0,8 cm, relation of hypopodium to epipodium at least 1 : 5     | 26                       | 34' Bracts reddish, scale like  | 39                      |
| 25' Inflorescence laxiflorous, hypopodium 1 – 20 cm, relation hypopodium to epipodium at least 1 : 1    | 33                       | 35 Bracts of the secondary and all subsequent flowers also green and large, the outer tepals slightly larger than the inner ones, south Ecuador to Peru | <i>B. tribrachiata</i>  |
| 26 Flowers campanulate, outer tepals cuculate; Ecuador and northern Peru                                | <i>B. campanularia</i>   | 35' Bracts of the secondary flowers conspicuous smaller than if the primary flowers   | 36                      |
| 26' Flowers funnel shaped, outer tepals oblong  | 27                       | 36 Hypopodium 10-20 cm, flowers 1,5-3,5 cm; Ecuador, Peru   | 37                      |
| 27 Inner tepals exceeding outer ones 0.5 cm, inner tepals white with dark spots; Ecuador, Peru          | <i>B. pardina</i>        | 36' Hypopodium 1-3 cm, flowers 1-1,8 cm; Peru   | <i>B. nematocaulon</i>  |
| 27' Inner tepals not exceeding outer ones, inner tepals not white                                       | 28                       | 37 Outer tepals spotted, fruit elongated  | <i>B. dolichocarpa</i>  |
| 28 Flowers orange or red; from central Peru to Bolivia  | 29                       | 37' Outer tepals unspotted, fruit turbinate   | 38                      |
| 28' Flowers pink and green  | 30                       | 38 Bracts large similar to the normal leaves  | <i>B. campylophylla</i> |
|   |                          | 38' Bracts significant smaller to the normal leaves   | <i>B. angustissima</i>  |
|   |                          | 39 Inner tepals exceeding outer ones 0,7-1 cm; Peru   | 40                      |
|   |                          | 39' Inner tepals equal to outer ones  | 41                      |
|   |                          | 40 Inner tepals 3,5-5 cm  | <i>B. multipes</i>      |

40' Inner tepals 2–3 cm	<i>B. dispar</i>	16 Hojas completamente glabras y nervaduras laxas; Ecuador y norte de Perú	<i>B. dissitifolia</i>
41 Hypopodium 1–4 (–5) cm	42	16' Hojas pubescentes, o con muy prominentes pelos	17
41' Hypopodium (5-) 8–25 cm	43	17 Flores e inflorescencias colgantes, rojas con puntos oscuros, norte de Perú	<i>B. amazonica</i>
42 Flowers pendent, actinomorphic, mostly 2 per cyme, seldom 3; Peru, Bolivia and Argentina	<i>B. ovata</i>	17' Flores colgantes, inflorescencias erectas o colgantes, amarillas a anaranjadas con puntos oscuros u otros colores sin puntos oscuros, Perú	18
42' Flowers horizontally, zygomorphic, at least 3,1 mostly 4–5 per cyme; from central Peru to Bolivia	<i>B. tarmensis</i>	18 Hojas adaxialmente con nervaduras muy prominentes, sin pelos, con pelos cortos o pubescentes	<b>complejo</b> <i>B. setacea</i>
43 Flowers 2,5–3,5 cm, leaves adaxially densely pubescent; central Peru	<i>B. cordifolia</i>	18' Hojas adaxialmente sin nervaduras muy prominentes, densamente pubescentes	19
43' Flowers 4–5 cm, leaves adaxially nearly glabrous or glabrous; Peru	<i>B. speciosa</i>	21 Flores muy púrpura oscuro, tépalos internos sin puntos oscuros	22
<b>Clave para las especies</b>			
1 Tépalos externos con un cuerno	2	21' Flores anaranjadas o amarillas, tépalos internos con puntos oscuros	23
1' Tépalos internos sin un cuerno	5	22 Flores rojas, tépalo con lámina redondeada, suberecto; Ecuador y norte de Perú	<i>B. hartwegii</i>
2 Hojas adaxialmente pubescentes, distribuidas en el Centro del Perú	3	22' Flores púrpura oscuro, enredadera; centro del Perú, Dpto. Huánuco	<i>B. pseudopurpurea</i>
2' Hojas adaxialmente ligeramente pubescentes o glabras	4	23 Hojas denticuladas, flores amarillas con cortos pedicelos; centro del Perú	<i>B. denticulata</i>
3 Hojas ampliamente ovadas, tépalos externos rosados	<i>B. cordifolia</i>	23' Hojas no denticuladas, flores anaranjadas con largos pedicelos; región Amotape-Huancabamba	<i>B. densiflora</i>
3' Hojas lanceoladas, tépalos externos rojos con un ápice verde	<i>B. lopezii</i>	24 Tépalo interno mas bajo, significativamente mas pequeño que los otros dos; Altiplano	<i>B. boliviensis</i>
4 Cuerno 3–6 mm, tépalos externos angostamente oblongos; de Ecuador y Perú	<i>B. cornuta</i>	24' Tépalos internos casi iguales, tépalo interno mas bajo algunas veces ligeramente más pequeño	25
4' Cuerno 1–2 mm, tépalos externos ampliamente oblongos; norte hasta el centro del Perú.	<i>B. cornigera</i>	25 Inflorescencia densiflora, hipopodio 0,1– 0,8 cm, relación entre hipopodio a epipodio al menos 1:5	26
5 Inflorescencia un tirso	23	25' Inflorescencia laxiflora, hipopodio 1–20 cm, relación hipopodio a epipodio al menos 1: 1	33
5' Inflorescencia una umbela	6	26 Flores campaniformes, tépalos externos oblongos; Ecuador y norte de Perú	<i>B. campanularia</i>
6 Tépalos internos excediendo a los externos al menos en 0,5 cm	7	26' Flores infundibuliformes, tépalos externos oblongos	27
6' Tépalos internos y externos de igual tamaño	9	27 Tépalos internos excediendo a los externos 0,5 cm, tépalos internos blancos con puntos oscuros; Ecuador	<i>B. pardina</i>
7 Flores 4 – 5 cm, pedicelos 10–15 cm; norte del Perú	<i>B. crinita</i>	27' Tépalos internos no excediendo a los externos, tépalos internos no blancos	28
7' Flores 2–3,5 cm, pedicelos 4–12 cm	8	28 Flores anaranjadas o rojas; desde el centro del Perú hasta Bolivia	29
8 Pedicelos mas de 8 cm de largo; distribuido en el Perú, Dpto. Ayacucho	<i>B. weigendii</i>	28' Flores rosadas y verdes	30
8' Pedicelos no mas largos de 6 cm; Bolivia	<i>B. chaparensis</i>	29 Tépalos internos punteados, ligeramente pubescentes	<i>B. herrerae</i>
9 Tépalos externos rosados, tépalos internos con un ápice verde	10	29' Tépalos internos no punteados, conspicuamente denso pubescentes	<i>B. aurantiaca</i>
9' Tépalos externos rojos, anaranjados o amarillos, tépalos internos sin un ápice verde	11	30 Hojas grandes hasta 20 x 8 cm; restringida a las lomas del sur del Perú	<i>B. latifolia</i>
10 Pétalos internos con puntos oscuros lineares, inflorescencia siempre una umbela; centro del Perú	<i>B. rosea</i>	30' Hojas más pequeñas hasta 16 x 4 cm	31
10' Tépalos internos con puntos oscuros redondos, inflorescencia una umbela sólo en plantas pobres con pocas flores	<i>B. ovata</i>	31 Flores pequeñas 2–3,5 cm largo	32
11 Flores muy abiertas; en Amotape-Huancabamba	<i>B. alstromeroides</i>	31' Flores grandes 4–5 cm largo; Ecuador a centro del Perú	<i>B. gniocaulon</i>
11' Flores infundibuliformes	12	32 Tépalos externos ampliamente oblongos, flores 2–2,5 cm; Ecuador	<i>B. unciifolia</i>
12 Flores grandes 3,5–5 cm	13	32' Tépalos externos oblongos, flores 2,5 – 3,5 cm; Ecuador a norte del Perú	<i>B. angulata</i>
12' Flores pequeñas 1,5–3 cm	15	33 Flores campaniformes, tépalos externos cuculados	<i>B. obovata</i>
13 Tépalos internos con puntos oscuros, tépalos externos rojos; del centro de Perú y Bolivia	<i>B. formosissima</i>	33' Flores infundibuliformes, tépalos externos oblongos	34
13' Tépalos internos sin puntos oscuros, tépalos externos amarillos	14	34 Brácteas verdes, similar a las hojas del follaje	35
14 Planta conspicuamente pubescente, flores 3,5–4 cm; del centro de Perú a Bolivia	<i>B. aurantiaca</i>	34' Brácteas rojizas, similar a la escama	39
14' Planta casi glabra, flores 5 cm; norte del Perú	<i>B. superba</i>		
15 Brácteas mas bajas grandes hasta 3 x 1,5 cm, formando un conspicuo involucre	<i>B. macusanii</i>		
15' Todas las brácteas pequeñas hasta 2,5 x 0,3 cm, algunas veces una o dos mas grandes, pero nunca formando un involucre	16		



**Figure 21.** *B. angulata*; (A) habit; (B) flower preparation, inner tepal on the left side; (C) distribution. Scale bars: (A)= 4 cm; (B)= 2 cm.

- 35 Brácteas de las flores secundarias y subsiguientes también verdes y grandes, tépalos externos ligeramente más largos que los internos; sur de Ecuador a Perú *B. tribrachiata*
- 35' Brácteas de las flores secundarias conspicuas más pequeñas que en las flores primarias 36
- 36 Hipopodio 10–20 cm, flores 1,5–3,5 cm; Ecuador, Perú 37
- 36' Hipopodio 1–3 cm, flores 1–1,8 cm; Perú *B. nematocaulon*
- 37 Tépalos externos punteados, fruto elongado *B. dolichocarpa*

- 37' Tépalos externos no punteados, fruto turbinado 38
- 38 Brácteas grandes similar a las hojas normales *B. campylophylla*
- 38' Brácteas significativamente mas pequeñas que las hojas normales *B. angustissima*
- 39 Tépalos internos excediendo a los externos 0,7–1 cm; Perú 40
- 39' Tépalos internos igualando a los externos 41
- 40 Tépalos internos 3,5–5 cm *B. multipes*
- 40' Tépalos internos 2–3 cm *B. dispar*
- 41 Hipopodio 1–4 (–5) cm 42
- 41' Hipopodio (5–) 8–25 cm 43
- 42 Flores péndulas, actinomorfas, mayormente 2 por cima, raramente 3; Perú, Bolivia y Argentina *B. ovata*
- 42' Flores orientadas horizontalmente, cigomorfas, al menos 3, mayormente 4–5 por cima; desde el centro de Perú a Bolivia *B. tarmensis*
- 43 Flores 2,5–3,5 cm, hojas con cara adaxial densamente pubescente; centro del Perú *B. cordifolia*
- 43' Flores 4–5 cm, hojas con cara adaxial casi glabra o glabra; Perú *B. speciosa*

**The species of *Bomarea* subgenus *Bomarea* s.str. arranged alphabetically**

**1. *Bomarea alstroemeroides* Hofreiter & E. Rodr.**

Arnaldoa 11(2): 21-28. 2004

Type: Peru, Depto. Amazonas, Prov. Leymebamba, near the Laguna de Los Cóndores, primary forest, 2550-2600 m, 31.01.1999, Eric Rodríguez et al. 2167a (HOLOTYPE: HUT!).

Plant twining, up to 4 m long, stem robust, up to 0,5 cm in diameter, not recurved at apex, pubescent with increasing density towards the top, or glabrous. Leaves linear or linear-lanceolate, 2–8 x 0,2–0,8 cm. Both leaf surfaces glabrous. Inflorescence an umbel, pedicels 2–4 cm, pubescent. Subtending leaves of the lower-most flowers bracteose, 0,5– 1 x 0,1–0,2 cm, subsequent bracts smaller. Flowers zygomorphic, horizontally oriented, wide open, ca 3–4 cm in diameter, inner tepals equal to outer ones in length, 2–3 cm long, outer tepals oblong, outer surface red, paler red on inner surface. Inner tepals subdivided in blade and claw, orange with a red stripe at outer side and with many dark spots. Ovary pubescent, fruit turbinate and seeds globose.

Distribution: *B. alstroemeroides* grows in the Amotape-Huancabamba-region from the Abra de Calla-Calla to the mountains east of Bolivar on the windward sides in small shrubs and fog forests at altitudes between 2500 and 3600 m.

Note: *Bomarea alstroemeroides* is so far known only from a small area and even there it seems to be rare. In contrast to most other species of the Multiflora group it does not occur in large population, but dispersed. The next relatives are maybe *B. multiflora* from Ecuador and Colombia and *B. formosissima* from southern Peru and northern Bolivia. The shape of the flower can distinguish the new species, but the shape of the tepals and the colour of the flowers are very similar to *B. formosissima*. It was found to grow sympatrically with 4 other species of the Multiflora group (*B. densiflora*, *B. purpurea*, *B. setacea* and *B. superba*). An illustration can be found in Hofreiter & Rodríguez (2004).

Additional specimen examined: PERU. Depto. Amazonas, Prov. Chachapoyas, Balsas road to Leymebamba, 3559 m, 19.10.2000,

*Weigend et al. 2000/863* (HUT, MSB); Balsas road to Leymebamba, 3300 m, 5.01.1979, *Dillon & Turner 1747* (F); Entre Leymebamba y Balsas, 2900 m, 01.06.1963, *López et al. 4415* (HUT). Depto. **La Libertad**: Prov. Bolívar, east of Bolívar, ca. 3400 m, *Hofreiter s.n.* (MSB). Depto. **San Martín**: Prov. Huallaga, Dist. Saposoa, Entre El Tambo y Jalca del Rayo, camino a Leymebamba, 2800-3200 m, 15.09.2000, *Quipuscoa et al. 2485* (HAO, HUSA).

## 2. *Bomarea amazonica* Hofreiter & E. Rodr., spec. nov.

Type: Depto Amazonas, Prov. Bongará, near Pomacocha, 2300-2700 m, 19.06.1962, *Wurdack 910* (holotype: NY!, isotype: F!).

Fig. 3A; 34B, E; distribution 34C.

*Inter speciebus affinis insignis caule spiraliter scandente, pubescente, foliis late ovatis, abaxialiter glabris, adaxialiter pubescentibus, umbella pendula, pedicellis 3–6 cm longis, floribus actinomorpha, 1,5–2 cm longis, segmentis perianthii aequalibus, tepalis externis oblongis, rubris, tepalis internis unguiculatis, rubris, ovario piloso.*

Plant twining, several metres long (2–5 m), stem robust, up to 0,5 cm in diameter, not recurved at apex, pubescent with increasing density towards the top, or glabrous. Leaves lanceolate ovate to ovate, 3–15 x 2–6 cm. Adaxial side of leaves pubescent, abaxial side glabrous, leaves denticulate. Inflorescence a pendulous umbel, pedicels 3–6 cm, pubescent. Subtending leaves of the lower-most flowers bracteose, 0,5–1 x 0,3–0,5 cm, subsequent bracts smaller, 0,5–1 x 0,1–0,2 cm. Flowers actinomorphic, pendulous, ca 1,5–2 cm long, inner tepals equal to outer ones in length, outer tepals oblong, outer surface deep red, paler on inner surface. Inner tepals subdivided in blade and claw, red with a deep red stripe at outer side and dark spots. Ovary pubescent, fruit turbinate and seeds globose. *B. amazonica* grows in northern Peru in small shrubs and cloud forests at altitudes between 2200 and 3500 m.

Note: *Bomarea amazonica* is so far known only from the Amotape-Huancabamba-region, it can be distinguished by the combination of deep red, pendulous flowers with dark spots and the denticulate leaves from all other *Bomarea* s.str. species. Rarely flowering shoots bear only scales comparable to *B. nervosa*.

Additional material examined: PERU: Depto. **Amazonas**: Prov. Bagua, Serranía de Bagua, 1800-1950 m, *Gentry et al. 22943* (MO); Prov. Bagua, Cordillera de Colan, near La Peca, 2500-2600 m, *Barbour 2523, 2859, 3686, 4002* (MO); La Peca, near Chonza, 1700-1900 m, *Doster 98/100* (M, MSB); Prov. Bongará, Dist Yambrasbamba, 1860-2000 m, *Tillett 673-296* (GH); Depto. **San Martín**: Jepelasio near Moyobamba, 1800 m, *Woytkowski 35298* (F); Prov. Rioja, road Pedro Ruiz-Rioja, between La Esperanza and Nueva Cajamarca, 2000-2300 m, *Weigend et al. 2000/925* (MSB).

Ecuador: Prov. Loja, Loja – Zamora road, 2700 m, *Harling & Andersson 22054* (GB).

## 3. *Bomarea angulata* Benth.

Pl. Hartw. 156. 1845.

Type: Ecuador, Prov. Loja, Chuquiribamba, *Hartweg s.n.* (K!).

= *B. angustifolia* Benth., Pl. Hartw. 156. 1845.

Type: Ecuador, Prov. Loja, Chuquiribamba, *Hartweg 853* (K!).

= *B. isopetala* Kraenzl., Bot. Jahrb. Syst. 40: 232. 1908.

Type: Ecuador, Prov. Canar, Huariacaja, near Pindili and Marivina, 3000-3300 m, *Lehmann 4609* (B!).

= *B. cuencensis* Kraenzl., Bot. Jahrb. Syst. 40: 232. 1908.

Type: Ecuador, Prov. Azuay, Cuenca, near Yerbabuena and Huasihuaco, 2600-3500 m, *Lehmann 5886* (B!, K!).

= *B. calyculata* Kraenzl., Kew Bull. 189. 1913.

Type: Bolivia, *Pearce 205* (K!).

Fig. 21A, B, distribution 21C.

Plant twining, stem robust, several metres long, up to 0,5 cm in diameter, recurved at apex, glabrous. Leaves lanceolate to ovate, 3–10 x 1–4 cm. Adaxial side of leaves pubescent or seldom glabrous, abaxial side glabrous. Inflorescence in strong specimens a thyrse, hypopodium of primary flowers 0,1–0,5 cm, epipodium 2–4 cm. In weaker specimens reduced to an umbel. Bracts of lower most primary flowers similar to the normal leaves, 2–5 x 0,5–1 cm, bracts of secondary flowers always small, 0,5–2 x 0,1–0,3 cm. Perianth slightly actinomorphic, pendant, ca 2–4 cm long, inner tepals equal to outer ones in length, outer tepals oblong, pink with a green tip. Inner tepals subdivided in blade and claw, yellow-white with a green blade and dark spots. Filaments slightly shorter than inner tepals, straight, fruit turbinate and seeds globose. *Bomarea angulata* grows in northern Peru and southern Ecuador in small shrubs and fog forests at altitudes between 2300 and 3200 m.

Note: *Bomarea angulata* is very similar to *B. gniocaulon*. The main character to separate the two species is the size of the flowers 2-4 cm in *B. angulata*; 5-6 cm in *B. gniocaulon*.

Additional material examined: PERU: Depto. **Amazonas**, Prov. Chachapoyas, Balsas to Leimebamba, 3000 m, *Metcalfe 30738* (MO); Jalca de Calla-Calla, 3650 m, 3.7.1978, *López & Aldave 8491* (HUT); Depto. **Cajamarca**, Prov. Chota, Chota to Tacabamba, 2800 m, *Smith & Vasquez 3541* (NY); Prov. Contumazá, Cascabamba Carriba de Contumazá, 3100 m, *Sagástegui et al. 10022* (MO, NY); Depto. **Lambayeque**, Prov. Ferreñafe, Sinchigual, 2650 m, *Sagástegui et al. 12759* (MO, NY); Huasica, 3200 m, *Quiroz 1334* (F); Depto. **Piura**, Huancabamba, 3000 m, *Scolnik 1406* (MO); Cerro la Viuda, 2300 m, *Sagástegui et al. 8220* (MO).

## 4. *Bomarea angustissima* Killip

J. Wash. Acad. Sc. 22: 60. 1932.

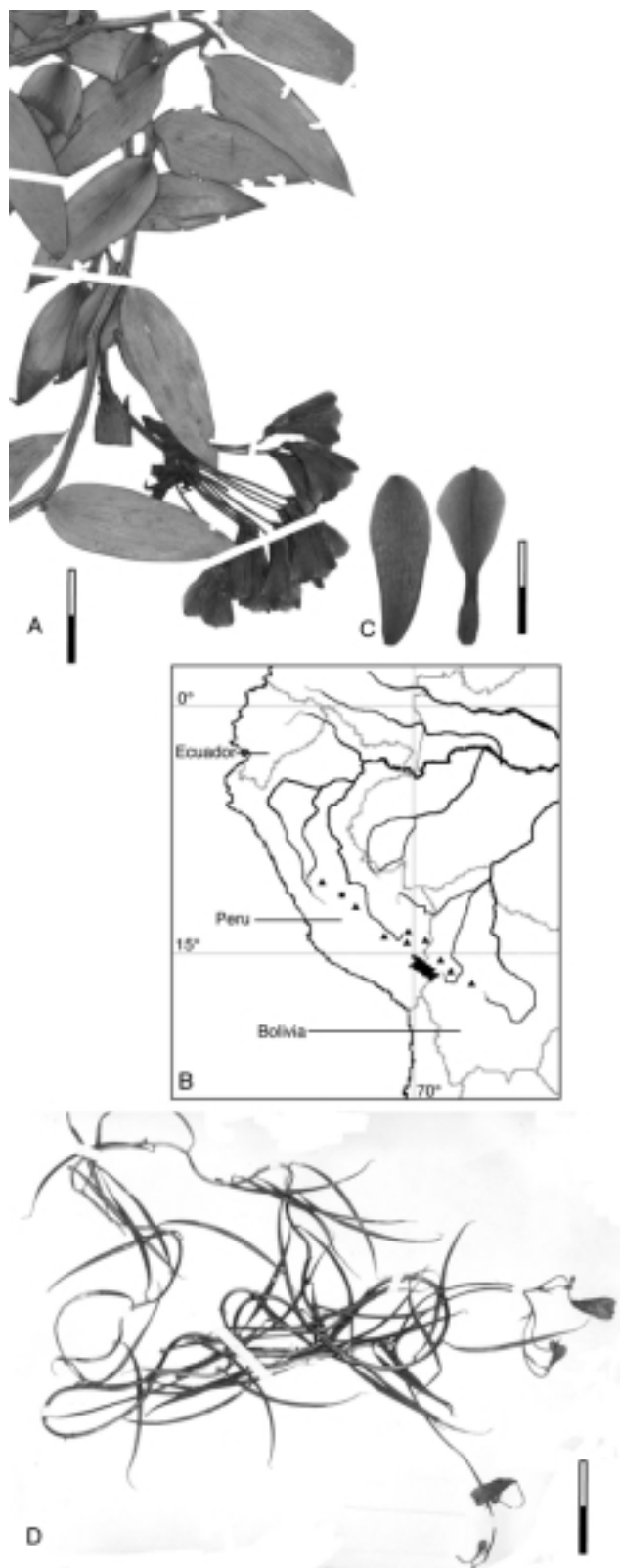
Type: Peru, Tambo de Vaca, 4000 m, 1932, *Macbride 4409* (HOLOTYPE: F, photo B!, fragment US!).

Fig. 22D; distribution 22B.

Plant twining, stem robust, several metres long, up to 0,5 cm in diameter, not recurved at apex, glabrous. Leaves linear, 8–12 x 0,3–0,8 cm. Adaxial side of leaves pubescent, abaxial side glabrous. Inflorescence a thyrse, hypopodium of primary flowers 8–12 cm, epipodium 2–3 cm. Bracts of primary flowers small, 0,5–1,5 x 0,2–0,4 cm, bracts of secondary flowers 0,8–1,2 x 0,2–0,3 cm. Perianth slightly zygomorphic, pendent, ca. 3 cm long, inner tepals slightly shorter than outer ones in length, outer tepals oblong, slightly cucullate, red with a green tip. Inner tepals subdivided in blade and claw, yellow claw and green blade with dark spots. Filaments straight, fruit turbinate, glabrous and seeds unknown. *B. angustissima* grows in the eastern cordillera of Peru on the windward sides in small shrubs and fog forests at altitudes around 4000 m.

Note: *Bomarea angustissima* is very similar to *B. campylophylla*, but it can be distinguished by the primary bracts, small in *B. angustissima*, large and leaf like in *B. campylophylla*.

Additional material examined: only known so far from the type collection.



**Figure 22.** (A) *B. aurantiaca*; (B) distribution, triangle *B. aurantiaca*, quadrate *B. angustissima*; (C) *B. aurantiaca*, inner tepal on the right side; (D) *B. angustissima*. Scale bars: (A), (D)= 3 cm; (C)= 1,5 cm.

**5. *Bomarea aurantiaca* Herb.**

Amaryllidaceae 399. 1837.

Type: Peru, Panahuanca, Mathews 1160 (K!).

=*B. cernua* Grisebach ex Baker, Handb. Amaryllidaceae 149. 1888.

Type: Peru, Depto. Cusco, Sachapata, *Lechler* 2597 (K!, photo M!).

=*B. macleanica* Herb., Bot. Reg. 28: Misc. 66. 1842.

Type: Peru, Depto. Junin, Vitoc, *Maclean* s.n. (K).

=*B. trachypetala* Kraenzl., Bot. Jahrb. Syst. 50: Beiblatt 112: 5. 1913.

Type: Bolivia, *Bang* 1936 (B!,M! US!).

=*B. weberbaueriana* Kraenzl., Bot. Jahrb. Syst. 40: 233. 1908.

Type: Peru, Depto. Puno, Sandia, 2900 m, *Weberbauer* 669 (B!).

Fig. 22A, C; distribution 22B.

Plant twining, stem robust, several metres long, up to 1 cm in diameter, not recurved at apex, strongly pubescent. Leaves linear-lanceolate or lanceolate, 8–15 x 2–5 cm. Adaxial side of leaves densely pubescent, yellowish-white, abaxial side glabrous. Inflorescence in strong specimens a thyrses, hypopodium of primary flowers 0,1–0,5 cm, epipodium 2–6 cm. In weaker specimens reduced to an umbel. Bracts of primary flowers frondose or bracteose, 2–5 x 0,5–1 cm, bracts of secondary flowers bracteose, 1–2 x 0,2–0,5 cm. Perianth slightly zygomorphic, horizontally oriented, ca 2–4 cm long, inner tepals equal to outer ones in length, outer tepals oblong, yellow-orange. Inner tepals subdivided in blade and claw, yellow-orange without dark spots. Filaments slightly shorter than inner tepals, weakly curved, fruit turbinate and seeds globose. *B. aurantiaca* grows in the eastern cordillera of Peru and Bolivia on the windward sides in small shrubs and fog forests at altitudes between 2600 and 3600 m.

Note: *B. aurantiaca* is even in vegetative state easy identified, because of its remarkable pubescence. In central Peru it is a rare plant, but it is often found in the Cordillera Oriental of southern Peru and northern Bolivia.

Additional material examined: PERU: Depto. **Ayacucho**: Prov. Huanta, Putis, Choimacota Valley, 3400 m, *Weberbauer* 7528 (F). Depto. **Cuzco**: Prov. Paucartambo, Pillahuata, 2800 – 3000 m, *West* 7081 (GH); Prov. Paucartambo, Tres Cruces, 3290 – 3500 m, *Luteyn & Lebrón-Luteyn* 6400 (NY); Marcachea, *Vargas* 11110 (F, K); Prov. Quispicanchi, entre Abra Walla Walla y Marcapata 2800 – 4600 m, *Nunez et al.* (F).

BOLIVIA: Depto. Cochabamba: Choro, above Cocapata river, 3600 m, *Brooke* 6093 (BM); Prov. Chapare, La Aduana, 3000 m, *Steinbach* 9531 (BM, ED, G, MO); Prov. Chapare, Villa Tunari, 3025 m, *Hawkes et al.* 4438 (MO); Depto. La Paz: Prov. Inquisivi, down of Laguna Huara Huarani, near Choquetanga, 3500 – 3550 m, *Lewis* 40936 (LPB); Prov. Murillo, Zongo, 3180 m, *Moraes* 88 (LPB); Prov. Murillo, Valle del Rio Zongo, 3400 m, *Solomon* 17434 (LPB); Prov. Nor Yungas, Cocapata, 3240 m, *Eriksen & Molau* 503 (LPB); Prov. Nor Yungas, above Undavi, 3500 – 3600 m, *Lyle* 6444 (LPB); Prov. Nor Yungas, Chuspipata, 2800 m, *Solomon* 14976 (LPB); Larecaja, 3200 m, *Mandon* 1203 (BM, G); Unduavi, 2600 m, *Rusby* 563 (GH); La Paz, 3300 m, *Bang* 724 (BM, ED, G, GH); Prov. Nor Yungas, Unduavi, 3200 m, *Buchtien* 103 (G, GH).

**6. *Bomarea boliviensis* Baker**

Bull. Torrey Bot. Club 29: 700. 1902.

TYPE: BOLIVIA, near La Paz, 3300 m, *Rusby* 573 (NY!).

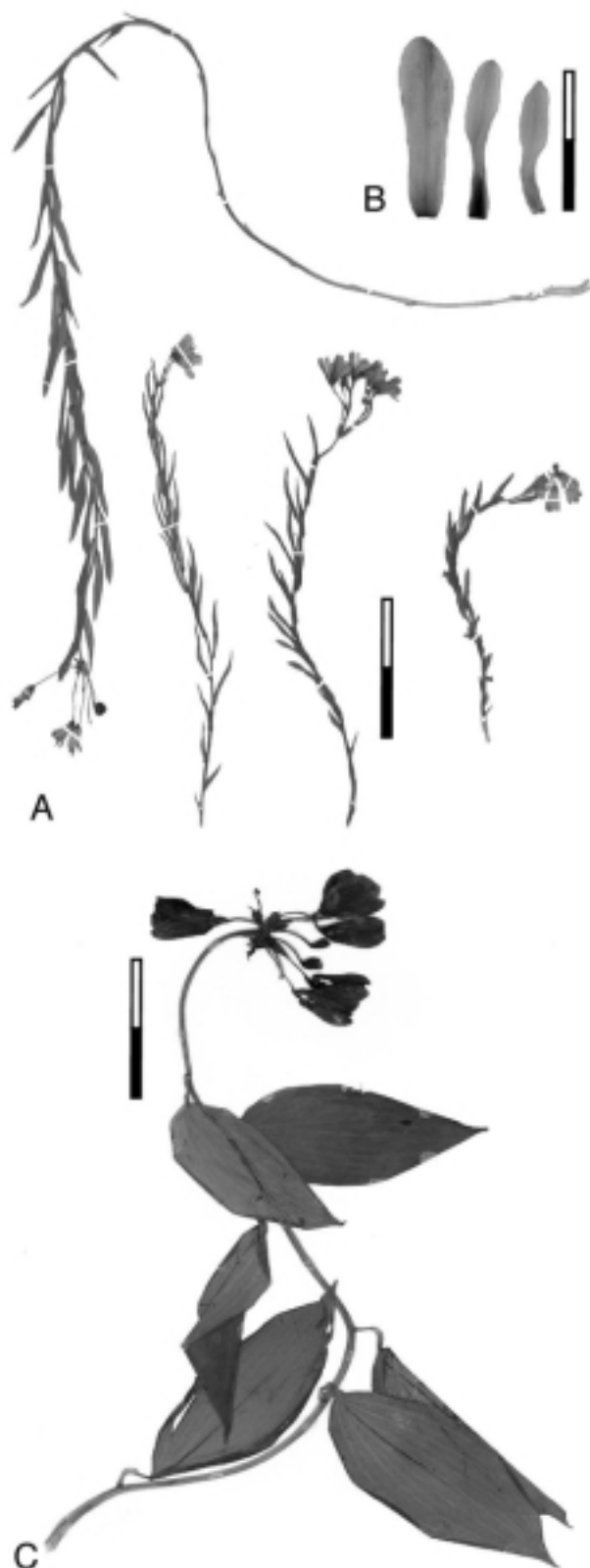
Fig. 4C, D; distribution 4E.

=*B. flava* Baker apud Rusby, Bull. N. Y. Bot. Gard. 4: 459. 1907.

TYPE: BOLIVIA, Cochabamba, *Bang* 2013 (NY!).

Fig. 23A, B; distribution 24D

Plant erect, 10–50 (100) cm high, stem robust, not recurved at apex, glabrous. Leaves lanceolate, 2–15 x 0,3– 1 cm wide, resupinate, adaxial side pubescent or glabrous, abaxial side glabrous. Inflorescence an erect thyrses, hypopodium of primary flowers 0,5–4 cm, pubescent or glabrous, epipodium 0,5–3 cm, pubescent or glabrous. Subtending leaves of primary flowers



**Figure 23.** (A & B) *B. boliviensis*, inner tepal in the middle, lower inner tepal on the right side; (C) *B. campanularia*. Scale bars: (A)= 6 cm; (B)= 1,5 cm; (C)= 4 cm.

frondose or bracteose, 0,5–2 x 0,1–0,3 cm wide, bracts of secondary flowers bracteose, 0,1–0,5 x 0,1–0,2 cm wide. Flowers zygomorphic, horizontally oriented ca. 1–2 cm long, inner tepals equal to outer ones in length, outer tepals free, oblong, dorsal surface yellow, ventral surface pale yellow. Inner tepals subdivided in blade and claw, yellow. Inner tepals dissimilar to each other, the

lower inner tepal smaller than the other two inner tepals. Ovary glabrous, fruit a turbinate, dehiscent capsule and seeds globose. *B. boliviensis* grows in the altiplano of Bolivia and the northern cordilleras of Argentina at altitudes of between 1600 and 3600 m.

Note: two different forms of *B. boliviensis* exist: a small flowered (1cm), more pubescent one and a larger flowered (2cm) completely glabrous one. The larger flowered form occurs only in Argentina at lower altitudes (around 1600 m). The small flowered form occurs in Bolivia and Argentina.

Additional material examined: BOLIVIA: Depto. Cochabamba: Prov. Arque, camino a Oruro, 3250 m, *Ibisch 946* (LPB); Depto. La Paz: Prov. Murillo, south of Calacoto, 3300 – 3600 m, *Solomon 6654* (LPB); Depto. Potosi, entre Betangos y Retiro, 3200 m, *Ceballos et al. 296* (G).

### 7. *Bomarea campanularia* Harl. & Neuendorf

Fl. Ecuador 71: 33-35. 2003

Type: Ecuador, Prov. Loja, Almor-Celica road, 1400-1500 m, *Harling & Andersson 17934* (HOLOTYPE: GB).

Fig. 23C; distribution 24D.

Plant twining, stem robust, several metres long, up to 0,5 cm in diameter, not recurved at apex, glabrous. Leaves ovate, 4–12 x 2–6 cm. Both leaf surfaces glabrous. Inflorescence in strong specimens a thyrse, hypopodium of primary flowers 0,1–0,3 cm, epipodium 2–4 cm. In weaker specimens reduced to an umbel. Bracts of primary flowers small, 0,5–1,5 x 0,2–0,4 cm, bracts of secondary flowers 0,3–0,4 x 0,1–0,2 cm. Perianth pendent, ca 1,5–3 cm long, inner tepals equal to outer ones in length, outer tepals cucullate, yellow-orange. Inner tepals subdivided in blade and claw, yellow-orange without dark spots. Filaments slightly shorter than inner tepals, fruit globose and seeds globose. *B. campanularia* grows in the western cordillera of northern Peru and southern Ecuador in shrubs and hedges at altitudes of between 1200 and 1600 m.

Note: see *B. obovata*.

Additional material examined: PERU, Depto. Piura: Prov. Huancabamba, Canchaque, Chorro Blanco, 1250 m, *Stork 11402* (G, GH, K); Prov. Huancabamba, above Palambra, 1500-1600 m, *Ferreya 10844* (USM).

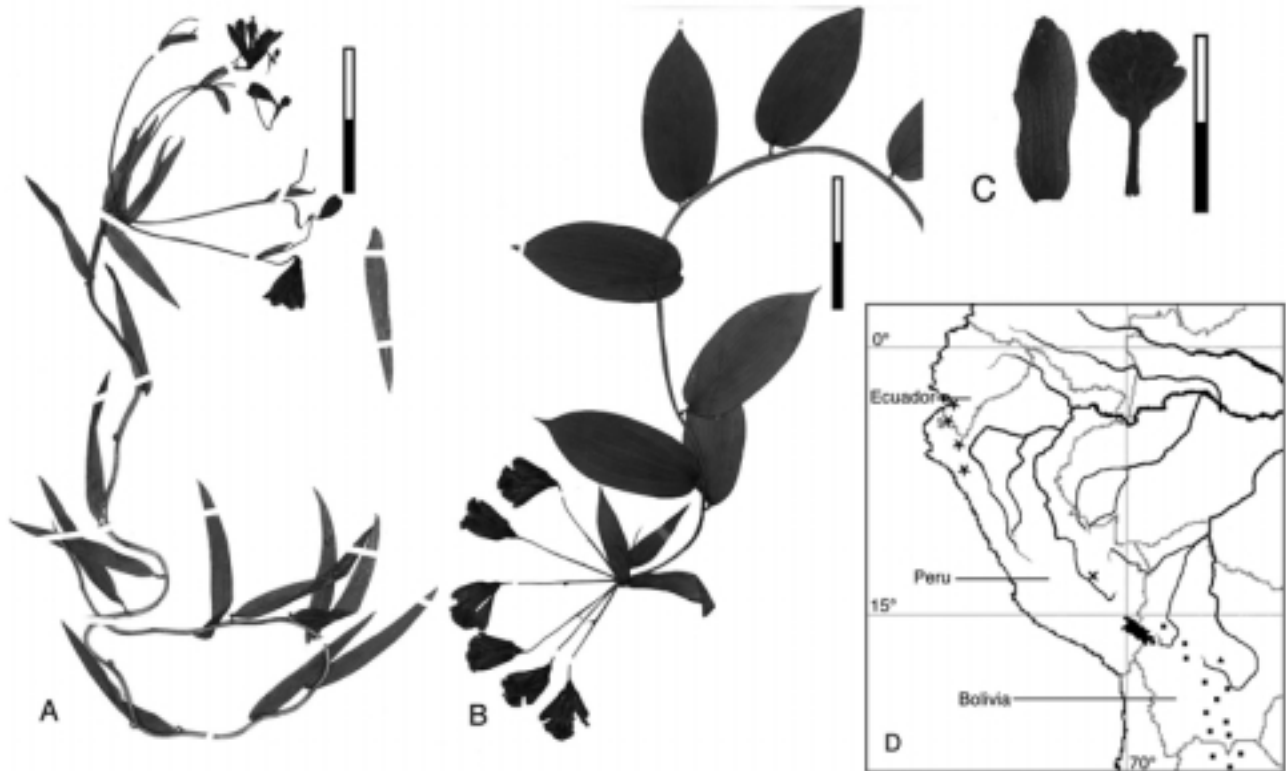
### 8. *Bomarea campylophylla* Killip

J. Wash. Acad. Sc. 25: 374. 1935.

Type: Peru, Vilcabamba, Hacienda on Rio Chinchao, 1800 m, 1923, *Macbride 4961* (US!, B!, K!).

Fig. 24A, distribution 24D.

Plant twining, stem robust, several metres long, up to 0,5 cm in diameter, not recurved at apex, glabrous. Leaves linear-, 8–12 x 0,3–0,8 cm. Both leaf surfaces glabrous. Inflorescence a thyrse, hypopodium of primary flowers 8–12 cm, epipodium 2–3 cm. Bracts of primary flowers similar to the normal leaves, bracts of secondary flowers 4–6 x ca. 1 cm. Perianth slightly zygomorphic, pendent, ca. 1,5 cm long, inner tepals slightly shorter than outer ones, outer tepals oblong, slightly cucullate, red with a green tip. Inner tepals subdivided in blade and claw, yellow claw and green blade with dark spots. Filaments straight, fruit turbinate, glabrous and seeds unknown. *B. campylophylla* grows in the eastern cordillera of Peru on the windward sides in small shrubs and fog forests at altitudes of around 4000 m.



**Figure 24.** (A) *B. campylophylla*; (B & C) *B. chaparensis*, inner tepal on the right side; (D) distribution, quadrate *B. boliviensis*, star *B. campanularia*, cross *B. campylophylla*, triangle *B. chaparensis*. Scale bars: (A), (B) = 4 cm; (C) = 2 cm.

Note: see *B. angustissima*.

Additional material examined: only known so far from the type collection.

