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Monograph

The genus *Chlorophytum* Ker Gawl. (Asparagales, Asparagaceae) in Madagascar, with the description of 12 new species, 4 new subspecies and 1 new variety

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Abstract. The genus *Chlorophytum* Ker Gawl. (Asparagaceae) is revised taxonomically for Madagascar. It is a palaeotropical genus of more than 200 species, all of which are geophytes that are distributed throughout Africa, the Arabian Peninsula (Oman), Southeast Asia, the Indian subcontinent, China and Australia. We recognise 39 endemic taxa for Madagascar (30 species, 4 subspecies, 3 varieties and 2 potential species not formally named due to incomplete material). Descriptions and geographical data are provided for all taxa, of which 17 are newly described in this revision: 12 species (*C. albociliatum* sp. nov., *C. aspidistrifolium* sp. nov., *C. basivaginatum* sp. nov., *C. candelabrum* sp. nov., *C. darainense* sp. nov., *C. helvillae* sp. nov., *C. meridionale* sp. nov., *C. nigrogranulosum* sp. nov., *C. nusbaumeri* sp. nov., *C. ranirisonii* sp. nov., *C. ratovosonii* sp. nov., *C. tolyanum* sp. nov.); 4 subspecies (*C. sofiense* subsp. *gautieri* subsp. nov., *C. graniticum* subsp. *ambrense* subsp. nov., *C. meridionale* subsp. *ihosyense* subsp. nov., *C. meridionale* subsp. *tulearense* subsp. nov.); and 1 variety (*C. madagascariense* var. *boinense* var. nov.). *Chlorophytum gramineum* (Baker) H.Perrier, is based on an illegitimate name (*Anthericum gramineum* Baker), and is replaced by the later legitimate name, *C. madagascariense* Baker, that we consider to be a taxonomic synonym. We retain the varieties described by Perrier de la Bâthie within this species, transferring them to *C. madagascariense*, and we give a new name – *C. madagascariense* var. *pervillei* nom. nov. Furthermore, we lectotypify eight species: *C. decaryanum*, *C. decipiens*, *C. dianellifolium*, *C. geayanum*, *C. graniticum*, *C. namorokense* H.Perrier, *C. sofiense*, *C. subligulatum*, and two varieties: *C. dianellifolium* var. *transiens* and *C. madagascariense* var. *sciaphilum* comb. nov.). An identification key and preliminary conservation status assessments following IUCN Red List criteria are provided for all species.

Keywords. *Anthericum*, Anthericaceae, Asparagaceae, *Chlorophytum*, Madagascar.

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Introduction

Chlorophytum Ker Gawl. is a palaeotropical genus of more than 200 species. The first species from Madagascar assigned to this genus were described by John Baker (1887, 1890) on the basis of material collected by Richard Baron, who explored the 'Grande Ile' from 1872 to 1907, and by George Vatke in 1885. The latest revision of the genus for Madagascar was undertaken by Perrier de la Bâthie (1935) in his treatment of the Liliaceae (s. lat.), work that was taken-up for the *Flore de Madagascar* a few years later (Perrier de la Bâthie 1937 [1938]), subsequent volumes of which were published as the *Flore de Madagascar et des Comores*. In these works 13 species of *Chlorophytum* were recognised, all endemic. The two taxonomic treatments differ only in minor respects and lead essentially to the same taxonomic conclusions. In the latter work, Perrier de la Bâthie (1937 [1938]) also recognised five species in the related genus *Anthericum* L. from Madagascar, all endemic. Four of these species were later transferred to *Chlorophytum* by Wessel Marais and Jacqueline Reilly (1978), as *C. geayanum* (H.Perrier) Marais & Reilly, *C. hypoxiforme* (H.Perrier) Marais & Reilly, *C. parkeri* (Baker) Marais & Reilly, and *C. sofiense* (H.Perrier) Marais & Reilly, while a fifth species was transferred to *Trachyandra* Kunth as *T. mandrarensis* (H.Perrier) Marais & Reilly, bringing the total number of species recognised across these three genera in Madagascar to 17. No further changes to the taxonomy of this group have been made in the past 46 years.

The genus *Chlorophytum* was included in the Liliaceae Juss. in Cronquist's classification (Cronquist & Takhtadjan 1981), but was subsequently placed in the Anthericaceae J.Agardh (Asparagales Link) by Dahlgren *et al.* (1985), while this family was recently incorporated into the Asparagaceae Juss. by The Angiosperm Phylogeny Group (2009).

The island of Madagascar is located approximately 400 km from the nearest point on the African coastline, situated almost entirely between latitudes 12°00′ and 25°30′ south. It occupies an area of 587 000 km² and displays a great diversity of physical relief. Extensive highlands occur at over 1000 m altitude, with mountain peaks reaching or exceeding 2000 m, there are also extensive coastal lowlands, especially in the west. Its geology is dominated by granitic and metamorphic rocks, sandstones and limestones, but also includes derived sands. Due to its considerable latitudinal and altitudinal gradients, Madagascar has a very varied climate. These characteristics, combined with a long period of geographical isolation – Madagascar separated from the African continent some 165 million years ago (Coffin & Rabinowitz 1987) –, have led to the development of exceptional biological diversity, with a high level of species endemism, estimated at 87% with respect to the flora (Humbert 1959; White 1983; Morat & Lowry 1997; Callmander *et al.* 2011; Phillipson *et al.* 2017). However, knowledge of the flora is still incomplete (Lowry *et al.* 2018), although it continues to progress steadily. Nevertheless, habitats and populations of individual species are threatened by environmental degradation, mainly due to anthropogenic activities (Rakotoary 2021). Within the Malagasy flora, the genus *Chlorophytum*, which also occurs in Africa, Asia and Australia, is a good example of this high level of local endemism, since 100% of the species of *Chlorophytum* known from Madagascar exist nowhere else in the world.

When Perrier de la Bâthie prepared his treatment of the Liliaceae for the *Flore de Madagascar* in 1937–1938, he only had 60 collections of *Chlorophytum* and *Anthericum* available, of which he had personally collected 22. Nevertheless, the study of this material allowed him to describe 12 new species and three new varieties, most of which we retain. We note that seven of these taxa are not known to have ever been re-collected subsequently in the field: i.e., *A. hypoxiform*e H.Perrier, *A. mandrarense* H.Perrier, *A. sofiense* H.Perrier, *C. distichum* H.Perrier, *C. madagascariense* var. *sciaphilum* (H.Perrier) Bard.-Vauc. & M.Pignal comb. nov., *C. namorokense* H.Perrier and *C. subligulatum* H.Perrier, and they were all collected by Perrier de la Bâthie himself. Since that time, the available material reached a total of more than 300 known collections (Fig. 1). The situation of a limited amount of material that faced Perrier de la Bâthie is still with us today, since among the new taxa described in the taxonomic treatments presented here, 11 are taxa known only from the type material. It should be noted that two other probable new species have

been identified (that we refer to as *Chlorophytum* sp. 1 and sp. 2) and for which the material currently available is incomplete, and allows us to provide only summary descriptions, and is inadequate for these taxa to be formally described. *Chlorophytum* is morphologically close to certain other genera, notably *Anthericum* and *Trachyandra*. With respect to seed characteristics, according to Obermeyer (1962), based only on South African taxa, it appears that seeds of the *Anthericum* species are small, angular and wrinkled, while those of the genus *Chlorophytum* are round and flattened. Subsequently, Marais & Reilly (1978) revised the delimitation of several genera of Asparagaceae (at that time included in Liliaceae), in particular *Anthericum* and *Chlorophytum*. Based on the characteristics of the fruit, and specifically the seeds, their conclusion was that all of the Malagasy species of *Anthericum* should be placed in *Chlorophytum*, with the exception of *A. mandrarense*, which they transferred to the genus *Trachyandra*. Seeds of *Trachyandra* are surrounded by an aril that gives them a brown colour and dull aspect, while those of *Chlorophytum* lack an aril and are black and shiny (Nordal & Bjorå 2016).

Chlorophytum has been revised for several regions in Africa, as follows in chronological order:
- South Africa (Obermeyer 1962),
- The Horn of Africa – Ethiopia, Somalia, Kenya (Nordal & Thulin 1993),
- The Flora Zambesiaca region – Zambia, Malawi, Mozambique, Zimbabwe, Botswana and the Caprivi Strip of Namibia (Kativu 1994),
- Tropical East Africa – Uganda, Kenya and Tanzania (Nordal *et al.* 1997),
- Gabon (Bjorå & Nordal 2010),
- Democratic Republic of the Congo, Rwanda, Burundi (Meerts & Bjorå 2012),
- Namibia (Kativu *et al.* 2012),
- Cameroun (Bjorå & Nordal 2014).

Partial molecular phylogenetic analyses have been published by Bjorå (2008) and Bjorå *et al.* (2017) for Ethiopia, by Meerts & Bjorå (2012) for Central Africa, and by Sævareid *et al.* (2023) for the *Chlorophytum andongense* Baker complex (continental Africa from Mozambique to Guinea).

The work carried out by Bjorå (2008) and Bjorå *et al.* (2017), based on nrDNA ITS and plastid rps16 and trnL-F sequences, concluded that the current delimitation of the *Chlorophytum* and *Anthericum* as distinct genera results in paraphyly. The authors distinguished seven clades that were supported by chromosomal, molecular, morphological and phytogeographic characters. Five of these clades belong to *Chlorophytum* (as currently circumscribed), i.e., "the former african *Anthericum*", "the distichous leaves group", "*Dasystachys* sensu Baker", "Paniculate spongy-rooted group" and "*Euchlorophytum*". However, the only species included in the analysis from Madagascar, namely *C. tripedale* (Baker) H.Perrier, belongs to Bjorå's "former african *Anthericum* group", that shares the diagnostic characters or character combinations cited by Bjorå (2008) and Bjorå *et al.* (2017): i.e., "thickened roots and white flowers"; "fine roots with distal tubers" or "white flowers with pink spots", depending on the sub-clade. We consider that the following Malagasy species possess similar character combinations and could be included in this group: *C. decipiens* Baker, *C. dianellifolium* (Baker) H.Perrier and *C. subligulatum*, while we consider it likely that *Chlorophytum distichum* should be included in Bjorå's "distichum leaves group". Nevertheless, these are simply hypotheses extrapolated from morphological knowledge and environmental data that should be tested by phylogenetic analysis that does not yet exist for this group in Madagascar.

In this article we have lectotypified eight species: *Chlorophytum decaryanum* H.Perrier, *C. decipiens* Baker, *C. dianellifolium* (Baker) H.Perrier, *C. geayanum* (H.Perrier) Marais & Reilly, *C. graniticum* (Baker) H.Perrier, *C. namorokense* H.Perrier, *C. sofiense* (H.Perrier) Marais & Reilly, *C. subligulatum* H.Perrier, and two varieties: *C. dianellifolium* var. *transiens* H.Perrier and *C. madagascariense* var. *sciaphilum* comb. nov.

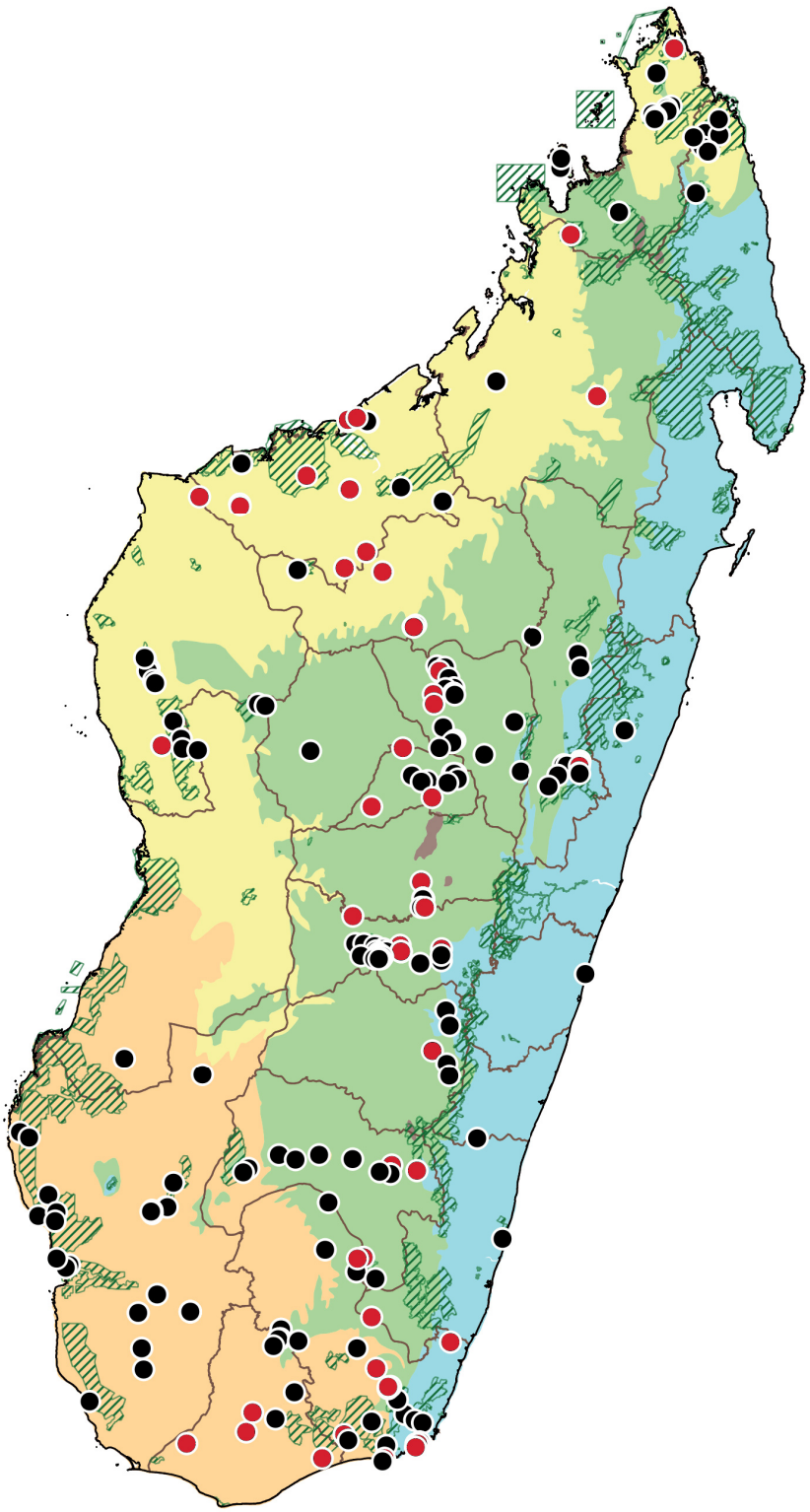


Fig. 1. Map of Madagascar showing the boundaries of the administrative regions, the five bioclimatic zones (coloured areas), protected areas (green hashed areas and lines) and material of *Chlorophytum* Ker Gawl. seen by Perrier de la Bâthie (1937 [1938]) (red dots) and additional material added during the present study (black dots).

Material and methods

Plant material

Our study is based on the examination of more than 300 collections, for which specimens are deposited at BR, CLF, G, MO, P, TAN and TEF, and from scanned images from BM, BRNU, K, L and WAG. Acronyms of herbaria follow Index Herbariorum (Thiers continuously updated). In addition, we used several virtual herbaria: the Global Plant Initiative (Global Plants 2024) and the RECOLNAT infrastructure (Anonymous 2024b).

Illustrations and Madagascar flora citations

Illustrations in the *Flore de Madagascar* (Perrier de la Bâthie 1937–1938) signed "M.J.V." are the works of Marthe Vesque (1879–1962) and Juliette Vesque (1881–1949), artists at MNHN (Florence Tessier, librarian at MNHN, pers. com.). As these are frequently the only illustrations available for the described species, we have included their citations in the species treatments under the heading 'Illustrations'. The protologues of the species published in Perrier's earlier work (Perrier de la Bâthie 1935) do not include illustrations. It should also be noted that *C. ankarense* H.Perrier, *C. chloranthum* Baker, *C. decipiens* Baker and *C. graniticum* H.Perrier are the only species that were not illustrated in the flora treatment.

Citizen science

The authors made use of the citizen science platform 'Les herbonautes' to obtain post-facto georeferences based on geographical data on specimen labels through the project: "Les *Chlorophytum* et ses genres alliés" [*Chlorophytum* and allied genera] (http://lesherbonautes.mnhn.fr/missions/3388690) these were subsequently assessed by the authors and accepted when plausible, or rejected (Herbonautes Development Team 2024).

Furthermore, photos from the iNaturalist (2024) have added a potential additional source to complete species descriptions and to discover additional localities, but should be used with caution. Observations based on the images are cited for each species concerned in the dedicated iNaturalist observation section, and specify the name of the observer followed in parentheses by their iNaturalist pseudonym.

Software tools

Herbarium images were measured using the Annotate-on tool (ver. 1.9.56) made available by the RECOLNAT infrastructure (Anonymous 2024a) downloadable at https://www.recolnat.org/fr/annotate (Pignal *et al.* 2024). Geographical coordinates presented in square brackets were estimated post facto for material based on available locality information.

Identification keys were produced using XPER3 software (XPER3 Development Team 2024) and dkeys ver. 2.0.0 software, downloadable from https://drawwing.org/dkey (Tofilski 2018).

IUCN

Provisional IUCN Red List assessments follow the recommendations of IUCN Standards and Petitions Committee (2022).

Geographical tools

The maps were produced with QGIS software ver. 3.22 (QGIS Development Team 2024), bioclimatic regions of the base maps are derived from Schatz (2001a, 2001b). Localities are cited verbatim from original specimen labels to avoid ambiguity, and post facto geo-locations are indicated in square brackets. In the new treatment for *Chlorophytum* presented here, all specimens currently available have been examined, and maps are provided to illustrate their known areas of occurrence. The base-map shows outlines of Madagascar's 22 administrative regions, the five principal bioclimatic regions (coloured polygons), and protected areas (green outlined and hashed polygons).

State of the collections and recommendations for botanists

Chlorophytum species from Madagascar flower and fruit mainly during the rainy season when access routes are frequently in a poor, or impassable condition, causing many targeted sites to be inaccessible or very difficult to access, and this partially explains the low number of collections available. Furthermore, many areas in Madagascar have never been explored adequately. Another collecting bias lies in the fact that certain localities have been targeted for botanical inventory within the context of certain research projects. For example, the programs in northern Madagascar, which have made it possible to recognise nine new species of *Chlorophytum* in this previously poorly explored region.

The specimens of *Chlorophytum* are often incomplete and some of the oldest collections are in poor condition, and for this reason the descriptions of certain species often lack details of their flowers or their fruits. The root system is rarely adequately collected, even though it has important diagnostic value. As a result, two of the new taxa included in this article lack material necessary to make adequate descriptions, *Chlorophytum* sp. 1 and *C.* sp. 2, and therefore they are not formally published.

We wish to reinforce the importance of observation of living populations in situ. This always serves to compliment the study of herbarium material, in particular with respect to delicate or fleshy organs such as flowers or tubers, as well as the arrangement and coloration of the leaves, and the extent of root penetration into the soil. Of course, this does not only apply to *Chlorophytum*, but to many geophytes such as *Drimia* Jacq. ex Willd. and herbaceous species such as *Impatiens* L. (Balsaminaceae A.Rich.), terrestrial orchids in the genera *Cynorkis* Thouars or *Disperis* Sw. For all these plants, the development period is three to five months.

Abbreviations

ANGAP = Association Nationale pour la Gestion pour la Gestion des aires Protégées [National Association for the Management of Protected Areas]
fl bud = flower bud
CJBG = Conservatoire et Jardin botaniques de la Ville de Genève
DS = dorsal side
fl = flower
fr = fruit
MNP = Madagascar National Parks
MBV = Martine Bardot Vaucoulon
se = seed
st = sterile
sta = stamen
P = profile
PA = Protected areas
PBP = Peter B. Phillipson
VS = ventral side

A version in french is available here: https://hal.science/hal-05433587

Results

Morphology

Underground parts

The underground parts consist of a rhizome surrounded by fasciculate roots. The latter are sometimes few in number, as in *C. basivaginatum* sp. nov., or conversely, the rhizomes may develop a very dense hair-

like covering of fine roots, as in *C. chloranthum* Baker (Fig. 3D). Several other root types may occur: for example a mixture of fibrous and somewhat thickened roots (e.g., *C. decipiens*, *C. meridionale* sp. nov. and *C. tripedale*), strongly thickened roots (diam. 1.5–3 mm) (e.g., *C. appendiculatum* H.Perrier and *C. albociliatum* sp. nov.), or sometimes more or less tuberous and fusiform roots (e.g., *C. basivaginatum*). The root system may spread superficially (e.g., *C. sylvestre* Bard.-Vauc. and *C. parkeri*) or it may penetrate the substrate, up to ca 20 cm in depth (e.g., *C. humbertianum* H.Perrier and *C. chloranthum*).

The root system often also features tubers. Their abundance varies – for example, they are scarce in *C. decipiens* but numerous in *C. madagascariense* Baker. The tubers may also have various shapes: ovoid (e.g., *C. humbertianum*), fusiform (e.g., *C. tolyanum* sp. nov.), oblong (e.g., *C. dianellifolium*) or pyriform (e.g., *C. graniticum*, Fig. 2C). For most species, the tubers occur in a sub-terminal position on the primary roots, or more rarely, in a lateral position, but they are arranged in clusters in the case of *C. humbertianum*. In certain species, such as *C. aspidistrifolium* sp. nov., *C. candelabrum* sp. nov., *C. ratovosonii* sp. nov. and *C. sylvestre*, the tubers dominate the rootstock and form a bundle at the base of the plant.

It is important to mention that herbarium specimens rarely contain the complete root system; it may be absent or severely truncated. Therefore, the absence or abundance of the tubers in herbarium specimens should be taken into consideration with caution. It is recommended that collectors be vigilant and systematically collect the entire root system. For instance, in the case of *C. humbertianum*, the tubers are present on roots at a depth of about 10 cm and are often broken-off during the collection process.

The rhizome, when present, is at times very short, and is not easy to observe.

Leaves

The number of leaves typically produced by mature individuals varies among the species: from just two in *C. aspidistrifolium* sp. nov. (Fig. 2A) and *C. sylvestre* (Fig. 2J), to over fifteen in *C. chloranthum* (Fig. 3A). The leaves are of various shapes and sizes, for example: short and cordate in *C. sylvestre*, long and broad in *C. tolyanum* sp. nov., narrow and filamentous in *C. geayanum*. In some species, they are grass-like and folded, as observed in *C. appendiculatum*, *C. dianellifolium* and *C. tripedale*, or rolled-up in *C. albociliatum* sp. nov. and *C. meridionale* subsp. *ihosyense* subsp. nov. Generally, the leaves are elliptical to lanceolate with a sheathing base, and are often surrounded at the base by 1–2 short sheaths of a straw-yellow colour. The zone of transition from the sheathing base to the leaf-blade is sometimes marked by a fold, for example in *C. dianellifolium*, *C. meridionale* sp. nov. and *C. subligulatum*, or it can form a distinct angle in *C. basivaginatum* sp. nov.

The leaf blade margins are also diverse: entirely scabrous (e.g., *C. dianellifolium*, *C. madagascariense*, *C. meridionale* sp. nov., *C. tolyanum* sp. nov., *C. subligulatum* and *C. tripedale*), or smooth (e.g., *C. basivaginatum* sp. nov., *C. decipiens*, *C. helvillae* sp. nov. and *C. humbertianum*), however, in *C. appendiculatum* the margins are partially scabrous. The leaf blade surfaces are mostly glabrous, but in *C. candelabrum* sp. nov. and *C. tripedale* the veins are covered with trichomes on both surfaces, while some other species may have rugosities on the abaxial surface only (e.g., *C. madagascariense* var. *boinense* var. nov. [on the main veins only] and *C. meridionale* sp. nov. [on the entire leaf]).

Pseudo-petioles and venation

The leaves may have a pseudo-petiole ranging from a fifth to more than a half of their total length, as seen in *C. aspidistrifolium* sp. nov. The blade has a pseudo-midrib, marking the central fold of the leaf, often of a lighter colour on the adaxial surface, and the veins are visible, at least on the lower surface. The number of veins is not always proportional to the width of the leaf blade, for example: 16–20 veins for a width of 3–4 mm in *C. albociliatum* sp. nov. (average spacing ca 0.20 mm), 19–23 veins for a width of 3–7 mm in *C. tripedale* (average spacing 0.15–0.30 mm), 16–32 veins for a width of 18–50 mm in *C. sylvestre* (average spacing 1.01–2.02 mm) and 10 veins for a width of 1–2 mm in *C. geayanum* (average spacing 0.10–0.20 mm).

Inflorescences

Chlorophytum inflorescences can be simple or branched. However, in certain taxa, such as *C. decipiens* and *C. tripedale*, for which the majority of specimens have only simple inflorescences, some individuals have inflorescences with 1 or 2 short additional basal branches. Inflorescences are sometimes robust and erect (e.g., *C. dianellifolium*, *C. humbertianum* and *C. tripedale*), or slender and rather spreading at ground level (e.g., *C. namorokense* and *C. parkeri*). An intermediate case exists for taxa with an erect central axis and flexible, decumbent lateral branches (e.g., *C. chloranthum*). The peduncle may be very short, such as for *C. namorokense* (often < 4 cm long), or very long, such as for *C. candelabrum* sp. nov., where the infructescence attains the length of the pseudopetiole (ca 20 cm long). The flowering portion of the rachis is a more-or-less contracted cluster, with the flowers grouped in small fascicles along the axis.

In *C. hypoxiforme* and in *C. sofiense*, the inflorescences are very short and compact, and do not exceed the leaves in length. In contrast, most other species have inflorescences that surpass the foliage in length (as observed in *C. chloranthum*, *C. decaryanum*, *C. sylvestre*, *C. humbertianum* and *C. basivaginatum* sp. nov., among others).

Inflorescence bracts

Depending on the species, the peduncle bears from 1 to 5 bracts, with their size decreasing from the base to the apex, or sometimes bracts are absent. When present, they are triangular in shape, usually with the base embracing the peduncle, and sometimes forming a pseudo-petiole; they may be foliaceous, in which case they are veined, and the margins are entire or sparsely to densely scabrous. Like the well-known widely cultivated South African species, *C. comosum* (Thunb.) Jacques, two Malagasy taxa also produce adventitious plantlets at the nodes of the inflorescence (*C. chloranthum* and *C. meridionale* sp. nov. subsp. *meridionale*).

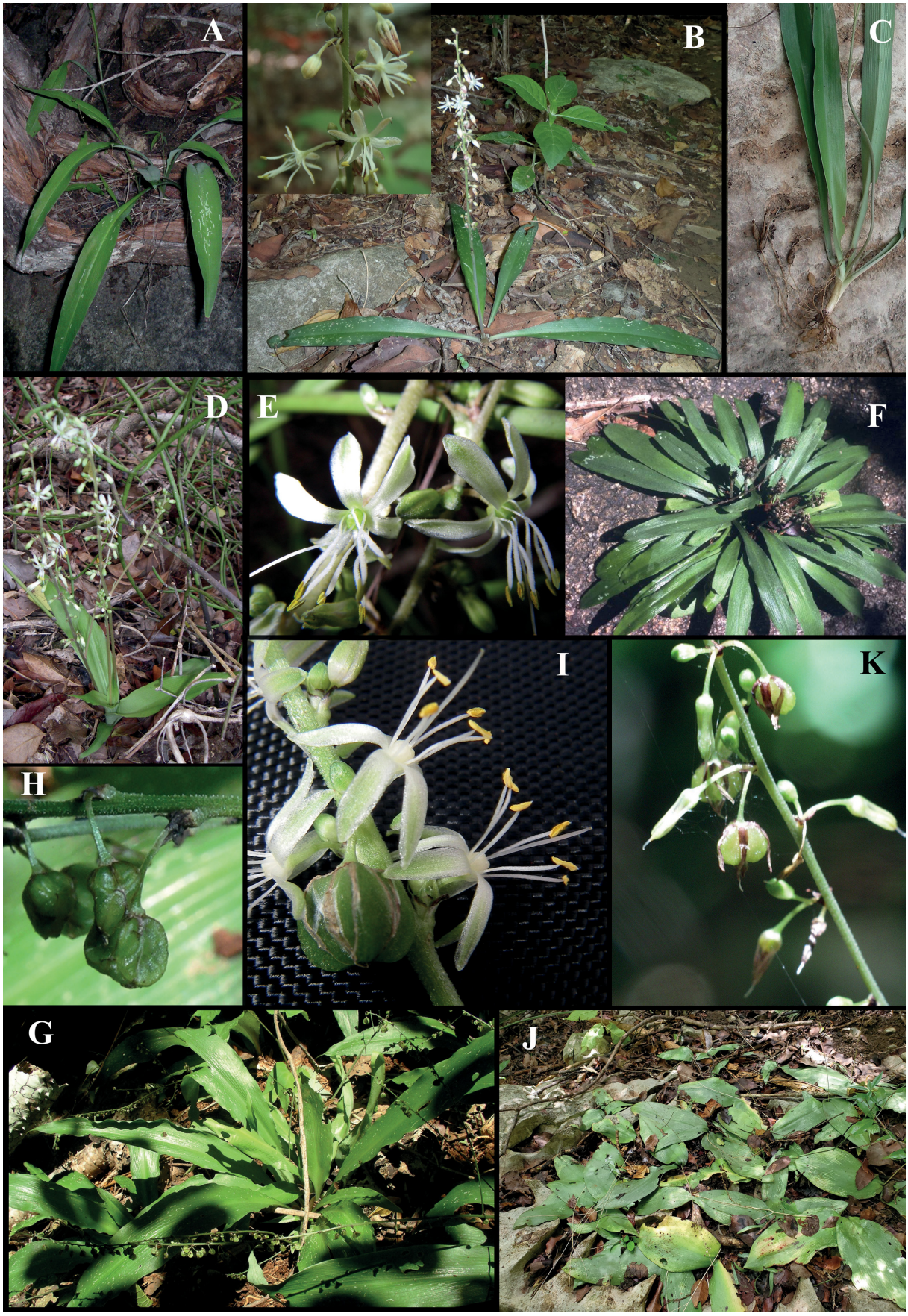
Peduncles and rachises

The floral axes can either be smooth or covered with triangular, hyaline scale-like outgrowths, with more or less rounded apices (for example in *C. darainense* sp. nov. and in *C. graniticum*). In certain species, the inflorescence exhibits only hair-like trichomes (*C. humbertianum*), other species have a combination of scales and hairs (*C. ankarense*); certain other species have glandular trichomes (*C. ranirisonii* sp. nov.).

Flowers

The flowers are predominantly white or green, solitary or grouped in fascicles of 2–7, along the inflorescence axes; the fascicles undoubtedly correspond to highly reduced axes, each of which represents a contracted thyrse. The flowers are borne on an articulated pedicel, the joint is often marked by a bulge and may be located at different levels depending on the species, and is most often at an inframedial position. In certain species the joint is located almost at the base of the pedicel (*C. helvillae* sp. nov., *C. basivaginatum* sp. nov., *C. subligulatum* and *C. parkeri*). It has been observed that the pedicel continues to grow after anthesis, which should be taken into account when identifying fruiting or post-fruiting specimens. The floral bracts are shortly triangular (*C. tripedale*) or subulate (e.g., *C. sofiense* subsp.

Fig. 2 (on next page). **A**. *Chlorophytum aspidistrifolium* Bard.-Vauc. & M.Pignal sp. nov., habit. **B–C**. *C. graniticum* H.Perrier. **B**. Habit, flower detail (left). **C**. Habit showing roots. **D–E**. *C. ranirisonii* Bard.-Vauc. & M.Pignal sp. nov. **D**. Habit. **E**. Flowers. **F**. *C. sofiense* subsp. *gautieri* Bard.-Vauc. & M.Pignal subsp. nov., habit. **G–H**. *C. nusbaumeri* Bard.-Vauc. & M.Pignal sp. nov. **G**. Habit. **H**. Fruits and rachis. **I**. *C. darainense* Bard.-Vauc. & M.Pignal sp. nov., flowers and fruit. **J–K**. *C. sylvestre* Bard.-Vauc. **J**. Habit. **K**. Part of inflorescence. Image credits: A, D–H = L. Nusbaumer; B = R.F. Bolliger; C, I = L. Gautier; J = iNaturalist 61286825; K = iNaturalist 52799171.


A
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gautieri subsp. nov.). The flowers follow the typical trimerous pattern of most monocotyledons, with an outer whorl of three tepals and an inner whorl of three similar tepals.

Flowers of three species are currently unknown: *C. aspidistrifolium* sp. nov., *C. sofiense* and *C. ratovosonii* sp. nov., while for *C. candelabrum* sp. nov., floral data are incomplete.

Figs 4–6 show the flowers, stamens and fruits (with seeds in the case of Group 1) of all species, when these parts are known.

Tepals

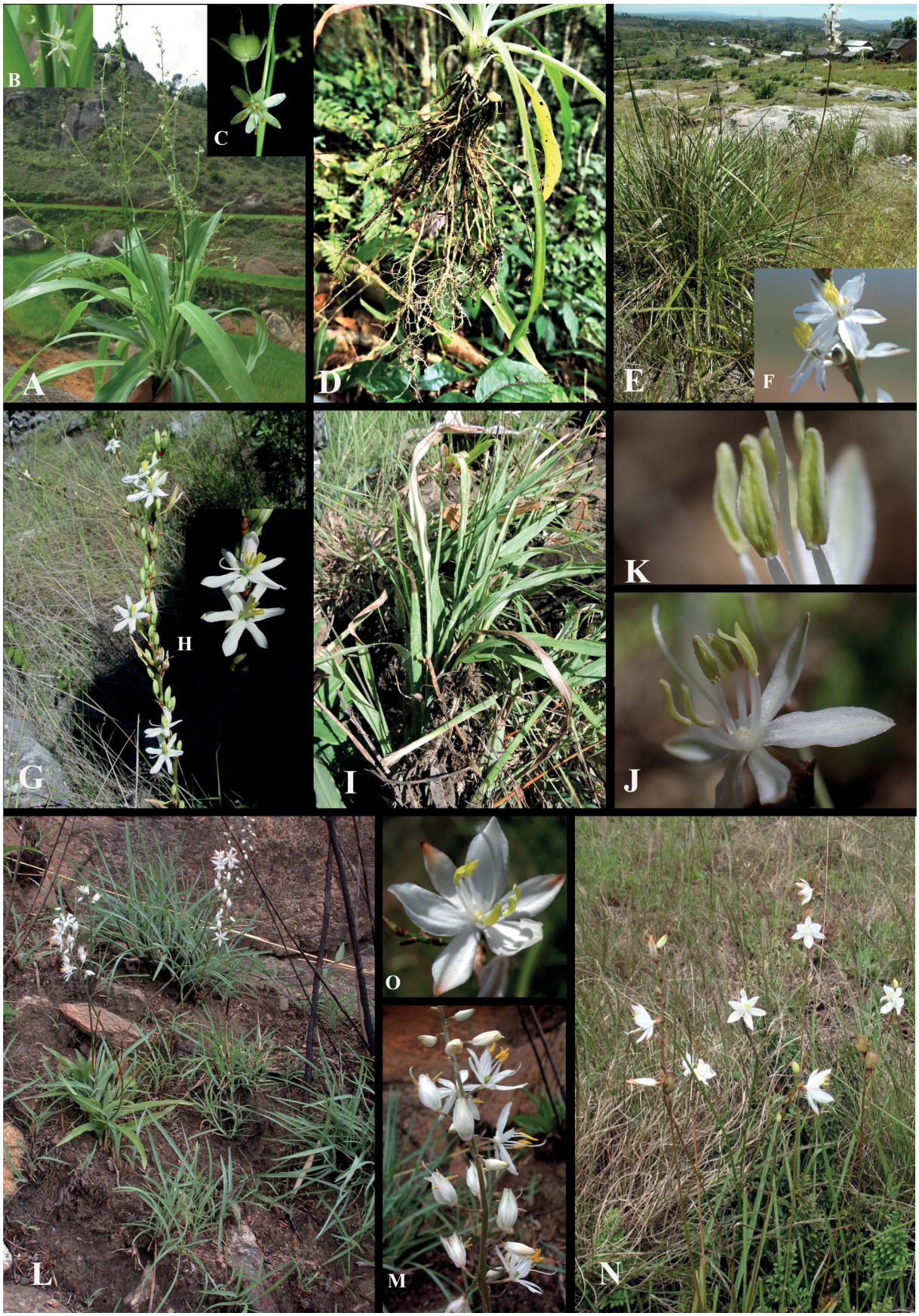
Tepals are elliptic to obovate, sometimes slightly fleshy, and organised in two cycles of 3 pieces, the outer cycle often longer and narrower than the inner cycle. They sometimes have a brown tip (on all tepals in *C. decipiens* and only on inner tepals in *C. dianellifolium*, Fig. 3O), often visible when dry. In species descriptions, the term 'tepal' will be used when the parts are identical, and 'outer tepal/inner tepal' when they are different. Tepals may be recurved at anthesis (*C. darainense* sp. nov., Fig. 2I, *C. meridionale* sp. nov. subsp. *meridionale* subsp. nov., Fig. 3J and *C. ranirisonii* sp. nov., Fig. 5A).

The tepal venation is always visible on dried specimens, and sometimes visible when held to the light in fresh material, each tepal has 3–7 veins. Some species have a constant number of veins, while others are much more variable, even on the same inflorescence. The veins may be regularly spaced (e.g., in *C. dianellifolium* and *C. namorokense*), but sometimes form a tight bundle of 3 veins in the centre (e.g., in *C. appendiculatum*, *C. decipiens*, *C. humbertianum* and *C. meridionale* sp. nov.). Some species typically have 5 veins, such as *C.* sp. 1, *C. albociliatum* sp. nov., *C. dianellifolium* (rarely 6–7) and *C. helvillae* sp. nov. (rarely 4 veins). Several species regularly have more than 5 veins, such as *C. basivaginatum* sp. nov. (7 veins for outer tepals and 5 for inner tepals), *C. subligulatum* (6 veins, sometimes as few as 3 for inner tepals) and *C. tripedale* (5–7 veins for outer tepals, 3 for inner tepals). The ends of the central veins often anastomose to form a network.

Stamens

The stamens have many diagnostic characters. They are about as long as the tepals in *Chlorophytum dianellifolium*, *C. subligulatum* or *C. darainense* sp. nov., but in other species they are shorter. For some species, they are often arranged in two equal whorls, but sometimes also independently of the verticels in two equal groups (3 up–3 down), e.g., in *Chlorophytum ankarense* or *C. basivaginatum* sp. nov.,

Fig. 3 (on next page). **A–D**. *Chlorophytum chloranthum* Baker. **A**. Habit. **B**. Flower. **C**. Flower and fruit. **D**. Root system. **E–F**. *C. decipiens* Baker. **E**. Habit. **F**. Flower detail. **G–H**. *C. tripedale* (Baker) H.Perrier. **G**. Inflorescence. **H**. Flower. **I**. *C. meridionale* subsp. *tulearense* Bard.-Vauc. & M.Pignal subsp. nov., habit. **J–K**. *C. meridionale* Bard.-Vauc. & M.Pignal sp. nov. subsp. *meridionale*. **J**. Flower. **K**. Anther detail (abaxial side) showing a small basal heel. **L–M**. *C. humbertianum* H.Perrier. **L**. Habit. **M**. Inflorescence. **N–O**. *C. dianellifolium* (Baker) H.Perrier. **N**. Habit. **O**. Flower. Image credits: A–B = N. Ravololomanana (*N. Ravololomanana 378*; MO, P) (ex Tropicos); C = L. Nusbaumer (*L. Nusbaumer 1062*; G, K, MO, P); D = L. Nusbaumer (*L. Nusbaumer 5237*, G); E = M. Rabarimanarivo (*M. Rabarimanarivo 466*, MO, P, TAN) (ex Tropicos); F = M. Rabarimanarivo (*M. Rabarimanarivo 449*, MO, P, TAN) (ex Tropicos); G–H = G. Schatz (*G. Schatz 4052*, BR, G, P, WAG) (ex Tropicos); I = N.H. Rakotoarivelo (*N.H. Rakotoarivelo 985*, G, MO, P, TAN) (ex Tropicos); J–K = L. Ramon (*M. Bardot Vaucoulon 2052*, P, TAN); L–M = P.B. Phillipson (*P.B. Phillipson 5718*, G, MO, P, TAN) (ex Tropicos); N = N.H. Rakotoarivelo (*N.H. Rakotoarivelo 234*, MO, P, TAN) (ex Tropicos); O = H. Razafindraibe (*H. Razafindraibe 257*, MO, P, TAN) (ex Tropicos).


A
B
C
D
E
F
G
H
I
J
K
L
M
N
O

or unequal (4–2, in many *C. chloranthum* or more rarely 5–1, e.g., in *C. meridionale* sp. nov. subsp. *meridionale*). This character is stable for most species, but in others the groups of stamens appear to be variable, including on the same inflorescence (*C. decipiens*). The insertion point of the stamen is at the base of each tepal, but in *C. geayanum* the stamens of one of the whorls are partially fused to the tepals for ca 1–2 mm.

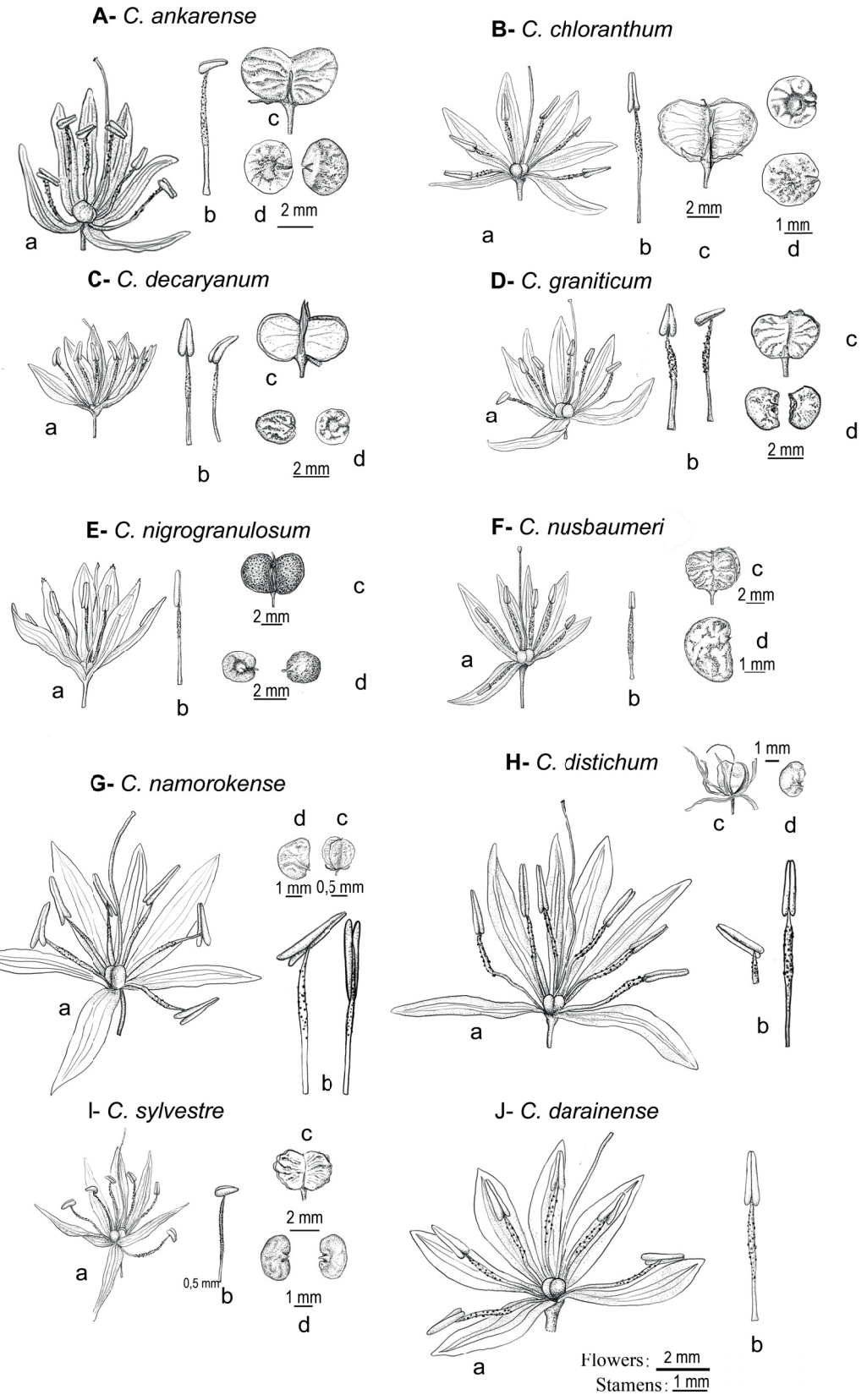
There are two types of filament, the first type is flattened, broad at the base and narrowed towards the apex (e.g., *C. appendiculatum*, *C. dianellifolium*, *C. madagascariense* and *C. subligulatum*), the second is fusiform (*C. chloranthum*, *C. darainense* sp. nov., *C. distichum*, *C. ranirisonii* sp. nov. and *C. tolyanum* sp. nov.). An intermediate situation with a flattened base which gradually changes to a spindle shape has also been observed, in this case the filaments possess papillae of varying densities (*C. ankarense*). The characters 'fusiform and papillose filaments' versus 'flattened and glabrous filaments' roughly correspond to the two groups defined by Perrier de la Bâthie for the flora of Madagascar (Perrier de la Bâthie 1935, 1937–1938). While the species formerly placed in *Anthericum* by Marais & Reilly (1978) have flat, non-papillose filaments (we note that the stamens of *C. sofiense* are still not known).

The anthers are generally more or less narrowly hastate, but in some cases they have almost parallel sides and are therefore (almost) narrowly oblong (*C. distichum*, *C. nigrogranulosum* sp. nov. and *C. tripedale*). In *C. namorokense*, an interesting mechanism has been observed – the anthers are folded over the filaments before anthesis and then become erect. In *C. humbertianum*, longitudinal dehiscence of the anthers from above has been observed, and initially has a poricidal appearance (this can be seen in an iNaturalist photo: https://www.inaturalist.org/observations/191241917).

The anther colour is generally yellow or pale yellow, but some species, such as *C. parkeri* and *C. graniticum*, have green anthers (the colours are retained on dried material). They are generally shorter than the filaments but sometimes more-or-less equal in length (in *C. appendiculatum* and *C. meridionale* sp. nov.) or even longer (in *C. helvillae* sp. nov., *C. subligulatum*, *C. tripedale* and *C.* sp. 1).

