The Alstroemeriaceae in Peru and neighbouring areas
Alstroemeriaceae en Perú y áreas vecinas

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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 Wichuraea. 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. lopexii, B. macusanii, B. pseudopurpurea, B. weigendii.

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

Introduction

The Alstroemeriaceae recently comprise two genera: Alstroemeria (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 Iridiaceae.

A Istroemeria 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. A Istroemeria 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 Bomarea 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); Baxata, 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 Alstroemeriaeae especially in Peru

Feuillée (1714) discovered the first species of Bomarea and A. istoernea in Chile. He described them as H. ecoreaalis. Limné (1762) described them formally in the Planta Alströmeria and named them A. istoernea ligtu, A. pelgrina and A. salsilla. The first Peruvian species was described by Cavanilles (1791) as A. istoernea ova (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 (1802) described 19 new species in their Flora of Chile and Peru. The type collection contains an erect and a climbing species. 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 (Dept. Junin), Muna (Dept. Huánuco) and Pillao (Huánuco). All these collection sites are in the Cordillera Central. From Huassa-Huassi Ruiz & Pavón described 4 different species, two of them are known in Bomarea s.str. (B. anopla and B. roane), one in Sphaerine (B. coccina) 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. seuntifolia). Bomarea seuntifolia 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 A purmac in the south, in central Peru he was in Ayacucho, Huánuco, Pasco and Huanayo. 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 A istoernea species for Peru (A. pygmaea).


<table>
<thead>
<tr>
<th>Alstroemeria</th>
<th>Bomarea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>10</td>
</tr>
<tr>
<td>Bolivia</td>
<td>1</td>
</tr>
<tr>
<td>Brazil</td>
<td>39</td>
</tr>
<tr>
<td>Chile</td>
<td>33</td>
</tr>
<tr>
<td>Colombia</td>
<td>0</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>0</td>
</tr>
<tr>
<td>Ecuador</td>
<td>0</td>
</tr>
<tr>
<td>Greater Antilles</td>
<td>0</td>
</tr>
<tr>
<td>Guatemala</td>
<td>0</td>
</tr>
<tr>
<td>Guianas</td>
<td>1</td>
</tr>
<tr>
<td>Honduras</td>
<td>0</td>
</tr>
<tr>
<td>Mexico</td>
<td>0</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>0</td>
</tr>
<tr>
<td>Panama</td>
<td>0</td>
</tr>
<tr>
<td>Paraguay</td>
<td>1</td>
</tr>
<tr>
<td>Peru</td>
<td>2</td>
</tr>
<tr>
<td>Uruguay</td>
<td>1</td>
</tr>
<tr>
<td>Venezuela</td>
<td>1</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Year of publication</th>
<th>Author</th>
<th>Genera/subgenera description</th>
<th>Valid status of group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1762</td>
<td>Linné, C.</td>
<td>Genus Alstroemia; type: A. pelegrina L.</td>
<td>Genus A. Alstroemia</td>
</tr>
<tr>
<td>1804</td>
<td>Mirbel, C. F. B.</td>
<td>Genus Bomarea; type: B. ovata (Cav.) Mirb.</td>
<td>Genus Bomarea</td>
</tr>
<tr>
<td>1812</td>
<td>Salisbury, G.</td>
<td>Genus Vandasia; type: B. edulis (Tussac.) Herb.</td>
<td>Synonym of Bomarea</td>
</tr>
<tr>
<td>1836</td>
<td>Adanson, M.</td>
<td>Genus Ligut; type: A. ligut L.</td>
<td>Synonym of Alstroemia</td>
</tr>
<tr>
<td>1837</td>
<td>Herbert, W.</td>
<td>Genus Sphaerine; type: B. distichifolia (Herb.) Baker</td>
<td>Subgenera Sphaerine of Bomarea</td>
</tr>
<tr>
<td>1837</td>
<td>Herbert, W.</td>
<td>Genus Collania; type: B. involucrosa (Herb.) Baker</td>
<td>Subgenera Wichuraea of Bomarea</td>
</tr>
<tr>
<td>1838</td>
<td>Rafinesque, C. S.</td>
<td>Genus Piripoptatum; type: A. palida Grah.</td>
<td>Synonym of Alstroemia</td>
</tr>
<tr>
<td>1838</td>
<td>Rafinesque, C. S.</td>
<td>Genus Lilavia; type: A. psittacina Leh.</td>
<td>Synonym of Alstroemia</td>
</tr>
<tr>
<td>1838</td>
<td>Rafinesque, C. S.</td>
<td>Dodecasperma; type: B. acutifolia (Link &amp; Otto) Herb.</td>
<td>Synonym of Bomarea</td>
</tr>
<tr>
<td>1847</td>
<td>Roemer, M.</td>
<td>Genus Wichuraea; type: B. involucrosa (Herb.) Baker</td>
<td>Subgenera Wichuraea of Bomarea</td>
</tr>
<tr>
<td>1866</td>
<td>Salisbury, G.</td>
<td>Danbya; type: B. distichifolia</td>
<td>Synonym of Bomarea</td>
</tr>
<tr>
<td>2002</td>
<td>Hofreiter, A.</td>
<td>Subgenera Baccata of Bomarea; type: B. allenii Killip</td>
<td>Subgenera Baccata of Bomarea</td>
</tr>
</tbody>
</table>

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 Urena R. R.). 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: E ubomarea, Sphaerine and Wichuraea, the latter he named incorrectly Wichuraea. He accepted 64 species for Peru: 39 in E ubomarea, 7 in Sphaerine and 12 in Wichuraea, in A istroemia 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 Peruvaria Alstroemeriaceae see table 3.

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

**Alstroemia and Bomarea**

In the study area the two genera can be easily distinguished. Only two species of A. istroemia occur (Fig. 19). One species (A. lineatiflora), is a typical member of the Chilean group of A. istroemia, 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: A. istroemia 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. A. istroemia 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 A. istroemia and Bomarea. But there exist some less obvious differences as well. The basic chromosome number in A. istroemia is x = 8 and in Bomarea s.str. x = 9 (Whyte, 1929; Sato, 1938; Bayer, 1988; Hunziker & Xifreda, 1990). Some examinations in subgenus Wichuraea (B. dulcis, B. gaucoens) and in subgenus Sphaerine (B. distichifolia, B. brevis) have confirmed this number, so that x = 13 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. A. istroemia 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 A. istroemia 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 is not enlarged compared to central cylinder of the slender nutritive roots. This has been observed in five further species of A. istroemia (A. lineatiflora Ruiz & Pav., A. psittacina Lehmann, A. pelegrina L., A. ligut L. and A. pygmaea Herb.). In Bomareas 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 A. istroemia and Bomarea.
Phylogeny of the Alstroemeriae

The genera of the Alstroemeriae 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 Lililiorae 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 hypogyny 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. They also speculated about possible relations between the

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

<table>
<thead>
<tr>
<th>Year of publication</th>
<th>Author of species</th>
<th>Accepted species</th>
</tr>
</thead>
<tbody>
<tr>
<td>1791</td>
<td>Cavánilles, A. J.</td>
<td>B. ovata</td>
</tr>
<tr>
<td>1802</td>
<td>Ruiz, H. and Pavón, J.</td>
<td>A. lineatiflora, B. bracteata, B. coccinea, B. cordifolia, B. crocea, B. denticulata, B. distichifolia, B. formosissima, B. latifolia, B. purpurea, B. rosea, B. secundifolia, B. setacea</td>
</tr>
<tr>
<td>1815</td>
<td>Kunth, C. S.</td>
<td>B. glaucescens, B. torta</td>
</tr>
<tr>
<td>1831</td>
<td>Hooker, W. J.</td>
<td>B. dulcis</td>
</tr>
<tr>
<td>1837</td>
<td>Herbert, W.</td>
<td>A. pygmaea, B. andimarcana, B. aurantiaca, B. brevis, B. cornigera, B. cornuta, B. cinerea, B. densiflora, B. dispar, B. involucrosa, B. nervosa, B. obovata, B. pardinia, B. superba</td>
</tr>
<tr>
<td>1842</td>
<td>Herbert, W.</td>
<td>B. uncinifolia</td>
</tr>
<tr>
<td>1845</td>
<td>Bentham, G.</td>
<td>B. angulata, B. brachsepala, B. multipes</td>
</tr>
<tr>
<td>1882</td>
<td>Baker, J. G.</td>
<td>B. dissitifolia, B. goniocaulon, B. hartwegii</td>
</tr>
<tr>
<td>1888</td>
<td>Baker, J. G.</td>
<td>B. crassifolia, B. parvifolia, B. pumila</td>
</tr>
<tr>
<td>1902</td>
<td>Baker, J. G.</td>
<td>B. boliviensis</td>
</tr>
<tr>
<td>1908</td>
<td>Kränzlin, F.</td>
<td>B. endotrichys, B. engleriana, B. tarmensis, B. tribrachiata</td>
</tr>
<tr>
<td>1932</td>
<td>Killip, E. P.</td>
<td>B. angustissima, B. nematoaulon, B. speciosa</td>
</tr>
<tr>
<td>1935</td>
<td>Killip, E. P.</td>
<td>B. campylophylla, B. dolichocarpa</td>
</tr>
<tr>
<td>1936</td>
<td>Killip, E. P.</td>
<td>B. porrecta</td>
</tr>
<tr>
<td>1943</td>
<td>Vargas, C.</td>
<td>B. ampanyesana, B. velascoana</td>
</tr>
<tr>
<td>1945</td>
<td>Vargas, C.</td>
<td>B. harræae</td>
</tr>
<tr>
<td>1965</td>
<td>Vargas, C.</td>
<td>B. longistylæ</td>
</tr>
<tr>
<td>1991</td>
<td>Smith, N. D. and Gereau, E. R.</td>
<td>B. albimontana</td>
</tr>
<tr>
<td>2003</td>
<td>Hofreiter, A.</td>
<td>B. vergusii</td>
</tr>
<tr>
<td>2003</td>
<td>Harling, G and Neuendorf, M</td>
<td>B. canpanuliflora</td>
</tr>
<tr>
<td>2004</td>
<td>Hofreiter, A.</td>
<td>B. peruviana</td>
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<tr>
<td>2004</td>
<td>Hofreiter, A. and Rodriguez, E.</td>
<td>B. alstroemoides</td>
</tr>
<tr>
<td>2005</td>
<td>Hofreiter, A.</td>
<td>B. chaparensis, B. foertheriana, B. huanuco</td>
</tr>
<tr>
<td>This publication</td>
<td>Hofreiter, A and Rodriguez, E</td>
<td>B. amazonica, B. libertadensis, B. iopezii, B. macusani, B. pseudopurpurea, B. wegendii</td>
</tr>
</tbody>
</table>

*Denotes branches with 50-80% support; +Denotes branches with <50% support

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

- Corsiacae
- Astroemeriacae
- Luzuriagiacae
- *Uvulariacae*
- *Colchicum* etc.
- Campynemataceae
- Melanlaciaceae
- Philesiaceae
- Smilacaceae
- *Calochortus* etc.
- *Lilium* etc.

http://www.mobot.org/MOBOT/Research/APweb/orders/lilialesweb.htm
Figure 2. (A) *B. pardina* (photo G. Lewis); (B) *B. superba* (photo H. Förther); (C) *B. weigendii*; (D) *B. formosissima*; (E) *B. macusani*. 

