

**The Genus *Hippeastrum*
(Amaryllidaceae)
in Bolivia**

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The information for this volume has come from various sources. Among the most important is the field work which we conducted, sometimes together and at other times separately, and which has allowed us to learn *in situ* the diverse species treated here, and to distinguish their genetic variability, their distribution, and their present conservation status. It was very important to review the existing collections in the Herbario Nacional de Bolivia (LPB), the Herbario del Oriente (USZ), the Herbario del Sur de Bolivia (HSB), and above all, to study the original herbarium sheets duplicated by Cárdenas, which we found in the Herbario Nacional Forestal “Martín Cárdenas” (BOLV).

The search and study of the literature on this topic opened a new horizon of information. It was of great help to visit, thanks to modern technology, the principal herbaria of the world without leaving our desks, including the Royal Botanical Garden of KEW (K), the Missouri Botanical Garden (MO), and the Herbarium of the New York Botanical Garden (NY). Thus we could see and study, on the computer screen, the type specimens of species collected by Mandon, Bang, Rusby, and others, more than a century before.

It is worth mentioning that the past 15 years have seen an increase in inventories of Bolivian plants, resulting in a large number of new records for the country and in the discovery of many genera and species new to science. Among these finds one may mention the publication of more than 200 new species in the families Orchidaceae, Bromeliaceae, Cactaceae, and Passifloraceae.

In the first years of this new millennium, we confront what may be the greatest crisis of humanity: the potential loss of a major portion of biological diversity, of the wealth of species, ecosystems, and ecological processes that have made our living planet what it is. To confront this great challenge, we need many kinds of creativity and innovation, able to maintain this critical base of natural resources. Within them is found a need for greater knowledge of biodiversity, and a much greater appreciation of its intrinsic value and a clear demonstration of an entire new range of economic benefits which conservation can provide for local communities and the national government.

Therefore, there is an imperative need for humans in general, and Bolivians in particular, to learn to value our biological diversity, for intellectual, cultural, and economic reasons, in order to ensure its conservation in perpetuity. We believe we must first admit the one cannot value what one does not understand. Moreover, as one thinker said, “In the final instance, we conserve only what we love, we love only what we understand, and we understand only what we have been taught.”

In other words, it is necessary to seek all possible ways to teach the populace about the importance of biodiversity, after which they will know, learn to love, and become able to make conscientious decisions and know conservation for our own wellbeing. We believe that the publication of this book will contribute in a significant way to increasing knowledge of the flora of our country, as well as bridging a gap of information and offering literature more accessible to the general public.

Distribution of this work, thus, offers an important way to augment all conservation activities for genetic resources, as the region undergoes development and suffers severe deterioration, owing in part to the lack of knowledge about wild species.

At the same time, it will serve as an indispensable tool to help with academic work and teaching materials intended for understanding, using, and conserving natural resources.

Finally, we hope that works like this will encourage and motivate further reviews, monographs, and guides, until most of the plant families of Bolivia enjoy similar documentation.

I. INTRODUCTION

Interest in studying the flora of Bolivia arose in the 19th century, when early natural scientists began their botanical explorations in that area. Since that time this interest has endured among new generations of scientists who have continued careful work to define our rich flora. Nevertheless, alongside this difficult trek to that goal, another process has moved equally quickly: the destruction of our forests, the result of expanding activities by farmers, loggers, and pastoralists, the predictable consequences of responding to the basic needs of the population. But unfortunately, and in the great majority of cases, that expansion has taken place in an irrational way, affecting sites and entire regions where the native plant cover has been altered.

The confluence in Bolivia of three great geographical regions — the Andes, the Amazon, and the Chaco — has formed a great variety of ecoregions with extreme elevational differences, and great diversity of climate, soil structure, and amount of precipitation, stimulating the evolution of various types of vegetation with extraordinary biological diversity. Of an estimated total of 18,000 to 20,000 species of vascular plants present in the country, particularly large numbers are members of certain families, such as the *Arecaceae* (100 species), *Araceae* (175), *Cactaceae* (260), *Bromeliaceae* (317), *Poaceae* (630), and *Orchidaceae* (1,200), which gives us just an idea of the exceptionally rich and varied flora (Jorgensen, Nee & Beck 2014).