**9. *Bomarea chaparensis* Hofreiter**

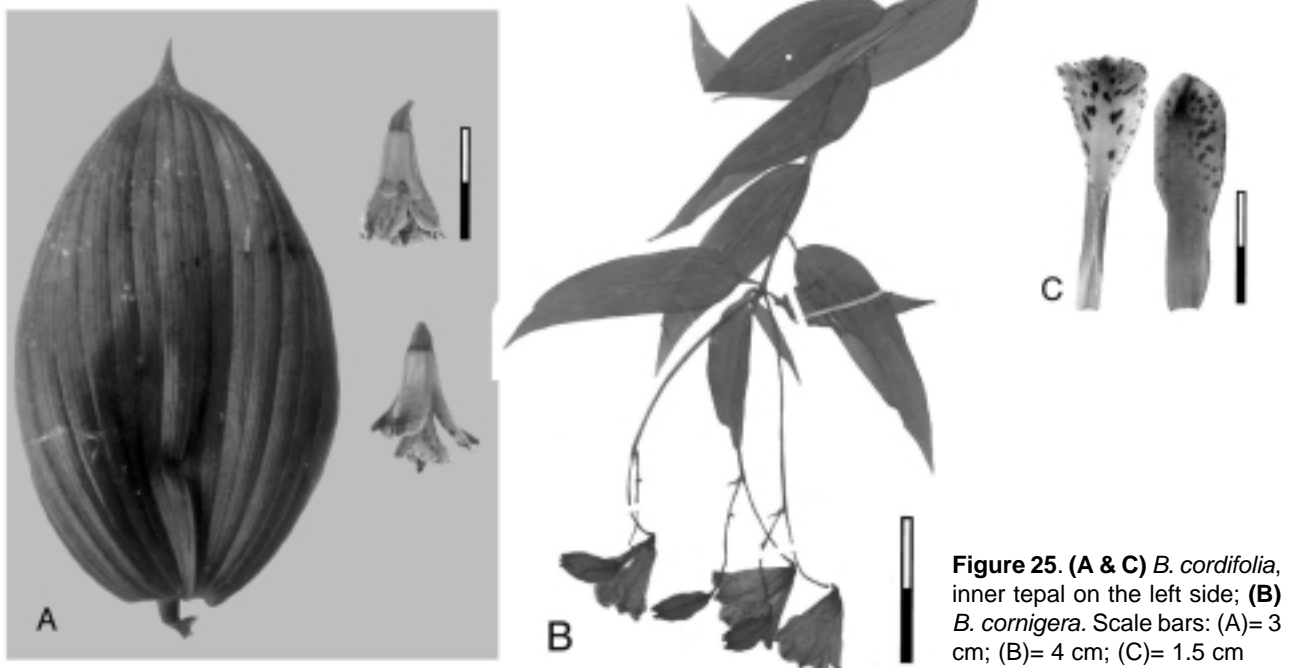
Havard Pap. Bot., 9(2): 354. 2005.

TYPE: BOLIVIA, Depto. Cochabamba, Prov. Chapare, 2200 m, Incachaca, Steinbach 8897 (HOLOTYPE: B!, ISOTYPES: BM!, E!, K!, U!).

Fig. 24B, C; distribution 24D.

Plant twining, stem robust, glabrous. Leaves lanceolate to ovate, 5–12 x 2–6 cm, adaxial side nearly glabrous, a few hairs mostly on the nerves at the base of the leaves or glabrous, abaxial side glabrous. Inflorescence a pendent umbel, pedicels 4–6 cm, pubescent with a bracteose prophyll. Subtending leaves frondose or bracteose, 1–8 x 0,1–3 cm; 2–3 bracts of the lower most flowers frondose, the following subtending leaves bracteose. Flowers actinomorphic, ca 2–2,5 cm long, inner tepals up to 0,5 cm longer than the outer ones, outer tepals oblong, red on the outside with a green tip, pale yellow on the inside.

<http://sisbib.unmsm.edu.pe/BV/Revistas/biologia/biologiaNEW.htm>



**Figure 25.** (A & C) *B. cordifolia*, inner tepal on the left side; (B) *B. cornigera*. Scale bars: (A)= 3 cm; (B)= 4 cm; (C)= 1.5 cm



Inner tepals subdivided in blade and claw, yellow with a red stripe on the outside and with a green blade and dark spots. Ovary pubescent, fruit turbinate, and seeds globose. *B. chaparensis* grows in the eastern cordillera of Bolivia on the windward sides in small shrubs and mountain forests at altitudes of between 2200 and 2700 m.

Note: see *B. weigendii*.

Additional material examined: BOLIVIA: Cochabamba: Carmen, valley de Choro, 2650 m, *Brooke 6126* (BM); Prov. Chapare, Incachaca, 2300 m, *Ibisch & Ibisch 94.0430* (LPB).

#### 10. *Bomarea cordifolia* (Ruiz & Pav.) Herb.

Amaryllidaceae 113. 1837.

Basionym: *Alstroemeria cordifolia* Ruiz & Pav., Fl. Peruv. Chil. 3: 1802.

Type: Peru, Pozuzo, *Ruiz & Pavón s.n.* (MA, photo FI, MO!).

Fig. 25A, C; distribution 26C.

Plant twining, stem robust, glabrous or pubescent with increasing density towards the top. Leaves ovate 7 – 16 x 3 – 10 cm. Adaxial side of leaves densely pubescent, yellowish-brown, abaxial side glabrous. Inflorescence laxiflorous, hypopodium of primary flowers 5 – 22 cm, epipodium 1 – 6 cm. Subtending leaves of primary flowers 1 – 2,5 x 0,2 – 0,5 cm, bracts of secondary flowers 1 – 1,5 x 0,3 – 0,5 cm wide. Perianth ca. 2,5 – 3 cm long, inner tepals equal to outer ones in length, outer tepals oblong, pink on the outside, pale pink with brown spots on inside, with a short horn (around 1 mm long). Inner tepals subdivided in blade and claw, white with a pink stripe on the outside and dark spots. Fruit turbinate and seeds globose in shape. *B. cordifolia* grows in the eastern cordillera of central Peru at the windward sides in small shrubs and fog forests at altitudes of between 1800 and 2900 m.

Note: because of the shape of the leaves *B. cordifolia* cannot be confused with any other species. The closest relative seems to be *B. moritziana* from north Ecuador and Colombia. The two species can be distinguished because of the shape of the leaves and the colour of the flowers, pink in *B. cordifolia* and red in *B. moritziana*, also see note at *B. speciosa*.

Additional material examined: PERU: Depto. Pasco: Oxapampa, Cordillera Yanachaga, 2300 – 2500 m, *Foster & Smith 9076* (MO); Oxapampa, valle de San Alberto, 1900 m, *Foster et al. 7709* (MO).

#### 11. *Bomarea cornigera* Herb.

Amaryllidaceae 116. 1837

Type: Peru, *Mathews 1659* (K!).

Fig. 25B; 26C.

Plant twining, several meters (2 – 4), stem robust, glabrous, around 0,3 cm in diameter. Leaves linear or linear-lanceolate, 5 – 14 x 1 – 3 cm wide. Adaxial and abaxial side of leaves glabrous. Inflorescence laxiflorous, hypopodium of primary flowers 2 – 9 cm, epipodium 2 – 3 cm. Bracts of primary flowers frondose, 1 – 7 x 1 – 2 cm, bracts of secondary flowers 0,2 – 0,4 x 0,1 – 0,2 cm. Perianth ca. 2,5 cm long, inner tepals equal to outer ones in length, outer tepals broadly oblong with a 0,1 – 0,3 cm horn, red on the outside with a green tip, pale yellow on the inside. Inner tepals subdivided in blade and claw, yellow with a red stripe on the outside and a green tip. Fruit triangular, and seeds globose in shape with a red to orange sarcotesta. *B. cornigera* grows in northern and central Peru in valleys and in small shrubs at altitudes between 1000 and 1800 m.

Note: *B. cornigera* is very similar to *B. cornuta*. The species can be distinguished by the shape of the outer tepals, the horn, the pubescence of the leaves and their habitat preference.

Additional material examined: PERU: Depto. Junin: Prov. Tarma, Utcuyacu, 1800 m, *Woytkowski 35373* (F, MO); Prov. Chanchamayo, Rio Tulumayo Valley, road San Ramón-Vitoc, 1000 m, *Stein & Todiza 2355* (NY, MO); Chilipes, 8 km south of Vitoc, 1420 – 1700 m, *Gentry et al. 40161* (MO).

#### 12. *Bomarea cornuta* Herb.

Amaryllidaceae 114. 1837.

Type: Peru, Parahuancas, *Mathews 1161* (K!).

= *B. caudata* Killip, J. Wash. Acad. Sci. 22 (3): 59. 1932.

Type: Peru, Depto. Ayacucho, Prov. Huanta, Choimacota Valley, 2800 m, *Weberbauer 7559* (B!).

Fig. 26A, B; distribution 26C.

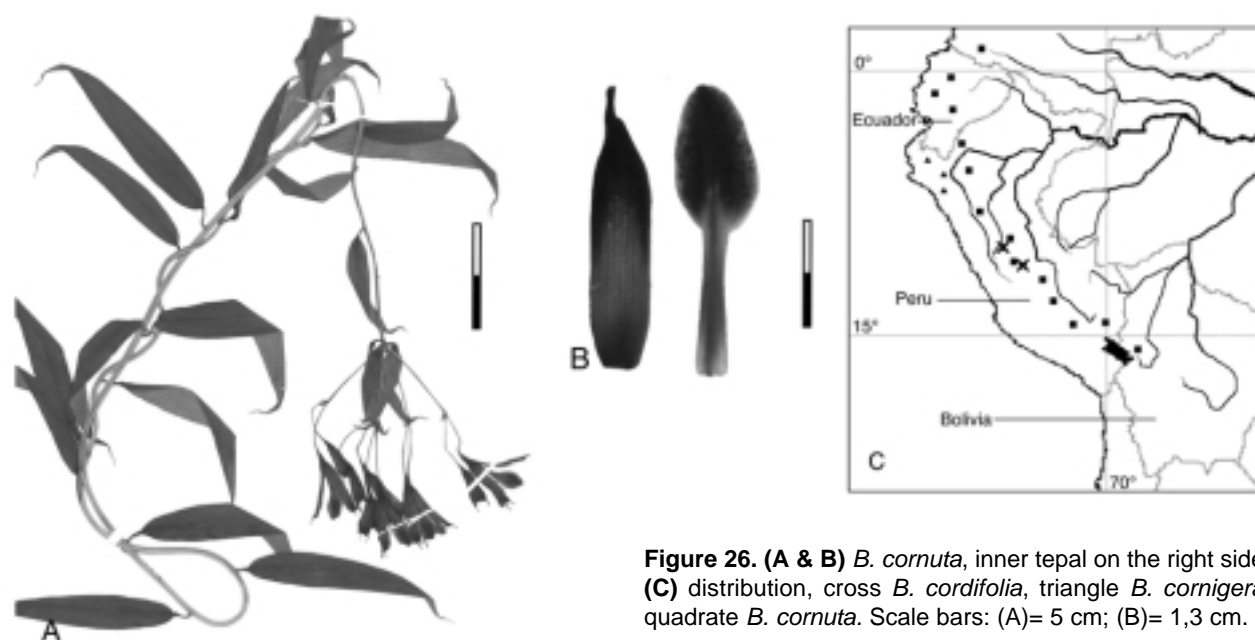
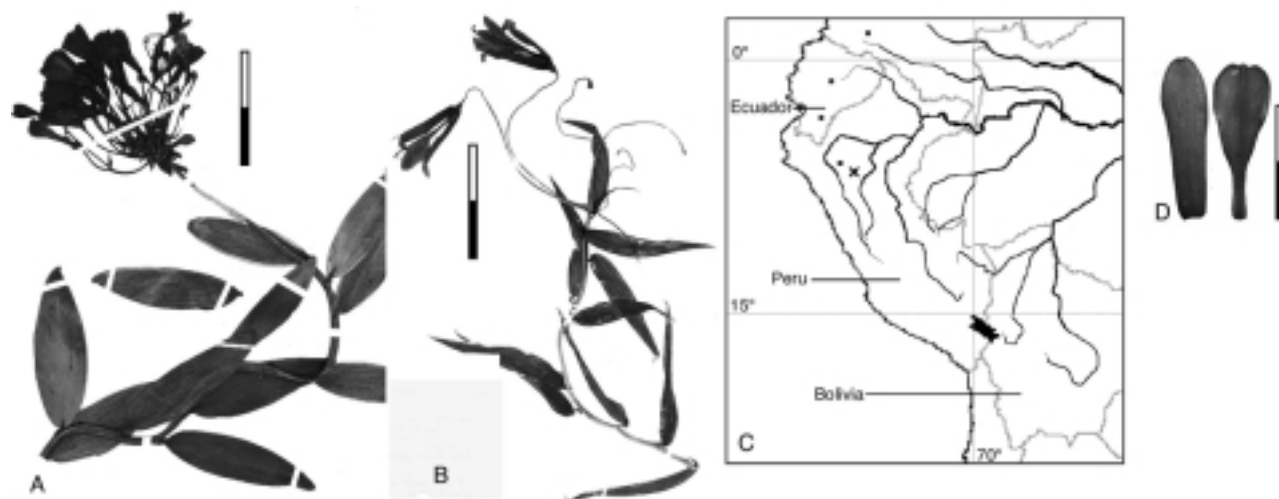


Figure 26. (A & B) *B. cornuta*, inner tepal on the right side; (C) distribution, cross *B. cordifolia*, triangle *B. cornigera*, quadrate *B. cornuta*. Scale bars: (A) = 5 cm; (B) = 1,3 cm.



**Figure 27.** (A & D) *B. crassifolia*, inner tepal on the right side; (B) *B. crinita*; (C) distribution, quadrate *B. crassifolia*, cross *B. crinita*. Scale bars: (A)= 4,5 cm; (B)= 6 cm; (C)= 2 cm

Plant twining, stem robust, glabrous. Leaves linear or linear-lanceolate, 9 – 18 x 1 – 5 cm wide. Adaxial side of leaves pubescent, mostly on the nerves, yellowish-white, abaxial side glabrous. Inflorescence laxiflorous, hypopodium of primary flowers 3 – 20 cm, epipodium 1 – 5 cm. Bracts of primary flowers frondose, 3 – 16 x 1 – 5 cm, bracts of secondary flowers 0,3 – 2 x 0,1 – 0,3 cm. Perianth ca. 2,5 – 3 cm long, inner tepals equal to outer ones in length, outer tepals oblong with a 0,3 – 0,6 cm horn, red on the outside with a green tip, pale yellow on the inside. Inner tepals subdivided in blade and claw, yellow with a red stripe on the outside and a green tip. Fruit triangular elongated, and seeds ovoid in shape with a yellow sarcotesta. *B. cornuta* grows in the eastern cordillera of central Peru at the windward sides in small shrubs and fog forests at altitudes of between 2000 and 3500 m.

Note: see *B. cornigera*.

Additional material examined: PERU: Depto. **Amazonas**: Prov. Rodríguez de Mendoza, Alrededores de Rodríguez de Mendoza, 2200 m, 28.7.1991, *Mostacero et al.* 2521 (HUT); Depto. **Huánuco**: Carpish, 2500 m, *Young & Sullivan* 562 (MO); Carpish, *Díaz & Baldeón* 2247 (NY); between Huánuco and Pampayacu, 3300 m, *Kanehira* 285 (GH); Prov. Leoncio Prado, Road from Huanuco to Tingo María, Abra Carpish, just north of the tunnel, 2720 m, 22.3.2002, *Weigend et al.* 5290 (HUT, BSB); Depto. **Pasco**: Oxapampa, Rio Boqueria, 2040 m, *Smith et al.* 1830 (MO); Oxapampa, road from Oxapampa to Villa Rica, 2100 m, *Skog et al.* 5097 (US); Oxapampa-Cerro de Pasco road 20 km west of Oxapampa, 1980 – 2000 m, *Gentry et al.* 39927 (USM). Depto. **San Martín**: Prov. Mariscal Cáceres, trail between Las Papayas and Gran Pajaten Camps, 2500-2600 m, 25.7.1985, *Young* 1296 (HUT)  
BOLIVIA: Depto. La Paz: Sorata, 2300 m, *Wood* 21034 (K).

### 13. *Bomarea crinita* Herb.

Amaryllidaceae 119. 1837.

Type: Peru, *Mathews* 1664 (K!).

Fig. 27B; distribution 27C.

Plant twining, stem robust, several metres long, up to 1 cm in diameter, not recurved at apex, pubescent. Leaves linear-lanceolate or lanceolate, 5–8 x ca. 1 cm. Adaxial side of leaves weakly pubescent, abaxial side glabrous. Inflorescence an umbel, pedicels very long 10–12 cm. Bracts of primary flowers mostly small and linear, 2–5 x 0,1 cm, one bract leaf like. Perianth actinomorphic pendent, ca 4,5 cm long, inner tepals up to 0,5

cm longer than outer ones, outer tepals oblong, red with a green tip. Inner tepals subdivided in blade and claw, yellow-orange with a green tip. Ovary pubescent, fruit and seeds unknown. *B. crinita* grows in northern Peru.

Note: *B. crinita* seems to be a very rare species it was collected only once again since. The similar *B. longipes*, probably the closest relative is known in Ecuador only from two collections.

Additional material examined: Peru: Depto. Amazonas, near Molinobamba, *Sandeman* 63 (K).

### 14. *Bomarea densiflora* Herb.

Amaryllidaceae 399. 1837.

Type: Peru, Depto. Amazonas, *Mathews* 1667 (K!).

=*B. hookeriana* Herb., Amaryllidaceae 398. 1837.

Type: Peru, Chachapoyas, *Mathews* s.n. (K).

=*B. porphyrophila* Kraenzl., Ann. K. K. Nat. Hofmus. 27: 154. 1913.

Type: Ecuador, Cuenca, Pichul, Yerba Buena, 3000 m, *Lehmann* 299.

=*B. subspecta* Sodiro, Sert. FL. Ecuad. Ser. 2: 49. 1908.

Type: Ecuador, Prov. Bolívar, near Chillanes, *Sodiro* 55/10 (QPLS, US frag.).

=*B. tomentosa* (Ruiz & Pavón) Herb. var. *ebracteata* Herb., Amaryllidaceae 118. 1837.

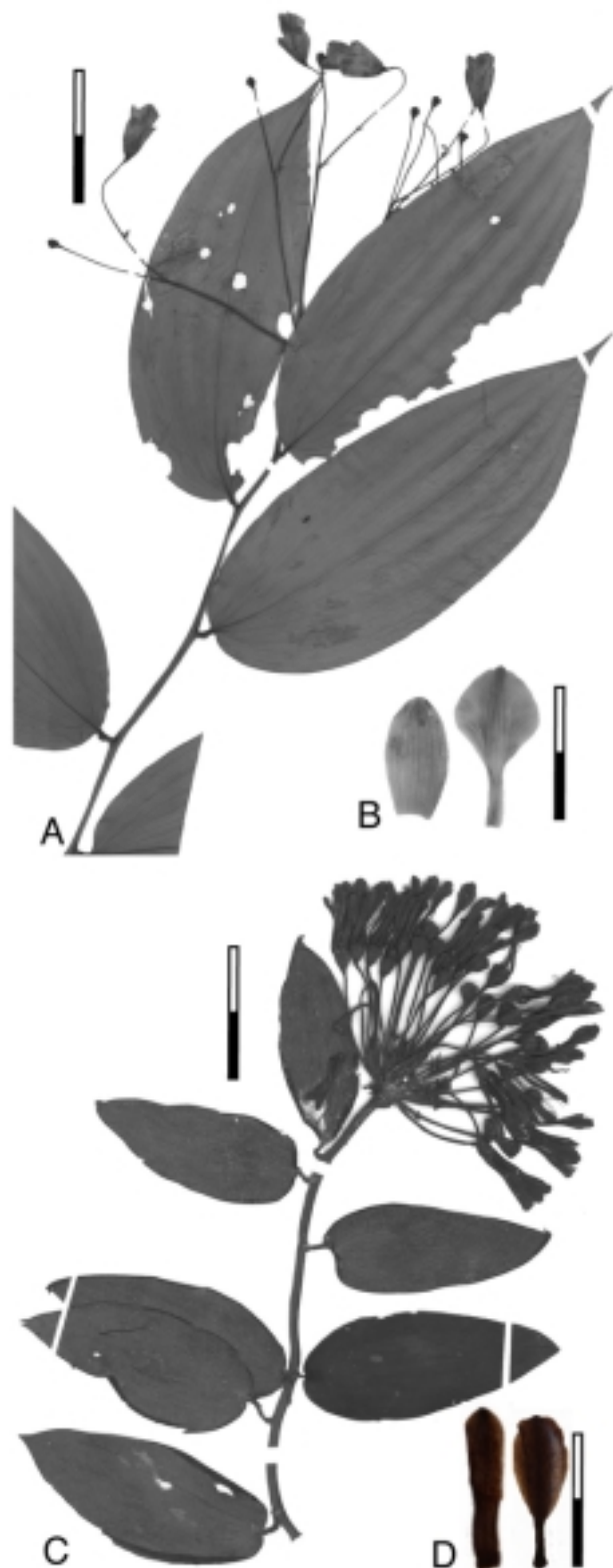
Type: Peru, Chachapoyas, *Mathews* 1666 (K!).

Fig. 28C, D; distribution 29B.

Plant twining, several metres long (2–5 m), stem robust, up to 0,5 cm in diameter, not recurved at apex, pubescent with increasing density towards the top, or glabrous. Leaves lanceolate to ovate, 3–12 x 1–4 cm. Adaxial side of leaves densely pubescent, abaxial side glabrous. Inflorescence an umbel, pedicels 3–5 cm, pubescent. Subtending leaves of the lower-most flowers small, 0,5–1 x 0,3–0,5 cm, subsequent bracts smaller, 0,5–1 x 0,1–0,2 cm. Flowers slightly zygomorphic, horizontally oriented, ca 1,5–2 cm long, inner tepals equal to outer ones in length, outer tepals oblong, outer surface red to orange, paler orange on inner surface. Inner tepals subdivided in blade and claw, yellow-orange with a orange stripe on the outside and with dark spots. Ovary pubescent, fruit turbinate and seeds globose. *B. densiflora* grows in northern Peru and Ecuador in small shrubs and fog forests at altitudes between 2200 and 3500 m.

Note: see *B. denticulata*.

Additional specimen examined: PERU, Depto. **Amazonas**, Leimebamba, 2400 m, *Woytkowski 7829* (MO); between Balsas and Chachapoyas, 2900 m, *Dillon & Turner 1719* (F); Dept: **Cajamarca**, Prov. Chota, below Las Palmas, 2750 m, 18.04.1993, *Dillon et al. 6393* (F, MO); road Querocoto-La Granja, near Paraguay, 2500 m, 8.08.1994, *Leiva et al. 1412* (F); La Paccha, Rejopampa, 2450 m, *Cabanillas 743* (F); Bosque El Pargo, above Huarimarca, 18.03.1997, *Sagástegui et al. 16002* (F); road Chota-Tacabamba, 2800 m, 19.02.1983, *Smith & Vasquez*



**Figure 28. (A & B) *B. dispar***, inner tepal on the right side; **(C & D) *B. densiflora***, inner tepal on the right side. Scale bars: (A), (C)= 4 cm; (B)= 1,8 cm; (D)= 2 cm.

3564 (F, MO); Prov. Santa Cruz, Bosque de Monteseco, 1600 m, *Leiva & Lezama 929* (F); Prov. San Miguel, Niepos, camino a Lanchez, 2500 m, 1.11.1985, Llatas 1569 (F); near Quellahorco, Tongot, 2650 m, 14.09.1991, *Sanchez & Briones 5781* (F); above Agua Blanca, Cerro Guion, 3320-3500 m, 14.10.2000, *Weigend et al. 2000/737* (HUT, MSB); Prov. San Miguel de Pallaques, Above Agua Blanca: Cerro Quillón, 3500 m, 14.10.2000, *Weigend et al., 2000-737* (HUT, MSB); Prov. Chota, A 1 km de Paraguay (Querocoto-La Granja), 2500 m, 8.8.1994, *Leiva et al. 1412* (HAO); Bosque El pargo (arriba de Huarimarca) Llama-Huambos, 3000 m, 18.3.1997, *Sagástegui et al. 16002* (HAO); Prov. Santa Cruz, Bosque Monteseco, 1600 m, 10.10.1993, *Leiva & Lezama 929* (HAO); Prov. Cutervo, La Pucarilla, entre Sókota y San Andes, 2500 m, 3.3.1991, *Sánchez Vega et al., 5956* (HAO); Depto. **Lambayeque**: Prov. Ferreñafe, Bosque de Chinama, 2500-2600 m, 23.08.1988, *Cano 2116* (MO); Depto. Piura, Prov. Ayabaca, Bosque Cuyas, 2480 m, 21.09.1996, *Leiva & Quipuzcoa 1869* (F); Depto. **Piura**: Prov. Huancabamba, Jumbe-Turmalina, 2100 m, 13.9.1981, *López et al. 8829* (HUT); Alrededores de Salalá., Quebrada, 3083 m, 20.10.2001, *Sagástegui et al., 16825* (HAO); Palambra-Turmalina, 2050 m, 18.10.2001, *Sagástegui et al. 16737* (HAO); Prov. Ayavaca, Bosque Cuyas, 2480 m, 21.9.1996, *Leiva & Quipuzcoa 1869* (HAO).

### 15. *Bomarea denticulata* (Ruiz & Pav.) Herb.

Amaryllidaceae 118. 1837.

Basionym: *Alstroemeria* Ruiz & Pav., Fl. Peruv. Chil. 3: 1802.

Type: Peru, Depto. Huánuco, Patasaria, *Ruiz & Pavón s.n.* (MA!, photo F!).

Fig. 20A, B; distribution 39C.

Plant twining, several metres long (2–5 m), stem robust, up to 0,5 cm in diameter, not recurved at apex, pubescent with increasing density towards the top, or glabrous. Leaves lanceolate to ovate, 3–12 x 1–4 cm. Adaxial side of leaves densely pubescent, abaxial side glabrous, leaves denticulate. Inflorescence an umbel, pedicels 2–3 cm, pubescent. Subtending leaves of the lowermost flowers bracteose, 0,5–1 x 0,3–0,5 cm, subsequent bracts smaller, 0,5–1 x 0,1–0,2 cm. Flowers slightly zygomorphic, horizontally oriented, ca 1,5–2 cm long, inner tepals equal to outer ones in length, outer tepals oblong, outer surface yellow to orange, paler orange on inner surface. Inner tepals subdivided in blade and claw, yellow with a orange stripe on the outside and with dark spots. Ovary pubescent, fruit turbinate and seeds globose. *B. denticulata* grows in central Peru in small shrubs and fog forests at altitudes between 2200 and 3500 m.

Note: *B. denticulata* is known only so far from the Depto. Huánuco. It can be distinguished from all other *Bomarea* s.str. species by the combination of the yellow-orange flowers with dark spots and the denticulate leaves. Its most similar species seem to be *B. densiflora*.

Additional material examined: PERU: Depto. **Huánuco**: Carpish, 2800 – 2900 m, *Ferreira 1210* (USM); Lima-Tingo Maria road, Km 450 – 454, 2600 m, *Maas et al. 4616* (MO); Huánuco-Tingo Maria, Carpish, 2350 – 2430 m, *Plowman & Rury* (F, NY); Carpish, 3000 m, *Sandeman 3485* (K).

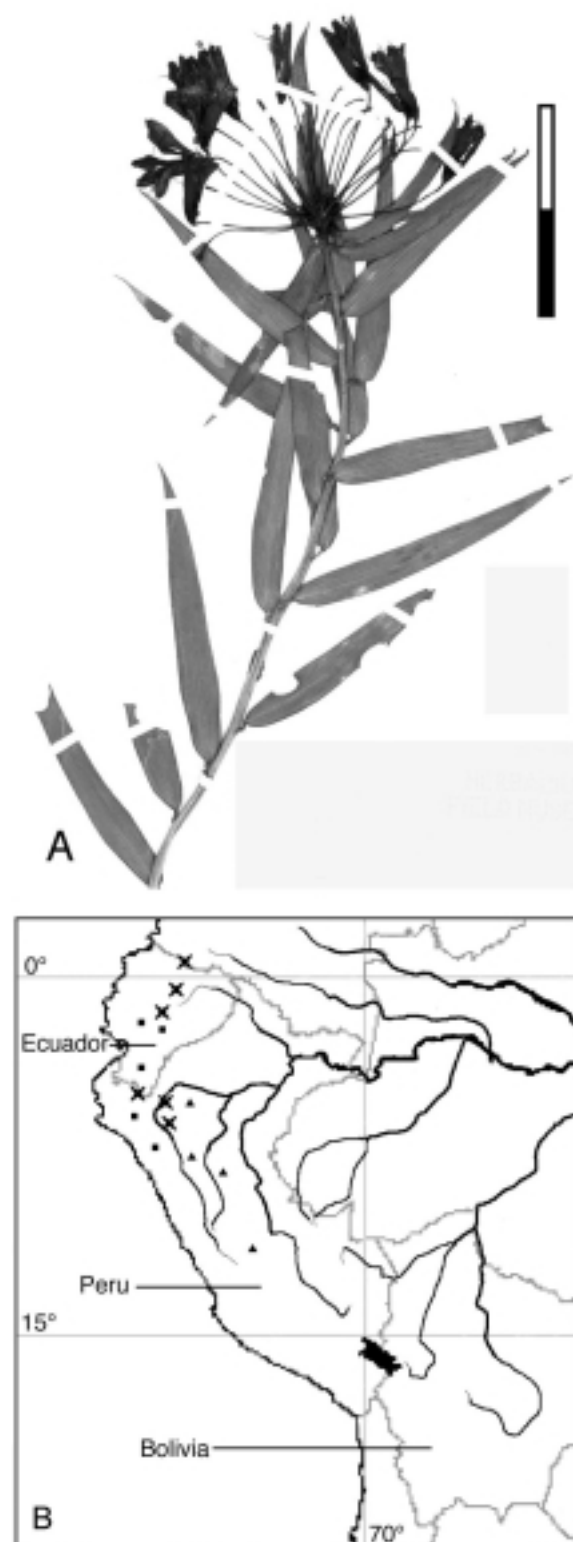
### 16. *Bomarea dispar* Herb.

Amaryllidaceae 115. 1837.

Type: Peru, *Matthews 1658* (K!, photo MSB!).

= *B. declinata* (Poepp. & Endl.) Klotzsch ex Kunth, Enum. 5: 802. 1850  
Basionym: *Alstroemeria declinata* Poepp. & Endl., Nov. Gen. Sp. Pl. 2: 44. 1838.

Type: Peru, Depto. Huanuco, Cochero, *Poeppig 1586* (W destroyed, photo F!).



**Figure 29. (A)** *B. dissitifolia*; **(B)** distribution, triangle *B. dispar*, quadrate *B. densiflora*, cross *B. dissitifolia*. Scale bar: (A) = 4 cm.

=*B. ulei* Kraenzl., Bot. Jahrb. Syst. 50: Beibl 111: 3. 1913.

Type: Peru, Depto. Loreto [San Martín], Cerro de Ponasa, 1200 m, Ule 6848 (B!, G!).

Fig. 28A, B; distribution 29B.

Plant twining, stem robust, glabrous. Leaves lanceolate to ovate, 5–25 x 2–10 cm wide. Adaxial side of leaves nearly glabrous, few hairs mostly on the nerves at the base of the

leaves or glabrous, abaxial side glabrous. Inflorescence a pendent thyrses, hypopodium around 6–12 cm and epipodium around 3 cm of the primary flowers, bracts small 0,5–1,2 x 0,2–0,4 cm, the bracts of the secondary flowers are larger than the bracts of the primary flowers. Perianth ca. 2 cm long, inner tepals up to 0,7–1 cm longer than the outer ones, outer tepals oblong, red on the outside with green tip, pale yellow on the inside. Inner tepals subdivided in blade and claw, yellow with a red stripe on the outside and with a green blade and dark spots. Ovary glabrous, fruit turbinate, and seeds globose. *B. dispar* grows in the eastern cordillera of Peru at the windward sides in mountain forests at altitudes between 500 and 1500 m.

Note: see *B. weigendii*.

Additional material examined: PERU: Depto. **Huánuco**: near Tingo Maria, 600 m, Hart 617 (GH); Depto. **San Martín**: Prov. Mariscal Cáceres, Rio Sion, Schunke 3544 (F); Peru, Schenk s.n. (B).

### 17. *Bomarea dissitifolia* Baker

J. Bot. 20: 203. 1882.

Type: Ecuador, Tambo de Vanilla, 2800 m, Andre 4522 bis (K).

Plant twining, stem robust, several metres long, up to 0.5 cm in diameter, not recurved at apex, strongly pubescent to nearly glabrous. Leaves linear-lanceolate or lanceolate, 6–12 x 0,8–1,5 cm. Both leaf surfaces glabrous. Inflorescence an umbel, pedicels 4–5 cm. Bracts small, reddish, 1–2 x ca. 0,1 cm. Perianth slightly zygomorphic, horizontally oriented to pendent, ca 2–3 cm long, inner tepals equal to outer ones in length, outer tepals oblong, red. Inner tepals subdivided in blade and claw, red-orange without dark spots. Filaments slightly shorter than inner tepals, weakly curved, fruit turbinate and seeds globose. *B. dissitifolia* grows in the Amotape-Huancabamba-region of Peru and Ecuador in small shrubs and fog forests at altitudes between 2300 and 3200 m.

Note: The flowers of *B. dissitifolia* are very similar to *B. purpurea*, a species of the *B. setacea* complex, but the leaves of *B. dissitifolia* have loosely ordered veins without the conspicuous bladder like hairs which are characteristic for the species of the *B. setacea* complex.

Additional material examined: Peru: Depto. **Cajamarca**: Prov. Cutervo, Socota-Tambillo, 3000–3200 m, 14.12.1938, Stork & Horton 10188 (F); Prov. San Miguel, Bosque Quellahorco, Tongod, 2700 m, 14.09.1991, Sanchez & Briones 5797 (F, MO, NY).

### 18. *Bomarea dolichocarpa* Killip

J. Wash. Acad. Sci. 22: 62. 1932.

Type: Peru, Depto. Junín, Puerto Yessup, 400 m, Killip & Smith 26306 (US, F, NY!).

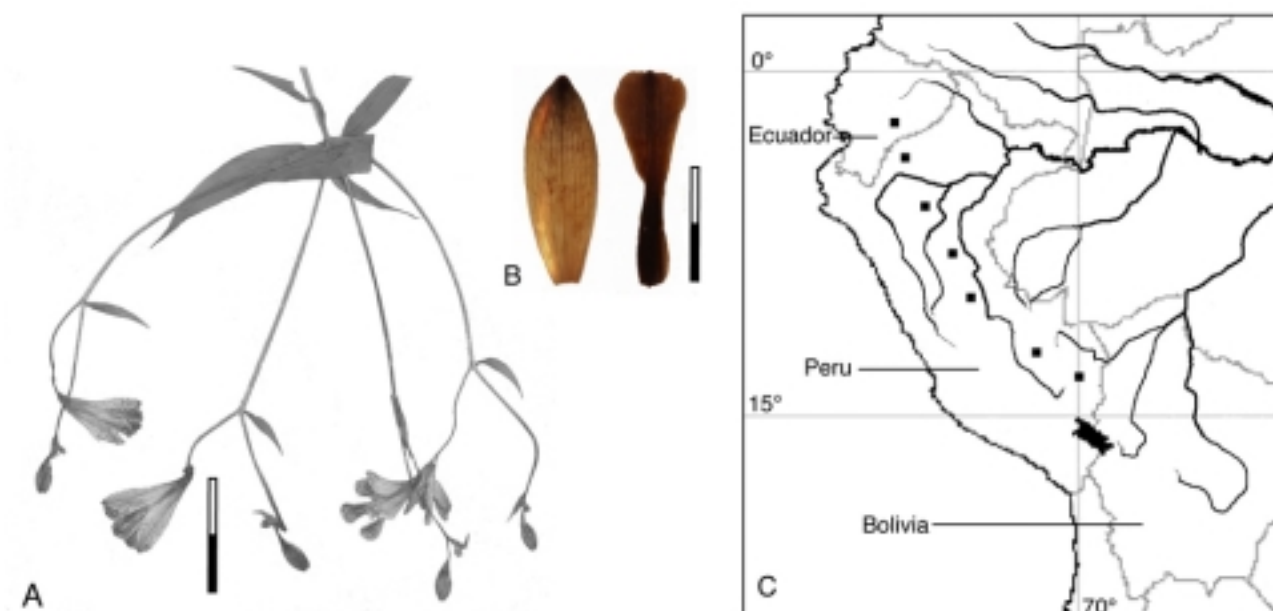
=*B. klugii* Killip, Publ. Field Mus. Nat. Hist. Bot. 8: 648. 1936.

Type: Peru, Depto. San Martín, Moyobamba, Zepelacio, 1600 m, Klug 3410 (US!).

=*B. killipii* Vargas, Bol. Mus. Hist. Nat. Javier Prado 8: 216. 1944. Type: Peru, Depto. Cusco, Prov. Convención, Pintobamba, 2800 m, Vargas 3493 (CUZ!).

Fig. 30A, B; distribution 30C.

Plant twining, 2–8 m long, stem robust, around 0,4 cm in diameter, apex pendulous, glabrous. Leaves resupinate, ovate or lanceolate-ovate, 8–15 x 1,5–4 cm, in the middle of the stem leaves largest. Adaxial side of leaves pubescent, abaxial side glabrous or completely glabrous. Inflorescence a very laxiflorous



**Figure 30.** *B. dolichocarpa*; (A) habit; (B) inner tepal on the right side; (C) distribution. Scale bars: (A)= 3 cm; (B)= 1,3 cm.

thyrses or an umbel, hypopodium of primary flowers 10–20 cm, epipodium 2–4 cm. Subtending leaves of primary flowers frondose, 4–12 x 0,5–3 cm, subtending leaves of secondary flowers frondose to bracteose, 1–2,5 x 0,4–0,6 cm. Perianth ca. 3–3,5 cm long, inner tepals equal to outer ones in length, outer tepals free, oblong, pink on the outside with green tip, pale yellow on the inside, sometimes with dark spots. Inner tepals free, subdivided in blade and claw, pale greenish to cream with a pink stripe on the outside and many dark, purple spots, sometimes the entire blade is purple because of fusion of the spots. Filaments about as long as the inner tepals, ovary inferior, glabrous, fruit an elongated, dehiscent capsule and seeds spherical, 3–4 mm in diameter with a red sarcotesta. *B. dolichocarpa* grows in the lowland and mountain forests of Ecuador and Peru twining between 200 and 1000 m.

Note: *B. dolichocarpa* may be confused in Herbarium specimen with *B. edulis*. The most noted difference is the fruit. Flowering plants can be differentiated by the very heavy spotted inner tepals in *B. dolichocarpa* and the shape of the outer tepals.

Additional material examined: PERU: Depto. **Huánuco**: Prov. Tingo Maria, Santa Rosa-Shapanguilla, 775 m, 3.8.1965, *Aldave & Fernandez 5588* (HUT, MSB); Depto. **Junín**: Satipo, Rio Negro, 800 m, *Woytkowski 5803* (MO); Depto. **Ucayali**: Stromgebiet des Ucayali, *Tessmann 3102* (G); Rio Abajao, Quebrada Shesha, 250 m, *Gentry & Diaz 58567* (MO); Bosque Nacional Humboldt, Km 88 Pucallpa-Tingo Maria, 270 m, *Gentry et al. 36386* (MO); Prov. Coronel Portillo, Yarinacocha, Pucallpa, 130 m, 10.8.1975, *Sagástegui & Aldave s.n.* (5663, HUT); Depto. **Cuzco**: Prov. Cuzco, Camisea, 467 m, *Acevedo 8614b* (NY, US); Depto. **Madre de Dios**, Prov. Tambopata, near Puerto Maldonado, 200 m, *Gentry & Revilla 16237* (F, MO); 30 km from Puerto Maldonado, 260 m, *Barbour 5069* (F, MO)

### 19. *Bomarea formosissima* (Ruiz & Pav.) Herb.

Amaryllidaceae 111. 1837.

Basionym: *Alstroemeria formosissima* Ruiz & Pav., Fl. Peruv. Chil. 3: 1802.

Type: Peru, Muña, *Ruiz & Pavón s.n.* (BM!, MA, photo MO!, MO!).

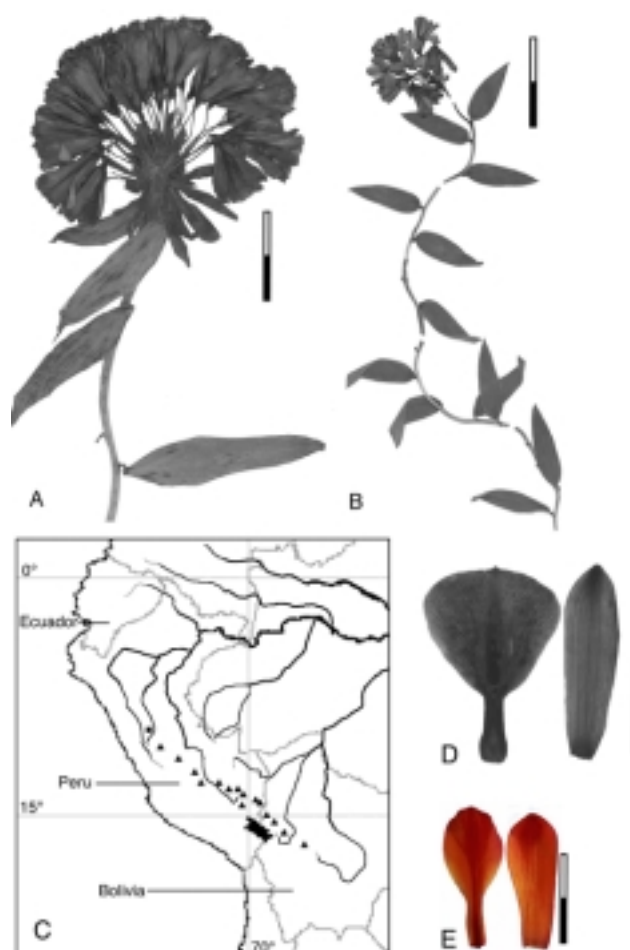
= *B. fimbriata* var. *paltariumensis* Herb., Amaryllidaceae 116. 1837.