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*. 

http://sisbib.unmsm.edu.pe/BVRevistas/biologia/biologiaNEW.htm
Astroemeriaeae and Philesiaeae. The Philesiaeae were part of their Asparagales. Their Philesiaeae contain beside the Lagenaria and Philesia,Behnia and L. luzuriaga, with some doubts they add D rymphila, E ustarphus and G etnoplasm. D'ahlgren et al. (1985) placed the Astroemeriaeae again near the Liliales. G oldblatt (1995) placed in his cladistic analysis the orders Liliales and Melanthiales sensu D'ahlgren near his Liliales/Chicoriaeae, his Uvulariaeae and the Campynemataeae. Rudall et al. (1997, 2000) placed them in their analyses besides the Luzuriagaeae and the Colchicaeae. The Colchicaeae also contains in their work the genera Uvularia and Petromania. It was a combined analysis of morphologic and molecular dates. For the molecular dates they used rbcL and trnL-F. In the work of Chase et al. (2000) about the phylogeny of the Monocots are the Astroemeriaeae sister group to the Colchicaeae, no Luzuriaga or D rymphila species were examined. The Astroemeriaeae and the Luzuriagaceae are sister groups in the work of Vinnersten & Bremer (2001) about the Liliales. Luzuriagaceae contains the genera Luzuriaga and D rymphila. Vinnersten & Bremer (2001) examined 40 genera. Their Colchicaeae, Luzuriagaceae-, Astroemeriaeae-clade is the sister group to all the other families of the Liliales. This second clade contains the 4 families Campynemataeae, Liliaeae, Melanthicaeae and Smilicaeae. The next relatives of a Astroemeriaeae are the Luzuriagaceae and the Colchicaeae (Fig. 18).

**Astroemeria L.**

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

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

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


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 epigean 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 thyrse, 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 spathulate 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 spathulate tepals have a flat base. The stamens are free, the filaments straight or curved, the anthers yellow or grey-blue. The ovary is inferior, trilocular with axial placentation, without septal nectaries. The fruit is a dehiscent explosive capsule.

**Bomarea Mirbel**

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


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

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


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


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


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

![Figure 6](https://example.com/image.png)

**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*. 

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**Repository Details:**

- **Repository:** Dataset
- **Title:** Revising Peruvian Flora
- **Accession:** 1005 - 069 (octubre 2006)

**DOI:** [10.15447/rev.peru.biol.13.1.005](https://doi.org/10.15447/rev.peru.biol.13.1.005)
Plants herbaceous, rhizomatous, erect or twining perennials with root tubers, terrestrial, occasionally epiphytic. The vegetative part of the epigean 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 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 or semi-inferior, trilocular or rarely unilocular with axial placentation, without septal nectaries. The tepals are shed after blooming, when they are fresh and still have colour. Inner tepals differentiated in blade and claw. Inflorescence an umbel or a thyrse. The species of subgenus can be arranged into 3 groups:

- **Short description of the subgenera of *Bomarea***

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

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


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

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


  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. Planzenfam. 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 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. oxine* 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 of this group are *B. brevis*, *B. distichifolia*, *B. foertheriana*, *B. huanuco*, *B. nervosa* and *B. soundifolia* 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.


  Section Wichuraea Pax in: Engler & Prantl. (Hrsg.): Nat. Planzenfam. 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 thyrs, 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. anguliana, B. porrecta, B. puviana 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. elindmarana, B. bracteata, B. dulcis, B. involucrosa, B. parvifolia and B. longistyla are found, in the Cordillera Oriental B. amayesana, B. andimarana, 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 Alstroemeriaceae: 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 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**

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

<table>
<thead>
<tr>
<th>Caracter / grupo</th>
<th>Alstroemeria</th>
<th>Bomarea s.str.</th>
<th>Sphaerine</th>
<th>Wichuraea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posición del ovario</td>
<td>Infero</td>
<td>Infero</td>
<td>Infero</td>
<td>Semi-infero</td>
</tr>
<tr>
<td>Fruto</td>
<td>Seco,</td>
<td>Coriáceo, con cápsula con dehiscencia lenta.</td>
<td>Baya, indehiscente.</td>
<td>Coriáceo, cápsula con dehiscencia lenta.</td>
</tr>
<tr>
<td>Tegumento de la semilla</td>
<td>Seco, marrón</td>
<td>Sarco testa carnosa, roja o anaranjada.</td>
<td>Sarco testa delgada, gris-blanquecina.</td>
<td>Sarco testa carnosa, roja.</td>
</tr>
<tr>
<td>Tépalos</td>
<td>Deciduos</td>
<td>Generalmente deciduos</td>
<td>Deciduos</td>
<td>Persistentes en el fruto maduro.</td>
</tr>
<tr>
<td>Nectarios</td>
<td>Tépalo interno más bajo sin nectario funcional</td>
<td>Tépalo interno más bajo sin nectario funcional</td>
<td>Tépalo interno más bajo con nectario funcional</td>
<td>Tépalo interno más bajo generalmente con nectario funcional</td>
</tr>
<tr>
<td>Polinización</td>
<td>Generalmente insectos</td>
<td>Generalmente colíbries</td>
<td>Colíbries / insectos</td>
<td>Colíbries</td>
</tr>
<tr>
<td>Hábitat</td>
<td>En terrenos abiertos.</td>
<td>Mayordoma en bosques y sus márgenes.</td>
<td>En bosque de neblina.</td>
<td>Puna / Jalca</td>
</tr>
</tbody>
</table>

http://sisbib.unmsm.edu.pe/BVRevistas/biologia/biologiaNEW.htm
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) thyrs with foliage subtending leaves; (B) thyrs with small bracts; (C) umbel with prophylls; (D) umbel. a= Hypododium, b= epipodium.

Leaf morphology. Fig. 13-16. The adaxial surface of the leaf means always the side facing the shoot in normal orientation. This surface is still called adaxial when the leaf is resupinated. The leaves are always simple. In most species only the adaxial surface bears stomata. In some species both leaf surfaces are resupinated, this is a very variable character, in some species it varies within one population (B. andimaranana, B. dulcis, B. invulcans or also A. lineatiflora) and in the shadow of the fog forests growing species of the subgenus 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. In Bomarea and A. formosissima 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.

Inflorescence morphology. Fig. 8. The inflorescence is a polytelic thyrs with a mostly shortened main axis, which can be reduced to an umbel. The partial inflorescences are monoachasic cymes. The branching occurs at the prophyll. The Multiflora group in Bomarea s.str. and the Distichifolia group in Sphaerine always have an umbel, even in very strong specimens. In some species a umbel can contain more than 80 flowers (B. superba, B. formosissima). In the groups where normal strong specimens have a thyrs they can be reduced to an umbel. A. formosissima has a thyrs 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. stacta). 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. astromerioides, 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.

**Outer tepals.** 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. váscoana). 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 A. 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.

**Androceum.** 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 latrorsly, the filaments are pseudobasifix, and the connective has a bag which is pointing to the inner side where at
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 A. Istroemia. The length of the filaments is variable within one flower in some species (z. B. andamaniana). 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. oratafolia (Neuendorf 1977) and B. pardinia (Schulze, 1978)). The A. Istroemia species have a striate reticulate pollen surface (Sanso & Xifreda, 2001).

Gynoeceum. The ovary is conoekarb, triolocular, unilocular in B. ovallei, inferior or semi-inferior in the subgenera Wichuraea. The other Bomarea species and the A. Istroemia species have an inferior ovary. The ovary has very prominent nerves in A. Istroemia. No species has nectaries on the ovary.

Fruits. Fig 7b. All A. Istroemia 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 placenta. The indehiscent fruits are triolocular 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. A. Istroemia species have a dry seed coat. The indehiscent Bomarea species have a weekly 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 abaxial side of the leaves, the spongy mesophyll parenchyma is always on the adaxial side, of those examined so far. The abaxial epidermis is more strongly developed in most species. In most species the adaxial 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 abaxial side often is clearly more strongly developed than on the adaxial side. Epicuticular wax can be found on both sides of the leaf, but if present it is denser on the adaxial side. So the abaxial side is the functional lower leaf side. The epidermal cells are on the adaxial 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-vascular 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 one 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 rizodermis followed by a single-layered exodermis. The cortex contains irregularly arranged cells with starch grains. The cortex cells of the innermost layers have thick lignified cell walls. The endodermis 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 A. Istroemia 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 A. Istroemia 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. distichidifolia) confirmed x= 9 for Bomarea.

Description of the study areas


1. Amotape-Huancaamba-region. The low mountains are covered with dense fog forest, and a very wet puna called Jala 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 Huancaamba 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 Chana. 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) = 200 m; (B), (C) = 100 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 m; (B), (C), (F) = 100 m; (D), (E) = 50 m.

Figure 13. Leaf surface of subgenus *Bomarea* (*B. setacea*), adaxial side. Scale bars: (A) = 600 m; (B) = 200 m; (C) = 100 m.
Figure 14. Leaf surface of subgenus Bomarea (B. ovata), adaxial side. Scale bars: (A) = 400 m; (B), (C) = 100 m.

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

Figure 16. Leaf surface of subgenus Wichuraea (B. andimarcana); (A), (C) and (D) adaxial side; (B) abaxial side. Scale bars: (A), (B) = 400 m; (C) = 200 m; (D) = 270 m.

Figure 17. Leaf surface, microhairs and epicuticular wax; (A) abaxial side of B. distichifolia; (B) adaxial side with microhairs; (C) abaxial side of B. andimarcana with wax platelets; (D) abaxial side of B. formosissima; (E) adaxial side of B. andimarcana; (F) adaxial side of B. cordifolia. Scale bars: (A) = 180 m; (B) = 75 m; (C), (D), (E), (F) = 40 m.
of the West Cordillera is the 400 km long Cordillera Blanca with several peaks of above 6000 m. The highest peak is the Nevado Huascaran 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 Vulkans’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. distichofila occurs, associated to relict fog forests in the most northern parts.

No Alstroemaria species is found in the Amotape-Huancabamba-region.