The *Amaryllidaceae*, in particular the genus *Hippeastrum*, the subject of this revision, form a natural or biological group characterized not so much for their number of species as for their degree of endemism. This genus is distinguished from narrowly related genera by a gap determined on the basis of morphological characters, chromosomal mechanisms, or both. After Baker (1888), 35 species of *Hippeastrum* were recognized, distributed in Mexico, the West Indies, Central America, and South America. By 1963 this number had increased to 55 species. At present (according to *The Plant List* 2013), about 93 species are placed in the genus *Hippeastrum*. Collaboration between the Royal Botanic Garden at Kew, Great Britain, and the Missouri Botanic Garden in the United States has permitted the creation of a plant list that combines multiple specimen records and databases from those institutions and other collaborators. As a result, we now know that the country with the greatest number of *Hippeastrum* species is Brazil (38 species), followed by Bolivia (34), Peru (21), and Argentina (10).

The family *Amaryllidaceae* was established in 1805 by the botanist Jaume St.-Hilaire, using as the type for this family the species *Amaryllis belladonna* L., discovered at the Cape of Good Hope in present-day South Africa. In 1752, Carl von Linné (Linnaeus) published his famous *Species plantarum*, in which he included new species assigned to the genus *Amaryllis* without specifying which of those was the type species of the genus. In 1819, William Herbert retained *Amaryllis belladonna* L. collected in the African continent as the type of the genus, while he moved into other genera the other eight species Linnaeus had included in *Amaryllis*.

With the discovery of similar bulbous plants in the Americas, those too were described within the genus *Amaryllis*. In 1821, Herbert proposed the genus name *Hippeastrum* for the plants native to the Americas and chose as the type species *H. equestre* Herbert, now a synonym of *H. puniceum* (Lam.) Kuntze. From 1938 to 1984, there was strong controversy over whether to use the name *Amaryllis* or *Hippeastrum* for these bulbous plants with their attractive flowers. The 8th International Botanical Congress, held at Paris in 1956, decided that the name *Amaryllis* should apply exclusively to African species, and that the American species should be recognized in the genus *Hippeastrum*. This decision, however, was not respected by many botanists, nursery growers, hybridizers, and hobby gardeners specializing in these plants, some of whom continue (especially in the mass bulb market) to use the name “*Amaryllis*” for both the African and American species.

Among the principal opponents to this decision was a group headed by Dr. Hamilton P. Traub, then editor of the scientific journal *Plant Life*, a publication dedicated to the Amaryllidaceae; he was followed by some other botanists, such as William Louis Tjaden and Harold N. Moldenke, who tenaciously opposed the application of *Hippeastrum* to what they had traditionally known as *Amaryllis* (Traub 1980a; Tjaden 1981a, 1981b). Joining this line of thinking were such South American botanists as Martín Cárdenas Hermosa of Bolivia, Julio César Vargas of Peru, Pedro Felix Ravenna of Chile, and Carlos A. Gomes Ruppel of Argentina, who continued to describe their new species in *Plant Life* under the generic name *Amaryllis* until the death of Traub in 1983. Finally, the 14th International Botanical Congress in 1987 agreed that the species of Amaryllidaceae discovered at the Cape of Good Hope in South Africa would keep the name *Amaryllis*, while those species of the Americas should be recognized as belonging to the genus *Hippeastrum*.

In 1997, Alan Meerow, Johan Scheepen, and Julie H. A. Dutilh proceeded to transfer all the American species that had been placed in *Amaryllis* to the genus *Hippeastrum* (Meerow et al. 1997). Among those changes they included 14 species native to Bolivia.

During the study of the genus *Hippeastrum* Herb. in Bolivia, which we have developed over several years, we have checked some doubts which encouraged us to search for their foundation. This spurred our dedication to investigating in depth all such information, which in many cases remained forgotten, and thus we have undertaken a historical review of Bolivian *Hippeastrum* with the aim of uncovering and bringing to light certain discoveries which have been forgotten over the years and the nomenclatural changes that occurred after recommendations by botanical congresses, such as the transfer of American species from the genus *Amaryllis* to *Hippeastrum* in 1997, which did not take those aspects into account.

The present study aims to establish validation and nomenclatural updating, the strong point being its quality of completeness: it combines what is known in an update of the genus in Bolivia. It offers a key to all the species and subspecies known for the country, as well as a summary of their nomenclature, distribution, and further observations.