Anthers may be basifixed (see Fig. 7), dorsifixed or medifixed (Figs 4A, C–D, G, I, 5B, J). The anther connectives of Group 1 species are not enlarged at their base and do not have a prolongation, which is

Fig. 4 (on next page; continued in Fig. 5). Flowers, stamens and fruits of Group 1 species of *Chlorophytum* Ker Gawl. following Perrier de la Bâthie (1935). Seeds are shown as they were arranged in the capsule. Abbreviations: fl = flower; sta = stamen; fr = fruit; se = seed; P = profile; VS = ventral side. **A**. *C. ankarense* H.Perrier; a–b from *H. Perrier de la Bâthie 10948*, P [P01046141]; c–d from *RN7115*, P [P02157232] (a = fl; b = sta P; c = fr; d = se both sides). **B**. *C. chloranthum* Baker, from *H. Perrier de la Bâthie 16852*, P [P02071720] (a = fl; b = sta VS; c = fr; d = se both sides). **C**. *C. decaryanum* H.Perrier; a–b from *R. Decary 10315*, P [P02071710]; c–d from *R.Decary 10321*, P [P02071712] (a = fl; b = st VS and P; c = fr; d = se both sides). **D**. *C. graniticum* H.Perrier subsp. *graniticum*, from *H. Perrier de la Bâthie 460*, P [P01046135] (a = fl; b = sta VS and P; c = fr; d = se both sides). **E**. *C. nigrogranulosum* Bard.-Vauc. & M.Pignal sp. nov., from *M. Bardot-Vaucoulon et al. 1662*, P [P00643195] (a = fl; b = sta P; c = fr; d = se, both sides). **F**. *C. nusbaumeri* Bard.-Vauc. & M.Pignal sp. nov., from *L. Nusbaumer & P. Ranirison 1469*, P [P04186576] (a = fl; b = sta VS; c = fr; d = se). **G**. *C. namorokense* H.Perrier, from *H. Perrier de la Bâthie 1700*, P [P01046130] (a = fl; b = sta P (on the left), VS before anthesis (on the right); c = immature fr; d = immature se). **H**. *C. distichum* H.Perrier, from *H. Perrier de la Bâthie 10979*, P [P01142919] (a = fl; b = sta P (on the left), VS (on the right); c = immature fr; d = immature se). **I**. *C. sylvestre* Bard.-Vauc., from *M. Bardot-Vaucoulon 383*, P [P00078336] (a = fl; b = sta P; c = fr; d = se both sides). **J**. *C. darainense* Bard.-Vauc. & M.Pignal sp. nov., from *L. Gautier & C. Chatelain 5005*, G [G00019617] (a = fl; b = sta VS). Drawings by Laurence Ramon and Martine Bardot-Vaucoulon.


A- C. ankarense
a
b
c
d
2 mm
B- C. chloranthum
a
b
c
d
2 mm
1 mm
C- C. decaryanum
a
b
c
d
2 mm
D- C. graniticum
a
b
c
d
2 mm
E- C. nigrogranulosum
a
b
c
d
2 mm
2 mm
F- C. nusbaumeri
a
b
c
d
2 mm
1 mm
G- C. namorokense
a
b
c
d
1 mm
0,5 mm
H- C. distichum
a
b
c
d
1 mm
I- C. sylvestre
a
b
c
d
0,5 mm
2 mm
1 mm
J- C. darainense
a
b
Flowers: 2 mm
Stamens: 1 mm

characteristic of Group 2 species. Group 2 species are characterised by a significant basal development of the anther connective. This character is important from a diagnostic point of view, even if it presents some variability between individuals. It can be simply enlarged (in *C. decipiens* and *C. tripedale*), while in other species, it presents a more or less developed heel. It is reduced to a simple rim in *C. albociliatum* sp. nov., *C. basivaginatum* sp. nov., *C. helvillae* sp. nov. and *C. humbertianum*, while it just reaches the base of the anthers in *C. dianellifolium*, *C. subligulatum* and in some individuals of *C. meridionale* sp. nov. While it forms a short triangular extension in *C. madagascariense* var. *sciaphilum* comb. nov. and var. *boinense* var. nov. and some individuals of *C. meridionale* (Fig. 3K), it can also form a distinct apicule (in *C. appendiculatum*, *C. madagascariense* var. *boinense* and *Chlorophytum* sp. 1). The different forms are shown in Fig. 7. In species of Group 1, such modifications are not observed and the connective is not enlarged.

The more or less pronounced development of a heel or an appendix in the genus led H. Perrier de la Bâthie (1937 [1938]) to postulate the establishment of a new genus, close to those genera having anthers with basal appendages, such as *Arthropodium* R.Br. However, it should be emphasized that this character is specific to the Malagasy species mentioned; it does not seem to occur in Africa or elsewhere among related species.

Pistil

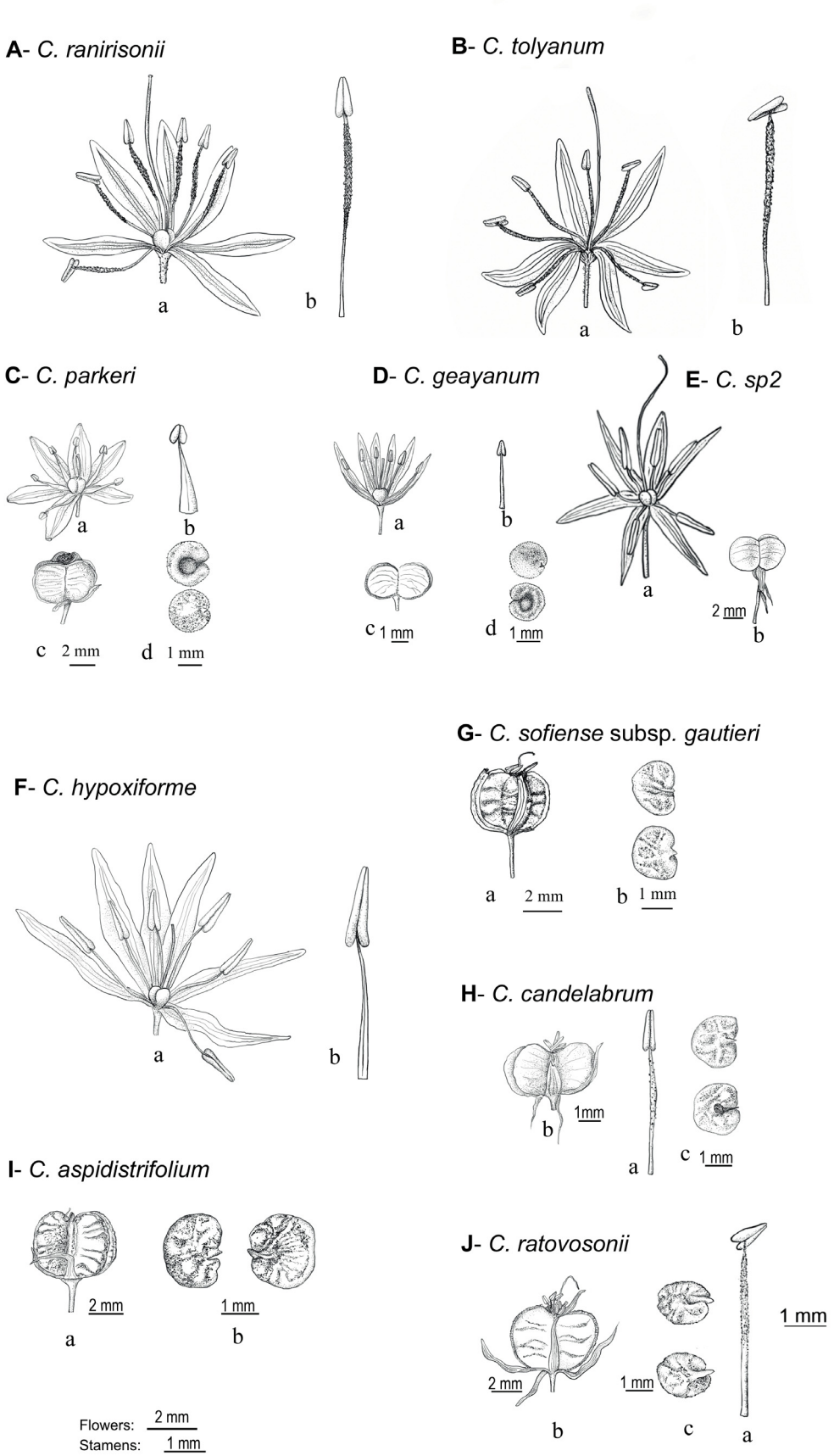
In most species, the pistil is as long as, or longer than the perianth segments. It is significantly shorter only in three species: *C. geayanum*, *C. hypoxiforme* and *C. parkeri*, and in *C. tripedale*, it is a little shorter than the perianth lobes. The style is most of the time curved except for the shorter ones, in an offset position, with an obtuse terminal stigma.

Gynoecium

Ovary

The ovary is generally green (as observed on living material and photographs), with the exception of *C. darainense* sp. nov. (Fig. 2I), for which it is white. Three ovary forms have been observed: wider than long (e.g., in *C. ankarense*, *C. decaryanum* and *C. nigrogranulosum* sp. nov.), narrower than long (e.g., in *C. dianellifolium*, *C. humbertianum* and *C. tripedale*), and sub-globular (in *C. hypoxiforme*, *C. madagascariense*, *C. parkeri* and *C. tolyanum* sp. nov.).

Fig. 5 (on next page; continued from Fig. 4). Flowers, stamens and fruits of Group 1 species of *Chlorophytum* Ker Gawl. following Perrier de la Bâthie (1935). Seeds are shown as they were arranged in the capsule. Abbreviations: fl = flower; sta = stamen; fr = fruit; se = seed; P = profile; VS = ventral side. **A**. *C. ranirisonii* Bard.-Vauc. & M.Pignal sp. nov., from *L. Nusbaumer & P. Ranirison 1715*, P [P02091352] (a = fl; b = sta VS). **B**. *C. tolyanum* Bard.-Vauc. & M.Pignal sp. nov., from *M. Bardot-Vaucoulon, O. Andrianantoanina, A. Toly & T. Manesy 1193*, P [P00455486] (a = fl; b = sta P). **C**. *C. parkeri* (Baker) Marais & Reilly, from *H. Perrier de la Bâthie 17322*, P [P02071717] (a = fl; b = sta VS; c = fr; d = se both sides). **D**. *C. geayanum* H.Perrier, from F. *Geay 8111*, P [P01046127] (a = fl; b = sta VS; c = fr; d = se both sides). **E**. *C.* sp. 2, from *L. Boivin 2338*, P [P06169866] (a = fl; b = fr with pedicel). **F**. *C. hypoxiforme* H.Perrier, from *H. Perrier de la Bâthie 10978*, P [P01046123] (a = fl; b = sta VS). **G**. *C. sofiense* subsp. *gautieri* Bard.-Vauc. & M.Pignal subsp. nov., from *L. Gautier 4625*, P [P04186579] (a = fr; b = se both sides). **H**. *C. candelabrum* Bard.-Vauc. & M.Pignal sp. nov., *P. Ranirison & L. Nusbaumer 875*, G [G00019617] (a = sta VS; b = fr; c = se both sides). **I**. *C. aspidistrifolium* Bard.-Vauc. & M.Pignal sp. nov., from *L. Nusbaumer & P. Ranirison 2033*, G [G00090381] (a = fr; b = se both sides). **J**. *C. ratovosonii* Bard.-Vauc. & M.Pignal sp. nov., from *F. Ratovoson 1134*, P [P06169905] (a = st P, b = fr; c = se). Drawings by Laurence Ramon and Martine Bardot-Vaucoulon.


A- C. ranirisonii
a
b
B- C. tolyanum
a
b
C- C. parkeri
a
b
c 2 mm
d 1 mm
D- C. geayanum
a
b
c 1 mm
d 1 mm
E- C. sp2
a
2 mm
b
G- C. sofiense subsp. gautieri
a 2 mm
b 1 mm
F- C. hypoxiforme
a
b
H- C. candelabrum
b
1mm
a
c 1 mm
I- C. aspidistrifolium
2 mm
1 mm
a
b
Flowers: 2 mm
Stamens: 1 mm
J- C. ratovosonii
2 mm
b
1 mm
c
1 mm
a

Ovules

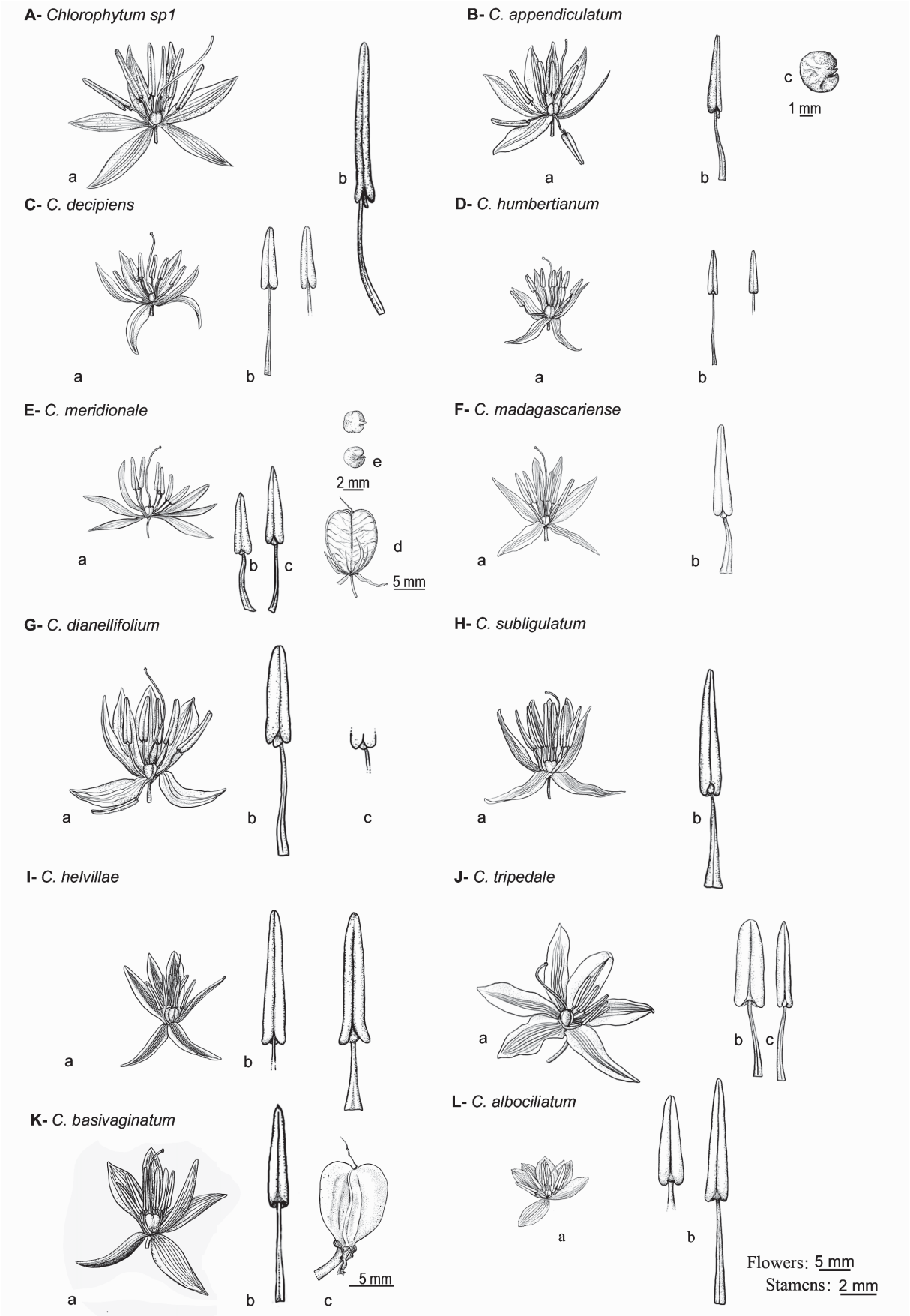
The number of ovules per locule varies from 1 to 20 between the different species: for 16 of the species, only one or two ovules are known, and in the cases of *C. hypoxiforme*, *C. tolyanum* sp. nov. and *C. sylvestre* only single ovules have been observed; among the other species, 6–8 ovules have been observed in *C. humbertianum* and *C. madagascariense*, 10–12 ovules in *C. appendiculatum*, *C. basivaginatum* sp. nov., *C. decipiens* and *C. helvillae* sp. nov., 12–16 ovules in *C. dianellifolium* and *C. subligulatum*, and 14–20 ovules in *C. tripedale*.

Fruit

The fruiting capsule is similar to the ovary, it is erect for most species (Fig. 3C, N), but it is pendulous in *C. ankarense*, *C. darainense* sp. nov. (Fig. 2I), *C. graniticum*, *C. nusbaumeri* sp. nov., *C. sofiense* and *C. sylvestre* (Fig. 2J). However, fruits of *C. helvillae* sp. nov., *C. hypoxiforme*, *C. ranirisonii* sp. nov., *C. tolyanum* sp. nov., *C. subligulatum* and *C.* sp. 1 are not known.

Among the species for which capsules are known, they are all brown in colour when ripe, with the exception of *C. nigrogranulosum* sp. nov. which has black capsules. Furthermore, this species is the only one known to have a smooth surface with a grainy appearance, that lacks both wrinkles and ribs. In other species for which capsules are known, the capsule walls are of two types: either thin, with only a few veins visible (in *C. candelabrum* sp. nov., *C. chloranthum*, *C. decaryanum* and *C. humbertianum*), or they have thickened walls, decorated with wrinkles or ribs, and carpel sutures that are most often thick, with a distinct rim. Among the latter group of species, diagnostic characters include the thickness and ornamentation patterns of the walls, the appearance of the sutures of the capsule locules, and the persistence of the base of the style in the form of a hard beak (in *C. tripedale* and *C. graniticum*), however, this is not clearly observable other than on fully ripe fruits. Generally speaking, to identify a specimen, the fruits must be mature, and for *C. basivaginatum* sp. nov., *C. darainense* sp. nov., *C. distichum*, *C. albociliatum* sp. nov. and *C. namorokense* mature fruits are unknown.

Fig. 6 (on next page). Flowers, stamens and fruits of Group 2 species of *Chlorophytum* Ker Gawl. following Perrier de la Bâthie 1935. Seeds are presented, when available, in the same orientation as in the capsule. Abbreviations: fl = flower; sta = stamen; fr = fruit; se = seed; P = profile; VS = ventral side. **A**. *Chlorophytum* sp. 1, from *J. Botanique 5668*, P [P06169906] (a = fl; b = sta DS). **B**. *C. appendiculatum* H.Perrier, from *R. Alluaud 84*, P [P01046114] (a = fl; b = sta DS; c = se). **C**. *C. decipiens* Baker, from *R. Baron 2070*, P [P01046113] (a = fl; b = sta, DS on the left, VS on the right). **D**. *C. humbertianum* H.Perrier, from *H. Humbert 6754*, P [P02071370] (a = fl; b = sta, DS on the left, VS on the right). **E**. *C. meridionale* Bard.-Vauc. & M.Pignal sp. nov.; a–c from *H. Humbert 28824*, P [P06169895]; d–e from *J. Bosser 19916*, P [P06169882] (a = fl; b = short sta DS; c = large sta DS; d = fruit, e = seed both sides). **F**. *C. madagascariense* Baker var. *madagascariense*, from *R. Decary 2419*, P [P02071707] (a = fl; b = sta DS). **G**. *C. dianellifolium* (Baker) H.Perrier; a–b from *H. Perrier de la Bâthie 12443*, P [P01046109]; c from *RN 5547*, P [P01046109] (a = fl; b = sta DS; c = anther base (variation)). **H**. *C. subligulatum* H.Perrier, from *H. Perrier de la Bâthie 10976*, P [P01046107] (a = fl; b = sta DS). **I**. *C. helvillae* Bard.-Vauc. & M.Pignal sp. nov., from *C. d'Alleizette 46*, P [P06169865] (a = fl; b = sta, VS on the left, ventral side DS on the right). **J**. *C. tripedale* (Baker) H.Perrier; a–b from *H. Perrier de la Bâthie 1098*, P [P02071361] and picture of living plant from *G. Schatz 4052*, P [P06169842]; c from *H. Humbert 28381*, P [P02158251] (a = fl; b = sta DS; c = anther base (variation)). **K**. *C. basivaginatum* Bard.-Vauc. & M.Pignal sp. nov.; a–b from *T. Andriamihajarivo et al. 417*, MO [MO-3020298]; c from iNaturalist 9931965 (a = fl; b = sta, DS; c = young fruit). **L**. *C. albociliatum* Bard.-Vauc. & M.Pignal sp. nov., from *H. Humbert 28077*, P [P06169851] (a = immature fl; b = sta (immature on the left, mature on the right)). Drawings by Laurence Ramon and Martine Bardot-Vaucoulon.


A- Chlorophytum sp1
a
b
B- C. appendiculatum
a
b
c
1 mm
C- C. decipiens
a
b
D- C. humbertianum
a
b
E- C. meridionale
a
b
c
d
e
2 mm
5 mm
F- C. madagascariense
a
b
G- C. dianellifolium
a
b
c
H- C. subligulatum
a
b
I- C. helvillae
a
b
J- C. tripedale
a
b
c
K- C. basivaginatum
a
b
c
5 mm
L- C. albociliatum
a
b
Flowers: 5 mm
Stamens: 2 mm

Seeds

Species that have many ovules per locule have flat seeds, while they have a rounded or hollow face when there are few ovules per locule. The seeds may be rounded or semi-orbicular (in which case they are higher than wide), black in colour, shiny and slightly grainy. The seed has a central or off-centered notch, in the middle of which the radicle is visible under the integuments.

Natural groupings of Chlorophytum species as defined by Perrier de la Bâthie for Madagascar

In Perrier de la Bâthie's treatment of *Chlorophytum* for the *Flore de Madagascar et des Comores* (Perrier de la Bâthie 1935, 1937 [1938]), two groups of species were established on the basis of floral morphology, that the author referred to as Group 1 (Figs 2, 4–5, Tables 1–2) and Group 2 (Figs 3, 6–7, Tables 1–2). Since that time, several species of the genus *Anthericum* were transferred to the genus *Chlorophytum* (Marais & Reilly 1978) and collections of hitherto unknown species have become available. While the morphological characters now available generally support Perrier de la Bâthie's concept of two groups within *Chlorophytum*, there are nevertheless a few exceptions, notably with respect to those species formerly placed in *Anthericum*. The latter group of species displays most of the characters of Group 1, but with the exception of the stamens, which have flattened filaments without papillae, which aligns them also as intermediate to Group 2. The characters that differentiate the two groups are given in Table 1, with Perrier de la Bâthie's placements indicated in bold type. We present a full list of the known species, and their placement by group in Table 2. Figure 8 shows the geographical distribution of the two groups in Madagascar.

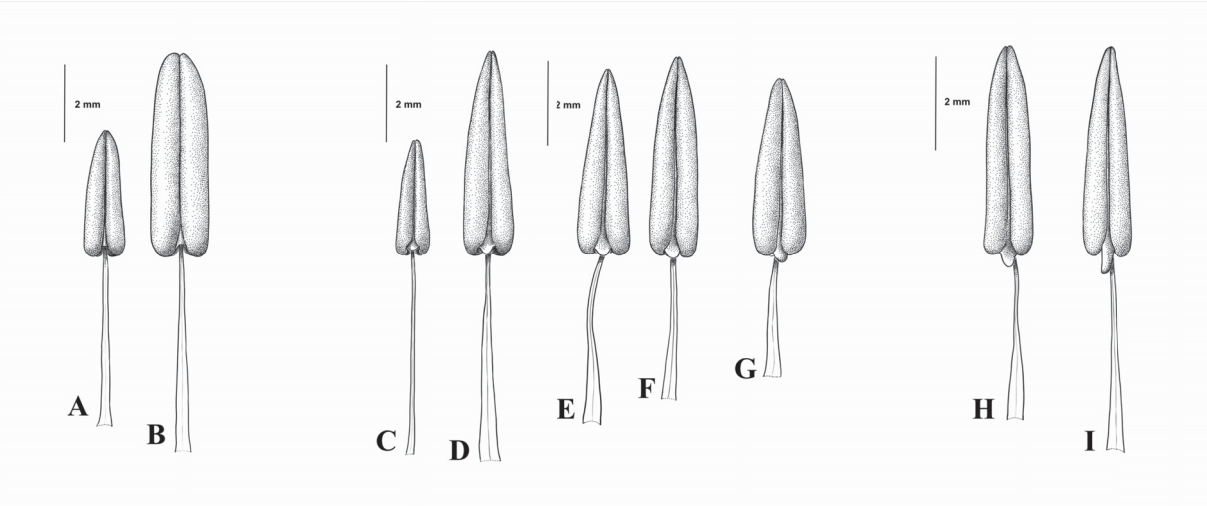


Fig. 7. Different anther types showing connective development in Group 2 of the genus *Chlorophytum* Ker Gawl. in Madagascar. **A–B**. Connective lacking a heel. **A**. *C. decipiens* Baker (*R. Baron 2070*, P [P01046113]). **B**. *C. tripedale* (Baker) H.Perrier (*H. Perrier de la Bâthie 10988*, P [P02071361]). **C–D**. Heel connective reduced to a simple flange. **C.** *C. humbertianum* H.Perrier (*H. Humbert 6754*, P [P02071370]). **D**. *C. dianellifolium* (Baker) H.Perrier (*H. Perrier de la Bâthie 12443*, P [P01046109]). **E–G**. Heel connective triangular. **E**. *C. meridionale* Bard.-Vauc. & M.Pignal sp. nov. (*H. Humbert 28824*, P [P06169895]). **F**. *C. madagascariense* var. *sciaphilum* (H.Perrier) Bard.-Vauc. & M.Pignal comb. nov. (*Perrier de la Bâthie 10950*, P [P01046105]). **G**. *C. madagascariense* var. *boinense* Bard.-Vauc. & M.Pignal var. nov. (*Perrier de la Bâthie 1441*, P [P02071702]). **H–I**. Heel connective with evident appendix. **H**. *C. madagascariense* Baker var. *madagascariense* (*R. Decary 2419*, P [P02071707]). **I**. *C. appendiculatum* H.Perrier (*C. Alluaud 84*, P [P01046114]). Drawings by L. Longou. Scale bars = 2 mm.

Table 1. Comparison of *Chlorophytum* Ker Gawl. Groups 1 and 2. The differential characters defined initially by H. Perrier de la Bâthie (1935, 1937 [1938]) are shown in bold font.

Character or distribution	**Group 1**	**Group 2**
Inflorescences	simple or branched, lateral branches recumbent	erect, mostly simple
Size of the flowers	**small, perianth less than 8 mm long**, often ca 5 mm	**perianth 10 mm long, or more**
Tepals	always 3-veined	5–7-veined
Stamens	– anthers always shorter than the filaments – **filaments swollen and +/- papillate, or only flattened** – **anthers dorsifixed** – a**nther connective without heel extension**	– anthers shorter, equal or longer than the filaments – **filaments flat, wide, narrowed at apex, always without papillae** – **anthers basifixed** – **anther connective frequently with a more-or-less elongated heel**
Ovary	**locules with 1–5(–6) ovules**	**locules with 6–16(–20) ovules**
Fruits	capsules erect or recumbents (like the flowers); as broad as high, at most 5 mm high, except for *C. namorokense*, which measure 8–9 mm high	capsules always erect, longer or equal than wide, large: 6 mm long or more
Geographical distribution see Fig. 8	throughout Madagascar except the SW and extreme S, most species from the North	from the South, South-east, Centre, South-west, many species from the central zone of the high plateaus. Absent from the centre-west and the East coastal band (ecoregion East), and the North.

Table 2. Updated list of species of *Chlorophytum* Ker Gawl. in Groups 1 and 2 as initially defined by Perrier de la Bâthie (1935, 1937 [1938]), with the addition of newly described species, and the species formerly placed in the genus *Anthericum*. The latter have morphological characters that bring them close to Group 1, and are indicated by an asterisk (note that the flowers of *C. sofiense* are unknown).

***Chlorophytum* Group 1**	***Chlorophytum* Group 2**
C. ankarense H.Perrier	*C. albociliatum* Bard.-Vauc. & M.Pignal sp. nov.
C. aspidistrifolium Bard.-Vauc. & M.Pignal sp. nov.	*C. appendiculatum* H.Perrier
C. candelabrum Bard.-Vauc. & M.Pignal sp. nov.	*C. basivaginatum* Bard.-Vauc. & M.Pignal sp. nov.
C. chloranthum Baker	*C. decipiens* Baker
C. darainense Bard.-Vauc. & M.Pignal sp. nov.	*C. dianellifolium* (Baker) H.Perrier
C. decaryanum H.Perrier	*C. helvillae* Bard.-Vauc. & M.Pignal sp. nov.
C. distichum H.Perrier	*C. humbertianum* H.Perrier
C. geayanum (H.Perrier) Marais & Reilly *	*C. madagascariense* Baker var. *madagascariense*
C. graniticum H.Perrier	*C. madagascariense* var. *pervillei* Bard.-Vauc. & M.Pignal nom. nov.
C. graniticum subsp. *ambrense* Bard.-Vauc. & M.Pignal subsp. nov.	*C. madagascariense* var. *sciaphilum* (H.Perrier) Bard.-Vauc. & M.Pignal comb. nov.
C. hypoxiforme (H.Perrier) Marais & Reilly *	*C. madagascariense* var. *boinense* Bard.-Vauc. & M.Pignal var. nov.
C. namorokense H.Perrier	*C. meridionale* Bard.-Vauc. & M. Pignal sp. nov. subsp. *meridionale*
C. nigrogranulosum Bard.-Vauc. & M.Pignal sp. nov.	*C. meridionale* subsp. *ihosyhense* Bard.-Vauc. & M.Pignal subsp. nov.
C. nusbaumeri Bard.-Vauc. & M.Pignal sp. nov.	*C. meridionale* subsp. *tulearense* Bard.-Vauc. & M.Pignal subsp. nov.
C. parkeri (Baker) Marais & Reilly *	*C. subligulatum* H.Perrier
C. ranirisonii Bard.-Vauc. & M.Pignal sp. nov.	*C. tripedale* (Baker) H.Perrier
C. ratovosonii Bard.-Vauc. & M.Pignal sp. nov.	*C.* sp. 1
C. sofiense (H.Perrier) Marais & Reilly *	
C. sofiense subsp. *gautieri* Bard.-Vauc. & M.Pignal subsp. nov.	
C. sylvestre Bard.-Vauc.	
C. tolyanum Bard.-Vauc. & M.Pignal sp. nov.	
C. sp. 2	

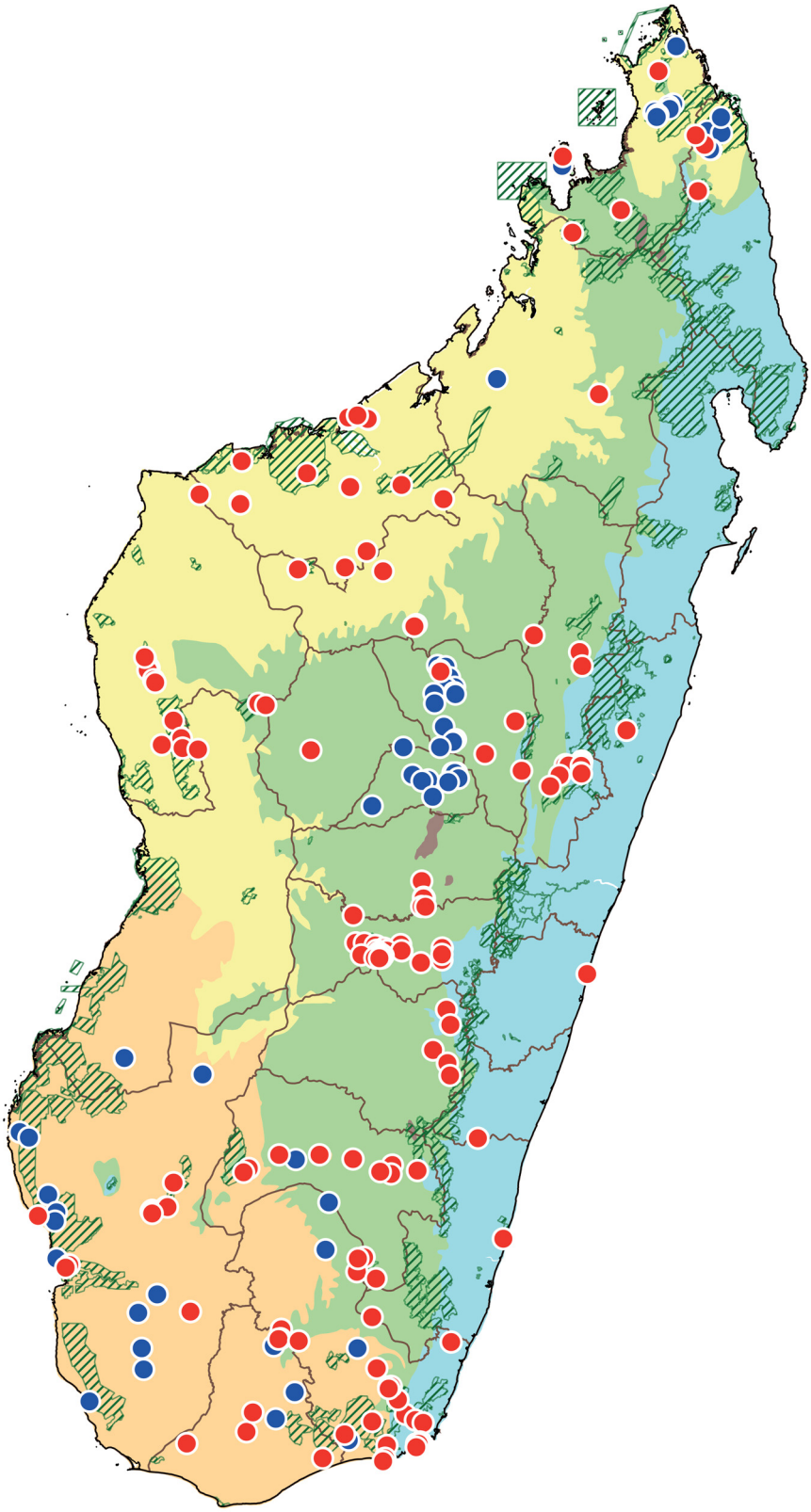


Fig. 8. Geographic distribution of the 2 groups defined by Perrier de la Bâthie (1937 [1938]), Group 1 = orange dots; Group 2 = blue dots.

Dividing *Chlorophytum* into two informal groups of species on the basis of the characters mentioned above is easy and provides a practical approach to the identification of the Malagasy species. However, we note that this arrangement does not correspond to taxonomic entities established globally within the genus at infrageneric levels.

Habitats and ecology

In Madagascar, the genus *Chlorophytum* occupies diverse habitats: including the undergrowth of dense humid forest (e.g., *C. chloranthum*), dry 'tropophilous' forest, open grassland, rocky areas, and also somewhat degraded areas, including those that are subjected to annual burns and more rarely border of wetlands, including stream banks. The distribution of the genus extends from near the coast (e.g., *C. decaryanum*) to altitudes of 1600–1800 m, in the case of *C. tripedale*. The latter appear to be the only species of the genus in Madagascar that is restricted to metamorphic substrates, including soils derived from quartzite and cipolin. The other species occur on diverse substrates, such as those derived from limestone, metamorphic rocks and granite or occur on volcanic soils. Certain species are nevertheless associated with rocky outcrops, but sufficient soil and humus is always necessary between the rocks to allow for adequate root development.

Flowering is generally simultaneous with leaf development and usually extends throughout the rainy season from November or December to March or April (depending on the region). Exceptions to this include *C. humbertianum*, which flowers in November and December but this is before the leaves develop fully in this species, *C. parkeri*, for which flowers and fruits have been observed mainly in the dry season, and *C. decaryanum*, which occurs in the southeast, and flowers mainly during the autumn and winter, a time when the rainfall is lower, but nevertheless persistent. However, the ecology and the phenology are far from being fully understood for all species, and in particular, the newly described species, that are mostly known only from a single or just a few individuals. The maps presenting the distributions of the taxa treated in this article display the terrestrial ecoregions of Madagascar (Schatz 2001a, 2001b), as a base-map, with an overlay of the outlines of the current 23 administrative regions, and with green cross-hatched areas showing the extent of the formally protected area network.

After fruiting, the aerial parts of most species dehydrate and die, and only their underground parts persist. The ombrophilous species, *C. chloranthum* is however an exception, being the only known Malagasy species that persists above ground all year round. Its main reproductive period is between October and April, although flowering has also been observed outside this period. It is the most-collected species of the genus in Madagascar, known from about 60 collections, and has the widest distribution range.

The short duration of development, as well as this seasonality which causes these species to be invisible for part of the year, explains the paucity of herbarium collections from certain regions that are difficult to access during the rainy season. Among recent contributions, there is a significant number of collections made near the larger towns and along main communication routes, as well as in areas where botanical inventory projects with in-depth surveys have been carried out over extended periods – for example at Beanka, Daraina and Itremo. The genus is also under-collected due to a lack of general inventories in many parts of Madagascar.

Three areas in particular have very few collections of *Chlorophytum* – the eastern coastal strip, that extends from Sambava to Tolagnaro, but with the exceptions of the Andohahela National Park in the southeast, the southern part of the Tsaratanana massif that corresponds to the Northern Highlands ecoregion as defined by the National Protected Areas Network (Anonymous 2001), and the Menabe Region, in the west.

Different geographical distribution ranges can be observed for the two groups defined by Perrier de la Bâthie (Fig. 8). Group 1 species are present throughout Madagascar, except for the southwest and the

extreme south, and many species have been collected in the north of Madagascar. Group 2 species appear to be absent from the center west and the extreme north, and are also unknown from the eastern coastal zone (Eastern ecoregion). The central zone of the High Plateau is particularly rich in species of this group.

We note here that the forests near Daraina are exceptionally rich in *Chlorophytum*, many of which are strictly endemic to the area, as far as is currently known. These include five new species described in this treatment, which are only known from Daraina, as well a new subspecies of *C. sofiense* – a poorly-known species, known otherwise from a single collection made over 100 years ago from a site further to the south. Daraina also harbours the typical form of the widespread *C. chloranthum* (see Fig. 19). This species richness can perhaps be explained by the intensity of the botanical inventories carried out over the last 5 years as part of the programmes conducted at Loky-Manambato, that have generated more than 54 000 records of plant occurrences in the 10 main forest areas of the region (Nusbaumer, pers. com.).

Taxonomic treatments

Class Angiospermae Lindl
Subclass Magnoliidae Takht.
Order Asparagales Bromhead
Family Asparagaceae Juss.

Genus *Chlorophytum* Ker Gawl.

Key to all species, subspecies and varieties of *Chlorophytum* Ker Gawl. in Madagascar

The authors recommend that specimen identification should be performed on the most complete specimens available, and that flowers, fruits, leaves and the root system should all be examined whenever possible. Some characteristics are difficult to determine: if possible, alternatives such as 'scabrous vs smooth' should be observed with a binocular microscope at ×25 magnification; seeds are often distorted, either due to being closely packed in the capsule or due to drying artefacts. Supplementary keys to accepted infraspecific taxa are placed at the beginning of the treatment for each species.

1. Floral bracts short and acute, 4 × 5 mm, purple (reddish when dry); fruits erect, longer than they are wide, the apex distinctly apiculate; plants up to 1 metre in height ..... ***C. tripedale*** (Baker) H.Perrier
– Floral bracts of varying sizes, usually acuminate, not purple (brown or pale grey when dry); fruits erect or pendulous, with an apex that is not apiculate, or if apiculate then with pendulous fruits (*C. graniticum*) and of variable proportions; plants rarely exceed 60 cm in height 2

2. Plant with hairy rachises and peduncles; perianth approximately 5 mm long; anthers longer than the filaments ..... ***Chlorophytum* sp. 2**
– Plant does not exhibit this character combination 3

3. Inflorescence branched 4
– Inflorescence simple 5

4. Inflorescence sparsely branched (with a few branches at the base) 10
– Inflorescence well-branched 12

5. The largest inflorescence bract > 12 cm long, always scabrous ..... ***Chlorophytum* sp. 1**
– The largest inflorescence bract < 12 cm long, scabrous or smooth 6

6. Blade width uniform (except the basal pseudopetiole) 7
– Blade width not uniform, narrowly elliptic 9

7. Blade filiform, enrolled, 0.3 to 0.5 cm wide 8
– Blade graminoid, 0.3–2.5 cm wide 14

8. Blade margin with fine white hairs, not scabrous .....
.....***C. albociliatum*** Bard.-Vauc. & M.Pignal sp. nov.
– Blade margin lacking fine white hairs, partially scabrous .....
..... ***C. meridionale* subsp. *ihosyense*** Bard.-Vauc. & M.Pignal subsp. nov.

9. Blade elliptical or lanceolate 19
– Blade ovate .....***C. sylvestre*** Bard.-Vauc.

10. Blade of uneven width, broader in the middle, and tapering at both ends 11
– Blade of uniform width, excluding the pseudo-petiole 21

11. Blade ovate .....***C. sylvestre*** Bard.-Vauc.
– Blade elliptical or very narrowly lanceolate, and with a graminoid appearance when folded (e.g., for *C. parkeri*) 22

12. Leaf with at least a portion of the blade with a rough margin 13
– Leaf with a smooth margin 23

13. Leaf with a partially scabrous margin, at least the apical portion 25
– Leaf with an entirely scabrous margin 26

14. Leaf with an entirely scabrous margin 15
– Leaves with a smooth margin 18

15. Leaf lacking a distinct fold at the zone of transition from the sheath to the blade 16
– Leaf with a pronounced fold at the zone of transition from the sheath to the blade 17

16. Perianth with equal-sized tepals; leaf–blade 0.4–0.5 cm wide .....
..... ***C. meridionale* subsp. *ihosyense*** Bard.-Vauc. & M.Pignal subsp. nov.
– Perianth with unequal tepals; leaf–blade 0.8–2.5 cm wide .....
..... ***C. meridionale*** Bard.-Vauc. & M.Pignal sp. nov. **subsp**. ***meridionale***

17. Leaves 3–7 mm wide, with 12–23 veins; tepals with the veins uniformly spaced; anther connective with a small triangular projection .....
..... ***C. dianellifolium*** (Baker) H.Perrier
– Leaves, 5–10 mm wide, with 29–32 veins; tepals with the veins closely-spaced in the centre; anther connective reduced to a simple ridge ..... ***C. subligulatum*** H.Perrier

18. Sepals with 3 veins .....***C. decipiens*** Baker
– Sepals with more than 3 veins ..... ***C. basivaginatum*** Bard.-Vauc. & M.Pignal sp. nov.

19. Peduncle not glabrous 20
– Peduncle glabrous 28

20. Peduncle rough or papillose 30
– Peduncle pilose 31

21. Blade with a glabrous surface 32
– Blade with a scabrous surface .....
..... ***C. meridionale*** sp. nov. Bard.-Vauc. & M.Pignal **subsp**. ***meridionale***

22. Floral bract shorter than the pedicel 34
– Floral bract equal to or longer than the pedicel 35

23. Floral bract equal to or longer than the pedicel 24
– Floral bract shorter than the pedicel 50

24. Leaves 12–18 mm wide, with 17–18 veins; pseudopetiole comprising 1/3 to 1/2 of the leaf length .
..... ***C. graniticum*** **subsp**. ***ambrense*** Bard.-Vauc. & M.Pignal subsp. nov.
– Leaves 15–50 mm wide, with 15–25 veins; pseudopetiole comprising 1/4 to 1/5 of the leaf length .
..... ***C. nusbaumeri*** Bard.-Vauc. & M.Pignal sp. nov.

25. Pedicel glabrous 36
– Pedicel with an indument ..... ***C. ranirisonii*** Bard.-Vauc. & M.Pignal sp. nov.

26. Peduncle with an indument 27
– Peduncle glabrous 37

27. Peduncle tomentose ..... ***C. ankarense*** H.Perrier
– Peduncle rough or papillose 39

28. Leaf with a scabrous margin 29
– Leaf with a smooth margin 40

29. Blade margin partially scabrous (visible on young leaves for 1 cm from the tip, sometimes visible along the margin) ..... ***C. parkeri*** (Baker) Marais & Reilly
– Blade margin entirely scabrous ..... ***C. aspidistrifolium*** Bard.-Vauc. & M.Pignal sp. nov.

30. Inflorescence equal to or shorter than the leaves 41
– Inflorescence longer than the leaves 43

31. Sepals with 3 veins ..... ***C. graniticum*** H.Perrier **subsp**. ***graniticum***
– Sepals with 5 veins ..... ***C. helvillae*** Bard.-Vauc. & M.Pignal sp. nov.

32. Leaves with a scabrous margin 33
– Leaves with a smooth margin 44

33. Leaves with a partially scabrous margin (only at the tips of the blades) .....
..... ***C. decipiens*** Baker
– Leaf with an entirely scabrous margin 45

34. Peduncle rough or papillose ..... ***C. nigrogranulosum*** Bard.-Vauc. & M.Pignal sp. nov.
– Peduncle glabrous 47

35. Fruit with a beaked apex formed by the hardened remnant of the style .....
..... ***C. graniticum*** H.Perrier **subsp**. ***graniticum***
– Fruit with a rounded apex 49

36. Blade filiform and curled ..... ***C. geayanum*** (Baker) Marais & Reilly
– Blade elliptical or lanceolate .....***C. chloranthum*** Baker

37. Blade surface glabrous 52
– Blade surface not-glabrous, either asperous or with an indument 38

38. Blade denticulate on the margins, and with long, translucent hairs on the veins .....
.....***C. candelabrum*** Bard.-Vauc. & M.Pignal sp. nov.
– Blade with scabrous margins and a scabrous surface 55

39. Pedicel with indumentum .....***C. tolyanum*** Bard.-Vauc. & M.Pignal sp. nov.
– Pedicel glabrous ..... ***C.* aff**. ***chloranthum*** Baker

40. Inflorescence shorter than or equal in length to the leaves .....
..... ***C. hypoxiforme*** (H.Perrier) Marais & Reilly
– Inflorescence longer than the leaves .....***C. decaryanum*** H.Perrier

41. Blade with a scabrous surface .....
.....***C. sofiense* subsp**. ***gautieri*** Bard.-Vauc. & M.Pignal subsp. nov.
– Blade with a glabrous surface 42

42. Raceme lax .....***C. helvillae*** Bard.-Vauc. & M.Pignal sp. nov.
– Raceme congested ..... ***C. sofiense*** (H.Perrier) Marais & Reilly **subsp**. ***sofiense***

43. Fruit with a beaked apex formed by the hardened remnant of the style .....
……. .....***C. graniticum*** H.Perrier **subsp**. ***graniticum***
– Fruit with a rounded apex 56

44. Inflorescence equal to or shorter than the leaves .....***C. distichum*** H.Perrier
– Inflorescence longer than the leaves .....***C. decipiens*** Baker

45. Sepals with more than 4 veins 46
– Sepals with 3 veins 57

46. Undulating fold at the junction of the sheath and the blade .....
..... ***C. dianellifolium*** (Baker) H.Perrier
– No fold at the junction of the sheath and the blade .....
.....***C. madagascariense*** Baker **var**. ***madagascariense***

47. Leaf with a smooth margin .....***C. hypoxiforme*** (Baker) Marais & Reilly
– Leaf with a partially scabrous margin (visible on young leaves for 1 cm from the tip, sometimes visible along the edge) 48

48. Loose inflorescence; stamens in a single whorl .....***C. parkeri*** (Baker) Marais & Reilly
– Constricted inflorescence; stamens in two whorls ..... ***C.* aff**. ***parkeri*** (Baker) Marais & Reilly

49. Pedicel with indument ..... ***C. humbertianum*** H.Perrier
– Pedicel glabrous ..... ***C. sofiense*** (H.Perrier) Marais & Reilly **subsp**. ***sofiense***

50. Leaves spreading on the ground, with 25–28 veins .....***C. namorokense*** H.Perrier
– Leaves upright, or initially upright then arching, with up to 25 veins 51

51. Leaves (5–)8–15(–21) × 0.3–1.2 cm in size, with 5–12 veins; filaments with scattered papillae ....***C. decaryanum*** H.Perrier
– Leaves 13–40(46) × 0.8–2.5–3 cm, with 15–20(–25) veins; filaments with abundant papillae ....***C. chloranthum*** Baker

52. Blade graminoid 53
– Blade elliptical or lanceolate .....***C. ratovosonii*** Bard.-Vauc. & M.Pignal sp. nov.

53. Blade more than 1 cm in width .... ***C. madagascariense*** **var**. ***sciaphilum*** (H.Perrier) Bard.-Vauc. & M.Pignal comb. nov.
– Blade less than 1 cm in width 54

54. Pseudo-petiole present; anthers with short appendages; fruit as tall as it is wide .... ***C. madagascariense*** **var**. ***pervillei*** Bard.-Vauc. & M.Pignal nom. nov.
– No pseudo-petiole present; anthers with a developed appendage; fruit taller than it is wide .... ***C. appendiculatum*** H.Perrier

55. Tuberous areas on the roots, true tubers very rare; 1–3 inflorescence bracts; petals with 3 veins .... ***C. meridionale*** **subsp**. ***tulearense*** Bard.-Vauc. & M.Pignal subsp. nov.
– No tuberous areas on the roots, numerous true tubers; a single inflorescence bract; petals with more than 3 veins ..... ***C. madagascariense*** **var**. ***boinense*** Bard.-Vauc. & M.Pignal var. nov.

