

NOTES ON THE SYSTEMATICS OF *HESPERANTHA* (IRIDACEAE) IN TROPICAL AFRICA¹

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ABSTRACT

Three species of *Hesperantha* are here recognized in tropical Africa: *H. petitiana* is widespread in highland areas from Ethiopia to eastern Zimbabwe; *H. ballii* is a local endemic of the Chimanimani Mountains in eastern Zimbabwe; and *H. longicollis* occurs in highlands in Malawi and Zimbabwe, extending into eastern Botswana and the Transvaal, South Africa. *Hesperantha petitiana* is taxonomically complex and includes lowgrowing and small-flowered plants corresponding to *Ixia petitiana* and *I. hochstetteriana*, and tall and large-flowered forms corresponding to *H. volkensii* from Mt. Kilimanjaro, and *H. alpina* from Mt. Cameroun. *Hesperantha petitiana* is closely allied to the southern African *H. baurii* complex and is not readily separable from some southern African collections assigned to this alliance. Chromosome numbers are reported for three populations of *H. petitiana*, all polyploid and either tetraploid or hexaploid, in contrast to all southern African plants so far counted, which are diploids.

The genus *Hesperantha* comprises some 55 species of Iridaceae-Ixioideae, all small perennial corm-bearing geophytes. While it occurs widely in Africa (Fig. 1), species are concentrated in southern Africa. There are some 36 species in the winter rainfall region of the Cape Province (Goldblatt, 1984) and about 20 species in the well-watered areas of coastal and montane eastern southern Africa (Goldblatt, 1982; Hilliard & Burtt, 1979, 1982). Six species of *Hesperantha* have been recorded in tropical Africa, from Zimbabwe in the south to Ethiopia in the north, but only three are recognized here. These are the closely allied *H. ballii* Wild and *H. longicollis* Baker (section *Radiata*), and the unrelated *H. petitiana* (A. Richard) Baker (section *Concentrica*), which is variable and often treated as comprising two or more species or varieties. *Hesperantha ballii* and *H. petitiana* are found only in tropical Africa, *H. ballii* being a local endemic of the Chimanimani Mountains of eastern Zimbabwe, while *H. petitiana* occurs in highland areas above 8,000 ft., almost throughout eastern tropical Africa as well as in Cameroun. *Hesperantha longicollis* is centered in the highveld of the Transvaal and Zimbabwe (Obermeyer, 1980) but it extends into Botswana to the west and Malawi to the north.

Both *Hesperantha longicollis* and *H. ballii* are well-defined species, but *H. petitiana* is variable over its wide range and appears taxonomically complex. Moreover, it does not seem particularly distinctive and is difficult to separate from a complex of southern African species centered around *H. baurii* Baker. The variation pattern and taxonomy of *H. petitiana* is dealt with in detail in this paper, while *H. ballii* and *H. longicollis* are discussed only briefly.

Chromosome number has been determined here for three populations of *Hesperantha petitiana*, the species previously unknown cytologically. A collection from Mt. Kilimanjaro (*Puff s.n.*) is tetraploid, $2n(4x) = \text{ca. } 50$. Two more populations are hexaploid, one from Ethiopia (*Puff et al. 820911-1/1*) $2n(6x) = \text{ca. } 72$ and the other from Mt. Cameroun (*Thomas sub Goldblatt 7272*), $2n(6x) = \text{ca. } 76$. Basic chromosome number in *Hesperantha* is $x = 13$ (Goldblatt, 1984) and all of the many other species so far counted, all from southern Africa, have numbers at the diploid level. The counts for *H. petitiana* are interesting because they are the first reports of polyploidy in the genus and also because the numbers recorded suggest a possible $x = 12$ rather than 13 as basic for this species. Unfortunately, the high numbers and small chromo-

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somes make it difficult to establish an exact count and so a second base number in *Hesperantha* remains uncertain.

HESPERANTHA LONGICOLLIS

Hesperantha longicollis, typical in *Hesperantha* in being evening blooming, is closely related to the widespread southern African *H. radiata*, which extends from Namaqualand on the west coast, through the southern and eastern Cape to Swaziland in the eastern escarpment. The two have, in common, a curved perianth tube and unusual floral bracts, the outer of which have margins partly united around the axis. The two species can readily be identified by a series of distinguishing features. In *H. longicollis* the flower has a longer perianth tube, 18–25(–30) mm long, well exerted from the bracts; the outer bract is united around the axis only near the base; the leaves are relatively long, usually about half as long as the stem or longer, and plane; and the corm tunics are typically spiny below. In *H. radiata*, the perianth tube is 10–18 mm long, and only slightly exceeds the bracts; the outer bract has margins united around the axis for half to two-thirds its length; the leaves are typically short, about one-third to half as long as the stem, and tend to be thicker in the midrib area; and, at least in populations from eastern southern Africa, the corm tunics are not spiny below (Goldblatt, 1984) although some southwestern Cape forms do have a corm with a spiny base.

