



## A new *Hippeastrum* (Amaryllidaceae) species from Brazil

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The largest genus of Amaryllidaceae in Brazil is *Hippeastrum* Herbert (1821: 31), with about 30 species and the widest geographical distribution in the country. The whole genus has about 60 species with two centers of diversity, Bolivia/Peru and Southeast/Southern Brazil (Meerow & Snijman 1998).

In Chile, species originally described as narrow leaved *Amaryllis* Linnaeus (1753: 292) or *Hippeastrum* were later assigned to a separate genus, mainly *Rhodophiala* Presl (1844: 115) (Traub 1963). Later on, the separation was confirmed by cytological studies (García *et al.* 2014). Recently *Hippeastrum cipoanum* (Ravenna 1970: 86) Meerow (2010: 159), initially described as *Rhodophiala*, was confirmed to have cytological and phylogenetic features typical of *Hippeastrum*, in spite of its narrow leaves. Other species of *Hippeastrum* with very narrow leaves were also found (Oliveira *et al.* 2013).

Amaryllidaceae are represented in Brazil by several genera, some endemic. One endemic genus is *Eithea* Ravenna (2002: 2), based on *Eithea blumenavia* (K.Koch & C.D.Bouché ex Carrière 1867: 32) Ravenna (2002: 4) from Southern Brazil, which was first described under the genus *Griffinia* Ker Gawler (1820: t. 444), because of its small size, rather pseudopetiolated leaves and white with purplish/magenta striped flowers. A combination under *Hippeastrum* was also made (Sealy, 1938), because of its similarities also with this genus. However, morphology of seed structure and phylogenetic analysis showed that this species belongs to a distinct lineage, showing also cytological differences (Meerow *et al.* 2000, García *et al.* 2014).

Recently, Idimá da Costa Gonçalves found a specimen morphologically similar in flower and leaves to *Eithea*, during an excursion to a patch of native forest of the Northern part of Rio de Janeiro. The analysis of other morphological characters and chromosomes, showed it represents a new species belonging to the genus *Hippeastrum*, which is here described and compared with *Eithea blumenavia*. The phylogenetic position in *Hippeastrum* was also confirmed by molecular data (Oliveira 2012).