56. Pedicel with a short indument ..... ***C. humbertianum*** H.Perrier
– Pedicel glabrous ..... ***C. darainense*** Bard.-Vauc. & M.Pignal sp. nov.

57. Connective of the anther reduced to a simple heel; pseudo-petiole present ....***C. madagascariense*** Baker **var**. ***madagascariense***
– Connective of the anther appendiculate; no pseudo-petiole present .... ***C. appendiculatum*** H.Perrier

1. ***Chlorophytum albociliatum*** Bard.-Vauc. & M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324185-1
Figs 6L, 9–10

Diagnosis

A C. madagascariense affinis est, sed inflorescentia simplici (vs ramosam), laminae foliorum bractearumque margine pilis albis erectisque (vs scabram), foliorum margine revoluta (vs planam), tepalis quinque-nervosis (vs tri-nervosa).

Etymology

The specific epithet refers to the thick, white and rough hairs present on the margin of the leaves and bracts.

Type material

MADAGASCAR – **Amoron'i Mania [Fianarantsoa Prov.]** • Betsileo, West of Ambatofinandrahana; [20°33′ S, 46°48′ E]; 16 Jan. 1955; fl bud, fr; *H. Humbert 28077*; holotype: P [P06169851]!; isotype: P [P06169856]!.

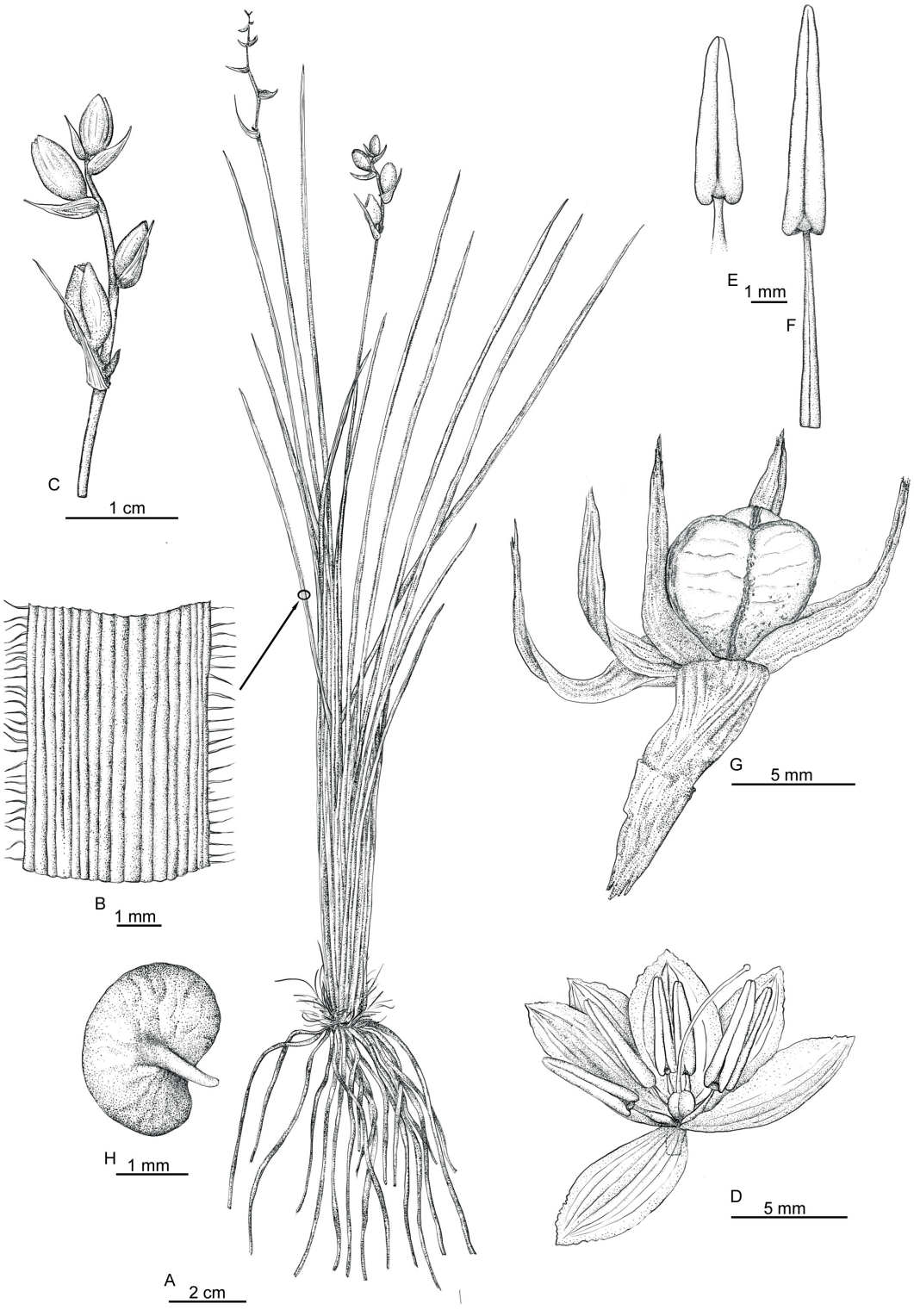


Fig. 9. *Chlorophytum albociliatum* Bard.-Vauc. & M.Pignal sp. nov. holotype; *H. Humbert 28077*, P [P06169851]. **A**. Habit. **B**. Leaf detail. **C**. Young inflorescence. **D**. Immature flower. **E**. Young anther. **F**. Mature stamen. **G**. Young fruit. **H**. Seed. Drawing by Laurence Ramon.

Description

Plant herbaceous, 20–30 cm tall; *rhizome* short, *roots* numerous, clustered, thickened, 1.2–1.5 mm in diam., some becoming tuberous, 2.5–3 mm thick; the remnants of old leaves in the form of fibres at the base; *leaves* filiform, 7–10, erect, thick, curled, 11–26 × 0.3–0.4 cm, outer leaves shorter than the inner ones on the shoot, the margins bordered by fine white hairs 0.1–0.4 (–1.2) mm long, perpendicular to the margin, veins 16–20, thick, closely spaced, raised on the lower surface, not visible on the upper surface; *inflorescence* barely longer than the leaves, 20–33 cm tall, unbranched, sparsely flowered, with a naked peduncle, 15–28 cm long; *rachis* short, 2.5–3.5 cm, with a single flower per node; floral bracts at the base, triangular, long-acuminate, 13 × 2.5 mm, much longer than the pedicel, veins 5, margin carrying hairs similar to those on the leaf margin; bracts transitioning gradually towards the apex to deltoid-based bracts, with a short pedicel, 2–2.5 mm long, articulated at 0.5 mm from the base; *immature flowers* with elliptical *tepals*, 8 × 4 mm, slightly laciniate at the upper margin, veins 5, the 3 central ones fused at the top; *stamens* shorter than the perianth; filaments 2.5 mm long; anthers 5 mm long, with a short triangular heel; *gynoecium*: ovary 1.3 mm long, ovules 12 per locule, style 5.5 mm long, stigma with a slightly spatulate tip; *floral parts* (observed on a young fruit): tepals ca 14 mm long; *stamens* shorter than the perianth, filaments flattened, 5.5–6 mm long, anthers 7 × 1 mm long, conical, with a short triangular margin that does not reach the base of the anther, and a filiform style 9 mm long; *capsule* higher than wide, 7 × 6 mm, with thickened sutures; *young seed* brown, ovate, 2.5 × 2 mm, with a granulate surface, not notched, and with a prominent radicle.

Phenology

The only known specimens, collected in January, bear immature inflorescences and young fruits, suggesting that the plant flowers as early as December and bears fruit in January and likely also in February.

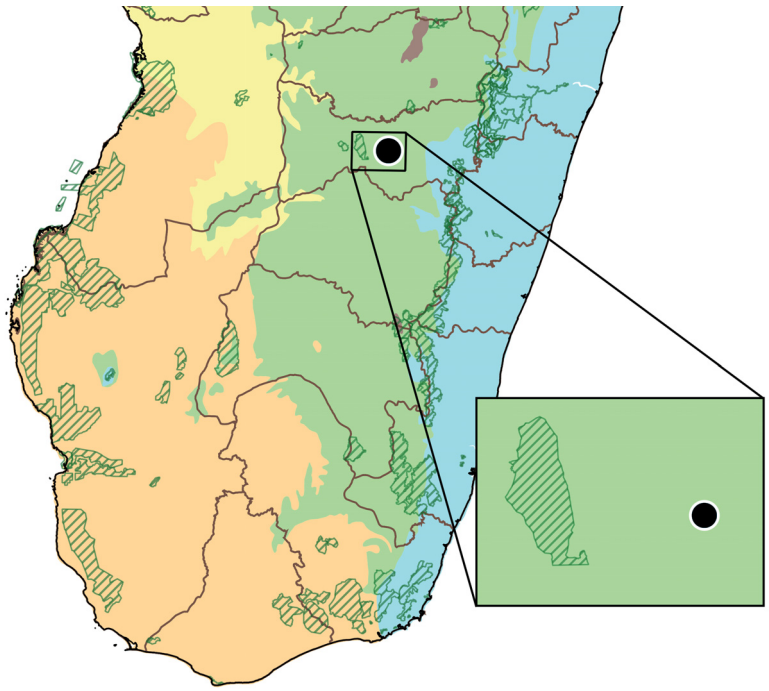


Fig. 10. Type (and only known) locality of *Chlorophytum albociliatum* Bard.-Vauc. & M.Pignal sp. nov. within the Amoroni'i Mania Region (N.B. the plotted point for the species to the east of the Itremo protected area is approximate, see relevant text).

Distribution and ecology

Chlorophytum albociliatum sp. nov. is endemic to Madagascar, and known only from the Amoron'i Mania Region near the town of Ambatofinandrahana in central Madagascar (approximate post facto georeference, 20°33′ S, 46°48′ E). The precise location for this single known occurrence of the species is not known, but it was described as occurring on western slopes in woodland on gneiss, at an altitude of 1400–1500 m. However, the eastern edge of the Itremo Massif protected area (status: Harmonious Protected Landscape, designated in April 2015) lies only 23 km to the west of Ambatofinandrahana and it is likely that the species was collected in this area. Nevertheless, a moderate level of botanical exploration has been undertaken in this vicinity, and the species is not known to have been collected again – it is clearly rare, or possibly even extinct.

Provisional IUCN Red List assessment

Chlorophytum albociliatum sp. nov. is endemic to Madagascar. It is known from a single collection made in January 1955 and is therefore known from a single occurrence at a single location. The area in which it was recorded is not well-explored, and a targeted search for the species is recommended to determine whether the species is extant, and if so, to obtain data to re-evaluate its conservation status and update this assessment. The species is therefore assessed as Data Deficient (DD).

Remark

A young fruit surrounded by the remains of a flower enabled us to obtain measurements of the tepals, anthers and style.

2. ***Chlorophytum ankarense*** H.Perrier
Figs 4A, 11

Chlorophytum ankarense H.Perrier (Perrier de la Bâthie 1935: 47).

Etymology

The epithet refers to the Ankara Plateau (NW Madagascar).

Type material

MADAGASCAR – **Boeny [Mahajanga Prov.]** • Rochers (calcaires) boisés de Kamakama, causses d'Ankara; [16°55′ S, 46°28′ E]; Mar. 1901; fl; *H. Perrier de La Bâthie 10948*; holotype: P [P01046141]!.

Other material examined

MADAGASCAR – **Androy [Toliara Prov.]** • Ampandrandava; 1943; fl; *Jardin botanique 5989*; TAN! • Crête des Pisopiso, Nord d'Ampandrandava; [24°04′ S, 45°42′ E]; 900 m; Jan. 1943; fl; *A. Seyrig 521*; P [P02071689]! • same data as for preceding; 1943 (en culture); fl, fr; *A. Seyrig 521B*; P [P02071695]!. – **Atsimo-Andrefana [Toliara Prov.]** • Sud-ouest Manombo; [22°57′44″ S, 43°29′58″ E]; 26 Jan. 1947; fr; *H. Humbert 19977*; P [P02158247]!, MO [MO-3020335, MO-3020336] image!. – **Boeny [Mahajanga Prov.]** • Massif de l'Ankarafantsika; [16°19′ S, 46°48′ E]; 19 Jan 1938; fr; *R. Decary 12828*; P [P02157231]!, TAN! • RN 8, Soalala, Andranomava; [16°28′ S, 45°20′ E]; 27 Mar. 1954; fr; *RN 6144* (*Rakotovao*); P [P02157237]! • same data as for preceding; [16°34′ S, 45°34′ E]; 10 Mar. 1955; fl, fr; *RN 7115* (*H. Randriamiera*); P [P02157232, P02157224]!.

Description

Plant herbaceous, 13–38 cm tall; *roots* fasciculated, fibrous, slightly thickened, 0.5–0.7 mm, bearing infrequent fusiform tubers, 8–10 × 1–2 mm; *leaves* 4–13, lanceolate, 13–38 × 1.5–3 cm, base attenuated

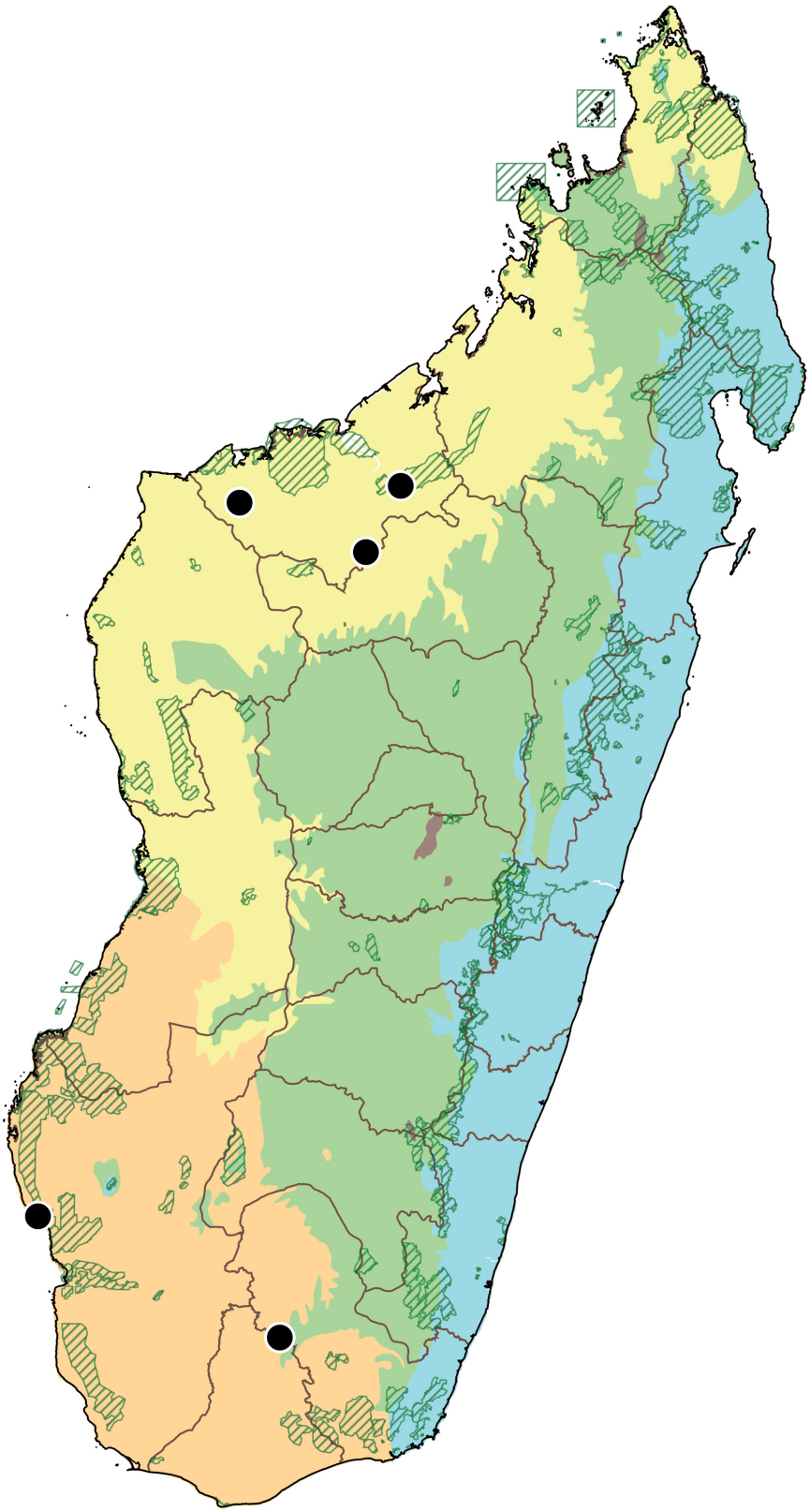


Fig. 11. Distribution of *Chlorophytum ankarense* H.Perrier in Boeny, Atsimo-Andrefana and Androy Regions.

into a pseudo-petiole of 4.5–10 cm long, approximately 1/3 to 1/4 of the total length of the leaf blade, leaf-base sheathing, surrounded by a fibrous sleeve composed of the remains of old leaves, leaf margins hyaline, mostly scabrous (except for *RN 6144* where the leaf margin is smooth), leaf apex tapered, with a pseudo-midrib, comprising 24–34 evenly-spaced, conspicuous veins and with a network of transverse veinlets; *inflorescence* 1(–2) per plant, erect, branched, robust, 32–60 cm in height; central axis and lateral branches covered with hyaline, more or less papillose hairs up to 0.1 mm long, mixed with short excrescences of variable density differing between the specimens, peduncle 18–32 cm long, with 1–3(–4), triangular, often long-tapered bracts, 7–40 × 2.5–5 mm at the base, veins 8–16, *rachis* 16–30 cm long; flowers 2–5(–7) per node, floral bracts triangular, very slender, reddish, 2.5–6(–10) × 1.5–3 mm, veins 3–5, shorter than the pedicel, the latter (3–)4–8 mm long, generally articulated below the middle, or occasionally ca 1.5 mm from the base (e.g., *Seyrig 521* and *521B*), pedicel glabrous; *perianth* white or very pale green; *tepals* narrowly elliptical, equal or subequal, 4.5–5.7 × 0.5–0.8 mm; veins 3, discreet; *stamens* unequal, shorter than the tepals, in two groups – 3 long (2.5–4 mm) and 3 short (1.8–3 mm), filaments flattened at the base, spindle-shaped, thickened, papillose above, anthers with a triangular base, sometimes curved at anthesis, 0.5–1 × 0.2–0.3 mm, divergent at the base, anthers dorsifixed, inserted on the filament at the lower 1/3; *gynoecium*: ovary, 0.5–0.8 × 0.6–1 mm; ovules 1(–2) per locule, style filiform, 4.2–6 mm long, exserted; stigma with thickened tip; *capsules* pendulous at maturity, distinctly wider than tall, 3–5 × 5–7 mm, often with one or two aborted locules, with 4–6 thick transverse ribs; *seeds* 1 per locule, black, somewhat discoid, 2–2.8 mm, with a convex surface and a small depression on the flat side behind the hilum, shiny, granulate, with a narrow notch, where the radicle is visible, but not protruding.

Phenology

Flowering has been recorded from December to March, and fruiting from January, and continues beyond the month of March.

Distribution and ecology

Chlorophytum ankarense has a highly disjunct known distribution. It has been recorded in the western parts of Madagascar in Boeny and Atsimo-Andrefana Regions, as well as in the Androy Region in the south-central part of the country, near Ampandrandava. It occurs at elevations ranging from 100 to 900 m above sea level, on both sandy and limestone substrates, but always in dry forest, and generally in well-shaded areas. The disjunct and climatically heterogeneous distribution of the species does raise questions, and furthermore the available material is limited, and no recent collections of *C. ankarense* are known. Close to half of the available collections consist of separate elements, including just a few leaves, inflorescences, or a single infructescence. Observing similarities in the hairiness of the floral axes, the size and arrangement of the floral parts, the appearance of the fruit and seeds, we group together the cited elements as a single species without absolute certainty, as not all these characteristics are consistently present together, and new material is needed to confirm the species delimitation.

Provisional IUCN Red List assessment

Chlorophytum ankarense is endemic to Madagascar. The species is known from a total of 9 collections that represent 5 occurrences. These show a highly disjunct distribution with one group of records from the south of the country, and a second group from the northeast. The species is not known to have been collected or observed since 1955. Furthemore, the known collection sites are mostly not considered to be badly degraded, and there are records of the species from the following three formally protected areas: the Parc National d'Ankarafantsika and Parc National de Namoroka in the west, and the Aire Protégée de Ranobe PK32 in the southwest. The two other known records are from areas lacking formal protection, the Causse d'Ankara in the west – which nevertheless has relatively intact vegetation, and Ampandrandava in the south, where, in contrast, the vegetation is badly degraded. We therefore consider the 5 known

subpopulations to represent 5 locations due to differing management levels of the corresponding sites, due to there diverse conditions and wide separation. With an AOO of only 20 km^2, but an EOO of over 150 000 km^2, *Chlorophytum ankarense* could be assessed as Endangered [EN B2ab(i,iii,iv,v)], however, given the lack of any recent material of the species, we propose an assessment of Data Deficient [DD]. Nevertheless, we suspect that this rather inconspicuous plant is likely to be more frequent across its broad range than the limited number of available collections would suggest, and we recommend a targeted search for the species in the vicinities of the known localities.

3. *Chlorophytum appendiculatum* H.Perrier
Figs 6B, 7I, 12

Chlorophytum appendiculatum H.Perrier (Perrier de la Bâthie 1935:58).

Etymology

The specific epithet refers to the appendix of the connective of the anthers, which is particularly well-developed.

Type material

MADAGASCAR • Sud; Sep. 1900; fl, fr; *C. Alluaud 84*; holotype: P [P01046114]!; isotype: P [P01046115]!.

Other material examined

MADAGASCAR – **Androy [Toliara Prov.]** • Kokomba; [25°2′ S, 44°51′ E]; Dec. 1917; fl; *R. Decary, s.n. (334?)*; P [P02157241]! • Ankobo, district d'Ambovombe; [24°55′ S, 45°23′ E]; 6 May 1924; fl; *R. Decary 2713*; P [P02157243]! • Ambovombe [25°10′ S, 46°5′ E]; 3 Feb. 1931; fl; *R. Decary 8494*; P [P02157244]!. – **Anosy [Toliara Prov.]** • Andrahomana, Fort Dauphin; [25°10′ S, 46°39′ E]; 21 Jun. 1926; fl; *R. Decary 4155*; P [P02157240]! • Vallée du Mandrare moyen; [24°57′ S, 46°17′ E]; 4 Aug. 1926; fl; *R. Decary 4598*; P [P02157242]! • Andrahomana, cap Andavaka, Fort Dauphin; [25°12′ S, 46°38′ E]; 25–26 Feb. 1955; fl; *H. Humbert 29086*; P [P06169833]! • W of Tolanaro, NE of Amboasary sud, Hazofotsy Madagascar, Toliara, Anosy, Fort Dauphin (Tôlanaro) region, W of town and NE of Amboasary Sud, near village of Hazofotsy; [24°50′ S, 46°32′ E]; 80–120 m; 28 Jan. 1990; fl; *G. McPherson et al. 14928*; MO [MO-3020343] image!, TAN! • Ranopiso, Fort Dauphin; [25°03′S, 46°40′E]; 23 Nov. 1959; fl; *J. Peltier & M. Peltier 1476*; P [P02157239]!. – **Atsimo-Andrefana [Toliara Prov.]** • Toliara, Vallée de l'Onilahy, Route de Toliara à Ambohivahavelona; 23°25′43.1″ S, 43°49′39.7″ E; 88 m; 5 May 2024; *M. Bardot-Vaucoulon & J.-D. Randrianandrasana 2025*; végétation xérophyte, forêt sèche clairsemée, arbres et arbustes souvent épineux et ou à feuilles réduites; vallon calcaire bordé de zones escarpées; en bordure de petite falaise de 2.5 m, en sous-bois, dans un sol peu profond argilo calcaire, petite population d'une vingtaine de pieds dispersée sur plusieurs mètres; MO!, P [P02275952, P02275953]!, TAN! • same data as for preceding; 23°25′38.6″ S, 43°49′45″ E; 98 m; 11 May 2024; *M. Bardot-Vaucoulon & J.-D. Randrianandrasana 2054*; végétation xérophyte, fourré constitué d'arbres et arbustes souvent épineux et ou à feuilles réduites; vallon calcaire bordé de zones escarpées; en bordure de petite falaise de 2.5 m, en sous-bois, dans un sol peu profond argilo calcaire, petite population répartie en haut de la falaise et dans les rochers 1 m en contrebas; MO!, P [P02275951]!, TAN! • Colline de la Table, Tuléar; [23°24′ S, 43°47′ E]; Mar. 1960; *J. Bosser 14206*; TAN! • La Table, Tuléar; [23°24′ S, 43°46′ E]; 1952–1955; fl; *J. Dequaire 27578*; P [P06169847, P06169855]! • La Table, près de Tuléar; [23°24′ S, 43°47′ E]; 4 Feb. 1957; fl; *B. Descoings 2260*; MO [MO-3020331]!, TAN! • Environs de Tuléar, La Table; [23°21′ S, 43°40′ E]; Mar. 1960; fl; *M. Keraudren 594*; P [P06169890]! • Entre Tuléar et Saint Augustin; [23°26′ S, 43°45′ E]; 31 Mar. 1966; fl; *J. Peltier et M. Peltier 5834*; P [P06169917]!. – **locality unknown** • s.loc.; 1898–1901; *G. Grandidier s.n.*; P [P02157245]!.

Description

Plant herbaceous, 20–55 cm in height; underground part with a *rhizome*, *roots* fleshy, shallow at a depth of 5–10 cm, 1–3 mm in diam., 13–30 cm in length, bearing one or more ovoid tubers 1–4 × 1–1.2 cm, some showing constrictions; *leaves* 4–8, glaucous green in living specimens, sometimes surrounded at their base by the remains of old leaves forming a fibrous sheath, narrow, grass-like, folded; leafblade, 12–56 × 0.4–0.6 cm, with finely scabrous margins, tip tapered, veins, 15–21, closely spaced and clearly visible; *inflorescence* robust, solitary, 24–50(–86) cm in height, simple or slightly branched, peduncle smooth, 16.5–32 (–56.5) cm long, bearing 1–2 triangular inflorescence bracts, 10–30 × 2.5–4 mm, with at least 8 veins, smooth margins and tapered tips; *rachis* (8–)11–32 cm long, bearing solitary or clustered flowers, up-to 4 per node; floral bracts with a triangular base and a tapered apex, 5.5–12.0 mm × 1.5–2.0 mm; pedicels 3–7 mm long (shorter than the bracts), with an infra-medial articulation; *perianth* white or pale pink, 8.5–11.5 mm long, elliptic, with 3 closely-spaced veins at the centre; outer tepals shorter and narrower, 7.8–10 × 1.5–2 mm; inner, 9–10 × 2–2.5 mm; *stamens* equal, shorter than the perianth, filament with a flattened base and tapered apex, 3.5–4.5 mm long, anthers triangular, 3.4–5 × 1–1.2 mm, basifixed, with a well-developed triangular appendage on the connective, 0.5–0.8 mm long; *gynoecium*: ovary longer than wide, 1.1–2 × 0.7–1.8 mm, ovules 6–10 per locule, style 7–10 mm long, weakly deflexed, with a slightly thickened stigma; *capsule* taller than wide, 10 × 7.5 mm, with distinct transverse veins; *seeds* black, flat, 2.3 × 3.2 mm, with a wide, shallow notch, and with the radicle protruding.

Phenology

Flowering can occur from September to June, and is well-represented by the available collections. Fruiting starts in September and can last until June, depending on the population.

Distribution and ecology

Chlorophytum appendiculatum is endemic to Madagascar, where it occurs primarily in the southern, subarid bioclimatic region, with its range just extending into the subhumid region to the east. It has a disjunct known distribution across its geographic range that comprises a subpopulation in the vicinity of the city of Toliara on the west coast that lies within the Tsinjoriake Protected Landscape and the Amoron'i Onilahy protected area, and a second subpopulation that is sparsly scattered across a large area of southern and southeastern Madagascar, including within the Behara-Tranomaro Protected area. It occurs on limestone and on acidic rocks, such as sand or gneiss, at altitudes below 500 m. It can form small populations in humus-rich clay-limestone undergrowth on cliff tops or under limestone boulders.

Fig. 12. Distribution of *Chlorophytum appendiculatum* H.Perrier, in Atsimo-Andrefana, Androy and Anosy Regions.

Provisional IUCN Red List assessment

Chlorophytum appendiculatum is endemic to Madagascar. The species is known from 15 collections from 5 occurrences across its range and has an AOO of 44 km² and an EOO of 21 270 km². It is known to occur in the protected areas of Amoron'i Onilahy and Behara-Tranomaro in the west of its range and in Tsinjoriake in the southeast, and at the six other locations that currently lack any formal protection, but where its habitat is undoubtedly threatened by overgrazing or by land clearance for agriculture locations. The species is assessed as Vulnerable [VU B2ab(i,ii,iii,iv)].

Illustrations

Perrier de la Bâthie 1937 [1938]: fig.VIII 1–4.

Nomenclatural remarks

1) The specimen, *C. Alluaud 84*; [P01046114], bears the word "type" on a determinavit written by H. Perrier de la Bâthie, and must therefore be considered to be the holotype, while another sheet [P01046115] contains dissected elements of the same collection.

2) We include *Decary 4598* in *C. appendiculatum*, although it was originally determined as *C. decipiens* by H. Perrier de la Bâthie, and only later reclassified by him as *C. appendiculatum* in order to maintain geographical consistency. The specimen currently consists of two separated leaves, a dry floral scape without flowers, and a damaged flower fragment, likely consumed by insects, that is impossible to identify with certainty. It is likely that the degradation of the specimen occurred after Perrier de la Bâthie's determination.

4. ***Chlorophytum aspidistrifolium*** Bard.-Vauc. & M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324056-1
Figs 2A, 5I, 13,19

Diagnosis

Chlorophyto ratovosonii Bard.-Vauc. & M.Pignal *affinis, sed planta paucifoliata (2 foliis vs 7), pseudo-petiolo gracili aequante vel longiore laminae (vs latiorem et 1/3 longitudine laminae), inflorescentia simplice (vs ramosam), pedunculo ebracteoso (vs 2-bracteatum), pedicello breviore articulatoque infra medium (vs longiorem supra medium articulatum), loculo fructi uniseminali (2–3 seminales), radicula seminis breviore paulo prominentique (vs latiorem clare prominentemque) praecipue differt.*

Etymology

The specific epithet of this new species refers to the shape of its leaves, which resemble those of *Aspidistra elatior* Blume (Asparagaceae), the well-known houseplant.

Type material

MADAGASCAR – **SAVA Region [Antsiranana Prov.]** • Vohemar, Daraina, forêt de Solaniampilana-Maroadabo; 13°05′37″ S, 49°34′31″ E; 133 m; 7 Feb. 2006; fr; *L. Nusbaumer & F. Ranirison 2033*; holotype: G [G00090381]!; isotype: TEF n.v.

Description

Plant herbaceous, 20 cm tall; the base of the plant is surrounded by fibres formed from the remains of old leaves; *rootstock* clustered, a mixture of fibrous and tuberous roots, the tubers forming on fibrous roots at a distance of ca 1 cm from the crown; tubers fusiform, very slender, 12–20 × 1–2 mm, often extending into a distal fibrous-root portion; *leaves* 2(–3), inclined, 27.0–31.5 × 1.4–2.0 cm, lanceolate, tapering at

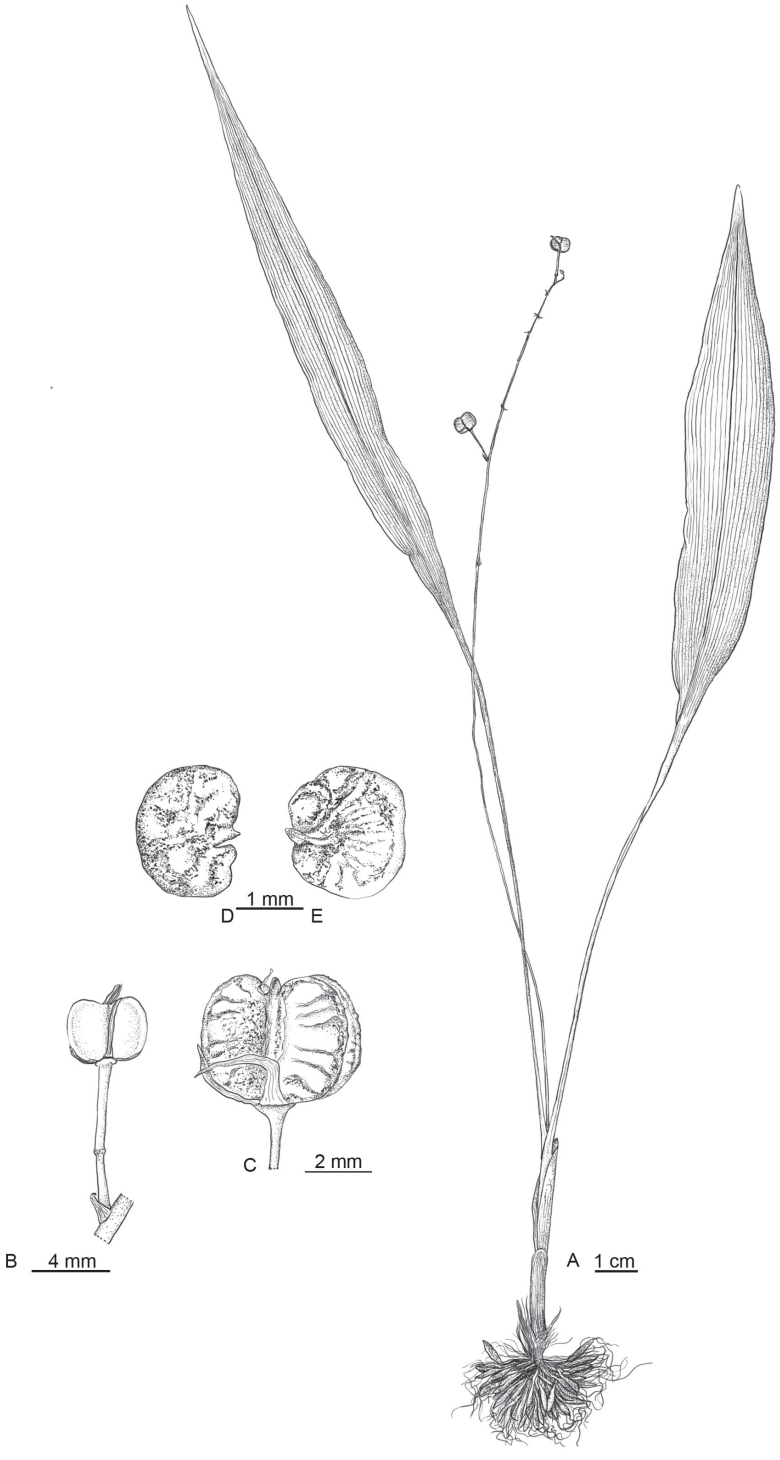


Fig. 13. *Chlorophytum aspidistrifolium* Bard.-Vauc. & M.Pignal sp. nov. holotype; *L. Nusbaumer & F. Ranirison 2033*, G [G00090381]. **A**. Habit. **B**. Young fruit with pedicel. **C**. Fruit. **D–E**. two sides of one seed. Drawing by Laurence Ramon.

both ends, the base transitioning to a slender, 14–16 cm long pseudo-petiole, equaling or surpassing the blade in length, leaf-bases nested, protected by two short congruent sheaths measuring 2.5 and 5 cm, the underside appearing blue-green when fresh, the margins finely scabrous, displaying 15–25 conspicuous, well-spaced veins, with a central pseudo-vein and visible transverse veins (at least on dried material) on the underside; *inflorescence* inadequately known (N.B. complete *flowers* unknown, but some data for the floral remains were observed and measured and presented here), *tepals* 5 mm long, with 3 veins; *stamens* with filaments papillose in their upper part; *infructescence* 24 cm in height, simple, erect, with a smooth peduncle lacking bracts, *rachis* 7 cm long in fruit, fruits few, usually 1–2(–3) per node, axillary floral bract, triangular, tapering to a point, 4 × 1.5 mm, with 5 veins, shorter than the fruiting pedicel; fruiting pedicel ca 8 mm long, with an medial articulation, and marked by a swelling, ca 2 mm from the base, the lower part tinged reddish-orange, upper part green (in vivo); *capsule* blue-green, becoming brown-purple, almost as long as wide, 4–5 × 5 mm; *seeds* 1 per locule, semi-circular, 2 × 1.5 mm, with a pronounced notch; radicle short, wide barely protruding.

Phenology

The only known collection of the species was made in early February and bears young fruit, suggesting that flowering took place in December or January.

Distribution and ecology

The sole population known for the species is in the Solaniampilana forest at approximately 130 m above sea level, in northeastern Madagascar within the Paysage Harmonieux de Loky Manambato (category 5 protected area, see Lowry *et al.* 2018) in the region known as Daraina (see Fig. 19). It occurs in the understory of a dense, medium-sized sclerophyllous forest, dominated by a few emergent trees, on ferric and humus-rich soil, between numerous granite slabs. This plateau forest is interlaced with areas of more humid riparian forest. For a map showing the only known locality of *C. aspidistrifolium* sp. nov. see Fig. 19.

Provisional IUCN Red List assessment

Chlorophytum aspidistrifolium sp. nov. is endemic to Madagascar, where it is known from a single collection made in 2006 from Loky Manambato in NE Madagascar within the Daraina forest. While little exploration of the forests of Loky Manambato had been undertaken prior to the expeditions carried out recently by staff of CJBG (Gautier *et al.* 2006; Nusbaumer *et al.* 2010), data from the site has shown the different forest patches to be rich in highly localised endemism. However, with only a single known fully documented occurrence, in an area that is not well explored, this species is assessed as DD (Data Deficient). While the species is probably highly localised, further information about its occurrence is needed in order to provide a realistic assessment of any treat to the species at its only known location. It is therefore recommended that targeted fieldwork be undertaken to provide adequate data for an assessment.

Morphological remark

The papillose upper part of the filament confirms that this taxon belongs to Group 1.

5. ***Chlorophytum basivaginatum*** Bard.-Vauc. & M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324061-1
Figs 6K, 14–15

Diagnosis

A Madagascariae omnibus aliis speciebus vagina foliorum brevi stramineaque ad basim caulis disposita, duobus foliis brevis complanatisque, apice antherae apiculato baseque paulo auriculata differt.

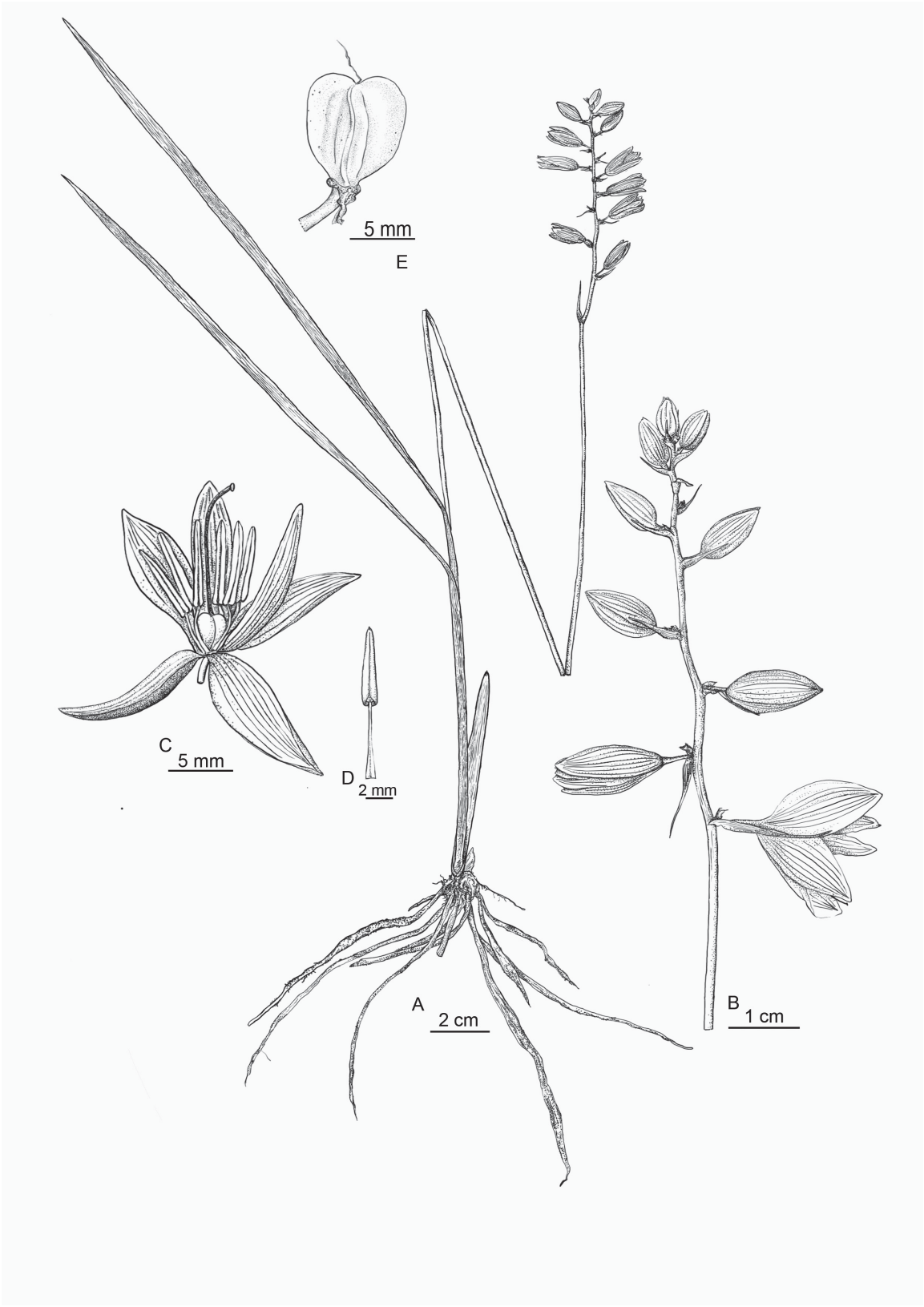


Fig. 14. *Chlorophytum basivaginatum* Bard.-Vauc. & M.Pignal sp. nov. **A**. Habit. **B**. Inflorescence. **C**. Flower. **D**. Stamen. **E**. Young fruit. A–D after *T. Andriamihajarivo*, *B. Rakotonirina & J.N. Rakotonirina 417*, holotype: MO [MO-3020298]; E after iNaturalist 9931965. Drawing by Laurence Ramon.

Etymology

The specific epithet refers to the basal sheath of the vegetative parts.

Type material

MADAGASCAR – **Amoron'i Mania [Fianarantsoa Prov.]** • Fianarantsoa, Amoron'i Mania, Ambatofinandrahana, Itremo, au Nord-ouest de Soatsihotapaka; 20°30′16″ S, 46°34′23″ E; 1652 m; 23 Nov. 2004; fl; *T. Andriamihajarivo, B. Rakotonirina & J.N. Rakotonirina 417*; holotype: MO [MO-3020298]!; isotypes: P n.v., TAN!, TEF n.v.

iNaturalist observation

MADAGASCAR – **Amoron'i mania [Fianarantsoa Prov.]** • (Itremo); 20°33′56.0″ S, 46°34′32.3″ E; 15 Feb. 2018; fr; *Ramaro* (*sederaramarom*); iNaturalist 9931965.

Description

Plant herbaceous, slender, vegetatively with a grass-like appearance; *roots* few, clustered – less than 10 – thickened and fusiform, 40–100 × 1.5–3 mm in diam.; *leaves* ≤ 3, the outer consisting of a short, cuspidate, straw-yellow sheath, 7–9 × 0.5 cm, and the two others with sheathing bases 10–13 cm long, the blade rigid, narrow, grass-like, folded, distinctly diverging from the axis opposite the sheath, blades almost parallel glabrous, with a smooth margin, a tapered tip, and 15 prominent veins, 28–36 × 0.4–0.5 cm; *inflorescence* solitary, large, simple, spicate, 50 cm in length, surpassing the leaves, peduncle smooth, lacking bracts, reddish-tinged (observed in situ), with a short *rachis*, 6–7 cm long; *flowers* few, large, isolated, the floral bract 16 × 1.5 mm, triangular, with a tapered apex, much longer than the pedicel; pedicel 3–4.5 mm long, articulated at 1–2 mm from the base; *perianth* 14 mm long, *tepals* white, of uniform length with numerous veins, the 3 central veins forming a bundle that anastomoses at the apex;

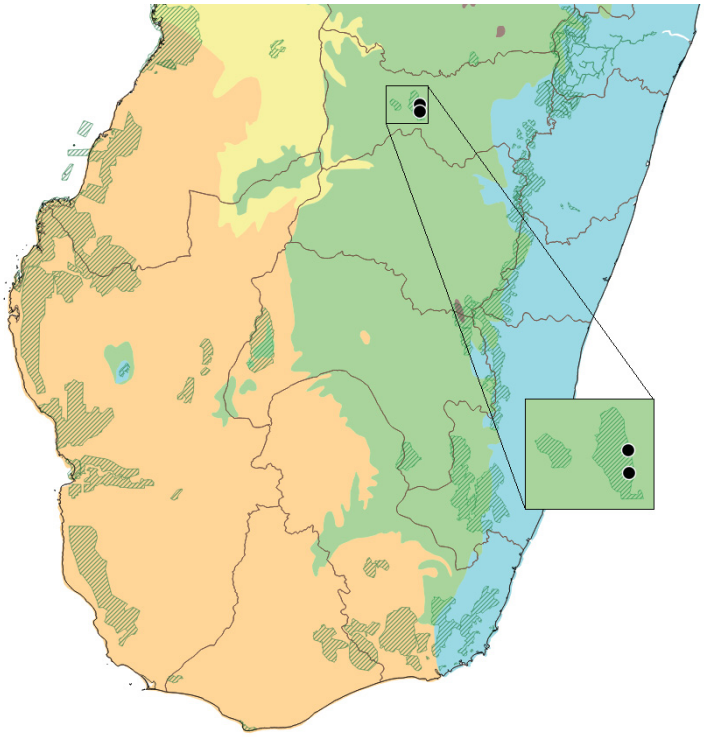


Fig. 15. Map showing the known range of *Chlorophytum basivaginatum* Bard.-Vauc. & M.Pignal sp. nov.

outer tepals 5 mm wide, with 7 veins, inner 4 mm wide with only 5 veins; *stamens* equal in length, shorter than the tepals, arranged in two groups of 3 on each side of the ovary, filaments flattened, 5 mm long, anthers ca 6 × 1 mm, the apex apiculate, sub-basifixed, attached ca 0.5 mm from the base, heel in the form of a rounded thickening or a short ridge; *gynoecium*: ovary 3 × 2.5 mm, with 10–12 ovules per locule; style 10 mm long, not surpassing the perianth, curved in its upper part; stigma flattened; *capsule* young erect (mature not seen), more-or-less pyriform, 10 × 8 mm, with slightly thickened sutures, surface not ornamented (based on iNaturalist 9931965).

