

The Madagascan *Geissorhiza ambongensis* transferred to *Crocasmia* (*Iridaceae-Ixioideae*)

P. GOLDBLATT & J. C. MANNING

Summary : The species of Madagascan *Iridaceae* described as *Geissorhiza ambongensis* by PERRIER in 1939 was removed from this exclusively South African genus in 1982. However, the species was incompletely known and this had made its generic disposition uncertain. Leaf anatomical studies suggest that *G. ambongensis* correctly belongs in subtribe *Tritoniinae*. The leaf has thickened and radially elongated marginal epidermal cells and lacks subepidermal marginal sclerenchyma. This combination of characters accords with subtribe *Tritoniinae*, but not with *Gladiolinae*, species of which have normal marginal epidermal cells and submarginal sclerenchyma in their leaves. Morphology of the corm, bracts and flowers is also consistent with *Tritoniinae*. *G. ambongensis* corresponds most closely with *Crocasmia*, an African genus of six species, and it is accordingly transferred there as *C. ambongensis* (H. Perrier) Goldbl. & Manning.

Résumé : *Geissorhiza ambongensis*, espèce d'*Iridaceae* malgache décrite par PERRIER en 1939, a été ôtée du genre *Geissorhiza*, exclusivement sud africain, en 1982. Cependant, cette espèce était incomplètement connue, ce qui rendait sa position générique incertaine. Des études d'anatomie foliaire suggèrent que *G. ambongensis* appartient à la sous-tribu des *Tritoniinae*. Les feuilles renferment, au niveau des marges, des cellules épidermiques épaisses et allongées radialement, et il n'y a pas de sclérenchyme marginal sous-épidermique. Ces caractères s'accordent avec ceux de la sous-tribu des *Tritoniinae*, mais pas avec ceux des *Gladiolinae* dont les espèces ont des feuilles renfermant, au niveau des marges, des cellules épidermiques et du sclérenchyme submarginal normaux. La morphologie du bulbe, des bractées et des fleurs est également compatible avec les *Tritoniinae*. Les caractères observés chez *G. ambongensis* correspondent davantage à ceux de *Crocasmia*, genre africain renfermant six espèces ; en conséquence, cette espèce lui est rattachée sous le nom de *C. ambongensis* (H. Perrier) Goldbl. & Manning.

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INTRODUCTION

The Madagascan endemic species of *Iridaceae*, described in 1939 as *Geissorhiza ambongensis* by PERRIER was excluded from this entirely Cape genus of 81 species by GOLDBLATT (1982, 1985). PERRIER included this species together with *G. bojeri* in *Geissorhiza* in his treatment of *Iridaceae* for the Flore de Madagascar et des Comores (PERRIER, 1946) but

although the latter has been convincingly shown to be a species of *Gladiolus* (GOLDBLATT, 1982; 1990), the generic position of *Geissorhiza ambongensis* has remained in doubt. An orange flower colour and the general aspect of the species led GOLDBLATT to suggest that *G. ambongensis* might belong in either *Tritonia* or *Crocasmia*, two predominantly southern African genera of *Tritoniinae* that also occur in south tropical Africa. In the absence of living material and fruiting specimens, we have resorted to studies of leaf anatomy to help determine an appropriate genus for this species in preparation for a revised treatment of *Iridaceae* for the Flore de Madagascar. At the generic level leaf anatomical characters have been found to be useful in recent studies in *Iridaceae*. For example, DE VOS (1984) used two leaf characters in defining genera of *Tritoniinae* and one in separating the three main genera of the subtribe, in conjunction with traditional morphological characters.

METHODS AND OBSERVATIONS

Leaf anatomy was studied from leaf fragments removed from herbarium specimens (Table 1) and rehydrated prior to sectioning in paraplast following standard procedures for wax embedding. Serial sections were stained in safranin. Venation patterns were examined in leaves taken from herbarium specimens (Table 1) and cleared in NaOH and NaHCO₃ and stained with safranin. Styloid crystals were photographed in polarized light.

TABLE 1 : Voucher data for material studied.

<i>Crocasmia ambongensis</i>	
Perrier 1519, Madagascar, Majunga, Tsingy de Namaroka (P)	
Rakotovo G. Sarde 6113, Madagascar, Majunga, Soalala dist., Andranomavo (P)	
<i>C. aurea</i> Planch.	
Schlieben 5981, Tanzania, Lindi, Muera plateau (MO)	
<i>Tritonia securigera</i> (Ait.) Ker	
Bean 1581, S. Africa, Cape, Outshoorn (MO)	

LEAF ANATOMY

Like most *Iridaceae*, the leaves of *Geissorhiza ambongensis* are equitant and ensiform and arranged in a distichous fan. They are plane with a major vein in the centre (pseudomidrib) slightly raised above the surface and six smaller parallel longitudinal veins on either side of pseudomidrib. These veins issue consecutively from the mid vein in the lower half of the blade.