### Materials and Methods

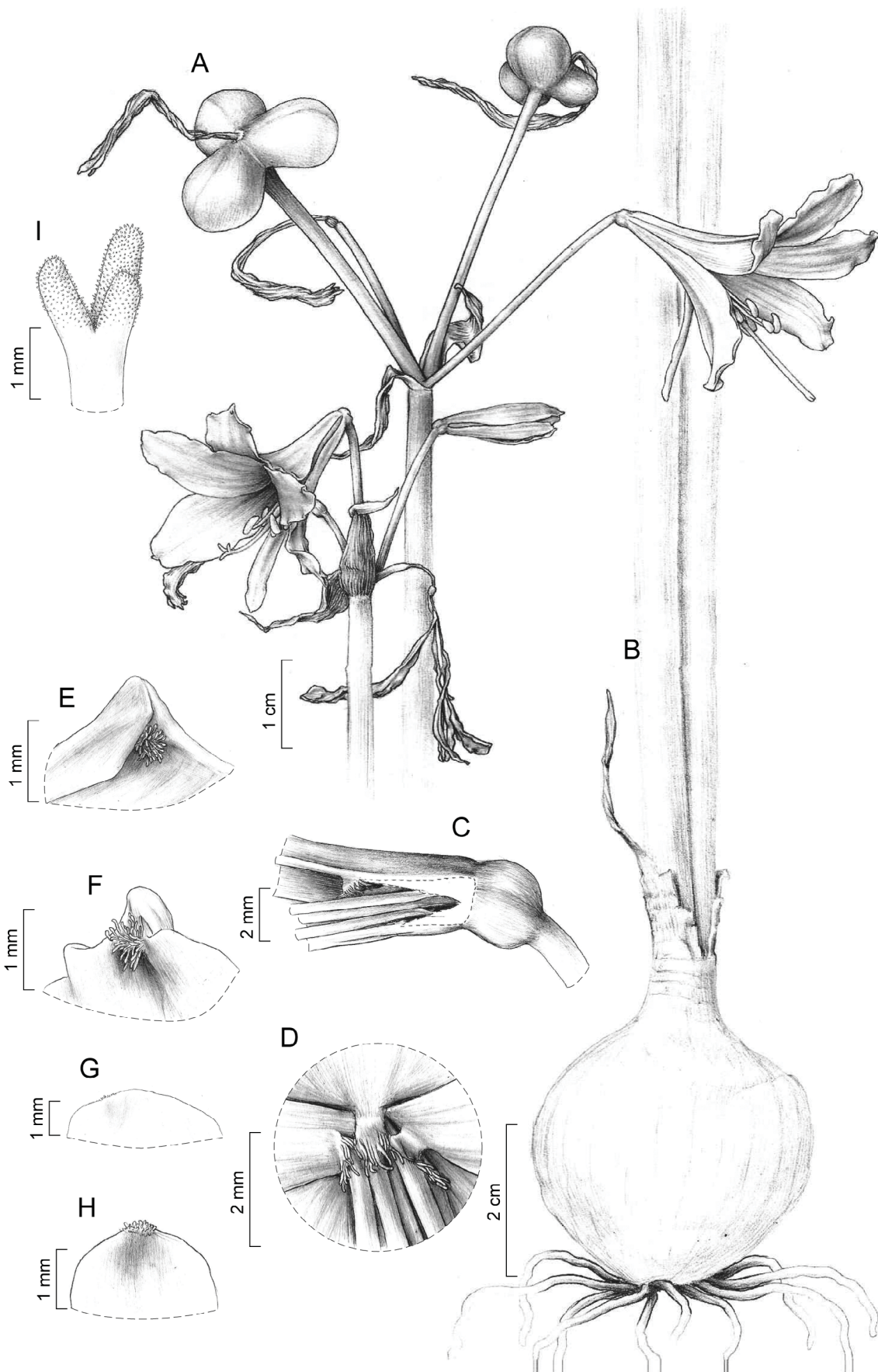
Chromosome preparations were obtained of root tips from germinating seeds, pretreated with 2 mM 8-hydroxyquinoline for 7–8 h at 15 °C and fixed in ethanol:acetic acid (3:1, v:v). For conventional chromosome analysis, the HCl/Giemsa technique (Guerra 1983) was used and five metaphases plates, with similar condensations, were selected to prepare the idiograms. The karyotypes were described according to chromosome morphology determined by the centromeric index as suggested by Levan *et al.* (1964).

### Description of the new species

*Hippeastrum idimae* Dutilh & R.S.Oliveira, *sp. nov.* (Fig. 1A–I & Fig. 2A–B)

It is similar to *Eithea blumenavia*, but differs from it by the seeds which are flat and winged (not globose, with an expansion), and by the basic chromosome number  $x = 11$  (not  $x = 9$  with no bimodality). The flowers are the smallest in *Hippeastrum*.

**Type**:—BRAZIL. Rio de Janeiro: Cardoso Moreira, Santissimo, 18 August 2006, Dutilh *et al. s.n.* (holotype UEC174130!)



**FIGURE 1.** *Hippeastrum idimae* (From Dutilh *et al.* UEC 174130). **A.** Habit. **B.** Bulb in reproductive phase. **C.** Longitudinal section in hypanthium tube, showing the presence of fimbriae and staminal filaments base. **D.** Flower fauce showing the fimbriae enclosing the filaments. **E–H.** Papillary region at the adaxial apex of tepals. **E.** Upper sepal. **F.** Lower sepal. **G.** Upper petal. **H.** Lower petal. **I.** Stigma.