Phenology

The only known collection was in bloom at the end of November, young fruits were observed in February (iNaturalist 9931965).

Distribution and ecology

The species is known only from the high plateau of the Itremo Massif, growing among metamorphic rocks such as quartzite or cipolin, at an altitude of 1600 metres. It occurs in open habitats, such as sparsely-wooded meadows, often in stony ground, where it has been noted as frequent.

Provisional IUCN Red List assessment

Chlorophytum basivaginatum sp. nov. is only known from a single collection and an iNaturalist observation, both of which were made from locations in the Itremo Massif Protected Harmonious Landscape only ca 6 km apart from each other. While the species is undoubtedly highly localised, further information about its occurrence within the protected area will be needed to estimate the threats to species and to provide an adequate conservation assessment, and it is therefore assessed as DD (Data Deficient).

6. ***Chlorophytum candelabrum*** Bard.-Vauc. & M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324059-1
Figs 5H, 16, 19

Diagnosis

Chlorophyto aspidistrifolio Bard.-Vauc. & M.Pignal *affinis, sed foliis majoribus (32–50 × 4–5.9 vs 27–31.5 × 1.4–2 cm), pseudopetiolis longioribus (18–23 vs 14–16 cm), nervis laminae numerosioribus (25–36 vs 19–25), pseudopetiolo nervisque utrinque pubescentibus (vs glabros), inflorescentiis majoribus (36.5 cm vs 24 cm), candelabriformibus (vs eramosam), rhachidibus inflorescentiae flexuosis (vs rectam), capsula latiore quam alta (vs altiorem quam latam), laevi (vs ornatam), pariete tenui (vs crassum), praecipue differt.*

Etymology

The specific epithet of this new species refers to the shape of its inflorescence, which is likened to a candelabra.

Type material

MADAGASCAR – **SAVA Region [Antsiranana Prov.]** • Daraina, forêt de Bekaroaka, partie nord; 13°06′42.6″ S, 49°42′18.0″ E; 200 m; 12 Jan. 2005; fr; *P. Ranirison & L. Nusbaumer 875*; holotype: G [G00019617]!; isotypes: K!, MO!, P [P04186575]!, research herbarium of Daraina, TEF n.v.

Description

Plant herbaceous, 30–50 cm tall; *roots* clustered, fibrous, each bearing a slender fusiform tuber, 10–13 × 2–3 mm, often extending into the system of fine, often branched, fibrous roots; base of the plant bearing

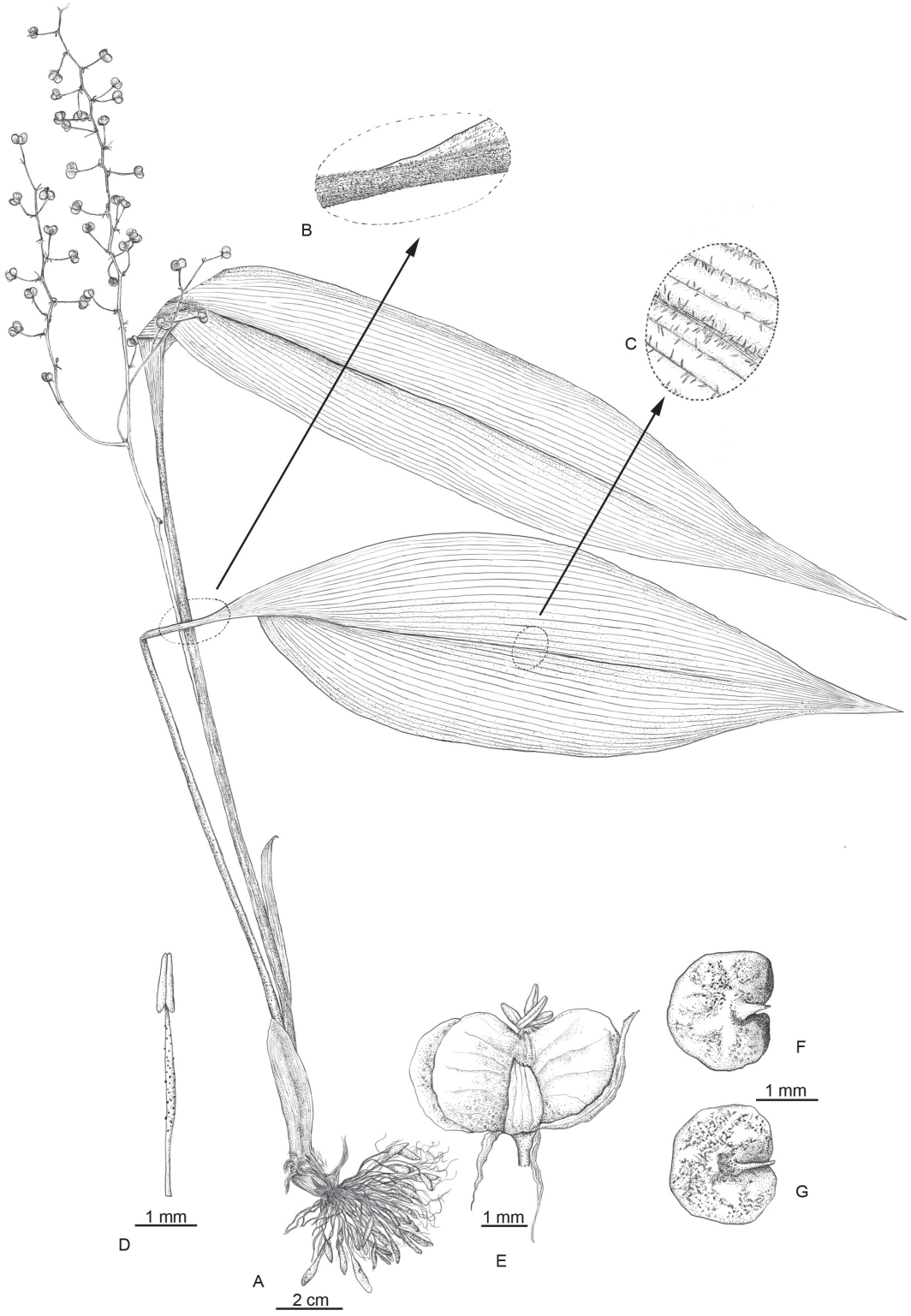


Fig. 16. *Chlorophytum candelabrum* Bard.-Vauc. & M.Pignal sp. nov. holotype; *P. Ranirison & L. Nusbaumer 875*, G [G00019617]. **A**. Habit. **B**. leaf-base detail. **C**. Leaf, abaxial surface detail. **D**. Stamen. **E**. Fruit with flowering remains. **F–G**. two faces of one seed. Drawing by Laurence Ramon.

the remains of old leaves; *leaves* 2(–3), lanceolate, and tapering at both ends, with an acuminate apex, 32–50 × 4.5–9.0 cm, the leaf-base transitions into an elongated pseudo-petiole, 18–23 × 0.6 cm, ca half the length of the blade, the leaves somewhat variable, with the upper typically lanceolate, and the lower sub-elliptical; the margins rough with numerous small, tightly-packed, short, irregular teeth, the pseudo-petiole and leaf veins with translucent hairs, 0.5–1.0 mm long, which are more abundant on the lower leaf surface and towards the base; central pseudo-vein yellow when dry, veins 25–36, well-spaced, conspicuous, leaf-base surrounded by one or two sheaths, 3.0–4.5 cm and 6.0–9.5 cm, respectively, pedicels (1–)2–4 per node; *flowers* known only from observations of floral remains on a fruit; *tepals* 4.5 × 0.8 mm, veins 3, well-spaced, brown; *stamens* shorter than the perianth, the filaments flattened, ca 3 mm long, widened in the upper 1/3 and slightly papillose on the upper 2/3, anthers 1.0 × 0.2 mm, dorsifixed (point of attachment towards the lower 1/3); *gynoecium*: ovary and style not observed; *infructescence* 1 per plant, upright, 22.0–36.5 cm in height, peduncle smooth, 16–20 cm long, bract translucent, situated at basal branch, 9 × 2 mm, with a triangular base and a very acute, long-tapered apex, veins 8, dark, with a scabrous margin near the tip, *rachis* (6–)13–15 cm long in fruit, branches of the ramifications curved, in candelabra shape; *capsules* 3–5 per node, wider than tall 2.5 × 3.5–4.0 mm, fruiting bract translucent with a triangular base, 3.5 × 1.0 mm, 3-veined, shorter than the pedicel; pedicel slender; 8–9 mm long in fruit, articulated below the middle at ca 3 mm from the base; walls thin, lacking ornamentation except for the veins; *seeds* 1(–2) per locule, shiny, black, finely granulate, suborbicular, 2.0 × 1.8 mm, with one side slightly convex and the other side with a tiny hollow behind the radicle, the radicle visible and protruding when the locule contains two compressed seeds.

Phenology

The only known collection was in fruit in December, which suggests that it flowered just before that month.

Distribution and ecology

The only known population of this species was found in the vicinity of Loky-Manambato in northeast Madagascar, within Bekaroaka forest, at an altitude of 200 metres. It grows in the understory of a dense dry forest, alongside tall emergent trees. It is present at the bottom of the slope on a poorly developed soil consisting of fine rubble derived from the underlying granite.

Provisional IUCN Red List assessment

Chlorophytum candelabrum sp. nov. is endemic to Madagascar, where it is known from a single collection made in 2005 in Bekaroaka forest, within the Loky Manambato Harmonious Landscape in NE Madagascar, representing a single known occurence. While little exploration of the forests of Loky Manambato had been undertaken prior to the expeditions carried out recently by staff of CJBG (Gautier *et al.* 2006; Nusbaumer *et al.* 2010), data from the site has shown the different forest patches are often rich in highly localised endemism. Within Loky Manambato, extensive habitat degradation of many of the forest patches has been observed during recent expeditions, and this is undoubtedly the major threat to this species. Based on this information, we assess the species as CR B1B2ab(i,ii,iii,iv,v). For a map showing the only known locality of *C. candelabrum* sp. nov. see Fig. 19.

Morphological remarks

1) One of the specimens whose leaves have been grazed by herbivores, has only the scabrous edge of the blade remaining, and the abundant hairiness of the blades and the pseudo-petioles is not apparent.

2) In two specimens, the axis forms a zig-zag pattern.

7. ***Chlorophytum chloranthum*** Baker
Figs 3A–D, 4B, 17

Chlorophytum chloranthum Baker (Baker 1887: 529).

Chlorophytum gracile Baker (Baker 1890: 348). – **Type:** MADAGASCAR – **Analamanga [Antananarivo Prov.]** • East Imerina; yrs 1880; fl, fr; *R. Baron 5927*; holotype: K [K000432401, K000432402] images!.

Etymology

The epithet refers presumably to the greenish colour of the perianth (according to the protolog).

Type material

MADAGASCAR • Central Madagascar; *R. Baron 3825*; holotype: K [K000432403] image!; isotypes: P [P01046133, P01046134]!. (See Nomenclatural remarks.)

Other material examined

MADAGASCAR – **Alaotra-Mangoro [Prov. Toamasina Prov.]** • Forêt d'Analamazotra; [18°49′24″ S, 48°26′ E]; 800 m; Dec. 1905; *C. d'Alleizette s.n.*; CLF [CLF345104]! • Moramanga, Commune Ambohibary, Fokontany Ampitambe. Sahaviana forest. Ambatovy; 18°51′46″ S, 48°17′16″ E; 1024 m; 22 Feb. 2007; fl, fr; *P. Antilahimena 5394*; MO n.v., P [P02090186]!, TAN n.v., TEF n.v. • Alaotra Mangoro, Ambohibary, Ampitambe Vavanomby; 18°51′56″ S, 48°18′56″ E; 1006 m; 13 Feb. 2008; fr; *P. Antilahimena et al. 6037*; MO [MO-3020353] image!, P [P06773989]!, TAN n.v. • Fivondronana: Moramanga, Commune: Ambohibary, Fokontany: Ampitambe. Ambatovy forest / Zone de déblai Celearing zone 5; 18°51′41″ S, 48°17′06″ E; 950 m; 28 Feb. 2008; *Antilahimena et al. 6078*; MO [MO-3020346] image!, P [P06773988]!, TAN n.v., TEF n.v. • Périnet; [18°56′ S, 48°25′40″ E]; 900 m; Dec. 1962; fr; *J. Bosser 16975*; P [P02071699]!, TAN! • Ambatondrazaka, Ankaropa; [17°50′ S, 48°25′ E]; 1300 m; 30–31 Jan. 1938; fl, fr; *G. Cours 137*; P [P02071666]! • Rahobevava; [17°58′ S, 48°26′ E]; 960 m; 11 Mar. 1951; fr; *G. Cours 4280*; P [P02071669]! • Iandrangato, sud de Moramanga; [18°57′ S, 48°14′ E]; 6 Mar. 1942; fl, fr; *R. Decary 17767*; P [P02071671]! • Forêt d'Analamazaotra; [18°51′24″ S, 48°25′43″ E]; 800–900 m; Feb. 1912; fl, fr; *H. Perrier de la Bâthie 10980*; MO [MO-3020322] image!, P [P02071736]! • same data as for preceding; [18°52′ S, 48°26′ E]; Dec.; fl, fr; *H. Perrier de la Bâthie 10982*; P [P02071739]!, TAN! • Moramanga, Amboasary, Mangabe, forêt Amparihy; 19°3′15″ S, 48°8′59″ E; 929 m; 16 Nov. 2012; fl bud; *J.A. Ramahenina, R. Randrianaivo, H. Rasoazanany, E. Razanakoto & C. Randriamialisoa 180*; MO!, P [P00820742]!, TAN n.v. • Alaotra Mangoro, Ambohibary, Ampitambe Vavanomby; 18°51′27″ S, 48°17′17″ E; 1005 m; 1 Mar. 2008; fr; *S. Rakotondrasana, A. Rakotondrafara, M. Ratovomanana, J.M. Rakotomazava, J.D Ramarolahy 1285*; MO [MO-3020430] image!, TAN n.v. • Moramanga, forêt d'Analamazotra; [18°50′ S, 48°26′ E]; 900 m; 21 Jan. 1912, fl, fr; *R. Viguier & H. Humbert 894*; P [P02071735, P06169919]!. – **Amoron'i mania [Fianarantsoa Prov.]** • environs d'Ambatofinandrahana, gneiss; [20°29′40″ S, 46°47′31″ E]; 1600–1800 m; 23 Feb. 1938; fl, fr; *R. Decary 13282*; P [P02071667]! • Ambositra, près d'Andina, gneiss; [20°31′32″ S, 47°10′ E]; 1500 m; Dec. 1911; fl, fr; *H. Perrier de la Bâthie 10970*; P [P02071731, P02071732]!. – **Analamanga [Antananarivo Prov.]** • Madagascar, la Mandraka; [18°54′48″ S, 47°53′26″ E]; Aug. 1906; fr; *C. d'Alleizette 1022*; P [P02071727]! • Manerinerina, sur le Tampoketsa, entre Ikopa et Betsiboka; [18°00′ S, 47°09′ E]; 1500 m; Dec. 1924; fl, fr; *H. Perrier de la Bâthie 16852*; G!, P [P02071720, P02071721]! • Anjorozobe, Ambohitsaratany; 18°27′49″ S, 47°49′55″ E; 1433 m; 18 Dec. 2013; fl, fr; *N. Ravololomanana, S. Porembski, R.N. Rabarijaona & F.A. Rajaonary 378*; MO [MO-3047200] image!, P [P00910350]!. – **Androy [Toliara Prov.]** • Forêt de Belambo, N d'Ampandrandava; [24°05′ S, 45°42′ E]; 1000–1200 m; Mar. 1943; fl, fr; *A. Seyrig 600*; P [P02071696, P02071691]! • Forêt de Belambo, N d'Ampandrandava, entre Bekily et Tsivory; [24°05′ S, 45°42′ E]; Mar. 1943; fr; *A. Seyrig 600B*; P [P02071690]! • Environs d'Ampandrandava, entre Bekily et Tsivory; [24°05′ S, 45°42′ E]; May 1943; fr; *A. Seyrig 600C*; P [P02071700]!. – **Anosy [Toliara Prov.]** • Betroka, Ivahona, Kalambatitra, forêt d'Analamaro; 23°28′14″ S, 46°23′38″ E; 1330 m;

4 Nov. 2005; fl bud; *N.M. Andrianjafy, R.L. Andriamiarisoa, L.J. Razafitsalama, J. Realy, N. Reaka & Resaviny 467*; MO [MO-3020288] image!, P [P06169870]!, TAN n.v. • SE Madagascar, off Route National XI, Andohahela Parcel 1, path to Iminiminy; 24°46′ S, 46°50′ E; 300 m; 7 Dec. 1989; fl, fr; *B. Du Puy, D.J. Du Puy, M. Cheek, G. Rafamantanantsoa, J. Dransfield, S. Dransfield & D. Cooke MB 534*; K n.v., P [P00075192]! • Fort Dauphin, forêt de Manantantely; [25°01′ S, 46°58′ E]; 60–300 m; 22 Sep. 1928; fl; *H. Humbert 5819*; P [P02071733, P02071728]! • Bassin de la Manampanihy, col de Fitana; [24°06′36″ S, 47°15′ E]; 300–700 m; 15 Oct. 1928; fl, fr; *H. Humbert 6031*; P [P02071725, P02071723]! • Massif du Kalambatitra, Mt Analatsitendrika, gneiss; [23°20′20″ S, 46°27′34″ E]; 1650–1850 m; Nov. 1933; fl; *H. Humbert 11917*; P [P02071672, P02071673]! • Fort Dauphin; [25°01′35″ S, 46°58′ E]; 1888–1892; fl; *G.F. Scott Elliot 2504*; BM [BM013839984] image!, P [P02071729]! • Toliara, Taolanaro, Ifarahatsa, Ivorona; 24°49′11″ S, 46°55′31″ E; 6 Apr. 2010; fl, fr; *Rakotonasolo et al. 1628*; BR [BR0000021754968]!, TAN n.v. • Anosy, Tolagnaro, Mahatalaky, Farafara Vatambe, forêt humide de basse altitude de Farafara Andohavolo située au Sud du village de Farafara; 24°50′42″ S, 46°59′46″ E; 280 m; 19 Feb. 2009; fl, fr; *Rakotovao, R. Razakamalala, R. Ramison & Deba Raymond 4360*; MO [MO-3020320] image!, P n.v., TAN n.v. • Andohahela, parcelle n°1, cours supérieur de la rivière Ankaranangatobe. Versant rive gauche d'un des bras supérieurs de l'Ankaranangatobe, 220 m au N-NE du camp n°2; 24°49′18.7″ S, 46°46′42″ E; 840 m; 7 Feb. 2023; fr; *J.-P. Randrianirina & L. Rapp 71*; G n.v., P [P01101476]!. – **Atsinanana [Toamasina Prov.]** • Itinéraire Didy à Brickaville, forêt orientale; [18°32′44″ S, 48°50′31″ E]; fl, fr; *G. Cours 4841*; P [P02071686, P02071687, P02071688]!. – **Betsiboka [Mahajanga Prov.]** • Tsaratanana, Ambakireny; forêt Ambatondrazana; 17°40′53″ S, 48°00′06″ E; 1111 m; 18 Jan. 2010; fr; *B. Andrianaivoravelona, H. Ralimanana, M. Rakotoarinivo, R. Rajaonarison, T. Ratiarison & L. Robinson ANB 260*; BR n.v., K n.v., MO [MO-3020321] image!, P [P01184070]!, TAN n.v. – **Bongolava [Antananarivo Prov.]** • Anarombato, plateau du Bongolava, N-O Tsironomandidy; [18°43′36″ S, 45°58′36″ E]; 17–18 May 1970; fr; *J. Bosser 20288*; P [P02071676]! • 5.6 km NW of Ambohitsaratelo-Bebao (NW of Tsiroanomandidy); 18°19′ S, 045°34′ E; 1200 m; forest remnant; 22 Jan. 1985; fr; *L.C. Barnett et al. 379*; G n.v., MO [MO-3020350]! • ca 16 km NW of Ambohitsaratelo-Bebao (NW of Tsiroanomandidy); 18°18′ S, 45°30′ E; forest; 1100 m; 11 Jan. 1985; fr; *L.J. Dorr & al 3478*; MO [MO-3020349]!. – **Haute Matsiatra [Fianarantsoa Prov.]** • Fianarantsoa, Sanga-Sanga; [21°27′13″ S, 47°5′9″ E]; Nov. 1963; fl; *J. Bosser 17362*; P [P02071378]! • PK 376, RN 7, 34 km N Fianarantsoa; [21°16′ S, 47°13′ E]; 1250–1260 m; 31 Jan. 1975; fl; *T. Croat 30098*; MO [MO-3020302] image!, P [P06169904]! • Ambohimahasoa, Ialatsara; [21°05′ S, 47°12′ E]; 7 Feb. 1942; fr; *R. Decary 17470*; P [P02071694]!, WAG [WAG.1151863] image! • S Betsileo, Fianarantsoa; [21°27′ S, 47°05′ E]; Mar. 1881; fl, fr; *J.M. Hildebrandt 4199*; BM [BM013839983] image!, G!, P [P02071722]!. – **Ihorombe [Fianarantsoa Prov.]** • Fianarantsoa, Begogo, Bekora, forêt de Sahalava; 23°31′59″ S, 46°32′04″ E; 1180 m; 28 Jan. 2005; fl bud; *N.M. Andrianjafy, M. Ramanantsoa, P. Resabo, D. Razafindraibe, B. Kidamaoly 750*; MO [MO-3020324] image!, P [P02071741, P02071742]!, TAN n.v. • Ihosy, Ranotsara; [22°40′ S, 44°44′ E]; Dec. 1963; fl, fr; *J. Bosser 18718*; G!, MO!, P [P02071670]! • Chaîne du Vohibory, O. d'Ivohibe; [22°30′ S, 46°43′ E]; 1000–1300 m; 1 Nov. 1924; fl; *H. Humbert 3096*; P [P02071726]!, TAN! • forêt à l′ E d'Ivohibe; [22°33′ S, 46°56E]; 1000 m; 5–11 Nov. 1924; fl, fr; *H. Humbert 3388*; P P02071724]! • Ranohira, Est Isalo; [22°32′ S, 45°25′ E]; 750–800 m; 3 Feb. 1955; fl, fr; *H. Humbert 28791*; P [P02158248]!, TAN! • Col piste Ihosy-Ivohibe, vallée de la Menarahaka; [22°27′ S, 46°21′ E]; 1000 m; Jan. 1974; fl; *P. Morat 4235*; P [P02071376]! • District Ivohibe. Commune rurale Ivohibe. Fokontany Longoza; forêt de moyenne altitude à gros arbres élevés et savane herbeuse de Vohibory. Rivière Efanôla; 22°34′51″ S, 046°42′17″ E; 1001 m; 4 Dec. 2016; fl; *C. Rakotovao et al. 7234*; MO [MO-3066355]!, P n.v., TAN n.v. – **SAVA Region [Antsiranana Prov.]** • Vohémar, Daraina, forêt d'Antsahabe; 13°13′ S, 49°33′ E; 880 m; 22 Nov. 2004; fl, fr; *L. Gautier & L. Nusbaumer 4731*; G [G00019115]!, P [P02071740]!, TEF n.v. • Vohémar, Andrafainkona, forêt de Sorata; 13°38′26.5″ S, 49°29′29.1″ E; 1280 m; 3 Mar. 2022; fr; *Havinga & Iharivolana 372*; G [G00390534]!, P [P04186580]!, TEF n.v. • Vohémar, Daraina, forêt d'Antsahabe; 13°13′10.2″ S, 49°33′05.4″ E; 855 m; 20 Jan. 2004; fl, fr; *L. Nusbaumer 1062*; G [G00006504]!, K n.v., MO [MO-3020325] image!, P [P01698916]!, research herbarium of Daraina n.v.,

TEF n.v. – **Vatovavy Region [Fianarantsoa Prov.]** • Est de Fianarantsoa, station forestière d'Andrambovato; [21°31′30″ S, 47°45′30″ E]; Nov. 1956; fl, fr; *B. Descoings 1829*; MO [MO-3020329] image!, TAN!. – **locality unknown** • s.loc.; 26 Oct. 1935; fl; *Jardin botanique 1146*; TAN! • Madagascar; 1878–1880; fl, fr; *L. Humblot 516*; P [P02071737, P02071734, P02071738]!, TAN n.v.

Additional material examined (*Chlorophytum* sp. cf. *chloranthum* Baker; Fig. 17)

MADAGASCAR – **Androy [Toliara Prov.]** • Ampandrandava (material cultivated); 1943; fl; *A. Seyrig 600D*; P [P02071697]! • same data as for preceding; fl; *A. Seyrig 600E*; P [P02071698]!. – **DIANA Region [Antsiranana Prov.]** • Low-altitude humid evergreen forest on granite, river Antsaharatsy, Tsaratanana RNI; 13°48′49″ S, 48°47′29″ E; 500 m; 13 Apr. 2000; fl, fr; *C.R. Birkinshaw, J.F. Adamainty, B. Razafindrazaka & P. Antilahimena 660*; MO [MO-3020345] image!.

Description

Plant herbaceous, 15–40 cm tall, rhizomatous; *roots* fasciculate, mostly hairy, 0.5–1.2 mm thick, extensively branched, sometimes exceeding 200 mm, with occasional small rare tubers developing on fibrous roots or on short side roots; *leaves* generally 5–11(–19), flexible, 13–40(–46) × 0.8–2.5 (–3) cm; some stems with 2–3 significantly shorter leaves on the outside; lanceolate or linear-lanceolate, base attenuated into a pseudo-petiole, 4–11(–13) cm long, approximately 1/4 to 1/3 of the blade's length, widened at the base forming a sheath, the overlapping of sheaths may create a pseudobulb, smooth-margined or rarely finely scabrous margin, tapering towards the tip, veins (9–)10–20(–25), spaced and well-visible; *inflorescence* 1–2(–3) per stem, branched, with a rigid or slender and flexible axis; peduncle, 9–30(–40) cm in height, smooth, bearing a long, very slender, bract, 10–48 × 1.8–4 mm, and an additional smaller bract at each branching point of the rachis, the bracts are at ca 1/2 or 2/3 of the length of the peduncle; *rachis* 8–27(–43) long, with well-developed basal branches, often with secondary branching; *flowers* 1–4(–6) per node; floral bracts long-triangular, acuminate (13–)20–40(–100) × 1–3 mm, shorter than the pedicel, with 1–3 veins, the lateral veins often hardly visible; pedicels 4–11 mm long, with medial or submedial articulation (except for *Cours 4280*, *Hilldebrandt 4199*, *Du Puy et al. 534*, *Gautier & Nusbaumer 4731*, *Nusbaumer 1062*, where the articulation is distinctly inframedial); *perianth* green or pale green, 3–5.5 mm long; *tepals* elliptical-lanceolate, subequal; outer tepals slightly shorter and narrower than the inner, 3–5 × 0.5–1.5(–1.8) mm, 3 central veins dark, close together, converging below the tip; *stamens* shorter than the tepals, divided into 2 groups, either 3+3 or 4+2, with subequal or distinctly unequal filaments, narrow at the base becoming fusiform towards the apex, distinctly papillose, the long ones 1.8 to 3.4 mm long, the short ones, 1.5 to 2.6 mm long, anthers elongate, 0.8–1.4 × 0.2–0.5 mm, often hastened in base, dorsifixed, filament attached to the anther in their lower 1/4; *gynoecium*: ovary 0.7–1.5 × 0.8–1.2 mm, 2 ovules per locule; style long, thread-like, 2.2–4 mm long, flattened at the top; *capsule* wider than long, 3–4 × 4.5–6(–7–8) mm, with a thin wall and a slightly raised suture, ornamentation reduced to a few transverse veins; *seeds* 1–2 per locule, black, suborbicular, 2.5 mm in diam., shiny, granulate, with a convex surface on one side and a circular depression on the other, notch closed or very narrow, radicle visible, but barely protruding.

Phenology

Evergreen plant, found in humid forest. Flowering occurs primarily from October to March, but can begin as early as September and last until May. Fruiting takes place from October to May. In dry forest, flowering is dependent on the rainy season, starting in January and continuing until March, while fruiting begins in February.

Distribution and ecology

Chlorophytum chloranthum is an abundant species in the central and eastern regions of Madagascar, ranging from the Vohémar Region in the north to the extreme south, with some records from the western

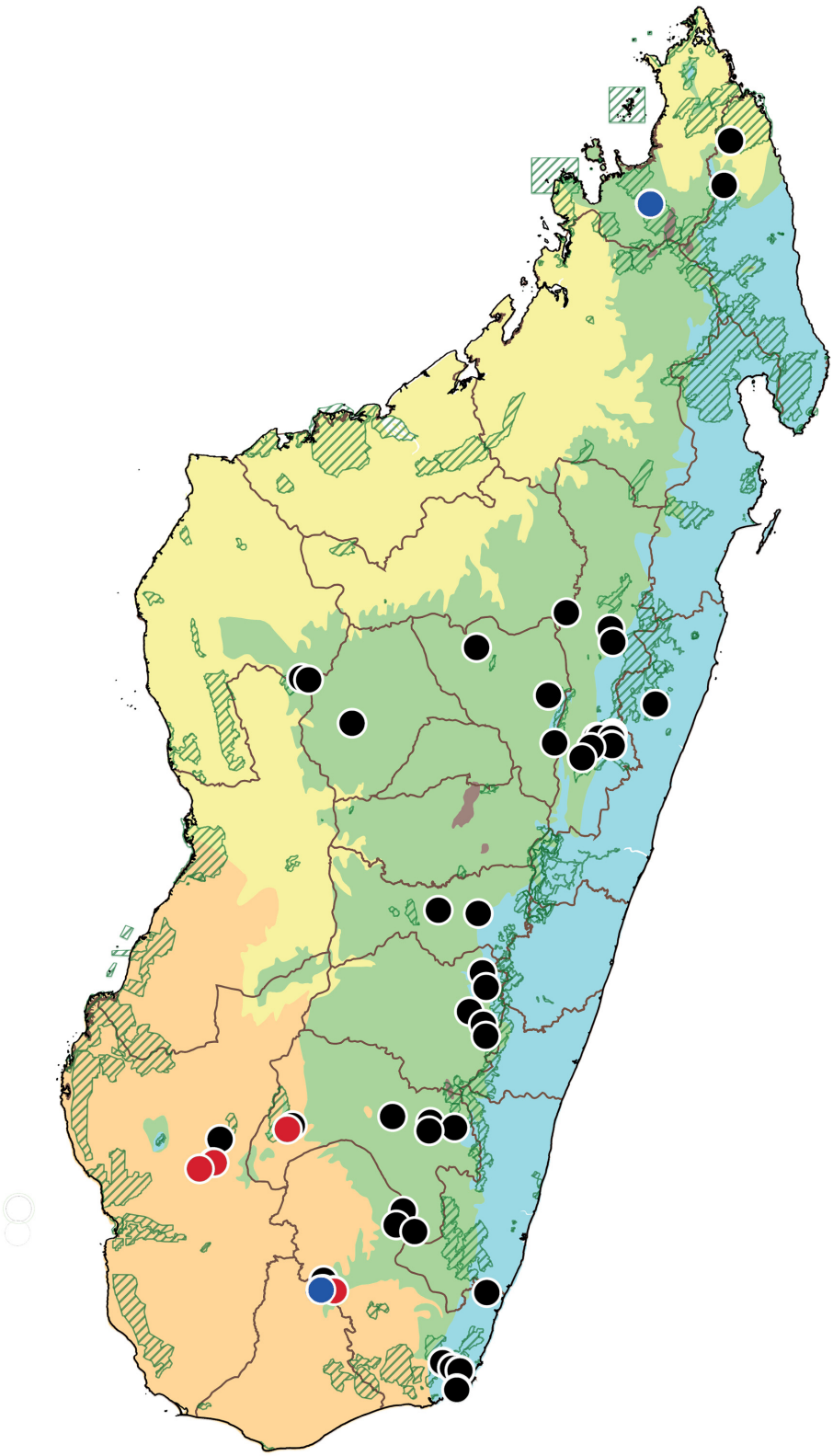


Fig. 17. Distribution of *Chlorophytum chloranthum* Baker (black dots), *C.* aff. *chloranthum* (red dots), *C.* cf. *chloranthum* (blue dot).

Tsaratanana zone, both of which belong to the same climatic zone. The species is typically found on diverse acidic substrates such as granite, sands, sandstones, and metamorphic rocks.

This species is locally frequent in humus-rich undergrowth of evergreen rainforests, sometimes in degraded conditions, whether on moss-covered rocks, along riverbanks, or in wet areas, at elevations ranging from 300 m to 1800 m.

Where it is encountered in dry deciduous forest, such as in the Isalo Massif and at Zombitse, it thrives in shaded, moist areas, such as in gorges or along riverbanks.

Provisional IUCN Red List assessment

Chlorophytum chloranthum is endemic to Madagascar, where it is relatively widespread, occurring throughout the central and southern uplands where it has been recorded in all of the regions of the central interior, with the exception of the Itasy and Vakinkaratra Regions. The species also occurs at lower elevation sites in the southeast, including in the Atsimo-Atsinanana and Anosy Regions in the coastal areas and also into the higher parts of the Androy and Atsimo-Andrefana Regions to the southwest. The species also has an outlying population in the mountains of the north, that spans the SAVA and DIANA Regions. *Chlorophytum chloranthum* is known from 54 collections, representing a total of 27 known occurrences at a range of elevations from near sea level to 1650 m, but mostly in the central highlands. It has been recorded from six protected areas, where it is not considered to be threatened: the national parks of Analamazaotra, Andohahela, Mantadia and Zombitse-Vohibasia, and the special reserves of Kalambatritra and the Pic d'Ivohibe. It occurs in at least five other protected areas of a lower status (where habitats are not necessarily adequately protected) and also at sixteen other known locations where it has no protection, and where the species is threatened by wildfire, over-grazing, construction and conversion of land for agriculture, including on the Isalo Massif (but outside of the park limits). It has an EOO of just over 315 000 km^2 and an AOO of 192 km^2. On the basis of the large number of known locations and the documented occurrence in 12 protected areas covering a large part of its known range, we assess the species as LC, despite its somewhat limited AOO.

Morphological and nomenclatural remarks

1) Due to the large number of specimens, significant variation is observed in both the number and the length and width of the leaves.

2) For *Cours 4280*, *Scott Elliot 2504*, *Nusbaumer 1062* and *Viguier & Humbert 894*, the bract located on the peduncle is the size of a small leaf, measuring 9–13 × 0.35–0.40 cm with 9–12 veins. Moreover, for the first three collections (*Cours 4280*, *Scott Elliot 2504*, *Nusbaumer 1062*), its base tapers into a pseudo petiole of 0.5–1.0 cm long.

3) For *Morat 4235* and *Andrianjafy at al. 750*, the specimens bear one or several adventitious plantlets along the floral scape, composed of several pseudo-petioled leaves with sheathing bases.

4) K000432401 and K000432402 in fact correspond to a single specimen artificially separated during digitisation.

Chlorophytum* sp. aff. *chloranthum Baker
Fig. 17

Material examined

MADAGASCAR – **Androy [Toliara Prov.]** • Forêt de Belambo, N d'Ampandrandava; [24°04′45″ S, 45°42′ E]; 900 m; Jan. 1943; fl; *A. Seyrig 487*; P [P02071379]! • same data as for preceding; 1300 m;

Jan. 1943; fl, fr; *A. Seyrig 497*; P [P02071701]! • same data as for preceding; ca 1300 m; Mar. 1943; fr; *A. Seyrig 497B*; P [P02071693]! • same data as for preceding; 1943; fr; *A. Seyrig 497C*; P [P02071692]!. – **Atsimo-Andrefana [Toliara Prov.]** • Sakaraha, Forêt du Zombitsy; [22°53′ S, 44°40′29″ E]; 12 Feb. 1970; fl; *J. Bosser 19899*; G!, P [P06169868]! • Zombitsy, sous-bois de forêt sèche; [22°52′48″ S, 44°39′46″ E]; Mar. 1970; fl; *P. Morat 3482*; TAN! • Tsaramasao, 20 km S de Sakaraha; [22°56′25″ S, 44°32′ E]; Mar. 1970; fl bud; *P. Morat 3506 p.p.*; P [P06169921]! TAN!. – **Ihorombe [Fianarantsoa Prov.]** • Isalo, gorges du rat; [22°34′ S, 45°22′ E]; Mar. 1960; fl bud; *M. Keraudren 429*; P [P06169867]!.

Morphological remarks

The following collections: *Bosser 19899*, *Keraudren 429*, *Morat 3482* and *3506 p.p.*, *Seyrig 487*, *497*, *497B* and *497C*, differ from typical *C. chloranthum* by the following characteristics: 1) leaves with pseudo-petioles of more than one-third of the leaf length, 2) margin of the blade always scabrous, 3) peduncle of the inflorescence bearing small hyaline triangular protuberances (more or less abundantly), 4) floral pedicels jointed in the middle or above the middle, 5) floral clusters separated by long internodes of 3–5 cm.

The flowers are similar, but the most surprising aspect concerns the number of ovules per locule, i.e., (2–)3–4(–5) vs 2. However, these differences do not seem adequate to formally separate these collections from typical *C. chloranthum*, especially considering that collections corresponding to the general description also occur in the same localities.

Regarding the Seyrig material cited above, the specimens come from the same locality, but at two different altitudes: 900 m and 1300 m.

We note that other Seyrig specimens (e.g., from the north of Ampandrandava) often consist of scattered elements, sometimes cultivated, and all attributed by the author to the same number. We tentatively associate some of them with *C. chloranthum*, but without absolute certainty.

8. ***Chlorophytum darainense*** Bard.-Vauc. & M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324058-1
Figs 2I, 4J, 18–19

Diagnosis

Chlorophyto ranirisonii Bard.-Vauc. & M.Pignal *affinis, sed foliis juvenibus integris (vs scabra), laminis 24–26-nervis (vs 16–21), inflorescentiis simplicibus (vs 1–2 ramosas), pedunculo inflorescentiae scabro, eglanduloso (vs scabrum glandulosumque), pedicello glabro (vs scabrum), tepalis albo-viridis (vs alba), filamento complanato paulo papilloso (vs inflatum papillosissimumque), antheris 1.5 × 0.4 mm (vs 1 × 0.2 mm), praecipue differt.*

Etymology

The specific epithet of this new species refers to the rural town of Daraina in northern Madagascar.

Type material

MADAGASCAR – **SAVA Region [Antsiranana Prov.]** • Diego-Suarez / Antsiranana, Daraina, forêt de Binara; 13°15′43.2″ S, 49°36′38.4″ E; 630 m; 2 Dec. 2006; fl, fr; *L. Gautier & C. Chatelain 5005*; forêt dense semi-décidue +/- sclérophylle; holotype: G [G00096120]!.

Fig. 18. *Chlorophytum darainense* Bard.-Vauc. & M.Pignal sp. nov. holotype; *L. Gautier & C. Chatelain 5005*, G[G00019617]. **A**. Leaves (the separate leaves on the specimen are shown in situ). **B**. Inflorescence. **C**. Inflorescence detail, flowers and young fruit (from picture of the living plant). **D**. Flower. **E**. Stamen. Drawing by Laurence Ramon.

Description

Plant herbaceous, 30 cm tall, underground parts unknown; *leaves* 4–5, (detached from the specimen, but arranged in situ in the drawing), 12–21 × 2.4–3.5 cm, lanceolate, base tapered with a very short pseudo-petiole, 2 cm long, corresponding to the sheathing base of the leaves, blade with a wavy hyaline margin, apex acuminate, acumen 1–1.5 cm long, veins 24–26, conspicuous, well-spaced; *inflorescence* solitary, erect, 20–27 cm long and unbranched, peduncle 10–14 cm long – the upper part of the peduncle and the rachis covered with short hyaline excrescences with a conical base; bracts narrow, triangular, 6.5 × 1.0 mm; *rachis* 7.5–12.5 cm long, floral bract, triangular, longer than the pedicel, the base clasping, 6 × 2 mm, transparent, 3 conspicuous veins, tip acuminate, pedicel 3.5 mm, articulation submedial; *flowers* 2–4(–6), erect; *perianth* pale green, 5.5 mm long; *tepals* unequal, recurved at anthesis, outer elliptic, 5 × 1.2 mm, inner oblanceolate, 5 × 0.8 mm, with 3 central veins that anastomose (fuse) before reaching the tip; *stamens* equal in length, the filaments 3.5 mm long, white, flattened in their upper half, slightly papillose, the papillae limited to their upper half, anthers 1.5 × 0.4 mm, yellow, dorsifixed, filament inserted at the lower 1/4; *gynoecium*: ovary 1.1 × 0.8 mm, the ovules 4–5 per locule, white when fresh; style 4.5 mm long, filiform, barely extending beyond the perianth; *immature capsule* 5 × 6 mm wide, pendulous.

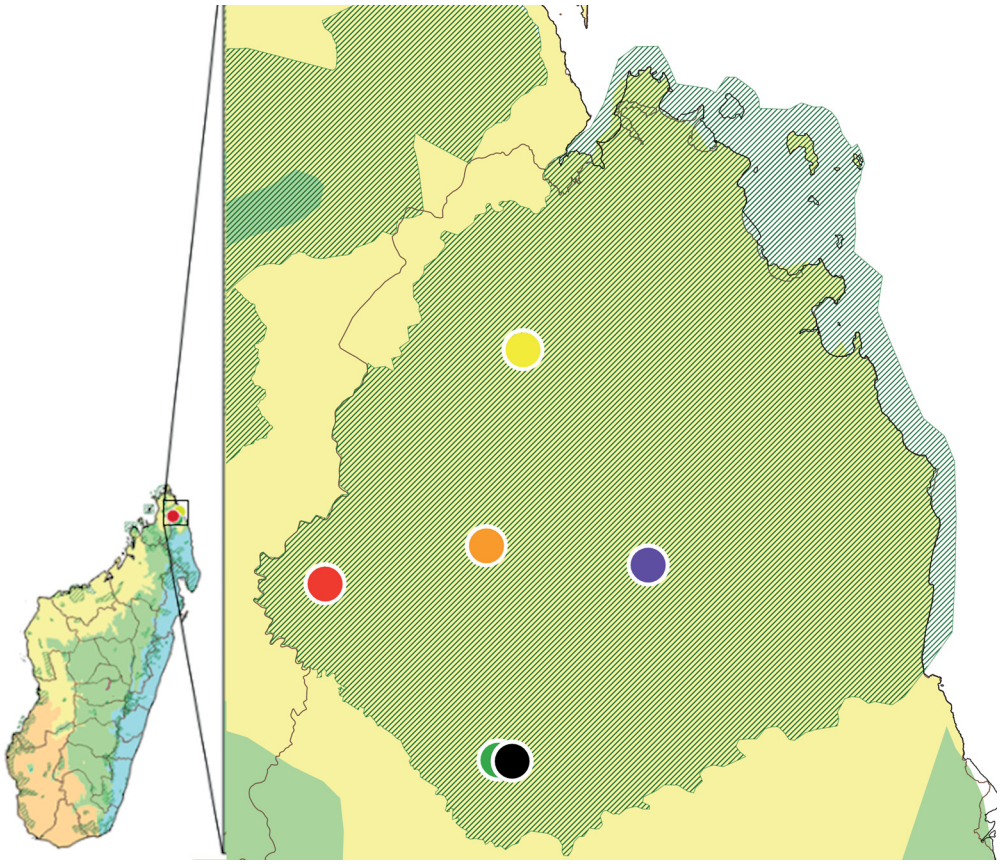


Fig. 19. Map showing the known ranges of six taxa endemic to Daraina in NE Madagascar, SAVA Region, including: *Chlorophytum aspidistrifolium* Bard.-Vauc. & M.Pignal sp. nov. (orange dot), *C. candelabrum* Bard.-Vauc. & M.Pignal sp. nov. (violet dot), *C. darainense* Bard.-Vauc. & M.Pignal sp. nov. (black dot), *C. nusbaumeri* Bard.-Vauc. & M.Pignal sp. nov. (yellow dot), *C. ranirisonii* Bard.-Vauc. & M.Pignal sp. nov. (green dot – partially obscured by black dot) and *C. sofiense* subsp. *gautieri* Bard.-Vauc. & M.Pignal subsp. nov. (red dot) (see also Fig. 41). Note that the widespread *C. chloranthum* is the only other species of *Chlorophytum* known to occur in Daraina (see Fig. 17).

Phenology

The collection, made in early December, includes flowers and two young fruits, suggesting that flowering likely occurs as early as November, and fruiting starts in December.

Distribution and ecology

This species has only been found in the north-eastern Madagascar, near the town of Daraina, in Binara forest, which forms part of the Loky-Manambato protected area, at an altitude of 630 m on a secondary ridge covered with dense, semi-deciduous, and somewhat sclerophyllous forest, near the edge of the secondary grassland. The substrate consists of compact or fragmented granites, resulting in poorly developed soils.

We note here that the forests near Daraina are exceptionally rich in *Chlorophytum*, many of which are strictly endemic to the area, as far as is currently known. These include five new species described in this treatment, which are only known from Daraina, as well a new subspecies of *C. sofiense* – a poorly-known species, known otherwise from a single collection made over 100 years ago from a site further to the south. Daraina also harbours the typical form of the widespread *C. chloranthum* (see Fig. 19). This species richness can perhaps be explained by the intensity of the botanical inventories carried out over the last 5 years as part of the programmes conducted at Loky-Manambato, that have generated more than 54 000 records of plant occurrences in the 10 main forest areas of the region (Nusbaumer, pers. com.).

Provisional IUCN Red List assessment

Chlorophytum darainense sp. nov. is endemic to NE Madagascar, where it is known from a single collection made within the Loky Manambato Harmonious Landscape in 2005 in the forest at Daraina that represents just one known occurence at one known location where the species is presumed to be a strict endemic. While little exploration of the forests of Loky Manambato had been undertaken prior to the expeditions carried-out recently by staff of CJBG (see Gautier *et al.* 2006 and Nusbaumer *et al.* 2010), data from the site has shown the different forest patches to be rich in highly local plant species endemism. Within Loky Manambato, extensive habitat degradation of many of the forest patches has been observed and this is undoubtedly the major threat to this species. *Chlorophytum darainense* is assessed as CR B2ab(i,ii,iii,v).

Remark

Only one collection of this species has been seen, and these were limited to just leaves and inflorescences in order to leave the living plants alive in situ.

9. ***Chlorophytum decaryanum*** H.Perrier
Figs 4C, 20

Chlorophytum decaryanum H.Perrier (Perrier de la Bâthie 1935: 45–46).

Etymology

The species is dedicated to Raymond Decary (1891–1973), who has made a considerable contribution to the history, ethnology and natural sciences of Madagascar (Balard & Maestri 2001).

Type material

MADAGASCAR – **Anosy [Toliara Prov.]** • Domaine oriental (S.E.): camp d'aviation, Fort-Dauphin, sur des sables humides; [25°02′07″ S, 46°57′16″ E]; 3 Jul. 1932; fl; *R. Decary 9974*; lectotype: P [P01046131]!, **here designated**; isolectotype: P [P01046132]!.