No Bomarea and A stroemaria species are found on the dry and hot bed of the Maranon valley and on the very dry western mountainside of the Cordillera O ccidental between 800 and 2000 m. The subgenera are differently distributed over both areas (Cordillera O ccidental 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 O ccidental only one species of Bomarea s.str. (B. ovata) occurs. The subgenus Wichuraea shows a different picture. In the Cordillera O ccidental seven species occur compared to 4 in the Cordillera Central. In the Cordillera O ccidental four species are endemic compared to one in the Cordillera Central. The two regions have only 4 species (A. pygmaea, B. andimaranana, B. dulcis and B. ovata) in common, in spite of the long common border. In the lomas two species can be found: A. linatifolia 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. linatifolia 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. bardina from southern Colombia to Central Peru, B. doliocarpa 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 they 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. bolivianis and B. ovata) occur. B. bolivianis 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 Wichuraea 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 zygomorphic or plant small and flowers actinomorphic

A stroemaria

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 actinomorficas

A stroemaria

1' Fruto una cápsula coriácea, lentamente dehiscente o una baya (carnoso); plantas erectas o trepadoras, flores zigomorfas o actinomórficas

Bomarea

For an alphabetic list of all A stroemaria 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 zigomórficas; centro y sur de Perú
   A. lineatiflora
1’ Plantas pequeñas y flores actinomórficas; desde el centro de Perú hasta Argentina
   A. pygmaea

1. Alstroemeria lineatiflora Ruiz & Pav.

Type: Peru, Depto. Arequipa, Pongo near Camaná, Ruiz & Pavón s.n. (MA).
Type: Peru, collected 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 foliages 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 tepal is slightly dissimilar to each other, the lower inner tepal is smaller with fewer brown spots. 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. chorisillas, A. ligata, A. pêgerina, A. pygmaea, A. reembns and A. violaça) species for Peru. A. lineatiflora Killip & Pavón is erroneously only mentioned as a synonym of A. chorillensis Herb., but A. lineatiflora is described 1802 and therefore the older name. A. chorillensis has a type from Peru according to Killip (1936). Mclean sent a rhizome from Lima to London; probably A. chorillensis is a synonym of A. lineatiflora R&P. A. lineatiflora is described 1802 and therefore the older name. A. chorillensis has a type from Peru according to Killip (1936). Mclean sent a rhizome from Lima to London; probably A. chorillensis is a synonym of A. lineatiflora R&P. A. lineatiflora is described 1802 and therefore the older name. A. lineatiflora is a synonym of A. lineatiflora. A. chorillensis is a 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, HAQ, F); Prov. Huaylas, Dist. 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. Caraveli, Lomas, ca. 15 m, Ferreyra 6370 (USM); Atico, 100 – 150 m, Ferreyra 12002 (USM); Depto. Lima, Barranca, Cerro Paccac, 350 m, Carpo 507 (USM); Prov. Chachani, 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. Melgaréjo S. s.n. (40360, HUT). Depto. Moquegua: Lomas de llo, 200 – 300 m, Ferreyra 11607 (USM), Depto. Tacna, Prov. Tacna, Morro Sama, 600 m, Ferreyra 12566 (USM).

2. Alstroemeria pygmaea (H. A. & A. W. S.) A. Mathews

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 in central and southern Peru at altitudes around 3500 m.

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


Bomarea

Key to the subgenera (for Peru)
1 Ovary semi-inferior
   Widuran
1’ Ovary inferior
   2

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.

2 Fruit dehiscent, leathery
2’ Fruit indehiscent, fleshy

Subgenus Bomarea

Key to the species:

1 Ovario semiínfero
1’ Ovario ínfero 2

2 Ovario semiínfero
2’ Ovario ínfero 2

Clave para los subgéneros (para Perú)

1 Ovario semiínfero
2 Ovario ínfero

Subgenus Bomarea

Key to the species:

1 Outer tepals cornate 2
1’ Outer tepals not cornate 5

2 Adaxially densely pubescent; in central Peru 3
2’ Adaxially weakly pubescent or glabrous 4

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 thyrse
5’ Inflorescence an umbel 6

6 Inner tepals excising outer ones at least 0,5 cm 7
6’ Inner and outer tepals equal to 9

7 Flowers 4-5 cm, pedicels 10-15 cm, north Peru
7’ Flowers 2-3,5 cm, pedicels 4-12 cm 8

8 Pedicels more than 8 cm long; distributed in Peru, Depto. Ayacucho 8’ Pedicels not longer than 6 cm, Bolivia
8’ Pedicels not longer than 6 cm, Bolivia

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

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 11’ Outer tepals without dark spots, inner tepals yellow 14
13’ Inner tepals without dark spots, outer tepals yellow 14

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

15 Lower most bracts large up to 3 x1,5 cm, forming a conspicuous involucrum
15’ All bracts small up to 2,5 x 0,3 cm, sometimes one or two larger, but never forming a involucrum

16 Leaves completely glabrous and nerves loose, Ecuador and northern Peru 16’ Leaves pubescent, or with very prominent hairs

17 Flowers and inflorescence pendant, red with dark spots, northern Peru
17’ Flowers nodding, inflorescence erect or nodding, yellow to orange with dark spots or other colours without dark spots, Peru

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.

18 Leaves adaxially with very prominent and dense nerves, without hairs or very short ones or pubescent B. setacea complex (5 species see additional key)

18' Leaves adaxially without very prominent nerves, densely pubescent

19 Flowers very dark purble, inner tepals without dark spots 22

19' Flowers orange or yellow, inner tepals with dark spots 23

22 Flowers red, tepal plate round, growing suberect, Ecuador, north Peru B. hartwegii

22' Flowers dark purple, twining, Central Peru, Depto. Huanuco B. pseudopurpurea

23 Leaves denticulate, flowers yellow with short pedicels; central Peru B. denticulata

23' Leaves not denticulate, flowers orange with longer pedicels; Amotape-Huacabamba-region B. densiflora

24 Lower inner tepal, significant smaller than other two ones, Altiplano B. boliviensis

24' Inner tepals nearly equal, the lower one sometimes slightly smaller

25 Inflorescence dense, hypopodium 0.1 - 0.8 cm, relation of hypopodium to epipodium at least 1 : 5 26

25' Inflorescence laxiflorus, hypopodium 1 - 20 cm, relation hypopodium to epipodium at least 1 : 1 33

26 Flowers campanulate, outer tepals cuculate; Ecuador and northern Peru B. ampanularia

26' Flowers funnel shaped, outer tepals oblong

27 Inner tepals exceeding outer ones 0.5 cm, inner tepals white with dark spots; Ecuador, Peru B. pardina

27' Inner tepals not exceeding outer ones, inner tepals not white

28 Flowers orange or red; from central Peru to Bolivia 29

28' Flowers pink and green 30

29 Inner tepals spotted, weakly pubescent B. herrerae

29' Inner tepals not spotted, conspicuous dense pubescent B. aurantiaca

30 Leaves large up to 20 x 8 cm, restricted to the lomas of southern Peru B. latifolia

30' Leaves smaller up to 16 x 4 cm

31 Flowers small 2 -3,5 cm long

31' Flowers large 4-5 cm long; Ecuador to central Peru B. goniocaulon

32 Outer tepals broad oblong, flowers 2-2.5 cm, Ecuador B. undulata

32' Outer tepals oblong, flowers 2,5-3,5 cm; Ecuador to north Peru B. angulata

33 Flowers campanulate, outer tepals cuculate B. obovata

33' Flowers funnel shaped, outer tepals oblong

34 Bracts green, similar to the foliage leaves

34' Bracts reddish, scale like

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 B. tribrachiata

35' Bracts of the secondary flowers conspicuous smaller than if the primary flowers

36 Hypopodium 10-20 cm, flowers 1,5-3,5 cm; Ecuador, Peru B. dolichocarpa

36' Hypopodium 1-3 cm, flowers 1-1,8 cm; Peru B. nematocaulon

37 Outer tepals spotted, fruit elongated B. duidroarpa

37' Outer tepals unspotted, fruit turbinate

38 Bracts large similar to the normal leaves B. campylophylla

38' Bracts significant smaller to the normal leaves B. angustissima

39 Inner tepals exceeding outer ones 0.7-1 cm; Peru

39' Inner tepals equal to outer ones 41

40 Inner tepals 3,5-5 cm B. multipes
43 Flowers 2.5–3.5 cm, leaves adaxially densely pubescent; central Peru to Bolivia

42 Flowers horizontally, zygomorphic, at least 3, mostly 4–5 per cyme; B. ovata

42 Flowers pendent, actinomorphic, mostly 2 per cyme, seldom 3; Peru, Bolivia and Argentina

41 Hypopodium 1–4 (-5) cm

41 Hypopodium (5-) 8–25 cm

Clave para las especies

1 Tépalos externos con un cuerno (5-)

1 Tépalos internos sin un cuerno

2 Hojas adaxialmente pubescentes, distribuidas en el Centro del Perú

2 Hojas adaxialmente ligeramente pubescentes o glabras

3 Hojas ampliamente ovadas, tépalos externos rosados; B. cordifolia

3 Hojas lanceoladas, tépalos externos rojos con un ápice verde; B. lopatii

4 Cuerno 3–6 mm, tépalos externos angostamente oblongos; de Ecuador y Perú

4 Cuerno 1–2 mm, tépalos externos ampliamente oblongos; norte hasta el centro del Perú

5 Inflorescencia un tisro

5 Inflorescencia una umbela

6 Tépalos internos excediendo a los externos al menos en 0.5 cm

6 Tépalos internos y externos de igual tamaño

7 Flores 4–5 cm, pedicelos 10–15 cm; norte del Perú

7 Flores 2–3.5 cm, pedicelos 4–12 cm

8 Pedicelos más de 8 cm de largo; distribuido en el Perú, Dpto. Ayacucho

8 Pedicelos no más largos de 6 cm; Bolivia

9 Tépalos externos rosados, tépalos internos con un ápice verde

9 Tépalos externos rojos, anaranjados o amarillos, tépalos internos sin un ápice verde

10 Pétalos internos con puntos oscuros lineares, inflorescencia siempre una umbela; centro del Perú

10 Pétalos internos con puntos oscuros redondos; Bolivia

11 Flores muy abiertas; en Amotape-Huancabamba

11 Flores infundibuliformes

11 Flores grandes 3.5–5 cm

12 Flores pequeñas 1.5–3 cm

13 Tépalos internos con puntos oscuros, tépalos externos rojos; del centro de Perú y Bolivia

13 Tépalos internos sin puntos oscuros, tépalos externos amarillos

14 Planta conspicuamente pubescente, flores 3.5–4 cm; del centro de Perú a Bolivia

14 Planta casi glabra, flores 5 cm; norte del Perú

15 Brácteas mas bajas grandes hasta 3 x 1.5 cm, formando un conspícuo involucro

15 Todas las brácteas pequeñas hasta 2.5 x 0.3 cm, algunas veces una o dos mas grandes, pero nunca formando un involucro

16 Hojas completamente glabras y nervaduras laxas; Ecuador y norte de Perú

16 Hojas pubescentes, o con muy prominentes pelos

17 Flores e inflorescencias colgantes, rojas con puntos oscuros, norte de Perú

17 Flores colgantes, inflorescencias erecta o colgantes, amarillas a amarronadas con puntos oscuros u otros colores sin puntos oscuros, Perú