Type: Peru, Paltariumi, *Matthews 867* (K!, photo M!).

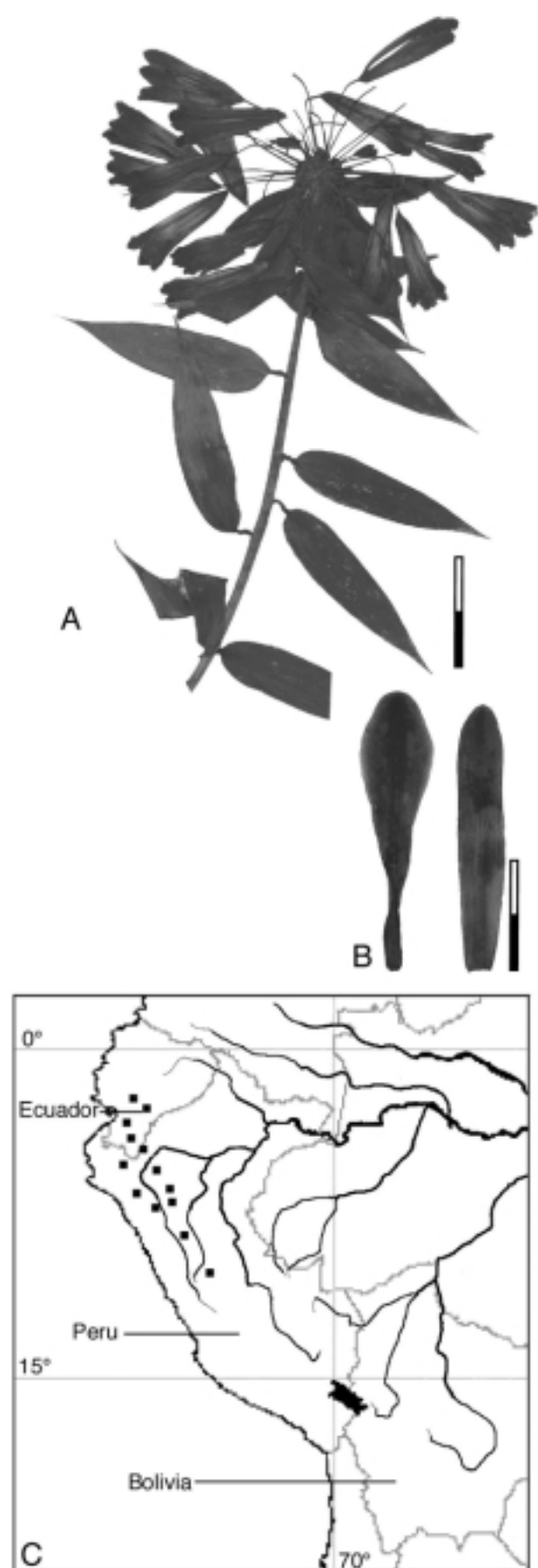
= *B. sanguinea* Kraenzl., Bot. Jahrb. Syst. 1 Beibl. 112: 6. 1913.

Type: Peru, Depto. Cusco, above Urubamba, 3300 m – 3400 m, *Weberbauer 4918* (B!, photo MO!).

=? *B. subglobosa* Herb., Bot. Reg. 28: Misc. 66. 1842.



**Figure 31.** (A & D) *B. formosissima*, inner tepal on the left side; (B & E) *B. endotrachys*; (C) distribution, triangle *B. formosissima*, quadrate *B. endotrachys*. Scale bars: (A)= 6 cm; (B)= 4,5 cm; (D)= 1,5 cm; (E)= 1,3 cm.



**Figure 32.** *B. goniocaulon*; (A) habit, (B) inner tepal on the left side; (C) distribution. Scale bars: (A) = 4 cm; (B) = 1,5 cm.

Type: Peru, Depto. Junin, Vitoc, *Maclean s.n.* (K).

Fig. 2D; 31A, D; distribution 31C.

Plant twining, several metres long (2–8 m), stem robust, up to 1 cm in diameter, not recurved at apex, pubescent with increasing density towards the top, or glabrous. Leaves linear-lanceolate or lanceolate, 4–20 x 1–3 cm. Adaxial side of leaves pubescent or glabrous, abaxial side glabrous. Inflorescence an umbel, pedicels 2–4 cm, pubescent. Subtending leaves of the lower-most flowers bracteose, 3–6 x 1–1,5 cm, subsequent bracts smaller, 1,5–3,5 x 0,2–0,5 cm. Flowers slightly zygomorphic, horizontally oriented, ca. 2,5–4 cm long, inner tepals equal to outer ones in length or up to 0,6 cm longer, outer tepals oblong, outer surface red, paler red on inner surface. Inner tepals subdivided in blade and claw, orange with a red stripe on the outside and with many dark spots. Ovary pubescent, fruit turbinate and seeds globose. *B. formosissima* grows in the eastern cordillera from central Peru to central Bolivia on the windward sides in small shrubs and fog forests at altitudes between 2700 and 3800 m.

Note: *B. formosissima* is a conspicuous species and very abundant in south Peru and north Bolivia around the timberline with often more than 50 red flowers per inflorescence. The closest relative seems to be *B. multiflora* from Ecuador and Colombia. The two species can be distinguished by the shape of the inner tepals and the colour of the flowers. Both species are most abundant in the centre of their distribution within the *Bomarea* species.

Additional material examined: PERU: Depto. **Cuzco**: Prov. Paucartambo, Tres Cruces, 3200 m, 22.3.1965, *Aldave s.n.* (4998, HUT); Depto. **Huancavelica**: Prov. Tayacaja, Salcabamba, 3500 m, *Stork & Horton 10323* (F, K, MO); Depto. Huánuco: near Huánuco, 3500 m, *Macbride & Featherstone* (F, BM); Depto. **Junin**: 1 hour from Huancayo, 3250 m, *Maguire & Maguire 61649* (NY); Satipo to Concepcion, 2750 m, *Stein & Todiza 2418* (MO); Depto. **Pasco**: Prov. Oxapampa, Los Chacos, 2250 m, *Smith & Pretel 1534* (MO); Dept: Cuzco: Prov. Paruro, entre Huanca-Huanca y Huillcacunca, 3600 m, *Vargas 2393* (MO); Prov. Paucartambo, hills of Escalerayoc, 3400 m, *Vargas 11105* (F); Prov. Paucartambo, Pillahuata, 2600 m, *Nunez et al. 8511* (NY); Prov. Paucartambo, Accanaco, 4000 m, *Balls 6775* (K); Prov. Urubamba, Machupicchu, 4150 m, *Nunez & Arque 8312* (MO); Prov. Urubamba, near Wenner gren ruins, 3400–3600 m, *Metcalf 30761* (GH, MO); Prov. Convencion, Cordillera Vilcabamba, Yupanqui to Rio Apurimac, 3500 m, *Davis et al. 1223* (F); Prov. Quispicanchis, near Marcapata, 3120 m, *Wasshausen & Encarnación 768* (K); Depto. Puno: Prov. Sandia, Limbani Canyon, 3000–3600 m, *Vargas 9665* (F, MO); Prov. Sandia, Limbani Canyon, 3550–3650 m, *Metcalf 30449* (MO); Prov. Macusani, road from Macusani to Ollachea, 3600–3800 m, *Weigend & Weigend 2000/122* (MSB); BOLIVIA: Depto. Cochabamba: Chapare, 3100 m, *Steinbach 641* (GH, U); Choro, 3500 m, *Brooke 5976* (BM); Depto. La Paz: Prov. Larecaja, Sorata, 2700–3000 m, *Mandon 1202* (G); Prov. Murillo, Valle del Rio Zongo, 3400 m, *Solomon 17261* (MO); Prov. Murillo, upper valle de Zongo, 2800 m, *Solomon 5281* (MO); Prov. Nor Yungas, Unduavi to Yolosa, 3100 m, *Solomon 4912* (MO); Prov. Sur Yungas, Unduavi, 3200 m, *Solomon & Stein 11675* (MO); Depto. SANTA CRUZ: Prov. Florida, La Yunga ca 25 N of Mairana, 2300 m, *Lawrence & Vargas 282* (U); Prov. Florida, Mairana, 2200 m, *Nee 40660* (LPB).

## 20. *Bomarea goniocaulon* Baker

J. Bot. 11: 204. 1882.

Type: Ecuador, Prov. Pichincha, Cerro Corazón, 2500 m, *André 3646* (K!, NY).

=*B. stuebelii* Pax, Bot. Jahrb. Syst. 11: 333. 1889.

Type: Peru, Depto. Amazonas, between Ventanilla and Bagazan, 3000 m, *Stuebel 25* (B!).

Fig. 32A, B; distribution 32C.

Plant twining, around 2–8 m long, stem robust, around 0,8 cm in diameter, glabrous, apex erect. Leaves narrowly ovate to lanceolate, 6–15 x 2–4 cm, resupinate; adaxial surface glabrous and abaxial surface glabrous or pubescent. Inflorescence dense, bracteose, hypopodium of primary flowers 0,2–0,5 cm, epipodium around 5 cm; bracts of lowermost primary flowers up to 10 x 3 cm, subsequent bracts conspicuous smaller, bracts of secondary flowers 0,3–0,5 x 0,2–0,4 cm. Perianth ca. 5–6 cm long, inner tepals equaling outer ones in length, all tepals free to base and divided into limb and claw, outer tepals abaxially pink with a green tip, adaxially whitish; inner tepals abaxially greenish with a pink streak, adaxially basally pink blade green without dark spots. Filaments straight, slightly shorter than the tepals or equaling them, ovary inferior, 4–5 x 4–5 mm, pubescent. Capsule turbinate, loculicidally dehiscent, seeds spherical, 3–4 mm in diameter. *B. goniocaulon* grows in the central cordillera of Central Peru on the windward in fog forests at altitudes between 2000 and 2800 m.

Note: *B. goniocaulon* is the largest flowered pink and green species in Peru. It is rare in Central Peru, but fairly abundant in the Amotape-Huancabamba-region, also see note at *B. angulata*.

Additional material examined: PERU: Depto. **Amazonas**: Prov. Chachapoyas, entre Leimebamba y Balsas, 3100 m, 1.6.1963, *López et al. s.n.* (4414, HUT); Depto. **Cajamarca**: Prov. San Miguel de Pallaques, alrededores El Tingo, Dist. Unión Agua Blanca, 2930 m, 9.2.2000, *Alvitez et al. 1058* (HUT, F, M); El Tingo, Dist. Unión Agua Blanca, 3200 m, 17.2.2000, *E. Rodríguez et al. 2316* (HUT, F, M); Prov. Contumazá, Jalca El Chuño (Pozo Chuño), 4000 m, 2.11.1979, *Sagástegui et al. 9386* (HUT); Bosque de Cachil, 2600 m, 26.11.1994, *E. Rodríguez et al. 140* (HUT); Arriba de Contumazá, 2700 m, 24.4.1966, *Sagástegui & Fukushima s.n.* (6101, HUT); Pampa de la Sal, 3600 m, 31.5.1990, *Sagástegui et al. 14333* (HAO); Bosque de Cachil (parte alta), 2500 m, 13.4.1995, *Sagástegui et al. 15573* (HAO); 12–15 km below Contumazá en route to Cascas, 2050 m, 24.10.1990, *Dillon & Sagástegui 6069* (F, HAO); alrededores de Casa Hacienda de Lledén, 2500 m, 28.3.1997, *Leiva et al. 1948* (HAO); Bosque de Cachil, 2500 m, 12.10.1992, *Sagástegui & Leiva 14827* (HAO); Depto. **La Libertad**: Prov. Otuzco, San Pedro (Motil), 2980 m, 10.5.1997, *M. Rodríguez-Espejo 26* (HUT); Depto. **Pasco**: Prov. Oxapampa, La Suiza to San Gotardo, 2100 – 2650 m, *Smith 4110* (NY, MO, USM); Prov. Oxapampa, road to Villa Rica, 2300 – 3000 m, *Weigend & Dostert 97/67* (MSB); Depto. **Piura**: Prov. Huancabamba, Canchaque-Minas Turmalina, 2200 m, 23.7.1975, *López 8280* (HUT).

n.v.: «flor de duende» [E. Rodríguez et al. 140 (HUT)]

## 21. *Bomarea hartwegii* Baker

J. Bot. 20: 203. 1882.

Type: Ecuador, 3000 m, *Andre 4603 bis* (K!).

Fig. 33A; distribution 33C.

Plant suberect, stem robust, up to 1 m high, up to 0,5 cm in diameter, not recurved at apex, strongly pubescent. Leaves lanceolate, to ovate 5–8 x 2–4 cm. Adaxial side of leaves densely pubescent, abaxial side glabrous. Inflorescence an umbel, pedicels 2–3,5 cm. Bracts of small, reddish, 0,2 – 0,5 x ca. 0,1 cm. Perianth slightly zygomorphic, horizontally oriented to pendent, ca. 2 cm long, inner tepals equal to outer ones in length, outer tepals oblong, red. Inner tepals subdivided in blade and claw, red without dark

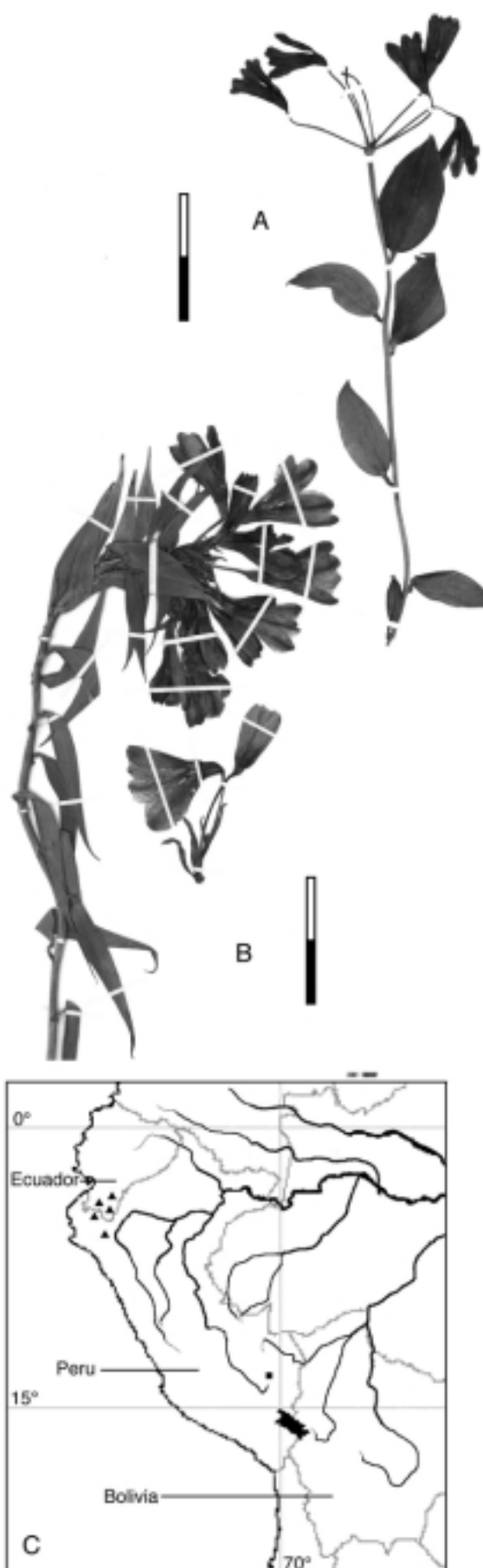


Figure 33. (A) *B. hartwegii*; (B) *B. herrerae*; (C) distribution, triangle *B. hartwegii*, quadrate *B. herrerae*. Scale bars: (A) = 4 cm; (B) = 6 cm.

spots. Filaments slightly shorter than inner tepals, weakly curved. *B. hartwegii* grows in Amotape-Huancabamba-region of Ecuador in fog forests at altitudes between 2600 and 2800 m.

Note: *B. hartwegii* can be identified by the combination of a strongly pubescent stem, a suberect to erect growth form and deep red flowers. Harling & Neuendorf (2003) placed it in subgenus *Sphaerine*. The shape of the flowers, the leaves and the shape of the ovary point to *Bomarea* s.str. In *Bomarea* s.str. there are 8 known species with the ability to grow erect. It was not collected in Peru so far, but may occur in the Cordillera del Condor.

Additional material examined: ECUADOR: Prov. Loja, Loja-Zamora road, 2700 m, Harling & Andersson 22055 (GB); Prov. Loja, Cerro Villonaco, 2800 m, Harling & Andersson 21855 (GB); Prov. Loja, Villonaco, 2600 m, Harling 11263 (GB).

## 22. *Bomarea herrerae* Vargas

Contr. Gray Herb. 40: 154. 1945.

Type: Peru, Depto. Cusco (PROV. Paucartambo, Tres Cruces, 3400–3600 m, Vargas 2258 (HOLOTYPE CUZI, ISOTYPE MO!, US!).

Fig. 33B; distribution 33C.

Plant twining, stem robust, several metres long, up to 0,5 cm in diameter, not recurved at apex, glabrous. Leaves linear-lanceolate or lanceolate, 5–8 x 1–1,5 cm. Adaxial side of leaves pubescent, abaxial side glabrous. Inflorescence a thyrs, hypopodium of primary flowers 0,1–1 cm, epipodium 2–3 cm. Bracts of primary flowers frondose or bracteose, 2–5 x 0,5–1 cm, bracts of secondary flowers bracteose, 1–2 x 0,2–0,5 cm. Perianth slightly zygomorphic, horizontally oriented, ca 3 cm long, inner tepals equal to outer ones, outer tepals oblong, yellow-orange. Inner tepals subdivided in blade and claw, yellow-orange with dark spots. Filaments slightly shorter than inner tepals, weakly curved, fruit turbinate and seeds unknown. *B. herrerae* grows in the eastern cordillera of southern Peru on the windward sides in fog forests at altitudes between 3400 and 3600 m.

Taxonomic note: This species was collected only once. This is strange because the type location is easily reached and since then a lot of collections have been made in this area. The specimens are between *B. aurantiaca* and *B. formosissima*. Maybe the explanation for the rareness of *B. herrerae* is that it is a hybrid of this abundant species. The area is still fog forest and well protected so the destruction of the habitat cannot be given as an explanation.

Additional material examined: This species is known so far only from the type collection.

## 23. *Bomarea latifolia* (Ruiz & Pavón) Herb.

Amaryllidaceae 113. 1837.

Basionym *Alstroemeria latifolia* Ruiz & Pavón, Fl. Peruv. Chil. 3: 64. 1802.

Type: Peru, Depto. Arequipa, Lomas, Ruiz & Pavón s.n. (MA!).

Plant twining, 1–5 m long, stem robust, around 1 cm in diameter, apex erect, glabrous or slightly pubescent near the inflorescence with increasing density towards the top. Leaves resupinate, ovate, 10–16 x 4–8 cm. Adaxial side of leaves slightly pubescent, abaxial side glabrous. Inflorescence a thyrs, erect or horizontally orientated, hypopodium 0,2–0,5 cm epipodium 2–5 cm. Subtending leaves of the first flowers similar to the normal leaves, subtending leaves of following flowers

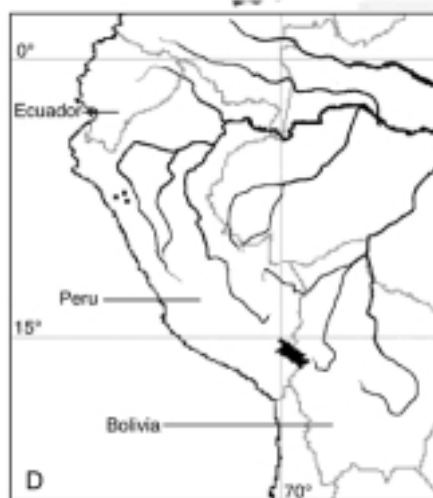
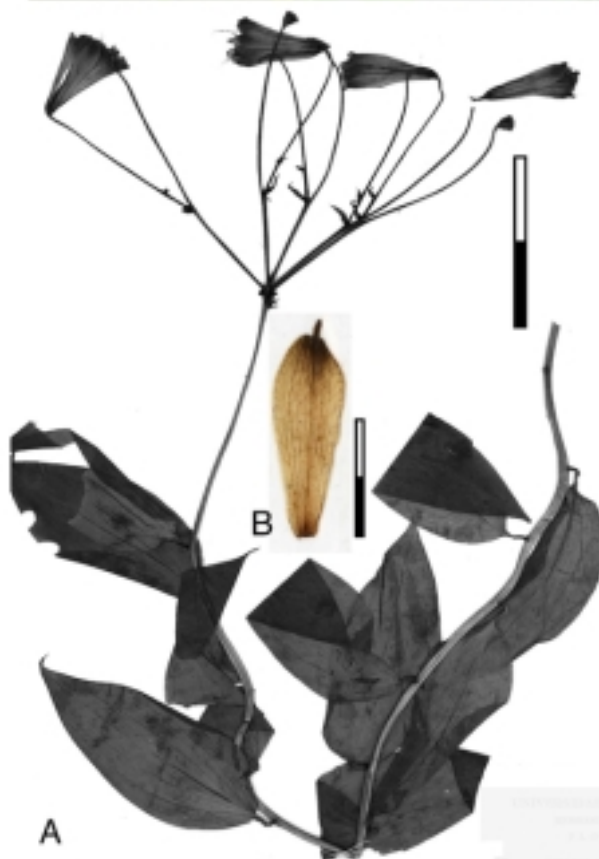


Figure 33a. *B. lopezii*; (A, B & C) habit and outer tepal; (D) distribution. Scale bars: (A)= 6 cm; (B)= 1,5 cm.



0,3–2 x 0,1–0,3 cm. Perianth ca. 2,5–3 cm long, inner tepals slightly longer than outer ones, outer tepals oblong, pink on the outside with green tip, pale yellow at inner side. Inner tepals subdivided in blade and claw, pale yellow or greenish with a pink stripe on the outside and inner side greenish yellow with a green tip and dark spots. *B. latifolia* grows in the lomas of Arequipa.

Note: This species was only collected twice, but in the lomas south west of Arequipa no one has made collections since. It is a very conspicuous species with the large leaves and bracts. The next similar species is *B. ovata* which occur in the same area and habitat.

Additional material examined: This specie is known so far only from the type collection.

#### 24. *Bomarea lopezii* Hofreiter & E. Rodr., spec. nov.

Type: Peru, Depto. La Libertad, Prov. Trujillo, Lomas de Viru, 550 m, 30.9.1976, A. López et al. 8423 (holotype: HUT).

Fig. 33a A, B, C; distribution 33a D.

*Inter speciebus affinis insignis caule spiraliter scandente, pubescente, foliis lanceolatis, abaxialiter glabris, adaxialiter pubescentis vel subglabris, floribus in thyrso aggregatis, hypopodio 4–10 cm longo, epipodio 2–5 cm longo, floribus actinomorphis, (2) 3–4 cm longis, segmentis perianthii aequalibus longitudine, tepalis externis oblongis cornutis, amerello-aurantiacis vel rubris cum apice verde, tepalis internis spatulato-ungiculatis, flavido-aurantiacis, ovario piloso.*

Plant twining, stem robust, several metres long, up to 1 cm in diameter, not recurved at apex. Leaves linear-lanceolate or lanceolate, 8–15 x 2–5 cm. Adaxial side of leaves pubescent to nearly glabrous, yellowish-white, abaxial side glabrous. Inflorescence a thyrs, hypopodium of primary flowers 4–10 cm, epipodium 2–5 cm. Bracts of primary flowers frondose or bracteose, 2–5 x 0,5–1 cm, bracts of secondary flowers bracteose, 1–2 x 0,2–0,5 cm. Perianth slightly zygomorphic, horizontally oriented, ca. 2–4 cm long, inner tepals equal to outer ones in length, outer tepals oblong, yellow-orange to red with a green tip and a 0,1 cm long horn. Inner tepals subdivided in blade and claw, yellow-orange without dark spots. Filaments slightly shorter than inner tepals, weakly curved. Ovary densely pubescent, fruit turbinate with many globose seeds with a deep red sarcotesta. *B. lopezii* grows in the western cordillera of Peru in relict cloud forests at altitudes between 2600 and 3600 m.

Note: The name of the new species is dedicated to Dr. Arnaldo López Miranda of the Herbarium Truxillense (HUT), the first collector of this species. The closest relative of *B. lopezii* seems to be *B. ovata*. *B. lopezii* flowers in the lomas in September, in the relict forests at the end of the rainy season.

Additional material examined: PERU: Depto. **Cajamarca**, Prov. Contumazá, Las Chirimoyas, 1400 m, 20.04.1984, *Sagástegui 11402* (MO); Cascas, 1845–1900 m, 14.04.1986, *Dillon et al 4500* (F); El Molino, 1800 m, 4.04.1985, *Sagástegui et al. 12553* (HUT, MO, NY); Cerro Chungarrán (Guzmango), 2700 m, 24.05.1978, *Sagástegui & Mostacero 9175* (HUT, MO); Bosque de Cachil Cascas-Contumazá, 2410 m, 16.04.1992, *Sagástegui et al. 14546* (F, HAO); Dto. Contumazá. Around bosque de Cachil, 2640–2720 m, 30.4.1999, *Binder et al., 1999-22* (HUT); Andaloy (San Benito-Yetón), 2000 m, 23.3.1988, *Sagástegui et al., 13045* (HUT); Las Chirimoyas (San Benito-Guzmango), 1450 m, 5.5.1965, *Sagástegui & Fukushima s.n.* (5056, HUT); Guzmango-Cruz Grande, 2700 m, 18.4.1967, *Sagástegui et al. s.n.* (6368, HUT); Above Cascas along the road to Contumazá, 1950 m, 4.4.1985, *Molau et al. 1795* (HUT); Las Chirimoyas (San Benito-Guzmango), 1400 m,

20.4.1984, *Sagástegui 11402* (HUT); El Chorrill (Cascas-Contumazá), 2200 m, 18.3.1995, *Sagástegui et al 15555* (HAO); Cerca de Contumazá, sobre la ruta a Cascabamba, 2700 m, 21.2.1987, *Sánchez Vega 4240* (CPUN, HAO); Alrededores de Guzmango (Distrito), 2500 m, 7.4.1990, *Sagástegui & Sagástegui 14246* (HAO). Depto. **La Libertad**, Prov. Otuzco, near Sinsicap, 1300 m, 22.04.1995, *Sagástegui et al. 15656* (F, HAO); Conumbara (Sinsicap), 2900 m, 10.5.1954, *López s.n.* (4850, HUT); Prov. Trujillo, Lomas de Viru, 550 m, 30.9.1976, *López et al. 8423* (HUT); Lomas de Viru, 550 m, Sept. 1945 *Lopez 382* (USM); Lomas de Viru, 550 m, 15.9.1986, *Mostacero et al. 1461* (HUT, F); Lomas de Viru, 500 m, 3.9.1949, *Angulo et al. 1091* (HUT).

#### 25. *Bomarea macusanii* Hofreiter & E. Rodr., spec. nov.

Type: Peru, Depto. Puno, Prov. Macusani, road from Macusani to Ollachea, 3200 m, 1.2.2000, *Weigend & Weigend 2000/114* (holotype: HUSA!, isotype: M!).

Fig. 2E; 34A, D; distribution 34C.

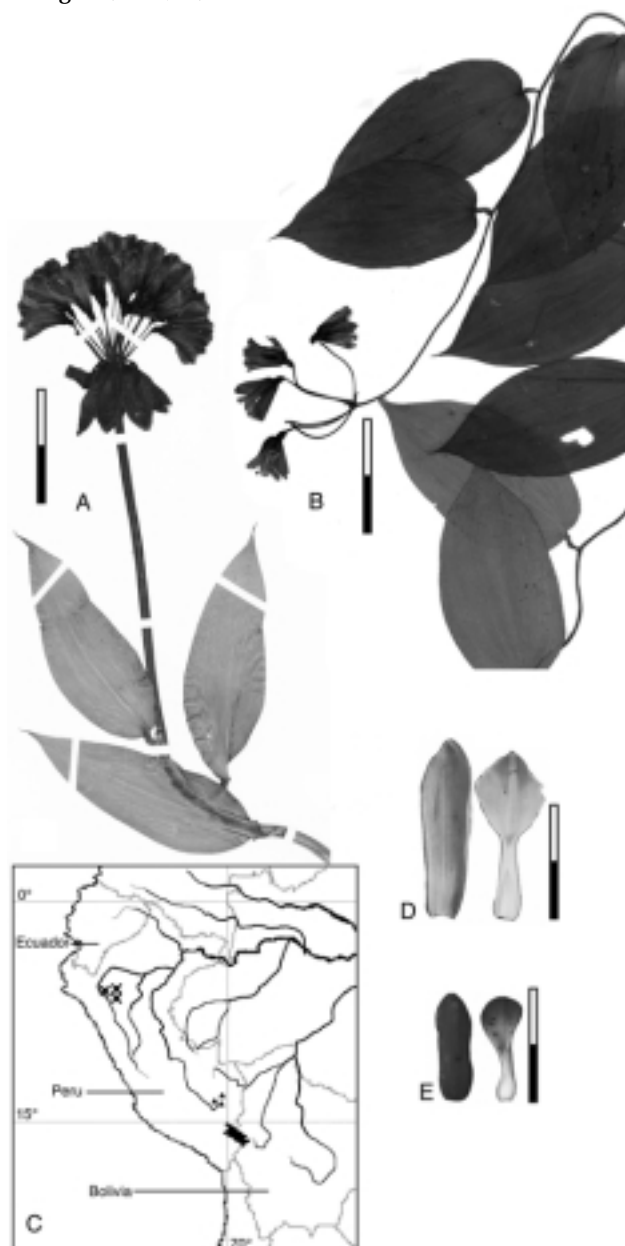
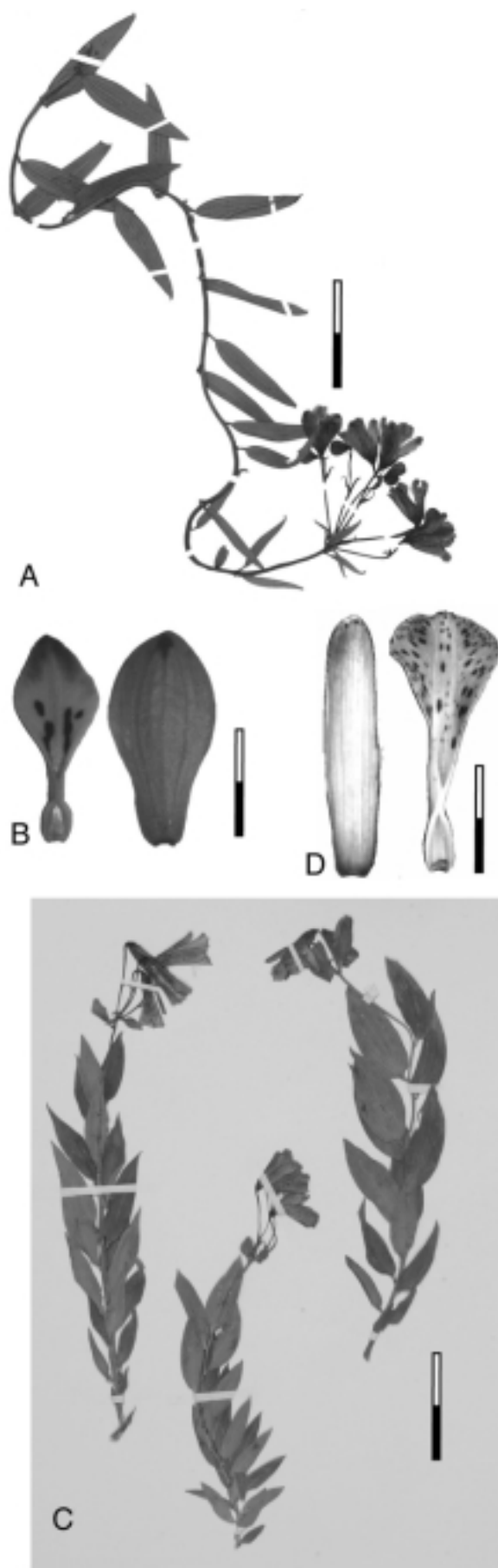


Figure 34. (A & D) *B. macusanii*, inner tepal on the right side; (B & E) *B. amazonica*, inner tepal on the right side; (C) distribution, triangle *B. macusanii*, cross *B. amazonica*. Scale bars: (A)= 5 cm; (B)= 4 cm; (D), (E)= 2 cm.



**Figure 35.** (A & B) *B. nematocaulon*, inner tepal on the left side; (C & D) *B. ovata*, inner tepal on the right side. Scale bars: (A)= 3 cm; (B)= 0,7 cm; (C)= 5 cm; (D)= 1 cm.

*Inter speciebus affinis insignis caule spiraliter scandente, glabro, foliis ellipticis, utrimque glabris, umbella erecta, pedicellis 2 cm longis, bracts form an involucrem, floribus zygomorphis, 2 – 2,5 cm longis, segmentis perianthii aequalibus, tepalis externis oblongis, rubris, tepalis internis spathulato-unguiculatis, flavido-rubris. Ovarium pilosum.*

Plant twining, several metres long (1–3 m), stem robust, around 0,5–1 cm in diameter, not recurved at apex, nearly to completely glabrous. Leaves lanceolate, 4–16 x 1–4 cm. Adaxial side of leaves weakly pubescent with increasing density towards the petiole or glabrous, abaxial side glabrous. Inflorescence an umbel, pedicels around 2 cm, pubescent. Subtending leaves of the lower-most flowers, 2,5–3 x 1–1,5 cm, forming a conspicuous involucrem, subsequent bracts smaller, 0,3–1 x 0,1–0,3 cm, without prophylls. Flowers slightly zygomorphic, horizontally oriented, ca. 2–2,5 cm long, inner tepals equal to outer ones in length, outer tepals oblong, outer surface red, paler red on inner surface. Inner tepals subdivided in blade and claw, orange with a red stripe on the outside. Ovary pubescent, fruit turbinate and seeds globose. *B. macusanii* grows in the fog forest region of southern Peru at altitudes between 2700 and 3800 m.

Taxonomic note: The closest related species seems to be *B. acutifolia* from Central America and northern South America and *B. hirsuta* from Colombia and Ecuador. *B. macusanii* is easily recognised by its conspicuously involucrem. The most similar species in the region are *B. setacea* and *B. formosissima*. The former species can be distinguished by its smaller flowers, the different shaped inner tepals and the pubescence of the leaves, the second species by its larger flowers and the heavy spotted inner tepals.

Additional material examined: PERU: Depto. **Cuzco**: Prov. Urubamba, Huayllabamba, Lagunas de Yanacocha, 2900–4600 m, *Tupayachi* & *Galiano* 1160 (MO); Machu Picchu, *Pride* 1244 (GH); Machu Picchu, 3000 m, *Balls* 6799 (BM); Prov. Paucartambo, above Paucartambo on road to Abra Acanacu, 3200 m, *Plowman* & *Davis* 4922 (U).

## 26. *Bomarea multiples* Benth.

Pl. Hartw. 156. 1845.

Type: Ecuador, Prov. Loja, Chuquiribamba, 1841, *Hartweg* 854 (K!).

Plant twining, around 2–8 m long, stem robust, around 1 cm in diameter, glabrous, apex erect. Leaves narrowly ovate to lanceolate, 6–15 x 2–4 cm, resupinated; adaxial surface glabrous and abaxial surface glabrous or pubescent. Inflorescence dense, bracteose, hypopodium of primary flowers 0,5–2 cm, epipodium around 6–10 cm; bracts of lowermost primary flowers up to 10 x 3 cm, subsequent bracts conspicuous smaller, bracts of secondary flowers 0,3–1,5 x 0,2–0,6 cm. Perianth ca. 4,5–6 cm long, inner tepals equaling outer ones in length or up to 1 cm longer than outer ones, all tepals free to base and divided into limb and claw, outer tepals abaxially pink with a green tip, adaxially whitish; inner tepals abaxially greenish with a pink streak, adaxially basally pink blade green with dark spots. Filaments straight, slightly shorter than the tepals or equaling them, ovary inferior, 4–5 x 4–5 mm, glabrous or pubescent. Capsule turbinate, loculicidally dehiscent, seeds spherical, 3–4 mm in diameter. *B. multiples* grows in the western cordillera of northern Peru in relict fog forests at altitudes between 2000 and 2800 m.

Note: *B. multiples* and *B. gniocaulon* can be distinguished by

the colour of the inner tepals; with small dark spots in *B. multipes*, not in *B. goniocaulon*. The species is illustrated in Harling & Neuendorf (2003).

Additional material examined: PERU: Depto. **Cajamarca**, Prov. Contumazá, Cascabamba, 2700 m, 12.06.1981, *Sagástegui et al.* 9995 (MO, NY); Prov. Contumazá, Cascas, 2550 m, 27.12.1970, *Lopéz & Sagástegui* 7659 (NY); Depto. **Piura**: Prov. Ayavaca, Cerro Chacas, 2000-2800 m, 8.7.2000, *Sagástegui* 16229 (HAO); Bosque Cuyas, 2480 m, 21.9.1996, *Leiva & Quipuscoa* 1871 (HAO).

## 27. *Bomarea nematocaulon* Killip

J. Wash. Acad. Sci. 22 (3): 60. 1932.

Type: Peru, Depto. Huánuco, Playapampa, *Killip* 4870 (F!).

Fig. 3B; 20D; 35A, B; distribution 36C.

Plant twining, around 0.5 – 4 m long, stem robust, around 0.2 cm in diameter, glabrous, apex erect. Leaves narrowly ovate to linear, 3–14 x 0.4–2 cm, resupinate; adaxial surface glabrous and abaxial surface glabrous or pubescent. Inflorescence lax, bracteose, hypopodium of primary flowers 1–3 cm, epipodium around 1 cm; bracts of primary flowers, 1–6 x 0.2–2 cm, bracts of secondary flowers 0.3–0.5 x 0.2–0.3 cm. Perianth ca. 1–1.8 cm long, inner tepals equaling outer ones in length, all tepals free to base and divided into limb and claw, outer tepals abaxially red, adaxially lighter red; inner tepals abaxially yellow to orange with a red streak, adaxially yellow to orange with dark spots. Filaments slightly curved, several millimeter shorter than the tepals, ovary inferior, 2–3 x 3–4 mm, pubescent. Capsule turbinate, loculicidally dehiscent, seeds spherical, brown, 2–3 mm in diameter. *B. nematocaulon* grows in the central cordillera of Central Peru on the windward in fog forests at altitudes between 2700 and 3500 m.

Note: *B. nematocaulon* can be distinguished from all other Peruvian species by a thyrse the combination of small flowers (1–1.8 cm).

Additional material examined: PERU: Depto. **Huánuco**: Prov. Huánuco, Carpish, 2700 m, *Duncan et al.* 2684 (F, MO); Carpish, 2800 – 2900 m, *Ferreyra* 2409 (USM); 2800 m, *Sandeman s.n.* (BM); Carpish, 3000 m, *Sandeman* 5264 & 5160 (K); 2700 – 2850 m, *Stein & Todzia* 2288 (MO); Depto. **Pasco**: Prov. Oxapampa, Santa Barbara, 3230 – 3430 m, *La Torre et al.* 1579 (USM).

## 28. *Bomarea obovata* Herb.

Amaryllidaceae 112. 1837.

Type: Ecuador, road to Angus, *Hall* 7 (K!).

=*B. chontalensis* Seemann, Gard. Chron. 479. 1871.

Type: Nicaragua, Chontales mountains, 700 – 850 m, *Seemann s.n.* (BM!).

=*B. sternbergiiflora* Kraenzl., Ann. Nat. Hofmus. 27: 156. 1913.

Type: Ecuador, *Lobb s.n.* (W probably destroyed).

=*B. subtriflora* Sodiro, Sert. Fl. Ecuad., Ser 2: 59. 1908.

Type: Ecuador, Prov. Imbabura, *Sodiro s.n.* (QPLS, US fragm.).

Plant twining, stem robust, several metres long, up to 1 cm in diameter, not recurved at apex, glabrous. Leaves lanceolate, 8–22 x 2–6 cm. Adaxial side of leaves weakly pubescent or glabrous, abaxial side glabrous. Inflorescence a thyrse, hypopodium of primary flowers 6–15 cm, epipodium 2–4 cm. Bracts of primary flowers leaf like or sometimes a part of the bracts smaller 3–5 x 0.8–1 cm, bracts of secondary flowers 1–2 x 0.4–1 cm, up to 10 flowers per partial inflorescence. Perianth

actinomorphic, pendent, ca 3–4 cm long, inner tepals equal to outer ones in length, outer tepals cucullate, pink with a green tip. Inner tepals subdivided in blade and claw, yellow with a green tip and dark spots. Filaments slightly shorter than inner tepals, fruit large and globose and seeds globose. *B. obovata* grows in the western cordillera of Ecuador and in Colombia, Panama, Costa Rica and Nicaragua in forests and hedges at altitudes between 200 and 1000 m.

Note: The shape of the flowers is very similar to *B. campanularia*. Both species are easily recognised, because of their nearly closed flowers and cucullate outer tepals. *B. obovata* has pink flowers and inflorescence is laxiflorous with hypopodia between 6 and 15 cm; *B. campanularia* has orange flowers and the inflorescence is dense with hypopodia not longer than 0.5 cm. *B. obovata* has not been collected so far in Peru, but may occur in the north western region which borders Ecuador.