Other material examined

MADAGASCAR – **Anosy [Toliara Prov.]** • Fort Dauphin; [25°2′ S, 46°59′ E]; 1 May 1932; fr; *R. Decary 9798*; prairie à sol siliceux; P [P02071713]! • same data as for preceding; 27 May 1932; fl, fr; *R. Decary 9819*; dans la broussaille, sol sableux; P [P02071711]! • District de Fort Dauphin, Vinanibe; [25°3′ S, 46°56′ E]; 14 Aug. 1932; fl, fr; *R. Decary 10315*; forêt littorale sur sables; P [P02071710]! • same data as for preceding; [25°3′ S, 46°56′ E]; 19 Aug. 1932; fr; *R. Decary 10321*; fente des rocailles; P [P02071712]! • Massif de Kalambatritra, Mt Beanjavidy; [23°16′ S, 46°24′ E]; Nov. 1933; fl, fr; *H. Humbert 12066*; forêt; G!, K!, MO!, P [P02071674, P02071675]! • Andohahela, Parcelle n°1, cours moyen de la rivière Andranohela. Berges de la rivière Andranohela, en dessus du camp n°1, base de la cascade, versant rive gauche; 24°37′26.3″ S, 46°45′56.3″ E; 450 m; 27 Oct. 2022; fl, fr; *L. Gautier, A.J. Tahinarivony & L. Rapp 6682*; G!, MO!, P [P01101477]!, TAN n.v. • NW de Tolagnaro, RN 11, Andohahela, forêt proche rivière; [24°36′ S, 46°34′ E]; 14–19 May 1992; fr; *S. Malcomber, C. Hemingway & S. Compton 1520*; BR [BR0000021754975]!, G!, MO [MO-3020326] image!, P [P02071730]!, WAG [WAG.1151038] image! • NW de Tolagnaro, RN 11, Andohahela, à côté rivière; [24° 38′ S, 46°46′ E]; 500–1000 m; 6–13 Feb. 1993; fl, fr; *S. Malcomber, H. van der Werff, C. Hemingway, M. van Bergen, S. Rapanarivo, P.J. Rakotomalaza, O. Andrianantoanina & B. Randriamampionona 2190*; G n.v., K n.v., MO n.v., NY n.v., P [P02071377]!, TAN n.v, WAG n.v. • Fort Dauphin, Ifarantsa, Ivorona, forêt de Mamoareny; 24°49′ S, 46°56′ E; 706 m; 29 Nov. 2009; fl bud; *R. Razakamalala 4978*; MO!, P n.v., TAN n.v. – **Atsimo-Atsinanana [Fianarantsoa Prov.]** • Fianarantsoa. Fivondronana: Farafangana, Firaisam-pokontany: Agnalazaha Reserve (= Mahabo Mananivo); 23°10′13″ S, 47°43′27″ E; 22 m; 26 Aug. 2003; fl bud, fr; *D. Rabehevitra, R. Razakamalala, Dely Iaban'i 487*; MO [MO-3011131]!, P [P02071380]!.

Description

Plant herbaceous, 19–38 cm in height, frequently exhibiting a *rhizome* (19 × 2 mm), and a hair-like root network, sometimes forming clumps with numerous stems; main *root* axes thick, 0.5–1.9 mm in diameter, occasionally slightly flattened, bearing fine fibrous roots with a diam. of 0.1–0.4 mm, without any evidence of tubers; *leaves* 5–16, linear to lanceolate, (5–)8–15(–21) × 0.3–1.2 cm, leaf blade narrowly lanceolate, tapering at both ends, base gradually narrowing into a pseudo-petiole of 2.5–7(–9) cm, approximately 1/3 to 1/2 of the total length of the leaf blade, leaf-base sheathing, margin smooth, except for *Humbert 12066* which is scabrous, apex tapered, main veins 5–12, conspicuous, well-spaced, with a network of visible transverse secondary veins on the abaxial surface; *inflorescences* 2–7 per plant depending on the robustness of the individual, erect, simple or branched, (13–)25–32(–50) cm long; peduncle (4–)6–20 cm long, smooth, sometimes with a single linear, leafy-bract, attached to the peduncle at ca 2/3 from the base, (4–)5–20(–38) × (0.2–)0.8–2(–4) mm, and tapering toward the apex, the bract margins smooth, and with ca 5 veins, *rachis* (6–)9–23(–32) cm long; *flowers* 2–4(–6) per node, floral bract 4.5 × 1 mm, triangular, tapering towards the apex, shorter than pedicel, 3-veined, the veins more or less visible, pedicel 4–8 mm long, articulation supra-medial, submedial or in the case of *Decary 9798*, with infra-medial articulation; *perianth* white or pale green, 3–5 mm long; *tepals* linear to elliptical, obovate, 3–5 × 0.5–1.5 mm; veins 3, central, brown; *stamens* equal to, or slightly shorter than the tepals, filaments fusiform and flattened, 1–3 mm long, sparsely papillose, anthers triangular, sometimes curved at anthesis, 1 × 0.2–0.4 mm, divergent at the base, dorsifixed, filament attached at the lower 1/4; *gynoecium*: ovary 0.9–1 × 0.9–1.2 mm; ovules 2 or occasionally 4 (seen only in *Malcomber et al. 2190*) per locule, style filiform, 2 mm long, with a thickened stigmatic apex; *capsule* broader than long, 2–4 × 3.5–6 mm, with a thin wall and reduced ornamentation consisting of a few transverse veins, *seeds* 2 per locule, black, orbicular, 2 mm in diam., shiny, and granular, the convex side with a depression and a narrow notch where the radicle is visible, but barely protruding.

Phenology

At low-altitudes, flowering and fruiting of this species occurs throughout the year, while it is only known to occur in November and December for populations found above 1000 m.

Distribution and ecology

Most specimens have been collected in the southeast of Madagascar on siliceous soils, near Tolagnaro, from sea level to 1000 m in altitude, but there are scattered records from further north-south of Fianarantsoa from elevations over 1000 m. This species appears to be associated with a relatively high humidity, as it is found along riverbanks, near the coast, or in the coolness of forest undergrowth.

Provisional IUCN Red List assessment

Chlorophytum decaryanum is known from 11 collections, representing 4 occurrences that correspond to 4 locations. The majority (5) of the collections were made in the vicinity of the town of Tolagnaro (formerly Fort Dauphin) in 1932 by Raymond Decary, and the species is not known to have been recorded there since, and it is likely that the species has been extirpated from this locality where very little natural vegetation remains. The following year it was collected further to the north in the Massif de Kalambatritra, now a site with Special Reserve status, it is not known to have been recollected there but it is likely to still occur. More recently (1992–1993) the species was collected on two occasions in forest within the Andohahela National Park, and in 2003 it was collected in the Agnalazaha Reserve on the east coast just over 200 km to the north of Tolagnaro. Excluding the old records from Tolagnaro and Kalambatritra, but including the records from sites where the species is likely still to occur, *C. decaryanum* has an estimated EOO of 10 000 km^2 and an AOO of 12 km^2. However, it is clearly not a common species, and it is difficult to assign a status other than Data Deficient (DD).

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. VIII 6–7.

Fig. 20. Distribution of *Chlorophytum decaryanum* H.Perrier, with inset enlarged map of the cluster of known localities between Ambinanibe, the airport and Tôlanaro town.

Nomenclatural and morphological remarks

1) The type specimen, *Decary 9974*, P01046131 was chosen as the lectotype because it bears an original Decary label, unlike the other duplicates.

2) *Humbert 12066* has a root system composed of a mixture of fine fibrous roots and thickened branching, fibrous roots, that are not tuberous, a character that it shares with *C. decaryanum*, as well as a similar growth habit, and similar capsules and seeds. However, it can be distinguished by its leaves with their scabrous margins, pale green flowers, broader tepals, and a longer style that extends beyond the perianth.

10. ***Chlorophytum decipiens*** Baker
Figs 3E–F, 6C, 7A, 21

Chlorophytum decipiens Baker (Baker 1883–1884: 275).

Etymology

The epithet '*decipiens*' (meaning: 'deceiving'), refers to this species being the first known member of what Baker referred to as the "*Anthericum*-like section of the genus" *Chlorophytum* to have been described from Madagascar. Previously only *Chlorophytum madagascariense* Baker (1878), had been described from Madagascar, which he evidently considered to be a more typical member of the genus.

Type material

MADAGASCAR • Central Madagascar; Oct. 1882; fl, fr; *R. Baron 2070*; lectotype: K [K000432399] image!, **here designated**; isolectotypes: BM [BM01839963] image!, K [K000432398] image!, P [P01046113, P01046112]!.

Other material examined

MADAGASCAR • Central Madagascar; s.d.; fr; *R. Baron 5231*; K n.v., P [P02071685]! • same data as for lectotype; Jun. 1889; fl; *R. Baron 5291*; K n.v., P [P02071683]!. – **Analamanga [Antananarivo Prov.]** • Angavo près d'Ankazobe; [18°12′ S, 47°05′ E]; 8 Mar. 1930; fr; *R. Decary 7290*; P [P02071679]! • Tampoketsa N d'Ankazobe; [18°18′ S, 47°6′ E]; 11 Mar. 1930; fl; *R. Decary 7371*; P [P02071684]! • Tananarive dans les jardins; [18°54′ S, 47°30′ E]; 7 Feb. 1939; fl, fr; *R. Decary 13867*; P [P06169861]! • Tampoketsa d'Ankazobe, Manerinerina; [18°0′ S, 47°9′ E]; 2 Jan. 1942; fl, fr; *R. Decary 17168*; P [P06169863]! • Antananarivo: Tampoketsa d'Ankozobe, forested region along RN4, near the village of Manankazo, and the river of the same name. Embankment on road, 50 m S of bridge at R. Manankazo; 18°9′39″ S, 47°12′21″ E; 1590 m; 29 Dec. 1998; *T.C. Flores & J. Andriantiana 91*; MO image! • Tampoketsa Ankazobe; [17°58′ S, 47°12′ E]; 1955; *A. Gillard s.n.*; TAN! • Antananarivo, Analamanga, PK 67, RN 4, 27 km au sud d'Ankazobe; 18°30′44″ S, 47°11′04″ E; 16 Nov. 2003; fl, fr; *P. Lowry, P.B. Phillipson, G.E. Schatz, C. Hong Wa & H.H. Schmidt 6256*; G n.v., K n.v., MO!, NY n.v., P [P06169840]!, TAN! • Entre Arivonimamo et Soamananety; 26 Dec. 1959; fl, fr; *M. Peltier & J. Peltier 1663*; P [P02071682]! • Entre Mahabo et Andranavelona. N. Antananarivo; [18°39′ S, 47°16′ E]; 1 Dec. 1963; fl; *M. Peltier & J. Peltier 4410*; P [P06169830]! • Antananarivo: Analamanga region. Dct Ankazobe, CR Fihaonana, Fkt Andranovelona, Inselberg de Lohavohitra, PK 45 de la RN 4 allant d'Antananarivo - Mahajanga, sur le côté droit; 18°38′18″ S, 47°16′45″ E; 1417 m; 11 Mar. 2011; fl, fr; *M. Rabarimanarivo, S. Porembski, J. Andriantiana & S. Andriantiana 341*; G!, MO [MO-3020316] image!, P [P06836539]! • Ankazobe, Fkt Bevomanga, PK 67 le long de la RN 4 allant d'Antananarivo - Mahajanga, ca 22 km N d'Andranovelona, sur le côté gauche. Inselberg dégradé; [18°30′47″ S, 47°11′07″ E]; 14 Sep. 2021; *M. Rabarimanarivo, S. Porembski & N. Ravololomanana 449*; MO!, P n.v., TAN n.v. • Ankazobe, PK 45 RN 4 Tana-Mahajanga, Fihaonana; 18°37′47″ S, 47°17′24″ E; 9 Mar. 2010; fr; *F. Rajaonary 9*; MO [MO-3020310]!, P [P06836544]! • Analamanga, Ankazobe, NO Ambohitantely Special Reserve; 18°9′12″ S, 47°16′56″ E;

14 Feb. 2018; fl; fr; *U. Swenson V. Razafindrahaja, A. Atalahy & S. Razafimandimbison 1941*; MEL n.v., MO [MO-2682025] image!, P [P01182487]!, S n.v., TAN n.v. – **Itasy [Antananarivo Prov.]** • Antongona, environs de Tananarive; [18°56′ S, 47°16′ E]; Jan. 1956; fl, fr; *J. Bosser 8944*; MO [MO-3020328] image!, TAN! • Tananarive, PK 26, route d'Arivonimama; [18°58′55″ S, 47°18′59″ E]; Dec. 1955; st.; *J. Bosser 8907*; MO [MO-3020328] image!, TAN! (2 parts) • Itasy, PK 78, route Miarinarivo; [18° 57′ S, 46° 54′ E]; May 1962; fl, fr; *J. Bosser 16006*; P [P06169852]!, TAN! • Km 60, route de Miarinarivo, ouest de Tananarive; [18°59′48″ S, 47°02′28″ E]; Jan. 1958; fl, fr; *B. Descoings 2908*; MO [MO-3020330] image!, TAN! • Mont Antongona, au NO d'Imerintsiatosika; [18°56′ S, 47°17′ E]; Jan. 1958; fl, fr; *B. Descoings 2996*; TAN! (2 parts) • Antongona, 40 km ouest de Tananarive; [18°56′ S, 47°17′ E]; 16 Jan. 1960; fl; *J. Léandri 2583*; P [P06169832]! • Sabotsy, massif de l'Antongona; [18°56′ S, 47°18′ E]; 4 Dec. 1959; fl; *M. Peltier & J. Peltier 1551*; P [P02179669, P02179670]!, TAN! • Antongona; [18°56′ S, 47°17′ E]; 16 Jan. 1960; fr; *M. Peltier & J. Peltier 1760*; P [P02071681]! • Tampoketsa entre Ikopa et Betsiboka; [19°9′ S, 47°5′ E]; Dec. 1924; fl; *H. Perrier de la Bâthie 16755*; P [P02071680]! • Antananarivo: Itasy Region. Arivonimano, Soamahamanina, Inselberg Maroampona, sur la RN1, du côté gauche de la route. Antananarivoa-Miarinarivo. Inselberg perturbé (une ancienne carrière); 19°00′24″ S, 46°59′08″ E; 23 Mar.

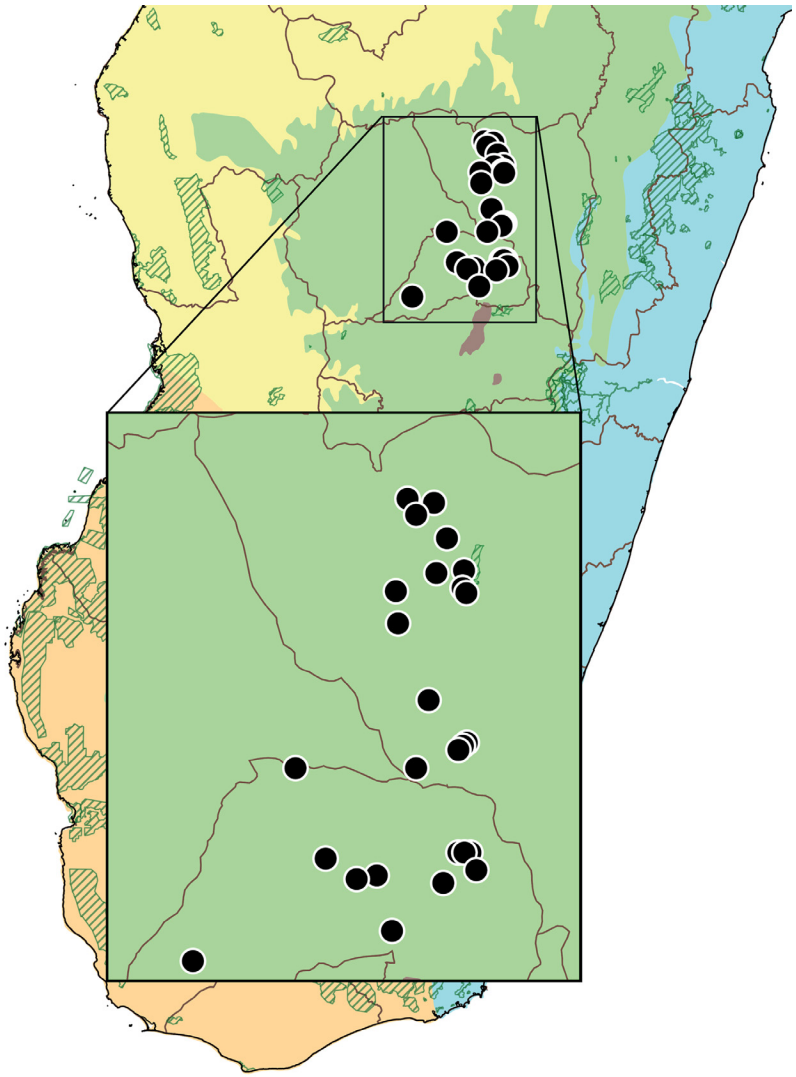


Fig. 21. Distribution of *Chlorophytum decipiens* Baker, including a single locality within the Ambohitantely Special Reserve, in the NE of the species' range.

2015; fl, fr; *M. Rabarimanarivo, S. Porembski, L. R. Andriamiarisoa 466*; MO!, P [P00910357]!, TAN n.v. • Arivonimamo, Andranomena, Inselberg à 36 km d'Antananarivo; 19°01′3″ S, 47°13′30″ E; 1497 m; 12 Mar. 2011; fl; *A. Ramahefaharivelo, S. Porembski, F.A. Rajaonary, J. Andriantiana 390*; MO [MO-3020342] image!, P [P06836545]! • Itasy, district du Kitsamby; [19°14′ S, 46°32′ E]; 1912; fl; *R. Viguier & H. Humbert 1622*; P [P06169834]!.

iNaturalist observations

MADAGASCAR – **Analamanga [Antananarivo Prov.]** • 18°03′52.6″ S 47°14′06.4″ E; 14 Jan. 2016; fl; *T. Randriamboavonjy* (*tiana123*); iNaturalist 2591145 • 18°12′07.8″ S, 47°16′41.5″ E; 3 Apr. 2022; fl; *D. Scherberich* (*dscherberich*); iNaturalist 120304349 • 18°12′07.6″ S, 47°16′41.8″ E; 3 Apr. 2022; fr; *A. Bour* (*botanarchiste*); iNaturalist 116276055 • 17°57′20.0″ S, 47°07′34.3″ E; 15 Feb. 2023; fl, fr; *D. Rabehevitra* (*davidrabehevitra*); iNaturalist 148823840 • 17°57′19.9″ S, 47°07′34.2″ E; 15 Feb. 2023; fl; *D. Rabehevitra* (*davidrabehevitra*); iNaturalist 148823821 • 18°12′58.2″ S, 47°17′19.1″ E; 11 Jan. 2024; fl; *Len deBeer* (*Elendebeer*); iNaturalist 196911818 • 18°12′08.0″ S, 47°16′42.1″ E; 11 Jan. 2024; fl, fr; *Len deBeer* (*Elendebeer*); iNaturalist 197395700.

Description

Plant herbaceous, 20–30 cm high, with a *rhizome*; *roots* fasciculate, strongly thickened, 1.5–2 mm, some clavate at the apex; *leaves* 5–9, linear, mostly folded, 12–39 × 0.4–1(–1.2) cm, with the outer leaves shorter than the inner ones, leaf-base attenuate, sheathing, margins smooth, or irregular and finely toothed towards the tip, (visible at ×25 magnification) in some collections (*Baron 2070*, *Decary 7290*, *Bosser 16006*, *Peltier & Peltier 1663*, *1551*, *1760* and *Rabarimanarivo et al. 466*), veins 13–20, visible on both surfaces, apex tapering; *inflorescence* large, 35–84 cm in height, robust, unbranched or slightly branched; peduncle smooth, 23–52 cm long, bracts 3–5, foliaceous, triangular, acute, 10–35 × 3–5 mm, sometimes scabrous near the tip, *rachis* 13–16 cm long; flowers numerous, paired or in groups of three per node, floral bracts, triangular, acuminate, 6 × 2 mm, much longer than the pedicel, with the tip and sometimes the margin scabrous, gradually transitioning upwards to deltoid-based bracts; pedicel short, ca 4 mm long, articulation infra- or supra-medial; *perianth* with obovate *tepals*, 8–10 × 2.5–4.0 mm, white with a brownish spot at their tips (visible when fresh), veins 3, closely-spaced, converging at the centre and forming a bundle at the apex; *stamens* almost equal in length to the perianth, filaments slender, narrowed at the apex, ca 5 mm long, anthers 3.5 × 1.0 mm, sub-basifixed; *gynoecium*: ovary 2.0 × 1.5 mm, ovules 8–12 per locule, style 8 mm long, stigma slightly thickened; *capsule* higher than wide, 9 × 8 mm, with shallow ornamentation; *seeds* black, orbicular, 3 mm in diam., surface nearly smooth, with a distinct notch, radicle prominent.

Phenology

The flowering season generally extends from December to March, and occasionally to April, with fruits present as early as February. One exceptional collection (*Lowry et al. 6256*) was both in flower and fruit during November.

Distribution and ecology

Chlorophytum decipiens is a species of the High Plateau (Hauts Plateaux), to the West and North of Antananarivo, in the region of Lake Itasy and on the Tampoketsa of Ankazobe, respectively. It has been collected frequently on granite inselbergs, migmatites and other igneous rocks at altitudes ranging from 1300 to 1600 m.

It forms clumps in diverse open environments, including rocky areas, dry meadows and wetlands.

Provisional IUCN Red List assessment

Chlorophytum decipiens is endemic to Madagascar, where it occurs only on the central highlands to the west and northwest of Madagascar's capital city, Antananarivo, where natural habitats are highly threatened throughout the area. The species is known from at least 27 collections of which 24 have geo-coordinates or which could be reliably assigned coordinates post facto, and these span the regions of Analamanga and Itasy. However, only six of these documented occurences have been made in the past 25 years, mostly from isolated inselbergs or rocky outcrops; older collections were also recorded from forest patches but now very little natural forest remains, and only two collections have been gathered from within a protected area (the Réserve Spéciale d'Ambohitantely). The species occurs primarily in a zone that is subject to increasing human pressure, due to a growing human population and urbanisation in the vicinity of the capital, as well as the intensification of agriculture in the region. The paucity of recent records suggests that the species may have been extirpated from many of its former sites of occurrence, and it appears to have become relatively rare. Given the high level of threat and the limited up-to date information on the species, we assess the species as DD. In order to provide a useful conservation assessment, field work needs to be undertaken to gather up-to-date information to assess the status of *C. decipiens*, and to determine the level of threat to the species.

Nomenclatural and morphological remarks

1) The sheet chosen as the lectotype contains a determination in Baker's handwriting.

2) The specimens collected in the Antongona massif exhibit variability between the flowers within the same inflorescence. Specifically, minor differences in the size of the stamens were observed, with some flowers having three long and three short filaments while others have four long and two short filaments; and the anthers can be equal in length or longer than the filaments.

11. ***Chlorophytum dianellifolium*** (Baker) H.Perrier
Figs 3N–O, 6G, 7D, 22

Chlorophytum dianellifolium (Baker) H.Perrier (as *dianellaefolium*) (Perrier de la Bâthie 1935: 54–55) – *Anthericum dianellifolium* Baker (Baker 1887: 149).

Chlorophytum dianellifolium var. *transiens* H.Perrier syn. nov. (Perrier de la Bâthie 1935: 55–56). – **Type:** MADAGASCAR – **Haute Matsiatra [Fianarantsoa Prov.] •** Environs d'Ambalavao; [21°49′ S, 46°55′ E]; Mar. 1912; fl; lectotype: *H. Perrier de la Bâthie 10942*; rocailles dénudées (gneiss); P [P01046110]!, **here designated**. – **Paralectotypes:** MADAGASCAR • Central Madagascar; fl; *R. Baron 4121*, K [K000432396] image!. – **Vakinankaratra [Antananarivo Prov.] •** Ambatomena Lona; [19°51′ S, 47°15′ E]; 1876; fl; *A. Grandidier s.n.*; P [P01046111]!. – **Amoron'i mania [Fianarantsoa Prov.] •** Sur des cipolins, aux environs d'Ambatofinandrano; [20°33′ S, 46°48′ E]; ca 1000 m; fl, fr; *H. Perrier de la Bâthie 12443*; P [P01046109]!.

Etymology

The specific epithet refers to the shape of the leaves of this species that resemble those of species of the genus *Dianella* Lam. ex Juss., a member of the Asphodelaceae Juss., that occurs in Madagascar, East Africa, Australasia and Southeast Asia.

Type material

Type

MADAGASCAR • Central Madagascar; s.d.; fl; *R. Baron 659*; lectotype: K [K000432395] image!, **here designated**; isolectotype: P [P01046116]!.

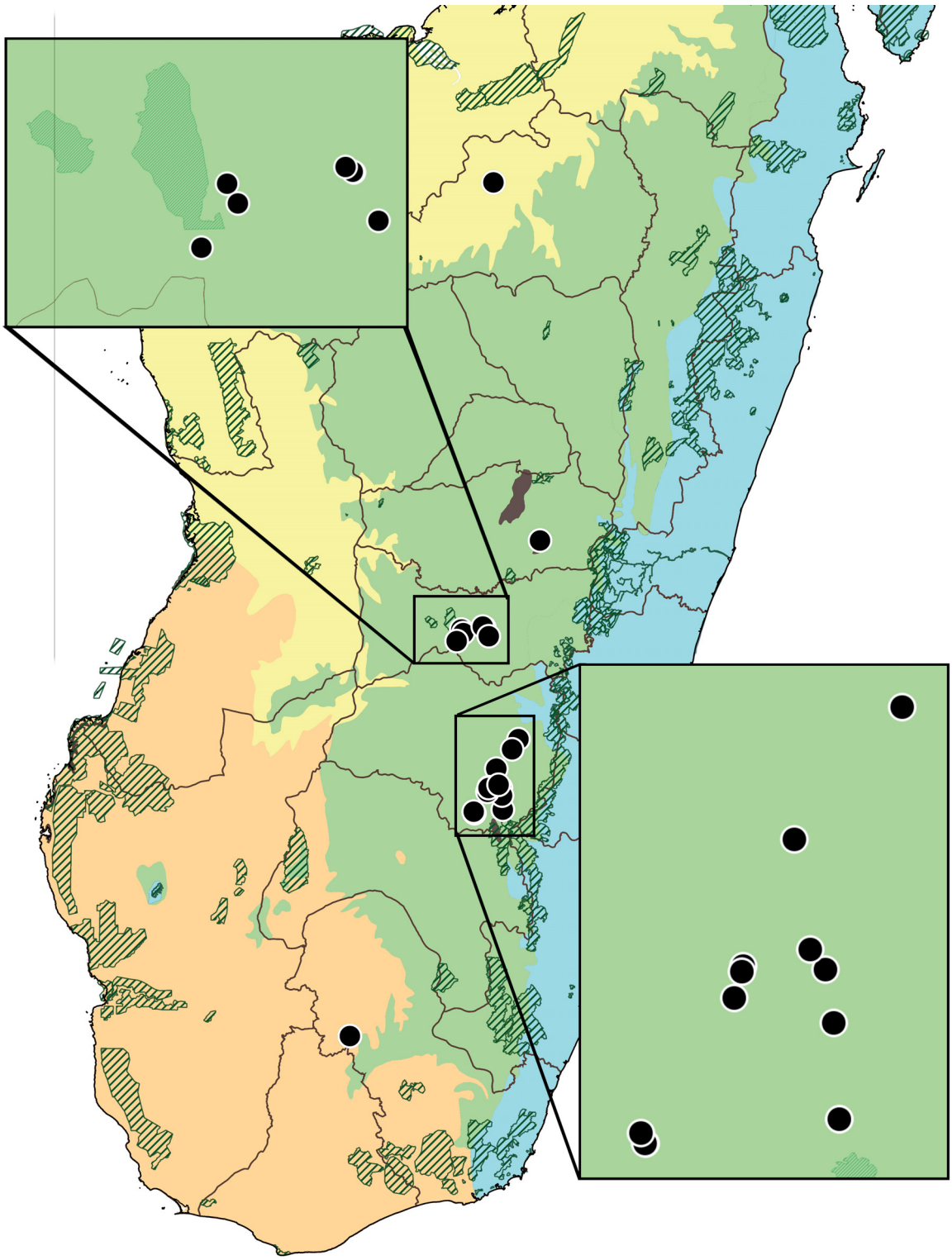


Fig. 22. Distribution of *Chlorophytum dianellifolium* (Baker) H.Perrier (black dots), with enlargement for two locality clusters: 1. the upper enlarged area – to the east and south of the Itremo Massif protected area; 2. the lower enlarged area – to the north of Andringitra National Park. Note the other scattered localities to the N and the S.

Paralectotype

MADAGASCAR • Central Madagascar; s.d.; fl; *R. Baron 4121*; K [K000432396] image!.

Other material examined

MADAGASCAR – **Amoron'i mania [Fianarantsoa Prov.]** • Itremo, Col de l'Itremo, bare hillside covered with pebbles and larger rocks; [20°34′ S, 46°37′ E]; 1500–1685 m; 5 Nov. 2011; fl, fr; *T. Croat 29863*; MO [MO-3020270] image!, TAN! • Environs d'Ambatofinandrahana (Betsileo); [20°33′ S, 46°48′ E]; 16 Jan. 1955; fl, fr; *H. Humbert & R. Capuron 28079 ter p.p.*; P [P06169848, P06169857]! • A l'ouest d'Itremo (ouest Betsileo); [20°36′ S, 46°38′ E]; 17 Jan. 1955–22 Apr. 1955; fl; *H. Humbert 28180*; P [P06169897]! • Ambatofinandrahana; [20°33′ S, 46°48′ E]; Mar. 1960; fr; *M. Keraudren 197*; P [P06169871]! • same data as for preceding; fl; *M. Keraudren 217*; P [P06169894]! • Fianarantsoa, Ambatofinandrahana. Itremo. Ankevo. Savannah on rockery; [20°39′36″ S, 46°34′46″ E]; 12 Mar. 2012; fr; *F. Rakotonasolo, M. Vorotsova & G. Ratovonirina RNF 1906*; K n.v., P [P01018907]!, TAN n.v. – **Androy [Toliara Prov.]** • Environs d'Isoanala; [23°50′ S, 45°43′ E]; Jun. 1963; fl; *J. Bosser 17384*; K!, P [P06169914]!, WAG!. – **Betsiboka [Mahajanga Prov.]** • N-O Ankazobe, vallée de l'Ikopa; [16°58′ S, 46°43′ E]; 15 Mar. 1930; fl; *R. Decary 7571*; P [P02071678]!, TAN! (2 parts). – **Haute Matsiatra [Fianarantsoa Prov.]** • Andriainjato, Andranovorivato, Km 10 N d'Ambalavao; [21°41′14″ S, 46°53′54″ E]; 1298 m; 14 Mar. 2010; fl, fr; *C. Frasier, A. Ramahefaharivelo, B. Ramandimbisoa, H. Razafindraibe & S. Porembski 110*; G!, MO [MO-3020316] image!, P [P06836541]!, TAN n.v. • Sandrisoa. Ambalavao; [22°01′ S, 46°57′ E]; 25 Feb. 1961; fl; *J. Peltier & M. Peltier 3098*; K!, P [P06169860]! • Ambalavao, Sandrisoa; [22°01′ S, 46°57′ E]; ca 1100 m; 12 Feb. 1953; fl; *J. Rakodo RN 5547 (Rakodo)*; P [P06169829]! • Haute Matsiatra, Iarintsena, Tananomby, inselberg Ambalalova; [21°50′ S, 46°50′ E]; 1127 m; 15 Mar. 2010; fl; *N. Rakotoarivelo, M. Rabarimanarivo, F.A. Rajaonary, N. Ravalimanarivo, J. Andriantiana & A. Raonizafitionimalaza 234*; MO [MO-3020315] image!, P [P06836540]!, TAN n.v. • Ambalavao, Vohitsoaka; [22°03′ S, 46°43′ E]; ca 1100 m; 21 Feb. 1962; fl; *Rakotoson RN 11997*; P [P06169896]! • Ambalavao, Sandrisoa; [21°54′ S, 46°57′ E]; ca 1100 m; 6 Feb. 1955; fl; *RN 7309 (Rakotovao)*; P [P06169892, P06169828]! • Ambalavao, Iarintsena, Anja, Mahavelo, Inselberg Tangorika; [21°52′ S, 46°49′ E]; 1056 m; 17 Mar. 2010; fl, fr; *A. Ramahefaharivelo, M. Rabarimanarivo, F.A. Rajaonary, N. Rakotoarivelo, B. Ramandimbisoa, H. Razafindraibe, N. Ravalimanarivo, L. Ratsimabazafy 53*; Tapis de monocotylédones et prairie marécageuse; MO [MO-3020314] image!, P [P06836725]!, TAN n.v. • Haute Matsiatra, Langela, Andromivato, Soaindrana, PK 420; [21°31′53″ S, 47°01′32″ E]; 1216 m; 14 Mar. 2010; fl, fr; *B. Ramandimbisoa, A. Ramahefaharivelo, C.L. Frasier, F.A. Rajaonary, M. Rabarimanarivo, H. Razafindraibe, J. Andriatiana, N. Rakotoarivelo, J. Rakotomalala, J.C. Riandrianantenaina 13*; MO [MO-3020317] image!, P [P06234101]!, TAN n.v., TEF n.v. • Ambalavao, Iarintsena, Anja; [21°50′35S, 46°50′10″ E]; 1105 m; 16 Mar. 2010; fl; *H. Razafindraibe, C.L. Frasier, S. Porembski, A. Ramahefaharivelo, B. Ramandimbisoa 257*; MO [MO-3020318] image!, P [P06836542]!, TAN! • Ambalavao, Vohitsoaka; [22°03′ S, 46°43′ E]; ca 1100 m; 19 Mar. 1949; fl; *RN 1832 (A. Razafindrakoto)*; P [P06169853, P06169854]! • Ambalavao, Ivohitsoaka; [22°02′ S, 46°43′ E]; ca 1100 m; 22 Mar. 1960; fl, fr; *s.coll. RN 11193*; P [P06169843]!. – **Ihorombe [Fianarantsoa Prov.]** • Entre Ambohimana-Androtra et Tsiazomborona (Prov. d'Ivohibe); [22°31′30″ S, 46°59′00″ E]; 9 Apr. 1970; fl; *P. Boiteau 2063*; P [P02071677]!.

iNaturalist observation

MADAGASCAR – **Amoron'i mania [Fianarantsoa Prov.]** • 20°37′14.6″ S, 46°50′16.2″ E; 5 Dec. 2021; fl; *Landy Rita Rajaovelona (landyrita1)*; iNaturalist 103085397.

Description

Plant herbaceous, 20–60 cm tall; *rhizomatous*; *roots* fasciculate, 2–2.5(–3.5) mm in diam., bearing a few oblong tubers of 20–30 × 6 mm; *leaves* 5–10, linear, varying in length from (8–)17 to 60 cm, sheathing

at the base, narrow, 0.3–0.7 cm wide, sheath variable in length, often yellowish, the zone of transition from the sheath to the blade not constricted, but with 2 lateral undulations along the margin, the blade margin scabrous, veins 12–23, visible, apex tapered; *inflorescence* 22–65 cm long, unbranched or with a single short branch at the base of the rachis, peduncle 19–61 cm long, with a single bract, 1.8–10.5 × 0.2–0.4 cm, located very high up, margin and surface of the bract mostly smooth, rarely scabrous, *rachis* 4–12(–17) cm in length; *flowers* solitary or in groups of 2–3 at each node, floral bracts slightly scabrous or smooth, 10–20 × 4 mm, longer than the pedicel, pedicel 5–7 mm long, with a submedial articulation; *perianth* 12–18 mm long, white; outer tepals oblong and obtuse, 3.5 mm wide with (5–)6–7 veins, with a brown spot in vivo; inner, 5 mm wide, 5-veined; *stamens* with the filaments 3.5–6.5 mm long, flattened at the base for half of their height and then sharply narrowed, anthers 5–7 × 1.5 mm, sub-basifixed, the connective usually with a short triangular heel (lacking in *Baron 639* [659]); *gynoecium*: ovary 2 × 1.2 mm, ovules ca 12–16 per locule, *style* slender, 10–16 mm long, stigma thickened; *capsule*, taller than wide, 10–13 × 8–9 mm, with parallel thickened veins; *seeds* disciform, 3 mm in diam., shiny, very finely granulate; with a broad notch, the radicle thick and barely protruding.

Phenology

Flowering has mostly been recorded from January to March, and fruiting typically begins in February, but with some individuals fruiting in January, suggesting earlier flowering may occur, likely in December.

Distribution and ecology

This species is found on the high central plateau area of Madagascar at altitudes above 1000 m, mainly in the vicinity of Ambatofinandrahana and Ambalavao, but with one collection further to the north in the Ikopa valley, and another one to the south near Isoanala. It occurs on granite or metamorphic substrates, on rocky outcrops or in rocky grasslands.

Provisional IUCN Red List assessment

Chlorophytum dianellifolium is endemic to Madagascar, where it is known from a total of 24 collections representing 17 occurences, and a single iNaturalist observation. It has a disjunct distribution, with most records from the central highlands at elevations of at least 1000 m a.s.l., but with an outlying record from the Betsiboka Region to the NW (at ca 1000 m a.s.l.) and another from the Anosy Region in the S (at ca 700 m a.s.l.). The species has another nine known subpopulations in the central highlands of Madagascar, where it ranges from near Ambalavao in the S to Antsirabe to the N, all of which occur at elevations of over 1000 m a.s.l. However, none of the known subpopulations occur within a formal protected area (although one is adjacent to the Itremo Massif Protected Landscape, and the species is likely to occur within that site). The species has an EOO of over 45 000 km^2 but an AOO of just 72 km^2. It is therefore assessed as Near Threatened (NT), as it meets the necessary values for a threatened category for the EOO, but it meets only one sub-criterion of B2 (b,iii).

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. IX 1–3.

Nomenclatural and morphological remarks

1) The label on a specimen at P [P01046116] bears the number 639, and was cited in Perrier's revision. However, this number is not in Perrier de la Bâthie's handwriting, and it is evidently a transcription error for *Baron 659*. Furthermore, no specimen labelled "*Baron 639*" has been found at K among the specimens of *Chlorophytum*, nor was it mentioned in the original protologue.

2) In his revision, H. Perrier de la Bâthie cited material of *Baron 659* as the type of *A. dianellifolium*, but without formally designating a specimen. We here designate the specimen at K, with the barcode

K000432395 as the lectotype of this species, since it is more complete than the duplicate specimen at Kew (barcode K000432396). Similarly, we have chosen P01046110 as the lectotype of *C. dianellifolium* var. *transiens*, which is more complete than other syntypes of this collection deposited at K and P.

3) Leaf variability: The margins are more or less scabrous, ranging from a very slight roughness, for example *Grandidier s.n.*, *Decary 7571*, to clearly marked teeth, as for *Boiteau 2063*, *Perrier de la Bâthie 10942*, *Ramahefaharivelo et al. 53*, *RN 11193*. Some specimens are scabrous across the entire lower leaf surface, resulting in a more or less pronounced rough appearance (*Perrier de la Bâthie 10942*, *Ramahefaharivelo 53*, *RN 11193*, *RN 7309*, *RN 11997*, *Frasier et al. 110*, *Ramandimbisoa et al. 13*, *Keraudren 217*, *Peltier & Peltier 3098*). The basal portion of the leaf often has a yellowish straw-coloured sheath that forms an angle with the lamina.

4) The peduncle sometimes has short transparent scabrae stuctures below the flowering portion of the rachis, as seen in two specimens at P, *Frasier 110* and *Ramandimbisoa 13*, collected between Fianarantsoa and Ambalavao, a characteristic not shared with other collections further south or north.

5) The tepal veins, which are not very visible in vivo, become more apparent when the flower is dried. Although the perianth segments sometimes have 6–7 veins instead of 5, there is a unity in the structure: the tepals are relatively wide with 5 or more veins, the stamens are equal to the perianth in length, with flattened filaments at their base, as long as the anthers, and a short extension of the connective.

6) We include two collections from outside the main distribution range of this taxon: *Decary 7571* from the north of the country and *Bosser 17384* from the southeast. The latter does show some minor morphological differences (pedicel inframedial articulation, longer style, heel of anther connective reduced to a simple rim).

7) In the P herbarium, the collection number *H. Humbert & R. Capuron 28079* was assigned to three collections from the same locality: the first two appear in the collection notebooks of Henri Humbert: one of these is the type of *Pimpinella betsileensis* Sales & Hedge, the second, bearing the number *28079 bis*, is a collection of *C. tripedale*. The third collection based on this number, was identified by Humbert as *Chlorophytum* sp. (P06169857 and P06169848), the latter of which is heterogeneous, consisting of a part of *C. tripedale 28079 bis* and *C. dianellifolium*. We renumber the latter collection as *28079 ter*. The sheet P06169848 includes two *C. dianellifolium* plants located on either side, one bearing fruit, the other with an inflorescence in buds, with a fragment of an inflorescence of *C. tripedale 28079 bis* mounted in between. An attached envelope contains a mixture of fruits and flowers.

12. ***Chlorophytum distichum*** H.Perrier

Figs 4H, 23

Chlorophytum distichum H.Perrier (Perrier de la Bâthie 1935: 49–50).

Etymology

The specific epithet refers to the distichous arrangement of the leaves.

Type material

MADAGASCAR – **Amoron'i Mania Region [Fianarantsoa Prov.]** • Est: forêt orientale, dans le bassin du Matitanana; [22°15′22″ S, 47°29′35″ E]; ca 100 m; Oct. 1911; fl; *H. Perrier de la Bâthie 10979*; holotype: P [P01142919]!.

Description

Plant herbaceous, 30–50 cm tall, tuft-forming; *rhizome* lateral; *roots* all thickened and hairy, 1–1.5 mm in diam., a few roots solely fibrous; *leaves* ca 10, arranged in a fan, rigid (fide Perrier de la Bâthie), grass-like, lanceolate, with the leaf-base attenuate, forming a pseudo-petiole 6–9 cm long, with an enlarged sheathing portion at the base, and a central pseudo-vein; veins 11–13, visible on both sides, apex narrowly tapered; *inflorescence* solitary, 33.0–42.5 cm in height, upright and weakly branched, branches flexible; peduncle 18–20 cm long; bracts 1–2, triangular, 2–3 × 0.1–0.2 cm, apex long and finely pointed, 5-veined; the lower bract often very large and leaf-like, up to 9 cm in length, the upper bract situated at the level of the lowest ramification; *rachis* 12–23 cm long; *flowers* (2–)3(–4) per node; floral bract axillary, triangular, apex tapered, 6 × 2 mm, 3-veined, longer or equal to the pedicel; pedicel 5.5–7 mm, articulation below the middle, 2 mm from the base; *perianth* 6.5–7.0 mm long, *tepals* white, narrowly elliptical and with green veins (fide Perrier de la Bâthie), outers 7 × 0.8 mm, inners 7 × 1 mm, veins, 3, visible; *stamens* roughly equal, slightly shorter than the perianth, filaments 4 mm long, fusiform, papillose, and swollen in their upper half, anthers yellow, rectangular, 1.2–1.5 × 0.2 mm, dorsifixed, filament attached close to the anther base; *gynoecium*: ovary 1.4–0.8 mm in diam., ovules, 4–5 per locule, style 7.2 mm long, extending beyond the perianth, stigma slightly thickened; *young capsule* higher than wide, 5 × 4 mm, 3-lobed, *immature seeds* 4–5, subglobose, 1.8 × 1.4 mm, notch wide and radicle forming a distinct protrusion within this notch.

Phenology

The only known collection was in bloom in October and bears young fruits.

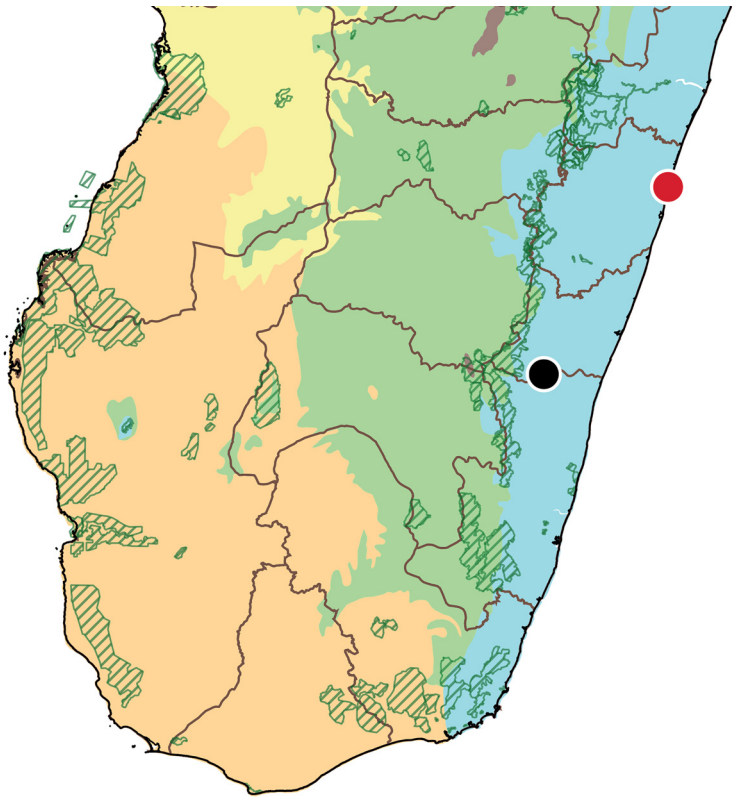


Fig. 23. Type localities of *Chlorophytum distichum* H.Perrier (black dot) and *C. geayanum* (H.Perrier) Marais & Reilly (red dot), neither known from within currently protected areas.

Distribution and ecology

Chlorophytum distichum occurs south of Manakara, in the Matitana basin, in humid forest on gneiss at ca 100 m altitude. The locality indicated by Perrier de la Bâthie is a source of confusion because the Matitana River is indicated on old maps (e.g., Barrère 1930), whereas on modern maps, it is considered a branch of the Sandrananta River. However, the altitude mentioned on the label (100 m) enables at least an approximate geo-location to be determined for this locality.

Provisional IUCN Red List assessment

Chlorophytum distichum is endemic to Madagascar, and is only known from a single gathering made over a hundred years ago in the Matitanana river basin (see explanation above for more information on this locality). It is assessed as DD (Data Deficient) since no additional information is available, and no recent search for the species has been undertaken, but the species may be extinct. Despite general collecting that has been conducted in the area, which contains a significant area of intact vegetation, the species is not known to have been re-collected.

Illustrations

Perrier de la Bâthie 1937 [1938]: fig.VIII 5.

13. ***Chlorophytum geayanum*** (H.Perrier) Marais & Reilly
Figs 5D, 23

Chlorophytum geayanum (H.Perrier) Marais & Reilly (Marais & Reilly 1978: 660). – *Anthericum geayanum* H.Perrier (Perrier de la Bâthie 1935: 36–37).

Etymology

The species is dedicated to Martin François Geay (1859–1910) according to Poisson (1911) and Dorr (1997).

Type material

Type

MADAGASCAR – **Vatovavy [Fianarantsoa Prov.]** • Domaine oriental: Zone côtière, province de Mananjary; Mar.–Apr. 1909; fl, fr; *F. Geay 8111*; lectotype: P [P01046126]!, **here designated**.