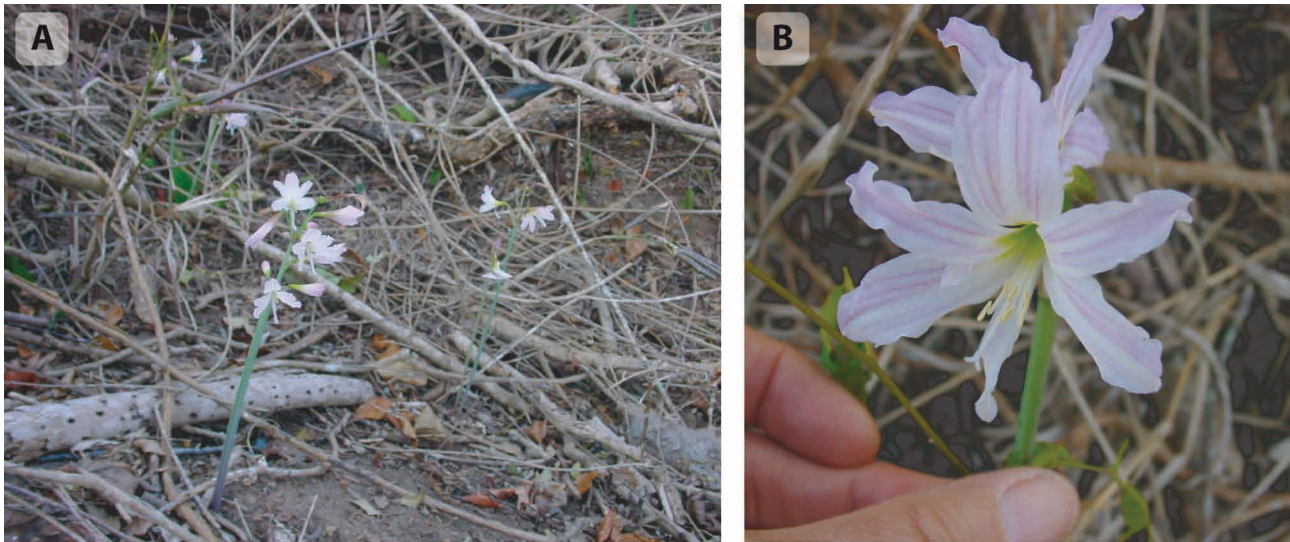


FIGURE 2. *Hippeastrum idimae*. A. Population in habitat. B. Flower detail. (Photos by J.H.A. Dutilh).

Bulb ca. 2.5–3.5 cm long, oval to round, subterranean. Leaves up to 10–15(–20) × 1.2–2.3 cm, narrower at the base and broader at the distal third part, resulting in a slightly spatulated form, similarly green colored abaxially and adaxially. Inflorescence 1–7 flowers in different stages of maturity; scape 14–30 cm long; spathe with 2 free bracts, 1.4–3 cm long. Flowers with pedicels 0.8–3.2 cm long at anthesis, with different lengths in flowers of the same inflorescence; hypanthium tube 0.4–0.6 cm long, with many fimbriae, 0.1–0.2 cm long, above the junction of the filament with the tepals; tepals white with longitudinal rose colored to magenta stripes and yellowish green base; upper sepal 3.2–4.5 × 0.9–1.6 cm, lower sepals 3–4.2 × 0.5–1.3 cm, upper petals 3–4.3 × 0.4–0.9 cm, lowermost petal 2.7–3.7 × 0.2–0.4 cm. Stamen filaments 1.7–2.8 cm long, in two or three different lengths; pollen cream colored. Ovary trilocular, 0.2–0.4 cm long; style 2.7–3.6 cm long ascending distally; stigma trifid, with lobes 0.1–0.2 cm. Fruit trilocular, 1.4–2.1 × 0.4–0.8 cm dehiscent dry capsule, flat winged seeds 0.4–0.6 cm, dark brown to black.  $2n = 22$  chromosomes.

**Distribution and ecology:**—*Hippeastrum idimae* was found near the town of Cardoso Moreira, State of Rio de Janeiro, an area with low hills and granitic rock outcrops. It is an area that has been deforested a long time ago, just a few small wooded areas remain. The climate is classified as warm tropical sub humid, with about five dry months, during the winter, when the vegetation loses all its leaves. Two small populations were found on the sides of a few hills, each with at most about 40 flowering individuals. The plants grow in half shade, near rock outcrops, above and not far from humid areas, with bulbs completely buried in the soil.