Additional specimen examined: Ecuador: Prov. Los Rios, Rio Palenque, 200 m, *Gentry et al.* 54749 (MO); Quevedo Canton, Cerro Centinala, 650 m, *Tipaz & quella* 661 (MO); Prov. Pichincha, Santa Domingo – Puetrtto Limón road, 100 m, *Kvist* 40651 (AAU); Prov. Cotopaxi, Tenehuerte, km 55 Quevedo – Latacunga, 850 – 1000 m, *Dodson et al.* 14391 (MO); Prov. Esmeraldas, Rio Zapallo, 200 m, *Barfod* 41039 (MO).

## 29. *Bomarea ovata* (Cav.) Mirb.

Hist. Nat. 72. 1804.

Basionym: *Alstroemeria ovata* Cav., Icon. Pl. 1 54. 1791.

Icones et descriptiones plantarum. Madrid. 1791.

Type: habit. Peru. h R M (MA, photo BM!, F!).

=*B. amoena* (Herb.) M. Roem., Syn. Ensart. 274, 1847.

Basionym: *B. purpurea* var. *amoena* Herb. Amaryll. 399, 1837.

Type: Peru, Chachapoyas, 1835, *Matthews* 874 (K!).

=*B. marcocarpa* (Ruiz & Pavón) Herb., Amaryllidaceae 114. 1837.

Basionym: *Alstroemeria marcocarpa* Ruiz & Pavón, Fl. Peruv. Chil. 3: 62. 1802.

Type: Peru, Depto. Huánuco, Pillao, *Ruiz & Pavón s.n.* (MA, photo ?)

=*B. polyphylla* Kraenzl., Ann. K. K. Naturhist. Hofmus. 27: 158. 1913

Type: Bolivia, Yungas, *Bang* 593 (BM!, ED!, GH!, MO!).

=?*B. punctata* Herb., Bot. Reg. 28: Misc. 66. 1842.

Type: Peru, *Mathews s.n.* (K).

=*B. simplex* Herb. Amaryllidaceae 119. 1837.

Type: Peru, *Matthews* 786 (K!, E!, NY!).

=*B. subsessilis* Killip, J. Wash. Acad. Sci. 25: 373. 1935.

Type: Bolivia, Depto. Cochabamba, near Cochabamba, 3400 m, *Troll* 1630 (B!, M!).

=*B. tomentosa* (Ruiz & Pav.) Herb., Amaryllidaceae 117. 1837.

Basionym: *Alstroemeria tomentosa* Ruiz & Pavón, Fl. Peruv. Chil. 3: 62. 1802.

=*B. variabilis* Herb., Bot. Reg. 28: Misc. 66, 67. 1842.

Type: Peru, *Matthews* 866 (K!).

Type: Peru, Depto. Huánuco, Muña, *Ruiz & Pavón s.n.* (BM!, MA).

Fig. 35C, D; distribution 36C.

Plant twining, 1–3 m long or erect up to 70 cm high, stem robust, around 0.3 cm in diameter, apex erect, glabrous or pubescent with increasing density towards the top. Leaves resupinate, ovate or lanceolate-ovate, 3–8 x 0.5–4 cm, towards inflorescence leaves becoming wider. Adaxial side of leaves pubescent, abaxial side glabrous or completely glabrous. Inflorescence a laxiflorous thyrse or an umbel, erect or horizontally orientated, hypopodium of primary flowers 1.5–4 cm, epipodium 1.5–2 cm. Subtending leaves of primary flowers bracteose, 0.3–1 x

0,1–0,3 cm, subtending leaves of secondary flowers also bracteose, 0,1–0,5 x 0,1–0,3 cm. Perianth ca. 2–3 cm long, inner tepals equal to outer ones in length, outer tepals free, oblong, pink on the outside with green tip, pale yellow on the inside. Inner tepals free, subdivided in blade and claw, pale yellow or whitish with a pink stripe on the outside and with a green tip and dark spots. Filaments about as long as the inner tepals, ovary inferior, fruit a turbinate, dehiscent capsule and seeds spherical, 2–3 mm in diameter with a red sarcotesta. *B. ovata* grows in the costal desert of Peru and in drier parts of cordilleras of Peru, Bolivia and northern Argentina

twining in small shrubs and over rocks or erect at altitudes between 100 m and 3700 m.

Note: *B. ovata* is one of the most variable species within the genus; also see notes at *B. latifolia* and *B. lopezii*.

Additional material examined: PERU: Depto. **Cajamarca**: Prov. Contumazá, Cruz Grande-Contumazá, 2700 m, 20.4.1967, *Sagástegui et al. s.n.* (6493, HUT); Prov. Contumazá, alrededor de Guzmango (Distrito), 25000 m, 7.4.1990, *Sagástegui & Sagástegui 14246* (HAO); Depto. **Cuzco**: Sajsahuaman, 3600 m, 14.3.1948, López s.n. (624, HUT); Prov. Paucartambo, camino a Pillahuata, 2300 m, 22.3.1965, *Aldave s.n.* (5018, HUT); Depto. **Huancavelica**: Prov. Huancavelica, Ayán, 3300 m, *Tovar 152* (USM); entre Colcabamba y Surcabamba, 2800–2900 m, *Tovar 1815* (USM); Depto. **Huánuco**: Acomayo, 2100 m, *Woytkowski 34007* (F, MO); Pillao, 2700 m, *Woytkowski 34133* (F); Prov. Huánuco, Acomayo, *Ridoutt s.n.* (USM); Depto. **Lambayeque**: Entre Beatita de Humay y km 38, carretera Olmos-Marañón, 1500 m, *López et al. s.n.* (4055, HUT); Depto. **La Libertad**: Prov. Pataz, Fence row on trail between Pataz and Yalen, 2600–2800 m, 4.2.1986, *Young 2832* (HUT); Prov. Bolívar, alrededores de Longotea, 2500 m, 27.5.1960, *López & Sagástegui s.n.* (3166, HUT); Prov. Huamachuco/Sánchez Carrión, hacienda Yanazara, 2500 m, 26.3.1961; *Pinillos s.n.* (3655, HUT); Prov. Otuzco, alrededores de El Horcón (ruta Samne), 2850 m, 27.5.1993, *Leiva et al. 747* (HAO); Depto. **Pasco**: entre Salcachupán y Cerro de Pasco, 3300–3400 m, *Ferreyra 6613* (USM); Depto. **Cuzco**, Prov. Calca, alrededores de Pisac, 3010–3500 m, *Nuñez Motocanchi 8822* (MO); Prov. Calca, Cortica, 3100 m, *Vargas 227* (F); Prov. Urubamba, Chincheros, 3700 m, *Davis et al. 1448* (GH); Prov. Quispicanchis, Urcos, *Vargas 3120* (MO); Prov. Paruro, Quetepampa, 2820 m, *Vargas 9729* (F, K).

n.v.: «choro choro» [Pinillos s.n. (3655, HUT)]

BOLIVIA: Depto. Cochabamba: Carrasco, road Espinozana-Santa Cruz, 3100 m, *Fernández Casas 7789* (MO); Prov. Chapare, Locotal, 1600 m, *Steinbach 9312* (BM, E); between Vila Vila and Cochabamba, 3500 m, *Brooke 6236* (BM); Depto. La Paz: Prov. Larecacha, Sorata, 2600–2700 m, *Mandon 1201* (BM, G); Prov. Larecacha, Sorata, 2850 m, *Casas & Molero FC6524* (MA); Prov. Inquisivi, Rio Chichipata, *Lewis 882035* (LPB).

### 30. *Bomarea pardina* Herb.

Amaryllidaceae 120. 1837.

Type: Ecuador, Prov. Pichincha, Patacocha, 1800 m, *Hall 19* (K!).

=*B. brachypus* Kraenzl., Bot. Jahrb. Syst., Beibl. 91: 40. 1907.

Type: Ecuador, Prov. Pichincha, near Tamboloma, *Sodirol 176/15?* (B!).

=*B. falcata* Sodirol, Sert. Fl. Ecuador, Ser. 2: 56. 1908.

Type: Ecuador, Prov. Pichincha, Rio Yamboya, Cerro, Atacazo, *Sodirol s.n.* (QPLS, US fragm.).

=*B. grandiceps* Kraenzl., Bot. Jahrb. Syst., Beibl. 91: 40. 1907.

Type: Ecuador, Prov. Bolívar, between Atenas and Chillanes, *Sodirol s.n.* (B!).

=*B. loreti* Kraenzl., Bot. Jahrb. Syst., Beibl. 111: 4. 1913.

Type: Peru, Depto. Loreto, Cerro Panasa, 1300 m, *Ule 46* (B!).

=*B. lycina* Herb., Amaryllidaceae 398. 1837.

Type: Peru, Zambrabamba, *Mathews 1668* (K!).

=*B. pulchella* Sodirol, Sert. Fl. Ecuador, Ser. 2: 55. 1908.

Type: Ecuador, Prov. Cotopaxi, Angamarca, *Sodirol 11/905* (QPLS, US fragment).

=*B. venusta* Sodirol, loc. cit.

Type: Ecuador, Prov. Pichincha, Rio Yamboya, Cerro Atacazo, *Sodirol 7/907* (QPLS, US fragm.).

Fig. 2A; 36A, B; distribution 36C.

Plant twining, several metres long, stem robust, around to 0,5 cm in diameter, not recurved at apex, pubescent with increasing density towards the top, or glabrous. Leaves ovate to broadly lanceolate, 4–25 x 2–8 cm. Adaxial side of leaves

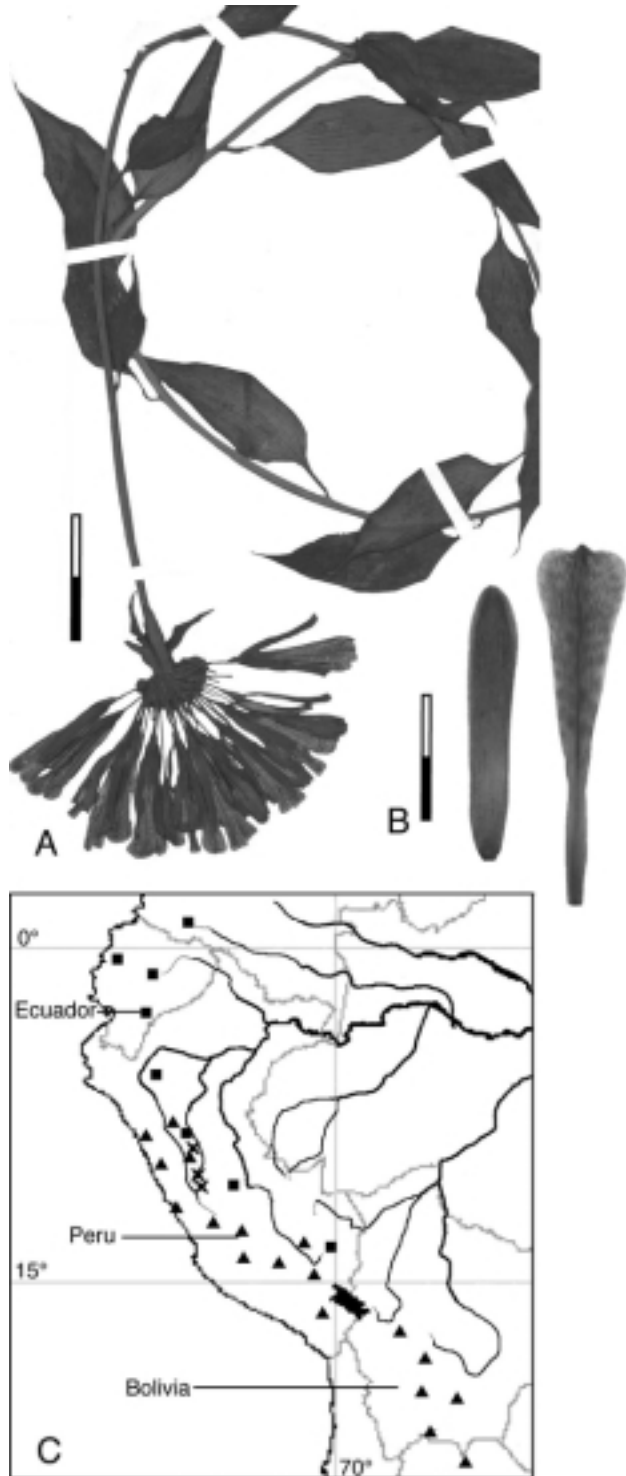


Figure 36. (A & B) *B. pardina*, inner tepal on the left side; (C) distribution, cross *B. nematocaulon*, triangle *B. ovata*, quadrate *B. pardina*. Scale bars: (A)= 6 cm; (B)= 2 cm.

pubescent or glabrous, abaxial side glabrous. Inflorescence a dense thyrse hypopodium 0,2 – 0,5 cm, epipodium 1,5 – 3 cm, pubescent. Subtending leaves of the lower-most flowers frondose, 2 – 10 x 0,5 – 4 cm, subsequent bracts smaller, 1,5 – 3,5 x 0,2 – 0,5 cm. Flowers slightly actinomorphic, pendulous, ca. 4 – 7 cm long, inner tepals up to 1 cm longer, outer tepals oblong, outer surface pink, whitish on inner surface. Inner tepals subdivided in blade and claw, white with a pink stripe on the outside and with many dark spots. Filaments about as long as

the inner tepals Ovary pubescent, fruit and seeds unknown. *B. pardina* grows in the eastern cordillera from south Colombia to central Peru on the windward sides in mountain and fog forests at altitudes between 500 and 2800 m. In Ecuador it occurs also in the western cordillera.

Note: *B. pardina* cannot be confused with any other Peruvian *Bomarea*, because of the distinct, inflorescence, the size and the colour of the flowers. The only similar species is *B. ceratophora* an endemic plant of Ecuador.

Additional material examined: PERU: Depto. **Cajamarca**, Prov. San Ignacio, Distrito San Jose de Lourdes: Región Nororiental del Maraón (RENOM). Caserío Santo Tomás, 2270 m, 31.10.1995. *E. Rodríguez 686* (HUT, MO); Depto. **Junin**: La Merced, 1300 m, *Macbride 5700* (F); Chanchamayo Valley, 1500 m, *Schunke 478* (F); Tarma, Aqua Dulce, 1600 m, *Woytkowski 7465* (MO); Depto. Cusco, Prov. Paucartambo, road to Pilcopata between Puente Unión, 1810 m, *Léon et al 3234* (USM).

### 31. *Bomarea pseudopurpurea* Hofreiter & E. Rodr., spec. nov.

Type: Peru, Depto. Huanuco, Cerro Carpish, 2600 m, *Hofreiter 2004/24*. (holotype: HUT!, isotype: MSB!)

Fig. 3F; 37A, B; distribution 37C.

*Inter speciebus affinis insignis caule spiraliter scandente, foliis lanceolato ovatis vel ovatis, abaxialiter glabris, adaxialiter pubescente, umbella subpendula, pedicellis 1-3 cm longis, floribus zygomorpha, 1,8–2,4 cm longis, segmentis perianthii aequalibus longitudine, tepalis externis oblongis, nigro-purpureis, tepalis internis spatulato-ungiculatis, nigro-purpureis, ovario piloso.*

Plant twining, several metres long (2–5 m), stem robust, up to 0,6 cm in diameter, not recurved at apex, glabrous next to the inflorescence pubescent. Leaves lanceolate ovate to ovate, 4–12 x 2– 4,5 cm. Adaxial side of leaves pubescent with several millimetre long hairs. Inflorescence an umbel, pedicels 1–3 cm, pubescent. Subtending leaves of the lower-most flowers bracteose, 0,4–0,9 x 0,2– 0,5 cm, subsequent bracts smaller, 0,3– 0,9 x 0,1–0,2 cm. Flowers slightly zygomorphic, horizontally oriented, ca. 1,8 – 2,4 cm long, inner tepals slightly longer than outer ones, outer tepals oblong, outer surface dark purple, paler on inner surface. Inner tepals subdivided in blade and claw, purple with a dark purple stripe at outer side, without dark spots. Ovary pubescent, fruit turbinate and seeds globose. *B. pseudopurpurea* grows in the eastern cordillera in Depto. Huanuco, Peru on the windward sides in small shrubs and fog forests at altitudes around 2800 m.

Note: *Bomarea pseudopurpurea* is only known so far from Depto. Huánuco, Peru. It has the darkest flowers of all species known so far. It is a very characteristic species. The leaves are different to *B. purpurea*, without dense prominent nerves, but long hairs.

### 32. *Bomarea rosea* (Ruiz & Pav.) Herb.

Amaryllidaceae 118. 1837.

Basionym: *Alstroemeria rosea* Ruiz & Pav., Fl. Peruv. Chil. 3: 61. 1802.

Type: Peru, Huassahuassi, *Ruiz & Pavón s.n.* (MA, photo)

= *B. fimbriata* (Ruiz & Pavón) Herb., Amaryllidaceae 116. 1837.

Basionym: *Alstroemeria fimbriata* Ruiz & Pav., Fl. Peruv. Chil. 3: 63. 1802.

Type: Peru, Pasco, Pozuzo, *Ruiz & Pavón s.n.* (MA, photo)

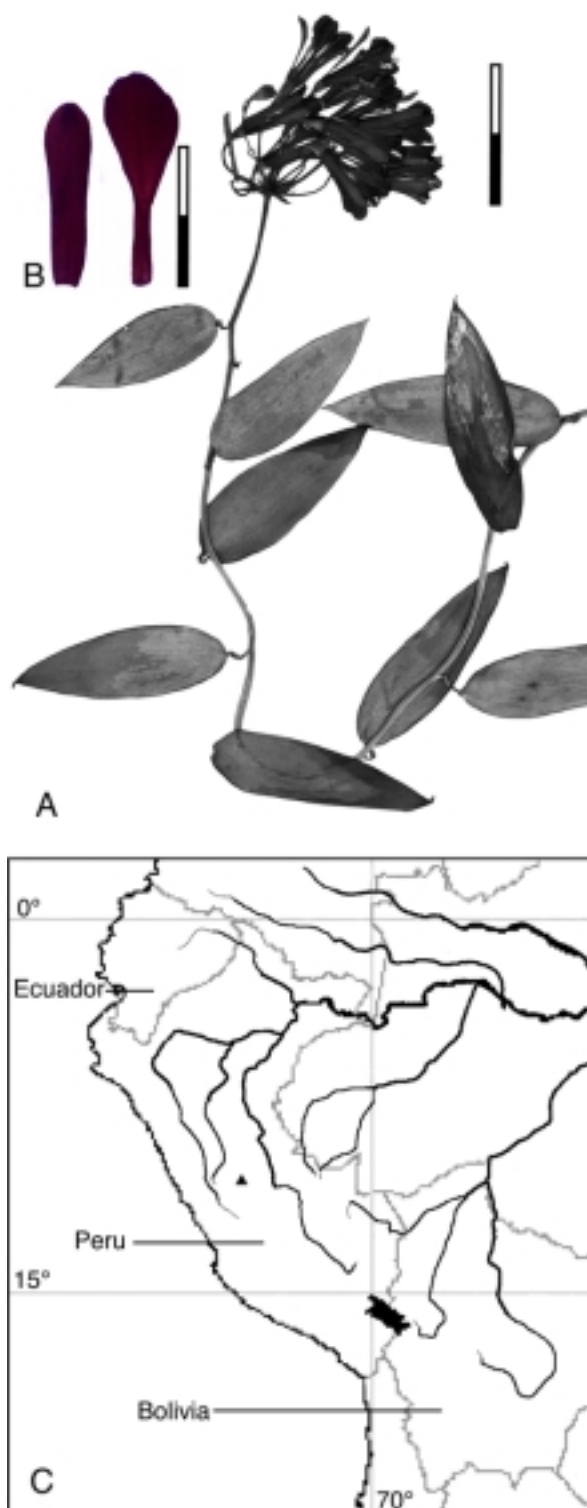
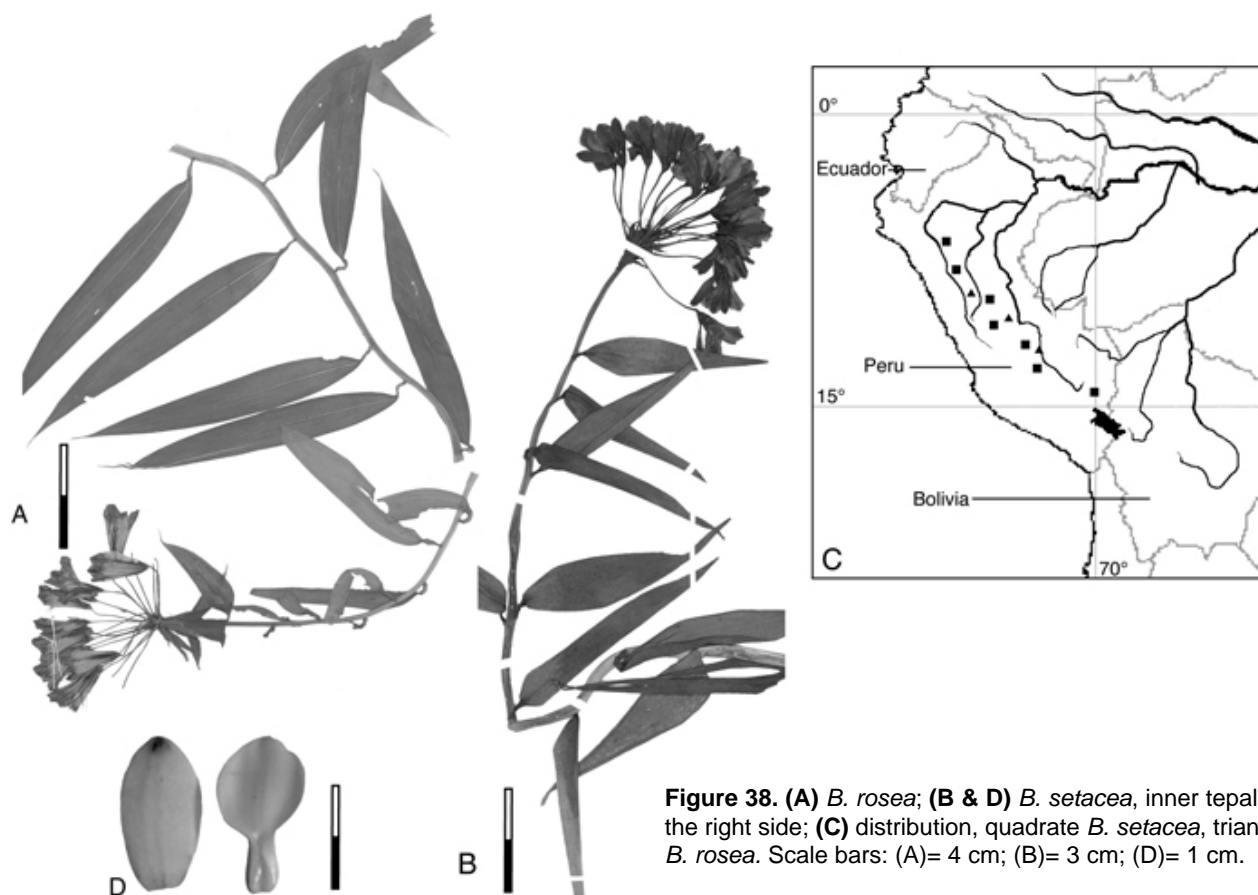


Figure 37. *B. pseudopurpurea*; (A & B) habit and inner tepal on the right side; (C) distribution. Scale bars: (A)= 4 cm; (B)= 1,8 cm.



**Figure 38.** (A) *B. rosea*; (B & D) *B. setacea*, inner tepal on the right side; (C) distribution, quadrate *B. setacea*, triangle *B. rosea*. Scale bars: (A)= 4 cm; (B)= 3 cm; (D)= 1 cm.

Fig. 38A; distribution 38C.

Plant twining, 1 – 5 m long, stem robust, around 0,4 cm in diameter, apex erect, glabrous or slightly pubescent near the inflorescence with increasing density towards the top. Leaves resupinated, lanceolate-ovate to lanceolate, 5–18 x 1–2 cm. Adaxiale side of leaves pubescent, abaxial side glabrous or completely glabrous. Inflorescence an umbel, erect or horizontally orientated, pedicel 3–7 cm, around 4–70 flowers. Subtending leaves of the first flowers 2–5 x 0,3–1 cm, subtending leaves of following flowers 0,3–2 x 0,1–0,3 cm. Perianth ca. 2,5–3 cm long, inner tepals slightly longer than outer ones, outer tepals oblong, pink on the outside with green tip, pale yellow on the inside. Inner tepals subdivided in blade and claw, pale yellow or greenish with a pink stripe on the outside and inner side greenish yellow with a green tip and linear, dark spots. Filaments about as long as the inner tepals, ovary inferior, pubescent, fruit a turbinate, dehiscent capsule and seeds spherical, 2–3 mm in diameter with a red sarcotesta. *B. rosea* grows at the edges of mountain forest in Peru at altitudes between 1800 and 2500 m.

Note: *B. rosea* is the only species known so far with pink and green flowers and even in strong specimen an umbel and not a thyrses.

Additional material examined: PERU: Depto. **Junin**: Yaupi, 1800 m, *Woytkowski* 6669 (MO); Depto. **Huánuco**: Muña, 2300 m, *Macbride* 3981 (F); Depto. **La Libertad**: Prov. Pataz, S side of Cerro Potosi, above Pampa Rosas, Pataz, 2800–3250 m, 3.03.1986, *Young* 3101 (HUT); Depto. **Pasco**: Prov. Oxapampa, road to Maria Teresa, 2150 – 2450 m, *Foster et al.* 7673 (MO).

### 33. *Bomarea speciosa* Killip

J. Wash. Acad. Sci. 22 (3): 61. 1932.

Type: Peru, Depto. Huanuco, Yanano, 1800 m, *Macbride* 3711 (F; US!).

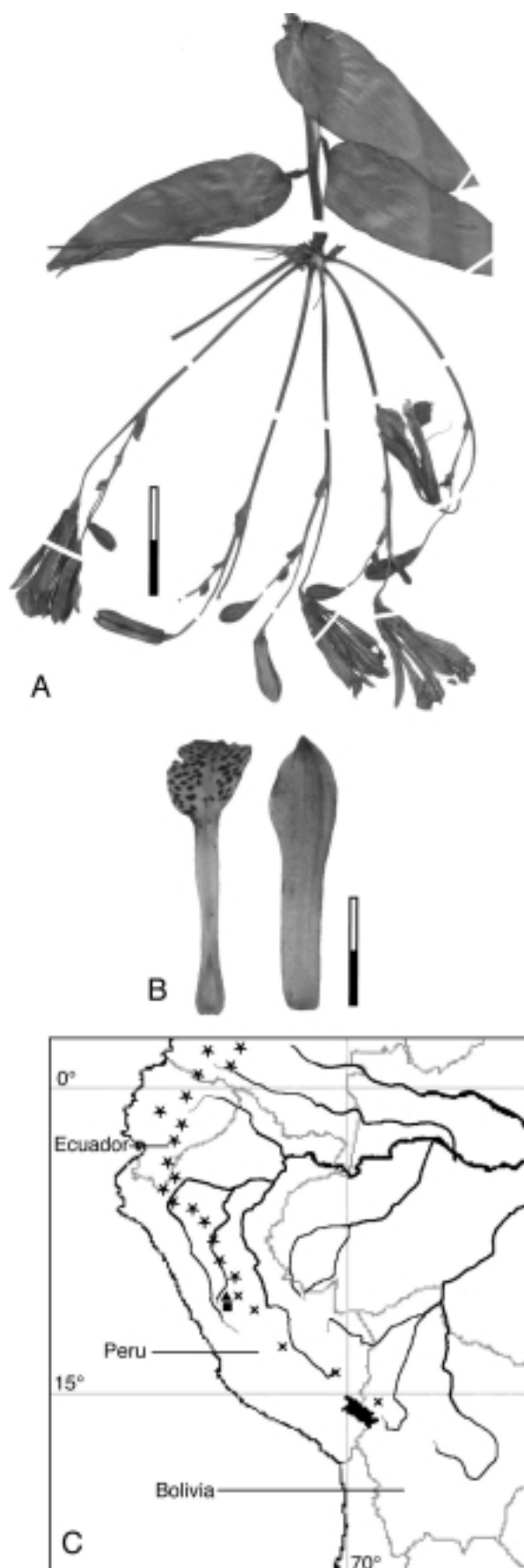
=*B. pillawantense* Vargas, Biota 8: 40. 1969.

Type: Peru, Depto. Cusco, Prov. Paucartambo, entre Yanamayo y Tambomayo, 2000–2300 m, *Vargas* 6754 (CUZ !)

Fig. 39A, B; distribution 39C.

Plant twining up to 6 m long, stem robust, glabrous, 1 cm in diameter. Leaves lanceolate, 7–20 x 2–6 cm. Adaxiale side of leaves pubescent, mostly on the nerves or glabrous, abaxial side glabrous. Inflorescence an erect laxiflorous thyrses, hypopodium of primary flowers 10–20 cm, epipodium 3–5 cm. Hypopodium and epipodium glabrous or pubescent. Bracts of primary flowers frondose or bracteose, 1–8 x 0,3–2 cm, bracts of secondary flowers bracteose, 0,3–4 x 0,3–0,5 cm. Flowers ca. 4–5 cm long, inner tepals equal to outer ones in length, outer tepals oblong, on outer surface red with green tip, pale yellow on inner surface. Inner tepals subdivided in blade and claw, yellow with a red stripe on outer surface and with a green tip. Ovary pubescent, fruit turbinate, and seeds globose. *B. speciosa* grows in the eastern cordillera of Peru and northern Bolivia on the windward sides in small shrubs and fog forests at altitudes between 2000 and 3000 m.

Note: dried specimen of *B. speciosa* may be confused with *B. cordifolia*. Living plants are easily distinguished by the shape of the flowers, funnel-shaped in *B. speciosa*, open in *B. cordifolia*.



**Figure 39. (A & B)** *B. speciosa*, inner tepal on the left side; **(C)** distribution, star *B. purpurea*, triangle *B. denticulata*, quadrate *B. crocea*, cross *B. speciosa*. Scale bars: (A)= 4,5 cm; (B)= 1,5 cm.

Herbarium specimen can be distinguished by the size of the flowers, the shape of the inner tepals and the shape of the leaves.

Additional material examined: PERU: Depto. **Huánuco**: carretera de Tingo María a Huánuco, 2600 – 2700 m, *Rimachi 4912* (MO); Carpish, cumbre entre Huánuco y Tingo María, 2800 – 2900 m, *Ferreya 1813* (USM); road from Tingo María to Huánuco, km 69, 29.3.2001, *Weigend et al. 5407* (HUT, M); Depto. **Cuzco**: Prov. Paucartambo, S. Pedro, 2000 m, *Vargas 7312a* (MO).

### 34. *Bomarea superba* Herb.

Amaryllidaceae 117. 1837.

Type: Peru, Mathews 1663 (K!).

= *B. sulphuræ* Kraenzl. Bot. Jahrb. Syst. 40: 236. 1908.

Type: Peru, Depto. Cajamarca, Prov. Hualgayoc, near Ninabamba, 2200-2300 m, *Weberbauer 4109* (B!).

Fig 2B; 40A, D; distribution 40C.

Plant twining, several meters long, up to 8 m, stem robust up to 1 cm in diameter, recurved at apex, glabrous. Leaves linear-lanceolate to lanceolate, 9–14 cm long and 1–3 cm wide. Adaxial surface of leaves pubescent or glabrous, abaxial side glabrous. Inflorescence an umbel, pedicels 2–4 cm. Bracts of lowermost primary flowers, 2–4 x 0,5–1 cm wide, subsequent bracts smaller. Flowers ca. 4–5,5 cm long, inner tepals equal to outer ones in length or up to 0,5 cm longer, outer tepals oblong, yellow. Inner tepals subdivided in blade and claw, yellow. *B. superba* grows in the Amotape Huancabamba–region in hedges and fog forests at altitudes between 2200 and 3000 m.

Note: *B. superba* cannot be confused with any other Peruvian *Bomarea* species, because of its large yellow flowers without any dark spots. It is closely related to a group of Ecuadorian and Colombian *Bomareas* (*B. euophylla*, *B. lutea*, *B. patacensis* and *B. patinii*). All these species are characterised by being large vines, with large (5–8 cm), many (often more than 50) flowers, yellow, orange or red tepals without a green tip and an umbel.

Additional material examined: PERU, Depto. **Amazonas**, Chachapoyas, *Mathews s.n.* (K); Depto. **Cajamarca**: Prov. Chota, alrededores de Pacopampa (cerca de Querocoto), 2400 m, 11.8.1994, *Leiva et al. 1467* (HAO); Prov. Cutervo, al Norte de San Andrés, 2200 m, *Vega & Mirando 6315* (MO); Camino al Parque Nacional San Andrés, 2050 m, 25.5.1965, *López & Sagástegui s.n.* (5446, HUT); San Andrés, 2100 m, *Llatas Quiroz 2721* (F); Prov. San Miguel de Pallaques, Niepos, 2200 m, *Llatas Quiroz 1524* (F); above Agua Blanca: Tingo, 3084 m, 14.10.2000, *Weigend et al. 2000-730* (HUT); alrededores El Tingo, Dist. Unión Agua Blanca, 2930 m, 9.2.2000, *Alvítez et al. 1060* (HUT); El Tingo (Agua Blanca), 2750 m, 12.5.1977, *Sagástegui et al. 8813* (HUT); El Tingo (camino a Taulis), Dist. Unión Agua Blanca, 3000-3250 m, 18.2.2000, *E. Rodríguez et al. 2358* (HUT); Alrededores El Tingo (Agua Blanca), 2950 m, 5.7.1986, *Mostacero et al. 1317* (HUT); Depto. **San Martín**: Prov. Huallaga, Distrito: Saposoa, 3400-3600 m, 24.8.2001, *Quipuscoa & Vilchez 2622* (HUT).

### 35. *Bomarea tarmensis* Kraenzl.

Bot. Jahrb. Syst. 40: 233. 1908.

Type: Peru, Depto. Junin, Prov. Tarma, Chanchamayo Tal, 700 – 1000 m, *Weberbauer 1846* (B!).

Fig 41A, C; distribution 40C.

Plant twining, 2–8 m long, stem robust, not recurved at



**Figure 40.** (A & D) *B. superba*, inner tepal on the left side; (B) *B. tribrachyiata*; (C) distribution, star *B. superba*, triangle *B. tribrachyiata*, cross *B. tarmensis*, quadrate *B. weigendii*. Scale bars: (A)= 4,5 cm; (B)= 4 cm; (D)= 2 cm.

apex, pubescent with increasing density towards the top or glabrous, up to 1,2 cm in diameter. Leaves linear or linear-lanceolate, 8–20 x 1–3 cm wide. Adaxial side of leaves pubescent or glabrous, abaxial side glabrous or weakly pubescent. Inflorescence a thyrse, hypopodium of primary flowers 1–5 cm, epipodium 1–3 cm. Subtending leaves of primary flowers

frondose or bracteose, 0,5–3 x 0,1–0,5 cm, bracts of secondary flowers bracteose, 0,5–1 x 0,1–0,3 cm. Flowers ca 1,5–2 cm long, inner tepals equal to outer ones in length, outer tepals oblong, pink with green tip on outer surface, pale yellow on inner surface. Inner tepals subdivided in blade and claw, yellow-white with a pink stripe on outer surface and with green tip. Fruit turbinate and seeds globose. *B. tarmensis* grows in the eastern cordillera of southern Peru and northern Bolivia on the windward sides in small shrubs and at edges of mountain forests at altitudes between 800 and 1700 m.

**Note:** This specie is well characterised by the small and dense flowered thyrse and the habitat.

Additional material examined: PERU: Depto. **Cuzco**: Prov. Camisea, along Camisea river, Segakiato, 380 m, *Acevedo 9986* (US); Prov. La Conveccion, Echerate, Kiteni, 667 m, *Nunez et al. 10095* (MO). Depto. **Huánuco**: Prov. Huánuco, Cucharas, cerca de Tingo Maria, 500 m, *Woytkowski 1120* (USM); Prov. Tingo Maria, Quebrada Las Pavas, 650 – 750 m, *Weigend & Dostert 97/101* (MSB). Depto. **Junín**: Chanchamayo, road to San Vicente, 980 m, *Stein & Todiza 2350* (NY, MO); Paucartambo to La Merced, Chanchamayo valley, 800 m, *Gentry et al. 39819* (MO). Depto. **Pasco**: Outskirts of Pozuzo, 830 – 900 m, *Gentry et al. 40084* (MO); Depto. **Puno**, Prov. Sandia, near San Juan del Oro, *Hofreiter 2AB11* (MSB); Depto. **Huánuco**: Rio Yuyapichis, 200 m, *Seidenschwarz 12/1* (F); Rio Yuyapichis, 200 m, *Seidenschwarz 12/3* (MO).

BOLIVIA: Depto. La Paz: Prov. Nor Yungas, Caranavi-Coroico, 850 m, *Besse et al. 1811* (MO); Prov. Nor Yungas, road Yolosa Coroico, 1700 m, *Solomon 4849* (MO); Prov. Nor Yungas, road Yolosa-San Juan de La Miel, 1700 m, *Solomon 9346* (MO); Depto. Santa Cruz: Prov. Cordillera, Camiri, 1200 m, *Michel 66* (MO).

### 36. *Bomarea tribrachyiata* Kraenzl.

Bot. Jahrb. Syst. 40: 235. 1908.

Type: Peru, Depto. Ancash, Cajatambo, between Tallanga and Piscapaccha, 3600-3800 m, *Weberbauer 2884* (B!).

=*B. ayavacensis* Kraenzl., Bot. Jahrb. Syst. 54, Beibl. 117: 2. 1916. Type: Peru, Depto. Piura, above Ayavaca, 2900 m, *Weberbauer 6373* (B!).

Fig. 40B; distribution 40C.

Plant twining, stem robust, several metres long, up to 0,5 cm in diameter, not recurved at apex, glabrous. Leaves lanceolate to ovate, 4 – 10 x 1,5–5 cm. Both leaf surfaces glabrous. Inflorescence a thyrse, hypopodium of primary flowers 3–8 cm, epipodium 2–3 cm. Bracts of primary flowers wider than the normal leaves compared to the length 3 – 4 x 2– 3 cm, bracts of secondary flowers, 2–2,5 x 2–2,5 cm. Perianth actinomorphic, pendent, ca 1,5–3,5 cm long, inner tepals shorter than outer ones, outer tepals oblong, pink with a green tip. Inner tepals subdivided in blade and claw, yellow with a green tip and dark spots. Filaments slightly shorter than inner tepals, weakly curved, fruit turbinate and large, seeds globose. *B. tribrachyiata* grows in Amotape-Huancabamba-region of Peru and Ecuador in the western part in small shrubs and fog forests at altitudes between 1600 and 3800 m.

**Note:** *B. tribrachyiata* has shorter inner tepals which is a rare character within *Bomarea*. The tepals are not shed after blooming which is untypical for the species of *Bomarea* s.str.

Additional material examined: PERU: Depto. **Cajamarca**: Prov. Contumazá, Bosque Cachil, 2400 m, *Dillon et al. 6510* (F, MO); Bosque de Cachil, 2400 m, 17.5.1993, *Dillon et al. 6510* (F, HAO); alrededores de Guzmango, 2500 m, 24.6.1994, *Sagástegui et al.*



15397 (HAO); Lledén-San Martín, 2500 m, 31.5.1988, *Sagástegui et al. 14021* (HAO); between Cascas and Contumaza, S of the summit, below the tunnel, 2550-2600 m, 6.4.1985, *Molau et al. 1822* (HUT); Cascas-Contumazá, 2250 m, 19.5.1962, *López et al. s.n.* (3698, HUT); Dto. Contumazá, Bosque de Cachil, 2640 m, 30.4.1999, *Binder et al. 1999-09* (HUT); El Puquio, Guzmango, 2900 m, 21.6.1962, *Sagástegui s.n.* (3931, HUT; MSB); Prov. San Miguel de Pallaques, entre Lives y Pallac, 1850 m, 11.5.1977, *Sagástegui et al. 8790* (F, HUT); Depto. **La Libertad**: Prov. Santiago de Chuco, alrededores de Stgo. de Chuco, 3100 m, 3.1950, *López s.n.* (4654, HUT); Prov. Otuzco, camino de El Granero (Hda. Llaguén), 2700 m, 6.1951, *López 645* (HUT); Huaranchal, 2750 m, 6.6.1958, *López et al. s.n.* (2654, HUT, MSB); Depto. **Piura**: Prov. Ayavaca, Ruinas de Aypate, Comunidad Campesina Tacalpo, Anexo Yanchalá, 2700-2800 m, 25.5.1996, *Quipuscoa et al. 524* (HAO); Yacupampa-Cuyas (Ayabaca), 2500 m, 26.5.1971, *López et al. 7755* (HUT, NY).

### 37. *Bomarea uncifolia* Herb.

Bot. Reg. 28, Misc. 66. 1842.

Type: Ecuador, Prov. Canar, Cerro Pilzhún, 3650 m, *Jameson s.n.* (K!, GH).

= *B. platypetala* Benth. Pl. hartweg. 156. 1845.

Type: Ecuador, Prov. Loja, Chuquiribamba, *Hartweg s.n.* (K!).