Paralectotypes

MADAGASCAR – **Vatovavy [Fianarantsoa Prov.]** • Domaine oriental: Zone côtière, province de Mananjary; Mar.–Apr. 1909; fl; *F. Geay 8075*; P [P01046128]! • same data as for preceding; fl; *F. Geay 8110*; P [P01046124]! • same data as for preceding; fl; *F. Geay 8074*; P [P01046127, P01046125]!.

Other material examined

MADAGASCAR – **Vatovavy [Fianarantsoa Prov.]** • Nosy Varika, Ambahy; 20°45′44″ S, 48°29′7″ E; 23 Mar. 2003; fr; *R. Razakamalala, R. Rabevohitra, T. Rakotomamonjy & Gaspard 385*; forêt littorale de basse altitude; MO [MO-3020294] image!, TAN n.v. • Fianarantsoa, Fivondronana: Nosy Varika, Firaisana: Ambahy, forêt d'Ambahy; 20°47′49″ S, 48°28′58″ E; 10 m; 23 Apr. 2004; fr; *R. Razakamalala, R. Ranaivojaona & Z. Rogers 1178*; MO [MO-3020284]!, P [P06169910]!, TEF n.v.

Description

Plant herbaceous, 25–30 cm tall, with underground parts consisting of a *rhizome* and numerous fasciculate roots; *roots* fibrous, somewhat thickened, 0.8–1.0 mm in diam., with some portions tuberous, 1.8–2.0 mm

in diam., and with a few secondary roots, 0.2 mm in diam., crown surrounded by the remnants of the old leaves reduced to fibres; *leaves* ca 10, flexuous, filiform, and either tangled or coiled upon themselves, 10–27 × 0.1–0.2 cm, with a sheathing base but no pseudo-petiole, veins 10, prominent, visible on both surfaces, leaf blade apex shortly pointed and scabrous; *inflorescences* 1–3 per plant, branched, slender, flexible, spreading, 17–34(–45) cm in height, peduncle short, 2.5–4(–7.5) cm long, with two overlapping bracts located at the nodes, the larger 8–14(–23) × 1.5–2.0 mm, triangular, tapering and scabrous at the tip, 5–7 veined, the smaller ones with the same form, 2.5–4.5 × 1 mm, *rachis* very lax, 14–26(–33) cm long; *flowers* 3–4 per node, separated by 2.3–4.5 cm long internodes, floral bract 3–4 × 2 mm, papery, 3–5-veined, with a triangular, embracing base, and a terminal acumen 1.2–2 mm long, shorter than the pedicel, pedicel 4.5 mm with an inframedial articulation; *perianth* white, 3 mm long, *tepals* oblong, obtuse, 3 × 0.8 mm, the 3 central veins very close together; *stamens* shorter than the perianth, unequal, inserted at different heights, in a basal position for the antisepalous stamens, and higher for the antipetalous stamens, filaments flattened, 1.2 mm long for the former and 0.8 mm long for the latter, anthers short, triangular, 0.3 × 0.2 mm, dorsifixed, filament inserted at the lower 1/4; *gynoecium*: ovary globose, 0.8 mm diam., ovules, 2 per locule, style short, 1 mm long, stigma rounded; *capsule* broader than tall, 2 × 4 mm, the sutures with bordered edges, surface with curved wrinkles; *seeds* 1(–2) per locule, black, shiny, globose, the surface echinulate (visible under ×40 magnification), 1.5 × 1.5 × 1 mm, one side convex, the other with a deep depression, lacking a notch, the radicle not visible.

Phenology

Flowering period ends in March, when the last flowers can be seen, and fruiting takes place in March and April.

Distribution and ecology

The distribution range of *C. geayanum* is limited to a small coastal area in the southeast of Madagascar, in the Vatovavy Region, near Nosy Varika, where it occurs within littoral forest, on sands and alluvial soils.

A map of the two known localities of *C. geayanum* is provided in Fig. 23 together with that of *C. distichum*.

Provisional IUCN Red List assessment

Chlorophytum geayanum is endemic to Madagascar, where it is known from a series of collections made by M.F. Geay at a single locality in 1909. It appears to have been collected again only once, nearly a hundred years later by Richard Razakamalala, at Nosy Varika, close to Geay's original collections. This single known occurrence, and the single known location for the species is not within a protected area, and is highly vulnerable to disturbance, due to its proximity to the busy RN11 road that runs along the coast to the SE of the country, and the species is therefore assessed as CR B2ab(i;ii;iii;iv;v).

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. VI 8–10.

Nomenclatural remark

Among the syntypes cited by Perrier de la Bâthie (*Geay 8111*, *8110*, *8075*, *8074*), we have chosen the most abundant material as the lectotype: *Geay 8111* (P01046127).

14. ***Chlorophytum graniticum*** H.Perrier
Figs 2B–C, 4D, 24

Chlorophytum graniticum H.Perrier (Perrier de la Bâthie 1935: 46–47).

Etymology

The specific epithet refers to the granitic soils on which the two gatherings studied by Perrier de la Bâthie originated. The species occurs most frequently on calcareous substrates, but in the case of subspecies *ambrense* subsp. nov., it also occurs on volcanic soils.

Type material

Type

MADAGASCAR – **Betsiboka [Mahajanga Prov.] •** Domaine occidental: Firingalava, aux environs d'Andriba; [17°36′ S, 46°55′ E]; Jan. 1898; fl; fr; *H. Perrier de la Bâthie 460*; lectotype: P [P01046138]!, **here designated**; isolectotypes: P [P01046135, P01046136, P01046137, P01046139]!.

Paralectotype

MADAGASCAR – **Betsiboka [Mahajanga Prov.] •** Domaine occidental: bois rocailleux (gneiss), bords du Besafotra, affluent de droite du Menavava, dans le Boina; [17°09′ S, 47°40′ E]; Jan. 1900; fl, fr; *H. Perrier de la Bâthie 460bis*; P [P01046140]!.

Description

Plant herbaceous, 17 to 34 cm tall; *rhizome* seen only on a few plants (*Alleizette s.n.*, *Léandri 2974* and *Poisson s.n.*); *leaves* (4–)5–7(–8), lanceolate, attenuate at the base forming a pseudopetiole, the central pseudo-vein visible, with more than 17 clearly visible well-spaced veins, apex tapered; *inflorescence* solitary, erect, the axis covered with transparent, aligned rugosities with a triangular base, the density of which increases towards the apex; sometimes mixed with small, stocky hyaline hairs (*RN 4667*, *Léandri 2662*), peduncle (9–)11–18(–23) cm, *rachis* with 1–3(–4) flowers per node, floral bract triangular, long and very slender, reddish, 4–7(–9) × 1.5–2 mm, with 3 veins, longer or equal to the pedicel, pedicel (3–)4–5.5 mm long, with inframedial articulation about 1.5 mm from the base; *tepals* elliptic, equal or subequal, with 3 central veins, more-or-less visible, external tepals narrower than internal tepals; *stamens* subequal or in two groups (3 long and 3 short), the longest equaling the tepals, filament fusiform and thickened in its upper part, 2.5–3.5 mm long for the short stamens and 3–3.5(–4.2) mm for the long stamens, papillose, white (dried material), anthers green; *gynoecium*: ovary subglobose 0.7–1(–1.2) mm in diam., 1(–2) ovules per locule, style filiform, exceeding the tepals, stigma with thickened tip; *capsules* pendulous when ripe, distinctly wider than high, 2.5–4 × 4–6 mm, the apex short-beaked, frequently one or two aborted locules (in which case the fruit is not beaked), with 3–4 transverse ribs, 1(–2) *seeds* per locule, black, discoid, semicircular to circular, 1.2–3.0 × 2.1–4.0 mm, surface shiny, granular, of the same profile as the locule with a rounded outer surface and a straight inner surface, narrowly notched at one third of the length, radicle visible and not protruding.

Nomenclatural remark

We here lectotypify *Chlorophytum graniticum* on *Perrier de la Bâthie 460*, specifically the specimen P01046138, as it is the most complete of the specimens available, and the collection with the most duplicates available, which include specimens the isolectotypes: P01046135, P01046136, P01046137, P01046139.

Key to the subspecies

1. Leaf with a smooth margin; pseudo-petiole 1/3 to 1/2 the length of blade; blade with 17–18 veins . ..... ***C. graniticum* subsp. *ambrense*** Bard.-Vauc. & M.Pignal subsp. nov.
– Leaf with a partially scabrous margin; pseudo-petiole 1/4 to 1/5 the length of the blade; blade with 25–31 veins ..... ***C. graniticum* subsp. *graniticum***

14a. ***C. graniticum*** H.Perrier **subsp**. ***graniticum***
Figs 2B–C, 4D, 24

Material examined

MADAGASCAR – **Betsiboka [Mahajanga Prov.]** • Madagascar, environs d'Andriba; [17°35′ S, 46°56′ E]; Mar. 1906; fl, fr; *Alleizette s.n.*; CLF [CLF345106]! • Causses du Kelifely, forêt de Kasiji; [17°05′ S, 45°52′ E]; Nov. 1974; fl; *P. Morat 4686*; P [P02157222]! • Domaine occidental: Firingalava, aux environs d'Andriba; [17°36′ S, 46°55′ E]; Jan. 1898; fr; *H. Perrier de la Bâthie 460*; P [P01046135, P01046136, P01046137, P01046138, P01046139]! • Bord du Besafotra, affluent du Menavava; [17°05′56″ S, 46°37′57″ E]; Jan. 1900; fl; *H. Perrier de la Bâthie 460 bis*; P [P01046140]!. – **Boeny [Mahajanga Prov.]** • Près de Majunga; [15°43′ S, 46°19′ E]; 1 Feb. 1921; fl; *H. Poisson s.n.*; P [P02157227]! • RN 8, Andranomavo, Soalala; [16°30′ S, 45°26′ E]; 23 Feb. 1953; fr; *RN 5092 (Rakotovao)*; P [P02157225]! • Mahajanga, Marohongo, station forestière; [15°43′04″ S, 46°30′08″ E]; 13 Mar. 2010; fl; *F. Rakotonasolo et al. 1605*; BR [BR0000021756603]!, TAN!. – **Melaky [Mahajanga Prov.]** • Province de Majunga / Mahajanga. Beanka, partie centrale, Analaomby; [17°58′39″ S, 44°30′26″ E]; 324 m; 5 Dec. 2011; fl, fr; *R.F. Bolliger 69*; BR [BR0000015214515V]!, G [G00340146]!,

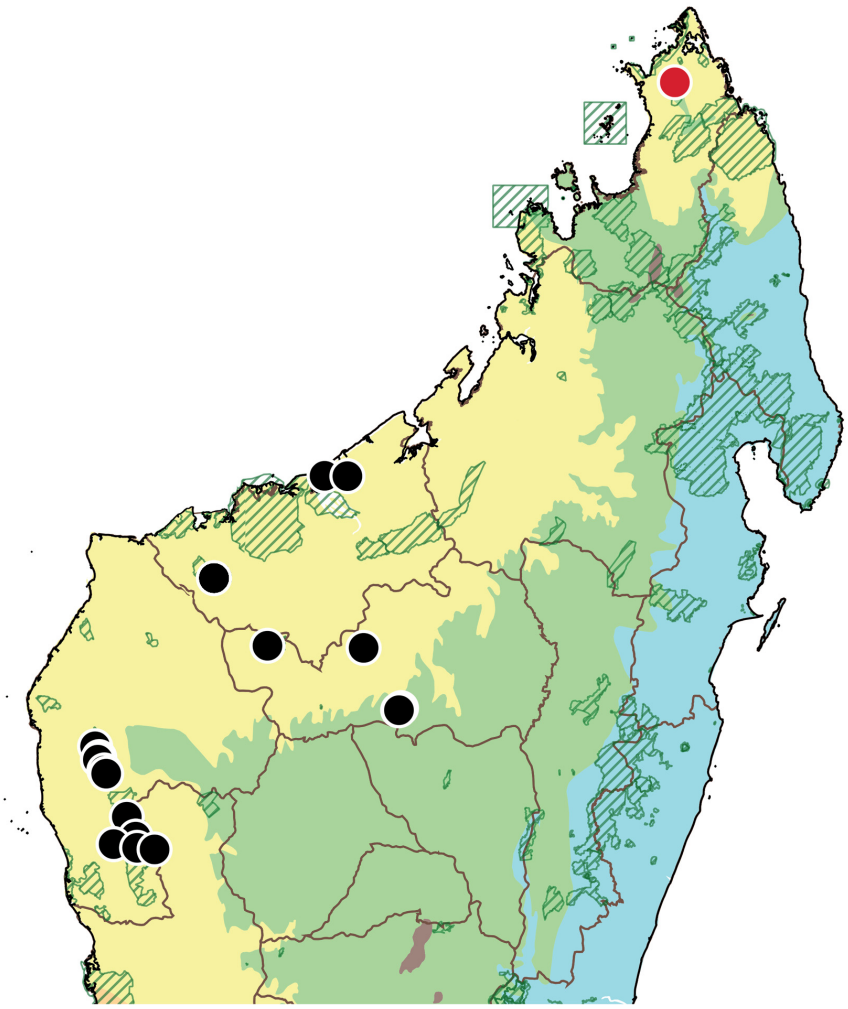


Fig. 24. Known distribution of *Chlorophytum graniticum* H.Perrier subsp. *graniticum* (black dots), subsp. *ambrense* Bard.-Vauc. & M.Pignal subsp. nov. (red dot).

K n.v., MO [MO-3241821]!, P [P00782679]!, TEF n.v. • Mahajanga, Beanka, partie centrale Analaomby; [17°59′53″ S, 44°29′46″ E]; 243 m; 21 Mar. 2012; fr; *R.F. Bolliger, R.M. Hanitrarivo & B.F.L. Rakotozafy 316*; G [G00340147]!, K!, MO!, P [P04186578]! • Route d'Antsalova, Tsiandro, RN IX; [18°42′ S, 44°49′ E]; 3 Feb. 1975; fl, fr; *G. Cremers 3800*; P [P02157229]! • Province de Majunga / Mahajanga, Région Melaky. Beanka, sud de la Kimanambolo; [18°06′38″ S, 44°33′47″ E]; 280 m; 27 Nov. 2012; fl; *L. Gautier, P. Ranirison, R.M. Hanitrarivo & I. Luino 5858*; G [G00377860]!, K n.v., MO [MO-3241820]!, P [P00967405]!, TEF! • Tsingy du Bemaraha. Anjohivazimba; [18°40′ S, 44°37′ E]; s.d.; fl, fr; *J. Léandri 934*; P [P02157235]! • Environs de Tsiandro, forêt de Behandrao; [18°43′ S, 44°57′ E]; 500–600 m; 25 Nov. 1952; fl, fr; *J. Léandri 2004*; P [P02157223]! • E d'Ansalova, vers Ambodiriana; [18°41′ S, 44°37′ E]; 100–150 m; 7 Dec. 1952; fl, fr; *J. Léandri 2075*; MO [MO-3020332] image!, P [P02157230, P02157228]! • same data as for preceding; [18°27′ S, 44°44′ E]; 21 Jan. 1960; fl, fr; *J. Léandri 2662*; P [P02157233]! • E. Antsalova, vers Bevary; [18°37′ S, 44°48′ E]; 400–600 m; 27 Jan.–2 Feb. 1960; fr; *J. Léandri 2946*; P [P02157238]!, TAN! • same data as for preceding; [18°37′ S, 44°48′ E]; 4 Feb. 1960; fr; *J. Léandri 2974*; P [P02157226]! • Mahajanga: Melaky Region. Maintirano, Belitsaky, Antsakobe. Vers le point culminant. Forêt dense sèche décidue dans le Tsingy Beanka; [18°05′05″ S, 44°32′55″ E]; 352 m; 20 Nov. 2012; fl bud; *C. Rakotovao, I. Luino & J. Razafimandimby 6299*; MO [MO-3241818]!, P [P00967406]!, TAN n.v. • Beanka, partie nord, bord rivière Bokarano; [17°53′26″ S, 44°28′27″ E]; 18 Dec. 2011; fl; *B.F.L. Rakotozafy, R. Bolliger & R.M. Hanitrarivo 16*; BR n.v., G [G00376365]!, K n.v., MO [MO-3241819]!, P [P00782478]!, TEF! • RN 9, Antsalova; [18°41′ S, 44°37′ E]; 7 Dec. 1952; fl, fr; *RN 4667 (Razafindrakoto)*; P [P02157234, P02157236]!, TAN!.

Description

Underground parts with numerous fine, fibrous, fasciculate *roots*, each bearing a tuber near the apex, tubers either fusiform, 8–15 × 1.5–2.5 mm, or pyriform, 8–11 × 3–6.5 mm; *leaves* 13–33 × 1.3–2.2 cm, with a pseudo-petiole 3.5 to 7 cm long, about 1/4 to 1/5 of the total length of the blade, base of the leaf enlarged, sheathing, often with one or two short, transparent external sheaths, margin of the blade finely scabrid at the tip, with 21 to 25 veins, the apex of the blade tapering; *inflorescence* 17–35 cm long, simple or sparsely branched, with 1–3 triangular, 7–20 × 1.5–3 mm, well-tapered, 6–8 veined bracts at the base, *flowering rachis* 6–18 cm long; *flowers* with a white, 3.5–4.5 mm long perianth, the outer tepals narrower (0.6–0.8 mm wide) than the inner ones (0.7–1.1 mm); *stamens*, filament dorsifixed inserted towards the middle of the anthers, anthers triangular, green, sometimes curved at anthesis, 0.5–0.9 × 0.2–0.3 mm, weakly hastate; *gynoecium* with a filiform style, 3–4 mm long; *capsules*, 2.5–4 × 4–6 mm; *seed* 1.2–2 × 2.1–2.8 mm.

Phenology

Flowering occurs mainly from November to February, but can extend until March. Fruiting begins in December and continues until March.

Distribution and ecology

Subspecies from western Madagascar, occurring in the Boeny, Melaky and Betsiboka Regions, and present in a number of protected areas, including the Tsingy de Bemaraha National Parc, occurring mainly on limestone at altitudes below 500 m. It is also found on acidic soils up to an altitude of 1000 m in the north of the Tampoketsa Region. It is encountered in the understory of dense dry forests, on rocks, and also near rivers.

Provisional IUCN Red List assessment

The typical subspecies includes all material of the species except for two records from Montagne d'Ambre, that lies at the extreme north of the species' range, and that we segregate as *Chlorophytum graniticum* subsp. *ambrense* subsp. nov. The typical variety, *C. graniticum* subsp. *graniticum*, is known from 21

collections, and occurs at nine localities that represent seven subpopulations, and has an EOO of 53 000 km² and an AOO of 68 km² (further details on the material included in this subspecies are provided above). However, throughout most of its range, we consider the typical subspecies to be threatened by habitat degradation in at least five of its seven known locations, whereas in Bemaraha National Park and Beanka Harmonious Landscape threats to its survival in are low. But thirteen of the known records of this subspecies are more than 50 years old. *Chlorophytum graniticum* subsp. *graniticum* is therefore assessed as VU.

Morphological remarks

1) The shape and orientation of the base of some of the available collections (*Léandri 2075*, *2974*, *Gautier et al. 5858*) suggest that the species is rhizomatous, but the point of origin is difficult to determine within its rocky habitat, and it may not be easily visible among the tangled roots, and furthermore, its fragility makes it prone to breaking.

2) The collection *Morat 4686* has significantly wider leaves than others, ca 2.5 cm, and a maximum length of ca 13 cm, and has a shorter or barely developed pseudo-petiole.

14b. ***C. graniticum* subsp**. ***ambrense*** Bard.-Vauc. & M.Pignal subsp. nov.
urn:lsid:ipni.org:names:77324051-1
Fig. 24

Diagnosis

A typo differt radicibus carnosis, aliquando incrassatis (vs tenues, fibrosas tuberculatasque), pseudopetiolis foliorum longioribus (1/3–1/2 longitudine laminae vs 1/4– 1/5), margine laminae laevi (vs apicem scabrum), laminis 17–18-nervatis (vs 25–31), inflorescentiis robustioribus, pedunculo unibracteato (vs 1–3-bracteatum).

Etymology

The subspecies is named for the type locality, the Amber Mountain or Montagne d'Ambre.

Type material

Type

MADAGASCAR – **DIANA Region [Antsiranana Prov**.**]** • Forêt d'Ambre; [12°31′ S, 49°11′ E]; 1000 m; 18 Jan. 1960; fl, fr; *H. Humbert 32096*; holotype: P [P02158253]!; isotypes: K n.v., MO [MO-3020333] image!, TAN!, WAG [WAG.1151827] image!.

Paratype

MADAGASCAR – **DIANA Region [Antsiranana Prov**.**]** • PN montagne d'Ambre, SW Ambohitra; [12°33S, 49°08′ E]; 20 Oct. 1988; fl, fr; *G. Schatz, J.S. Miller, A. Rakotozafy, F. Badré, J. Randrianasolo 2395*; BR [BR0000021754982]!, MO [MO-3020323] image!, P [P02071668]!, TAN n.v., WAG [WAG.1151037] image!.

Description

Underground parts with fleshy *roots*, 1.5–2.0 mm in diam., some of which thicken to 12 × 2–3 mm pseudo-tubers; *leaves* arranged in a rosette (fide Schatz), 11–27 × 1.2–1.8 cm, with a pseudo-petiole 5.0–12.5 cm long, 1/3 to 1/2 of the length of the leaf, dilated at the base into a very marked sheath, the sheaths all nested in a pseudobulb, blade margin undulate, with a smooth, very clearly-marked, hyaline margin, and 17 or 18 veins, the lower surface of the blade glaucous-green; *inflorescence* 30–52 cm long, branched, with a robust axis, the *rachis* 17–28 cm long, covered with transparent, triangular-based scabrae,

that are well aligned, and more abundant towards the apex, scabrae sometimes also occur on the young peduncles, with a solitary bract at the level of the first branch, 12–20 × 0.3 mm, the bract well tapered and 5-veined; *tepals* (observed persisting around young fruits) purple-brown when dry, 4.0–4.5 mm long; *stamens*, anther hastate, green, 1 × 0.15–2.00 mm, dorsifixed, filament inserted towards the lower 1/3; *gynoecium* with a filiform style, 4–5 mm long; *capsules*, 3.2–4.0 × 6 mm, *seed*, 2.5–3.0 × 3–4 mm.

Phenology

This subspecies flowers as early as October and bears its first fruits in the same month. Fruiting has been recorded until the end of December.

Distribution and ecology

This subspecies has only been collected in the Parc national de la Montagne d'Ambre, on deep clay soil derived from the degradation of predominantly basaltic volcanic rocks, at an altitude of approximately 1000 m. It can form dense colonies in the understorey of the ombrophilous forest.

Provisional IUCN Red List assessment

With only two known records from collection records from sites only circa 6 km apart, *Chlorophytum graniticum* subsp. *ambrense* subsp. nov. has a known AOO of only 8 km². The subspecies appears to be highly localised, with a known range that is over 450 km distant from the known range of the typical subspecies, and both records are from within the Montagne d'Ambre National Park where it is not considered to be threatened. The two records date from 1960 and 1988 respectively, and represent a single location. It is likely that the subspecies still exists at the site, which remains largely intact. It is therefore considered to be Least Concern (LC), even though it is poorly known, and apparently rare.

Morphological and taxonomic remarks

1) The flowers of subsp. *ambrense* subsp. nov. are very similar to the typical subspecies, but a little larger, as well as the fruits and seeds, 3–4 mm high against 2.1–2.8 for the typical subspecies.

2) This taxon may merit recognition as a separate species, but we consider the material inadequate to justify that choice.

15. ***Chlorophytum helvillae*** Bard.-Vauc. & M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324062-1
Figs 6I, 25–26

Diagnosis

Chlorophyto meridionali inflorescentiae pedunculo scabro (vs glabrum), rhachidi obtecta pilis numerosis brevisque (vs glabram), antheris angustatis viridisque, 6.3 × 1 mm longis (vs largiores flaveasque, 3.8–5 × 1–1.2 mm), antheris basi hastata (vs rotundatam vel obtusam) apice capitato (vs attenuatum), praecipue differt.

Etymology

The specific epithet of this new species refers to the town of Hell-Ville on Nosy Be Island in northwestern Madagascar.

Type material

MADAGASCAR – **DIANA Region [Antsiranana Prov.]** • Antsiranana: Nossi-Bé, environs de Helville [Hell-Ville]; [13°25′ S 48°19′ E]; Mar. 1905; fl; *C. d'Alleizette 46*; holotype: P [P06169865]!.

Fig. 25. *Chlorophytum helvillae* Bard.-Vauc. & M.Pignal sp. nov. holotype; *C. d'Alleizette 46*, P [P06169865]. **A**. Habit. **B**. Bracts and portion of the rachis. **C**. Flower. **D–E**. Stamen front (anther) and back. Drawing by Laurence Ramon.

Description

Plant herbaceous, up to 31 cm tall, *underground parts* unknown; *leaves* 8, 17–30.5 × 1.4–1.6 cm, with a sheathing base and wavy margins, lamina conduplicate, margins smooth in appearance, but distally bristly with very small teeth, visible only at high magnification (×40), apex tapering, veins 23–27, well-spaced, visible on the upper surface of the blade, somewhat obscure on the lower surface; *inflorescence* solitary, unbranched, incompletely developed, stiff, 28.5 cm in height, dense; peduncle 21 cm long, finely scabrous, covered with hairs in its upper half; *rachis* 7 cm long, covered with short, abundant hairs, ca 0.05–0.1 mm long, with a solitary bract at the base of the rachis, 12 × 3 mm, triangular, with a tapered tip, the floral bracts similar, but decreasing in size from 7.5 × 1 mm at the base to the top, longer than the pedicel (1.6–3.2 mm long), pedicel with an articulation at 0.2–1.5 mm from the base; *flowers* solitary at each node, campanulate, 11–12 mm long, pedicel short, 2–2.5 mm long, glabrous, articulated at the base; *tepals* narrowly lanceolate, 15 × 2.5–2.7 mm, with 4–5 conspicuous veins converging at the apex; *stamens* 9–9.5 mm long, shorter than the perianth, filaments flattened, 3.3 mm long, tapering towards the apex, anthers green, long and straight, 6.3 × 1 mm, apex rounded, base hastate, spurred, shortly rounded at the base of the connective; *gynoecium*: ovary 3.5 × 2.2 mm; ovules ca 10 per locule; style 6 mm long, barely equaling the perianth; *fruit* not seen.

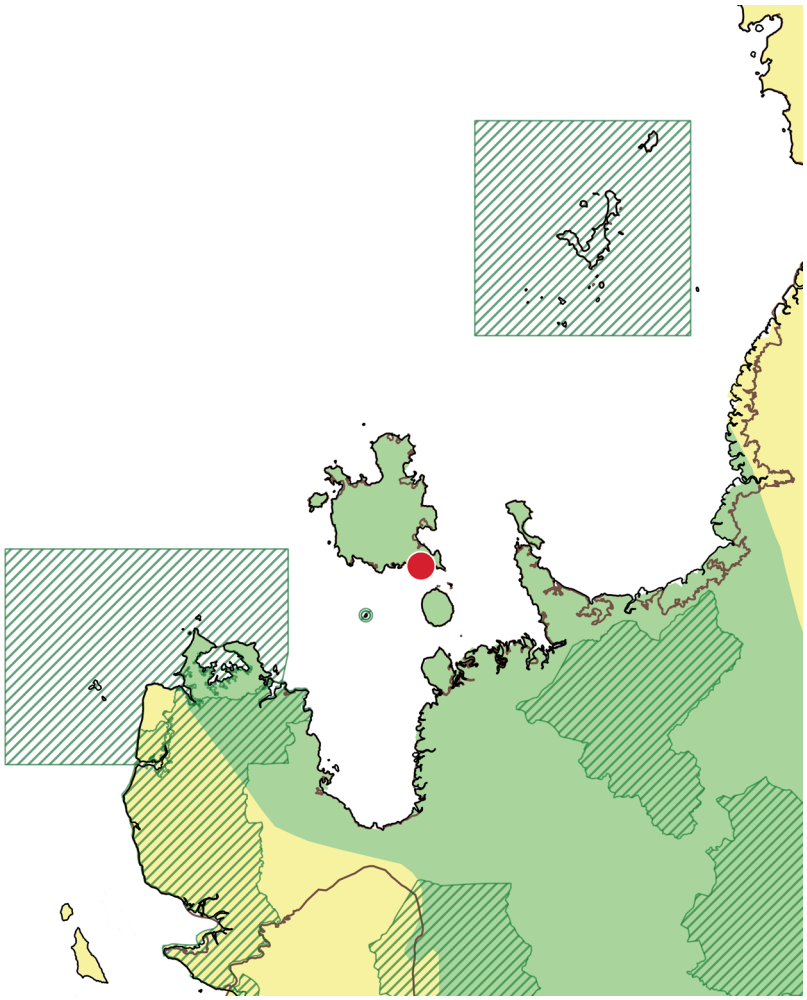


Fig. 26. Type locality of *Chlorophytum helvillae* Bard.-Vauc. & M.Pignal sp. nov.

Phenology

The only known specimen was in flower in March.

Distribution and ecology

Known only from the northwest of Madagascar, more precisely from the southeast of Nosy Be Island, on substrates formed from old or recent volcanic rocks, that give rise to deep soils, and the vegetation type in which the plant occurs is unknown.

Provisional IUCN Red List assessment

Chlorophytum helvillae sp. nov. is known from a single specimen collected over a hundred years ago. Its precise locality on Nosy Be is unknown, and although much of the island is highly degraded, Lokobe National Park is well-maintained and contains a significant portion of the island's flora. It's possible that the *C. helvillae* is extant, and most likely within the park. The species must be considered as Data Deficient (DD), although it may be extinct. A targeted search for the species in the park and in any remaining fragments of natural vegetation on the island and on the neighbouring island of Nosy Ambariovato (also known as Nosy Komba), is recommended.

16. ***Chlorophytum humbertianum*** H.Perrier
Figs 3L–M, 6D, 7C, 27

Chlorophytum humbertianum H.Perrier (Perrier de la Bâthie 1935: 52–53).

Etymology

The species is dedicated to Henri Humbert (1887–1967), director of the Laboratoire de Phanérogamie at the Muséum national d'Histoire naturelle in Paris and the initiator of the Flora of Madagascar and the Comoros (Heim 1967; Dorr 1997).

Vernacular name

Fanamato (fide H. Humbert).

Type material

MADAGASCAR – **Anosy [Toliara Prov.]** • Domaine du S.-W: sur les limites orientales: Isomony, vallée du Manambolo, affl. du Mandrare; [24°32′ S, 46°41′ E]; vers 450 m d'alt.; Jan. 1934; fl; *H. Humbert 13350*; holotype: P [P01046117]!.

Other material examined

MADAGASCAR • S-O; fl; *P.R. Montagnac 97*; P [P06169877]!. – **Androy [Toliara Prov.]** • Moyenne Mananara, sur la limite orientale de l'Androy; [24°45′ S, 45°27′ E]; 27 Nov. 1931; fl; *R. Decary 9446*; P [P02071371]! • Ampandrandava, Rochers de Belambo; [23°50′ S, 44°53′ E]; 1300 m; Jan. 1943; fl bud; *A. Seyrig 498*; P [P06169881]! • Ampandrandava, entre Bekily et Tsivory; [24°6′ S, 45°52′ E]; Jan. 1943; fl; *A. Seyrig 498B*; P [P02071374]! • Ampandrandava, entre Bekily et Tsivory; [23°50′ S, 44°53′ E]; 1000 m; May 1943; st.; *A. Seyrig 498C*; P [P06169880]! • same data as for preceding; May 1943; fr; *A. Seyrig 498D*; P [P02071375]! • Environs d'Ampandrandava (entre Bekily et Tsivory); [24°5′ S, 45°41′ E]; Dec. 1943; fl; *A. Seyrig 498E*; P [P06169836, P06169912]! • same data as for preceding; [23°50′ S, 44°53′ E]; Dec. 1943; fl; *A. Seyrig 498F*; en culture; P [P02071372]! • Environs d'Ampandrandava (entre Bekily et Tsivory), crêtes est; [23°50′ S, 44°53′ E]; 1000 m; Mar. 1943; fr; *A. Seyrig 541*; P [P02071373, P06169911]! • Environs d'Ampandrandava (entre Bekily et Tsivory); [23°50′ S, 44°53′ E]; Feb. 1944; fl; *A. Seyrig 541B*; P [P06169878]!. – **Anosy [Toliara Prov.]** • Bassin

supérieur du Mandrare, du col de Vavara à la vallée du Manambolo; [24°30′ S, 46°42′ E]; 20–22 Nov. 1928; fl; *H. Humbert 6754*; MO [MO-3020308]!, P [P02071370, P02071368, P02071369]! • Bassin supérieur de l'Onilahy (Mangoky), vallée de l'Andranomiforitra; [23°53′ S, 46°32′ E]; 19 Dec. 1928; fr; *H. Humbert 7065*; P [P02071365]! • Toliara, vallée moyenne du Mandrare près d'Anadabolava. Mont Vohitrotsy; [24°3′ S, 46°24′6″ E]; 700–800 m; fr; Dec. 1933; *H. Humbert 12643*; P [P06169874]! • Vallée de la Manambolo (bassin du Mandraré), NW Maroaomby; [24°21′ S, 46°34′30″ E]; Dec. 1933; fl, fr; *H. Humbert 12762*; P [P02071366]!, TAN n.v. – **Ihorombe [Fianarantsoa Prov.]** • 47–49 km au SE d'Ihosy route d'Ivohibe; [22°33′38″ S, 46°36′24″ E]; 650–700 m; 5 Nov. 1967; fl; *L. Bernardi 11191*; G!, P [P02071367]! • 9 km, W de Ihosy le long de la RN 7; [22°24′26″ S, 45°41′21″ E]; 12 Nov. 2003; fl; *P.B. Phillipson & S. Rakotonandrasana 5718*; G!, MO [MO-3020347]!, P [P02071364]!, TAN!. – **Menabe [Toliara Prov.]** • SW Madagascar, 11 km SW de Manja; [21°30′ S, 44°16′ E]; 240 m; 26 Dec. 1976; fr; *O. Appert 803*; TAN! • Manja; [21°30S, 44°16′ E]; 26 Dec. 1976; fr; *O. Appert 804*; forêt, sol sableux; TAN! • same data as for preceding; [21°30S, 44°16′ E]; 26 Dec. 1976; fr; *O. Appert 805*; MO [MO-3020307] image!, TAN n.v.

iNaturalist observation

MADAGASCAR – **Atsimo-Andrefana [Toliara Prov.]** • 24°21′23.6″ S, 44°30′00.8″ E; 16 Nov. 2023; fl; *Didie Cresson (cresson_didie)*; iNaturalist 191241917.

Description

Plant herbaceous, 10–30 cm tall; *rhizome* well-developed; *roots* fasciculate, numerous, hairy, long, slightly thickened, 1–1.5 mm in diam., often truncated, some terminated by a tuber or a cluster of tubers at least 8 cm from the base (*Humbert 6754*, *Bernardi 11191*), tubers ovoid, 8–30 × 3–7 mm; *leaves* 4–8, of two types depending on the specimen: linear ones, with a base surrounded by two shorter whitish sheaths, measuring 6–19.5(–33) × 1–1.5(–2) cm (*Seyrig 498B*, *D*, *F*, *Seyrig 541*), and others longer and wider, and more flexible, 26–36 × 2.8–4.4 cm, with sheathing base, sometimes attenuated into a pseudo-petiole, veins 17–34, conspicuous, well-spaced, the blade with fine hyaline margins, smooth or finely scabrous at the base (*Humbert 12762*) or very scabrous (*Montagnac 97*), all leaves with tapered tips;

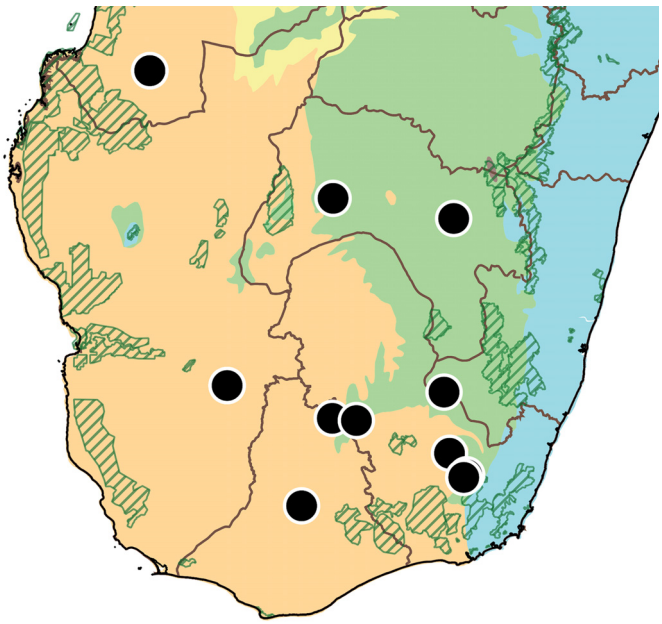


Fig. 27. Distribution of *Chlorophytum humbertianum* H.Perrier.

inflorescence 22–49 cm high, solitary, the rachis sometimes with a basal branch, peduncle 13–34 cm, dotted with small, white, translucent hairs of 0.1 mm, the density of which increases towards the apex, bearing 1–5 thin bracts of 10–20 × 1–2.5 mm, with acute apices, *rachis* 7–21 cm long, the pedicel and rachis pubescent; 1–5 flowers per node, the floral bracts subulate, 5–9 mm long, equalling or exceeding the pedicel, the latter 7–8 mm long, slender, with supramedial articulation 1–2.5 mm from the apex; *perianth* 8–10 mm long, with elliptical segments of equal length; outer tepals 1.5–2 mm wide, always with 3 central veins, the apex with an brown or green dot (in situ), inner, 2–3.5 mm wide, veins, 3 or sometimes 4–5, especially visible when dry; *stamens* equal to the perianth, with white filaments, 4–6 mm long, nearly cylindrical, slightly flattened at the base, anthers yellow, 2.5–4 × 0.7–1 mm, basifixed, with a slightly hastate base and a small swelling on the outer base of the connective; *gynoecium*: ovary, 1.5–2 × 1.2–1.8 mm, ovules, 6–8 per locule, style curved, 7–10 mm in length, terminated by a thickened stigma; *capsule*, 5–8 × 5–6.5 mm, with thickened sutures and a smooth surface; *seed* subcircular or taller than wide, black, shiny, 2.5 × 2.3 mm, with a thick, slightly prominent radicle.

Phenology

Flowering mainly occurs during the months of November and December and continues until February. The fruiting begins as early as November.

Distribution and ecology

Collections of this species are all from the south of Madagascar, mostly from the Mandrare basin in the southeast, but with two collections from near Ihosy, and three from the southwest (two near Manja and one without detailed locality information – *Montagnac 97*). The species is found at altitudes between 240 and 1300 m, and it grows on deep acidic soils in sands or soil derived from metamorphic rocks, generally in lowland meadows, or sparsely wooded environments but with a preference for shaded or humid areas.

Chlorophytum humbertianum can be locally abundant in suitable environments, but is rare on a larger scale (fide Seyrig).

Provisional IUCN Red List assessment

Chlorophytum humbertianum is endemic to Madagascar, where it is restricted to the southern interior. The species has mostly been recorded in the Anosy Region and in neighbouring areas of the Androy, Atsimo-Andrefana, Atsimo-Atsinanana and Vatovavy Regions, but it also with somewhat disjunct occurrences known from the Ihorombe and Menabe Regions further to the north and the northwest. The species has a total of 11 known occurences, with an EOO of over 54 500 km^2 and an AOO of 48 km^2, a total of seven subpopulations can be distinguished that occur at a range of elevations from 400 to 1300 m a.s.l. The species has only been collected three times in the past 50 years, and it is not known to occur in any formally protected area. It occurs mostly in localities that are subject to severe habitat degradation, representing 3 locations. It is therefore assessed as Critically Endangered CR B2ab(i,ii,iii,iv,v).

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. IX 13–16.

Morphological remarks

1) Variation has been observed in the vegetative parts and the flowers between some specimens. The size of the leaves and to a certain extent their shape, depends on the state of maturity of the plants, as follows: flowering can occur while the leaves are still expanding (*Decary 9446*, *Humbert 6754*, *12762* and *13350*); the edge of the blade is generally smooth, but sometimes scabrous at its base (*Humbert 12762*) or along its entire length (*Montagnac 97*). The veins of the tepals on the same floral stem are generally three in

number, but in *Seyrig 498B*, *498E*, *541B* and *Humbert 6754*, we find a mixture on the same inflorescence of flowers with 4 or 5 veins.

2) Seyrig noted that the veins of the tepals of this species became brown on drying specimens of the species, while the veins were not visible in situ, this is corroborated by the photographs of *Phillipson et al. 5718*.

17. ***Chlorophytum hypoxiforme*** (H.Perrier) Marais & Reilly
Figs 5F, 28

Chlorophytum hypoxiforme (H.Perrier) Marais & Reilly (Marais & Reilly 1978: 661). – *Anthericum hypoxiforme* H.Perrier (Perrier de la Bâthie 1935: 37–38).

Etymology

The specific epithet refers to the vegetative parts that resemble those of members of the family *Hypoxidaceae* R.Br.

Type material

MADAGASCAR – **Betsiboka [Mahajanga Prov.]** • Domaine central: Rocailles (basalte) sur le Tampoketsa [Tampoketsan'i Beveromay], entre le Bemarivo du N.-W. et le Mahazamba; [16°33′54″ S, 47°47′38″ E]; ca 900 m; Dec. 1910; fl; *H. Perrier de la Bâthie 10978*; holotype: P [P01046123]!.

Description

Herbaceous plant, small, up to ca 10 cm tall; *underground parts* formed from fasciculate, fleshy, elongated *roots*, ca 2.0 to 2.5 mm in diam., fusiform roots 15–26 × 3 mm, and fibrous roots 0.3 mm in diameter; *leaves* 9 to 14, lanceolate, 4–10 × 0.3–0.6 cm, with a sheathing base, buried for 1.0–1.3 cm, surrounded by fibrous remains, and forming a rosette (fide Perrier de la Bâthie), with 12 to 16 veins visible on both surfaces, margins smooth, hyaline, the apex long-tapered; *inflorescences* 1–5, simple or branched, comprised of erect, racemose units 1–2 cm long, the peduncle reduced, a short dense raceme, 2.5–7.0 cm high, with short internodes, pauciflorus, bearing a very long outer foliaceous bract, 2–4.5 × 0.2 cm, axillary to the branch, with 5–7 veins, and with a second, smaller inner bract, 1.5 × 0.12 cm; *rachis* 2.5–6 cm long, bearing up to 10 flowers; *flowers* 1 per node, surrounded by two triangular, pointed, 3-veined bracts, the larger 10–12(–15) mm long, as long as the pedicel, or longer, the pedicel 13 mm long, with articulation supramedial, 1–1.5 mm below the apex; *perianth* white, 7–8 mm long, somewhat twisted after anthesis, the *tepals* equal, oblong, with an obtuse apex, 7 × 1.0–1.2(–1.8) mm, with 3 central veins; *stamens* equal, shorter than the perianth, with a flattened, filament, 3.5–4.0 mm long, glabrous, anthers elongate, obtusely tipped, 2.0 × 0.5 mm, dorsifixed, filament inserted on the lower 1/4; *gynoecium*: ovary globose, 1 mm long, with 2 or 3 ovules per locule, style ca 3 mm long, cylindrical, thick; *capsule* not known.

Phenology

The single known collection flowered as early as October, and many flower buds can still be seen, while fruiting has only just begun.

Distribution and ecology

The only collection of this species was made in Northwestern Madagascar between the Bemarivo and Mahazamba rivers, on the Tampoketsa plateau. It is a rock-dwelling plant occuring on an ancient basalt flow, collected at an altitude of around 900 m.

Provisional IUCN Red List assessment

Chlorophytum hypoxiforme is known from a single collection made over a century ago in an area of the country which is highly degraded with only tiny fragments of semi-natural vegetation, the area being exploited mainly for grazing of livestock. It is likely Extinct but since no targetted search for the species has been undertaken, we assess *C. hypoxiforme* as DD (Data Deficient).

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. VII 6–8.

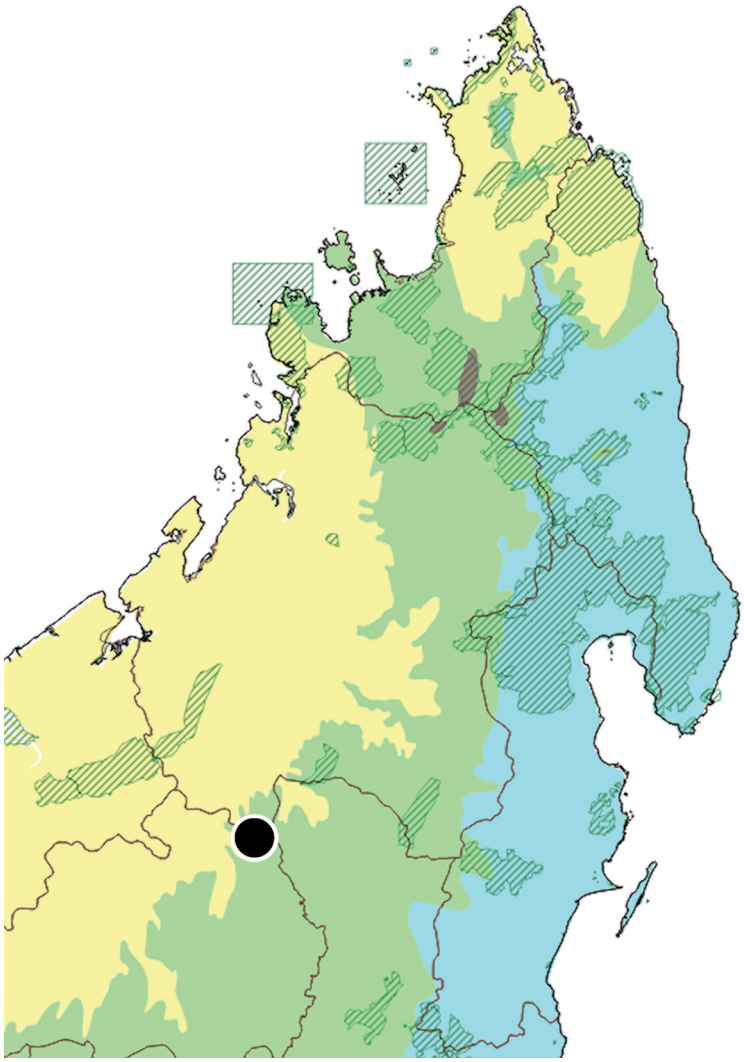


Fig. 28. Type locality of *Chlorophytum hypoxiforme* (H.Perrier) Marais & Reilly, between the Bemarivo and Mahazamba rivers, on the Tampoketsa plateau, in the Betsiboka Region.

18. ***Chlorophytum madagascariense*** Baker
Figs 6F, 7F–H, 29–30, Tables 3–4

Anthericum gramineum Baker (Baker 1877: 302), nom. illeg.

Chlorophytum madagascariense Baker (Baker 1878: 326).

Etymology

The species is named for its country of origin, Madagascar, it was the first Malagasy species to be formally described.

Type material

MADAGASCAR – s.loc.; s.d.; fl; *Hilsenberg & Bojer s.n.*; holotype: BM [BM013839962] image!.