The vascular bundles are arranged in a single row, each bundle formed by the fusion at the xylem poles of paired opposite bundles; the constituent bundles of the main vein alone remain distinct. All bundles have a sclerenchyma cap at the phloem pole that is most well

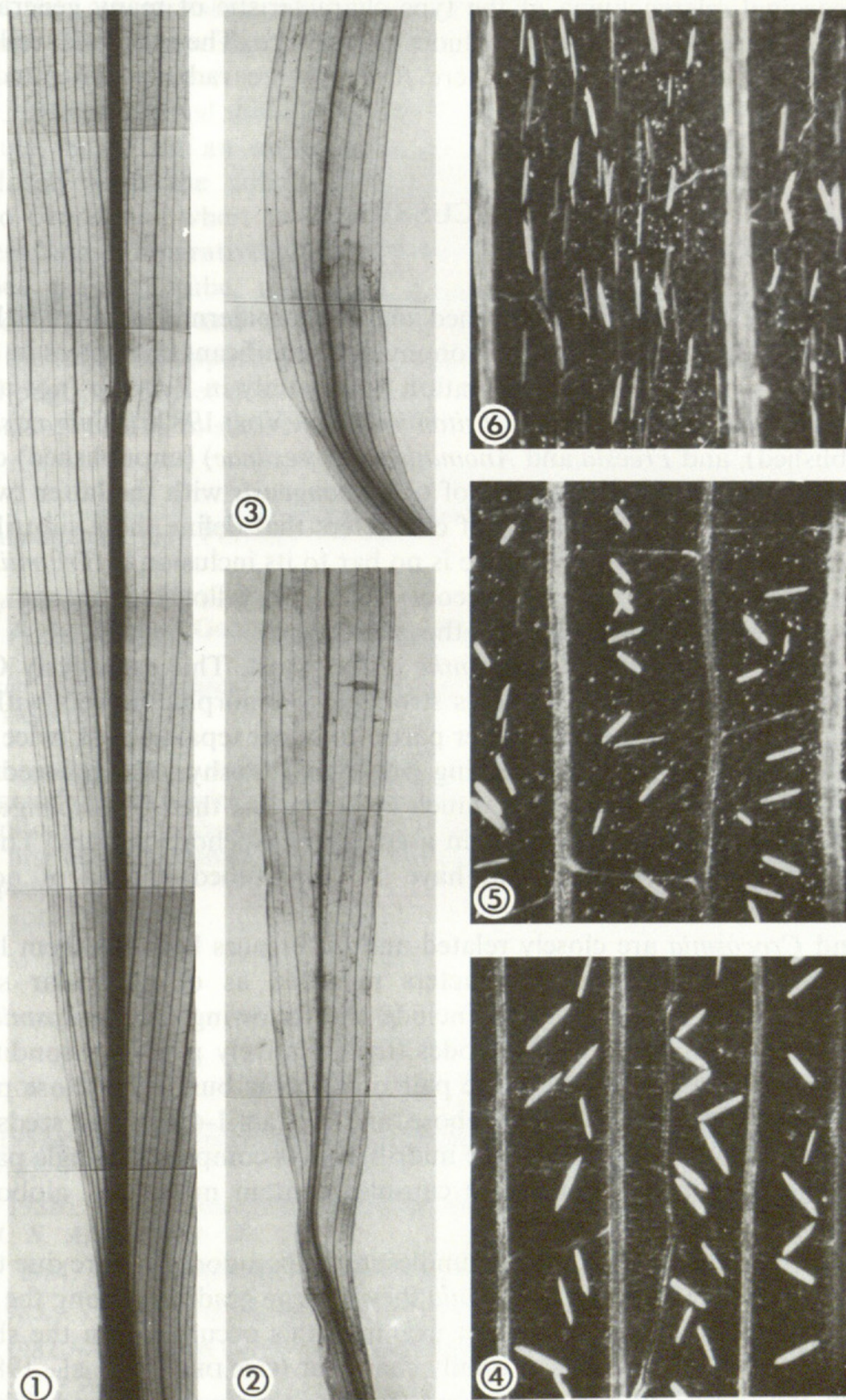


Fig. 1. — Leaf venation in *Crocosmia* and *Tritonia* : 1, *C. aurea* $\times 3$; 2, *C. ambongensis* $\times 3$; 3, *T. securigera* $\times 3$. — Arrangement of styloid crystals in leaf lamina : 4, *C. aurea* $\times 50$; 5, *C. ambongensis* $\times 50$; 6, *T. securigera* $\times 50$.

developed at the major veins, where it reaches the epidermis. There are no marginal veins nor subepidermal marginal sclerenchyma of the type characteristic of many genera of *Ixiodeae*, including the subtribe *Gladiolinae*, which includes *Geissorhiza*. The epidermal cells are papillate and thin-walled except at the margins where the cells are radially elongated and heavily thickened.