18 Hojas adaxialmente con nervaduras muy prominentes, sin pelos, con pelos cortos o pubescentes

18 Hojas adaxialmente sin nervaduras muy prominentes, densamente pubescentes

19 Flores muy purpura oscuro, tépalos internos sin puntos oscuros

20 Flores anaranjadas o amarillas, tépalos internos con puntos oscuros

20 Flores rojas, tepalo con lámina redondeada, suberecto; Ecuador y norte de Perú

20 Flores purpura oscuro, enredadera; centro del Perú, Dpto. Huánuco

21 Flores denticuladas, flores Amarillas con cortos pedicelos; centro del Perú

21 Flores muy púrpura oscuro, tepalo interno más pequeño que los otros dos; Altiplano

21 Flores internos casi iguales, tépalo interno mas bajo algunas veces ligeramente más pequeño

22 Inflorescencia densiflora, hipopodio 0,1–0,8 cm, relación entre hipopodio a epipodio al menos 1:5

22 Inflorescencia laxiflora, hipopodio 1–20 cm, relación hipopodio a epipodio al menos 1:1

23 Flores campaniformes, tépalos externos más grandes con puntos oscuros; Ecuador

23 Flores campaniformes, tépalos externos oblongos

24 Tépalos internos excediendo a los externos 0.5 cm, tépalos internos con puntos oscuros u otros colores sin puntos oscuros

24 Tépalos internos casi iguales, tépalo interno mas bajo algunas veces ligeramente más pequeño

25 Inflorescencia densiflora, hipopodio 0,1–0,8 cm, relación entre hipopodio a epipodio al menos 1:5

25 Inflorescencia laxiflora, hipopodio 1–20 cm, relación hipopodio a epipodio al menos 1:1

26 Flores campaniformes, tépalos externos cumulados, norte del Perú

26 Flores infundibuliformes, tépalos externos oblongos

27 Tépalos internos excediendo a los externos 0.5 cm, tépalos internos blancos con puntos oscuros

28 Flores rojas, tépalo con lámina redondeada, suberecto; Ecuador y norte de Perú

28 Flores anaranjadas o amarillas, tépalos internos con puntos oscuros

29 Flores muy púrpura oscuro, tépalos internos sin puntos oscuros

29 Flores rosadas y verdes

30 Flores anaranjadas o rojas; desde el centro del Perú hasta Bolivia

30 Flores campaniformes

31 Flores pequeñas hasta 16 x 4 cm

31 Flores pequeñas 2–3.5 cm largo

32 Tépalos externos oblongos, flores 2,5–3.5 cm; Ecuador

32 Tépalos externos oblongos, flores 2,5–3.5 cm; Bolivia

33 Hojas grandes hasta 20 x 8 cm; restringida a las lomas del sur del Perú

33 Hojas más pequeñas hasta 16 x 4 cm

34 Flores anaranjadas o rojas; desde el centro del Perú hasta Bolivia

34 Flores amarillas con largos pedicelos

35 Flores amarillas con cortos pedicelos; centro de Perú y Bolivia

35 Flores dolorosas con largos pedicelos

36 Flores campaniformes, tépalos externos amarillos

36 Flores campaniformes, tépalos externos blancos

37 Flores campaniformes, tépalos externos soldados

37 Flores campaniformes, tépalos externos soldados

38 Flores amarillas con largos pedicelos

38 Flores amarillas con cortos pedicelos

39 Flores campaniformes, tépalos externos rojos

39 Flores campaniformes, tépalos externos rojos

http://sisbib.unmsm.edu.pe/BVRevistas/biologia/biologiaNEW.htm
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, B. nematocaulon
36 Hipopodio 10–20 cm, flores 1,5–3,5 cm; Ecuador, Perú, B. dispers
36' Hipopodio 1–3 cm, flores 1–1,8 cm; Perú, B. samataculon
37 Tépalos externos punteados, fruto elongado, B. dolichoarpa
38 Tépalos internos excediendo a los externos 0,7–1 cm; Perú, B. campylophylla
38' Tépalos internos igualando a los externos, B. angustissima
39 Flores píndulas, actinomorfas, mayormente 2 por cima, raramente 3; Perú, Bolivia y Argentina, B. ovata
39' Flores orientadas horizontalmente, cymoformas, al menos 3, mayormente 4–5 por cima; desde el centro de Perú a Bolivia, B. tarmensis
40 Flores 2,5–3,5 cm, hojas con cara adaxial densamente pubescente; centro del Perú, B. nifidii
40' 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


Type: Peru, Depto. Amazonas, Prov. Leymebamba, near the Laguna de Los Cóndores, primary forest, 2550-2600 m, 31.01.1999, Eric Rodriguez 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 & Rodriguez (2004).

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

Additional material examined: PERU: 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 speiebus affinis insignis caule spiraliter scandente, pubescente, foliis lateovatis, abaxialibus glabris, adaxialibus pubescentibus, umbella pendula, pediolis 3–6 cm longis, floribus actinomorphis, 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 to ovate, 3–15 x 2–6 cm. A daxial 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, pediculoso, 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 fog forests at altitudes between 2300 and 3200 m.

Note: Bomarea angustissima is very similar to B. goniocaulon. The main character to separate the two species is the size of the flowers 2.4 cm in B. angustissima; 5–6 cm in B. goniocaulon.

Additional material examined: PERU: Depto. Amazonas, Prov. Bongará, near Pomacocha, 2300–2700 m, 19.06.1962, Wurdack 910 (holotype: NY; isotype: F!).

Fig. 22A; distribution 22B.

Plant twining, stem robust, several metres long, up to 0.5 cm in diameter, not recurved at apex, pubescent. Leaves lanceolate to ovate, 3–10 x 1–4 cm. A daxial side of leaves pubescent, s.str. species. Rarely flowering shoots bear only scales comparable to B. nervosa.


Pl. Hartw. 156. 1845.

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

=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. A daxial 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 smaller, 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.

B. angulata grows in northern Peru and southern Ecuador in small shrubs and fog forests at altitudes between 2300 and 3200 m.

Note: Bomarea angustissima is very similar to B. goniocaulon. The main character to separate the two species is the size of the flowers 2.4 cm in B. angustissima; 5–6 cm in B. goniocaulon.

Additional material examined: PERU: Depto. Amazonas, Prov. Bongará, near Pomacocha, 2300–2700 m, 19.06.1962, Wurdack 910 (holotype: NY; isotype: F!).

Fig. 22A; distribution 22B.

Plant twining, stem robust, several metres long, up to 0.5 cm in diameter, not recurved at apex, glabrous. Leaves lanceolate to ovate, 3–10 x 1–4 cm. A daxial side of leaves pubescent, abaxial side glabrous. Inflorescence a thyrse, hypopodium of primary flowers 0.1–0.5 cm, epipodium 2–4 cm. Bracts of primary flowers 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.

B. angulata grows in northern Peru and southern Ecuador in small shrubs and fog forests at altitudes between 2300 and 3200 m.

Note: Bomarea angustissima is very similar to B. goniocaulon. The main character to separate the two species is the size of the flowers 2.4 cm in B. angustissima; 5–6 cm in B. goniocaulon.

Additional material examined: only known so far from the type collection.
5. **Bomarea aurantiaca**

_Amaryllidaceae_ 399. 1837.

Type: Peru, Depto. Junin, Vitoc, _Maclean s.n._ (K).

= _B. macleanica_ Herb., _Bot._ Reg. 28: Misc. 66. 1842.

Type: Peru, Depto. Junin, Vitoc, _Maclean s.n._ (K).


Type: Bolivia, _Bang_ 1936 (B, M, US).  


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 thyrse, 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, Choirmacota 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); Prov. 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 Huarua 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); Prov. Nor Yungas, Unduavi, 3200 m, _Buchtien_ 103 (G, GH); Prov. Nor Yungas, Unduavi, 3200 m, _Buchtien_ 103 (G, GH).  

6. **Bomarea boliviensis** Baker


TYPE: BOLIVIA, near La Paz, 3300 m, _Rusby_ 563 (GH).  

Fig. 4C, D; distribution 4E.


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, resupinat, adaxial side pubescent or glabrous, abaxial side glabrous. Inflorescence an erect thyrse, hypopodium of primary flowers 0.5–4 cm, pubescent or glabrous, epipodium 0.5–3 cm, pubescent or glabrous. Subtending leaves of primary flowers
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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); Dept. La Paz: Prov. Murillo, south of Calacoto, 3300 – 3600 m, Solomon 6654 (LPB); Dept. Potosi, entre Betangos y Retiro, 3200 m, Ceballos et al. 296 (G).

7. Bomarea campanularia Harl. & Neuendorf

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 pendant, 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 Palambla, 1500-1600 m, Ferreyra 10844 (USM).

8. Bomarea campylophylla Killip

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 slightly shorter than inner tepals, fruit globose 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.
Note: see *B. angustissima.*

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

9. *Bomarea chaparensis* Hofreiter


TYPE: BOLIVIA, Dep. Cochabamba, Prov. Chapare, 2200 m, Incachaca, Steinbach 8897 (HOLOTYPE: BI, ISOTYPES: BM!, E!, KL, 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.

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) = 4 cm; (C) = 2 cm.

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. diapenesis* 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 F!, 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 laxiflorus, 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 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, stem robust, glabrous or pubescent, around 0,3 cm in diameter. Leaves linear or linear-lanceolate, 5 – 14 x 1 – 3 cm wide. A dactylic and abaxial side of leaves glabrous. Inflorescence laxiflorus, 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); Chilpes, 8 km south of Vitoc, 1420 – 1700 m, *Gentry et al. 40161* (MO).

### 12. *Bomarea cornuta* Herb.

**Amaryllidaceae 114. 1837.**

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


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

**Fig. 26A, B; distribution 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. A dactylic and abaxial side of leaves glabrous. Inflorescence laxiflorus, 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, white with a pink stripe on the outside and a green tip. Fruit triangular, and seeds globose in shape with a red to orange sarcotesta.

*B. cornuta* grows in northern and central Peru in valleys and in small shrubs at altitudes between 1000 and 1800 m.

**Note:** *B. cornuta* is very similar to *B. cornigera*. 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); Chilpes, 8 km south of Vitoc, 1420 – 1700 m, *Gentry et al. 40161* (MO).
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-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).


Amaryllidaceae 399. 1837.
Type: Peru, Depto. Amazonas, Mathews 1667 (K).
=B. hookeriana Herb., Amaryllidaceae 398. 1837.
Type: Peru, Chachapoyas, Mathews s.n. (K).
Type: Ecuador, Cuenca, Pichul, Yerba Buena, 3000 m, Lehmanna 299.
Type: Ecuador, Prov. Bolivar, 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. A daxial 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 of 2200 and 3500 m.

Note: B. densiflora 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.