Description

Plant herbaceous, with a subterranean part consisting of a *rhizome*, with thickened *roots* bearing ovoid tubercles, 7–30 × 2–8 mm; *leaves* 5–10, graminoid, 10–60 × 0.4–1.9 cm, often tapering into a pseudo-petiole except in *C. madagascariense* var. *boinense* var. nov., with a sheathing base surrounded by the remnants of old leaves forming a fibrous sheath, margin scabrous, pseudo-midrib present, veins, 15–36 visible, with a tapered apex; *inflorescence* erect and rigid, with a glabrous axis, 27–94 cm tall, peduncle 20–77 cm long, branched or unbranched, with numerous upright branches often arising from the same basal node, leaf-like bracts 1(–2) with a triangular base and a tapered tip, *rachis* 6–17 cm long, flowers 1–3 per node; *flowers*, 8–12 mm long, *tepals* white, narrowly ovate to narrowly elliptical, with veins spaced or clustered at the centre (depending on the variety); *stamens* equal or subequal, somewhat shorter than tepals, frequently arranged in 2 groups (4–2), filament 3–4.5 mm long, with a broad, flat base, narrower above, basifixed, anther narrowly triangular, apiculate, 4–5(–7.5) mm; *gynoecium*: ovary sub-spherical, ovules 6 or 8 per locule, style filiform, 10–13 mm long, curved at the tip, exceeding the perianth, with a thickened stigma; *capsule* broader or as long as wide, 5–7 × 7–9 mm, transversely wrinkled with thickened sutures; *seed* disc-shaped, black, shiny, with a finely granular surface, a narrow notch, and a broad, prominent radicle.

Provisional IUCN Red List assessment

Chlorophytum madagascariense Baker is endemic to Madagascar, where it has a highly disjunct known distribution, the species is however only known from a single recent (2013) collection, *Ralimanana et al. 1812*, which is referred to the typical variety, while three other recognised varieties are only known from old collections. The assessment can only be based on this single recent occurrence from near Ambalakida "along the road to La Grotte Anjiabe" in the Boeny Region. Given the extent of the known range of the species, including its three different varieties, it is likely that it persists at other sites where it was collected in the past, that include certain protected areas, but we are obliged to assess the species, including its recognised varieties as DD (data deficient). A targetted search for the species across its range is needed.

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. VIII 8–10.

Taxonomic and morphological remarks

1) *Anthericum gramineum* Baker (1877: 302) was transferred to the genus *Chlorophytum* by Perrier de la Bâthie (1935), giving *Chlorophytum gramineum* (Baker) H.Perrier priority over *C. madagascariense* Baker (1878: 326), described a year later. However, the name *A. gramineum* Baker is illegitimate, since it is pre-dated by *Anthericum gramineum* Vell. (da Conceição Velloso 1825: 143), a species from Brazil. We therefore re-establish *C. madagascariense* Baker as the correct, valid name for this species. The varieties described by Perrier de la Bâthie are transferred accordingly to the latter taxon.

Table 3. Comparison of *Chlorophytum madagascariense* Baker and *C. meridionale* Bard.-Vauc. & M.Pignal sp. nov.

Taxon	*C. madagascariense*	*C. meridionale* **sp. nov.**
Underground parts	roots 1.2–2.0 mm in diam.; tubers numerous	roots 1.0–3.0 mm in diam.; tuberised zones present, but true tubers rare
Leaves	leaf margin straight, even at the base; frequently with a pseudo-petiole	leaf margin undulate at the base, lacking a pseudo-petiole (except *C. meridionale* subsp. *tulearense* subsp. nov.)
Inflorescences	bract solitary, 1–3 cm long, situated at the point of branching	bracts 1–3, 1–11(–15 cm) long, the highest at the point of branching, the others, when present, below
Flowers	tepals with 3(–5) veins, well-spaced or occasionally closely-spaced; stamens equal	tepals always with 3 closely-spaced central veins, sometimes with 2 additional lateral veins; stamens unequal
Fruits	as long as wide	longer than wide

Table 4. Comparative table of varieties of *Chlorophytum madagascariense* Baker.

Taxon	*C. madagascariense* **var.** *boinense* **var. nov.**	*C. madagascariense* **var.** *madagascariense*	*C. madagascariense* **var.** *pervillei* **nom. nov.**	*C. madagascariense* **var.** *sciaphilum* **comb. nov.**
Leaves	ca 60 cm long; base sheaving, lacking a pseudo-petiole	< 35 cm long; spreading; basal 1/4 forming a pseudo-petiole	< 47 cm long, erect; basal 1/4– 1/3 forming a pseudo-petiole	< 45 cm long, flexible; basal 1/3, forming a pseudo-petiole
Inflorescence	40– 94 cm long; robust and well-branched at the base	27–45 cm long; sparsely-branched	44–70 cm long; branched at the base	42–50 cm long; sometimes branched
Flower size	8–12 mm	9–10 mm	8–10 mm	10 mm
Tepals	outer broader than inner	variable	equal size	equal size
Tepal veins	3–4(–5) closely-spaced	3–4 well-spaced (rarely closely-spaced	3 well-spaced	3 well-spaced
Stamens	equal	equal or unequal (4+2)	equal	equal or unequal (4+2)
Filaments	as long as the anthers	as long as, or slightly shorter than the anthers	as long as the anthers	as long as, or slightly shorter than the anthers

2) Thirteen collections, mostly old and sometimes incomplete, are attributed to *C. madagascariense*. Despite the disparity in their morphology (see Table 4) and their geographical locations (when known), we have essentially retained the treatment published by Perrier de la Bâthie in the *Flore de Madagascar* (Perrier de la Bâthie 1935, 1937 [1938]), but with certain modifications (see Table 4). Notably, we recognise three varieties within *C. madagascariense.* It is important to note that the varieties (including the typical variety) are known from only a few specimens, so additional collections are needed in order to refine the infraspecific taxonomy of *C. madagascariense*.

3) At first glance, *Chlorophytum madagascariense* and *C. meridionale* sp. nov. appear similar. However, in addition to their different distributions, they are separated by several notable characteristics, as presented in Table 3.

Key to the varieties

1. Leaf surface glabrous 2
– Leaf surface scabrous ..... ***C. madagascariense* var**. ***boinense*** Bard.-Vauc. & M.Pignal var. nov.

2. Floral bract shorter than the pedicel; leaf blade on average less than 1 cm wide .... ***C. madagascariense* var**. ***pervillei*** Bard.-Vauc. & M.Pignal nom. nov.
– Floral bract equal or longer than the pedicel; leaf-blade more than 1 cm wide on average 3

3. Length of the pseudo-petiole ca 1/3 the length of the blade .... ***C. madagascariense* var**. ***sciaphilum*** (H.Perrier) Bard.-Vauc. & M.Pignal comb. nov.
– Length of the pseudo-petiole equal to or less than 1/4 the length of the blade ....***C. madagascariense*** Baker **var**. ***madagascariense***

18.1 *Chlorophytum madagascariense* Baker **var**. ***madagascariense***
Figs 6F, 7H, 30, Table 4

Chlorophytum gramineum var. *madagascariense* (Baker) H.Perrier (Perrier de la Bâthie 1935: 57) nom. illeg.

Material examined

MADAGASCAR – **Boeny [Mahajanga Prov.]** • Majunga; [15°42′ S, 46°19′ E]; 5 Mar. 1924; fr; *R. Decary 2419*; P [P02071707]!, TAN! • Mahajanga. Falaise (calcaire) près de Majunga; [15°41′ S, 46°21′ E]; Feb. 1901; fl, fr; *H. Perrier de la Bâthie 1211*; K [K000432392] image!, P [P02071706, P0271709]!, TAN! • Mahajanga, Mahajanga Rural, Ambalakida, Andradia, road to La Grotte Anjiabe; 15°42′47″ S, 46°29′33″ E; 37 m; 16 Feb. 2013; fl, fr; *H. Ralimanana, J. Razanantsoa, M. Vorontsova, G. Besnard 1812*; K n.v., P [P00782941]!, TAN n.v. – **locality unknown** • s.loc.; s.d.; fl; *R. Baron 5926*; P [P02071708]! • s.loc.; s.d.; fl; *Hilsenberg & Bojer s.n.*; BM [BM013839962] image!.

Description

Plant herbaceous, with thickened *roots*, 1–2.5 mm diam.; *tubercles* less frequent than in other varieties; *leaves* 5–10, narrow, 10–44 × 0.4–1.9 cm, base almost always tapering into a short pseudo-petiole, about 1/4 the length of the blade, veins 15–28, visible; *inflorescence* solitary, 27–45 cm tall, peduncle, 20–35 cm long, very rarely branched, bracts, 1(–2), the second bract axilling an undeveloped bud, 10–24 × 2–3 mm, *rachis* 10–17 cm long, weakly branched, flowers, 1–2 per node, axilled by a subulated floral bract, 3.2–6 × 1–1.5 mm, equal to or longer than the pedicels, which are 3 to 4.2 mm long; *flowers*, 10–11 mm long, *tepals* white, unequal, narrowly ovate to narrowly elliptical, with 3 spaced veins converging at the apex (except for *Decary 2419*, which has equal tepals, 10 × 2.5 mm, and 3(–4) veins); outer tepals shorter and narrower than the inner tepals (9.5 × 1.5 mm vs 11 × 2 mm), anthers 4.5–7.5 × 1–1.5 mm, the connective appendage short, triangular or reduced to a simple flange; *gynoecium*: ovary, 1.5–2 × 2 mm, ovules, 8 per locule, style, 11–11.5 mm long; *capsule* almost as tall as wide, 6–7 × 7–8 mm; *seed* 2.3–3.5 × 2.5–4.5 mm.

Phenology

Flowering occurs from February to March, and fruiting from March onwards.

Distribution and ecology

This variety is distributed primarily in the western part of Madagascar, near the sea, in the vicinity of Mahajanga. It flourishes in localities with limestone or clay soils, particularly in exposed and rocky areas.

18.2 *Chlorophytum madagascariense* var. *boinense* Bard.-Vauc. & M.Pignal var. nov.
urn:lsid:ipni.org:names:77324173-1
Figs 7G, 29–30, Table 4

Diagnosis

Varietatibus alteris Chlorophyti madagascariensi Bard.-Vauc. & M.Pignal *affinis, sed robustiore habitu, foliis majoribus (plus quam 61 cm vs ut maximum 50 cm), inflorescentis acrogenis (vs simplicesbasigenasque), internis tepalis latioribus vel quasi similaribus externis) nervis tepalorum confertis (vs remotos) praecipue differt.*

Etymology

The taxon refers to the type locality, the Boina Region, also known as Boeny.

Type material

Type

MADAGASCAR – **Boeny [Mahajanga Prov.]** • Lac Kinkony, Ambongo; [16°12′30″ S, 45°56′30″ E]; May 1902; fl, fr; *H. Perrier de la Bâthie 1441*; alluvions; holotype: P [P02071702]!; isotype, P [P02071703]!.

Paratype

MADAGASCAR – **Boeny [Mahajanga Prov.]** • Soalala; [16°06S, 45°20′ E]; 18 Apr. 1955; fl, fr; *s.c. RN 7346 (Randriamiera)*; P [P06169838]!.

Description

Plant herbaceous, with a subterranean part having thickened *roots*, 1–2 mm diam.; *leaves*, 5–9, narrow, conduplicate, 13–60 cm long (and possibly longer due to a truncated apex) × 0.4–0.8 cm, base straw-yellow on dried material, followed by a short pseudo-petiole, 4–5 cm long, veins, 25–36, visible, the lower surface of the blade scabrous; *inflorescence* 35–94 cm long; peduncle, (21–)35–69(–77) cm long, branched, bearing a large bract at the point of branching (i.e., just at the base of the main rachis), 16–18 × 1.5–2 mm; frequently with several branches at the basal node, the *flowering rachises* 10–17 cm long, flowers, 1–2(–3) per node, axilled by a triangular pointed bract, 3.5–4 × 1–2 mm, longer or shorter than the pedicel which is 3–3.5 mm long, with an inframedial articulation, 1–1.5 mm above the base; *flowers* 8 to 12 mm long, *tepals* narrowly elliptical, white, with a dark spot at the apex of the outer tepals (fide *Perrier de la Bâthie 1441*), outer tepals narrower than the inner tepals, outer tepals 1.8 to 2.0 mm long with 3 veins, inner tepals 2.3–2.5 mm long with 4(–5) veins; *stamen*: anthers 4.0–4.5 × 0.9–1.2 mm, the connective appendix elongate, 0.2–0.4 mm long, with a triangular base; *gynoecium*: ovary 1 × 0.8 mm, ovules, 6 per locule, style filiform, 10.5–13 mm long; *capsule* wider than tall, 5–7 × 7–8 mm; *seed* 2.5–3 × 3–3.4 mm, with a broad, triangular, slightly protruding radicle.

Phenology

This variety flowers in April and May, with fruiting known to occur in April and May. *Perrier de la Bâthie 1441* noted “une deuxième floraison tardive d’une plante qui fleurit d’ordinaire en décembre” [a second late flowering of a plant that usually flowers in December].

Distribution and ecology

The taxon has been collected in the western region of Madagascar, in the Boeny Region, near Lac Kinkony (southwest of Mahajanga), on barren hills with soil composed of ancient alluvium, and near Soalala at an altitude below 100 m.

Fig. 29. *Chlorophytum madagascariense* var. *boinense* Bard.-Vauc. & M.Pignal var. nov. holotype; *H. Perrier de la Bâthie 1441*, P [P02071702]. **A**. Habit. **B**. Inflorescence. **C**. Flower. **D**. Stamen, posterior face. Drawing by Laurence Ramon.

18.3 *Chlorophytum madagascariense* var. *pervillei* Bard.-Vauc. & M.Pignal nom. nov.
urn:lsid:ipni.org:names:77324181-1
Fig. 30, Table 4

Basionym: *Chlorophytum gramineum* var. *typicum* H.Perrier, *Notulae Systematicae. Herbier du Muséum de Paris. Phanérogramie (Paris)* 5 (1): 57 (Perrier de la Bâthie 1935), nom. illeg.

Chlorophytum rutenbergianum Vatke (Vatke 1887: 138) – **Type:** MADAGASCAR – **DIANA Region [Antsiranana Prov.] •** Nossibe, Domaine du Sambirano; 12 Mar. 1878; fl, fr; *C. Rutenberg s.n.*; holotype: BRNU [BRNU347452] image!.

Etymology

This new name is dedicated to Auguste Pervillé (1840–1868?), gardener and botanist at the Muséum national d'Histoire naturelle in Paris, later a planter, who worked in Nossi-Bé and north-western Madagascar in the 1840s, as well as in the Seychelles (Dorr 1997).

Type material

Type

MADAGASCAR – **Boeny [Mahajanga Prov.] •** Ambongo; [16°20′ S, 46°20′ E]; 13 Feb. 1841; fl; *A. Pervillé 579*; sables humides; lectotype: K [K000432394] image!, **here designated**; isolectotypes: P [P01046118, P01046119, P01046120]!.

Paratype

MADAGASCAR – **Boeny [Mahajanga Prov.] •** NW Madagascar, Ambongo; [16°20′ S, 46°20′ E]; 13 Feb. 1841; fl, fr; *A. Pervillé 580*; K [K000432393] image!, L [L1439979, L1439981] image!, P [P02071704, P02071705]!.

Description

Plant herbaceous, with a subterranean part having thickened *roots*, 1–1.5(–2) mm diam.; *leaves* 5–9, narrow, 23–47 × 0.4–0.8 cm, with a base tapering into a pseudo-petiole representing between 1/4 and 1/3 of the blade length, veins 15–28, visible; *inflorescence* rigid, 44–70 cm tall, peduncle 32–55(–65) cm long, branched from the base, the *rachises* 6–15(–17) cm long, with a large bract at the node, 18–31 × 3 mm, flowers, 1–3 per node, floral bract triangular and pointed, 4.5–5 × 2 mm, longer than the pedicel, with a scabrous margin, pedicel 3.5–4 mm long, with an inframedial articulation; *flowers* 8–10 mm long, *tepals* white, veins 3, spaced; anthers 4 × 1.2 mm, the appendix of the connective short, triangular; *gynoecium*: ovary 1 × 0.8 mm, ovules 5 or 6 per locule, style 10 mm long; *capsule* generally as long as wide, 7–8 × 7.5 mm; *seeds* black, 2–2.5 × 3 mm.

Phenology

Flowering is known to occur from January to February, with fruiting beginning in February.

Distribution and ecology

The taxon occurs in western Madagascar, both on the island of Nosy Be, probably on volcanic substrates, and in Ambongo, on sand.

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. VIII 8–10.

Nomenclatural remark

Without having seen the type of *C. rutenbergianum* Vatke (*Rutenberg s.n.*), H. Perrier de la Bâthie considered it as a synonym of *C. gramineum* var. *madagascariense*. In his work (Perrier de la Bâthie 1935), he mentioned encountering the plant on Nosy Be without collecting it. He described it as the "forme habituelle des rocailles et des lieux découverts" [typical form of rocky and open places]. However, upon examining the photo of the type deposited at BRNU, it seems to correspond more closely to the variety *pervillei* due to its general 'graminoid' habit, its leaves with a pronounced pseudo-petiole and narrow blade, whereas the type variety has shorter and wider leaves with a much shorter pseudo-petiole.

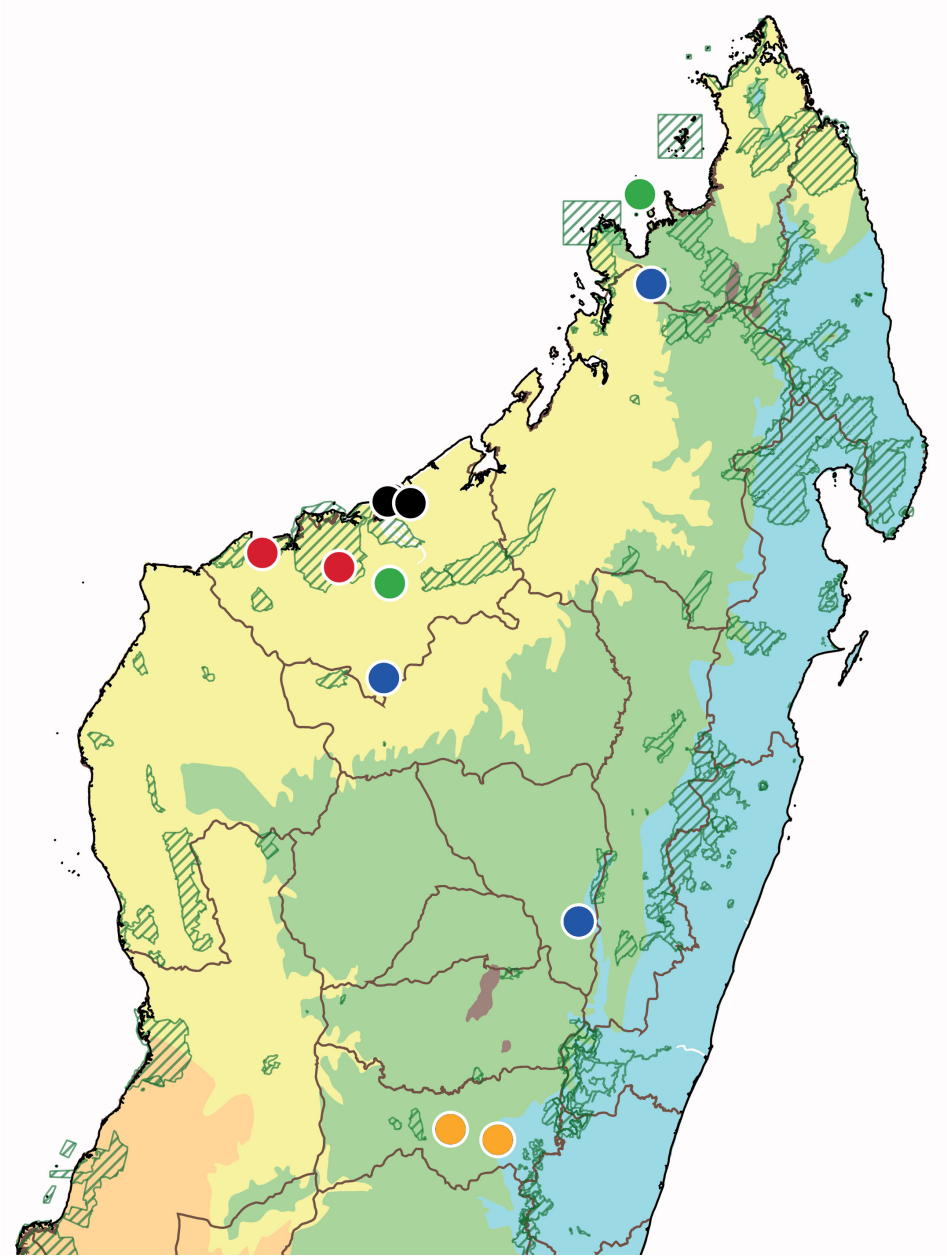


Fig. 30. Distribution of *Chlorophytum madagascariense* Baker var. *madagascariense* (black dots), var. *sciaphilum* (H.Perrier) Bard.-Vauc. & M.Pignal comb. nov. (blue dots), var. *boinense* Bard.-Vauc. & M.Pignal var. nov. (red dots), var. *pervillei* Bard.-Vauc. & M.Pignal nom. nov. (green dots), and aff. *madagascariense* (orange dots).

18.4 *Chlorophytum madagascariense* var. *sciaphilum* (H.Perrier) Bard.-Vauc. & M.Pignal comb. nov.
urn:lsid:ipni.org:names:77324172-1
Figs 7F, 30, Table 4

Basionym: *Chlorophytum gramineum* var. *sciaphilum* H.Perrier, *Notulae Systematicae. Herbier du Muséum de Paris. Phanérogramie (Paris)* 5 (1): 57–58 (Perrier de la Bâthie 1935), nom. illeg.

Type material

Type
MADAGASCAR – **DIANA Region [Antsiranana Prov.] •** Manongarivo, Ambongo; [14°01′ S, 48°21E]; Feb. 1903; fl; *H. Perrier de la Bâthie 10950*; bois sablonneux; lectotype: P [P01046105]!, **here designated**; isolectotypes: K [K000432391] image!, P [P01046106]!.

Paralectotype
MADAGASCAR – **Boeny [Mahajanga Prov.] •** Causse d'Ankara, bois de Bekambo; [17°04′ S, 46°17′ E]; Jan. 1902; fl; *H. Perrier de la Bâthie 10949*; P [P02275835]!.

Other material examined

MADAGASCAR – **Analamanga [Antananarivo Prov.] •** Ambatolaona; [18°56′ S, 47°53′ E]; Sep. 1905; *C. d'Alleizette 7432*; L [L.1450137] image!.

Description

Plant herbaceous, with a subterranean part having thickened *roots*, 1 to 1.5 mm in diam., bearing numerous ovoid tubercles, smaller than those of other varieties (7–24 × 2–8 mm vs 12–30 × 2–7 mm); *leaves* 5–7, 26–58 × 0.8–1.8 cm, with a base gradually tapering to a narrow pseudo-petiole, more than 1/3 of the total blade length, veins 16–30, conspicuous; *inflorescence* 42–62 cm long, solitary, peduncle 33–42 cm long, *rachis* 7–14 cm long, branched or not, with a triangular foliaceous bract situated ca 1.5 cm below the inflorescence, the bract tapering, 9–12 × 2 mm; with 1–3 flowers per node, floral bract triangular and pointed, 3.2–4.5 × 1.5 mm, with a scabrous tip, pedicel 3–3.5 mm long, with an infra-medial to medial articulation; *flowers*, 9.5 mm long, *tepals* white, narrowly elliptical, subequal, 9 × 1.8–2 mm, with 3 spaced veins converging at the tip; *stamens* 6, of which 4 with filaments 3 mm long, the base 0.35 mm wide, flat, narrowing to the apex, and 2 stamens with the filaments finer, long; anthers 4.5–5.0 × 1.1 mm, connective appendage short, triangular, extending beyond the base of the anthers; *gynoecium*: ovary 1.0 × 0.8 mm, ovules 6 per locule, style 10.5 mm long; *(immature) capsule* broader than high, 7 × 9 mm, with thickened sutures; *(immature) seeds* black.

Phenology

The species flowers from January to February, although the collection *Alleizette 7432* was in flower in September, and fruits develop from February.

Distribution and ecology

This variety is found in the northwest, specifically in the Manongarivo massif and on the Ankara plateau in Boina. It grows on sand and limestone substrates, in wooded areas (according to Perrier de la Bâthie 1935, 1937 [1938]). *Alleizette 7432* was collected in humid forest on the eastern slopes of Madagascar on granitic or metamorphic substrates at an altitude of 1400 m – higher than that of the other known collections, and this significantly extends the variety's distributional area eastwards. In contrast, the other varieties of the species tend to grow in open areas.

Nomenclatural remark

The specimens preserved at P bear the determination by H. Perrier de la Bâthie: "*C. gramineum* var. *typicum*". However, they are cited as being syntypes of *C. gramineum* var. *sciaphilum* comb. nov. in the protologue (Perrier 1935), clearly the author omitted to redetermine the material after the establishment of this variety. We have chosen P01046105 as the lectotype of this variety, the specimen has flowers and a fruit.

Chlorophytum* aff. *madagascariense Baker
Fig. 30

Material examined

MADAGASCAR – **Amoron'i Mania [Fianarantsoa Prov.]** • Environs d'Ambatofinandrahana (Betsileo); [20°33′ S, 46°48′ E]; 16 Jan. 1955; fr; *H. Humbert 28080*; P [P06169849]! • km 15, RN 35, Ivato; [20°38′ S, 47°10′ E]; 24 Dec. 1965; fl, fr; *M. Peltier & J. Peltier 5626*; P [P06169903]!.

Geographical and morphological remarks

The collections included here are well beyond the known distribution range of *C. madagascariense* var. *madagascariense*. They originate from the high plateau of Madagascar, on granitic or metamorphic substrates, at an altitude of 1500 m or more; while the typical variety is found near Mahajanga, close to the coast on limestone. Their ecology is therefore very different.

Although the morphology allows us to associate these specimens with *C. madagascariense* var. *madagascariense*, they are nevertheless incomplete. The first, *Humbert 28080*, is more abundant with a complete infructescence and vegetative part, but lacks flowers. The second, *M. Peltier & J. Peltier 5626*, lacks underground parts, and has only two detached and poorly preserved leaves, detached inflorescences and only a single flower. Despite the lacking features, it seems to us that varietal separation is pertinent and a broad concept of *Chlorophytum madagascariense*, divided into varieties is justified.

19. ***Chlorophytum meridionale*** Bard.-Vauc. & M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324174-1
Figs 3I–K, 6E, 7E, 31–33, Table 5

Diagnosis

Chlorophyto madagascariensi affinis, sed tuberculis raris (vs numerosa), foliorum inferne pagine densa asperitate (vs raram), inflorescentiis pluribracteatis (vs unibracteatam), floribus majoribus (9–12 mm vs 8–10 mm), tepalis tribus nervis confertis (vs remotos), staminibus inaequalibus (vs aequalia), praecipue differt.

Etymology

The specific epithet refers to the distribution of the taxon, limited to the southern quarter of Madagascar.

Type material

Type

MADAGASCAR – **Androy [Toliara Prov.]** • Androy, environs d'Antanimoro, 30–35 km au nord d'Ambia; [24°33′59″ S, 45°49′49″ E]; Feb. 1955; fl, fr; *H. Humbert 28824*; holotype: P [P06169895]!; isotype: G!.

Paratypes

See under the subspecies.

Description

Plant herbaceous, 30 to 80 cm tall, rhizomatous; *roots* fasciculate, predominantly thickened, 1–2(–3) mm in diam., but some finer roots also present; *leaves* (4–)7–14, sheathing at the base, ascending or sometimes spreading, graminoid to narrowly lanceolate, 13–60 × 0.4–2.5 cm, surrounded by a fibrous sheath formed by the remnants of older leaves, margins somewhat undulate near the base of the blade, hyaline, scabrous or obscurely scabrous depending on the variety, veins 15–27; *inflorescence* simple or branched, mostly 33–80 cm tall (occasionally more); peduncle 17–60 cm long, bearing on the upper third 1 or 2(–3) triangular, subulate bracts with a broad base, 1–11 × 0.35–0.60 cm, the most apical bearing an axillary ramification to the inflorescence branch, bracts variable in size, with sometimes scabrous margins and surface, veins 5–19, *rachis* 5–35 cm long, flowers 1–3(–4) per node, floral bracts subulate, triangular with

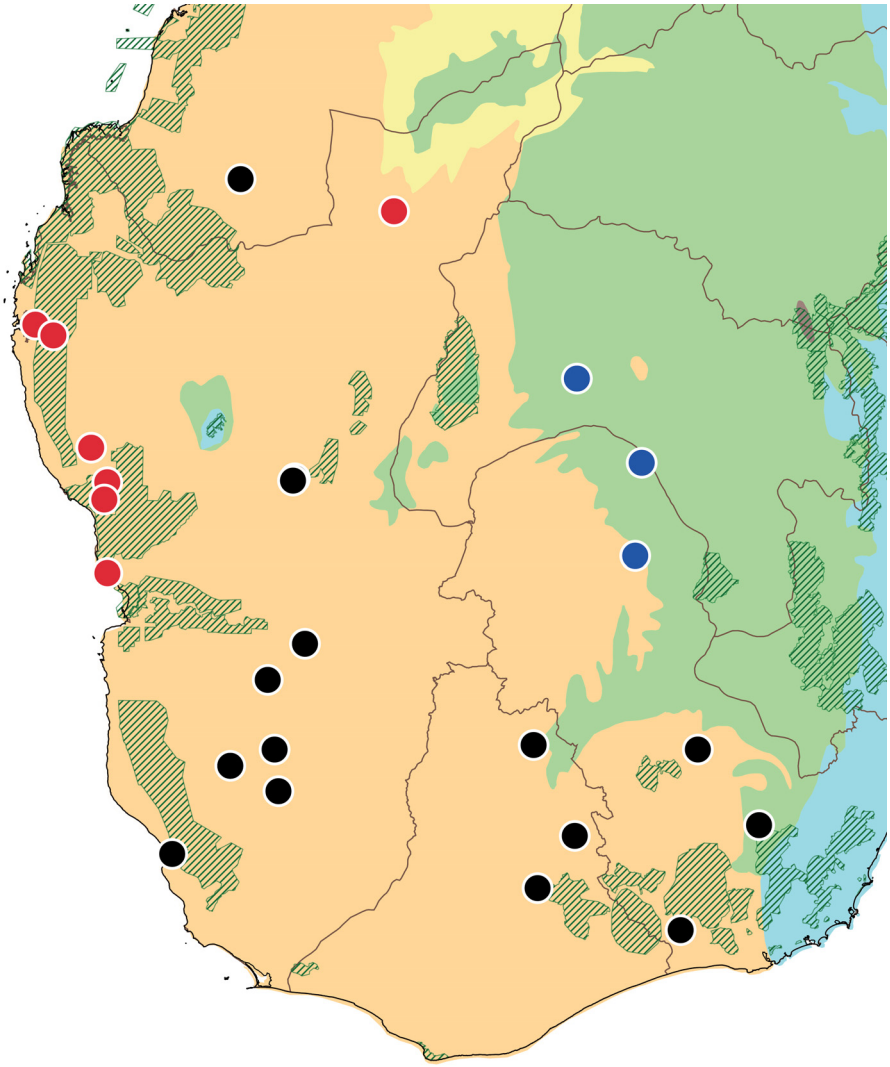


Fig. 31. Distribution of *Chlorophytum meridionale* Bard.-Vauc. & M.Pignal sp. nov. subsp. *meridionale* (black dots); subsp. *ihosyense* Bard.-Vauc. & M.Pignal subsp. nov. (blue dots); subsp. *tulearense* Bard.-Vauc. & M.Pignal subsp. nov. (red dots).

3–8 veins, pedicel with an inframedial articulation; *flowers* weakly zygomorphic (due to the position of the ovary and the curvature of the style); *perianth* white, 9–12 mm long, with elliptical segments, apex acute, the outer tepals narrower than inner, veins 3(–5), closely spaced in the centre, sometimes with 2 external non-convergent veins (*Homolle 1620*, *McPherson et al. 17423* and *Afzelius s.n.*); *stamens* shorter than the perianth (sometimes only slightly), usually arranged in 2 groups – one group with long, thin filaments and long anthers, the other with more robust filaments and shorter anthers, grouped most frequently 2+4, but occasionally 3+3, and more rarely 1+5 (*Seyrig 448C*), or occasionally the stamens not grouped; filaments flattened, anthers yellow, basifixed, the connectives with a blunt or obtuse pointed heel; *gynoecium*: ovary longer than wide, 1.2–2.8 × 0.8–2 mm, ovules (6–)8–10(–16) per locule; style filiform, 7–14 mm long, leaning towards the shorter stamens, and exceeding the perianth in length; stigma rounded; *capsule* longer than wide.

Provisional IUCN Red List assessment

Chlorophytum meridionale sp. nov. is endemic to Madagascar, where it is widely distributed in the southwest and south-central areas. It is known from at least 24 collections, and a total of 10 occurrences are known for the species as a whole. However, these include only six occurrences that have been documented in the past 25 years. The species is therefore assessed as DD, and further exploration is needed in the vicinity of the historical and recent localities is needed in order to assess the threats to the species and to provide a meaningful assessment for the species and its component subspecies.

Key to subspecies of *C. meridionale* sp. nov. (see also Table 5)

1. Pseudo-petiole present; leaves 5–10 (rarely 14), growing on sandy substrates .... ***C. meridionale* subsp. *tulearense*** Bard.-Vauc & M.Pignal subsp. nov.
– Pseudo-petiole absent; leaves 4–9 (rarely 11), not known from sandy substrates 2

2. Perianth segments equal; limb 0.4–0.5 cm wide .... ***C. meridionale* subsp. *ihosyense*** Bard.-Vauc & M.Pignal subsp. nov.
– Perianth segments unequal; limb 0.8–2.5 cm wide .... *C.* ***meridionale*** Bard.-Vauc & M.Pignal sp. nov. **subsp. *meridionale***

19.1 *Chlorophytum meridionale* Bard.-Vauc. & M.Pignal sp. nov. **subsp. *meridionale***

Figs 6J–K, 31–33, Table 5

Type material

Paratypes

MADAGASCAR – **Androy [Toliara Prov.]** • Antanimora; [24°48′30″ S, 45°39′29″ E]; Dec. 1959; fl; *J. Bosser 13958*; P [P06169875]! • Ampandrandava; [24°8′44″ S, 45°38′23″ E]; Mar. 1943; fr; *A. Seyrig 430*; P [P06169879]! • Ampandrandava entre Bekily et Tsivory; [24°8′44″ S, 45°38′23″ E]; 1944; fl; *A. Seyrig 448B*; P [P06169835]! • same data as for preceding; *A. Seyrig 448C*; P [P06169845]!. – **Anosy [Toliara Prov.]** • Fort Dauphin, vallée du Mandraré; [24°57′59″ S, 46°17′26″ E]; 4 Aug. 1926; fl; *R. Decary 4598*; P [P02157242]! • Isomony, NW Maroamby (Betsioky), vallée de la Manambolo; [24°9′59″ S, 46°24′0″ E]; Dec. 1933; fl bud, fr; *H. Humbert 12791*; G!, K!, MO!, P [P06169886, P06169883]! • Vallée Manambolo, confluent Sakamalio, environ d'Isomono [Isomony] Mont Morahariva; [24°32′ S, 46°38′ E]; Dec. 1933; fl; *H. Humbert 13111*; P [P06169898, P06169899, P06169901]! • Plateau Mahafaly, Ankaliano, W Edjeda; [23°49′52″ S, 45°42′58″ E]; fl, fr; Mar. 1960; *M. Keraudren 830*; P [P06169889]!. – **Atsimo-Andrefana [Toliara Prov.]** • Toliara, Vallée de l'Onilahy, Entre Bevoay et Itafoka, 6 km après le village d'Ankotrofotsy, falaise au bord de la piste le long du fleuve; 23°29′17.9″ S, 44°2′45.0″ E; 83 m; 8 May 2024; *M. Bardot-Vaucoulon 2038*; végétation xérophyte, grands arbres de type *Ficus* et *Moringa*, isolés, arbustes souvent épineux et ou à feuilles réduites, plantes ripicoles; pente de vallon calcaire bordé de

Table 5. Comparison of subspecies of *Chlorophytum meridionale* Bard.-Vauc. & M.Pignal sp. nov.

Taxon	***C. meridionale* sp. nov. subsp. *meridionale***	***C. meridionale* subsp. *tulearense* subsp. nov.**	***C. meridionale* subsp. *ihosyense* subsp. nov.**
Leaves	4–7, ascending and/or spreading, width 0.8–2.5 cm; no pseudo-petiole	5–10 (rarely 14), ascending, 0.4–1.8 cm wide, frequent pseudo-petiole	4–5(rarely 11), ascending, narrow, 0.4–0.5 cm, rolled up; no pseudo-petiole
Leaf blade: margin, lower surface.	scabrous, with asperities	more or less scabrous, with small asperities	scabrous, without asperities
Inflorescence	simple or sparsely branched	branched	simple
Flower	stamens in two groups: 2 long, 4 short or 1 long, 5 short	stamens in two groups of almost equal length	stamens in two groups: 2 long, 4 short or 1 long, 5 short

zones escarpées; dans les rochers, sol peu profond argilo calcaire, avec diverses succulentes: *Aloe* ssp., *Euphorbia tulearense*, *Xerosicyos* sp., *Oeceoclades* ssp., sol déstabilisé par le passage des chèvres; MO!, P [P02275956]!, TAN! • Toliara, Vallée de l'Onilahy, rive gauche, proximité village d'Anantsakoa; 23°33′14.3″ S, 44°5′51.9″ E; 69 m; 10 May 2024; *M. Bardot-Vaucoulon & J.-D. Randrianandrasana 2051*; végétation xérophyte, arbustes souvent épineux et ou à feuilles réduites, plantes ripicoles et lianes sur une falaise; falaise calcaire avec des ressauts; sur une terrasse, sol peu profond argilo calcaire, avec diverses xérophytes arbustives ou herbacées: *Stapelianthus insignis*, *Xerophyta*, *Aloe* sp., *Asparagus* sp., *Oeceoclades* ssp.; MO!, P [P02275955]!, TAN! • Toliara, Vallée de l'Onilahy, rive gauche, proximité village d'Anantsakoa; 23°33′12.5″ S, 44°5′47.3″ E; 94 m; 10 May 2024; *M. Bardot-Vaucoulon & J.-D. Randrianandrasana 2052*; végétation xérophyte, clairsemée, fourré arbustif épineux, strate herbacée réduite, souvent sous les arbustes; plateau calcaire au-dessus d'une falaise, sol caillouteux, peu profond, argilo calcaire; P [P02275954]!, TAN! • Tsarasao, Sud de Sakaraha; [22°54′42″ S, 44°32′4″ E]; 14 Feb. 1970; fr; *J. Bosser 19916*; P [P06169882]! • SW, coastal plain. ca 2 km north of Itampolo on route to Lavavolo; 24°39′0″ S, 43°58′0″ E; 8 Feb. 1990; fl; *B. Du Puy, D.J. Du Puy, J.-N. Labat & P.B. Phillipson MB 635*; P [P00075261]!, TAN! • Ambaty, route Betioky, clairières Mahafaly; [23°50′38″ S, 44°24′32″ E]; 18 Mar. 1960; fl; *M. Keraudren 783*; B!, P [P06169891]! • Tuléar, RN 10, km 111, entre Betioky et Ejeda; 23°51′0″ S, 44°24′0″ E; 10 Feb. 1990; fl, fr; *J.-N. Labat, B. Du Puy, D. Du Puy, P.B. Phillipson 2105*; BR [BR0000021756610] image!, MO [MO-3020309] image!, P [P06169902]!, WAG [WAG.1151260] image! • Ankazoabo, forêt sèche de Berenty; [22°11′29″ S, 44°00′00″ E]; Feb. 1967; fl; *P. Morat 2511*; TAN! • Piste de Sakaraha à Bezaha; Feb. 1968; fl; *P. Morat 2980*; TAN! • Tsaramasao, 20 km S de Sakaraha; [22°56′25″ S, 44°32′ E]; Mar. 1970; fr; *P. Morat 3506 p.p.*; P [P06169920]! • Tuléar, Beza Mahafaly près de Betioky; [23°40′36″ S, 44°34′53″ E]; 6 Jan. 1988; fl bud; *P.B. Phillipson 2815*; P [P06169844]! • Sakaraha, Mahaboboka, Marotsiraka-Betsileo, village le plus proche: Antsiritsy. Vestige forestier d'Antsitavohabe; 22°43′55″ S, 44°14′00″ E; 781 m; 31 Mar. 2019; fl; *N. Rakotoarivelo, T. Randrianarivony, Faeo, Milasoa & Rebesa 985*; forêt sèche sur substrat rocailleux, sur pente de 60°–70°; MO [MO-4258122] image!, P n.v., TAN n.v. – **Menabe • [Toliara Prov.] •** SW Madagascar, 10 km SW Manja; [21°28′ S, 44°17′ E]; 23 Jan. 1974; fl; *O. Appert 530*; colline, entre des blocs calcaires en forêt; TAN!. – **locality unknown •** s.loc.; s.d.; fl; *Homolle 1620*; P [P06169876]!.

Description

Plant herbaceous, 30–60 cm tall; basal stem forming a *rhizome*; *roots* fasciculate, some fine, but others predominantly strongly thickened, 1–2(–3) mm in diam., with swellings and with very few (2–3) oval or round tubercles, 25 × 10 mm (*Bosser 13958*, *Bardot-Vaucoulon 2038*, *Bardot-Vaucoulon & Randrianandrasana 2052*, and *Labat et al. 2105*); *leaves* (4–)7, ascending or sometimes spreading, graminoid, 13–60 × 0.8–2.5 cm, conduplicated, sheathing at the base, covered on the underside with

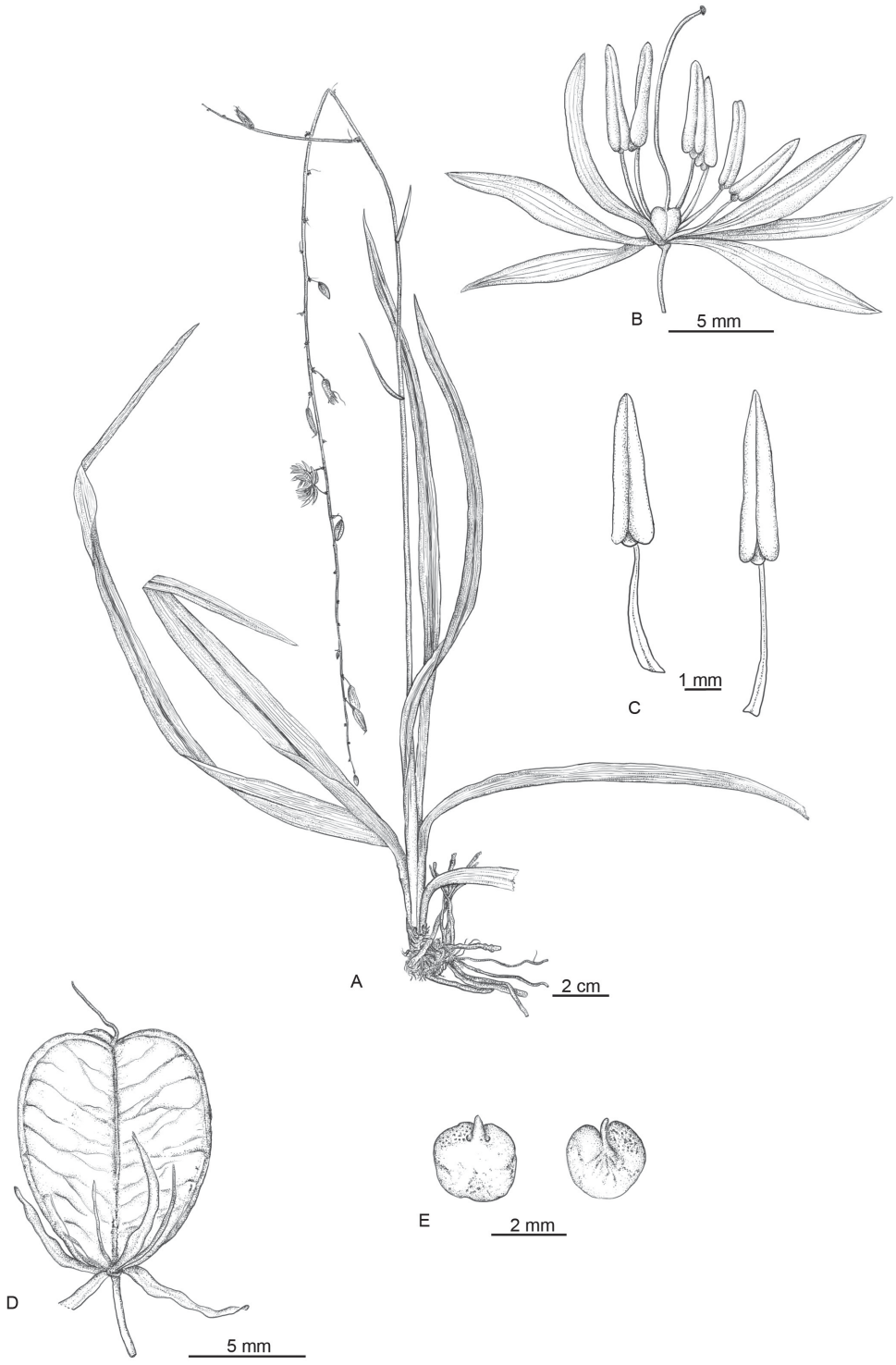


Fig. 32. *Chlorophytum meridionale* Bard.-Vauc. & M.Pignal sp. nov. subsp. *meridionale*. **A**. Habit. **B**. Flower. **C**. Stamens, two types, posterior face. **D**. Fruit. **E**. Seed, two faces. A–C after holotype, *Humbert 28824*; P [P06169895]; D–E after *Bosser 19916*, P [P06169882]. Drawing by Laurence Ramon.

small white rough, regularly aligned patches, including on the veins, leaf blade attenuate and pointed at the apex, with a marked pseudo-midrib, veins 15–20; *inflorescence* solitary, simple or more often slightly branched, 33–80 cm high (and more), peduncle, 17–60 cm long, bearing on the upper third, 1 or 2 triangular, acicular bracts, 1–11 × 0.35–0.6 cm, with (8–)14–15(–19) veins, sometimes with scabrous margins and surface, *flowering* portion of the *rachis* 10–35 cm long, flowers 2–(3–4) per node near the base, floral bracts triangular and acicular with 5 veins, shorter or longer than the pedicel, the latter 4–8 mm long, with an inframedial articulation, 1–1.5 mm above the base; *flower* with a white perianth, 9–12 mm long; *tepals*, the outer slightly narrower than the inner ones, (1.2–)1.5(–2.3) mm wide, the inner (1.8–)2(–2.8) mm wide, with 3 closely spaced veins in the centre (one collection, *Homolle 1620*, with two additional lateral veins), incomplete, convergent at the tip, green in vivo, brown when dry; stamens in two groups, almost equal to the perianth, the first with long, slender filaments, 4.5–6 × 0.1 mm and elongated anthers tapering at apex, 4–6 × 0.8–1 mm, the second with shorter, broader filaments, 3.5–5 × 0.2 mm and shorter, broader anthers, 3.8–5 × 1–1.2 mm, all with a small basal heel (see Figs 3K, 7E), flat and blunt; *gynoecium*: ovary 1.2–2 × 1–1.5 mm, ovules, 8–10 per locule, style 8 to 14 mm long; *capsule* taller than wide, large, 1 × 0.8 cm, with thickened suture margins and transverse veins; *seed* flattened, glossy, black, orbicular, 2 mm in diameter, slightly notched, with a broad radicle forming a point distinctly extending beyond the seed's edge.