Hesperantha longicollis grows in moist habitats, either in vleis, along streams or in seeps, and it blooms at the end of the dry season, typically in August or September. It is most common in the southern African highveld (Fig. 1) and has been recorded from the Transvaal, Northern Cape, extreme eastern Botswana, central and western Zimbabwe, and recently from Malawi, where it was collected by R. K. Brummitt on the Nyika Plateau (*Brummitt 10829*) flowering in May. This represents a significant range extension into tropical Africa of what has been regarded as essentially a southern species.

The species was recently reviewed for "Flowering Plants of Africa" (Obermeyer, 1980), in which a full description and synonymy were provided. This need not be repeated here; however, it should be noted that of the three synonyms cited, *Hesperantha matopensis*, *H. widmeri*, and *H. sabiensis*, the last does not apply to *H. longicollis*. It is a later synonym of *H. bulbifera*

(Goldblatt, 1984), a rare species, unrelated to *H. longicollis*, found on damp cliffs and waterfalls in the Eastern Cape and Transvaal (Goldblatt, 1984).

HESPERANTHA BALLII

Hesperantha ballii is a rare local endemic of the Chimanimani Mountains of eastern Zimbabwe (Fig. 1). It is a small plant, only some 12–25 cm high, with spikes of one to two flowers and narrow, filiform leaves. It is clearly related to *H. longicollis* and *H. radiata*, with which it shares the distinctive floral bracts characteristic of section *Radiata*, united to some extent around the spike axis, and curved perianth tube. In *H. ballii*, the perianth tube is 11–15 mm long, reaching a little beyond the apex of the bracts; the leaves are about 1 mm wide; the outer bracts are united for about 3 mm, about one-fourth their length; and the nearly globose corms apparently have tunics without spines below. The species seems most closely related to *H. radiata*, judging by the similarity of their corms, the length of the perianth tube, and the well-developed union of the outer bracts. It can readily be distinguished from *H. longicollis* by its small size, 1–2-flowered spike, and flowers with a perianth tube only a little longer than the bracts. It is separated from *H. radiata* also by the few-flowered spike, filiform leaves, and the outer bracts being united for ca. 3 mm, only about one-fourth their length, while those of *H. radiata* are united for half to two-thirds their length.

HESPERANTHA PETITIANA

As outlined in the introduction, *Hesperantha petitiana* is widespread in highland areas throughout eastern tropical Africa, from Zimbabwe to Ethiopia, with outlying populations to the west in Cameroun (Fig. 1). It is allied to a complex of southern African species centered around *H. baurii*, and it can be distinguished only with difficulty, if at all, from some collections from South Africa and Lesotho. The distinguishing features of *H. petitiana* appear to be its erect, comparatively thick and straight, unbranched stem, straight, 1–3(rarely to 8)-flowered spike, and actinomorphic, straight-tubed pink or white flowers. Like the other pink to reddish or purple-flowered species of the *H. baurii* complex, the flowers open during the day and close at night. Whether the white-flowered forms of *H. petitiana* are also day-blooming is not