= *B. gracilis* Sodiro, Sert. Fl. Ecuador., Ser. 2: 60. 1908.

Type: Ecuador, Prov. Imbabura, near Ibarra, *Sodiro 55/28* (Q, US fragm.).

= *B. lobbiana* Kraenzl., Ann. K. K. Nat. Hofmus. 27: 155. 1913.

Type: Peru, *Lobb s.n.* (W destroyed, photo FI, K!).

Plant twining, stem robust, several metres long, up to 0,2 m in diameter, not recurved at apex, glabrous. Leaves linear-lanceolate or linear, 3–7 x 0,3–1,5 cm. Adaxial side of leaves pubescent, with white short hairs, abaxial side glabrous. Inflorescence in strong specimens a thyrses, hypopodium of primary flowers 0,1–0,3 cm, epipodium 2–6 cm. In weaker specimens reduced to an umbel. Bracts of primary flowers frondose, 3–6 x 0,5–1,8 cm, bracts of secondary flowers bracteose, 0,4–0,6 x 0,2–0,5 cm. Perianth slightly zygomorphic, horizontally oriented, ca 2–2,5 cm long, inner tepals equal to outer ones in length, outer tepals oblong, pink with a green tip. Inner tepals subdivided in blade and claw, yellow with dark spots and a green plate. Filaments slightly shorter than inner tepals, weakly curved, fruit turbinate and seeds globose. *B. uncifolia* grows in Ecuador on the windward sides in small shrubs and fog forests at altitudes between 2600 and 3600 m.

Note: *B. uncifolia* is well characterised with its broad outer tepals and compared to the normal foliage leaves broad primary bracts. The species is illustrated in Harling & Neuendorf (2003).

Additional material examined: Ecuador, Prov. **Azuay**, Sigisig to Gualaquiza, 2800-3000 m, *Harling et al. 8273* (GB); Prov. **Morona-Santiago**, Gualaceo-El Limón 2800-3500 m, Van der Werff & Gudino 11090 (AAU); Prov. **Azuay**, Cuenca, 3050 m, Jaramillo 9881 (AAU).

### 38. *Bomarea weigendii* Hofreiter & E. Rodr., spec. nov.

Type: Peru, Depto. Ayacucho, Huanta, road from Tambo to Ayna, 3500 m, 19.2.2000, *Weigend & Weigend 2000/387* (holotype: USM!, isotype: MI!).

Fig. 2C; 41B, D; distribution 40C.

*Inter speciebus affinis insignis caule spiraliter scandente, glabro, foliis ellipticis, utrinque glabris, umbella pendente, pedicellis 12 cm longis,*



Figure 41. (A & C) *B. tarmensis*, inner tepal on the left side; (B & D) *B. weigendii*, inner tepal on the left side. Scale bars: (A)= 5 cm; (B)= 3 cm; (C)= 1 cm; (D)= 1,5 cm.

*floribus actinomorphis, 3 cm longis, segmentis perianthii inaequalibus, tepalis externis oblongis, rubris apice viridibus, tepalis internis quam sepala 0,6 cm longioribus, spathulato-unguiculatis, flavido-viridibus. Ovarium pilosum.*

Plant twining, several metres long (2–5 m), stem robust, around 0,4 cm in diameter, not recurved at apex, pubescent with increasing density towards the top, or glabrous. Leaves ovate, 4–12 x 1,5–4,5 cm, adaxial and abaxial side glabrous. Inflorescence an umbel, pedicels around 12 cm, close to the flowers pubescent with a bracteose prophyll. Subtending leaves of the lower-most flowers, 6–8 x 3–4 cm, subsequent bracts smaller, 4–6 x 0,3–0,5 cm. Flowers actinomorphic, pendent, ca 3 cm long, wide open, outer tepals spreading, inner tepals up to 0,6 cm longer, outer tepals oblong, outer surface red with a green tip, paler red on inner surface. Inner tepals subdivided in blade and claw, claw yellow with a red stripe at outer side, blade green with many dark spots. Ovary pubescent, fruit and seeds unknown. *B. weigendii* grows in the eastern cordillera of central Peru on the windward sides in small shrubs and fog forests at altitudes around 3500 m.

Note: This species is only known so far from the mountains east of Tambo. The most similar species are *B. dispar* and *B. chaparensis*. *B. dispar* has smaller flowers, a thyrse and occurs between 600 and 1500 m. *B. chaparensis* has slightly smaller flowers, the outer tepals are differently shaped and the pedicels much shorter (4–6 cm). *B. chaparensis* is only known from Central Bolivia, around 1000 km to the southeast. The name is dedicated to the collectors of type M. and K. Weigend.

Additional material examined: PERU: Depto. **Ayacucho**: Huanta, road from Tambo to Ayna, 3500 m, *Hofreiter CB15* (MSB); Depto. **Cusco**: Prov. Convención, Cordillera Vilcabamba, Yupanqui to Rio Apurimac, 3500 m, *Davis et al. 1224* (F).

### ***Bomarea setacea* complex**

The species of the *B. setacea* complex are difficult to distinguish with only dried specimen.

#### **Key to the species**

- 1 Flowers small 0,8–1,5 cm, more open, yellow to orange; Peru  
*B. setacea*
- 1' Flowers 2–3,5 cm, funnel shaped, orange, red or deep crimson 2
- 2 Nerves with very prominent bladders, flowers deep red, up to 3,5 cm  
*B. crassifolia*
- 2' Nerves with conspicuous less, flowers orange, up to 2,5 cm 3
- 3 Nerves very dense distance between two main nerves as wide as width of one nerve  
*B. purpurea*
- 3' Nerves less dense distance between two main nerves two to three times as wide as width of one nerve 4
- 4 Nerves ridged with only the bladder like base of the hairs, leaves appear glabrous  
*B. endotrachys*
- 4' Nerves ridged with the bladder like base which ends in long hairs  
*B. crocea*

#### **Clave para las especies**

- 1 Flores pequeñas 0,8–1,5 cm, mas abiertas, amarillas a anaranjadas  
*B. setacea*
- 1' Flores 2–3,5 cm, infundibuliformes, anaranjadas, rojas o carmesí intenso 2

- 2 Nervaduras con vesículas (ámpulas) muy prominentes, flores color rojo intenso, hasta 3,5 cm  
*B. crassifolia*
- 2' Nervaduras con vesículas menos conspicuas, flores anaranjadas, hasta 2,5 cm 3
- 3 Nervaduras muy densas, distancia entre las dos nervaduras principales tan ancha como el ancho de una nervadura  
*B. purpurea*
- 3' Nervaduras menos densas, distancia entre las dos nervaduras principales dos a tres veces tan ancha como el ancho de una nervadura 4
- 4 Elevación de las nervaduras con sólo la base de las vesículas de los pelos, hojas parecen glabras  
*B. endotrachys*
- 4' Elevación de las nervaduras con la base de las vesículas, éstas terminando en largos pelos  
*B. crocea*

### **The species of the *Bomarea setacea* complex, arranged alphabetically**

#### **1. *Bomarea crassifolia* Baker, Handb.**

Amaryllidaceae 150. 1888.

Type: Colombia, Depto. Antioquia, 2400–2700 m, *Lehmann s.n.* (K!) Fig. 27A, D; distribution 27C.

Plant twining, stem robust, several metres long, up to 1 cm in diameter, not recurved at apex, pubescent. Leaves linear-lanceolate or lanceolate, 5–12 x 2–5 cm. Adaxial side of leaves densely pubescent and nerves ridged with very prominent one cell thick bladderlike leaf base, yellowish-white, abaxial side glabrous. Inflorescence seldom in strong specimens a thyrse, hypopodium of primary flowers 0,1–0,5 cm, epipodium 2–4 cm. In most specimens reduced to an umbel. Bracts of primary flowers small reddish, 0,5–2 x 0,2–0,8 cm, Perianth slightly zygomorphic, horizontally oriented to pendent, ca 2–4 cm long, mostly around 3 cm, inner tepals equal to outer ones in length, outer tepals oblong, deep red. Inner tepals subdivided in blade and claw, orange red without dark spots. Filaments slightly shorter than inner tepals, weakly curved, fruit turbinate and seeds globose. *B. crassifolia* grows in the eastern cordillera of Peru, Ecuador and Colombia on the windward sides in small shrubs and fog forests at altitudes between 2600 and 3600 m.

Note: *B. crassifolia* is the species with the most prominent ridged nerves, also see *B. setacea*.

Additional material examined: PERU, Depto. Amazonas, camino Jumbilla – Granada, ca. 3000 m, *Hofreiter & Franke 4/28* (MSB); Prov. Utcubamba, Kuelap, 12.2.2003, *E. Rodríguez & Mora s.n.* (40722, HUT)

#### **2. *Bomarea crocea* (Ruiz & Pav.) Herb.**

Amaryllidaceae 119. 1837

Basionym: *Alstroemeria crocea* Ruiz & Pav., Fl. Peruv. Chil. 3: 61. 1802. Type: Peru, Tarma, Churupalla, *Ruiz & Pavón s.n.* (MA!, photo F!) Fig. 20E; distribution 39C.

Plant twining, several metres long (1–3 m) or suberect up to 60 cm high, stem robust, around 0,5 cm in diameter, not recurved at apex, pubescent with increasing density towards the top, or nearly glabrous. Leaves linear-lanceolate or lanceolate, 2–12 x 0,5–3 cm. Adaxial side of leaves pubescent with flattened, ridged nerves, abaxial side glabrous. Inflorescence an umbel or a raceme up to 3 cm long, pedicels 2–5 cm, pubescent. Subtending leaves of the lower-most flowers, 0,5–2 x 0,2–0,5 cm, subsequent bracts smaller, 0,3–1 x 0,1–0,3 cm, sometimes with a small

prophyll. Flowers slightly zygomorphic, horizontally oriented, ca 1,8–2,5 cm long, inner tepals equal to outer ones in length, outer tepals oblong, outer surface red, paler red on inner surface. Inner tepals subdivided in blade and claw, orange with a red stripe at outer side. Ovary pubescent, fruit turbinate and seeds globose. *B. setacea* grows in the fog forest region from Colombia to southern Peru at altitudes between 2700 and 3800 m.

Note: see *B. setacea*.

Additional material examined: PERU: Dept. **Huánuco**, Carpish *Hofreiter s.n.* (MSB).

### 3. *Bomarea endotrachys* Kraenzl.

Bot. Jahrb. Syst. 40: 234. 1908.

Type: Peru, Dept. Amazonas, Tambos Almirante – Bagazan, 2700–2800 m, *Weberbauer* (B!).

=*B. cruenta* Kraenzl., Bot. Jahrb. Syst. 40: 228. 1908.

Type: Peru, Dept. Amazonas, östlich Chachapoyas, Tambo Ventillas, 2400–2600 m, *Weberbauer* 4395 (B!).

=*B. sclerophylla* Kraenzl., Bot. Jahrb. Syst. 50, Beibl. 112: 6. 1913

Type: Peru, Dept. Huánuco, Monzon, 3400–3500 m, *Weberbauer* 3352 (B, Photo F!).

Fig 31B, E; distribution 31C.

Plant twining, several metres long (1–3 m) or suberect up to 50 cm high, stem robust, up to 0,6 cm in diameter, not recurved at apex, glabrous next to the inflorescence pubescent. Leaves lanceolate, 3–8 x 0,8–2 cm, sometimes nearly reduced to scales 1 x 0,2 cm. Adaxial side of leaves glabrous but with very prominent nerves, abaxial side glabrous. Inflorescence an umbel, pedicels 1–3 cm, pubescent. Subtending leaves of the lower-most flowers bracteose, 0,4–0,9 x 0,2–0,5 cm, subsequent bracts smaller, 0,3–0,9 x 0,1–0,2 cm. Flowers slightly zygomorphic, horizontally oriented, ca 1,8–2,4 cm long, inner tepals equal to outer ones in length, outer tepals oblong, outer surface red, paler red on inner surface. Inner tepals subdivided in blade and claw, orange with a red stripe at outer side. Ovary pubescent, fruit turbinate and seeds globose. *B. purpurea* grows in the eastern cordillera from north to central Peru on the windward sides in small shrubs and fog forests at altitudes between 2800 and 3500 m.

Note: see *B. setacea*.

Additional material examined: PERU: Dept. **Huánuco**, Tantamayo, near Laguna Negra, 3500 m, *Hofreiter & Franke* 4/7 (MSB).

### 4. *Bomarea purpurea* (Ruiz & Pav.) Herb.

Amaryllidaceae 118. 1837.

Basionym: *Alstroemeria purpurea* Ruiz & Pav., Fl. Peruv. Chil. 3: 63. 1802.

Type: Peru, Pillao, *Ruiz & Pavón s.n.* (BM!, MA photo and fragment F!, Barcelona photo B!).

Fig 3D, E; 20C; distribution 39C.

Plant twining, several metres long (1–3 m) or suberect up to 50 cm high, stem robust, up to 0,6 cm in diameter, not recurved at apex, glabrous next to the inflorescence pubescent. Leaves lanceolate, 3–8 x 0,8–2 cm, sometimes nearly reduced to scales 1 x 0,2 cm. Adaxial side of leaves glabrous but with very prominent nerves, abaxial side glabrous. Inflorescence an umbel, pedicels 1–3 cm, pubescent. Subtending leaves of the lower-most flowers bracteose, 0,4–0,9 x 0,2–0,5 cm, subsequent bracts smaller, 0,3–0,9 x 0,1–0,2 cm. Flowers slightly zygomorphic, horizontally oriented, ca 1,8–

2,4 cm long, inner tepals equal to outer ones in length, outer tepals oblong, outer surface red, paler red on inner surface. Inner tepals subdivided in blade and claw, orange with a red stripe at outer side. Ovary pubescent, fruit turbinate and seeds globose. *B. purpurea* grows in the eastern cordillera from north to central Peru on the windward sides in small shrubs and fog forests at altitudes between 2800 and 3500 m.

Note: see *B. setacea*.

Additional material examined: PERU: Dept. **Huánuco**, Carpish, 2800 m, *Hofreiter s.n.* (MSB); Depto. San Martín, Prov. Mariscal Cáceres, Rio Abiseo National Park, Parque Along trail at lower end of Chochos valley, E side of river, 3100 m, 11.2.1986, Young 2625 (HUT); Hill past Las Palmas, 2650 m, 16.8.1986, Young 4014(HUT); S side of river. Chochos. NW corner of Rio Abiseo National Park, 3400 m, 7.6.1986, Young 3687(HUT).

### 5. *Bomarea setacea* (Ruiz & Pav.) Herb.

Amaryllidaceae 117. 1837.

Basionym: *Alstroemeria setacea* Ruiz & Pav., Fl. Peruv. Chil. 3: 62. 1802.

Type: Peru, Pillao, *Ruiz & Pavón s.n.* (BM!, G photo F!, MA photo F!, Barcelona photo B!).

=*B. macranthera* Kraenzl., Bot. Jahrb. Syst. 40: 230. 1908.

Type: Peru, Depto. Junin, Huacapistana, *Weberbauer* 2201 (B!).

=*B. glomerata* Herb., Amaryllidaceae 115. 1837.

Type: Peru, *Mathews* 1662 (K!, fragment F!, W destroyed, photo F!).

Fig 3C; 38B, D; distribution 38C.

Plant twining, several metres long (1–3 m) or suberect up to 60 cm high, stem robust, around 0,5 cm in diameter, not recurved at apex, pubescent with increasing density towards the top, or nearly glabrous. Leaves linear-lanceolate or lanceolate, 2–12 x 0,5–3 cm. Adaxial side of leaves pubescent with flattened, rigged nerves, abaxial side glabrous. Inflorescence an umbel or a raceme up to 3 cm long, pedicels 2–5 cm, pubescent. Subtending leaves of the lower-most flowers, 0,5–2 x 0,2–0,5 cm, subsequent bracts smaller, 0,3–1 x 0,1–0,3 cm, sometimes with a small prophyll. Flowers slightly zygomorphic, horizontally oriented, ca 1,0–1,5 cm long, inner tepals equal to outer ones in length, outer tepals oblong, outer surface yellow to orange, paler on inner surface. Inner tepals subdivided in blade and claw, yellow to orange with an orange stripe at outer side without dark spots. Ovary pubescent, fruit turbinate and seeds globose. *B. setacea* grows in the fog forest region from Colombia to southern Peru at altitudes between 2700 and 3800 m.

Note: The *Bomarea setacea* complex contains at least 5 distinct species. However Harling & Neuendorf (2003) synonymized 12 species under *B. setacea*. They point out that *B. setacea* is «easily recognised by the peculiar nervation on the lower side of the leaf, a character not found in any other species». But the character is not found in any other species because their synonymies share this character under *B. setacea*. In the Cordillera Central clearly distinguishable species occur sympatrically (Depto. Huánuco, Tantamayo, Laguna Negra: *B. setacea* and *B. endotrachys*; Depto Huánuco, Carpish, *B. purpurea* and *B. crocea*). The species of the *B. setacea* complex are the most abundant *Bomareas* in Central Peru and the Amotape-Huancabamba-region.

Additional material examined: PERU: Depto. **Amazonas**: Prov. Chachapoyas, entre Leimebamba y Balsas, 2950 m, 1.6.1963, *López et al. s.n.* (4416, HUT); Jalca de Calla (Leimebamba-Balsas), 2800 m, 23.10.1965, *Sagástegui s.n.* (6053, HUT); Jalca de

Calla-Calla, 3200 m, 29.7.1991, *Mostacero et al. 2613* (HUT); Distrito Leymebamba, alrededores de Laguna de Los Cóndores, lado derecho, 2550-2600 m, 31.1.1999, *E. Rodríguez et al 2167* (HUT); Leymebamba, alrededor de Laguna de Los Cóndores, parte sur, 2500-2700 m, 16.8.1998, *Quipuscoa et al 1251* (HAO); ruta hacia Leymebamba, 2700-2950 m, 18.8.1998, *Quipuscoa 1328* (HAO); Prov. Bongará, Pomacochas-Vilcaniza, 2050 m, 19.10.1965, *Sagástegui s.n.* (6015, HUT). Depto. **Cajamarca**: Prov. Cutervo, Parque nacional de Cutervo, NW corner of Cordillera tarros, Chorro Blanco, Sector, ca. 10 km WNW of San Andres de Cutervo, 2250 m, 3.11.1990, *Dillon et al. 6106* (HAO); Prov. Cutervo, alrededores Gruta San Andrés, 2460 m, 15.11.1986, *Mostacero et al. 1648* (HUT); Prov. Cutervo, La Pucarilla (Sócota-San Andrés), 2450 m, 14.11.1986, *Mostacero et al. 1633* (HUT); Depto. **Cuzco**: Prov. Paucartambo, Tres Cruces-Valle Kosñipata, 3250 m, 5.10.1995, *López et al. 9293* (HUT); Prov. Paucartambo, Pillahuata, 2800 – 2900 m, *Pennell 14102* (S); Prov. Paucartambo, Acjanaco, 3150 – 3250 m, *Cano & Baldeon 4929* (F); Prov. Paucartambo, alturas de Lucuybamba, 3500 – 3600 m, *Cano 3884* (F); Prov. Convecion, Cordillera Vilcabamba, *Dudley 10716* (F, NY); Depto. **Huánuco**: Cerro Carpish on road to Tingo Maria, 2300 – 3000 m, *Landrum 4603* (NY); Cerro Carpish, 2600 m, *Duncan et al. 2685* (MO); Cerro Carpish, 2800 m, *Ellenberg* (UT); Cerro Carpish, *Díaz & Baldeón 2244* (MO); Carpish, 2600 m, *Dillon 2591* (F); Saraypampa, 2900 m, *Woytkowski 34183* (MO); Depto. **La Libertad**: Prov. Pataz, Puerta del Monte, ruta de Huayillas, 3200 m, 22.5.1961, *López & Sagástegui s.n.* (3449, HUT); Prov. Bolívar, East of Bolívar, 3500 m, 10.2004, *Hofreiter s.n.* (HUT); Depto. Piura: Prov. Huancabamba, Lomas Redonda (Sapalache-Chinguela), 2400 m, 15.9.1981, *Sagástegui et al. 10199* (HUT, MO); Depto. **Pasco**: Prov. Oxapampa, Cerro Pajonal, 2600 – 2750 m, *La Torre et al. 1494* (MO); Prov. Oxapampa, San Codardo, 2700 m, *van der Werff et al. 8597* (MO); Depto. **San Martín**: Prov. Huallaga, Dist. Saposoa, arriba de El Pantanoso, camino a la Morada, 3400-3600 m, 24.8.2001, *Quipuscoa & Vilchez 2620* (HUT); Prov. Mariscal Cáceres, Rio Abiseo National Park, *Young 2284* (F); Prov. Mariscal Cáceres, Rio Abiseo National Park, small forest match (C3) above timberline, Chochos, 3500 m, 25.11.1985, *Young 2234* (HUT); forest patch (C10) isolated above timberline, Chochos, NW corner of the Park, 3450 m, 29.7.1986, *Young 3897* (HUT); Chochos valley, NW corner of rio Abiseo National Park, 3325 m, 22.5.1986, *Young & Watson 3472* (HUT); Puerta del Monte, high elevation grassland on bottom of U-shaped valley, NW corner of Rio Abiseo national park, 3450 m, 10.7.1987, *Young & León 4413* (HUT); forest patch (P4) above timberline Puerta del Monte, 3450 m, 21.11.1985, *Young 1953* (HUT); along trail between Mirador and Puerta del Monte, 3300-3450 m, 27.6.1986, *Young 3818* (HUT); Above laguna de Chochos, Chochos, NW corner of Rio Abiseo National Park, 3300 m, 19.5.1986, *Young & Watson 3190* (HUT); small forest patch (P11) above timberline, Puerta del Monte, 3300 m, 22.11.1985, *Young 2024* (HUT); Puerta de Monte, 3400 m, 20.11.1985, *Young 1756* (HUT); first section of continuous forest on S side of river in Chochos valley, NW corner of Rio Abiseo National Park, 3450 m, 6.6.1986, *Young 3557* (HUT); forest patch (C15) above timberline, Chochos, 3350 m, 24.11.1985, *Young 2452* (HUT); forest patch (P3) above timberline, Puerta del Monte, 3400 m, 19.11.1985, *Young 1748* (HUT); forest patch (C1) isolated above timberline, Chochos, 3400 m, 14.2.1986, *Young 2790* (HUT); Chochos, NW corner of Rio Abiseo National Park, 3225 m, 24.5.1986, *Young & Watson 3246* (HUT); Chochos, NW corner of Rio Abiseo National Park, S side of river, 3400 m, 7.6.1986, *Young 3689* (HUT); Puerta del Monte, NW corner of Rio Abiseo National Park, 3100-3300 m, 11.7.1987, *Young & León 4481* (HUT); forest patch (C17) isolated above timberline, N side of Chochos valley, NW corner of Rio Abiseo National Park, 3425 m, 9.6.1986, *Young 3649* (HUT); forest patch (C9) above timberline, Chochos, 3425 m, 14.11.1985, *Young 2581* (HUT); forest patch (P5) above timberline, Puerta del Monte, 3400 m, 22.11.1985, *Young 2117* (HUT); forest patch (P12) above timberline, Puerta del Monte, 3350 m, 22.11.1985, *Young 2054* (HUT); forest patch (P3) above timberline, Puerta del Monte, 3400 m, 3.7.1986, *Young 3861* (HUT); forest patch (C5) above timberline, Chochos, 3500 m, 25.11.1985, *Young 2346* (HUT); forest patch (P3) above timberline, Puerta del Monte, 3400 m, 19.11.1985, *Young 1730* (HUT); trail between La Playa and Puerta del Monte,

2800-2930 m, 3.8.1985, *Young 1440* (HUT); Puerta del Monte, 3350 m, 4.8.1986, *Young 3911* (HUT); forest patch (P6) above timberline, Puerta del Monte, 3400 m, 20.11.1985, *Young 1760* (HUT).

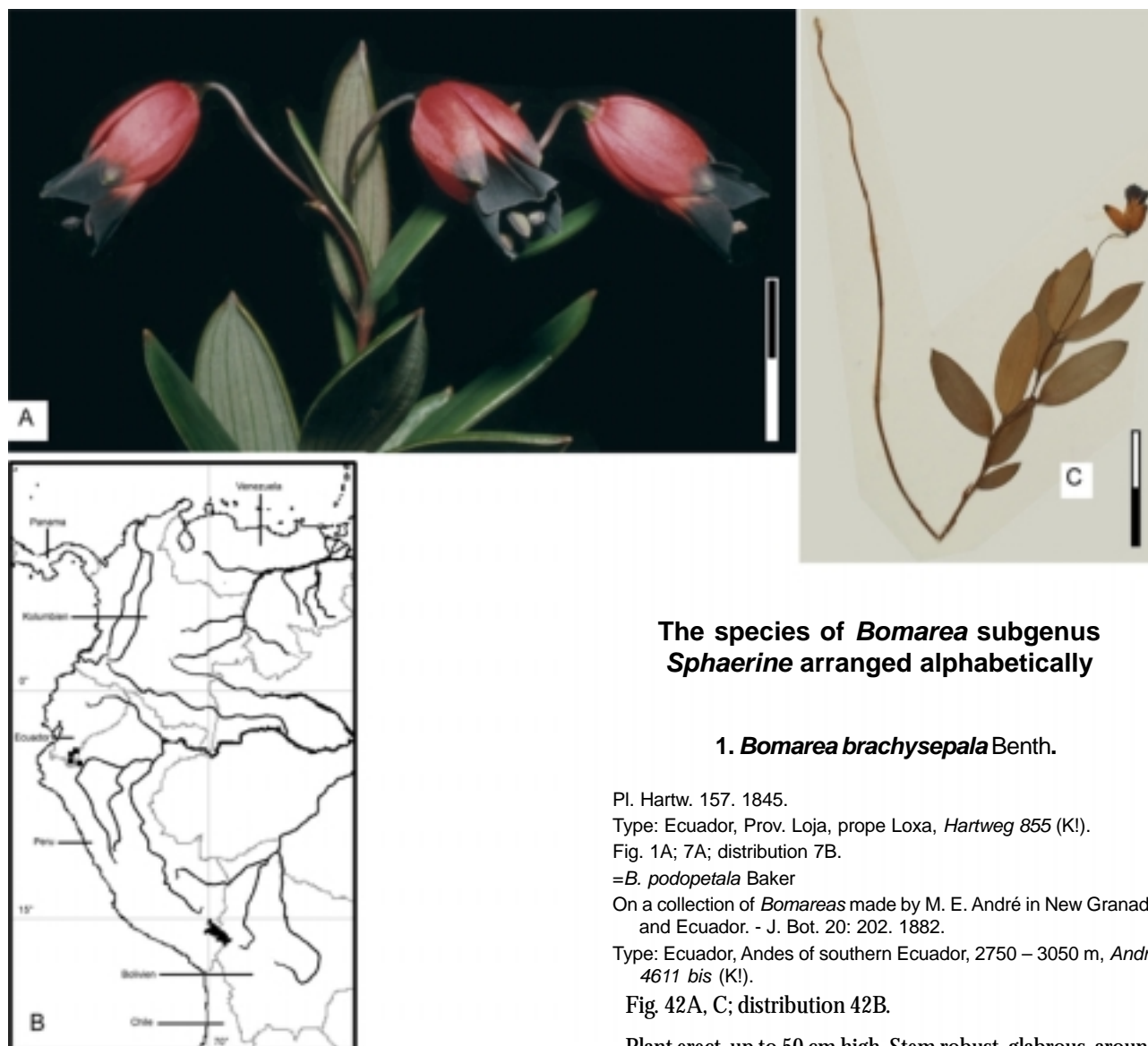
## Subgenus *Sphaerine*

### Key to the species

- 1 Partial florescence without prophyll, subtending bracts of the primary flower mostly bracteose 2
- 1' Partial florescence with prophyll, subtending bracts of the primary flower mostly frondose 7
- 2 Ovary glabrous 3
- 2' Ovary pubescent 4
- 3 Inner and outer tepals similar coloured, orange to red, not spotted, leaves distich, fruit orange to red, globose, distributed from Ecuador to Bolivia *B. distichifolia*
- 3' Outer tepals red, inner tepals yellow, dark spotted, leaves helical, fruit yellow, ovoid, distributed from Central-Peru to Bolivia *B. brevis*
- 4 Flowers at least 3 cm long, plant hanging down, mostly epiphytic, Peru *B. secundifolia*
- 4' Flowers mostly 2 cm long or smaller, seldom 2,5 cm long, growing erect 5
- 5 Leaf arrangement distich, fertile shoots mostly only with cataphylls, northern Peru *B. nervosa*
- 5' Leaf arrangement helical, fertile shoots mostly with normal leaves 6
- 6 Flowers slightly zygomorphic, the 3 inner tepals similar to each other, Peru, Depto. Huánuco and La Libertad *B. foertheriana*
- 6' Flowers strong zygomorphic, the lower inner tepal strongly curved, Peru, Depto. Huánuco *B. huauco*
- 7 Inner tepals exceeding outer one at least 0.5 cm, inner tepals with a conspicuous black tip; southern Ecuador and northern Peru *B. brachysepala*
- 7' Inner tepals equal to outer ones, inner tepals with a green tip 8
- 8 Plant only 5 – 8 cm, mostly one-flowered, seldom two-flowered, outer tepals pubescent, deep red, inner tepals yellow with a red stripe and a green tip, without dark spots, Central-Peru to northern Bolivia *B. punila*
- 8' Plants up to 1 m, mostly 3 – 4-flowered, up to 10 flowers, outer tepals glabrous, red, inner tepals yellow with a green tip, Central-Peru *B. coccinea*

### Clave para los especies

- 1 Partes de la inflorescencia sin profilos, brácteas basales de la flor primaria mayormente bracteosas 2
- 1' Partes de la inflorescencia con profilos, brácteas basales de la flor primaria mayormente foliosas 7
- 2 Ovario glabro 3
- 2' Ovario pubescente 4
- 3 Tépalos internos y externos con colores similares, naranja a rojo, sin puntos, hojas disticas, fruto naranja a rojo, globoso; Ecuador hasta Bolivia *B. distichifolia*
- 3' Tépalos externos rojos, tépalos internos amarillos con puntos oscuros, hojas helicoidales, frutos amarillos, ovoides; centro de Perú hasta Bolivia *B. brevis*
- 4 Flores al menos 3 cm de largo, planta péndula, mayormente epifítica; Perú *B. secundifolia*
- 4' Flores igual o menor que 2 cm de largo, planta erecta, mayormente terrestres 5



**Figure 42.** *B. brachysepala*; (A) habit (photo G. Lewis); (B) distribution; (C) herbaria sheet. Scale bar: (A)= 2 cm; (C)= 5 cm.

- 5 Hojas dispuestas disticamente, vástagos fértiles usualmente sólo con catáfilas; Norte de Perú *B. nervosa*
- 5' Hojas dispuestas helicoidalmente, vástagos fértiles usualmente con hojas desarrolladas y catáfilas sólo hacia la base 6
- 6 Flores ligeramente cigomórficas, los 3 tépalos internos similares, fruto ovoide; Perú, Deptos. Huánuco y La Libertad *B. foertheriana*
- 6' Flores completamente cigomórficas, tépalo interno inferior muy curvado, fruto globoso; Perú, Depto. Huánuco *B. Huanuco*
- 7 Tépalos internos excediendo a los externos al menos 0,5 cm, tépalos internos con un conspicuo ápice negro; sur de Ecuador y norte de Perú *B. brachysepala*
- 7' Tépalos internos igualando a los externos, tépalos internos con un ápice verde 8
- 8 Plantas pequeñas 5 (8) cm de alto, con una sola flor, raro dos flores, tépalos externos pubescente, rojo obscuro, tépalos internos amarillos y verde hacia la punta y con una línea roja en la mitad, sin puntos oscuros; Perú central al norte de Bolivia *B. punila*
- 8' Plantas grandes, cerca de 50 cm de alto, mayormente multifloras, tépalos externos rojos y glabros, tépalos internos amarillo con una punta verde; Perú central *B. cocinea*

## The species of *Bomarea* subgenus *Sphaerine* arranged alphabetically

### 1. *Bomarea brachysepala* Benth.

Pl. Hartw. 157. 1845.

Type: Ecuador, Prov. Loja, prope Loja, *Hartweg* 855 (K!).

Fig. 1A; 7A; distribution 7B.

=*B. podopetala* Baker

On a collection of *Bomareas* made by M. E. André in New Granada and Ecuador. - J. Bot. 20: 202. 1882.

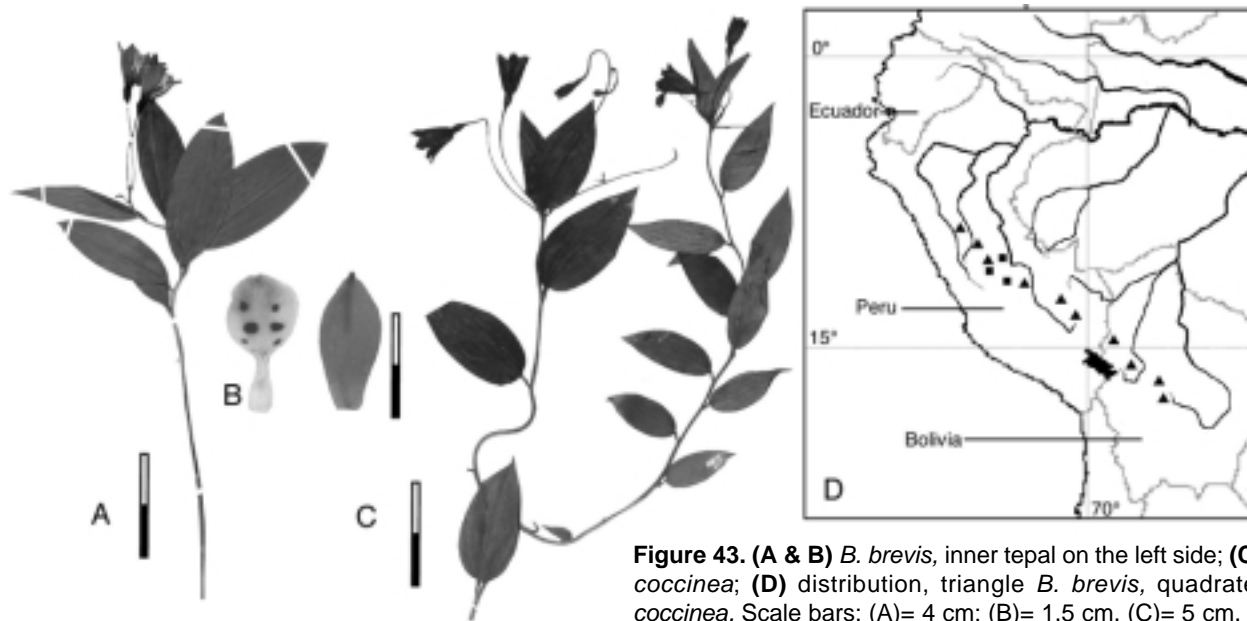
Type: Ecuador, Andes of southern Ecuador, 2750 – 3050 m, *Andre* 4611 bis (K!).

Fig. 42A, C; distribution 42B.

Plant erect, up to 50 cm high. Stem robust, glabrous, around 0,3 cm in diameter. Leaves linear-lanceolate to lanceolate, 2–6 x 0,5–2 cm, becoming longer and wider towards the inflorescence. Adaxial side glabrous and papillose, abaxial side glabrous with 5–7 primary nerves. Inflorescence an erect thyrses, partial florescence with 1–2 flowers, hypopodium of primary flowers 1,5–3,5 cm long, epipodium 1,5–3 cm long Bracts of primary flowers frondose, 2–4 x 0,7–2 cm, bracts of secondary flowers bracteose, 0,2 – 0,4 x 0,1–0,2 cm. The frondose bracts are similar to the foliage leaves. Flowers approximately 2–2,3 cm long, inner tepals exceed outer ones by 0,5–0,7 cm, outer tepals oblong, red on the outside with a dark spot, pale red on the inside. Inner tepals unguiculate, claw yellow, blade bluish-grey. Filaments and style slightly shorter than the perianth, ovary nearly glabrous, fruit a amphisarca, fruit and seeds spherical. Distributed in Ecuador and northern Peru, mostly in moss cushions between 2100 and 3200 m.

Additional material examined: ECUADOR: Prov. Loja: Parque Nacional Podocarpus, 2900 – 3200 m, *van der Werff & Palacios* 9161 (MO); Prov. Zamora-Chinchipec: road Loja Zamora, 2750 – 2770 m, *Jeppsen* 3928 (US); road Loja Zamora, 2770 m, *Holm-Nielsen et al.* 3928 (AAU, B);

PERU: Depto. Amazonas: Prov. Condorcanqui, Cordillera del Cóndor, 2160 m, *Beltrán & Foster* 1500 (USM).



**Figure 43.** (A & B) *B. brevis*, inner tepal on the left side; (C) *B. coccinea*; (D) distribution, triangle *B. brevis*, quadrate *B. coccinea*. Scale bars: (A) = 4 cm; (B) = 1,5 cm; (C) = 5 cm.

## 2. *Bomarea brevis* (Herb.) Baker

J. Bot. 20: 202. 1882.

Basionym: *Sphaerine brevis* Herb., Amaryllidaceae 108. 1837.

Type: Peru, *Matthews 1660* (K!, Photo MSB!).

= *B. recurva*: Baker, Handb. Amaryllidaceae 145. 1888.

Type: Peru, Cusco, Sachapata, *Lechler 2629* (K!, Photo MSB!).

Fig. 43A, B; distribution 43D.

Plant erect, up to 50 cm high. Stem robust, glabrous, helical, 0,2–0,3 cm in diameter. Leaves linear-lanceolate to lanceolate, 2–6 x 0,5–2 cm, towards the inflorescence becoming longer and wider. Adaxial side glabrous and papillose, abaxial side glabrous with 5–7 primary nerves. The inflorescence is an erect umbel. Subtending leaves bracteose, 0,2–0,5 x 0,1–0,2 cm. Flowers approximately 2–2,3 cm long, inner tepals do not exceed outer ones, outer tepals oblong, red on the outside with a dark spot, pale red on the inside, in some populations with a 0,1–0,3 cm long horn. Inner tepals unguiculate, yellow with some dark spots. Filaments and style slightly shorter than the perianth, ovary glabrous, fruit a ovoid berry, around 2 x 1 cm, seeds ovoid, around 2 mm in diameter. Distributed from central Peru to central Bolivia, in fog forests between 2500 and 3400 m.

Additional material examined: PERU: Depto. **Huánuco**: Prov. Huánuco, Cumbre de Carpish, 2750 m, *Schunke 5223* (G, GH); Prov. Huánuco, Cumbre de Carpish, 2600 – 2700 m, *Ferreira 21082* (USM); Prov. Huánuco, Cumbre de Carpish, 2800 – 2900 m, *Ferreira 6705* (USM); Prov. Huánuco, Cumbre de Carpish, 2500 m, *Young & Sullivan 555* (MO); Pillao, 2700 m, *Woytkowski 34066* (MO); Prov. Leoncio Prado, Road from Huánuco to Tingo María, Abra Carpish, just north of the tunnel, 2720–2800 m, 22.3.2001, Weigend et al. 5289 (HUT, BSB).

BOLIVIA: Depto. **Cochabamba**: Prov. Chapare, 3100 m, *Steinbach 603* (GH, MO); Depto. La Paz: Prov. Nor Yungas, Cotapata, 3100 m, *Solomon & Moraes 11433* (MO); Prov. Nor Yungas, Chuspipata, 3050 m, *Beck 8792* (LPB, MO); Prov. Sud Yungas, 4.7 km SE of Unduavi, 2900 m, *Solomon 8745* (MO).

## 3. *Bomarea coccinea* (Ruiz & Pav.) Baker

J. Bot. 20: 202. 1882.

Basionym: *Alstroemeria coccinea* Ruiz & Pav., Flora peruviana et chilensis 3. Madrid. 1802.

Type: Peru, Depto. Junin, Huassa-huassi, *Ruiz & Pavón s.n.* (MA!,

Photo und Fragment F!).

°*Sphaerine coccinea* (Ruiz & Pavón) Herb., Amaryllidaceae 108. 1837.

Fig. 43C; distribution 43D.

Plant erect, up to 80 cm high, or weakly twining and 1,5 m long. Stem rigid, pubescent, towards the tip increasingly pubescent, around 0,3 cm in diameter. Leaves lanceolate or ovate, 2–9 x 1–5 cm, in the middle of the stem longest and widest. Adaxial side of the leaves pubescent on the leaf ribs, with 5–9 primary ribs. Inflorescence an erect thyrse often reduced to an umbel, hypopodium of the primary flowers 1–6 cm, epipodium 1,5–5 cm. Subtending leaves of the primary flowers partly frondose, 2–8 x 0,5–2,5 cm, and partly bracteose, 0,3–0,8 cm long and 0,1–0,2 cm wide. Subtending leaves of the secondary flowers bracteose, 0,2–0,4 cm long and 0,1–0,2 wide, sometimes missing. The frondose bracts are similar to the normal leaves. Flowers 1,5–2,5 cm, oriented horizontally to pendulous, inner tepals not exceeding the outer ones, on the outside red with green tip, and sometimes corniculate. Inner tepals yellow with a green tip and dark spots on the inside. Tepals are not shed, instead desiccate onto the ovary, ovary pubescent. Filaments and style slightly shorter than the perianth, fruit a amphisarca, ovoid, pink and pubescent. *B. coccinea* occurs in Central Peru, Depto. Pasco and Junin at altitudes between 2700 and 3400 m.