The conclusions of this study can be summarized in the following statement: we propose seven changes, including two names to be recombined on the basis of priority, one clarification of identity, three nomenclatural combinations, and one description of a new species. We then try in some measure to answer those questions which we are able to discuss, although some certainly require closer analysis and further investigations in the field.

II. HISTORICAL PRECURSORS IN THE STUDY OF THE GENUS *HIPPEASTRUM* IN BOLIVIA

NATURALISTS OF THE 18TH AND 19TH CENTURIES

The earliest naturalists who came to the Americas were above all encyclopedists in the sense of the Enlightenment, eager to learn about the riches of the three kingdoms then present in these lands recently discovered by Europeans. Wilhelm von Humboldt, Charles Darwin, Hipólito Ruiz, and José Pavón were among the personages who made history with their discoveries.

As for the early naturalists who came to Bolivia, at that time known as Alto Perú (“High Peru”), we note names such as Thaddeus P. Haenke, Arcides d’Orbigny, Carl Fiebrig, Theodore Herzog, Richard W. Pearce, Henry H. Rusby, and Gilbert Mandon. Brief biographies of these explorers and scientists who engaged in collecting and studying the species of *Hippeastrum* in Bolivia appear below.

Thaddeus Peregrinus Haenke (1761–1816)

The first academically trained naturalist to collect plants in old Alto Perú (now Bolivia) was Thaddeus (Tadeo) Haenke, born in 1761 in Kreibitz, Bohemia, then a province of Austria. In 1789, he left the port of Cadíz as part of the Malaspina expedition, a circumnavigation of the globe with scientific goals, which ended in 1794, under Captain Alejandro Malaspina. Haenke had joined this expedition at the command of the king of Spain, Carlos III. After surviving various difficulties and adventures, among them being late to embark and missing the voyage with the remainder of the Malaspina expedition, he finally entered Bolivia from the Pacific coast at the end of the 18th century. His many travels in that wide and little-known territory gave him the privilege of being the first botanist to discover some truly extraordinary plants that even today astonish people, such as the giant water-lily *Victoria regia* (Vásquez 1997) and the towering bromeliad *Puya raimondii* (Ovando-Sanz 1974).

From 1796 until his death in 1816, Haenke resided in Cochabamba. He worked as a doctor, chemist, naturalist, and ethnographer. He sent one portion of his numerous collections to Lima, intending it eventually for Spain. The few specimens that reached Europe allowed K. B. Presl to describe the new species in his book *Reliquiae Haenkeanae*, published at Prague in 1830. The rest of Haenke’s legacy was probably lost during its long journey.

Although they did not achieve the influence of his competitors’ discoveries, “the works of Haenke in regard to botany should not have been,” as Cárdenas writes, “solely limited to the collection of plants of which the greater percentage were certainly new to science. What demands attention is that he did not describe the species he collected, labor which he could have accomplished very well at a time when there existed a few basic works necessary to determine botanical species.” Cárdenas probably did not know, or at any rate ignored the fact, that the plants collected by Haenke were described and depicted in illustrations of different kinds, including some in color, which sadly did not reach publication; and his manuscripts in Latin, Spanish, and some in German (more than 7,000 pages) can be found preserved in the archive of the Instituto Botánico José Cavanilles of the Royal Botanical Garden in Madrid. These writings are undoubtedly the largest and most important legacy of an immortal effort whose memory should be honored forever. The many new names and diagnoses bearing Haenke’s authority testify to his solid preliminary work.

Haenke also engaged in collecting the Amaryllidaceae, with the intention of describing 12 species under the genus *Amaryllis* and one under *Crinum*. In 1979, in the archive of the Royal Botanical Garden’s library, Raúl Lara Rico found an unpublished manuscript under the following label: “Segunda División No. 5(7). 1807. *Descripción de plantas y láminas de las*

Vargas Calderón had re-found it in 1975 in Peru, and described it as a new species, *Amaryllis bukasovii* Vargas, unaware that he was facing such an interesting specimen of *Amaryllis leopoldii*, and surely influenced by the publications of a North American specialist in these plants, Hamilton P. Traub, attributing the rediscovery of that species to Martín Cárdenas when he published the new species *Amaryllis pseudopardina* Cárdenas, which is a very different species from *Amaryllis leopoldii*, now *Hippeastrum leopoldii* (T. Moore) Dombrain.