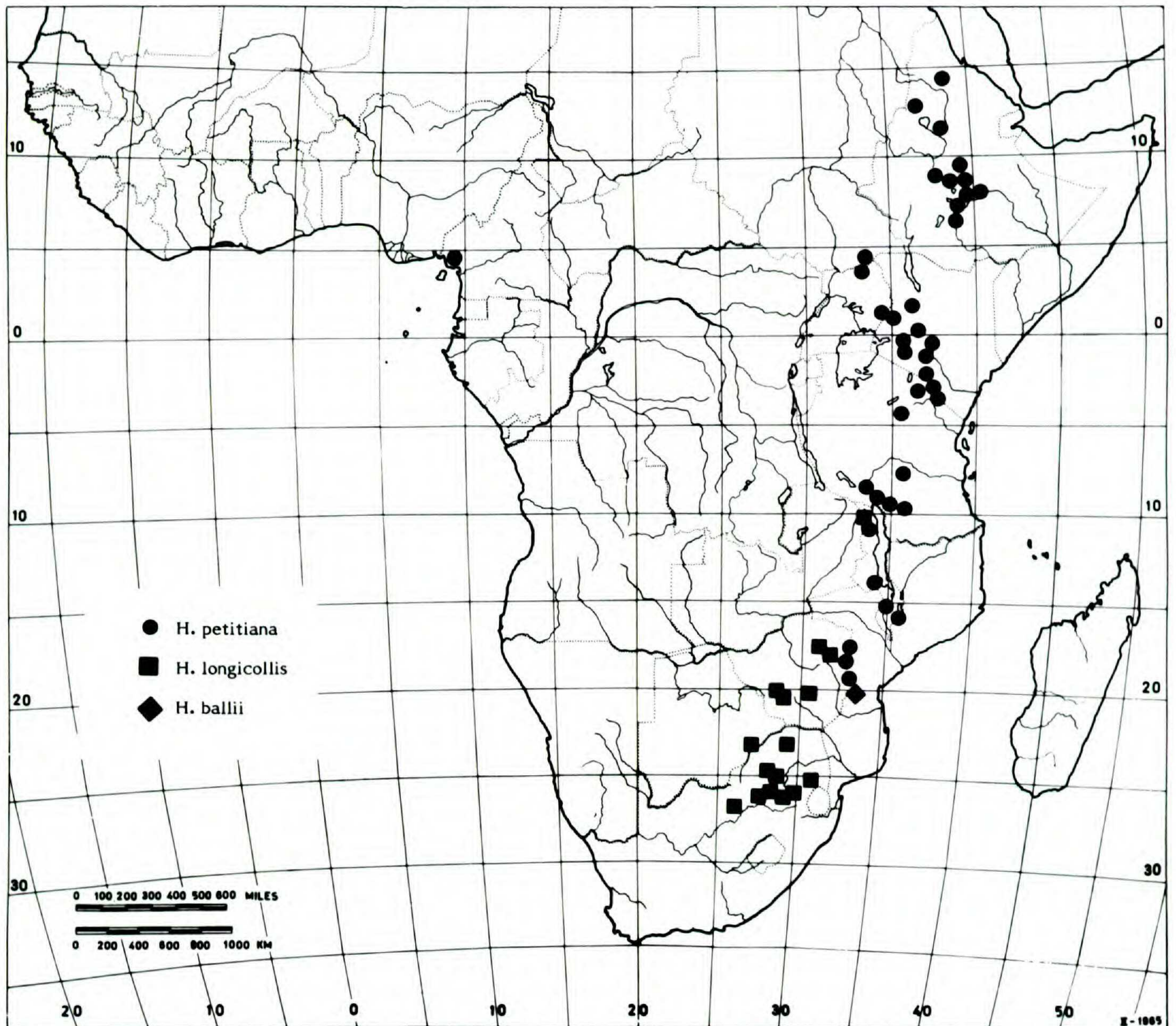


FIGURE 1. Distribution of the tropical African species of *Hesperantha*.

known. Species or races of *Hesperantha* with white flowers are often evening-blooming and those with colored flowers are day-blooming (Goldblatt, 1984) but white-flowered plants in eastern south Africa are generally day-blooming (Burt, pers. comm.).

The variation pattern in *Hesperantha petitiana* has prompted several authors to admit more than one species or variety in tropical Africa. Originally two species, based on collections of either tall or short plants, were recognized in Ethiopia (Richard, 1850): *Ixia petitiana* and *I. hochstetteriana*. Baker (1898) reduced the dwarf *I. hochstetteriana* to varietal rank as *Hesperantha petitiana* var. *uniflora* Hochst. ex Baker, a treatment followed by Cufodontis (1972) in his "Enumeratio Plantarum Aethiopiae Spermatophyta."

Collections from Cameroun and Tanzania were subsequently described as separate species, *Hes-*

perantha alpina (as *Geissorhiza alpina*) from Mt. Cameroun by J. D. Hooker in 1864, and *H. volkensii* from Mt. Kilimanjaro by Harms in 1894. *Hesperantha kilimanjarica*, described by Rendle in 1895, is clearly identical to *H. volkensii*. Baker (1898) recognized both *H. alpina* and *H. volkensii* in his treatment of the genus in "Flora of Tropical Africa." Later, Foster (1948) reduced *H. volkensii* to varietal status in *H. petitiana*, commenting that he had some misgivings about even recognizing the variety. Here, I suggest that *H. petitiana* be treated as a single variable species including both *H. alpina* and *H. volkensii*. An analysis of the variation pattern of *H. petitiana* is presented below, in which the Ethiopian populations are discussed first.