Additional material examined: PERU: Depto. **Junin**: Prov. Tarma, below Palca, 3000 m, *Stein et al. 3821* (AAU, MO); Prov. Tarma, 2750 m, *Díaz & Baldeón 2217* (NY); Prov. Tarma, Km 14 desde Huasahuasi, 3420 m, *Díaz 2909* (AAU, F, NY); Depto. **Pasco**: Prov. Oxapampa, Santa Barbara, 3150 m, *Smith 8188* (MO, USM); Prov. Oxapampa, Distr. Huancabamba, Santa Barbara, 2300 – 3300 m, *Foster et al. 10500* (MO, UT, USM)

## 4. *Bomarea distichifolia* (Ruiz & Pav.) Baker

J. Bot. 20: 202. 1882.

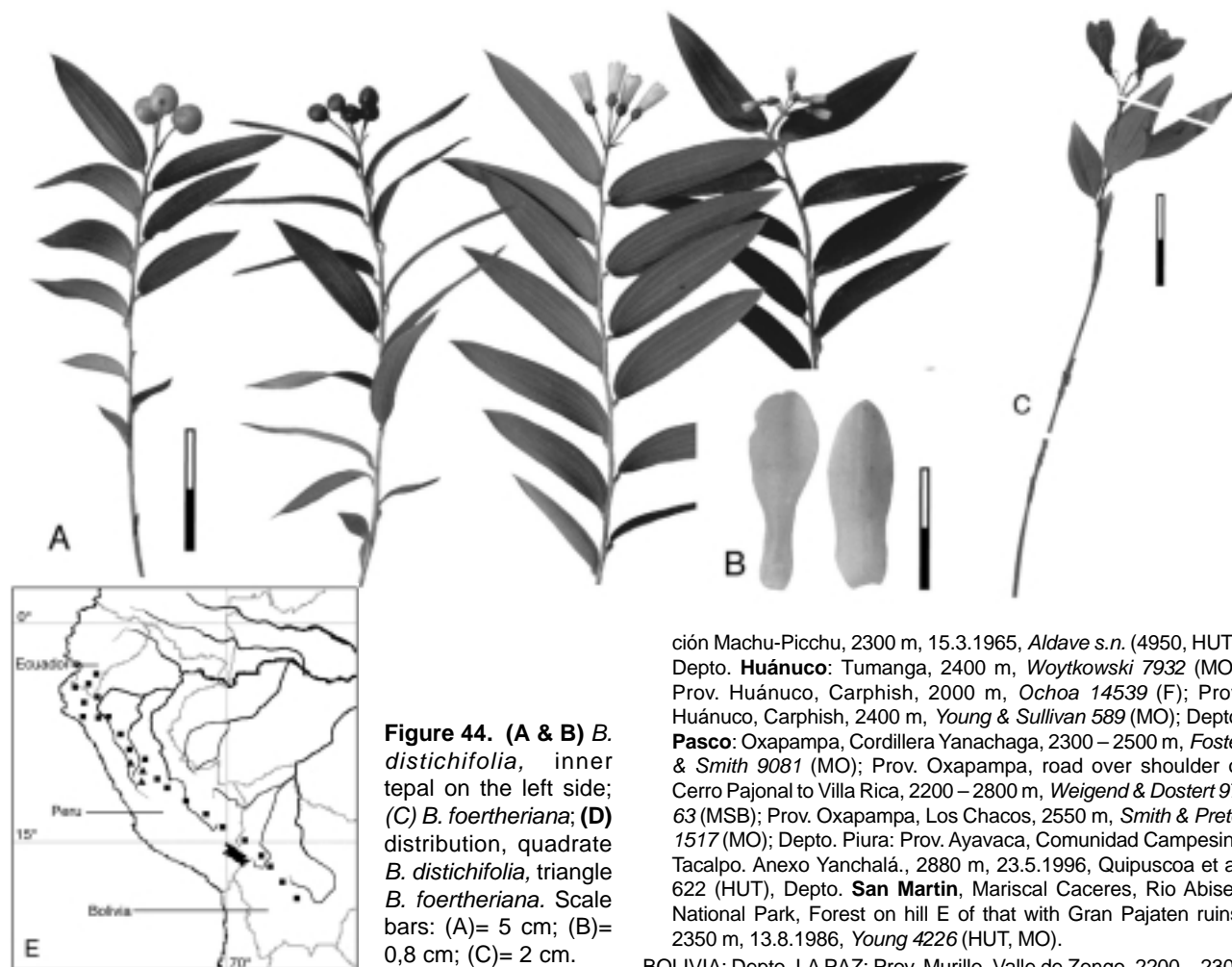
Basionym: *Alstroemeria distichifolia* Ruiz & Pav., Flora peruviana et chilensis 3. Madrid 1802

Type: Peru, Depto. Huanuco, Muña, *Ruiz & Pavón s.n.* (MA!, K!).

°*Sphaerine distichophylla* (Ruiz & Pav.) Herb. Amaryllidaceae 107. 1837.

= *B. polygonatoides* Baker, J. Bot. 20: 202. 1882.

Type: Ecuador, 3000 m, *Andre 4609* (K!).



**Figure 44.** (A & B) *B. distichifolia*, inner tepal on the left side; (C) *B. foertheriana*; (D) distribution, quadrate *B. distichifolia*, triangle *B. foertheriana*. Scale bars: (A)= 5 cm; (B)= 0,8 cm; (C)= 2 cm.

Fig. 4C, D; 44A, B; distribution 44D.

Plant erect, up to 1 m high. Stem rigid, glabrous, 0,2–0,6 cm in diameter. Leaves distichous, lanceolate to ovate, 2–12 x 1–2,5 cm, towards the inflorescence longer and wider, both sides glabrous, with 5–7 primary ribs. Inflorescence an erect umbel with 3–8 flowers. Peduncles 1,5–3 cm long, subtending leaves bracteose, 0,1 cm wide and up to 0,9 cm long. Flowers 0,8–1,2 cm and erect to horizontal, inner tepals do not exceed the outer ones, outer tepals oblong, bright red, orange or yellow, the inner tepals have the same colour than the outer ones. The tepals are shed when they are still more or less fresh and coloured. Ovary glabrous, filaments and style slightly shorter than the perianth, fruit a berry, spherical, glabrous, orange or red, around 0,8 cm in diameter and seeds ovoid, around 2 mm in diameter. *B. distichifolia* grows from southern Ecuador to Bolivia at altitudes between 1500 and 3600 m.

Additional material examined: PERU: Depto. **Cajamarca**: Prov. Chota, A 1 km de Paraguay (Querocoto-La Granja), 1994, 10.8.1994, *Leiva et al.* 1449 (HAO); Prov. Cutervo, San Andrés, 2200 m, 25.5.1965, *López & Sagástegui* 5441 (HUT, MO); Grutas de San Andrés, 2200 m, 15.7.1990, *Llatas & Suarez* 2731 (HAO); Alrededores Gruta San Andrés, 2460 m, 15.11.1986, *Mostacero et al.* 1681 (HUT); San Andrés, 2600 m, *Díaz & Osoro* 2588 (NY); Prov. Santa Cruz, Dist. Catache, Upper Rio Zaña valley, 1800 m, *Dillon et al.* 4885 (F, HUT, NY); Al norte de Chorro Blanco, 1500 m, 20.1.1989, *Leiva* 9 (HAO); Chorro Blanco (Monteseuco), 1900 m, 15.1.1989, *Sagástegui & Leiva* 14099 (HAO); ca. 3 km (por aire) ENE Monteseuco, 1800 m, 9.5.1987, 1800 m, 9.5.1987, *Santisteban & Guevara* 33 (HUT, F); Bosque Monteseuco, 1880 m, 20.1.1996, *Leiva et al.* 1749 (HUT, HAO, F); Depto. **Cuzco**: Esta-

ción Machu-Picchu, 2300 m, 15.3.1965, *Aldave s.n.* (4950, HUT); Depto. **Huánuco**: Tumanga, 2400 m, *Woytkowski* 7932 (MO); Prov. Huánuco, Carphish, 2000 m, *Ochoa* 14539 (F); Prov. Huánuco, Carphish, 2400 m, *Young & Sullivan* 589 (MO); Depto. **Pasco**: Oxapampa, Cordillera Yanachaga, 2300–2500 m, *Foster & Smith* 9081 (MO); Prov. Oxapampa, road over shoulder of Cerro Pajonal to Villa Rica, 2200–2800 m, *Weigend & Dostert* 97/63 (MSB); Prov. Oxapampa, Los Chacos, 2550 m, *Smith & Pretel* 1517 (MO); Depto. Piura: Prov. Ayavaca, Comunidad Campesina Tacalpo. Anexo Yanchalá., 2880 m, 23.5.1996, *Quipuscoa et al.* 622 (HUT), Depto. **San Martín**, Mariscal Cáceres, Rio Abiseo National Park, Forest on hill E of that with Gran Pajaten ruins, 2350 m, 13.8.1986, *Young* 4226 (HUT, MO).

BOLIVIA: Depto. LA PAZ: Prov. Murillo, Valle de Zongo, 2200–2300 m, *Luteyn & Dorr* 13656 (US); Prov. Nor Yungas, carretera fundamental 3, ca 19 km SW of Yolosa, 2330 m, *Davidson* 4900 (MO); Prov. Sud Yungas, road from Chulumani to Unduavi, 2800 m, *Davidson* 5022 (MO).

### 5. *Bomarea foertheriana* Hofreiter

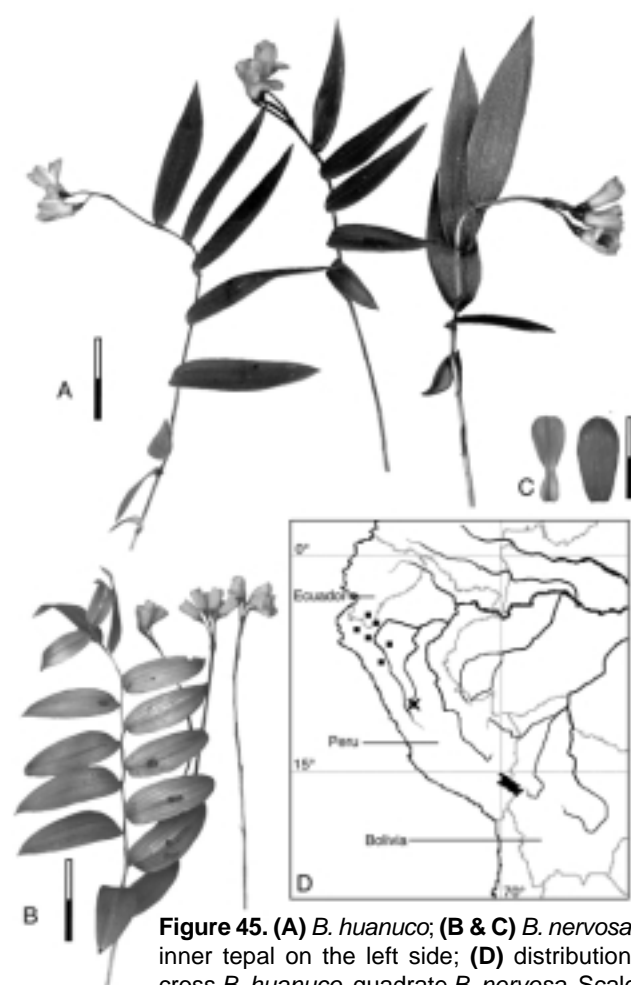
Nord. J. Bot., 2005 in press.

Type: Peru, Depto. Huánuco, Tantamayo, fog-forest above Laguna Negra, 3500 m, *Hofreiter & Franke* 4/5 (Holotype USM!, Isotype MSB!).

Fig. 4E, F; 44C; distribution 44D.

Plant erect, up to 50 cm high. Stem rigid, pubescent and helical, towards the inflorescence more densely pubescent. Leaves lanceolate to ovate, 2–12 x 1–4,5 cm, in the middle of the stem longest and widest, adaxiale side glabrous or little pubescent, abaxiale side glabrous, with 5–7 primary ribs. The leaves are reduced in a part of the fertile shoots. Inflorescence an erect umbel with 2–5 flowers, one-flowered examples are also relatively abundant. Pedicel 1,5–5 cm, subtending leaves bracteose, up to 0,5 x 0,1–0,2 cm, rarely one bract frondose, up to 1,5 x 0,3 cm. Flowers 1–2 cm long and horizontally orientated, inner tepals not exceeding outer ones, outer tepals oblong, bright red and conspicuous pubescent, inner tepals unguiculate, red with dark spots on the inside. Tepals are shed when they are fresh a coloured yet. Ovary densely pubescent, fruit and seeds ovoid. Distributed in Central Peru at altitudes between 1300 and 3500 m.

Additional material examined: PERU: Depto. **La Libertad**: Prov. Pataz, Puerta de Monte Paso, 3250 m, *López & Sagástegui* 3493 (MSB); Depto. **Huánuco**: Prov. Huánuco, Dist. Churubamba, Pampa Her-



**Figure 45.** (A) *B. huanuco*; (B & C) *B. nervosa*, inner tepal on the left side; (D) distribution, cross *B. huanuco*, quadrate *B. nervosa*. Scale bars: (A)= 4 cm; (B)= 5 cm; (C)= 1,5 cm.

mosa, 1500–2000 m, *Mexia* 8143 (BM, F, G, MO, UT); Muna, trail to Tambo de Vaca, 2660 m, *Macbride* 4308 (F); Prov. Huánuco, valley of Chinchao, 1300 m, *Standley* 9865 (G).

### 6. *Bomarea huanuco* Hofreiter

Nord. J. Bot., 2005 in press.

Type: Peru, Depto. Huánuco, Tantamayo, fog-forest above Laguna Negra, 3500 m, *Hofreiter & Franke* 4/12 (HOLOTYPE USM!, Isotype MSB!).

Fig. 4F; 45A; distribution 45D.

Plant erect, up to 50 cm high. Stem rigid, glabrous. Leaves lanceolate to ovate, 2–10 x 1–4,5 cm, at the middle of the stem longest and widest, adaxiale side pubescent, abaxiale side glabrous, with 5–7 primary ribs. Inflorescence an erect umbel with 2–4 flowers. Pedicel 1,5–5 cm, subtending leaves bracteose, up to 0,6 x 0,1–0,2 cm, in rare cases one subtending leaf frondose up to 1,5 x 0,3 cm. Flowers 1–2 cm and horizontally orientated, inner tepals not exceeding outer ones, outer tepals bright red, inner tepals orange-red with dark spots on the inside. The inner tepals are dissimilar to each other, the lower inner tepals strongly recurved, because of this flowers conspicuous zygomorphic. Tepals are shed, when they are still fresh and coloured. Ovary dense pubescent, fruit and seeds globose. Distributed in central Peru in the Depto. Huánuco at altitudes around 3500 m.

Additional material examined: This species was found only in the fog forest above Laguna Negra so far. Apart from a few places

which can be reached by car the whole area of the Cordillera Central hasn't been examined.

### 7. *Bomarea nervosa* (Herb.) Baker

J. Bot. 20: 202. 1882.

Basionym: *Sphaerine nervosa* Herb., Amaryllidaceae 108. 1837.

Type: Peru, *Matthews* 1661 (K!).

=*B. squamulosa* Kraenzl., Bot. Jahrb. Syst. 40: 229. 1908.

Type: Ecuador, Loja, Cerro del Condor, 3000 m – 3300 m, *Lehmann* 7783 (B!).

Fig. 4B; 45B, C; distribution 45D.

Plant erect, up to 1 m high. Stem rigid, glabrous, 0,2–0,5 cm in diameter. Leaves lanceolate to ovate, 2–15 x 1–2,5 cm, towards the inflorescence longer and wider, both sides glabrous, with 5–9 primary ribs. Some of the fertile shoots bear only cataphylls. Inflorescence an erect umbel with 2–20 flowers, peduncles 1,5–3 cm long, subtending leaves bracteose, up to 1,5 x 0,1–0,3 cm, often one bract frondose 2–5 x 0,3–0,8 cm. Flowers 0,8–1,5 cm and horizontally orientated, inner tepals not exceeding outer ones, outer tepals brightly red, inner tepals orange-red. Tepals are shed when they are still fresh and coloured. Ovary pubescent. Filaments and style slightly shorter than the perianth, fruit a spherical amphisarca, around 1 cm in diameter, seeds ovoid, 1–2 mm. Distributed from south Ecuador to north Peru at altitudes between 1200 and 3500 m.

Additional material examined: PERU: Depto. **Amazonas**: Prov. Chachapoyas, Jalca de Calla Calla (Leimebamba-Balsas), 2800 m, 23.10.1965, *Sagástegui* s.n. (6052, HUT); Prov. Bongará, Pomacochas - Vilcaniza, 2050 m, 19.10.1965, *Sagástegui* s.n. (6005, HUT); Depto. **Pasco**: Prov. Oxapampa, San Alberto, 2700 – 2730 m, *Torre et al.* 1212 (MO, USM); Prov. Oxapampa, Oxapampa, 12 km SE of town, 2200–2800 m, *Weigend & Dostert* 97/64 (MSB); Prov. Oxapampa, Los Chacos near Oxapampa, 2550 m, *Smith & Pretel* 1525 (MO, NY, USM); Prov. Oxapampa, Cordillera Yanachaga, 2450 m, *Gentry & Smith* 35954 (MO, USM); Depto. **San Martín**: Prov. Rioja, Dist. Elias Soplin Vargas, Camino al sur de Naciente Rio Negro, ruta a Pucatanbo (sector camino a Vista Alegre), arriba de Quebrada Coronto Chaque, 1100, 26.10.1996, *Sánchez Vega & Dillon* 8288 (HAO).

### 8. *Bomarea pumila* Grisebach ex Baker

Handb. Amaryllidaceae 145. 1888

Type: Peru, Cuzco, Sachapata, *Lechler* 2240 (K!, G!, B!).

Fig. 46A, B; distribution 46D.

Plant erect, up to 5 (-8) cm high. Stem rigid, glabrous. Leaves ovate, 1–3 cm long and wide, in the middle of the stem longest and widest, adaxiale side pubescent, hairs mostly on leaf ribs, 5–7 primary leaf ribs. Inflorescence an erect umbel with 1–2 flowers, pedicel 1,5–4 cm long, subtending leaves frondose, 1–3 cm long and 0,5–1 cm wide. Flowers 0,8–1,5 cm, inner tepals not exceeding outer ones, outer tepals oblong, bright red and conspicuous pubescent, inner tepals yellow with a red stripe and a green tip. Fruit globose and seeds ovoid. This species is distributed from Peru to Bolivia at altitudes between 2600 and 3600 m.

Additional material examined: PERU: Depto. **Pasco**: Prov Oxapampa, 2650 m, *León & Young* 1778 (USM); Prov Oxapampa, Cordillera Yanachaga, 2700 – 2800 m, *Foster* 9060 (USM).

BOLIVIA: Depto. LA PAZ: Prov. Nor Yungas, de Chuspipata, 3050 m, *Beck* 18674 (LPB).



**9. *Bomarea secundifolia* (Ruiz & Pav.) Baker**

J. Bot. 20: 202. 1882.

Basionym: *Alstroemia secundifolia* Ruiz & Pav. Flora peruviana et chilensis 3. Madrid. 1802.

Type: Peru, Depto. Huanuco, Muña, Ruiz &amp; Pavón s.n. (MA!, K!).

°*Sphaerine secundifolia* (Ruiz & Pav.) Herb., Amaryllidaceae 107. 1837.=*B. filicaulis* Kraenzl., Bot. Jahrb. Syst. 40: 228. 1908.

Type: Peru, Huánuco, Berge südwestlich von Monzon, 3300 – 3500 m, Weberbauer 3384 (B!).

Fig. 4A; 46C; distribution 46D.

Plant growing epiphytic, hanging down from tree branches, up to 50 cm long. Stem rigid, glabrous. Leaves lanceolate, 7–16 x 1–2 cm, in the middle of the stem widest and longest, adaxial side pubescent, hairs concentrated on the leaf ribs, more than 9 primary leaf ribs. Inflorescence a pendulous umbel with 2–5 flowers. Pedicel 2,5–4 cm, subtending leaves bracteose, 1–2 x 0,1–0,2 cm. Flowers 2–4 cm long, inner tepals not exceeding the outer ones, outer tepals oblong, red and pubescent, inner tepals unguiculate, yellow with a red stripe on the outside and green tip. Fruit ovoid and seeds globose. *B. secundifolia* grows in the Depto. Huanuco in central Peru at altitudes between 2500 and 3500 m.

Additional material examined: PERU: Depto. **Huánuco**: Carpish, 2800 m, Sandeman s.n. (BM), Tantamayo, oberhalb der Laguna Negra, 3500 m, Hofreiter & Franke 4/14 (MSB).

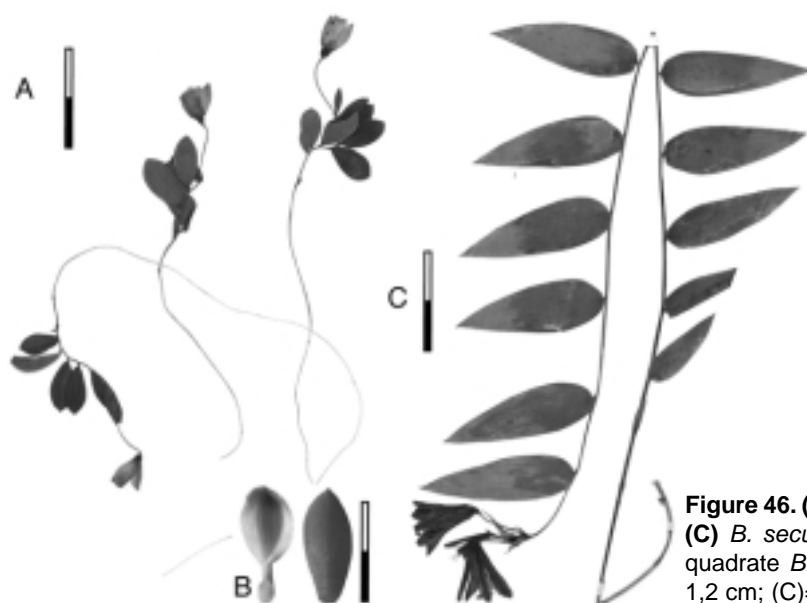
**Subgenus *Wichurea*****Key to the species**

- 1 Inner tepals differentiated into blade and claw, distributed from Ecuador to Ancash in central Peru 2
- 1' Inner tepals cuneately tapered to the base, distributed from Ancash in central Peru to the north of Argentina/Chile 7
- 2' Flowers 4–5 cm long, Depto. Ancash and southern Cajamarca *B. peruviana*
- 2 Flowers up to 3 cm long 3
- 3 Inflorescence dense, hypopodium of primary flowers not exceeding 0,5 cm, only lowermost bracts frondose, the others bracteose, distributed only in the Cordillera Blanca in Depto. Ancash *B. albimontana*
- 3' Inflorescence laxiflorous, hypopodium of primary flowers at least 1

- cm, all bracts frondose 4
- 4 Inflorescence nodding 5
- 4' Inflorescence erect, flowers red and yellow, distributed in northern Peru *B. Vargasii*
- 5 Plants always twining, all bracts at least 2 cm long, adaxial side of leaves densely pubescent, hairs several millimetre long, distributed only in central Peru, Depto. Huánuco *B. engleriana*
- 5' Plants mostly erect, bracts of secondary flowers 0,3–1,5 cm long, adaxial side of leaves nearly glabrous, or with short hairs 6
- 6 Plate of inner tepals rounded; distributed in Peru, Depto. La Libertad *B. porrecta*
- 6' Plate of inner tepal pointed; Peru, Cordillera Central *B. libertadensis*
- 7 Flowers 2 – 4 cm long 8
- 7' Flowers more than 5 cm long 9
- 8 Plants mostly erect, rarely with more than 6 inflorescence branches, distributed from Ancash in central Peru to Bolivia *B. dulcis*
- 8' Plants twining, strong specimen with more than 15 inflorescence branches, distributed in the Cordillera Occidental of central Peru *B. parvifolia*
- 9 Plants always twining, inflorescence erect or nodding, distributed in central Peru 10
- 9' Plants always erect, inflorescence always nodding, distributed in Peru and Bolivia 11
- 10 Inflorescence erect, hypopodium of primary flowers 3,5–4,5 cm, leaves 4–6 cm long and 0,5–1 cm wide *B. bracteata*
- 10' Inflorescence pendulous, hypopodium of primary flowers 1–3 cm, leaves 5–20 cm long and 0,5–3 cm wide *B. longistyla*
- 11 Flowers green, leaves next to the inflorescence and first bracts form an involucre, sometimes poorly developed, distributed from central Peru to Bolivia *B. involucrosa*
- 11' Flowers red or yellow, tepals with green tip, distributed from central Peru to Bolivia *B. andimarcana*

**Clave para los especies**

- 1 Tépalos internos divididos en lamina y uña; desde Ecuador hasta Ancash en el centro del Perú 2
- 1' Tépalos internos cuneadamente ahusados hacia la base; desde Ancash en el centro del Perú hasta el norte de Argentina/Chile 5
- 2 Flores 4–5 cm de largo; Depto. Ancash y sur de Cajamarca *B. peruviana*



**Figure 46.** (A & B) *B. pumila*, inner tepal on the left side; (C) *B. secundifolia*; (D) distribution, cross *B. pumila*, quadrate *B. secundifolia*. Scale bars: (A)= 5 cm; (B)= 1,2 cm; (C)= 5 cm.



A



B



C



D

**Figure 47.** (A) *B. involucrosa* in Herbert (1837); (B) *B. involucrosa*; (C) *B. andimarcana* in Herbert (1837); (D) *B. andimarcana*.

- 2' Flores hasta 3 cm de largo 3
- 3 Inflorescencia densiflora, hipopodio de los flores primarias no más largo que 0,5 cm, solamente las brácteas mas bajas frondosas, los otras bracteosas, Cordillera Blanca en el Depto. Ancash (Perú) *B. albimontana*
- 3' Inflorescencia laxiflora, hipopodio de las flores primarias al menos 1 cm, todas las brácteas frondosas 4
- 4 Inflorescencia péndula. 5
- 4' Inflorescencia erecta, flores rojos y amarillos; en el norte de Perú *B. vargasii*
- 5 Plantas siempre trepadoras, todas las brácteas al menos 2 cm de largo, cara adaxial de los hojas densamente pubescente, pelos de varios milímetros de largo; en el centro de Perú, Depto. Huánuco *B. engleriana*
- 5' Plantas mayormente erectas, brácteas de las flores secundarias 0,3–1,5 cm de largo, cara adaxial de los hojas casi glabro, o con pelos cortos 6
- 6 Lámina de los tépalos internos redondeada; distribuida en Perú, Depto. La Libertad *B. porrecta*

- 6' Lámina de los tépalos internos ahusada; Perú, Cordillera Central *B. libertadensis*
- 7 Flores 2–4 cm de largo 8
- 7' Flores más de 5 cm de largo 9
- 8 Plantas mayormente erectas, a veces trepadoras, raro con más de 6 ramas de inflorescencia; desde Ancash en el centro de Perú hasta Bolivia *B. dulcis*
- 8' Plantas trepadoras, plantas robustas con más de 15 ramas de inflorescencia; en la Cordillera Occidental del centro de Perú *B. parvifolia*
- 9 Plantas siempre trepadoras, inflorescencia erecta o péndula; en el centro de Perú 9
- 9' Plantas siempre erectas, inflorescencia siempre péndula; en Perú y Bolivia 10
- 10 Inflorescencia erecta, hipopodio de los flores primarias 3,5–4,5 cm,

hojas 4–6 x 0,5–1 cm

*B. bracteata*

10' Inflorescencia péndula, hipopodio de los flores primarias 1–3 cm, hojas 5–20 x 0,5–3 cm

*B. longistyla*

11 Flores verdes, hojas próximas de la inflorescencia y primeras brácteas forman un involucre, a veces pobremente desarrollado; desde el centro de Perú hasta Bolivia

*B. involucrosa*

11' Flores rojas o amarillas, tépalos con una ápice verde; desde el centro de Perú hasta Bolivia

*B. andimarcana*

### The species of *Bomarea* subgenus *Wichuraea* arranged alphabetically

#### 1. *Bomarea albimontana* D.N. Smith & R.E. Gereau

Candollea 46: 503-508. 1991.

Type: Peru, Depto. Ancash, Prov. Huari, Quebrada Pucaraju, a lateral valley of Quebrada Rurichinchay, 3900 m – 4200 m, *Smith, Gonzales & Maldonado 12701* (HOLOTYPE: USM!, ISOTYPES: CPUN, GI, HUTI, ISC, MO).

Fig. 49A, B; distribution 49E.

Plant twining, several meters long (2–4). Stem robust, around 0,5 cm in diameter, pubescent, with increasing density of pubescence to the apex, normally recurved at apex. Two types of foliage leaves: lower ones linear or linear-lanceolate and more or less appressed to the stem, ca. 4–6 x 0,7–1,2 cm, upper ones oblong-lanceolate, horizontally spreading, ca. 4–6 x 1,7–2 cm, both types densely nerved, abaxial side with dense white multicellular hairs only on the nerves. Inflorescence a dense, pendulous thyrses. Hypopodium of primary flowers 0,3–0,5 cm, epipodium 1,4–2,5 cm, subtending bracts of lowermost cymes similar in shape to upper leaves, 3–6 x 1–2,5 cm, forming an involucre, other bracts bracteose, up to 1,8 x 0,2 cm. Subtending bracts of secondary flowers 0,5–1,2 x 0,1–0,2 cm. Flowers 1,6–2,1 cm long, outer tepals oblong, pink to red, inner tepals unguiculate, yellow with pink to red stripe on the abaxial side, with purple spots on the adaxial side. Fruit globose, and seeds globose, too. Occurring in the Cordillera Blanca at altitudes between 3500 and 4600 m, in small shrubs.

Additional material examined: PERU: Depto. **Ancash**: Kerococha, 4550 m, *Bernardi 16559* (G); Quebrada Ulta, 4200 m *Beenken 1010* (MSB); Laguna Ichicpotrero, 4100 m, *Smith et al. 12405* (USM); slopes of Huascarán, 4500m, *Gentry et al. 37419* (USM); Quebrada Rima Rima, 4450 m, *Smith et al. 12338* (USM); Quebrada Honda, 4150 m, *Gibby & Barrett 12* (BM); Cerro San Cristóbal (N.E. de Huaraz), 3800 m, 8.7.1977, *Evangelista*, s.n.(14772 HUT, MO); Prov. Carhuaz, Huascarán National Park, Quebrada Ulta, on road to Ulta Pass., 4000-4400 m, 29.7.1985, *Smith 11409* (HUT, MO); Prov. Corongo, Al este y arriba de Cusca, 3600 m, 4.6.2002, *Leiva G., P. Lezama A. 2642* (HUT, HAO); Prov. Corongo, Nahuim, 4300 m, 25.7.1990, *Lezama 127* (HAO); Depto. **Cajamarca**: Prov. Cajabamba, Cajabamba-Luchabamba., 3800 m, 17.11.1983, *Sagástegui et al. 11186* (HUT, MO); Prov. Cajabamba, Pucamama (ruta a Luchabamba), 3790 m, 4.8.2002, *Sagástegui et al. 17003a* (HAO), Prov. Cajabamba, Pucamama (ruta a Luchabamba), 3790 m, 4.8.2002, *Sagástegui et al. 16976* (HAO); Prov. San Miguel de Pallaques, Las Lagunas (ruta Cajamarca-Hualgayoc), 4000 m, 10.7.1995, *Sagástegui et al. 15726* (HAO)

#### 2. *Bomarea ampayesana* Vargas

Natl. Hort. Mag. 22: 130. 1943.

Type: Peru, Depto. Apurímac, Abancay, Cordillera Ampay, *Vargas 1015* (HOLOTYPE: CUZI, ISOTYPE: GH!).

Fig 48A, B; distribution 48C.

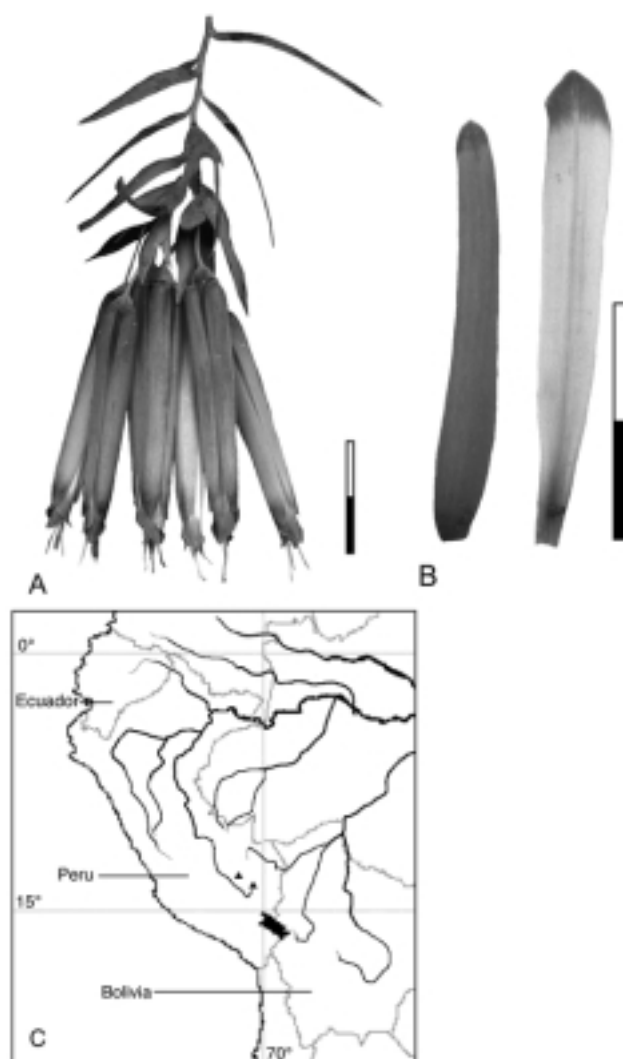
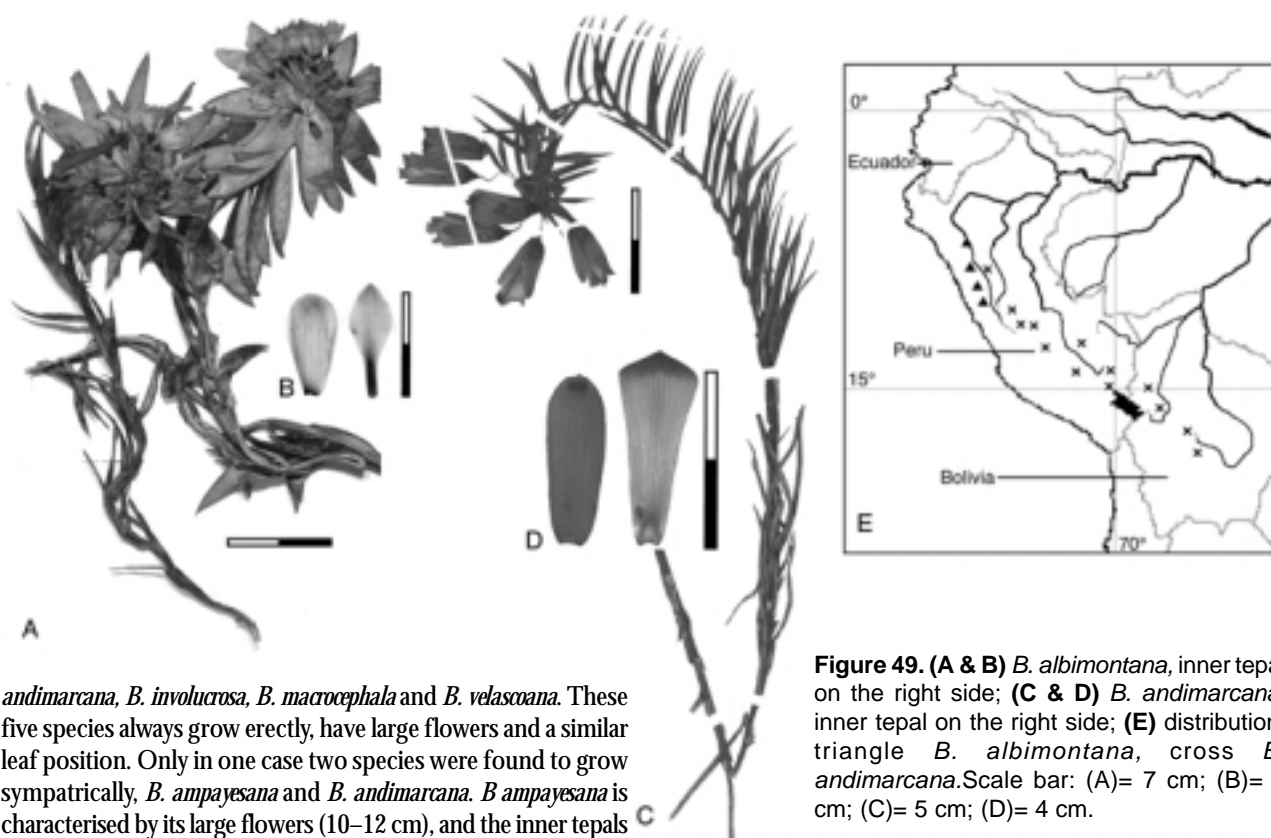


Figure 48. *B. ampayesana*; (A) habit; (B) inner tepal on the right side; (C) distribution. Scale bars: (A)= 4 cm; (B)= 5 cm.

Plant erect, up to 3 m high. Stem rigid, recurved at apex, pubescent with increasing density towards the top. Leaves linear or linear-lanceolate, 15–25 x 0,6–3 cm, towards the inflorescence leaves become shorter and wider. Adaxial side densely pubescent, hairs cream white, abaxial side glabrous except for the base which may bear some brown hairs. Inflorescence a pendulous thyrses, large flowers giving it a dense appearance, but hypopodium of primary flowers 2,5–3,5 cm, epipodium 2,5–3,5 cm. Bracts of primary flowers frondose, 8–9 x 1,5–2 cm, bracts of secondary flowers also frondose, 5–7 x 1–1,5 cm, those of tertiary flowers 3,5–4,5 x 0,7–0,9 cm, those of quaternary flowers bracteose, 1,8–2,2 x 0,4–0,6 cm. Frondose bracts conspicuously less pubescent than the foliage leaves, bracteose ones nearly glabrous. Flowers approximately 10–11,5 cm long, inner tepals exceeding the outer ones, outer tepals oblong, pink on the outside with green tip, pale yellow on the inside. Inner tepals cuneately tapered to the base, yellow with a red stripe on the outside and with green tip. Fruit and seeds ovoid in shape. Distributed only in some valleys east of Cusco at steep bank slopes along small streams, mostly in moss cushions, between 2800 and 4000 m altitude.

Taxonomic note: *B. ampayesana* is a member of the Dulcis group. Within this group it seems to be closely related to *B.*



**Figure 49.** (A & B) *B. albimontana*, inner tepal on the right side; (C & D) *B. andimarcana*, inner tepal on the right side; (E) distribution, triangle *B. albimontana*, cross *B. andimarcana*. Scale bar: (A)= 7 cm; (B)= 2 cm; (C)= 5 cm; (D)= 4 cm.

*andimarcana*, *B. involucrosa*, *B. macrocephala* and *B. velascoana*. These five species always grow erectly, have large flowers and a similar leaf position. Only in one case two species were found to grow sympatrically, *B. ampayesana* and *B. andimarcana*. *B. ampayesana* is characterised by its large flowers (10–12 cm), and the inner tepals always exceed the outer ones. *B. andimarcana* has medium sized red flowers, and the leaves next to the inflorescence are similar to the other leaves, *B. involucrosa* has green flowers and large bracts, and the uppermost leaves are often forming an involucre. *B. macrocephala* is an Argentinean species. *B. velascoana* is characterised by its red flowers, the outer tepals distal with a yellow spot and a green tip, the blue anthers and the shape and length of the inner tepals which are normally much shorter than the outer ones. *B. ampayesana* and *B. velascoana* are endemic in the Cordillera Oriental. The other three species have a wide area of distribution. Among these 5 species intermediary specimens were never found, even not along the common borders of distribution.

Additional material examined: PERU, Depto. **Cusco**, Prov. Convencion, Panticalla, 4000 m, Vargas 4439 (CUZ); Canchayocc, 3700 m, Vargas 19812 (CUZ); Prov. Cusco, Cusco – Quillabamba road, km 142., Boeke 3215 (MO); Cusco – Quillabamba road, 2800 m, Stern 121 (US).

### 3. *Bomarea andimarcana* (Herb.) Baker

J. Bot. 20: 201. 1882.

Basionym: *Collania andimarcana* Herb., Amoryllidaceae 105. 1837.

Type: Peru, Andamarca, Mathews 1164 (K!).

Fig. 1A, B, C; distribution map: Fig. 3C.

°*Wichuraea andimarcana* (Herb.) M. Roemer Fam. Nat. Syn. 4: 279. 1847.

=*Bomarea bridgesiana* Beauverd, Bull. Soc. Bot. Genève II. 14: 173. 1921.

Type: Bolivia, Bridges 1850 s. n. (G!).

- *Collania grandis* Kraenzl., Bot. Jahrb. Syst. 50: Beibl. 111: 2. 1913. (nomen).