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. A daxial 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 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 Huarimaca, 18.03.1997, Sagástegui et al. 16002 (F); road Chota-Tacabamba, 2800 m, 2800 m, 19.02.1983, Smith & Vásquez 3564 (F, MO); Prov. Santa Cruz, Bosque de Monteseco, 1600 m, Leiva & Lezama 929 (F); Prov. San Miguel, Nipeos, camino a Llanganuco, 2500 m, 1.11.1985, Llatas 1569 (F); near Quelllahorco, Tongot, 2550 m, 14.09.1991, Sánchez & Briones 5781 (F); above Agua Blanca, Cerro Guion, 3330-3500 m, 14.10.2000, Weigend et al. 2000/737 (HUT, MSB); Prov. San Miguel de Pallaquis, 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 Huarimaca) Llama-Huambos, 3000 m, 18.3.1997, Sagástegui et al. 16002 (HAO); Depto. Lambayeque: Prov. Ferreyra, Bosques de Chimagama, 2500-2600 m, 23.05.1988, Cano 2116 (MO); Depto. Piura, Prov. Ayavaca, 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); Palambla-Turmalina, 2500 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.


Type: Peru, Depto. Huánuco, Patasaria, *Alstroemeria* 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 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 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, Ferreyra 1210 (USM); Lima-Tingo Maria road, Km 450 – 454, 2600 m, Maas et al. 4616 (MO); Huánuco-Tingo Maria, Carpish, 2350 – 2430 m, Plowman & Runf (F, NY); Carpish, 3000 m, Sandeman 3485 (K).

16. **Bomarea dispar** Herb.

Amaryllidaceae 115. 1837.

-B. dispar* (Ruiz & Pav.) Herb. =

**Fig. 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.**

Additional material examined: PERU: Depto. Huánuco: Carpish, 2800 – 2900 m, Ferreyra 1210 (USM); Lima-Tingo Maria road, Km 450 – 454, 2600 m, Maas et al. 4616 (MO); Huánuco-Tingo Maria, Carpish, 2350 – 2430 m, Plowman & Runf (F, NY); Carpish, 3000 m, Sandeman 3485 (K).
Type: Peru, Depto. Loreto [San Martin], 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 thyrse, 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 Martin: 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.


18. Bomarea dolichocarpa Killip

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

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

Type: Peru, Depto. Casco, Prov. Convención, Pintobamba, 2800 m, Vargas 3493 (CUZ!).

Fig. 30A, B; distribution 30C.

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 very laxiflorus
thyrse 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 a 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. dulcis. 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 María, 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 Abajo, Quebrada Shesa, 250 m, Gentry & Diaz 36386 (MO); Prov. Cornejo Portillo, Yarinacocha, Pucallpa, 130 m, 10.8.1975, Sagástegui & Aldave s.n. (5663, HUT); Depto. Cusco: 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)


Amaryllidaceae 111. 1837.
Type: Peru, Muña, Ruiz & Pavón s.n. (BM!, MA, photo MO!, MO!).
= B. fimbriata var. paltarumensis Herb., Amaryllidaceae 116. 1837.
Type: Peru, Paltarum, Matthews 867 [KI, photo MI].
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 1–1.5 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, hills of Escalarayoc, 3400 m, Vargas et al. 11105 (F); Prov. Paucartambo, Pillahuata, 2600 m, Nunez et al. 11105 (NY); Prov. Paucartambo, Accanaco, 4000 m, Balls 6775 (K); Prov. Urubamba, Machucipichu, 4150 m, Nunez et al. 13812 (MO); Prov. Urubamba, near Wenner gren run, 3400 – 3600 m, Metcalf 30761 (GH, MO); Prov. Quispicanchis, near Marcapata, 3120 m, Wasshausen & Encarnación 768 (K); Prov. Convencion, Cordillera Vilcabamba, Yupanqui to Rio Apurimac, 3500 m, Davis et al. 1223 (F); Prov. Quispicanchis, near Marcapata, 3120 m, Wasshausen & Encar- nación 768 (K); Depto. Puno: Prov. Sandia, Limbani Canyon, 3000 – 3600 m, Vargas 3665 (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, 3000 m, Mordon 1202 (G); Prov. Murillo, Valle del Rio Zongo, 3400 m, Solomon 17261 (MO); Prov. Murillo, upper valle de Zongo, 2800 m, Solomon 5261 (MO); Prov. Nor Yungas, Urdauvi to Yolosa, 3100 m, Solomon 4912 (MO); Prov. Sur Yungas, Urdauvi, 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

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

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

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

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, resupinated; 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. gonioaulon grows in the central cordillera of Central Peru on the windward in fog forests at altitudes between 2000 and 2800 m.

Note: B. gonioaulon 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 Pallalaques, alrededores El Tingo, Dist. Unión Agua Blanca, 2930 m, 9.2.2000, Alvarez et al. 1059 (HUT, F, M); El Tingo, Dist. Unión Agua Blanca, 3200 m, 17.2.2000, E. Rodriguez et al. 2316 (HUT, F, M); Prov. Contumazá, Jaica 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. 1448 (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-Espino 26 (HUT); Depto. Pasco: Prov. Oxpampampa, La Suiza to San Gotardo, 2100 – 2650 m, Smith 4110 (NY, MO, USM); Prov. Oxpampamba, 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. A 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 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 spots.

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 the 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


Type: Peru, Depto. Cusco, Prov. Paucartambo, Tres Cruces, 3400 –3600 m, Vargas 2258 (HOLOTYPE CUZ!, 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 thyrse, hypopodium of primary flowers 0,1–1 cm, epipodium 2–3 cm. Bracts of primary flowers bracteose 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.


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 resupinated, ovate, 10–16 x 4–8 cm. A daxiale side of leaves slightly pubescent, abaxial side glabrous. Inflorescence a thyrse, 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 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 species is known so far only from the type collection.


Inter speciebus affinibus insignis caule spiraliter scandente, pubescen-te, foliis lanceolatis, axilis tetradermis, adaxialiter pubescentis vel subglabris, floribus in thyrso aggregatis, hypopodio 4–10 cm longo, epipodio 2–5 cm longo, floribus adnormorphis, (2) 3–4 cm longis, segmentis perianthii aequalibus longitudine, tepalis externis oblongis connotis, amello-aurtiacis vel rubris cum apice verde, tepalis internis spatulate-unguiculatis, flavido-aurtiacis, ovariis 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. A daxial side of leaves pubescent to nearly glabrous, yellowish-white, abaxial side glabrous. Inflorescence a thyrse, 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. Puno, Prov. Macusani, road from Macusani to Viru, 500 m, 3.9.1949, Viru, 550 m, 15.9.1986, Sagastegui et al. s.n. (HUT); Guzmango-Cruz Grande, 2700 m, 30.9.1976, B. lopezii. B. lopezii grows in the lomas of Arequipa.


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.
Inter speciebus affinibus insignis caule spiraliter scandente, glabro, foliis elipticis, utrimque glabris, umbella erecta, pedicellis 2 cm longis, bracts form an involucrum, floribus zygomorphis, 2 – 2,5 cm longis, segmentis perianthii aequalibus, tepalis exteris oblongis, rubris, tepalis internis spatulato-unguiculatis, flavido-rubribus. 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 involucrum, 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. mansani is easily recognised by it's conspicuously involucrum. The most similar species in the region are B. staax 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).


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. multipes grows in the western cordillera of northern Peru in relict fog forests at altitudes between 2000 and 2800 m.

Note: B. multipes and B. goniocaulon can be distinguished by
the colour of the inner tepals; with small dark spots in B. multiplex, not in B. gnioides. The species is illustrated in Harling & Neuenfeld (2003).


27. Bomarea nematocaulon Killip


Type: Peru, Depto. Huánuco, Playapampa, Killip 4870 (FI).
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, resupinated; 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 long, inner tepals equaling outer ones in length, all tepals nearly closed flowers and cucullate outer tepals. Additional specimen examined: Ecuador: Prov. Los Rios, Rio Palenque, 200 m, Gentry et al. 54749 (MO); Quevedo Canton, Cerro Centinalia, 650 m, Tipaz & quellea 661 (MO); Prov. Pichincha, Santa Domingo – Puerto Limón road, 100 m, Kvist 40651 (AAU); Prov. Cotopaxi, Teneuferte, km 55 Quevedo – Latacunga, 850 – 1000 m, Dodson et al. 14391 (MO); Prov. Esmeraldas, Rio Zapallo, 200 m, Bartol 41039 (MO).

Note: The shape of the flowers is very similar to B. amaranthulosa. 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 2700 and 15 cm; B. amaranthulosa 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 Centinalia, 650 m, Tipaz & quellea 661 (MO); Prov. Pichincha, Santa Domingo – Puerto Limón road, 100 m, Kvist 40651 (AAU); Prov. Cotopaxi, Teneuferte, km 55 Quevedo – Latacunga, 850 – 1000 m, Dodson et al. 14391 (MO); Prov. Esmeraldas, Rio Zapallo, 200 m, Bartol 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 BMI, Fl).
=B. amoena (Herb.) M. Roem., Syn. Ensat. 274. 1847.

Basionym: B. purpuraea var. amoena Herb. Amarnyl. 399, 1837.

Type: Peru, Chachapoyas, 1835, Matthews 874 (K).
=B. marccarpia (Ruiz & Pavón) Herb., Amaryllidaceae 114. 1837.


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


Type: Bolivia, Yungas, Bang 593 (BMD, E!, GHI, MO!)


Type: Peru, Matthews s.n. (K).
=B. simplex Herb. Amaryllidaceae 119. 1837.

Type: Peru, Matthews 786 (K, EI, NY).


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

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


Type: Peru, Matthews 866 (K).


Type: Bolivia, Depto. Huánuco, Muña, Ruiz & Pavón s.n. (BMD, 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 resupinated, ovate or lanceolate-ovate, 3–8 x 0.5–4 cm, towards inflorescence leaves becoming wider. A daxiale side of leaves pubescent, abaxial side glabrous or completely glabrous. Inflorescence a laxiflorous thyse 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...
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. lopazi.

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: Sajawahuan, 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 Scurcabamba, 2800 – 2900 m, Tovar 1815 (USM); Depto. HUÁNUCO: Acomayo, 2100 m, Woytkowski 34007 (F, MO); Pillao, 2700 m, Woytkowski 34133 (F); Prov. Huánuco, Acomayo, Ridout s.n. (USM); Depto. Lambayeque: Entre Beaita 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 2332 (HUT); Prov. Bolívar, alrededores de Longotes, 2500 m, 27.5.1960, López & Sagástegui s.n. (3166, HUT); Prov. Huamachuco-Sánchez Carrón, hacienda Yanazara, 2500 m, 26.3.1961; Pinillos s.n. (3655, HUT); Prov. Otuzco, alrededores de El Horcón (ruta Sanme), 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 Espinoza-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: Larecaja, Sorata, 2600 – 2700 m, Mandon 1201 (BM, G); Depto. La Paz: Larecaja, 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, Patacacha, 1800 m, Hall 19 (K!).
Type: Ecuador, Prov. Pichincha, near Tamboloma, Sodiro 176/15? (B!).

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

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

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

=B. lyncina Herb., Amaryllidaceae 398. 1837.
Type: Peru, Zambabamba, Mathews 1668 (K!).


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

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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, 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 coastal desert of Peru and in drier parts of cordilleras of Peru, Bolivia and northern Argentina.
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. eratophora an endemic plant of Ecuador.