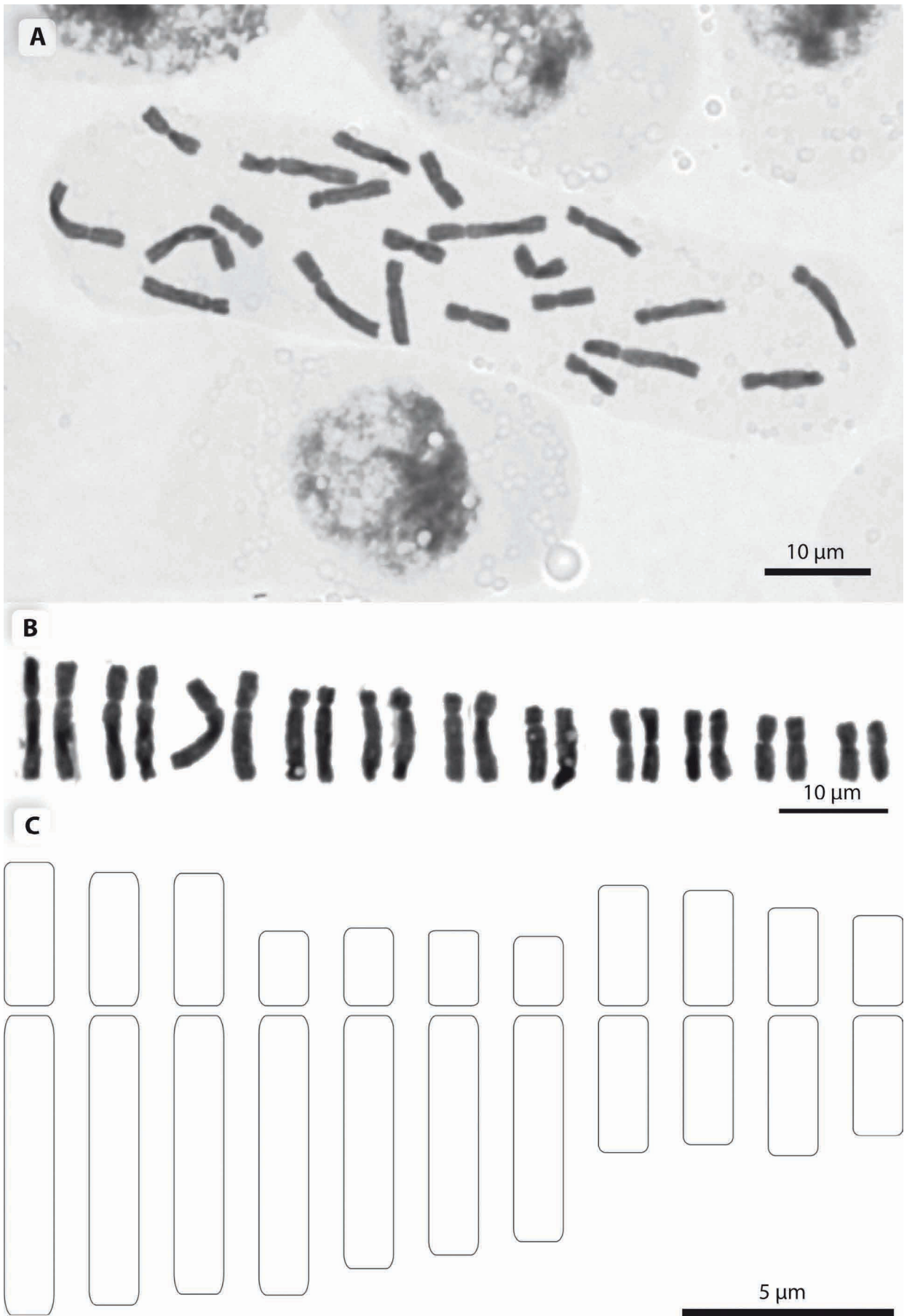
**Etymology:**—The specific epithet was chosen after its discoverer, Idimá Gonçalves da Costa, a self-taught amateur botanist who has been very helpful for many years to scientists investigating the species composition of the areas in the northern part of the State of Rio de Janeiro, an area where most of the original cover was removed, but where many unique species have been discovered by Idimá.

**Additional specimens examined (paratypes):**—BRAZIL. Rio de Janeiro: Cardoso Moreira, Santissimo, 17 August 2008, Dutilh *et al.* s.n. (UEC170593!).