Fig. 5B, C; 49C, D; distribution 49E.

Plant erect, up to 2 m high. Stem rigid, recurved at summit, normally glabrous. Leaves linear or linear-lanceolate, 3–15 cm

long, 0.3–1.8 cm wide, Adaxial side pubescent, yellowish-white, abaxial side glabrous or hairy at the base. Inflorescence a pendulous thyrses, dense or laxiflorous. Hypopodium of primary flowers 0.5–2.2 cm, epipodium 0.8–2.5 cm, hypopodium of secondary flowers 0.4–1.5 cm, epipodium 0.6–1.5 cm. Bracts linear to lanceolate, 2.5–7 cm long, 0.5–2 cm wide, generally wider compared to their length than the foliage leaves. Flowers mostly ca. 4 cm long, rarely up to 6 cm. Outer tepals oblong, inner tepals cuneately tapered to the base, with typical *Wichuraea* colours. The basic colour can vary from red to yellow. Inner tepals up to 1 cm longer than outer ones. Fruit and seeds ovoid in shape. *B. andimarcana* is widespread from central Peru to Bolivia. It grows on steep slopes and between rocks in central and eastern cordilleras at altitudes between 3000 and 4500 m.

***B. andimarcana* subsp. *andimarcana*** Hofreiter, Feddes Repert. 114 (3–4): 208–239. 2003.

Inflorescence laxiflorous, hypopodium of the primary flowers 1–2.2 cm long, epipodium 1.5–2.5 cm long. Distributed in the Cordillera Central and on the drier lee sides of the Cordillera Oriental.

***B. andimarcana* subsp. *densifolia*** (Vargas) Hofreiter, Feddes Repert. 114 (3–4): 208–239. 2003.

Basionym: *B. densifolia* Vargas, Contr. Gray herb. 154: 40. 1945. Type: Peru, Depto. Cusco, Prov. Urubamba, Puyupatamarca, Vargas 2725 (CUZ!).

This subspecies is not found in Central Peru, it is endemic in the Cordillera Oriental.

Additional material examined: Cultivated specimen from seeds gathered by Lobb in Peru, Hort. Veitch, type of *Collania grandis*

(K!); PERU: Depto. **Ancash**: Cordillera Huahuash, 4000 m, *Hofreiter* 7(MSB); Depto. **Junin**: between Acopalca and Huari, 4400 m, *Ducan* 2734 (USM); *Churupallana*, *Ruiz & Pavón s.n.* (MA).  
BOLIVIA: Depto. CHOCHABAMBA: Prov. Arani, near Rodeo, 3900 m, *Schmitt & Schmitt* 80 (MO); Prov. Quillacollo, Comunidad de Choroko, 3900 m, *Libermann* 2308 (MSB).

#### 4. *Bomarea bracteata* (Ruiz & Pav.) Herb.

Amaryllidaceae 112. 1837.

Basionym: *Alstroemeria bracteata* Ruiz & Pav., Fl. Peruv. Chil. 3: 1802.

Type: Peru, Depto. Junin, Huassahuassi, *Ruiz & Pavón s.n.* (MA!, photo F!).

Fig.50A, D; distribution 50C.

Plants twining, several meters long, not recurved at summit, pubescent. Leaves linear, remarkable small compared to the size of the plant, ca. 4–6 x 0,5–1 cm, adaxiale side pubescent, abaxial side glabrous except for the base. Inflorescence laxiflorus and erect. Hypopodium of primary flowers 3,5– 4,5 cm, epipodium 3,5– 4,5 cm. Subtending bracts of primary flowers 3–6 x 1–1,5 cm, subtending bracts of secondary flowers 2–4 x 1–1,5 cm. Inflorescence with 3–7 cymes, each cyme composed of up to 4 (-5) flowers. All bracts frondose. Flowers ca. 5,5–7 cm long, inner tepals exceeding the outer ones, outer tepals oblong, pink on the outside with green tip, pale yellow on the inside. Inner tepals cuneately tapered to the base, yellow with a red stripe on the outside and with green tip. Tepals glabrous or pubescent. Pubescence if present evenly, or more densely at the tip of outer tepals. Fruit and seeds ovoid in shape. *B. bracteata* grows in the cordilleras in central Peru at altitudes between 3000 and 4000 m.

Note: *B. bracteata* is a member of the Dulcis group. It was the first discovered species of the subgenus *Wichuraea*. Ruiz & Pavón (1802) described it as *Alstroemeria bracteata*. Herbert (1837) placed it in the genus *Bomarea*, but not in his new genus *Collania* which is similar to the recently described subgenus *Wichuraea*. Killip (1936) placed it in the subgenus *Wichuraea*. This seems to be the better placement, since although *B. bracteata* can be twining, it has a semi-inferior ovary, and the inner tepals have a flat base. It is twining in shrubs in semi-dry habitats. The *Alstroemeria bracteata* specimen of the Herbarium of Barcelona (BC) collected by Ruiz & Pavón is not *B. bracteata*, but a species of subgenus *Bomarea* s.str. The description and the figure (CCXCI b) in Ruiz & Pavón (1802) refers to the specimen of the Madrid Herbarium (MA).

Additional material examined: PERU: Depto. **Ancash**: Prov. Bolognesi, Cerro Palta – Chilcas, 3700 m, *Cerrate* 8323 (USM); Cordillera Huahuash, above Cajatambo, 3500 m, *Hofreiter* 10 (MSB); Prov. Bolognesi, Lanza Cruz Camina a Machaca, 3600 m, *Cerrate* 7846 (USM); Aquia. 3200 m, 5.10.1973, *Amado* s.n. (12672, HUT).

#### 5. *Bomarea dulcis* (Hook.) Beauverd

Bull. Soc. Bot. Genève II. 14: 172. 1921.

Basionym: *Alstroemeria dulcis* Hook., Bot. Misc. 2: 237. 1831.

Type: Peru, near Pasco, Huaylluyay, *Cruckshanks s. n.* (K!, photo MSB!).

°*Collania dulcis* (Hook.) Herb., Amaryllidaceae 104. 1837.

°*Wichuraea dulcis* (Hook.) M. Roemer, Fam. Nat. Syn. 4: 287. 1847

°*Bomarea glaucescens* var. *dulcis* (Hook.) Baker, Handbook of Amaryllideae. 147. 1888.

Fig. 11B, D; distribution 11E.



Figure 50. (A & D) *B. bracteata*, inner tepal on the left side; (B & E) *B. dulcis*, inner tepal on the left side; (C) distribution, cross *B. bracteata*, quadrate *B. dulcis*. Scale bars: (A), (B)= 4 cm; (D), (E)= 1,5 cm.

=*Wichuraea acicularis* M. Roemer, Fam. Nat. Syn. 4: 280. 1847.  
Basionym: *Collania puberula* var. *acicularis* Herb., Amaryllidaceae 105. 1837.

Type: Peru, Andamarca, Mathews 1165, right specimen type of *B. puberula* var. *acicularis* (K!), left specimen type of *B. puberula* (K!).

=*Bomarea biflora* Vargas, Bol. Mus. Hist. Nat. «Javier Prado» 10: 74. 1946.

Type: Peru, Depto. Cusco, Prov. Paruro, abra de Capillanayocc, Vargas 446 (CUZI, MO!).

=*B. calcensis* Vargas, Bol. Mus. Hist. Nat. «Javier Prado» 10: 74. 1946.

Type: Peru, Depto. Cusco, Prov. Calca, beneath Lares, 4000 m, Vargas 3589 (CUZI, MO!).

=*B. campanuliflora* Killip, J. Wash. Acad. Sci. 25: 371. 1935.

Type: Peru, Depto. Puno, Prov. Carabaya, Quebrada de Ivipata, Raimondi 10229 (B!, USM).

=*B. cuzcoensis* Vargas, Bol. Mus. Hist. Nat. «Javier Prado» 10: 74. 1946.

Type: Peru, Depto. Cusco, Prov. Calca, Huairaccpuncu, trail to Lacko, 3600 m – 4200 m, Vargas 4031 (CUZI!).

=*Collania guadelupensis* Kraenzl., Ann. K. K. Naturhist. Hofmus. 27: 157. 1913.

Type: Bolivia, near Guadalupe, valley of Chorolque, 3700 m, Hauthal 111 (B!).

=*C. herzogiana* Kraenzl., Bot. Jahrb. Syst. 50: Beibl. 111: 3. 1913.

Type: Bolivia, Cerro Chancapina, 5000 m, Herzog 2370 (B!).

=*W. parvifolia* M. Roemer, Fam. Nat. Syn. 4: 280. 1847 not *B. parvifolia* Baker 1888.

Basionym: *Collania dulcis* var. *parvifolia* Herb. Amaryllidaceae 400. 1837.

Type: Peru, Portachuela, Mathews s.n. (K).

=*Collania petraea* (Kraenzl.) Kraenzl., Bot. Jahrb. Syst. 50: Beibl. 111: 5. 1913.

Basionym: *B. petraea* Kraenzl., Amaryllidaceae andinae. – Bot. Jahrb. Syst. 40: 229. 1908.

Type: Peru, Depto. Puno, near Azangaro, 4000 m, Weberbauer 476, (B!).

=*B. puberula* (Herb.) Kraenzl. ex Perkins, Bot. Jahrb. Syst. 49: 192. 1913.

Basionym: *Collania puberula* Herb., Amaryllidaceae 105. 1837.

Type: Peru, Andamarca, Mathews 1165, left specimen type of *B. puberula* (K!), right specimen type of *B. puberula* var. *acicularis* (K!).

=*B. tacnaense* Vargas, Pl. Life 21: 155. 1965.

Type: Peru, Depto. Tacna, Prov. Tarata, trail from Livini to Tarata, 3800 m, Vargas 13025 (CUZI!).

- *B. torquipes* nomen, noticed on destroyed *Lobb* s.n. specimen of the Vienna herbarium, probably by Kraenzl., only a photo (no.: 31390) in the herbarium of the Field Museum remains.

=*B. uniflora* (M. Roemer) Killip, J. Wash. Acad. Sci. 25: 372. 1935.  
Basionym: *Wichuraea dulcis* var. *uniflora* M. Roemer, Fam. Nat. Syn. 4: 278. 1847.

Type: Peru, Huayllay, Mathews 864 (K!, E!, BM!).

- *Alstroemeria uniflora* Matthews MS (nomen), Herb., Amaryllidaceae 104. 1837, as synonym of *B. dulcis*.

=*B. zosterifolia* Killip, J. Wash. Acad. Sci. 25: 372. 1935.

Type: Peru, Depto. Ancash, Martinet 742 (P, photo and fragment US!).

Fig. 5A; 50B, E; distribution 50C.

Plant erect or twining, between 10 cm and 2 meters high. Stem rigid, recurved at apex, pubescent with increasing density towards the apex or glabrous. Leaves linear or linear-lanceolate, 2–10 x 0,2–1,5 cm wide towards the inflorescence the leaves can become shorter and wider, for example a plant which has leaves of around 5 cm length and 0,2 cm width in the middle of its stem may bear leaves of 3 cm length and 0,6 cm width next to the inflorescence. The adaxial surface of the leaves is pubescent,

yellow white, the abaxial surface can be glabrous except for the base, which may bear some hairs or be completely pubescent. The inflorescence can be dense or laxiflorous compared to the size of the flowers. It is normally a pendulous thyrse, rarely there are populations in Central Peru with an erect inflorescence. The hypopodium of the first flowers is 0,3–1,2 cm long, the epipodium is 0,8–1,5 cm long. The bracts of the primary flowers are frondose 2–4 x 0,4–0,8 cm, the bracts of the secondary flowers are also frondose 1–2 cm x 0,2–0,5 cm. The flowers are around 2–3 cm long, the inner tepals are equal to the outer ones in length, and the outer tepals are oblong, on the outer surface pink with a green tip, pale yellow on the inner surface. The inner tepals are cuneately tapered to the base, yellow with a red stripe at the outer side and with a green tip. The fruit and the seeds are ovoid. *B. dulcis* grows from Ancash in the north to Bolivia in the south on the windward side and the lee side on steep slopes and between rocks at altitudes between 2500 and 5200 m.

Note: *B. dulcis* is the widest distributed and most variable of all *Wichuraea* species.

Additional material examined: PERU: Depto. **Amazonas**: Prov. Recuay, Cerca del túnel Kahuish, lado oriental. 4250 m, 25.5.1970, López et al. 7536 (HUT); Depto. **Ancash**: Prov. Huaylas, Cordillera Blanca, Quebrada Alpamayo, 4700 m, Smith et al. 9716 (MO); Cordillera Blanca Quebrada Los Cedros, 4600 – 4850 m, Smith & Valencia 9962 (MO); Prov. Huari, Cordillera Blanca near tunnel Kahuish, 3000 – 4000 m, Stevens 21961 (MO); Cordillera Blanca Quebrada Pucaraju, 3900 – 4200 m, Smith et al. 12679 (MO); Cordillera Blanca Quebrada Rima Rima, 4200 – 4370 m, 6.5.1986, Smith et al. 12227 (HUT, MO); Cordillera Blanca, Quebrada Cancaraca, 4500 m, Beenken 1046 (MSB); Cordillera Negra, Callan, 4300 m, Bernardi et al. 16652 (G); Prov. Carhuaz, Cordillera Blanca Quebrada Honda, 4300 m, Gibby & Barrett 117 (BM); Cordillera Blanca Quebrada Ishinca, 4950 m, Smith & Buddensiek 11215 (MO); Huascarán National Park, Quebrada Ishinca, S side of valley., 4380-4500 m, 25.5.1970, Smith et al. 9511 (HUT, MO); Huascarán National Park, Quebrada Ulta, on road to Ulta Pass, 4400-4600 m, 29.7.1985, Smith 11368 (HUT, MO); Prov. Yungay, Cordillera Blanca Lagunas Llanganuco, 4200 – 4800 m, Gentry et al. 37419 (MO); Cordillera Blanca Quebrada Ranincuray, 4000 – 4300 m, Smith et al. 9123 (MO); Prov. Recuay, Cordillera Blanca Rio Pachacota, 4430 m, Stein et al. 2005 (MO); Cordillera Blanca Quebrada Quenua Ragra, 4600 – 4700 m, Smith et al. 10671 (MO); Alrededores de Laguna Querococha., 4060 m, 21.6.1991, Mostacero et al. 2255 (HUT); San Luis, Road from San Luis to Huari before Laguna Huachococha and near Laguna Huachococha., 4000-4500 m, 13.3.2001, Weigend et al. 5117 (BSB, HUT); Prov. Caraz, Alrededores de Laguna Paron., 4100 m, 26.8.1978, Mostacero et al. 542 (HUT). Prov. Junin, Ulcumayo, ruins of Condomarca, 4500 m, Johns 8137 (F); Ondores, 4200 m, Pettersson 157 (USM); Prov. Huancayo, Quebradas east of Huancayo, 3400 m, Stork & Horton 10225 (F); Shullcas Valley near Huancayo, 3200 m, Holt 65 (K). Depto. **Pasco**: Prov. Pasco, Huallay to Canta road km 3,4, 4230 – 4610 m, Boeke 1116 (NY, MO); Prov. Cerro de Pasco, Bosque de piedra, 4380 m, Urquize 93 (USM); Prov. Cerro de Pasco, between Cerro de Pasco and Salcachupán, 3750 – 3800 m, Ferreyera 8201 (USM); Depto. **Lima**: Prov. Huarochiri, San Mateo, Rio Blanca, 4100 m, Saunders 391 (NY); Prov. Huarochiri, near Laguna Chumpicocha, 4300 m, Cerrate 1988 (USM); Prov. Huarochiri, Cerro Campana 4200 m, Cerrate 4707 (USM).

BOLIVIA: Depto. CHOCHABAMBA: Choro, 4300 m, Brooke 6099 (BM); Depto. LA PAZ: Cerro de Comanche, 4050 m, Rilke 672 (B); Copacabana, Rilke 463 (B); Cordillera Real, Illampú, 4500 m, Troll 2118 (B, M); Tiaguanaco, Cerro Quimsachata, 4200 m, West 6387 (MO); Murillo, Zongo valley, 4500 m, Solomón 12284 (M, MO); Prov. Pacajes, Caquiaviri, 4300 m, Johns 8275 (MO); Depto. POTOSI: Prov. Chichas, near Zasma, 3800 m, Cárdenas 40 (GH); CHILE: Region 1: Prov. Parinacota, Episcacha, 3500 m, Ricardi & Marticorena 4749/1134 (B).

6. *Bomarea engleriana* Kraenzl.

Bot. Jahrb. Syst. 40: 231. 1908.

Type: Peru, Depto. Huánuco, beside trail from Tantamayo to Monzón, *Weberbauer 3307* (B!, fragment F!).

Plant twining, stem robust, recurved at apex, pubescent with increasing density towards the top. Leaves linear or linear-lanceolate, 3–5 x 0,3–0,8 cm, towards inflorescence leaves becoming wider. Adaxiale side of leaves densely pubescent, yellowish-white, abaxial side glabrous. Inflorescence laxiflorus, hypopodium of primary flowers 1,8–2,2 cm, epipodium 1,5–2 cm. Bracts of primary flowers 3–5 x 0,5–0,8 cm, bracts of secondary flowers 2,5 – 3,5 x 0,5–0,7 cm. Flowers ca. 2–3 cm long, inner tepals equal to outer ones in length, outer tepals oblong, pink on the outside with green tip, pale yellow on the inside. Inner tepals subdivided in blade and claw, yellow with a red stripe on the outside and with green tip. Fruit and seeds ovoid in shape. *B. engleriana* grows in the eastern cordillera of central Peru in the Depto. Huánuco at the windward sides in small shrubs and fog forests at altitudes between 2800 and 4000 m.

Additional material examined: PERU: Depto. Huánuco: beside trail from Tantamayo to Monzón, 4000 m, *Hofreiter & Franke 4/9* (MSB). The species is illustrated in Hofreiter & Tillich (2003).

7. *Bomarea glaucescens* (Kunth) Baker

J. Bot. 20: 201. 1882.

Basionym: *Alstroemeria glaucescens* Kunth Voyage de Humboldt et Bonpland 282. 1815.

Type: Ecuador, Pichincha, between Palmascuchu and the spring of Cantuna, *Humboldt & Bonpland s.n.* (B!).

°*Collania glaucescens* (Kunth) Herb. Amaryllidaceae 104. 1837.

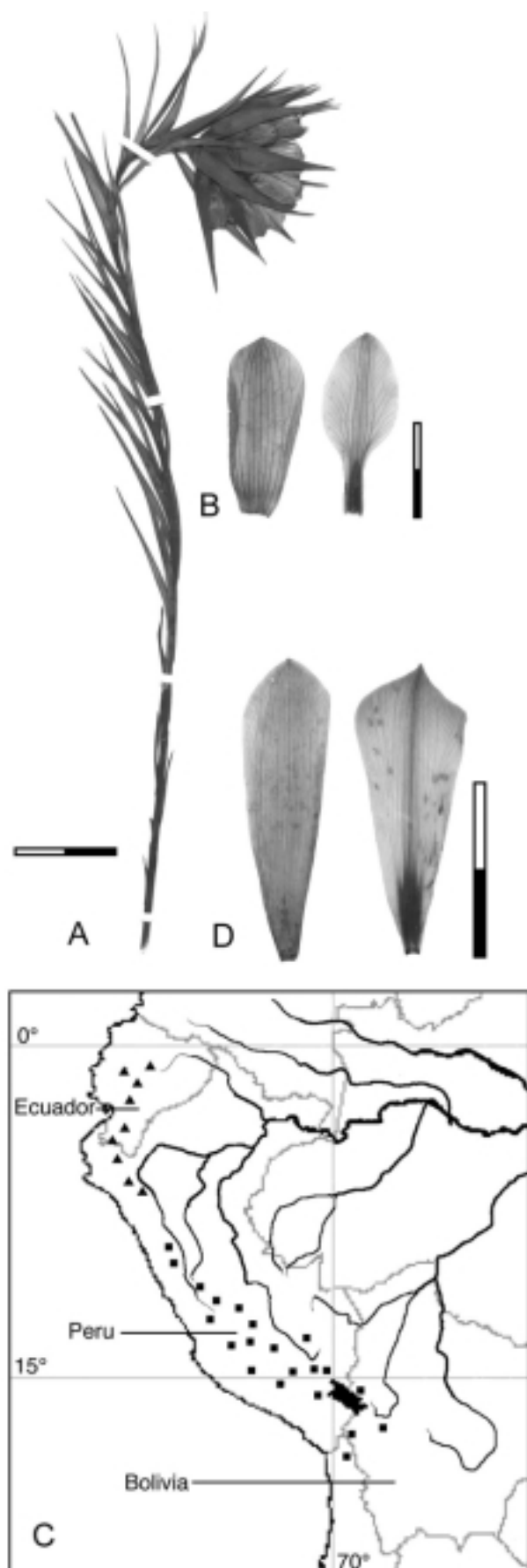
°*Wichuraea glaucescens* (Kunth) M. Roemer Fam. Nat. Syn. 4: 287. 1847

Fig. 51A, B; distribution 51C.

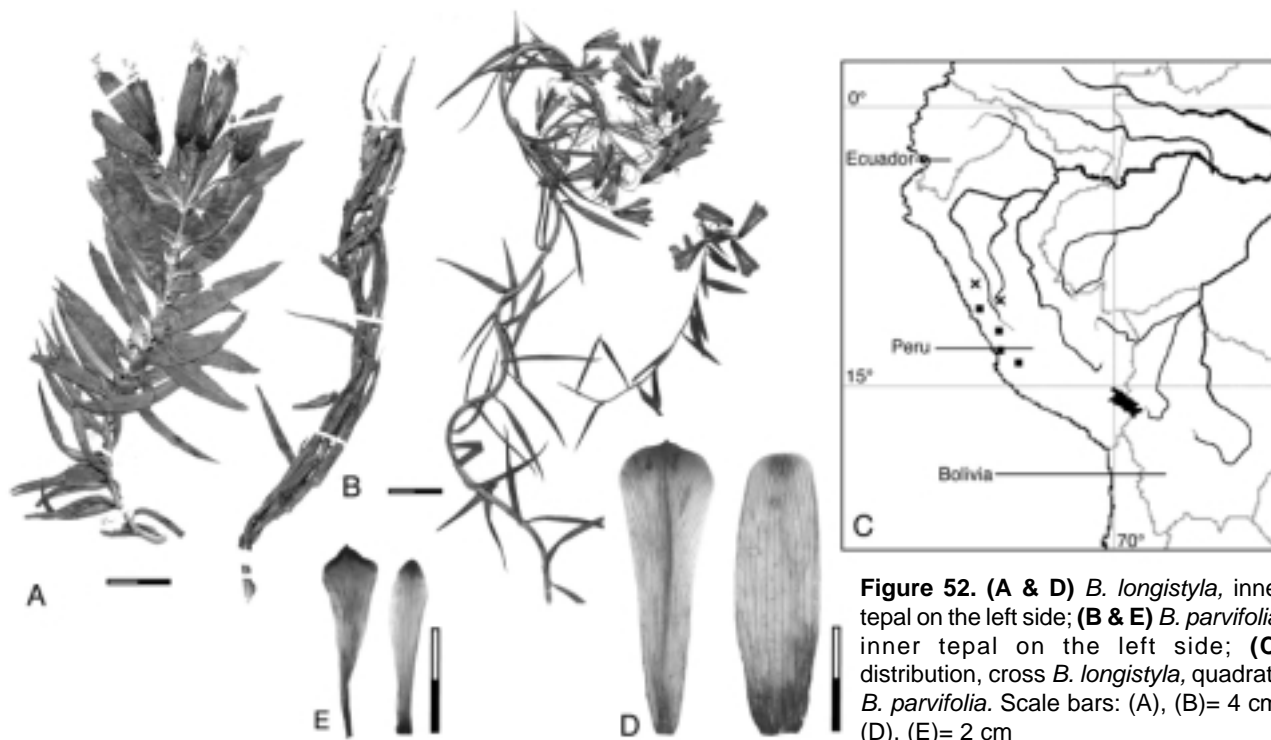
Plant erect, up to 1 meter high. Stem rigid, recurved at apex, glabrous. Leaves linear or linear-lanceolate, 3–6 x 0,2–0,5 cm, towards inflorescence wider (up to 1,2 cm), Adaxiale side of leaves pubescent, yellowish-white, abaxial side glabrous. Inflorescence dense, hypopodium of primary flowers 0,1–0,2 cm, epipodium 0,8–1,2 cm. Bracts of primary flowers frondose, 2–6 x 0,5–1,7 cm, bracts of secondary flowers frondose to bracteose, glabrous, 0,5–1,5 x 0,2–0,5 cm. Flowers ca. 2–2,5 cm long, inner tepals equal to outer ones in length, outer tepals oblong, pink on the outside with green tip, pale yellow on the inside. Inner tepals subdivided in blade and claw, yellow with a red stripe at outer side and with green tip. Fruit and seeds ovoid in shape. *B. glaucescens* grows in valleys of Ecuador and north Peru almost exclusively at step slopes and between rocks in altitudes between 3500 and 4500 m.

Additional material examined: ECUADOR, Prov.. Chimborazo/Morona-Santiago, trail Alao-Huamboya, 3700 m, *Øllgaard et al. 38228* (MO); Ecuador, Prov.. Azuay, Páramo de Cajas, 3650 – 3890 m, *Boeke & Loyola 632* (MO); Ecuador, Prov. Pichincha, *Jameson s. n.* (E, G, BM).

PERU, Depto. Piura, Prov. Huancabamba, Laguna Negra – Talanco, 3700 m, *Friedberg 810* (USM). Depto. Cajamarca, Prov. Hualgayoc, Coymolache – Chugur, Cerro Tantahuatay, 3700 m, *Sánchez 7083* (F); Hualgayoc, road from Cajamarca to Bambamarca, 3750 m, 11.5.1999, *Binder & Binder 1999/175* (HUT, MSB); Prov. Cajamarca, Yanacocha, cerro de las Vizcachas, 4010 m, *Soriano 347* (F).



**Figure 51.** (A & B) *B. glaucescens*, inner tepal on the right side; (D) *B. involucrosa*, inner tepal on the right side; (C) distribution, triangle *B. glaucescens*, quadrate *B. involucrosa*. Scale bars: (A), (D)= 4 cm; (B)= 1 cm.



**Figure 52.** (A & D) *B. longistyla*, inner tepal on the left side; (B & E) *B. parvifolia*, inner tepal on the left side; (C) distribution, cross *B. longistyla*, quadrate *B. parvifolia*. Scale bars: (A), (B)= 4 cm; (D), (E)= 2 cm

**8. *Bomarea involucrosa* (Herb.) Baker**

J. Bot. 20: 201. 1882.

Basionym: *Collania involucrosa* Herb., Amaryllidaceae 103. 1837.

Type: Peru, Depto. Lima, San Mateo, Mathews 863 (K!, photo MSB!, BM!, E!, G!).

Fig. 12C, D; distribution 13C.

=*B. maculata* Killip ex Vargas, Bol. Mus. Hist. Nat. «Javier Prado» 10: 70. 1946.

Type: Peru, Depto. Puno, Baja Isla in Lake Titicaca, 3850 m, Mexia 04258 (GH!).

=*A. pavoniana* Beauverd, Bul. Soc. Bot. Genève, II. 14: 176. 1921.

Type: Peru, Pavon s.n. (G!).

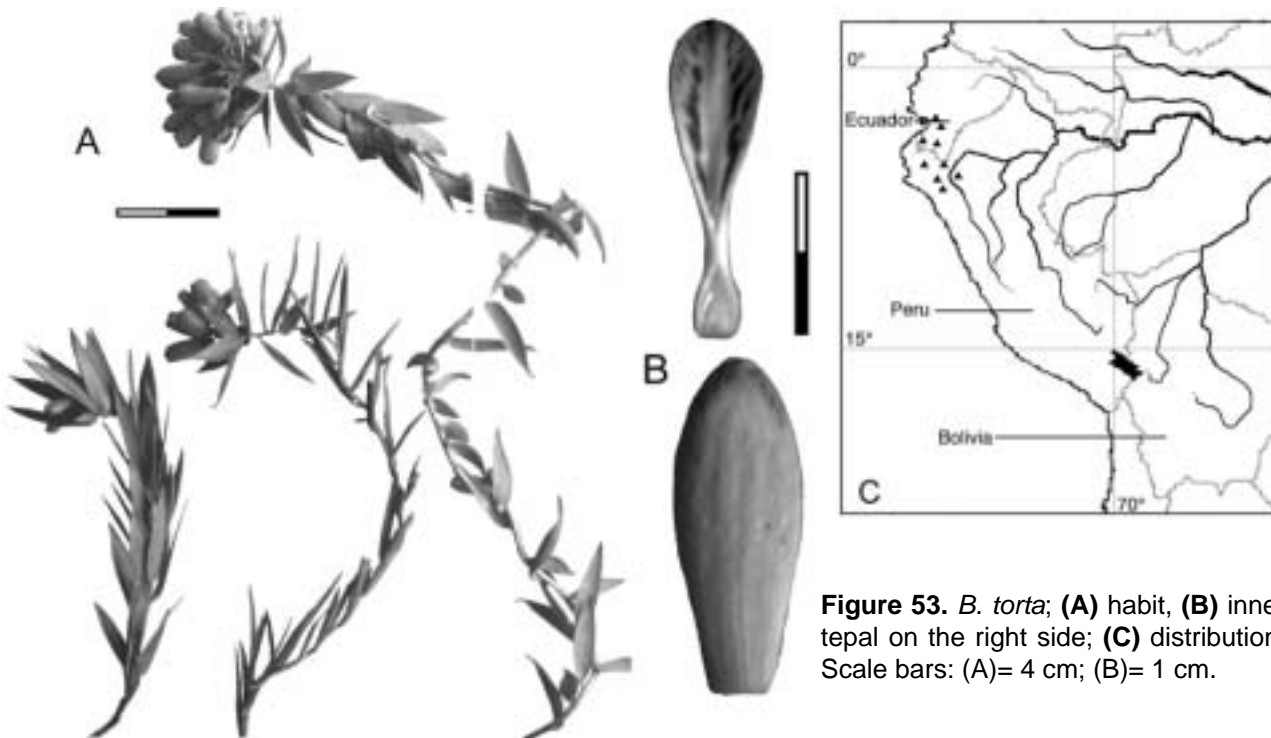
- *Alstroemeria grandiflora* (nomen) Mathews MSS in herbarium K! & E!.

- *Wichuraea roemeriana* (nomen) Klotsch MSS in herbarium B!.

Fig. 51D; distribution 51C.

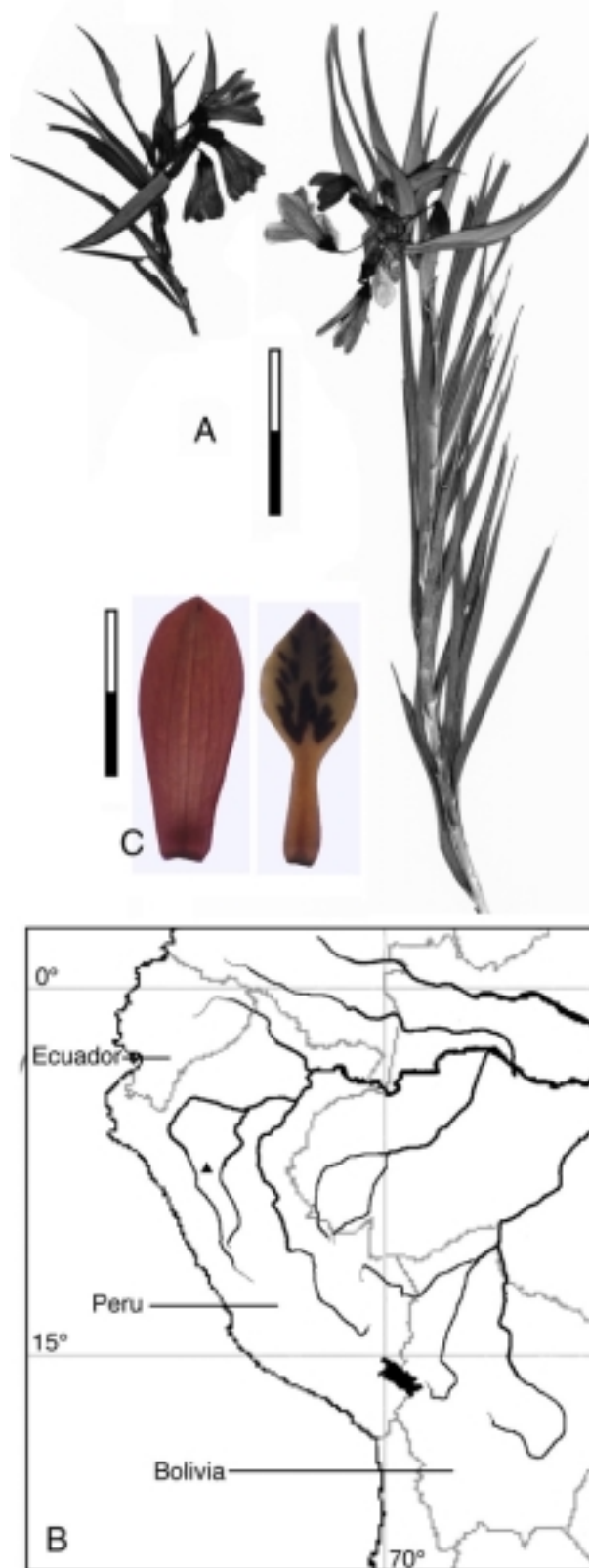
Plant erect, up to 3 meters high. Stem rigid, recurved at apex, more densely pubescent towards the apex or glabrous. Leaves linear or linear-lanceolate, 5–20 x 0,5–3,0 cm towards the inflorescence the leaves become shorter and wider, for example a plant which has leaves of around 8 x 0,5 cm in the middle of its stem may bear leaves of 3 x 0,7 cm next to the inflorescence.

<http://sisbib.unmsm.edu.pe/BV/Revistas/biologia/biologiaNEW.htm>



**Figure 53.** *B. torta*; (A) habit, (B) inner tepal on the right side; (C) distribution. Scale bars: (A)= 4 cm; (B)= 1 cm.





**Figure 54.** *B. libertadensis*: (A) habit; (B) distribution; (C) inner tepal on the right side. Scale bars: (A)= 4 cm; (C)= 1,5 cm.

The adaxial side of the leaves is pubescent, yellow white, the abaxial side is glabrous except for the base or all sides pubescent or nearly glabrous. The inflorescence is dense compared to the size of the flowers, the hypopodium of the first flower is 0,3–0,8 cm long, and the epipodium is 0,3–1 cm long. The bracts of the primary flowers are frondose 3–12 x 1–3 cm wide, the bracts of the secondary flowers are bracteose 2,5–4 x 1–2 cm. The

flowers are around 6–8 cm long, the inner tepals are equal to the outer ones in length, and the outer tepals are oblong, yellow-green on both surfaces. The inner tepals are cuneately tapered to the base, at both sides yellow green. In the south of Peru there are populations where around 10% of the specimen have flowers with outer tepals which are lightly pink with a green tip on the outer surface, pale yellow on the inner surface, the inner tepals yellow on the outer surface with a red stripe and with a green tip. The fruit and seeds are ovoid. *B. involucrosa* grows in the valleys from central Peru in the north to Bolivia in the south. In the eastern cordilleras it grows only on the lee side on steep slopes and between rocks, in the western cordillera on both sides. It grows at altitudes between 3200 and 4600 m.

Note: *B. involucrosa* is the only known *Bomarea* species with green flowers.

Additional material examined: PERU: Depto. **Lima**: Lima – La Oroya road 76 km west of La Oroya, 3500 m, *Gentry et al.* 39742 (USM, MO); Prov. Huarochiri, between Chicla and San Mateo, *Weigend & Förther* 97/892 (USM, MSB); Chicla, 3600 m, 15.12.1951, *López s.n.* (1292, HUT); La Oroya, near Pachacayo, 3600 m, *Gutte & Gutte* 1357b (LZ); Prov. Yauli, above Rio Blanca, Vargas 7 (USM); Depto. **Huancavelica**: Prov. Huaytará, Pte. Mollepallana on road Pisco – Ayacucho, 3900 – 4000 m, 29.9.1997 *Weigend & Förther* 97/608 (HUT, MSB); Pampas, 3600 m, *Gutte* 4169a (LZ).

### 9. *Bomarea libertadensis* Hofreiter & E. Rodr., spec. nov.

Type: Peru, Depto. La Libertad, Prov. Bolivar, above Bolivar, ca. 4000 m, *Hofreiter* 2004/18 (holotype: HUT!; isotype: MSB!).

Fig. 54A, B; distribution 54C.

*Inter speciebus affinis insignis caule erecto, glabro; foliis linearibus vel lineari-ellipticis, supra glabris, subtus pubescentibus; thyrso erecto; segmentis perianthii aequalibus longitudine; tepalis externis oblongis, rubris; tepalis internis acutis, luteis.*

Plant twining, several meters long, or erect, about 50 cm high. Stem robust or rigid, pubescent with increasing density towards the top, or glabrous. Leaves linear or linear-lanceolate, 2–8 cm long, 0,2–0,4 cm wide, towards inflorescence mostly becoming shorter. Adaxial side of leaves glabrous or pubescent, then hairs yellowish-white and very short, abaxial side glabrous or nearly so. Inflorescence more or less dense, hypopodium of primary flowers 0,3–0,6 cm, epipodium 1–2 cm. Subtending bracts of primary flowers frondose, 1,5–6 cm long and 0,3–0,6 cm wide, subtending bracts of secondary flowers frondose to bracteose, 0,3–1,5 cm long and 0,1–0,3 cm wide. Flowers ca. 2 cm long, inner tepals equal to outer ones in length, outer tepals oblong, outside pink with green tip, pale yellow on the inside. Inner tepals subdivided in blade and claw, yellow with a red stripe on the outside and with green tip. Fruit and seeds ovoid in shape. *B. porrecta* is distributed in valleys of north Peru, in the Depto. La Libertad. It grows almost exclusively on steep slopes and between rocks at 2800 and 4200 m.

Taxonomic note: the next similar species is *B. porrecta*. The species can be easily distinguished by the shape of the inner tepals; in living plants the colour of the flowers is also different.

Additional specimen examined: This species is only known so far from the type collection. But it is very abundant in the area and hundreds of plants were observed on the slopes.

**10. *Bomarea longistyla* Vargas**

Pl. Life 21: 158. 1965.

Type: Peru, Depto. Ancash, Prov. Bolognesi, Mangas, Cerro San Cristobal, 3800 – 3900 m, *Cerrate 4123* (CUZ!).

Fig. 52A, D; distribution 52C.

Plant twining, several meters long. Stem robust, pubescent, with increasing density of pubescence towards the apex, or glabrous, normally recurved at apex. Leaves linear or linear-lanceolate, 5–20 x 0,5–3,0 cm, towards inflorescence becoming wider. Adaxial side of leaves pubescent, yellowish-white, abaxial side glabrous except for the hairy base, or both sides pubescent or nearly glabrous. Inflorescence more or less laxiflorous, hypopodium of primary flowers 1–3 cm, epipodium 1–4 cm. Subtending bracts of primary flowers 6–9 x 1,5–2 cm, subtending bracts of secondary flowers 0,5–6 x 0,3–2 cm. Flowers 4–6 cm long, inner tepals equal to outer ones in length, outer tepals oblong, pink on outside with green tip, pale yellow on the inside. Inner tepals cuneately tapered to the base, yellow with a red stripe on the outside, and with green tip. Fruit and seeds ovoid in shape. *B. longistyla* grows in valleys of central Peru at altitudes between 3600 and 4300 m.

Note: *B. longistyla* is endemic in central Peru.

Additional material examined: PERU: Depto. **Lima**: near Suchi, road Chosica to Huanza, 3900 – 4000 m, *Gentry 21625* (USM); Prov. Huarochiri, above Matucana, 4000 m, *Saunders 301* (NY, MO); *Maclean s. n.* (K); San Mateo, 4300 – 4500 m, *Saunders 820* (US); Prov. Canta, Lachaqui, 4100 m, *Vilcapoma 1730* (MO).

**11. *Bomarea parvifolia* Baker**

Handb. Amaryllidaceae 154. 1888.

Type: Peru, near Huamantanga (?), *McLean s. n.* (K!, photo MSB!).

Fig. 9B,D; distribution map: Fig. 9E.

= *B. praeusta* Kraenzl., Ann. K. K. Naturhist. Hofmus. 27: 155. 1913.

Type: Peru, *Lobb s. n.*, the type was destroyed during world war II in Vienna, only a photo (F! no.: 31385) remains.

Fig. 52B, E; distribution 52C.

Plant twining, several meters long. Stem robust, leaves of specimens growing in full sun linear or linear-lanceolate, 3–10 cm long, 0,2–0,5 cm wide, toward inflorescence increasingly shorter. Specimens growing in shadow in general with wider leaves and less obvious difference in leaf shapes along stem. Adaxial side of leaves pubescent, yellowish-white, abaxial side glabrous or nearly so. Inflorescence laxiflorous, hypopodium of primary flowers 2–6 cm, epipodium 1–4 cm. Subtending bracts of primary flowers frondose, 2–4 cm long and 0,5–1 cm wide, subtending bracts of secondary flowers also frondose, 1,5–2 cm long and 0,3–0,6 cm wide. Flowers ca. 2–3 cm long, inner tepals equal to outer ones in length, outer tepals oblong, pink on the outside with green tip, pale yellow on the inside. Inner tepals cuneately tapered to the base, yellow with a red stripe on the outside and with green tip. Fruit and seeds ovoid in shape. *B. parvifolia* grows in valleys of Central Peru almost exclusively on steep slopes and between rocks at altitudes between 3500 and 4300 m.