Additional material examined: PERU: Depto. Cajamarca, Prov. San Ignacio, Distrito San Jose de Lourdes: Región Nororiental del Marañón (RENOM), Caserio Santo Tomás, 2270 m, 31.10.1995. E. Rodríguez 686 (HUT, MO); Depto. Junín: 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 Plicopata 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 caule spiraliter scandente, foliis lanceolato ovatis vel ovatis, abaxialiter glabris, adaxialiter pubescente, umbella subpendula, pedicellis 1-3 cm longis, floribus zygomorphis, 1.8-2.4 cm longis, segmentis perianthii aequalibus longitudine, tepalis externis oblongis, nigro-purpureis, tepalis internis spathulato-unguiculatis, 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. A daxial 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. Huanuco, 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.


Type: Peru, Huassahuassi, Ruiz & Pavón s.n. (MA, photo) = B. limbrata (Ruiz & Pavón) Herb., Amaryllidaceae 116, 1837.


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

Additional material examined: PERU: Depto. Junin: Yaupi, 1800 m, Woytkowski 6669 (MO); Depto. Huánuco: Muña, 2300 m, Macbride 3711 (F; US!).
33. Bomarea speciosa Killip

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. Adaxial side of leaves pubescent, mostly on the nerves or glabrous, abaxial side glabrous. Inflorescence an erect laxiflorous thyrs, 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.
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, Freynay 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 superb*a Herb.

Amaryllidaceae 117. 1837.

Type: Peru, Mathews 1663 (K!).


Type: Peru, Depto. Cajamarca, Prov. Huiligayoc, 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. 4.5–5.5 cm long, inner tepals equal to outer ones in length or up to 0.5 cm longer, outer tepals oblone, yellow. Inner tepals subdivided in blade and claw, yellow. *B. superb*a grows in the Amotape Huancabamba–region in hedges and fog forests at altitudes between 2200 and 3000 m.

Note: *B. superb*a 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 *Bomarea* (*B. europhylla*, *B. lutea*, *B. patacocensis* 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 & Miranda 6315 (MO); Camino al Parque Nacional San Andrés, 2050 m, 25.5.1965, Lópeze Sagástegui s.n. (5446, HUT); San Andrés, 2100 m, Llatas Quiroz 1524 (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, Alvitez 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); Airededores El Tingo (Agua Blanca), 2950 m, 5.7.1986, Mostacero et al. 1317 (HUT); Depto. San Martin: Prov. Huallaga, Distrito: Saposoa, 3400-3600 m, 24.8.2001, Quipuscoa & Vilchez 2622 (HUT).

35. *Bomarea tarmensis*Kraenzl.


Type: Peru, Depto. Junín, 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 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.
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 Convención, Kiteni, 667 m, Nunez et al. 10095 (MO); Depto. Huánuco: Prov. Huánuco, Cucharas, cerca de Tingo Maria, 500 m, Woykowski 1120 (USM); Prov. Tingo Maria, Quebrada Las Pitas, 650 – 750 m, Weigend & Dostert 97/101 (MSB); Depto. Junín: Chanchamayo, road to San Vicente, 980 m, Stein & Todiza 2550 (NY, MO); Paucartambo to La Merced, Chanchamayo valley, 800 m, Gentry et al. 39819 (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 tribrachiata Kraenzl.


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


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. tribrachiata* 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. tribrachiata* has shorter inner tepals which is a rare characteristic 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.
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).
Type: Ecuador, Prov. Imbabura, near Ibarra, Sodiro 55/28 (Q, US fragm.).
Type: Peru, Lobb s.n. (W destroyed, photo F!, K!)

Plant twining, stem robust, several metres long, up to 0,2 cm 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 thyrse, 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, Sigis to Gualaceqia, 2800-3000 m, Harling et al 8273 (GB); Prov. Morona-Santiago, Gualaceqia-El Limon 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: M!).

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

Inter speciebus affinis insignis caule spiraliter scandente, glabro, foliis ellipticis, utrimque glabris, umbella pendente, pedicellis 12 cm longis,
floribus actinomorphicis, 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. disparate and B. crassifolia. B. disparate has smaller flowers, a thyrse and occurs between 600 and 1500 m. B. crassifolia has slightly smaller flowers, the outer tepals are differently shaped and the pedicels much shorter (4–6 cm). B. disparate 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. Amazonas, camino Jumbilla – Granada, ca. 3000 m, Hofreiter & Franke 4/28 (MSB); Depto. Cusco: Prov. Convención, Cordillera Vilcabamba, Yupanqui to Río Apurímac, 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. Nervaduras con vesículas (ámpulas) muy prominentes, flores color rojo intenso, hasta 3,5 cm
   - B. crassifolia

2’ Nervaduras con vesículas menos conspicuos, flores anaranjadas, hasta 2,5 cm

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. Elevación de las nervaduras con sólo la base de las vesículas de los pelos, hojas parecen glabras
   - B. endotrichys

4’ Elevación de las nervaduras con la base de las vesículas, éstas terminando en largos pelos
   - B. crassifolia

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### 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. A daxial side of leaves densely pubescent and nerves ridged with very prominent cell thick bladerlike leaf base, yellowish-white, abaxial side glabrous. Inflorescence seldom in strong specimens a thrys, 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 pendant, 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)

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

Amaryllidaceae 119. 1837


Type: Peru, Tarma, Churupalla, 4000 m, Ruiz & Pavón s.n. (MA!, photo F!); distribution 39C.

Plant twining, stem robust, 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. A daxial side of leaves pubescent with flattened, rigid 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
prophyl. 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).


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


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


Type: Peru, Dept. Huánuco, Monzon, 3400 – 3500 m, Weberbauer 3362 (B, Photo Fi).

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, 0,5–2 x 0,2–0,5 cm, subsequent bracts smaller, 0,3–0,9 x 0,1–0,3 cm, sometimes with a small ovary pubescent. 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 Hofreiter & Franke 4/7 (B!).

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

Amaryllidaceae 118. 1837.


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


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

=B. glomerata Herb., Amaryllidaceae 118. 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, rigid 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 prophyl. 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 stauroides complex contains at least 5 distinct species. However Harling & Neuendorf (2003) synonymized 12 species under B. stauroides. They point out that B. stauroides 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. stauroides. In the Cordillera Central clearly distinguishable species occur sympatrically (Depto. Huánuco, Tantamayo, Laguna Negra: B. stauroides and B. endotrachys; Depto Huánuco, Carpish, B. purpurea and B. roxa). The species of the B. stauroides complex are the most abundant Bombaceae 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); Jacla de Calla (Leimebamba-Balsas), 2800 m, 23.10.1965, Sagástegui s.n. (6053, HUT); Jacla de
Clave para los especies

1 Parts de la inflorescencia sin profilos, brácteas basales de las flor primaria mayormente bracteesas
2 1’ Parts de la inflorescencia con profilos, brácteas basales de la flor primaria mayormente foliolas
7 2 Ovario glabros
3 2’ Ovario 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. distichidia
3’ Outer tepals red, inner tepals yellow, dark spotted, leaves helicoidal, 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. squamiflora
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. squamiflora
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. barbajana
6’ Flowers strongly zygomorphic, the lower inner tepal strongly curved, Peru, Depto. Huánuco
B. huauino
7 Inner tepals exceeding outer one at least 0.5 cm, inner tepals with a conspicuous brown tip, southern Ecuador and northern Peru
B. bradyspela
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. pumila
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
The species of Bomarea subgenus Sphaerine arranged alphabetically

1. Bomarea brachysepala Benth.

Type: Ecuador, Prov. Loja, prope Loxa, Hartweg 855 (K!).
Fig. 1A; 7A; distribution 7B.
=B. podopetala Baker

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. A daxial side glabrous and papillose, abaxial side glabrous with 5–7 primary nerves. Inflorescence an erect thyrse, 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, clay 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-Chinchipe: 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).
2. **Bomarea brevis** (Herb.) Baker


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


Type: Peru, Gusach, Sachapata, Lechler 2629 (K!, Photo MSBI).

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, 2–2.3 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, fruit a 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 Bolivia, in fog forests between 2500 and 3400 m.

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

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

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


Type: Peru, Depto. Junin, Huassa-huassi, Ruiz & Pavón s.n. (MA!), Solomon & Moraes 11433 (MO); 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).

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 ovoid, 2-9 x 1-5 cm, in the middle of the stem longest and widest. A dorsal 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 fangose, 2-8 x 0.5-2.5 cm, and partly bracteose, 0.5-0.8 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, ovary glabrous, flower a ovoid berry, around 2 x 1 cm, seeds ovoid, around 2 mm in diameter. Distributed from central Peru to Bolivia, in fog forests between 2500 and 3400 m.
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.

5. Bomarea foertheriana Hofreiter

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 distichous, 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 and coloured. Ovary densely pubescent, fruit and seeds ovoid. Distributed in Central Peru at altitudes between 1300 and 3500 m.
which can be reached by car the whole area of the Cordillera Central hasn’t been examined.

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

Basionym: *Sphaerine nervosa* Herb., Amaryllidaceae 1837.
Type: Ecuador, Loja, Cerro del Condor, 3000 m – 3300 m, Lehmam 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.


8. **Bomarea pumila** Grisebach ex Baker

Handb. Amaryllidaceae 145. 1888
Type: Peru, Cuzco, Sachapata, Lechler 2240 (K!, GI, B!).

Fig. 46A; 45B; 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, adaxial 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 1775 (USN); Prov Ocampa, Cordillera Yanachaga, 2700 – 2800 m, Foster 9060 (USN).