ETHIOPIAN COLLECTIONS

Hesperantha petitiana was first discovered in Ethiopia, where it was collected by Schimper and

by Quartin-Dillon and Petit in the mid-nineteenth century. In 1850, Achille Richard described two species of *Hesperantha* (as *Ixia*) from their collections, *I. hochstetteriana* based on Schimper's *I. uniflora* ined., a dwarf form with solitary flowers, and *I. petitiana*, based on taller, 2–3-flowered plants collected by Quartin-Dillon and Petit. The collection that must apparently be chosen as the lectotype of *Ixia petitiana* is in the Paris Herbarium. It comprises several tall plants, about 30 cm high, with 2–3-flowered spikes and four plane, soft-textured leaves, the uppermost almost or entirely sheathing. The flowers have a tube ca. 9 mm long and tepals about 10 mm long and are subtended by herbaceous bracts 10–15 mm long.

Most of the collections made by Schimper comprise dwarf plants under 10 cm long, usually with only three leaves, flowers with tepals ca. 10 mm long, and a tube 6–8 mm long. The type of *I. hochstetteriana*, *Schimper 185* from Mt. Bachit, Semien 'Bouahit, provinciae Semiene' (also labelled '*Hesperantha uniflora* Hochst. 1239') consists of such plants. However, a collection from 'Berg Gunna,' *Schimper 1182* (B), comprises a range of plants from 7.5 to 18 cm high and with three or four leaves. The taller individuals of the collection are interchangeable with plants from the type collection of *H. petitiana*, while the smaller cannot be distinguished from *I. hochstetteriana*. Another Schimper collection, *579* from 'Acallo Meda' (P), also consists of plants of variable size.

It seems likely on the basis of the available information and collections that the tall *Hesperantha petitiana* and the dwarf var. *uniflora* comprise a single taxon, representing size extremes in a phenotypically plastic species. It is possible that collections of plants of variable size represent a mixture of two species but in the absence of supportive evidence this is unlikely. The apparently continuous variation in some populations and the absence of any consistent morphological distinctions leaves little reason for the recognition of var. *uniflora*. It seems likely that the collections represent the range possible in a high altitude species that grows in situations where plants are subject to a variety of soil and climatic conditions that influence their growth into taller plants often with large flowers or shorter plants usually with smaller flowers.

Among recent collections of *Hesperantha* from Ethiopia there are both dwarf and taller specimens, but no gathering consists entirely of very

small plants, as do some of the Schimper collections. Several collections, such as *de Wilde 8109* and *Westphal & Westphal-Stevels 1652*, consist of both small-flowered plants that match *Ixia hochstetteriana* closely, and taller individuals that have larger flowers with tepals 12–15 mm long.

Occasionally collections from Ethiopia are particularly robust (*de Wilde 6574* consists of plants with up to eight flowers on a spike) or have flowers that seem beyond the normal range expected for *H. petitiana* (e.g., *de Wilde 6574*; *Hedberg 4245*) with tepals 15–16 mm long, and bracts 12(–15) mm long. Such collections correspond well with most specimens of *Hesperantha* collected in East Africa that have been described as the separate species, *H. volkensis* Harms.

The significant questions concerning the taxonomy of *Hesperantha* in tropical Africa are the following. Are smaller Ethiopian specimens matching *H. petitiana* different in any taxonomically significant way from the taller and very large-flowered plants from Ethiopia, East Africa (*H. petitiana* var. *volkensis* of several authors), and the Cameroun highlands (*H. alpina*)? A second problem concerns the relationship of the tropical African plants to any southern African species, of which there are several that are obviously closely allied.

EAST AFRICAN COLLECTIONS

Most specimens from East Africa are relatively uniform in flower size, but variable in height and leaf width and thickness. Plants matching the types of *Hesperantha volkensis* and *H. kilimanjarica*, both from Mt. Kilimanjaro, vary in height but reach a maximum of 45 cm, have four leaves, the lower two basal, the third partly sheathing and inserted near the base, all narrow, 2–3 mm wide and with clearly raised margins and midrib, while the fourth is entirely sheathing and inserted in the upper part of the stem. The bracts are (10–)12–15 mm long, and like the larger Ethiopian plants, the flowers are either white or pinkish purple, with a tube 9–10 mm long, tepals 15 mm long, and anthers 5–6.5 mm long.