**Taxonomic remarks:**—The flowers of *Hippeastrum idimae* have a very unique morphology; they resemble closely *Eithea blumenavia*, in color, shape and in the corona type, being the smallest flowers found in *Hippeastrum*. The leaves are also narrow near the base, resembling the leaves of *Eithea* and of some *Griffinia*, but they grow more prostrate than in these genera. The main external morphological difference, however, lies in the seeds, which are round and with an expansion in *Eithea* and in *Griffinia*, flat and winged in *Hippeastrum*, with the exception of *H. reticulatum* Herbert (1824: sub t. 2475), that has completely round black seeds, without any expansion.

**Cytological aspects of the new species:**—The cytological investigation was crucial for the confirmation of the position of the new species in the genus. *Hippeastrum idimae* has  $2n = 22$  chromosomes and a karyotype typical of *Hippeastrum* (Fig. 3A–B). The karyotype, according to the nomenclature of Levan *et al.* (1964) shows 4m, 3sm and 4st chromosome pairs (Table 1; Fig. 3C). Chromosome size ranges from 10.6 to 5  $\mu\text{m}$ , and interphasic nuclei are reticulate. Based on ITS rDNA data, this species is phylogenetically close to other *Hippeastrum* species (Oliveira 2012). In Amaryllidaceae chromosome number and karyotype are very characteristic and distinguish several different genera (Naranjo & Andrada 1975, Arroyo 1981, Poggio *et al.* 2007). In *Griffinia* there are  $x = 10$  chromosomes (Preuss 1999),





**FIGURE 3.** Chromosome complement of *Hippeastrum idimae* (2n = 22). A–B. Mitotic metaphase. C. Idiogram.

with at least one pair of the larger ones with a metacentric centromere. In *Eithea blumenavia*,  $x = 10$  (Arroyo 1982),  $x = 11$  (Sato 1938), and  $x = 9$  (Garcia *et al.* 2014) have been reported. Arroyo (1981) found no tendency to bimodality of the chromosomes in *Eithea*, as is common in *Hippeastrum*. An investigation by the last author of the present paper on the karyology of some individuals from a population of *Eithea blumenavia* in the Southern part of the State of São Paulo revealed  $2n = 18$  ( $x = 9$ ), with sometimes one or two extranumerary chromosomes (J.H.A. Dutilh, unpublished data). These B chromosomes have been found in several species of Amaryllidaceae and sometimes lead to mistaken interpretations (Dutilh 1989, Williams 1984, Guerra 1983). In *Hippeastrum*, a basic number of  $x = 11$  and a unique bimodal karyotype, with seven larger metacentric to submetacentric or subterminal and four smaller metacentric to submetacentric chromosome pairs has been described for all the species analyzed so far (Naranjo & Andrada 1975, Laksmi 1980, Arroyo 1982, Williams 1982, Brandham & Bhandol 1997, Poggio *et al.* 2007). This character was also decisive in confirming *Hippeastrum reticulatum* in the genus (Sharma & Jash 1958; Naranjo & Andrada 1975). Poggio *et al.* (2007) suggest an internal homeostasis that conserves bimodality and genome organization in *Hippeastrum*, however interspecific differences in nuclear DNA amount might result in variations in the chromosome size.

**TABLE 1.** Karyo-morphometric parameters for *Hippeastrum idimae*. Chromosome measures (in  $\mu\text{m}$ ) and centromere position. CI—chromosome index, L—long arm, S—short arm, TL—total length.

Pair	T	L	S	L/S		CI
1	10.69	7.26	3.47	2.08	sm	32.43
2	10.21	6.99	3.22	2.17	sm	31.52
3	9.93	6.73	3.21	2.10	sm	32.24
4	8.56	6.75	1.81	3.74	st	21.11
5	7.98	6.10	1.88	3.25	st	23.52
6	7.60	5.78	1.82	3.17	st	23.95
7	7.13	5.46	1.67	3.26	st	23.45
8	6.22	3.31	2.91	1.13	m	46.83
9	5.90	3.11	2.78	1.12	m	47.20
10	5.74	3.38	2.36	1.43	m	41.20
11	5.07	2.89	2.18	1.33	m	42.93
TL	170.1				Mean CI	33.31

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