BOLIVIA: Depto. LA PAZ: Prov. Nor Yungas, de Chusipata, 3050 m, Beck 18674 (LPB).
9. *Bomarea secundifolia* (Ruiz & Pav.) Baker


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


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

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 unguiculat, 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 *Wichuraea*

Key to the species

1 Inner tepals differentiated into blade and claw, distributed from Ecuador to Ancash in central Peru
   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
   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
   2’ Flowers up to 3 cm long
   4

3’ Inflorescence laxiflorous, hypopodium of primary flowers at least 1 cm, all bracts frondose

4 Inflorescence nodding
   4’ Inflorescence erect, flowers red and yellow, distributed in northern Peru
   5

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. Huanuco
   6

6 Plants mostly erect, bracts of secondary flowers 0,3–1,5 cm long, adaxial side of leaves nearly glabrous, or with short hairs
   7

7 Plate of inner tepals rounded; distributed in Peru, Depto. La Libertad
   9

9 Plants always twining, inflorescence erect or nodding, distributed in central Peru
   10

10 Plants always erect, inflorescence always nodding, distributed in Peru and Bolivia
   11

11 Flowers green, leaves next to the inflorescence and first bracts form an involucrum, sometimes poorly developed, distributed from central Peru to Bolivia
   12

12 Flowers red or yellow, tepals with green tip, distributed from central Peru to Bolivia
   13

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 abusados 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
   3

3 Inflorescencia laxiflora, hypopodium of primary flowers at least 1 cm, all bracts frondose

4 Inflorescencia nodding

4’ Inflorescencia erect, flowers red and yellow, distributed in northern Peru

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. Huanuco

6 Plants mostly erect, bracts of secondary flowers 0,3–1,5 cm long, adaxial side of leaves nearly glabrous, or with short hairs

7 Plate of inner tepals rounded; distributed in Peru, Depto. La Libertad

9 Plants always twining, inflorescence erect or nodding, distributed in central Peru

10 Plants always erect, inflorescence always nodding, distributed in Peru and Bolivia

11 Flowers green, leaves next to the inflorescence and first bracts form an involucrum, sometimes poorly developed, distributed from central Peru to Bolivia

12 Flowers red or yellow, tepals with green tip, distributed from central Peru to Bolivia

13 Plants always twining, inflorescence erect or nodding, distributed in central Peru

10 Inflorescencia erect, hypopodium of primary flowers 3,5–4,5 cm, leaves 4–6 cm long and 0,5–1 cm wide

10’ Inflorescencia pendulous, hypopodium of primary flowers 1–3 cm, leaves 5–20 cm long and 0,5–3 cm wide

11 Flowers green, leaves next to the inflorescence and first bracts form an involucrum, sometimes poorly developed, distributed from central Peru to Bolivia

12 Flowers red or yellow, tepals with green tip, distributed from central Peru to Bolivia

13 Plants always twining, inflorescence erect or nodding, distributed in central Peru

10 Inflorescencia erect, hypopodium of primary flowers 3,5–4,5 cm, leaves 4–6 cm long and 0,5–1 cm wide

10’ Inflorescencia pendulous, hypopodium of primary flowers 1–3 cm, leaves 5–20 cm long and 0,5–3 cm wide

11 Flowers green, leaves next to the inflorescence and first bracts form an involucrum, sometimes poorly developed, distributed from central Peru to Bolivia

12 Flowers red or yellow, tepals with green tip, distributed from central Peru to Bolivia

13 Plants always twining, inflorescence erect or nodding, distributed in central Peru

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.
2' Flores hasta 3 cm de largo
3' Inflorescencia densiflora, hipopodio de las flores primarias no más largo que 0,5 cm, solamente las brácteas mas bajas frondosas, los otras bracteas, Cordillera Blanca en el Depto. Ancash (Perú) B. altimontana
3' Inflorescencia laxiflora, hipopodio de las flores primarias al menos 1 cm, todas las brácteas frondosas 4
4' Inflorescencia péndula
5' 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. Huarmaco 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' Flores más de 5 cm de largo
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
9' Plantas trepadoras, plantas robustas con más de 15 ramas de inflorescencia; en la Cordillera Occidental del centro de Perú B. partida
9' Plantas siempre trepadoras, inflorescencia erecta o péndula; en el centro de Perú B. parvifolia
10 Inflorescencia erecta, hipopodio de los flores primarias 3,5–4,5 cm,
The species of Bomarea subgenus Wichuraea arranged alphabetically

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


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, HUT, ISC, MO).

Additional material examined: 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, HUT, 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 thyrse. 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 on the outside with green tip, inner tepals cuneately tapered to the base, yellow with a red stripe on the outside and with green tip. 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. Apurimac, Abancay, Cordillera Ampay, Santiago, 3980 m, 10.7.1995, Sagástegui et al. 11186 (HUT, MO); Prov. Corongo, Ñahuim, road to Ulta Pass, 4000-4400 m, 29.7.1985, Smith et al. 12405 (BM); Prov. Carhuaz, Huascaran 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 127 (HUT, HAO); Depto. Cajamarca: Prov. Cajabamba, Cajabamba-Luchabamba, 3900 m, 17.11.1983, Sagástegui et al. 11186 (HUT, MO); Prov. Cajabamba, Pucamama (ruta a Luchabamba), 3790 m, 29.8.2002, 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 Pallasca, Las Lagunas (ruta Cajamarca-Hualgayoc), 4000 m, 10.7.1995, Sagástegui et al. 15726 (HAO).

2. Bomarea ampayesana Vargas


Type: Peru, Depto. Apurimac, Abancay, Cordillera Ampay, Vargas 1015 (HOLOTYPE: CUZ!, ISOTYPE: GH!).

Fig. 48A, B; distribution 48C.

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. A abaxial side densely pubescent, hairs cream white, abaxial side glabrous except for the base which may bear some brown hairs. Inflorescence a pendulous thyrse, 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 globose. 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 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. alpina.
andimarcana, B. involucrosa, B. macrophala 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. ampyesana and B. andimarcana. B. ampyesana 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 involucrum. B. macrophala is a 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. ampyesana 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, Stem 121 (US).

3. Bomarea andimarcana (Herb.) Baker

J. Bot. 20: 201. 1882.
Basionym: Collania andimarcana Herb., Amaryllidaceae 105. 1837.
Type: Peru, Andimarca, Mathews 1164 (K).
Fig. 1A, B, C; distribution map: Fig. 3C.
Type: Bolivia, Bridges 1850 s. n. (G).
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 thyrs, 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.


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.


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

_Amaryllidaceae_ 112. 1837.


Type: Peru, Dept. Junin, Huassahuasi, _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, adaxial 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 Pampa – Chilcas, 3700 m, _Cerrate 8323_ (USM); Cordillera Huashuash, 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


Type: Peru, near Pasco, Huaylluay, _Cruckshanks s. n._ (KI, photo MSB).

*Collania dulcis* (Hook.) Herb., _Amaryllidaceae_ 104. 1837.


*Bomarea glaucescens* var. _dulcis_ (Hook.) Baker, _Handbook of Amaryllideae_. 147. 1888.

Fig 11B, D; distribution 11E.
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 laxiflorus compared to the size of the flowers. It is normally a pendulous thyrs, rarely there are populations in Central Peru with an erect inflorescence. The hydropod 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 frowndose 2-4 x 0.4-0.8 cm, the bracts of the secondary flowers are also frowndose 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 step 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 tunel Kahuash, 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 Cahuash, 3000 – 4000 m, Stevens 21961 (MO); Cordillera Blanca Quebrada Pucaraur, 3900 – 4200 m, Smith et al. 12679 (MO); Cordillera Blanca Quebrada Rima Rima, 4200 – 4370 m, 8.5.1986, 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 Honduras, 4300 m, Gibby & Barrett 117 (BM); Cordillera Blanca Quebrada Isinca, 4950 m, Smith & Buddensiek 11215 (MO); Huascaran National Park, Quebrada Isinca, S side of valley, 4300-4500 m, 25.5.1970, Smith et al. 9511 (HUT, MO); Huascaran National Park, Quebrada Ullta, on road to Ullta 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 Quemua Ragra, 4700 – 4700 m, Smith et al. 10871 (MO); Alrededores de Laguna Querococha., 4060 m, 21.6.1991, Steinc et al. 2225 (HUT); Prov. Huancayo, Quebradas east of Huancayo, 3400 m, Stark & 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, Urquiza 92 (USM); Prov. Cerro de Pasco, between Cerro de Pasco and Salachupan, 3750 – 3800 m, Ferreyera 8201 (USM); Depto. Lima: Prov. Huarochni, San Mateo, Rio Blanca, 4100 m, Saunders 391 (NY); Prov. Huarochni, near Laguna Chumpicocha, 4300 m, Cerrate 1988 (USM); Prov. Huarochni, Cerro Campana 4200 m, Cerrate 4707 (USM).

BOLIVIA: Depto. CHICHABAMBA: Choro, 4300 m, Brooke 6099 (BM); Depto. LA PAZ: Cerro de Comanche, 4050 m, Ribka 672 (B); Copacabana, Ribka 463 (B); Cordillera Real, Illampu, 4500 m, Troll 2118 (B, M); Tiaguanauco, Cerro Quimsachata, 4200 m, West 6387 (MO); Murillo, Zongo valley, 4500 m, Solomon 12284 (MO, PRO); Prov. Pacajes, Caquiaviri, 4300 m, Johns 8137 (USM); Depto. POTOSI: Prov. Chichas, near Zanja, 3800 m, Cárdenas 40 (GH); CHILE: Region 1: Prov. Puntacota, Epischaicas, 3500 m, Ricardi & Maricorena 47481134 (B).
6. Bomarea engleriana

Kraenzl.


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. Adaxial 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), Adaxial 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, 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. Huálayoc, Coymolache – Chugur, Cerro Tantahuatay, 3700 m, Sánchez 7083 (F); Huálayoc, 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, quadrat B. involucrosa. Scale bars: (A), (D)= 4 cm; (B)= 1 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.


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


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

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.

![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](image)

![Figure 53. B. torta; (A) habit, (B) inner tepal on the right side; (C) distribution. Scale bars: (A)= 4 cm; (B)= 1 cm.](image)
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 0.3–0.6 cm long, and the epipodium is 0.3–1 cm long. The bracts of the primary flowers are frondose 1.5–2 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


Type: Peru, Depto. Ancash, Prov. Bolognesi, Mangas, Cerro San Cristóbal, 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. A daxial 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. Huauraochiri, above Matucana, 4000 m, *Saunders* 301 (NY, MO); *Macleanea s. n.* (K); Sam Mateo, 4300 – 4500 m, *Saunders* 820 (US); Prov. Canta, Lachaqui, 4100 m, *Vilcapoma* 1730 (MO).

11. **Bomarea parvifolia** Baker


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

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


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, pubescent, with increasing density of pubescence towards the apex, or glabrous, normally recurved at apex. Leaves linear or linear-lanceolate, 3–10 cm long, 0,2–0,5 cm wide, towards inflorescence increasingly shorter. Specimens growing in shadow in general with wider leaves and less obvious difference in leaf shapes along stem. A daxial 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 fondonse, 2–4 cm long and 0,5–1 cm wide, subtending bracts of secondary flowers also fondonse, 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: *McLean* s.n, type of *B. praestus* donated by Lobb.

prov. Canta, near Huascaran, 3084 m, *Saunders* 3150 (MSH, HUT).

12. **Bomarea peruiana** Hofreiter


Plant twining (2–4 m), stem robust, about 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 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. peruiana* 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).


13. **Bomarea porrecta** Killip


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


Fig. 35A, 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. A daxial side of leaves glabrous or pubescent, then hairs yellowish-white and very short, abaxial side glabrous.