Plants essentially matching the Kilimanjaro specimens have been collected in highland Uganda, southern Sudan, and Kenya, on Mt. Elgon; the Aberdares, especially Mt. Kinangop; Mt. Kenya and elsewhere. Specimens are sometimes very dwarfed (only 4–10 cm high in *Gillett 18473*, *Bickford 34*) and with leaves as little as 1 mm

wide, but still with raised margins and midribs, although in several collections a whole range of plant and flower sizes is present (e.g., *Hedberg 1953*; *Gillett 16912*) and it seems that the taller plant matching the types of *H. volkensii* and *H. kilimanjarica*, as well as the smaller ones, all belong to the same species. Occasionally, as in *Battiscombe K715* (Kinohop Plateau), *Napier 719* (Kinangop), *Archer 676* (Namanga Hill), and a few others, the leaves are broader, and the margins and midrib less obviously raised, as in most Ethiopian specimens, but these are also connected by a series of intermediates to the typical Kilimanjaro form.

In Tanzania, the tall, Kilimanjaro form appears common at higher elevations throughout the Kilimanjaro Range and in the Southern Highlands, is sometimes robust and with leaves 3–4 mm wide, but also sometimes small. A collection made by Schlieben (4918) on Kilimanjaro is of especial interest. Plants range in size from 8–20 cm high and the tallest plants apparently match *H. volkensii* in every respect. The shorter individuals have smaller flowers, and in specimens at the Zurich and Stockholm herbaria the tepals may be as short as 10 mm. These plants can barely, if at all, be distinguished from the type material of the dwarf *Ixia hochstetteriana* from Ethiopia.

In the Southern Highlands plants tend to have more soft-textured leaves, 3–5 mm wide, and often have spikes with 6 or more flowers, but the fewer-flowered individuals appear to match in all respects plants from Kilimanjaro. In Malawi, the southern Tanzania form has been collected in all the higher areas including the Nyika Plateau, the Dezda Mountains, and Mt. Mlange. Further south in Zimbabwe, apparently the same form has been collected along the eastern highlands from Inyanga to the Vumba Mountains, where it is currently identified either as *H. petitiana* or as the southern African *H. baurii*, a name in current use for a complex probably including several species but not yet understood. In southern Africa there are several collections that appear to match exactly the Malawi and south Tanzania form of *H. petitiana*, but the entire *H. baurii* complex awaits further study before the systematics of the genus in this area can be resolved. However, I suggest that, for the present, all collections of *Hesperantha* occurring from Zimbabwe north to Kenya be assigned to the single taxon, *H. petitiana*.

Hesperantha alpina from Cameroun is poorly

known and only a few gatherings have been made. Specimens in the Berlin collection comprise dwarf, 3- or 4-leaved individuals in fruit (*Mann 2134*) and very tall plants with buds or closed flowers (*Preuss 968*). The dwarf plants match *Ixia hochstetteriana* well, while the tall plants are a fair match for *H. volkensii* but appear to have rather small flowers, perhaps not fully developed. The morphology and the range of size in these specimens corresponds closely with the more ample Ethiopian and Kenyan collections and I cannot distinguish the Cameroun plants other than by their origin. *Hesperantha alpina* is accordingly reduced here to synonymy in *H. petitiana*.

The treatment of the variable *H. petitiana* complex as a single species throughout tropical Africa seems the only consistent way in which to deal with the degree of variability encountered in the complex. None of the variation is strictly geographical, and both tall, large-flowered plants and dwarf, smaller flowered plants may be found almost throughout its range, though the latter appear more frequent in Ethiopia.

The taxonomy and nomenclature of *Hesperantha petitiana* is confusing and the extensive synonymy and a description are presented below:

Hesperantha petitiana (A. Richard) Baker, J. Linn. Soc., Bot. 16: 96. 1878 et Fl. Trop. Africa 7: 348–349. 1898; Cufodontis, Enum. Pl. Aethiopiae Sperm. 2: 1588. 1972. *Ixia petitiana* A. Richard, Tent. Fl. Abyss. 2: 309–310. 1850. TYPE: Ethiopia, near 'Maygougoua,' Sept., '*Ixia petitiana* Nob.' *Quartin-Dillon & Petit s.n.* (lectotype, P, here designated).