We consider that all those names synonymized by Traub — *A. pseudopardina*, *A. neo-leopoldii* y *A. leopoldii* f. *whitakeri* — are superfluous, and that there is no impediment to our restoring the original name used by Cárdenas for *Amaryllis pseudopardina* as validated for that species, and setting up the new combination in the genus *Hippeastrum*: *Hippeastrum pseudopardinum* (Cárdenas) Vásquez & Lara. As for the other two of Traub's species, the former is invalid owing to omissions in the original publication and is now described as *Hippeastrum menesesii*, and the latter is recombined as *H. menesesii* subsp. *whitakeri*.

In regard to *Hippeastrum leopoldii* (T. Moore) Dombrain, it is confirmed that *Hippeastrum bukasovii* (Vargas) Gereau & Brako is a synonym of that species.

Table A1: Differential characters among *Hippeastrum leopoldii*, *H. bukasovii*, and *H. leopoldii* (Bol).

Morphological characters	<i>H. leopoldii</i> (Baker 81. 1888)	<i>H. bukasovii</i> (Perú) (C. Vargas 1975)	<i>H. leopoldii</i> (Bol) (A. Fuentes 2005)
Plant		Not reported	
Bulbs	Globose, 5–8 cm in diameter, short neck	Subglobose	Globose, 5 cm long, 5 cm in diameter; neck 7cm long
Leaves	Lorate, 46–60 cm long	5–7 after flowering, 40–45 cm long, 3–3.5 cm wide	Loriform, 45–60 cm long
Scape	Stout, subterete	Subterete, 38–40 cm	30cm long, 12mm in diameter at base, 10mm at apex, slightly complanate with reddish tint at base
Umbel		2 flowers	2 flowers
Bracts	Lanceolate	Lanceolate, exceeding ovary	Lanceolate, glaucous green, 5 cm long, 1 cm wide
Pedicels		4.5–5 cm x 5 mm	4–4.4cm angular
Ovary		Purple, 1.5 cm	Green, 12 mm long, 8 mm wide, slightly trigonal
Tube	Short	8–10 mm	
Paraperigonium	Lacking clear corona in throat	Not very visible, hyaline hairs, 6 mm	White pilose, 5 mm long, completely closing the throat
Throat	Long, greenish white	With a greenish-white star	Greenish
Flowers	Very regular, 13 cm long, 15–18 cm in diameter	10cm long, 12–14 cm in diameter	20 cm in diameter, outside greenish at base, white toward apex
Tepals	Obovate, 5cm wide, white from upper mid-part to apex, brilliant red in base, with a bifid keel in the lower mid-part of the red	Obovate, acute, narrower at base, dark red in lower part, white in the upper	Elliptical, carinate, apiculate, 14 cm long, 4–5 cm wide; the lower is narrower
Stamens	Declinate, shorter than segments	Shorter than perigonium	Connivent with lower tepal, slightly incurved, 9–10 cm
Filaments	White		White
Anthers	Purple, 1 cm long	Yellow, slightly curved	Cream, 4 mm long, dorsiflexed, pollen yellow
Style	Longer than stamens	As long as perigonium	14.3 cm long, exserted, white
Stigma	Capitate	Clearly trilobate	Capitate, inconspicuously 3-lobed

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 Fig. 103. Type of *Hippeastrum crociflorum* collected by R. S. Williams.
 Fig. 104. Watercolor of *Hippeastrum pardinum* based on the original collection by Pearce.
 Fig. 105. Holotype of *Hippeastrum scopulorum* collected by Gilbert Mandon in 1857.
 Fig. 106. *Hippeastrum wilsoniae*.

Appendix 1

- Fig. A1.1. *Hippeastrum pseudopardinum*.
 Fig. A1.2. *Hippeastrum leopoldii*.
 Fig. A1.3. *Hippeastrum menesesii* confused with *H. leopoldii*.
 Fig. A1.4. *Hippeastrum menesesii*.
 Fig. A1.5. Photograph of holotype of *Hippeastrum pseudopardinum*.
 Fig. A1.6. Original drawing of *Hippeastrum leopoldii*.
 Fig. A1.7. Alfredo Fuentes crossing the río Sunchuli.
 Fig. A1.8. The rediscovery of *H. leopoldii* in its habitat.
 Fig. A1.9. The first illustration reproduced in natural size of *H. leopoldii*.
 Fig. A1.10. The enigmatic *Hippeastrum leopoldii* refound in all its splendor.

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