Additional material examined: PERU: Depto. Lima: *McLean* s.n, type of *B. praestus* donated by Lobb.
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 fimbriate, 1.5–6 cm long and 0.3–0.6 cm wide, subtending bracts of secondary flowers fimbriate 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); Depto. La Libertad: Prov. Julcán, Cerro Mirador (arriba de Mache), 3600 m, 18.9.2003, Sagástegui et al. 17463 (HAO); Prov. Huamachuco, Quebrada Urumanga, below Arenillas, on trail Huamachuco to Angasmarca, 3500 m, West 8159 (GH, MO); Prov. Huamachuco/Sanchez Carrion, Carretera a Huamachuco, Km 160, 3350 m, 18.12.1973, López 8082 (HUT, MO); Prov. Sánchez Carrion, Alrededores de Laguna Cushiuro (pie del nevado Huaylillas), 20.5.2001, López & Sagástegui 16816 (HAO).
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 Glaucocens 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. porrata and B. torta with pink and green colours. B. chimboracensis is intermediate in combining red and green colours. The inflorescence is dense in B. chimbrosanz, 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, Qcupuscoa & Schjellerup 209 (HUT); Depto. Cajamarca: Prov. Cajamarca, near Enanca, 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, 26.7.1983, Sagástegui A., J. Mostacero & E. Alveiz. 10726(HUT); Prov. Celendín, Challuyacu, 3250 m, 17.8.1984, Sagástegui et al. 12065(HUT); Prov. Celendín, La Tranca, 2800 m, 18.8.1984, Sagástegui et al. 12135 (HUT, NY); Prov. Celendín, Jaica de Gelig, 3100 m, 27.5.1985, Mostacero 914 (F, HUT); Prov. San Miguel de Pallafucos, Entre ciudad de San Miguel de Pallafucos and Distrito El Prado (carretera hacia el pueblo de Unión Agua Blanca), 2800 m, 7.10.2001, E. Rodríguez et al. 2499 (HUT); Above Agua Blanca, Cerro Quillón, 3320-3500 m, 14.10.2000, Weigend et al. 2000-741(HUT); Prov. Celendín, Challuyacu (Celendín-Kumulca), 3220 m, 23.6.1995, Mostacero et al. 3714 (HUT); Depto. La Libertad: Prov. Bolivar, West of Bolivar, 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 Incuahuasi, 2650 m, 11.9.1985, Sagástegui et al. 12759 (HUT, MO); Prov. Ferreñafe, Inkaawasi, 3300 m, Llatas Quizón 3345 (F, LZ); Prov. Ferreñafe, near Incuahuasi, below Cerro Punnamachy, 3000 m, Dillon & Skillman 4148 (F, NY, MO, US); Depto. Piura: Prov. Ayavaca, Suyupampa-Ayavaca, 2600 m, 8.9.1976, Sagástegui & Caballanillas 8665-a (HUT); Prov. Huancabamba, Cuello del Indio (Canchaque-Huancabamba), 3000 m, 2.9.1976, Sagástegui & Caballanillas 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 Martin: Prov. Mariscal Cáceres, S side of river, Chochos, NW corner of Rio Abiseo National Park, 3400 m, 7.6.1986, Young 3699 (HUT, ISOTYPES: USM!, ISOTYPES: MO!, NY!). 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 (C7) 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).

**EQUADOR:** 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


**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. A axidial 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.**

**Plant and seeds ovoid in shape.*** B. vargasii occurs in valleys of northern Peru in the Dep. 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, Aupiququisigu 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, 15.8.1982, 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, Sagéstegui 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, Sagéstegui & Fukushima s.n. (5147, HUT); Dto. Contumazá, around Bosque de Cachil, 2720 m, 30.4.1999, Binder et al. 1999-16 (HUT); Carretera Gascas-Contumazá, 2500 m, 27.12.1970, López & Sagástegui 7668 (HUT); Herilla, 3400 m, 31.5.1999, 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 Pallafucos, 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 – Lusquil, 2150 m – 2300 m, Weigend et al. 97/211b (F, MB), Prov. Otuzco, Alrededores de Huaranchal, 2140 m, 6.2.1999, Sagástegui et al. 16117 (HACO).
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. velasaxoa 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. velasaxoa 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 2C83 (MSB).

Acknowledgements

We thank the directors and curators of the herbaria AAU, B, BM, CUZ, E, F, G, GH, HBG, HUT, K, LP, LZ, M, MA, MO, NY, U, UC, US, USM and W.

We would like to thank H. Förther for his help with taxonomic problems, C. Köbele for assistance with computer problems, M. Weigend for collecting interesting specimens and his help, F.J. Höck for his photos of herbarium specimens, D. Podlech and H.J. Esser for help with the Latin diagnose, H. Kreuz and R. Betzenbichler for revising the English. We are grateful to A. Cano, F. Careras, N. Salinas and M. I. Torres for diverse help and assistance in Peru, and to S. Beck in Bolivia, and grateful to A. Cano, F. Careras, N. Salinas and M. I. Torres for taxonomic problems, C. Köbele for assistance with computer

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Literature cited


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).

<table>
<thead>
<tr>
<th>Species</th>
<th>genus/subgenus:</th>
</tr>
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<tbody>
<tr>
<td><em>Alstroemeria chorillensis</em> Herb. = <em>A</em>. lineatiflora</td>
<td><em>Alstroemeria</em></td>
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<tr>
<td><em>A. lineatiflora</em> Ruiz &amp; Pavón</td>
<td><em>Alstroemeria</em> (1)</td>
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<tr>
<td><em>A. pavoniana</em> Beauverd = <em>B</em>. involucrosa</td>
<td><em>Wichuraea</em></td>
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<td><em>A. pygmaea</em> Herb.</td>
<td><em>Alstroemeria</em> (2)</td>
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<td><em>Bomarea albimontana</em> Smith &amp; Gereau</td>
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<td><em>B. alstroemeroides</em> Hofreiter &amp; E. Rodr.</td>
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<td><em>B. amazonica</em> Hofreiter &amp; E. Rodr.</td>
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<td>*Bomarea s.str.</td>
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<td><em>B. andimarcana</em> (Herb.) Baker</td>
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<td><em>B. angulata</em> Benth.</td>
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<td><em>B. angustissima</em> Killip</td>
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<td><em>B. aurantiaca</em> Herb.</td>
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<td><em>B. boliviensis</em> Baker</td>
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<td><em>B. brachypus</em> Kraenzl. = <em>B. pardina</em></td>
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<td><em>B. calyculata</em> Kraenzl. = <em>B. angulata</em></td>
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<td><em>B. campanularia</em> Harling &amp; Neuendorf</td>
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<td><em>B. campanuliflora</em> Killip = <em>B. dulcis</em></td>
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<td><em>B. campylophylla</em> Killip</td>
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<td><em>B. chaparensis</em> Hofr.</td>
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<td><em>B. chontaensis</em> Seemann = <em>B. obovata</em></td>
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<td><em>B. cocinea</em> (Ruiz &amp; Pavón) Baker</td>
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<td><em>B. cornuta</em> Herb.</td>
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<td><em>B. declinata</em> (Poepp. &amp; Endl.) Klotzsch ex Kunth = <em>B. dispar</em></td>
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<td><em>B. endotrachys</em> Kraenzl.</td>
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</tr>
<tr>
<td>B. platypetala Benth. = B. uncfolia</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. podopetala Baker = B. brachysepala</td>
<td>Sphaerine</td>
</tr>
<tr>
<td>B. polygonoides Baker = B. distichifolia</td>
<td>Sphaerine</td>
</tr>
<tr>
<td>B. polyphylla Kraenzl. = B. ovata</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. porphyrophia Kraenzl. = B. densiflora</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. porrecta Killip</td>
<td>Wichuraea (13).</td>
</tr>
<tr>
<td>B. praestust Kraenzl. = B. parvifolia</td>
<td>Bomarea s.str. (31).</td>
</tr>
<tr>
<td>B. pseudopurpurea Hofreiter &amp; E. Rodr.</td>
<td>Wichuraea</td>
</tr>
<tr>
<td>B. puherula (Herb.) Kraenzl. ex Perkins = B. dulcis</td>
<td>Wichuraea</td>
</tr>
<tr>
<td>B. pulchella Sodiro = B. pardinia</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. punctata Herb. = B. ovata</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. pumila Grisebach ex Baker</td>
<td>Sphaerine (8).</td>
</tr>
<tr>
<td>B. purpurea (Ruiz &amp; Pavón) Herb.</td>
<td>Bomarea s.str.; B. setacea complex (4).</td>
</tr>
<tr>
<td>B. recurva Baker = B. brevis</td>
<td>Sphaerine</td>
</tr>
<tr>
<td>B. sanguinea Kraenzl. = B. formosissima</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. sclerophylla Kraenzl. = B. endotrachys</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. secundifolia (Ruiz &amp; Pavón) Baker</td>
<td>Sphaerine (9).</td>
</tr>
<tr>
<td>B. setacea (Ruiz &amp; Pavón) Herb.</td>
<td>Bomarea s.str.; B. setacea complex (5).</td>
</tr>
<tr>
<td>B. simplex Kraenzl. = B. ovata</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. speciosa Killip</td>
<td>Bomarea s.str. (33).</td>
</tr>
<tr>
<td>B. squamulosa Kraenzl. = B. nervosa</td>
<td>Sphaerine</td>
</tr>
<tr>
<td>B. sternbergiflora Kraenzl. = B. obovata</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. stricta Kraenzl. = B. porrecta</td>
<td>Wichuraea</td>
</tr>
<tr>
<td>B. stubelii Pax = B. goniocaulon</td>
<td>Bomarea s.str.</td>
</tr>
</tbody>
</table>

(continue...)
<table>
<thead>
<tr>
<th>Species</th>
<th>genus/subgenus:</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. subglobosa Herb. = B. formosissima</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. subsessilis Killip = B. ovata</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. subsipta Sodiro = B. densiflora</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. subtriflora Sodiro = B. obovata</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. sulphureae Kraenzl. = B. superba</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. superba Herb.</td>
<td>Bomarea s.str. (34).</td>
</tr>
<tr>
<td>B. tarmacense Vargas = B. dulcis</td>
<td>Wichurarea</td>
</tr>
<tr>
<td>B. tarmensis Kraenzl.</td>
<td>Bomarea s.str. (35).</td>
</tr>
<tr>
<td>B. tomentosa (Ruiz &amp; Pavón) Herb. = B. ovata</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. torquipes Kraenzl. = B. dulcis</td>
<td>Wichurarea</td>
</tr>
<tr>
<td>B. trachypetala Kraenzl. = B. aurantiaca</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. ulei Kraenzl. = B. dispar</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. uncifolia Herb.</td>
<td>Bomarea s.str. (37).</td>
</tr>
<tr>
<td>B. uniflora (M. Roemer) Killip = B. dulcis</td>
<td>Wichurarea</td>
</tr>
<tr>
<td>B. vargasii Hofreiter</td>
<td>Wichurarea (15).</td>
</tr>
<tr>
<td>B. velascoana Vargas</td>
<td>Wichurarea (16).</td>
</tr>
<tr>
<td>B. variabilis Herb. = B. ovata</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. venuata Sodiro = B. pardinana</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. weberbaueri Kraenzl. = B. aurantiaca</td>
<td>Bomarea s.str.</td>
</tr>
<tr>
<td>B. zosterifolia Killip = B. dulcis</td>
<td>Wichurarea</td>
</tr>
</tbody>
</table>

Collania guadelupensis Kraenzl. = B. dulcis | Wichurarea |
C. herzogiana Kraenzl. = B. dulcis | Wichurarea |
C. petraea (Kraenzl.) Kraenzl. = B. dulcis | Wichurarea |

Wichuraea acicularis M. Roemer = B. dulcis | Wichuraea |
W. parvifolia (Herb.) M. Roemer = B. dulcis | Wichuraea |