Ixia hochstetteriana A. Richard, Tent. Fl. Abyss. 2: 309. 1850. TYPE: Ethiopia, Mt. Bachit: Semien (Mt. Bouahit, Prov. Semiene), Aug., '*Hesperantha uniflora* Hochst.' *Schimper 1239* (lectotype, P, here designated; isolectotypes, B, BM, BR, G, L, S, Z). *Geissorhiza abyssinica* var. *parvula* Klatt, Linnaea 34: 717. 1866. *Hesperantha petitiana* var. *uniflora* Hochst. ex. Baker, Fl. Trop. Africa 7: 349. 1898; Cufodontis, Enum. Pl. Aethiopiae Sperm. 2: 1588. 1972.

Hesperantha uniflora Hochst. ms (*Schimper 185* etc.); Richard, Tent. Fl. Abyss. 2: 309. 1850, in synonym. *Geissorhiza alpina* Hook. f., J. Linn. Soc., Bot. 7: 223. 1864. *Hesperantha alpina* (Hook. f.) Pax ex Engler, Hochgebirgefl. Afrika 174. 1892. Abh. Preuss. Akad. Wiss., Phys.-Math. Kl. 1891: 1–461. 1892 [Mar.]; Hepper, Fl. W. Trop. Africa 3: 141. 1968. TYPE: Cameroun. Cameroun Mt., 9,000–10,000 ft., Nov. 1862, *Mann 2134* (lectotype, K; isolectotype, B).

Hesperantha volkensii Harms, Bot. Jahrb. Syst. 19 (Beibl. 47): 28. 1894. *Hesperantha petitiiana* var. *volkensii* (Harms) Foster, Contr. Gray Herb. 166: 22. 1948; Hedberg, Symb. Bot. Uppsal. 15: 68–69. 1957. TYPE: Tanzania, 'Kilimandscharo': 2,440 m, *Volkens 783* (lectotype, B; isolectotypes, BM, G).

Hesperantha kilimanjarica Rendle, J. Linn. Soc., Bot. 30: 402. 1895. TYPE: Tanzania. Mt. Kilimanjaro: above Morong, to 10,000 ft., 1888, *Taylor s.n.* (holotype, BM).

Geissorhiza abyssinica R. Br. ex A. Richard sensu Klatt, Linnaea 34: 716. 1866, non *G. abyssinica* R. Br. ex A. Richard (Tent. Fl. Abyss. 2: 308. 1850). [= *Lapeirousia abyssinica* (R. Br. ex A. Richard) Baker, the types being: Ethiopia. Near 'Maygouagoua': Sept., *Quartin-Dillon & Petit s.n.*; Selleuda prope Adowa, *Schimper s.n.*].

Plants (8–)12–30(–45) cm high. *Corm* 7–12 mm diam. with dark brown, concentric, usually woody tunics. *Cataphyll* membranous. *Leaves* (3–)4, the lower two basal, the third usually inserted near the base or in the lower part of the stem and sheathing in the lower half, the fourth leaf, if present, inserted in the mid to upper part of the stem and often entirely sheathing, 2–6 mm wide, usually about half as long as the stems, margins and midrib barely to moderately thickened. *Stem* erect, smooth, unbranched. *Spike* (1–)2–6(–9)-flowered, straight to slightly flexuose; *bracts* herbaceous, becoming membranous toward the apex, (9–)12–15 mm long, the inner narrower and slightly shorter. *Flowers* actinomorphic, stellate, white to pink, outer tepals flushed dull red to brown on reverse; *perianth tube* cylindrical, 6–9 mm long; *tepals* subequal, (9–)12–18 mm long, narrowly ovate to elliptic, 5–7 mm at widest point. *Filaments* 3–4 mm long; *anthers* (3–)4–7.5 mm long. *Ovary* 2–3 mm long, style branches 6 mm long. *Capsule* obovoid, 7–10 mm long, some-

what shorter to slightly exceeding the bracts. *Chromosome number* $2n = ca. 50$, ca. 72–76.

Flowering time. July–December in Ethiopia; May–August and December–February in Kenya, Uganda, and northern Tanzania; March–May in S. Tanzania, Malawi, and Zimbabwe; September in Cameroun.

Distribution. Highlands in Ethiopia, southern Sudan, eastern Uganda, Kenya, Tanzania, Malawi, Cameroun, and eastern Zimbabwe. Figure 1.

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