DISCUSSION

The presence of elongated and thickened marginal epidermal cells and the absence of subepidermal marginal sclerenchyma are taxonomically significant characters in *Ixiodeae*, and particularly in *Ixieae*, in which this combination occurs only in *Tritonia* (not all species) (DE VOS, 1982a), *Crocasmia*, *Chasmanthe* (all *Tritoniinae*) (DE VOS, 1982b), *Sparaxis* and *Synnotia* (*Ixiinae*) (unpublished), and *Freesia* and *Anomatheca* (*Freesiinae*) (unpublished) of the some 25 genera of this tribe. Any close relationship of *G. ambongensis* with the latter two subtribes is unlikely because it lacks the combination of characters that define these subtribes. However, from what we know of *G. ambongensis*, there is no bar to its inclusion in *Tritoniinae*. It has the fibrous corm tunics, more or less herbaceous bracts, a yellow to orange perianth, and undivided style branches characteristic of the alliance.

Of the genera of the subtribe, *Chasmanthe* differs most. This exclusively Cape genus of three species (DE VOS, 1985) is defined by its strongly zygomorphic flowers with a dimorphic perianth tube, tubular in the lower and upper parts, an upper tepal at least twice as long as the others, and few-seeded capsules containing somewhat fleshy orange seeds. Species of *Chasmanthe* are generally also tall plants, much larger in size than *G. ambongensis*, and they have spikes of numerous flowers arranged in a strongly distichous pattern. The spikes of *G. ambongensis* are only 10-15 cm long and have 1-3 long-tubed flowers of no pronounced orientation.

Tritonia and *Crocasmia* are closely related and differences between them largely involve the nature of the fruit and seed. Characters regarded as of particular significance in distinguishing the genera (DE VOS, 1984) include the following. In *Crocasmia* the corm is persistent and consists of numerous internodes (the putatively primitive condition); the leaf pseudomidrib may comprise more than one pair of vascular bundles in close proximity. The somewhat woody capsules are depressed-globose, and contain 1-4 rounded seeds per locule. In *Tritonia* the annual corm has few nodes; the midrib always comprises a single pair of bundles; and the membranous, ellipsoid to obovate capsules contain numerous, globose to angular seeds per chamber.

Differences in the number of vascular bundles in the pseudomidrib are due to the position at which the lateral veins diverge. In *Crocasmia* they diverge gradually along the lower portion of the blade (Fig. 1) whereas in *Tritonia* for example, this occurs within the sheath (Fig. 3). The orientation of the styloid crystals, a family character (GOLDBLATT et al., 1984), in the leaf blades differs in the species of *Crocasmia* and *Tritonia* that we examined. The styloids are randomly oriented in *Crocasmia* (Fig. 4) but aligned along the long axis of the leaf in *Tritonia* (Fig. 6). The consistency of this difference between the genera is unknown but the pattern in *Geissorhiza ambongensis* (Fig. 5) corresponds to the random condition of *Crocasmia*.

In *Geissorhiza ambongensis* the corms are relatively small, and thus comprise few internodes, but they are persistent, and a series of at least three old corms remains attached to the current one. The leaves show the characteristic diverging lateral veins of *Crocasmia* (Fig. 2). Unfortunately mature capsules are not present on any of the herbarium sheets, but PERRIER (1939, 1946) described the capsules as globose-trigonus with 3-4 wingless, subglobose seeds per locule, based on an examination of a single, immature fruit. This appears to correspond closely with the condition in *Crocasmia*. It now seems best to assign *G. ambongensis* to *Crocasmia*, where it is unusual in its small size, typically unbranched spike of only 1-3 flowers, and comparatively small corms. The flowers themselves are fairly large, with a funnel-shaped perianth tube, the lower, tubular part particularly long. The tepals are subequal, directed forwards, and weakly spreading in the upper half, and the anthers are well exerted from the tube and apparently unilaterally arranged. These features are consistent with *Crocasmia* although the flower does differ from other species of this genus, particularly in not having the tepals spreading to slightly reflexed. The necessary new combination is made below.

***Crocasmia ambongensis* (H. Perrier) Goldbl. & Manning, comb. nov.**

— *Geissorhiza ambongensis* H. PERRIER, Not. Syst. 8 : 130-131 (1939); Fl. Madagascar & Comores 45 : 20-21 & fig. (1946); GOLDBLATT, Ann. Missouri Bot. Gard. 69 : 380-381 (1982).

TYPE : *Perrier 1519*, Madagascar, Majunga, Tsingy de Namaroka, près d'Andranomavo (lecto-, here designated, P; isolecto- (2), P).

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