Additional material examined: PERU: Depto. **Lima**: Prov. Canta, near Huascayo, *Aceleto 102* (USM); Culluhuyay, 3800 m, *Gutte 4197a* (LZ); Prov. Yauyos, 3750 m, *Tovar 565* (USM); Chiclla, 3750 m, *Tovar & Cerrate 1148* (USM); Prov. Huarochiri, near Escomarca, 3600 – 3700 m, *Ferreya 19093* (USM); Depto. **Ancash**: Prov.

Huaraz, near Llanganuco, 3900 m, *Saunders 1316* (K); Prov. Huaraz, slopes of Huascarán, 4200 m, *Saunders 1335* (K); near Llanganuco, 3570 m, *Stein et al. 2019* (MO); near Guamantanga and San Buenaventura, *Ruiz & Pavón s. n.* (MA); Prov. Yungay, Laguna Llanganuco, 3400 m, 1.11.1984, *Sagástegui et al. 12310* (HUT, MO); Alrededores Laguna Llanganuco, 3750 m, 9.8.1986, *Mostacero et al. 1416* (HUT, F).

**12. *Bomarea peruviana* Hofreiter**

Feddes Repert. 115 (5-6): 438. 2004.

Type: Peru, Depto. Cajamarca, Prov. San Miguel de Pallaques, above Agua Blanca, Tingo, 3084 m, 14.10.2000, *Weigend et al. 2000/742* (MSB!, HUT!).

Plant twining (2–4 m), stem robust, around 0,5 cm in diameter, not recurved at apex, pubescent with increasing density towards the top. Leaves linear-lanceolate to lanceolate, 5–12 x 1–3 cm, adaxial side of leaves pubescent, yellowish-white, abaxial side glabrous. Inflorescence a laxiflorous thyrse, up to 25 flowers, but the secondary flowers are often not developed, hypopodium of primary flowers 0,5–3 cm, epipodium 5–7 cm. Bracts of primary flowers small, 0,5–3 x 0,2–0,8 cm, both sides pubescent, bracts of secondary flowers 0,3–0,7 x 0,2–0,3 cm. Perianth ca. 4–5 cm long, inner tepals 0,5–1,2 cm longer than outer ones, outer tepals oblong, abaxially pubescent at the tip, pink with green tip, adaxially pale yellow. Inner tepals subdivided in blade and claw, abaxially greenish with a pink stripe and a green tip, adaxially green with maroon spots. Style and filaments straight, slightly shorter than the inner tepals. Ovary semi-inferior, pubescent, 0,7–1,2 x 0,5–1 cm. Fruit ovoid in shape, 2–3 x 1–1,5 cm. *B. peruviana* grows in the western cordillera of Peru in the Depto. Ancash and Cajamarca in small shrubs at altitudes between 2500 and 3150 m.

Note: This species is easily distinguished from all the other species of the *Glaucescens* group with its large flowers (4–5 cm), 0,5–1,2 cm longer inner tepals. The species is illustrated in Hofreiter (2004).

Additional material examined: PERU: Depto. **Ancash**: Prov. Caraz, road from Pamparomas to Caraz, 3150 m, *Weigend et al. 2000/682* (MSB); Prov. Huaylas, between Pamparomas and Laguna Negra Huancana, *Weigend et al. 7406* (M); Depto. **Cajamarca**: Prov. Contumazá, Cerca del túnel, carretera Cascas-Contumazá, 2550 m, 27.12.1970, *López & Sagástegui 7659* (HUT); Contumazá, Entrada al bosque de Cachil, 2500 m, 13.12.1993, *Sagástegui et al. 15125* (HAO); Depto. **La Libertad**: Prov. Otuzco, Debajo de Shitahuara, 2800 m, 16.5.1991, *Leiva et al. 312* (HAO).

**13. *Bomarea porrecta* Killip**

Field Mus. Nat. Hist., Bot. Ser. 13: 641. 1936

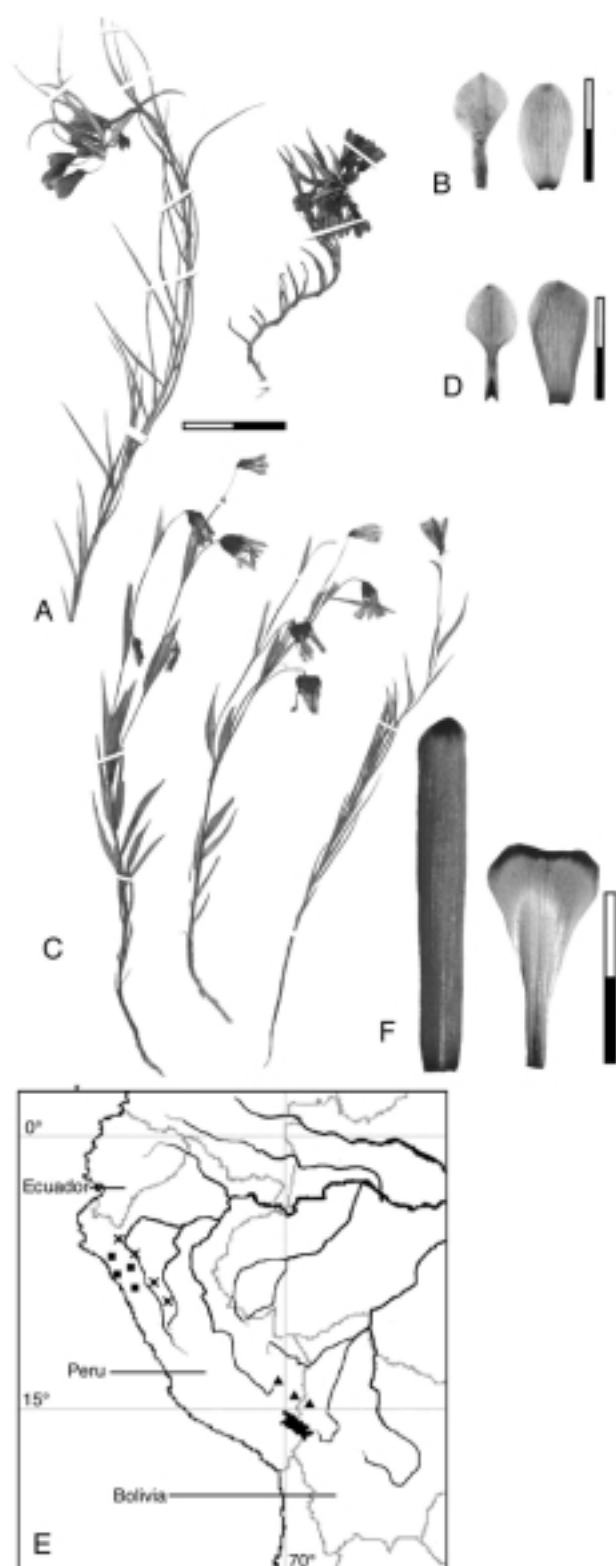
*B. stricta* Kraenzl. nomen illegitimum., Ann. K. K. Naturhist. Hofmus. 27: 156. 1913, non *B. stricta* Pax 1890.

Type: Peru, *Lobb s. n.* (W destroyed)

Neotype: designatus in Hofreiter & Tillich, Feddes Repert. 114 (3–4): 208 – 239. 2003: Peru, Depto. La Libertad, Cerro Cacanán, near Huamachuco, 3250 m, Nov. 26, 1936, *James West 8107* (MO!).

Fig. 55A, B; distribution 55E.

Plant twining, several meters long, or erect, about 50 cm high. Stem robust or rigid, pubescent with increasing density towards the top, or glabrous. Leaves linear or linear-lanceolate, 2–8 cm long, 0,2–0,4 cm wide, towards inflorescence mostly becoming shorter. Adaxial side of leaves glabrous or pubescent, then hairs yellowish-white and very short, abaxial side glabrous



**Figure 55.** (A & B) *B. porrecta*, inner tepal on the left side; (C & D) *B. vargasii*, inner tepal on the left side; (E) distribution, quadrate *B. porrecta*, cross *B. vargasii*, triangle *B. velascoana*; (F) *B. velascoana*, inner tepal on the right side. Scale bars: (A), (C)= 4 cm; (B), (D)= 2 cm; (F)= 3 cm.

or nearly so. Inflorescence more or less dense, hypopodium of primary flowers 0.3–0.6 cm, epipodium 1–2 cm. Subtending bracts of primary flowers frondose, 1.5–6 cm long and 0.3–0.6 cm wide, subtending bracts of secondary flowers frondose to bracteose, 0.3–1.5 cm long and 0.1–0.3 cm wide. Flowers ca. 2

cm long, inner tepals equal to outer ones in length, outer tepals oblong, outside pink with green tip, pale yellow on the inside. Inner tepals subdivided in blade and claw, yellow with a red stripe on the outside and with green tip. Fruit and seeds ovoid in shape. *B. porrecta* is distributed in valleys of north Peru, in the Depto. La Libertad. It grows almost exclusively on steep slopes and between rocks at 2800–4200 m.

Additional material examined: PERU: Depto. **Cajamarca**: Prov. Chota, Cerro El Leonero (arriba de Chuyubamba), 3000 m, 6.8.1988, *Sagástegui 14064* (HUT); Depto. Lambayeque, Ferreñafe, Togula, distrito Incahuasi, 2850 m, 11.9.1985. *Sagástegui et al. 12767* (HUT); Prov. Celendín, Jalca de Kumulca, 3300m, 19.8.1984, *Sagástegui et al. 19454* (HUT); Depto. **La Libertad**: Prov. Julcán, Cerro Mirador (arriba de Mache), 3600 m, 18.9.2003, *Sagástegui et al. 17463* (HAO); Prov. Huamachuco, Quebrada Uruganda, below Arenillas, on trail Huamachuco to Angasmarcha, 3500 m, *West 8159* (GH, MO); Prov. Huamachuco/Sanchez Carrión, Carretera a Huamachuco, Km 160, 3350 m, 18.12.1973, *López 8082* (HUT, MO); Prov. Sánchez Carrión, Alrededores de Laguna Cushuro (pie del nevado Huaylillas), 20.5.2001, *Sagástegui & Zapata 16480* (HAO); Caserío de Campo Bello-Dist. Mache, 2700 m, 13.9.1996, *Aredo s.n.* (30970, HUT); Santa Rosa-Chota, 3200 m, 6.12.1997, *E. Rodríguez 380* (HUT); Shitahuara (Al norte de Salpo), 3350 m, 7.1.1994, *Leiva et al. 980* (HAO, HUT); near Motil, 3800 m, *Saunders 944* (K); near Motil, 3100–3200 m, *Dillon et al. 2785* (US, F, NY, USM); Prov. Santiago de Chuco, El Vado, 3100–3300 m, 26.10.2002, *Cano et al. 12500* (USM, HAO); Los Quinuales (al Norte de Quiruvilca), 3775 m, 24.3.1994, *Leiva & Leiva 1097* (HAO); Laguna La Victoria (camino a Consuzo), 4000 m, 19.7.1966, *Aldave et al. s.n.* (6188, HUT); above Cachicadan, 2900 m, *Stork & Horton 9967* (F, K); Chota – Shorey, 3250 m, 15.11.1983, *Sagástegui et al. 11094* (HUT, NY, F); road from Otuzco to Huamachuco, *Weigend et al. 97/245* (F, USM); Huayllides, 4200 m, *Smith 2267* (MO); near Quiruvilca, 4000 m, *Saunders 951*(K); Prov. Pataz, Chigualén to Pataz, 3500 m, 10.10.1988, *Alayo 20* (HAO, NY, US); Retamas-La Paccha, 3800 m, 20.5.1961, *López & Sagástegui s.n.* (3401, HUT). Depto. **Piura**: Prov. Huancabamba, Jalca de Chinguelas, 3082 m, 19.10.2001, *Sagástegui et al. 16816* (HAO)

#### 14. *Bomarea torta* (Kunth) Herb.

Amaryllidaceae 115. 1837.

Basionym: *Alstroemeria torta* Kunth, Nova Genera et Species Plantarum 1: 283. 1815 [1816].

Type: Peru, Depto. Cajamarca, Parámo de Yanaguanga, 3000 m, *Humbolt & Bonpland s.n.* (B!).

Fig. 10B, D; distribution map: Fig. 10E.

=*B. cumbrensis* Herb. Amaryllidaceae 115. 1837.

Type: Ecuador, between Cumbre and Juna, *Jamieson s.n.* Herb. Hooker (K!).

=*B. isopetala* Kraenzl. Amaryllidaceae andinae. – Bot. Jahrb. Syst. 40: 232. 1908.

Type: Ecuador, Prov. Cuenca, *Lehmann 4609* (B, photo F!).

Fig. 53A, B; distribution 53C.

Plant twining, several meters long, or erect, about 50 cm high. Stem stiff, normally recurved at summit. Leaves linear or linear-lanceolate, stiff, 3–8 x 0.4–1.5 cm, densely nerved, glabrous or pubescent at adaxial side, margins revolute, apex acute. Inflorescence dense. Hypopodium of primary flowers 0.3–0.5 cm, epipodium 1.4–2.3 cm. Inflorescence branches 2–3-flowered. Subtending bracts of primary flowers forming an involucre. Involucre bracts similar in shape and size to upper foliage leaves, up to 5 x 2 cm, other bracts bracteose, up to 1.8 x 0.2 cm. Subtending bracts of secondary flowers bracteose, 0.5–1.2 x 0.1–0.2 cm. Flowers 2–3.5 cm long. Outer tepals oblong, pink to red, inner tepals unguiculate, yellow with a pink to red stripe

on the abaxial side, yellow with purple spots on the adaxial side. Fruit and seeds globose in shape. *B. torta* grows in north Peru inside small shrubs at altitudes between 2500 and 3500 m.

Additional note: The identification of species of the Glaucescens group may be supported by taking some additional characters into account: *B. glaucescens* and *B. vargasii* have flowers with red and yellow, *B. libertadensis* with pink and yellow, *B. porrecta* and *B. torta* with pink and green colours. *B. chimboracensis* is intermediate in combining red and green colours. The inflorescence is dense in *B. chimboracensis*, *B. glaucescens* and *B. torta*, the subtending bracts of the secondary flowers are bracteose. The bracts of the species with laxiflorous inflorescences are all frondose, i.e. green, even when they are small.

Additional material examined: PERU: Depto. **Amazonas**: Prov. Chachapoyas, Cochabamba, 2800 m, 23.7.1995, Quipuscoa & Schjellerup 209 (HUT); Depto. **Cajamarca**: Prov. Cajamarca, near Encanada, 3040 m, Dillon & Whalen 4033 (NY, MO); Prov. Chota., Chota-Bambamarca, 2600 m, 27.5.1965, López & Sagástegui s.n. (5484, HUT); Prov. Contumazá, Cascabamba, 3000 m, 27.6.1983, Sagástegui A., J. Mostacero & E. Alvítez, 10726 (HUT); Prov. Celendin, Challuayacu, 3250 m, 17.8.1984, Sagástegui et al. 12065 (HUT, NY); Prov. Celendin, La Tranca, 2800 m, 18.8.1984, Sagástegui et al. 12135 (HUT, NY); Prov. Celendin, Jalca de Gelig, 3100 m, 27.7.1985, Mostacero 914 (F, HUT); Prov. San Miguel de Pallaques, Entre ciudad de San Miguel de Pallaques y Distrito El Prado (carretera hacia el pueblo de Unión Agua Blanca), 2800 m, 7.10.2001, E. Rodríguez et al. 2459 (HUT); Above Agua Blanca, Cerro Quillon, 3320-3500 m, 14.10.2000, Weigend et al. 2000-741 (HUT); Prov. Celendin, Challuayacu (Celendin-Kumulca), 3220 m, 23.6.1995, Mostacero et al. 3714 (HUT); Depto. **La Libertad**: Prov. Bolívar, West of Bolívar, 3000 m, 9.2004, Hofreiter s.n. (40765, HUT); Prov. Otuzco, Alrededores de Chota, 2900 m, 23.9.1973, López & Sagástegui 8050 (HUT); Depto. **Piura**: Prov. Huancabamba, Subiendo al Cerro La Viuda (Distrito Sondor), 2300 m, 21.7.1975, Sagástegui et al. 8220 (HUT); Depto. **Lambayeque**: Prov. Ferreñafe, Sinchigual, Distrito Incahuasi, 2650 m, 11.9.1985, Sagástegui et al. 12759 (HUT, MO); Prov. Ferreñafe, Inkawasi, 3300 m, Llatas Quiroz 3345 (F, LZ); Prov. Ferreñafe, near Incahuasi, below Cerro Punamachy, 3300 m, Dillon & Skillman 4148 (F, NY, MO, US); Depto. **Piura**: Prov. Ayavaca, Suyupampa-Ayavaca, 2600 m, 8.9.1976, Sagástegui & Cabanillas 8665-a (HUT); Prov. Huancabamba, Cuello del Indio (Canchaque-Huancabamba), 3000 m, 2.9.1976, Sagástegui & Cabanillas 8573 (HUT); Prov. Huancabamba, Cuello del Indio (ruta Huancabamba), 2800 m, 13.9.1981, López et al. 8888 (HUT); Prov. Huancabamba, Huancabamba-Cuello del Indio, 2500 m, 15.9.1981, López et al. 8913 (HUT); Depto. **San Martín**: Prov. Mariscal Cáceres, S side of river. Chochos. NW corner of Rio Abiseo National Park; 3400 m, 7.6.1986, Young 3699 (HUT, USM); Prov. Mariscal Cáceres, Forest patch (C5) isolated above timberline. Chochos. NW corner of Rio Abiseo National Park, 3500 m, 15.7.1987, Young & León 4819 (HUT); Forest patch (C1) isolated above timberline. Chochos, 3400 m, 14.2.1986, Young 2789 (HUT); Forest patch (C5) above timberline, Chochos, 3500 m, 25.11.1985, Young 2345 (HUT); Forest patch (C17) isolated above timberline. N side of Chochos valley. NW corner of Rio Abiseo Nat. Park, 3425 m, 9.6.1986, Young, 3651 (HUT); Small forest patch (C3) above timberline, 3500 m, 24.11.1985, Chochos, Young 2490 (HUT); Forest patch (C9) above timberline, Chochos, 3425 m, 24.11.1985, Young 2582 (HUT); Small forest (C1) above timberline, Chochos, 3500 m, 25.11.1985, Young 2263 (HUT).

ECUADOR: Prov. Azuay, near Laguna Llaviucu, 3200 m, Lojtnant & Molau 14748 (MO).

n.v. «moco de shingo» (E. Rodríguez et al. 2459 (HUT), «cachurcuillo» (López et al. 8913 (HUT))

## 15. *Bomarea vargasii* Hofreiter

Feddes Repert. 114 (3-4): 208-239. 2003.

Type: Peru, Depto. Cajamarca, Prov. Contumazá, ca. 12 km south of Contumazá at the road to Cascas, 2530 m, Stein 2049 (HOLOTYPE: USM!, ISOTYPES: MO!, NY!).

Fig. 55C, D; distribution 55E.

Plant erect, up to 1 m high, or in rare cases twining up to 2 m. Stem robust, glabrous. Leaves linear or linear-lanceolate, 2-8 cm long, 0.2-1.5 cm wide. Adaxial side pubescent, yellowish-white, abaxial side glabrous. Inflorescence erect and laxiflorous, hypopodium of primary flowers 2-8 cm, epipodium 0.5-3 cm. Subtending bracts of primary flowers frondose, 2-10 cm long and 0.2-1.8 cm wide, subtending bracts of secondary flowers also frondose, glabrous, 1-6 cm long and 0.2-1.2 cm wide. Flowers ca. 2-2.5 cm long, inner tepals equal to outer ones in length, outer tepals oblong, pink on the outside, pale yellow on the inside. Inner tepals subdivided in blade and claw, yellow with a red stripe on the outside, and with dark spots. Fruit and seeds ovoid in shape. Plants of *B. vargasii* occur in valleys of north Peru in the Depts. of Ancash, Cajamarca and La Libertad. There they almost exclusively grow on steep slopes and edges of cloud forests between 2100 and 3800 m.

Additional material examined: PERU: Depto. **Ancash**: Prov. Huaylas, Auquispuquio area of ruins, 3800 m - 3900 m, Smith et al. 11922 (MO); Depto. **Cajamarca**: Prov. Contumazá, Alrededores del Pozo Kuan, 3600-3800 m, 13.6.1981, Sagástegui et al. 10056 (HUT); Prov. Contumazá, Las Altamisas (Guzmango), 3080 m, 1.5.1982, Sagástegui et al. 10390 (HUT); Alrededores de Guzmango, 2500 m, 22.5.1978, Sagástegui & Mostacero 9101 (HUT); La Herilla, Guzmango, 2850 m, 19.4.1967, Sagástegui et al. s.n. (6428, HUT); Contumazá, Arriba de Contumazá, 2700 m, 24.4.1966, Sagástegui & Fukushima s.n. (6102, HUT); Amanchaloc (Guzmango-Contumazá), 2600 m, 7.5.1965, Sagástegui & Fukushima s.n. (5147, HUT); Dto. Contumazá, around Bosque de Cachil, 2720 m, 30.4.1999, Binder et al. 1999-16 (HUT); Carretera Cascas-Contumazá, 2500 m, 27.12.1970, López & Sagástegui 7668 (HUT); Herilla, 3400 m, 31.5.1959, Sagástegui s.n. (2958, HUT); Prov. Cajamarca, ca. 11 km (air dist.) WSW of Cajamarca, 3400-3500 m, 24.3.1985, Molau et al. 1690 (HUT); Prov. San Miguel de Pallaques, Camino a Minis, Distrito Unión Agua Blanca, 2700-3000 m, 16.2.2000, E. Rodríguez et al. 2275 (HUT); Depto. **La Libertad**: Prov. Otuzco, road Otuzco - Usquil, 2150 m - 2300 m, Weigend et al. 97211b (F, MSB), Prov. Otuzco, Alrededores de Huaranchal, 2140 m, 6.2.1999, Sagástegui et al. 16117 (HAO).

## 16. *Bomarea velascoana* Vargas

Natl. Hort. Mag. 22: 130. 1943.

TYPE: PERU, Depto. Cusco, Prov. Paucartambo, Hacienda Marcachea, Escalera yoc, 3900 m, Vargas 1536 (HOLOTYPE: CUZI, ISOTYPES: FI, GH!, KI!).

Fig. 55D; 55F; distribution 55E.

Plant erect, up to 2 meters high. Stem rigid, pubescent, with increasing density of pubescence to apex, recurved at apex, around 1 cm in diameter. Leaves linear or linear lanceolate, 3-15 x 0.5-1.5 cm, towards inflorescence shorter and wider. Adaxial side pubescent, yellowish-white, or glabrous, abaxial side glabrous except for the base, or both sides pubescent or nearly glabrous. Inflorescence dense, hypopodium of primary flowers 0.5-1 cm, epipodium 1.5-3.5 cm. Subtending bracts of primary flowers frondose, 4-6 x 1.2-2.2 cm, subtending bracts of secondary flowers also frondose, 4-5 x 1.2-1.7 cm, of tertiary flowers 4-5

x 1–1,5 cm. Flowers 4–6 cm long, outer tepals oblong, outer surface red with a yellow stripe and green tip, inner surface pale yellow. Inner tepals cuneately tapered to base, yellow with a red stripe on outer surface and with a green tip. Inner tepals 0,5–1,5 cm shorter than outer ones. Fruit and seeds ovoid. *B. velascoana* is distributed in valleys from the Cordillera Vilcabamba in the north to the Cordillera Apolobamba in the South. It almost exclusively grows on the windward side on steep slopes and between rocks at altitudes between 3500 and 4500 m.

**Note:** *B. velascoana* occurs in Bolivia just south of the border to Peru.

Additional material examined: PERU: Depto. **Cusco**, Prov: Quispicanchis, Quinsacuchu, 4050 m, *Vargas 13440* (CUZ); above Marcapata, 3900 m – 4000 m, *Vargas 3759* (CUZ); above Marcapata, 3900 m – 4000 m, *Hofreiter 2CB3* (MSB).

BOLIVIA: Depto. LA PAZ: Prov. Franz Tamayo, Ulla Ulla, Cordillera Apolobamba, Pelechuco, 3500 m, *Holt 30* (LPB).

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## Appendix 1

*Alstroemeria* and *Bomarea* species of Peru and their synonyms (accepted names bold printed, number in brackets refers to the species number in this publication).

Species:	genus / subgenus:
<i>Alstroemeria chorillensis</i> Herb. = <i>A. lineatiflora</i>	<i>Alstroemeria</i>
<b><i>A. lineatiflora</i></b> Ruiz & Pavón	<i>Alstroemeria</i> (1).
<i>A. pavoniana</i> Beauverd = <i>B. involucrosa</i>	<i>Wichuraea</i>
<b><i>A. pygmaea</i></b> Herb.	<i>Alstroemeria</i> (2).
<b><i>Bomarea albimontana</i></b> Smith & Gereau	<i>Wichuraea</i> (1).
<b><i>B. alstroemeroides</i></b> Hofreiter & E. Rodr.	<i>Bomarea</i> s.str. (1).
<b><i>B. amazonica</i></b> Hofreiter & E. Rodr.	<i>Bomarea</i> s.str. (2)
<b><i>B. ampayesana</i></b> Vargas	<i>Wichuraea</i> (2).
<i>B. amoena</i> (Herb.) M. Roemer = <i>B. ovata</i>	<i>Bomarea</i> s.str.
<i>B. anceps</i> (Ruiz & Pavón) Herb. = unclear, type lost	<i>Bomarea</i> s.str.
<b><i>B. andimarcana</i></b> (Herb.) Baker	<i>Wichuraea</i> (3).
<b><i>B. angulata</i></b> Benth.	<i>Bomarea</i> s.str. (3).
<i>B. angustifolia</i> Benth. = <i>B. angulata</i>	<i>Bomarea</i> s.str.
<b><i>B. angustissima</i></b> Killip	<i>Bomarea</i> s.str. (4).
<b><i>B. aurantiaca</i></b> Herb.	<i>Bomarea</i> s.str. (5).
<i>B. ayavacensis</i> Kraenzl. = <i>B. tribrachiata</i>	<i>Bomarea</i> s.str.
<i>B. biflora</i> Vargas = <i>B. dulcis</i>	<i>Wichuraea</i>
<b><i>B. boliviensis</i></b> Baker	<i>Bomarea</i> s.str. (6).
<i>B. brachypus</i> Kraenzl. = <i>B. pardina</i>	<i>Bomarea</i> s.str.
<b><i>B. brachysepala</i></b> Benth.	<i>Sphaerine</i> (1).
<b><i>B. bracteata</i></b> (Ruiz & Pavón) Herb.	<i>Wichuraea</i> (4).
<b><i>B. brevis</i></b> (Herb.) Baker	<i>Sphaerine</i> (2).
<i>B. bridgesiana</i> Beauverd = <i>B. andimarcana</i>	<i>Wichuraea</i>
<i>B. calcensis</i> Vargas = <i>B. dulcis</i>	<i>Wichuraea</i>
<i>B. calyculata</i> Kraenzl. = <i>B. angulata</i>	<i>Bomarea</i> s.str.
<b><i>B. campanularia</i></b> Harling & Neuendorf	<i>Bomarea</i> s.str. (7).
<i>B. campanuliflora</i> Killip = <i>B. dulcis</i>	<i>Wichuraea</i>
<b><i>B. campylophylla</i></b> Killip	<i>Bomarea</i> s.str. (8).
<i>B. caudate</i> Killip = <i>B. cornuta</i>	<i>Bomarea</i> s.str.
<i>B. cerrateae</i> Vargas = <i>B. parvifolia</i>	<i>Wichuraea</i>
<b><i>B. chaparensis</i></b> Hofr.	<i>Bomarea</i> s.str. (9).
<i>B. chontalensis</i> Seemann = <i>B. obovata</i>	<i>Bomarea</i> s.str.
<b><i>B. coccinea</i></b> (Ruiz & Pavón) Baker	<i>Sphaerine</i> (3).
<b><i>B. cordifolia</i></b> (Ruiz & Pavón) Herb.	<i>Bomarea</i> s.str. (10).
<b><i>B. cornigera</i></b> Herb.	<i>Bomarea</i> s.str. (11).
<b><i>B. cornuta</i></b> Herb.	<i>Bomarea</i> s.str. (12).
<b><i>B. crassifolia</i></b> Baker	<i>Bomarea</i> s.str.; <i>B. setacea</i> complex (1).
<b><i>B. crinita</i></b> Herb.	<i>Bomarea</i> s.str. (13).
<b><i>B. crocea</i></b> (Ruiz & Pavón) Herb.	<i>Bomarea</i> s.str.; <i>B. setacea</i> complex (2).
<i>B. cruenta</i> Kraenzl. = <i>B. endotrachys</i>	<i>Bomarea</i> s.str.
<i>B. cumbrensis</i> Herb. = <i>B. torta</i>	<i>Wichuraea</i>
<i>B. cuzcoensis</i> Vargas = <i>B. dulcis</i>	<i>Wichuraea</i>
<i>B. declinata</i> (Poepp. & Endl.) Klotzsch ex Kunth = <i>B. dispar</i>	<i>Bomarea</i> s.str.
<i>B. densifolia</i> Vargas = <i>B. andimarcana</i>	<i>Wichuraea</i>
<b><i>B. densiflora</i></b> Herb.	<i>Bomarea</i> s.str. (14).
<b><i>B. denticulata</i></b> (Ruiz & Pavón) Herb.	<i>Bomarea</i> s.str. (15).
<b><i>B. dispar</i></b> Herb.	<i>Bomarea</i> s.str. (16).
<b><i>B. dissitifolia</i></b> Baker	<i>Bomarea</i> s.str. (17).
<b><i>B. distichifolia</i></b> (Ruiz & Pavón) Baker	<i>Sphaerine</i> (4).
<b><i>B. dolichocarpa</i></b> Killip	<i>Bomarea</i> s.str. (18).
<b><i>B. dulcis</i></b> (Hook.) Beauverd	<i>Wichuraea</i> (5).
<b><i>B. endotrachys</i></b> Kraenzl.	<i>Bomarea</i> s.str.; <i>B. setacea</i> complex (3).
<b><i>B. engleriana</i></b> Kraenzl.	<i>Wichuraea</i> (6).
<i>B. falcata</i> Sodiro = <i>B. pardina</i>	<i>Bomarea</i> s.str.
<i>B. flava</i> Baker = <i>B. boliviensis</i>	<i>Bomarea</i> s.str.
<i>B. ferreyrae</i> Vargas, unclear, type not located	<i>Bomarea</i> s.str.
<i>B. filicaulis</i> Kraenzl. = <i>B. secundifolia</i>	<i>Sphaerine</i>
<i>B. fimbriata</i> (Ruiz & Pavón) Herb. = <i>B. rosea</i>	<i>Bomarea</i> s.str.

(continue...)

Species:	genus / subgenus:
<b><i>B. formosissima</i></b> (Ruiz & Pavón) Herb.	<i>Bomarea</i> s.str. (19).
<b><i>B. fortheriana</i></b> Hofreiter	<i>Sphaerine</i> (5).
<b><i>B. glaucescens</i></b> (H.B.K.) Baker	<i>Wichuraea</i> (7).
<i>B. glomerata</i> Herb. = <i>B. setacea</i>	<i>Bomarea</i> s.str.
<b><i>B. goniocaulon</i></b> Baker	<i>Bomarea</i> s.str. (20).
<i>B. gracilis</i> Sodiro = <i>B. uncifolia</i>	<i>Bomarea</i> s.str.
<i>B. grandiceps</i> Kraenzl. = <i>B. pardina</i>	<i>Bomarea</i> s.str.
<b><i>B. hartwegii</i></b> Baker	<i>Bomarea</i> s.str. (21).
<b><i>B. herrerae</i></b> Vargas	<i>Bomarea</i> s.str. (22).
<i>B. hookeriana</i> Herb. = <i>B. densiflora</i>	<i>Bomarea</i> s.str.
<b><i>B. huanuco</i></b> Hofreiter	<i>Sphaerine</i> (6).
<b><i>B. involucrosa</i></b> (Herb.) Baker	<i>Wichuraea</i> (8).
<i>B. isopetala</i> Kraenzl. = <i>B. torta</i>	<i>Wichuraea</i>
<i>B. klugii</i> Killip = <i>B. dolichocarpa</i>	<i>Bomarea</i> s.str.
<i>B. killipii</i> Vargas = <i>B. dolichocarpa</i>	<i>Bomarea</i> s.str.
<b><i>B. latifolia</i></b> (Ruiz & Pavón) Herb.	<i>Bomarea</i> s.str. (23).
<b><i>B. libertadensis</i></b> Hofreiter & E. Rodr.	<i>Wichuraea</i> (9).
<i>B. lobbiana</i> Kraenzl. = <i>B. uncifolia</i>	<i>Bomarea</i> s.str.
<b><i>B. longistyla</i></b> Vargas	<i>Wichuraea</i> (10).
<b><i>B. lopezii</i></b> Hofreiter & E. Rodr.	<i>Bomarea</i> s.str. (24).
<i>B. loreti</i> Kraenzl. = <i>B. pardina</i>	<i>Bomarea</i> s.str.
<i>B. lyncina</i> Herb. = <i>B. pardina</i>	<i>Bomarea</i> s.str.
<i>B. macleanica</i> Herb. = <i>B. aurantiaca</i>	<i>Bomarea</i> s.str.
<b><i>B. macusani</i></b> Hofreiter & E. Rodr.	<i>Bomarea</i> s.str. (25).
<i>B. macranthera</i> Kraenzl. = <i>B. setacea</i>	<i>Bomarea</i> s.str.
<i>B. macrocarpa</i> (Ruiz & Pavón) Herb. = <i>B. ovata</i>	<i>Bomarea</i> s.str.
<i>B. maculata</i> Killip ex Vargas = <i>B. involucrosa</i>	<i>Wichuraea</i>
<b><i>B. multiples</i></b> Benth.	<i>Bomarea</i> s.str. (26).
<b><i>B. nematocaulon</i></b> Killip	<i>Bomarea</i> s.str. (27).
<b><i>B. nervosa</i></b> (Herb.) Baker	<i>Sphaerine</i> (7).
<b><i>B. obovata</i></b> Herb.	<i>Bomarea</i> s.str. (28).
<b><i>B. ovata</i></b> (Cav.) Mirb.	<i>Bomarea</i> s.str. (29).
<b><i>B. pardina</i></b> Herb.	<i>Bomarea</i> s.str. (30).
<b><i>B. parvifolia</i></b> Baker	<i>Wichuraea</i> (11).
<i>B. petrea</i> Kraenzl. = <i>B. dulcis</i>	<i>Wichuraea</i>
<b><i>B. peruviana</i></b> Hofreiter	<i>Wichuraea</i> (12).
<i>B. phyllostachya</i> Masters ex Baker = <i>B. dulcis</i>	<i>Wichuraea</i>
<i>B. pillawantense</i> Vargas = <i>B. speciosa</i>	<i>Bomarea</i> s.str.
<i>B. platypetala</i> Benth. = <i>B. uncifolia</i>	<i>Bomarea</i> s.str.
<i>B. podopetala</i> Baker = <i>B. brachysepala</i>	<i>Sphaerine</i>
<i>B. polygonatoides</i> Baker = <i>B. distichifolia</i>	<i>Sphaerine</i>
<i>B. polyphylla</i> Kraenzl. = <i>B. ovata</i>	<i>Bomarea</i> s.str.
<i>B. porphyrophila</i> Kraenzl. = <i>B. densiflora</i>	<i>Bomarea</i> s.str.
<b><i>B. porrecta</i></b> Killip	<i>Wichuraea</i> (13).
<i>B. prausta</i> Kraenzl. = <i>B. parvifolia</i>	<i>Wichuraea</i>
<b><i>B. pseudopurpurea</i></b> Hofreiter & E. Rodr.	<i>Bomarea</i> s.str. (31).
<i>B. puberula</i> (Herb.) Kraenzl. ex Perkins = <i>B. dulcis</i>	<i>Wichuraea</i>
<i>B. pulchella</i> Sodiro = <i>B. pardina</i>	<i>Bomarea</i> s.str.
<i>B. punctata</i> Herb. = <i>B. ovata</i>	<i>Bomarea</i> s.str.
<b><i>B. pumila</i></b> Grisebach ex Baker	<i>Sphaerine</i> (8).
<b><i>B. purpurea</i></b> (Ruiz & Pavón) Herb.	<i>Bomarea</i> s.str.; <i>B. setacea</i> complex (4).
<i>B. recurva</i> Baker = <i>B. brevis</i>	<i>Sphaerine</i>
<b><i>B. rosea</i></b> (Ruiz & Pavón) Herb.	<i>Bomarea</i> s.str. (32).
<i>B. sanguinae</i> Kraenzl. = <i>B. formosissima</i>	<i>Bomarea</i> s.str.
<i>B. sclerophylla</i> Kraenzl. = <i>B. endotrachys</i>	<i>Bomarea</i> s.str.
<b><i>B. secundifolia</i></b> (Ruiz & Pavón) Baker	<i>Sphaerine</i> (9).
<b><i>B. setacea</i></b> (Ruiz & Pavón) Herb.	<i>Bomarea</i> s.str.; <i>B. setacea</i> complex (5).
<i>B. simplex</i> Kraenzl. = <i>B. ovata</i>	<i>Bomarea</i> s.str.
<b><i>B. speciosa</i></b> Killip	<i>Bomarea</i> s.str. (33).
<i>B. squamulosa</i> Kraenzl. = <i>B. nervosa</i>	<i>Sphaerine</i>
<i>B. sternbergiflora</i> Kraenzl. = <i>B. obovata</i>	<i>Bomarea</i> s.str.
<i>B. stricta</i> Kraenzl. = <i>B. porrecta</i>	<i>Wichuraea</i>
<i>B. stuebelii</i> Pax = <i>B. goniocaulon</i>	<i>Bomarea</i> s.str.

(continue...)



Species:	genus / subgenus:
<i>B. subglobosa</i> Herb. = <i>B. formosissima</i>	<i>Bomarea</i> s.str.
<i>B. subsessilis</i> Kilip = <i>B. ovata</i>	<i>Bomarea</i> s.str.
<i>B. subspicata</i> Sodiro = <i>B. densiflora</i>	<i>Bomarea</i> s.str.
<i>B. subtriflora</i> Sodiro = <i>B. obovata</i>	<i>Bomarea</i> s.str.
<i>B. sulphuræ</i> Kraenzl. = <i>B. superba</i>	<i>Bomarea</i> s.str.
<b><i>B. superba</i></b> Herb.	<i>Bomarea</i> s.str. (34).
<i>B. tacnaense</i> Vargas = <i>B. dulcis</i>	<i>Wichuraea</i>
<b><i>B. tarmensis</i></b> Kraenzl.	<i>Bomarea</i> s.str. (35).
<i>B. tomentosa</i> (Ruiz & Pavón) Herb. = <i>B. ovata</i>	<i>Bomarea</i> s.str.
<i>B. torquipes</i> Kraenzl. = <i>B. dulcis</i>	<i>Wichuraea</i>
<i>B. trachypetala</i> Kraenzl. = <i>B. aurantiaca</i>	<i>Bomarea</i> s.str.
<b><i>B. tribrachiata</i></b> Kraenzl.	<i>Bomarea</i> s.str. (36).
<b><i>B. torta</i></b> (H.B.K.) Herb.	<i>Wichuraea</i> (14).
<i>B. ulei</i> Kraenzl. = <i>B. dispar</i>	<i>Bomarea</i> s.str.
<b><i>B. uncifolia</i></b> Herb.	<i>Bomarea</i> s.str. (37).
<i>B. uniflora</i> (M. Roemer) Killip = <i>B. dulcis</i>	<i>Wichuraea</i>
<b><i>B. vargasii</i></b> Hofreiter	<i>Wichuraea</i> (15).
<b><i>B. velascoana</i></b> Vargas	<i>Wichuraea</i> (16).
<i>B. variabilis</i> Herb. = <i>B. ovata</i>	<i>Bomarea</i> s.str.
<i>B. venusta</i> Sodiro = <i>B. pardina</i>	<i>Bomarea</i> s.str.
<i>B. weberbaueri</i> Kraenzl. = <i>B. aurantiaca</i>	<i>Bomarea</i> s.str.
<b><i>B. weigendii</i></b> Hofreiter & E. Rodr.	<i>Bomarea</i> s.str. (38).
<i>B. zosterifolia</i> Killip = <i>B. dulcis</i>	<i>Wichuraea</i>
<i>Collania guadelupensis</i> Kraenzl. = <i>B. dulcis</i>	<i>Wichuraea</i>
<i>C. herzogiana</i> Kraenzl. = <i>B. dulcis</i>	<i>Wichuraea</i>
<i>C. petraea</i> (Kraenzl.) Kraenzl. = <i>B. dulcis</i>	<i>Wichuraea</i>
<i>Wichuraea acicularis</i> M. Roemer = <i>B. dulcis</i>	<i>Wichuraea</i>
<i>W. parvifolia</i> (Herb.) M. Roemer = <i>B. dulcis</i>	<i>Wichuraea</i>