Phenology

The flowering occurs from December to March and can extend until June, fruits have been documented from February to March.

Distribution and ecology

The typical subspecies is found in the southern regions (mainly in Anosy, Androy and Atsimo-Andrefana Regions, but also extending into the S of Menabe) including on the Horombe Plateau, corresponding to the sub-arid bioclimatic zone, as defined by Cornet (1972) and simplified by Schatz (2001). It thrives on various substrates, both crystalline and limestone, on sandy soils or among rocks including steep cliffs shaded part of the day, and is commonly encountered in deciduous dry forests, open shrublands, and rocky open areas. The other subspecies are typically associated with sandy soils (*C. meridionale* subsp. *tulearense* subsp. nov.) and metamorphic substrates (*C. meridionale* subsp. *ihosyense* subsp. nov.).

Morphological remark

The development of an adventitious plantlet at the level of the lower bract was observed on the peduncle of the flower spike of the collection *Bosser 13958*.

19.2 *Chlorophytum meridionale* subsp. *ihosyense* Bard.-Vauc. & M.Pignal subsp. nov.

urn:lsid:ipni.org:names:77324177-1

Figs 31, 33, Table 5

Diagnosis

A typo differt foliis linearibus angustatioribus (0.4–0.5 cm vs 0.8–2.5 cm), nervis minus numerosis (15–19 vs 15–27), inflorescentiis simplicibus (vs ramosas), ovulis per loculum pluribus (8–9 ad 14–16 vs 8–10).

Etymology

The specific epithet refers to the type locality, which is located on the road from Ihosy to Betroka.

Type material

Type

MADAGASCAR – **Androy [Toliara Prov.]** • PK 65-66, route Ihosy à Betroka; [22°50′ S, 46°08′ E]; Feb. 1963; fl; *J. Bosser 17509*; rocher temporairement humide; holotype: P [P06169913]!.

Paratypes

MADAGASCAR – **Androy [Toliara Prov.]** • Plateau de l'Horombe, au Sud de Ihosy; [22°27′ S, 45°50′ E]; ca 1000 m; Mar. 1934; fl, fr; *H. Humbert 14427*; P [P06169916]!. – **Anosy [Toliara Prov.]** • Androtra, district de Betroka; [23°16′12″ S, 46°06′36″ E]; 12 Feb. 1961; fl; *J. Peltier & M. Peltier 2771*; P [P06169872]!.

Description

Plant herbaceous, 37–60 cm tall; *roots* fasciculate, 0.5(–3) mm in diam., with 4–5(11) linear, narrow, conduplicate or convolute leaves; blade, 18–44 × 0.4–0.5 cm, smooth on the underside, with 15–19 veins; *inflorescence* 1 per plant, unbranched, 36 to 68 cm tall, peduncle 29–49 cm long, with 1 or 2 triangular bracts 1.2–5 × 0.2–0.3 cm, narrow, acicular, with smooth margins and surface, with 5–12 veins, *rachis* 5–10 cm long, 1–2 flowers per node, floral bracts triangular and acicular, 9–9.5 × 1.5–2 mm with 3–6 veins, longer than the pedicel, which is 4–5 mm long, inframedial articulation; *flower* with white perianth, 10.5–11 mm long; outer tepals 1.5–2 mm wide, inner tepals 2–3 mm wide, with 3 closely spaced veins in the centre; *stamens* shorter than the perianth, in 2 groups, the first with fine, long filaments, 5–5.5 × 0.1–0.15 mm and anthers 5–5.5 × 1.1–1.3 mm, the second with filaments 4–4.5 × 0.15–0.2 mm and anthers 4.5–4.8 × 1.1–1.3 mm, with a short and rounded connective heel; *gynoecium*: ovary 1–1.5 × 0.8–1 mm, with 8–9 or 14–16 ovules per locule (see Morphological remark), style 10–11 mm long; *capsule* 11.5 × 7 mm, with thickened suture margins and transverse veins; *seed* flattened, shiny, black, orbicular, 2.5–3 mm in diam., with a prominent radicle.

Phenology

This subspecies flowers in February and begins to bear fruit in March.

Distribution and ecology

The species is found on the eastern edge of the Horombe Plateau, at an altitude of 1000 m and above, on metamorphic rocks (gneiss) in secondary grasslands subject to annual burning or in vegetation on temporarily moist rocks.

Morphological remark

The type collection (*Bosser 17509*) has twice as many ovules per locule as the collections of the type subspecies and even the paratypes of the present subspecies. However, the latter share with the type linear leaves with narrower laminae, fewer veins, simple inflorescences, and similar flowers. This has led us to include all these collections in the same taxon.

19.3 *Chlorophytum meridionale* subsp. *tulearense* Bard.-Vauc. & M.Pignal subsp. nov.

urn:lsid:ipni.org:names:77324176-1

Figs 3I, 31, 33, Table 5

Diagnosis

A typo differt foliis plus numerosis (5–14 vs 4–7), inflorescentia majore, staminibus quasi aequalibus (vs valde inaequalia).

Fig. 33. A–B. *Chlorophytum meridionale* subsp. *tulearense* Bard.-Vauc. & M.Pignal subsp. nov. **A**. Habit. **B**. Leaf, abaxial surface. **C**. *Chlorophytum meridionale* subsp. *ihosyense* Bard.-Vauc. & M.Pignal subsp. nov., habit. A–B after holotype, *R. Ranaivojaona & al 311*, P [P06169869]; C after holotype, *J. Bosser 17509*, P [P06169913]. Drawing by Laurence Ramon.

Etymology

The epithet of the subspecies refers to the type locality in the Toliara Province (Tuléar).

Type material

Type

MADAGASCAR – **Atsimo-Andrefana [Toliara Prov.]** • Forêt de Mikea, axe Ankilimihavotse-Ankindranoke, Basibasy, Morombe; 22°12′ S, 43°20′ E; 0–50 m; Jan. 2000; fl; *R. Ranaivojaona & al 311*; holotype: P [P06169869]!; isotypes: G!, MO [MO-3020313]!, TAN n.v.

Paratypes

MADAGASCAR – **Atsimo-Andrefana [Toliara Prov.]** • Tuléar, Manasao, Anosy; [23°21S, 43°40′ E]; 11 Jan. 1913; fl; *K. Afzelius s.n.*; MO [MO-3020311] image!, P [P06169888]! • Belalanda, Ranobe; [23°00′46″ S, 43°39′09″ E]; 14 Mar. 2006; fl, fr; *N.M. Andrianjafy, P.B. Phillipson, R. Ranaivojaona & R. Lubke 1654*; BR [BR0000021756597]!, MO [MO-3020312]!, P [P01034163]!, TAN! • Toliara, Atsimo-Andrefana, Belalanda, Ranobe; 22°55′36″ S, 43°39′58″ E; 127 m; 25 Jan. 2007; fl; *N.M. Andrianjafy 1891*; G!, MO [MO-3020341]!, P [P02275946]!, WAG [WAG.1924729] image!, TAN n.v. • Manombo (SO), forêt d'Isonto, à l'ouest d'Ankililoaka; [22°46′ S, 43°35′ E]; 28 Jan. 1947; fl; *H. Humbert 20014*; BR!, G!, K!, MO!, P [P06169837]! • Toliara, Atsimo-Andrefana, N of Toliara, in Forêt de Mikea, 23–25 road-km W of Vorehe; [22°15′ S, 43°25′ E]; 12 Feb. 1998; fl; *G. McPherson, S. Razafimandimbison, M. Olson & B. Alongi 17423*; deciduous forest on sand; MO [MO-3020344]!, TAN! • [Makay], Beroroha, fokontany Betorabato. Village le plus proche Ambalamanga. Forêt Akolitsika (rivière); 21°40′30″ S, 044°59′37″ E; 152 m; 18 Jan. 2011; fl, fr; *R. Razakamalala 6077*; MO n.v., P [P00995950, P00995951]!, TAN n.v.

Description

Plant herbaceous, up to 80 cm tall; *roots* fasciculate, approximately 1–1.5 mm in diam.; *leaves* 5–10 (rarely 14), (always) more numerous than in other subspecies, 23–38 × 0.5–1.8 cm, narrowly lanceolate, with a scabrous to obscurely scabrous margin, covered on the underside, including the veins, with small white tubercles, regularly aligned in some portions, with a marked pseudo-midrib, and 16–27 veins; 1(–2–4) robust *inflorescences*, 60–80 cm tall, usually branched (except in *Humbert 20014*), peduncle 18 to 42 cm long, with 1 to 3 acicular bracts, (2.5–)12–15 × 0.25–0.5 cm, with a broad base, with (8–)18 veins, sometimes with scabrous margins and surface, *rachis* 12–34 cm long, 1–4 flowers per node, floral bracts triangular and acicular, (2–)4–6(–9) × 1.5–3.5 mm with 5–8 veins, shorter or of the same length as the pedicel, which is 5–6 mm long, inframedial articulation; *flower* with white *perianth*, 9 to 11 mm long; outer tepals slightly narrower than the inner tepals, outer tepals 1.5–2.5 mm wide, inner tepals 2–2.8 mm wide, with 3 closely spaced veins in the centre (except in *McPherson et al. 17423* and *Afzelius s.n.*, where there are 2 additional non-convergent veins); *stamens* in two groups, shorter than the perianth but almost equal in length, the first with fine, long filaments 4–4.5 × 0.08–0.2 mm and anthers (4.2–)5 × 0.8–1 mm, and the second with filaments (3–)3.5–4 × 0.15–0.3 mm and anthers (3.5–)4(–4.5) × 1–1.3 mm, anther basifixed, connective heel varying in shape and size, blunt to triangular (0.2 to 0.4 mm long); *gynoecium*: ovary 1–2 × 0.8–1.3 mm, with (6–)8–10 ovules per locule, style (7–)9–12 mm long; mature *capsule* unknown, *immature fruit* 9 × 6 mm.

Phenology

Flowering occurs from January to March, with fruiting taking place in March.

Distribution and ecology

All of the known collections were located in an area extending north from Toliara to Manombo, at low altitude, primarily on unconsolidated sandy substrates, growing in the undergrowth of deciduous dry

forest. One collection comes from a locality further inland to the east, in dry forest, on sandy alluvium resulting from the degradation of sandstones from the Makay Massif.

Morphological remarks

1) As in the case of the collection *Homolle 1620*, which is related to the type collection, *Afzelius s.n.* also possesses flowers with tepals having 2 additional lateral veins, often incomplete.

2) The collection *Razakamalala 6077* from the western part of the Makay Massif has characteristics that link it to *C. meridionale* subsp. *tulearense* subsp. nov., notably its large number of leaves, the wavy base of the leaf blade, and the presence of asperities on the lower surface giving it a rasp-like appearance. It also possesses large, well-branched inflorescences. However, it differs from *C. meridionale* subsp. *tulearense* by the production of 2 to 4 inflorescences per plant vs 1, or rarely 2. The information regarding the flowers and fruits is incomplete, as the specimens only contain young fruits with remains of the flowers. Despite this limitation we still confidently assign this collection to *C. meridionale* subsp. *tulearense*.

20. ***Chlorophytum namorokense*** H.Perrier
Figs 4G, 34

Chlorophytum namorokense H.Perrier (Perrier de la Bâthie 1935: 48–49).

Etymology

The epithet refers to the type locality of the species in the Tsingy de Namoroka National Park.

Type material

MADAGASCAR – **Boeny [Mahajanga Prov.] •** Domaine occidental: rochers calcaires de Namoroka, près d'Andranomavo, dans l'Ambongo; [16°24′ S, 45°17′ E]; Jan. 1904; fl, fr; *H. Perrier de la Bâthie 1700*; lectotype: P [P01046130]!, **here designated**; isolectotype: P [P01046129]!.

Description

Plant herbaceous, forming an isolated tufts, 18–25 cm in diam.; *rhizome* short, almost vertical; *roots* numerous, fasciculate, consisting of a mixture of fibrous roots – some slender with a diam. of 0.2 mm, others slightly thickened and tortuous with a diam. of 0.5–0.9 mm, bearing at the apex a fusiform tuber, 6 × 1.5–2.0 mm; *leaves* 6, spreading at ground level "étalées sur le sol" (fide Perrier de la Bâthie), 10–21 × 2.3–3.8 cm, lanceolate, the base sheathing and with a distinct pseudo-petiole, 2.3–5.0 cm long, ca 1/5th of the total leaf length, the apex tapered, and the blade margins smooth, veins 25–28, conspicuous on both surfaces; *inflorescence* 1 or 2 per plant, branched, spreading on the ground "étalées sur le sol" (fide Perrier de la Bâthie 1935), 17–30 cm long, longer than the leaves, peduncle 2–4 cm long, with a foliaceous bract at the base of the rachis, 11–27(–53) × 4(–7) mm, lanceolate, the base narrowed to a short pseudopetiole, the tip tapered, 7 to 11-veined, the margin smooth, *rachis* 13–22 cm long, with well-developed branches, about 1/3 of the length of the main axis, flowers, 3–5 per node, with a lanceolate foliaceous floral bract, 11–22 × 2.5–3.5 mm, veins 5–7, transitioning upward to triangular-shaped bracts with a tapered tip, pedicel slender, 13–17 mm longer than the bract, inframedial articulation, 4–6 mm from the base; *flowers* white, 6 mm long, with sub-equal *tepals*, elliptical with 3 spaced veins, outer tepals 5.5 × 1 mm, dark and recurved at the tip, and inner tepals 6 × 2 mm; *stamens* equal, slightly shorter than the perianth, filament fusiform, narrower at both ends, 4.5 mm long, weakly papillose, anthers yellow, 2–2.5 × 0.3 mm, reflected, then erected at anthesis, distinctly divergent at the base, dorsifixed, filament inserted in the lower third; *gynoecium*: ovary taller than wide, 1.5 × 1.2 mm, ovules 3 to 5 per locule, style 6 mm in length, surpassing the perianth, stigma thickened; *immature capsule* 8–10 × 7–10 mm, with

a nearly smooth surface and a few transverse veins, thickened sutural edges; *seeds* suborbicular, black, 2 × 2.2 mm, with a notch on the flat side, radicle barely protruding.

Phenology

The only known collection was in flower in January, and fruiting had also begun.

Distribution and ecology

Chlorophytum namorokense is only known from the centre-west, in Boina Region, where it grows in woodland on limestone rocks at Namoroka.

Provisional IUCN Red List assessment

Chlorophytum namorokense is known only from the type collection, a single occurrence that was collected nearly 90 years ago in what is now the Namoroka National Park. In addition to its protected status, the Namoroka is partly inaccessible during the rainy season, and its rugged terrain is difficult to penetrate at all times. During a recent expedition to the site (2016), in which two of the authors of this treatment participated (MBV and PBP), we were able to confirm that the native vegetation is largely intact and we

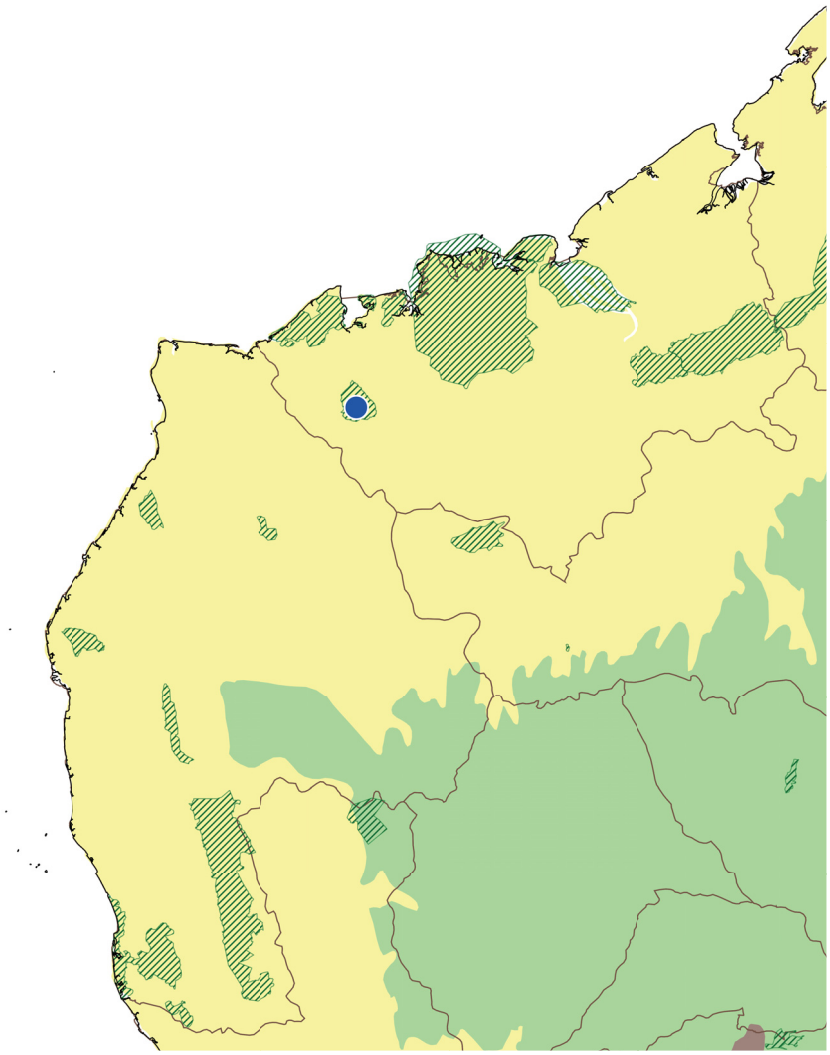


Fig. 34. Type locality of *Chlorophytum namorokense* H.Perrier (blue dot).

searched specifically for populations of *Chlorophytum namorokense*, however, we did not observe the species, and we concluded that it is rare or its appearance is somewhat ephemeral. Therefore, given the lack of new material of the species, it should be assessed DD (Data Deficient).

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. VII 12–13.

Nomenclatural remark

The two, and only known syntypes of *Perrier de la Bâthie 1700* are equivalent. We have chosen the specimen barcoded P01046130 as the lectotype.

21. ***Chlorophytum nigrogranulosum*** Bard.-Vauc. & M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324052-1
Figs 4E, 35–36

Diagnosis

Chlorophyto disticho H.Perrier *affinis, sed foliis spiralibus (vs disticha), nervis plus numerosis (26 vs 11–13), floribus minoribus, (tepalis 4.2 mm longis (vs 6.5–7), fructibus latioribus quam longis (vs longiores quam latos), nigris granulosisque (vs brunneos costatosque), praecipue differt.*

Etymology

The specific epithet refers to the appearance of the capsules, which are black and have a finely granulate indument.

Type material

MADAGASCAR – **DIANA Region [Antsiranana Prov.] •** Antsiranana, Montagne des Français, partie nord-est, montée en direction de la falaise; 12°19′28″ S, 49°20′52″ E; 4 Apr. 2007; fl, fr; *M. Bardot-Vaucoulon, G. Véné & G. Razafindrabelahasy 1662*; holotype: P [P00643195]!; isotypes: K!, MO [MO-3020338]!, TAN!.

Description

Plant herbaceous, 40 cm tall; *roots* fasciculate, rigid, white, slightly thickened, 0.8–1.0 in diam., and up to ca 4–5 cm long, and covered with long white hairs; some bearing a small fusiform tuber, 8 × 3 mm, also bearing hairs; *leaves* 7, lanceolate, 30–42 × 2.2–3.7 cm, base attenuate, pseudo-petiole 14 cm long, about 1/3 of the length of the lamina, leaf-base sheathing, margins smooth, veins ca 26, well-spaced and conspicuous, apex tapered; *inflorescence* solitary per plant, erect, weakly-branched, 25–60 cm in height, peduncle 34–42 cm long, covered with white triangular rugosities, the density of which decreases from the base to the apex, bracts 1–2 (only broken bracts seen), 4–5 mm wide at the base, with 11 veins; *rachis* 12–25 cm long, flowers (2–)4(–6) per node, floral bracts triangular, 1.8 × 1.2 mm, shorter than the pedicel, veins only faintly visible, pedicel 4–8 mm long, articulation inframedial; *flowers*: perianth pale-green, 4.2 mm long, *tepals* elliptic, 4.2 × 1 mm, 3-veined, the outer end of the outer tepals papillose, with some hairs; *stamens* slightly shorter than the tepals, filaments 2.5 mm long, flattened and papillose on the upper part, anthers 1.0 × 0.2 mm, rectangular, yellow, dorsifixed, filament inserted in the lower quarter; *gynoecium*: ovary 0.8 × 0.6 mm, ovules 4 per locule, style filiform, 3.2 mm long, stigma with a slightly thickened tip; *capsule* wider than high, 4 × 6 mm, black with a finely granulated surface overlapping fine transverse veins, *seeds* black, granulate, disciform, ca 2 mm in diam., with a convex surface on one side and with a circular central depression on the other surface, with a narrow notch in which the radicle is visible and sometimes protruding.

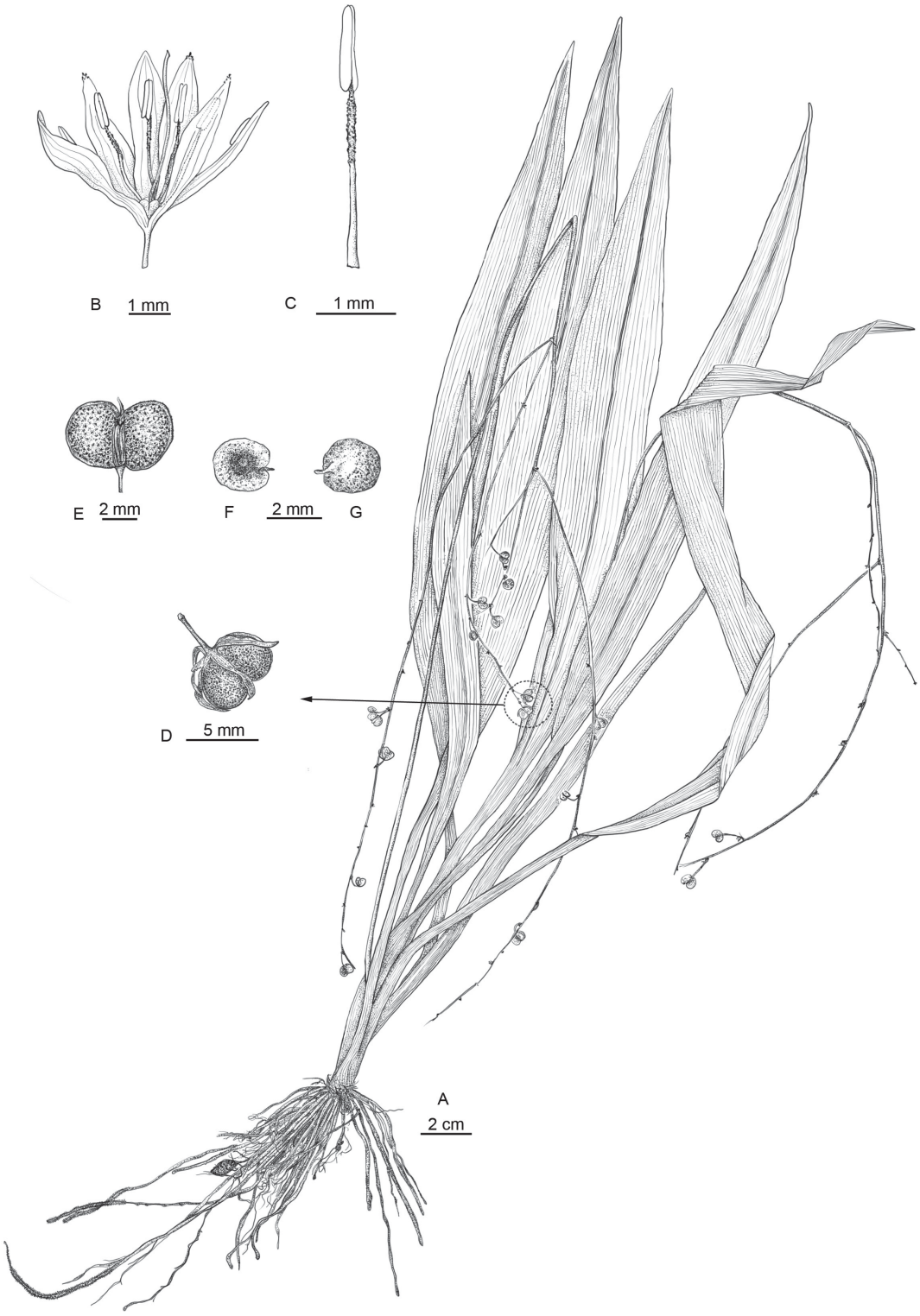


Fig. 35. *Chlorophytum nigrogranulosum* Bard.-Vauc. & M.Pignal sp. nov., holotype, *M. Bardot-Vaucoulon et al. 1662*, P [P00643195]. **A**. Habit. **B**. Flower. **C**. Stamen. **D**. Young fruit (with remnant tepals). **E**. Fruit. **F–G**. Two sides of one seed. Drawing by Laurence Ramon.

Phenology

The only known collection flowered in March–April and the fruit begin to develop in April.

Distribution and ecology

Chlorophytum nigrogranulosum sp. nov. was collected in the north of Madagascar, on the slopes of Montagne des Français overlooking the bay of Antsiranana. It occurs in undergrowth of the deciduous dry forest in the herbaceous layer on limestone.

Provisional IUCN Red List assessment

Chlorophytum nigrogranulosum sp. nov. is known only from the type collection, a single occurrence that was collected only a few years ago. The type locality is situated at the extreme north of the protected area, which is a IUCN category 5 harmonious landscape, near its boundary, and the adjacent zone outside of

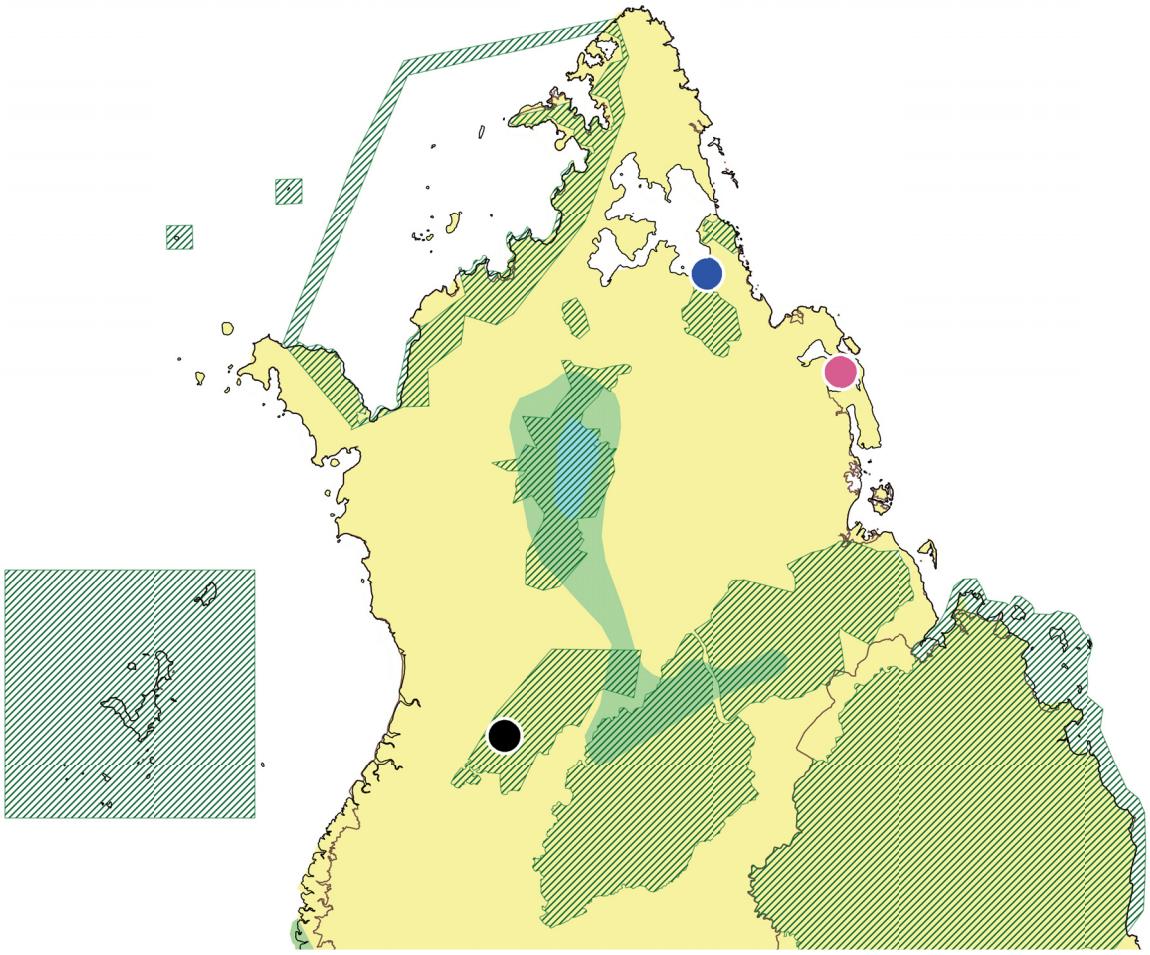


Fig. 36. Three species from N Madagascar, known only from their type collection and occurring on calcareous substrates in DIANA Province: *Chlorophytum nigrogranulosum* Bard.-Vauc. & M.Pignal sp. nov. (blue dot), *C. ratovosonii* Bard.-Vauc. & M.Pignal sp. nov. (pink dot) and *C. tolyanum* Bard.-Vauc. & M.Pignal sp. nov. (black dot).

the protected area is partially degraded, and used for grazing and is in some places being developed for tourism. On the basis of its highly restricted known range, a single known location, and the proximity of major impacts to the area, the species is assessed as CR B1B2ab(i,ii,iii,iv,v).

22. ***Chlorophytum nusbaumeri*** Bard.-Vauc. & M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324060-1
Figs 2G–H, 4F, 19, 37

Diagnosis

Chlorophyto nigrogranuloso Bard.-Vauc. & M.Pignal *affinis, sed pseudopetiolo breviore (6–8 vs 14 cm), vaginis foliorum clare dilatatis inflatisque (vs paulo dilatatam inflatamque), inflorescentiis tribus (vs unam), bracteis floris longioribus quam pedicellis (vs breviores), filamentis staminum quasi omnino papillosis (vs tantum tertia superiora), antheris 0.5–0.7 × 0.15 mm (vs 1 × 0.2 mm), ovulis 1–2 per loculum (vs 4), fructibus adultis pendulis (vs errectos), brunneolo costatoque (vs nigram subtiliter granulosamque), semine paulo reniformi (vs orbiculare), radicula excentrica (vs centralem), praecipue differt.*

Etymology

We are pleased to dedicate this new species to Louis Nusbaumer, Curator at the Conservatoire et Jardin botaniques de Genève and lecturer for the Plant Systematics and Biodiversity laboratory within the Department of Plant Sciences at the Université de Genève.

Type material

MADAGASCAR – **DIANA Region [Antsiranana Prov.] •** Daraina, Loky Manambato, forêt d'Ampondrabe; 12°58′09″ S, 49°42′00″ E; 360 m; 14 Feb. 2005; fl bud, fr; *L. Nusbaumer & P. Ranirison 1469*; forêt de pente décidue, gros blocs 2–3 m diamètre; holotype: G [G00019494]!; isotypes: K!, MO!, P [P04186576]!, research herbarium of Daraina n.v., TEF n.v.

Description

Plant herbaceous, 20 cm tall; *roots* fibrous, fasciculate, slightly thickened for 1 to 2 cm from the base (ca 1 mm in diam.); *leaves* 7 to 10, borne in a rosette ca 8 cm from the ground, soft green on the adaxial face and glaucous green on the abaxial face, bases expanded, forming a bulbous shape more than 3 cm in height, buried in the substrate at the base, lanceolate, attenuate at both ends, blade base with a short, wide pseudo-petiole, 6–8 × 0.4 cm, 1/4 to 1/5 of the length of the blade, the edge smooth, the pseudo-central vein comprised 15 to 25 of clearly visible and well-spaced veins; typically with 3 to 5 distinctly larger and broader leaves, 15–41 × 2–5 cm, the smaller leaves 7–15 × 1.0–1.5 cm; *inflorescences* 1–3 per plant, branched, erect or bending over towards the ground, 22–48 cm long, peduncle 10–13 cm, 1–2 bracts, large, foliaceous, 3.5–4.5 × 0.2–0.5 cm, 8-veined, *flowering rachis* 21–33 cm long, axis and branches covered with translucent rugosities with a triangular base, more abundant towards the apex, 2–4 basal branches very reduced; 2–4 *flowers* per node, floral bract purplish, triangular, very tapered, 8 × 1 mm, longer than the pedicel, the latter 4–4.5 mm long, articulation inframedial; *perianth* 4–5 mm long, tepals elliptical, purplish when dry, equal or subequal, 4 × 0.6 mm, 3 veins clearly visible, anastomosing below the apex; *stamens* shorter than the tepals, unequal, filament 2–2.5 mm long, fusiform, flattened in its central part, papillose, anther yellow, rectangular, 0.5–0.7 × 0.15 mm, base sometimes slightly divergent, dorsifixed, filament inserted near the base; *gynoecium*: ovary 0.5 × 0.5 mm, ovule, 1(–2) per locule, style 4 mm long, exceeding the perianth, stigma globose; *capsule* pendulous at maturity, broader than high, 3.8–4 × 4–4.5 mm, locules flattened, often with 1–2 aborted locules, sutures thickened, and few marked transverse ribs; *seeds* 1 per locule, shiny black, semi-circular, 2.5 × 2 mm, with a narrow notch, radicle visible to protruding.

Fig. 37. *Chlorophytum nusbaumeri* Bard.-Vauc. & M.Pignal sp. nov., holotype, *L. Nusbaumer & P. Ranirison 1469*, G [G00019494]. **A**. Habit. **B**. Flower. **C**. Stamen. **D**. Inflorescence detail with bud and fruit. **E**. Fruit. **F**. Seed. Drawing by Laurence Ramon.

Phenology

The only known collection of *C. nusbaumeri* sp. nov. was collected in February in fruit, with only one or two flowers remaining, but in addition, a large number of flower buds were present, suggesting that a second flowering phase would soon follow.

Distribution and ecology

The only gathering of this new species is from Loky-Manambato in northeast Madagascar, where it was collected in Ampondrabe forest at an altitude of 370 m. The collectors, Nusbaumer & Ranirison, noted that the species had not been observed at any other sites in the vicinity, despite the recent extensive surveys and vegetation studies carried out in the area (Nusbaumer, pers. com.). The species occurs in the ground layer of dry deciduous forest on slopes, where the substrate with typical red soil, is composed of granitic and/or metamorphic rocks, with conspicuous large boulders, typically with red soil, and other evidence of ancient volcanic activity.

Provisional IUCN Red List assessment

Chlorophytum nusbaumeri sp. nov. is endemic to Madagascar, where it is known from a single collection that was made in 2005 in Ampondrabe forest, within the Loky Manambato Harmonious Landscape in NE Madagascar that represents a single occurrence, and where it to be a strict endemic. While little exploration of the forests of Loky Manambato had been undertaken prior to the expeditions carried out recently by staff of CJBG (Gautier *et al.* 2006; Nusbaumer *et al.* 2010), data from the site has shown the different forest patches to be rich in highly local endemism. Within Loky Manambato, extensive habitat degradation of many of the forest patches has been observed and this is undoubtedly the major threat to this species in its sole location. It is assessed as CR B2ab(i,ii,iii,v).

Morphological and geographical remarks

The data concerning the flower were obtained from the most well-developed buds, a single flower, and the floral remains on young fruits.

For a map showing the only known locality of *C. nusbaumeri* sp. nov. see Fig. 19.

23. ***Chlorophytum parkeri*** (Baker) Marais & Reilly
Figs 5C, 38

Chlorophytum parkeri (Baker) Marais & Reilly (Marais & Reilly 1978: 661). – *Anthericum parkeri* Baker (Baker 1883 [1884]: 269).

Etymology

The species is dedicated to the English botanist, physicist, and missionary George William Parker (1848-1904), who collected in Madagascar on the Highlands near Antananarivo and Fianarantsoa between 1873 and 1890 (Dorr 1997).

Vernacular name

Ahitrakondro (fide Baker).

Type material

MADAGASCAR • Central Madagascar; before Aug. 1880; fr; *G.W. Parker s.n.*; holotype: K [K000432390] image!.

Other material examined

MADAGASCAR – **Analamanga [Antananarivo Prov.]** • près d'Ambohimanga, pays découvert; [18°45′35.4″ S, 47°33′26.5″ E]; 13 Jun. 1905; fl bud, fr; *C. d'Alleizette 475bis*; P [P02071714]!. – **Boeny [Mahajanga Prov.]** • bord d'un lac, près de Majunga; [15°40′52″ S, 46°23′57″ E]; Jul. 1925; fl, fr; *H. Perrier de la Bâthie 17322*; P [P02071717, P02071719, P02071718]!. – **Boeny-Melaky Border [Mahajanga Prov.]** • Pelouses, rocailles (basalte), près du Manombo (Ambongo); [16°24′ S, 44°58′ E]; Nov. 1903; fl, fr; *H. Perrier de la Bâthie 1642*; P [P02071716, P02071715]!. – **Melaky [Mahajanga Prov.]** • Beanka, partie nord. Bord du fleuve Manomba; 17°52′51S, 44°28′05″ E; 139 m; fl; 19 Dec. 2011; *B.F.L. Rakotozafy, R. Bolliger & R. M. Hanitrarivo 20*; BR [BR0000015214768V] image!, G [G00376362]!, K n.v., MO [MO-3241817] image!, P [P00782479]!, TEF!.

Description

Plant herbaceous, of highly variable height, from 7–10 cm (*Perrier de la Bâthie 1642*, *Alleizette 475bis*, *Parker s.n.*) to 15–30 cm (*Perrier de la Bâthie 17322*, *Rakotozafy et al. 20*), growing in dense clumps; the underground parts forming fasciculate *roots*, comprising a mixture of fibrous roots, and others strongly thickened, ca 1 mm in diam., terminating in a fusiforme tuber of 20–30 × 2.0–3.5 mm and a few secondary roots, ca 0.3 mm in diam.; *leaves* 5 to 12, narrowly lanceolate, but very variable in size at the different known localities, 6–30 × 0.3–0.6 cm, strongly conduplicate, somewhat thickened, with 6–15 veins (visible on both sides), and with a graminoid appearance, the base sheathing for ca 1 cm above the base, lacking a pseudopetiole, the margins scabrous distally, the apex narrowed abruptly, rounded, the outermost leaves papyraceous, the leaves lying on the ground and spreading-out to form a circle "étalées en cercle sur le sol" (fide Perrier de la Bâthie); *inflorescences* 1–3 per plant, flexible, spreading, highly variable in length (<10–)14–31(–38) cm, peduncle short, 1–2.5 cm, branched or unbranched, the branches up to 7.9 cm long, with triangular bracts located at the nodes, bracts 0.5–1.4 × 0.15–0.2 cm, 3-veined, often scabrous at the tips, *rachises* very variable in length, 5–26(–33) cm, flowers, 1–3(–4) per node, floral bract, 3–5 × 2.3–3 mm with embracing triangular base, terminated by an acumen of 1.2–4 mm long, with irregular or scabrous margin, veins, 5, the central one forming a keel-like structure, shorter than the pedicel, pedicel 4–5 mm long, articulation inframedial at 1–1.5 mm from the base; *flower* with a perianth white, 3 mm long, *tepals* oblong, obtuse, 3 × 1 mm, veins 3, central, close together; *stamens* equal, shorter than the perianth, flattened filament, 1.8–2 mm long narrowing towards the top, 0.5 mm wide at the base, anthers green, short, sub-rectangular, 0.5 × 0.3 mm, dorsifixed, filament inserted between 1/2 and the 1/3 lower part; *gynoecium*: ovary globose, 0.8–1 mm in diam., ovules, 2 per locule, style short, 1 mm long, terminated by a thickened and papillose stigma; *capsule* wider than tall, 2.5 × 3.5–5 mm, sutures with fringed edges, surface with superficial transverse wrinkles; *seeds* (1–)2 per locule, black, shiny, sub-globose with a surface very finely hispid (visible under × 50 magnification), 1.5–2 × 1.5–1.8 × 1 mm, one side convex, the other with a deep depression, no notch, radicle not visible.

Phenology

The limited data available do not provide a clear picture of the phenology of this species. For the collections from low elevation in the west, flowering occurs at the beginning and end of the dry season in habitats with residual moisture (near rivers or temporary lakes) and can extend into the early rainy season, and fruiting occurs later during this period. On the highlands, like the western populations, flowering is known to occur in the dry season, with buds present in June, fruiting material is not known.

Distribution and ecology

Chlorophytum parkeri is poorly known, it has been found from three sites near the west coast in Melaky and Boeny Regions at altitudes below 200 m, but it has also been collected in the central highlands at over 1500 m. It grows in grassy areas, sometimes associated with rocky outcrops, on various substrates, including limestone, basalt and granite.

Provisional IUCN Red List assessment

Chlorophytum parkeri is known from a single recent collection that represents a single known extant occurrence (*Rakotozafy et al. 20*) from the Melaky Region. Other records of the species date back to the early 20th century, when the species occurred across a broad zone of central and western parts of Madagascar, when it was known from four subpopulations, each represented by one or two scattered

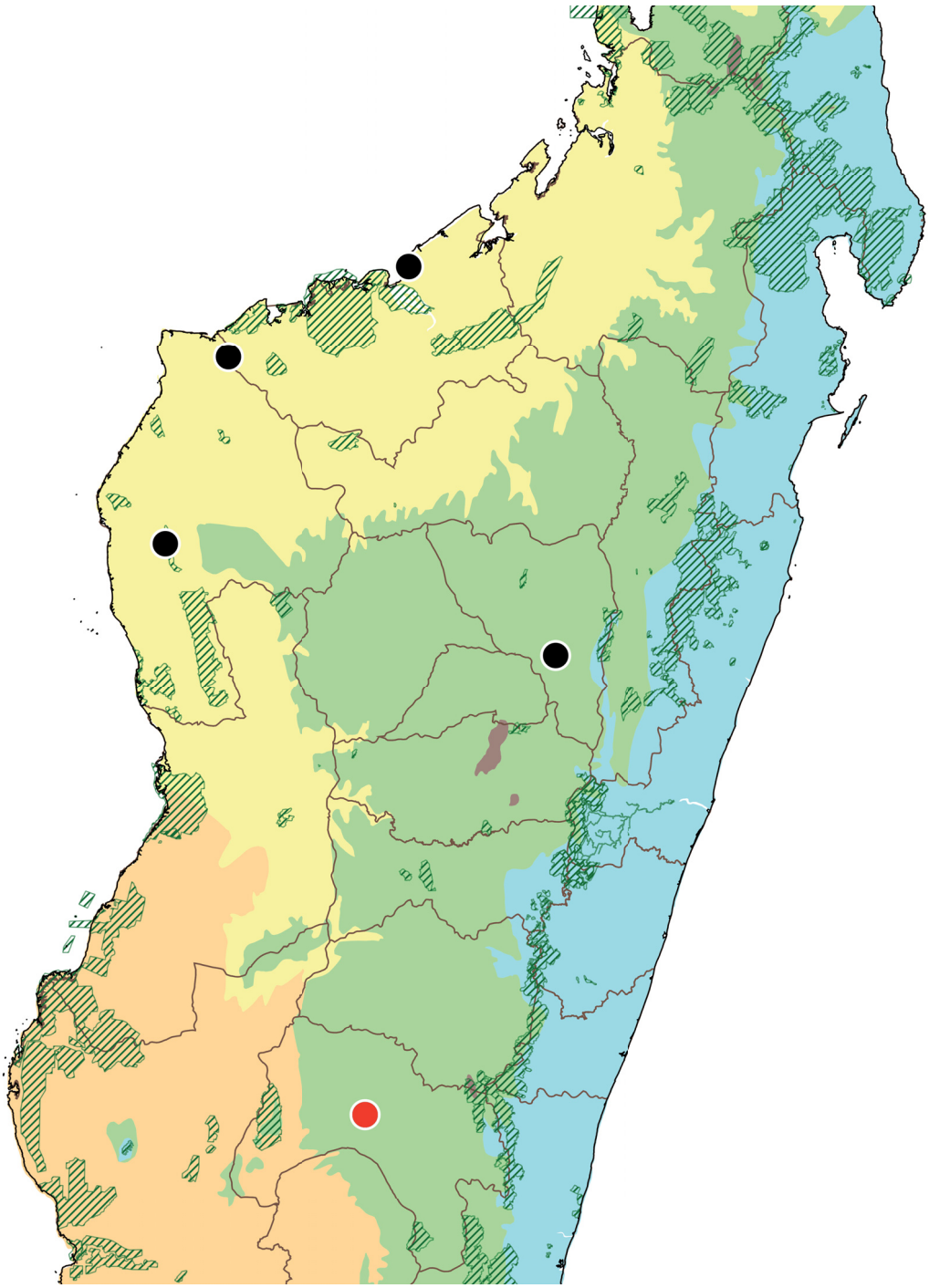


Fig. 38. Distribution of *Chlorophytum parkeri* (Baker) Marais & Reilly (black dots) and *C.* aff. *parkeri* (red dot).

collections. It is likely that species has been extirpated from the sites on the central plateau and near Mahajanga, but intact vegetation is found at another known site, Ankasakasa, although the area has no formal protection. The species is therefore assessed as DD Data Deficient.

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. VII 9–11.

Chlorophytum* aff. *parkeri (Baker) Marais & Reilly
Fig. 38

Material examined

MADAGASCAR – **Ihorombe [Fianarantsoa Prov.]** • Dct et Commune Ihosy, Fkt Ankily, Inselberg (roches stratifiées) dégradé le long de la RN7, ca 10 km d'Ihosy en allant à Tuléar (PK 10); 22°24′23″ S, 46°03′19″ E; 1010 m; 19 Mar. 2010; fl, fr; *J.-L. Andriantiana, F.A. Rajaonary, M. Rabarimanarivo & N.H. Rakotoarivelo 750*; sur une prairie marécageuse déjà sèche; MO [MO-3020306]!; P [P06836543]!, TAN n.v.

Morphological remark

The collection *Andriantiana et al. 750* resembles typical *Chlorophytum parkeri*, but it was recorded much further south, in a dried-up marshy meadow, near an eroded granite inselberg, on the northern limit of the Horombe Plateau, at an altitude of 1000 m. Nevertheless, the habitat is similar to that occupied by typical *C. parkeri* on the highlands, and it is a poorly-known species with somewhat variable characteristics. *Andriantiana et al. 750* is nevertheless distinguished from material of typical *C. parkeri* by the following characters: the upright habit of the leaves, its very short and contracted inflorescences, flowers with stamens in two cycles (instead of a single cycle), and its short style (ca half as long as the other specimens). However, only a single flower was available for examination, and the material as a whole is very poor, so we refrain from describing this collection as a distinct taxon. Further investigations in the field are needed.

24. ***Chlorophytum ranirisonii*** Bard.-Vauc. & M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324057-1
Figs 2D–E, 5A, 19, 39

Diagnosis

Chlorophyto granitico H.Perrier *affinis, sed foliis haud pseudopetiolatis 1–2 foliis externis exceptis (vs omnia pseudopetiolata), 16–26 nervis (vs 21–25), sine medio pseudonervo (vs manifestum), inflorescentia longo ramulo basili (vs simplicem vel pauciramosam), aliquot pilis inflorescentiae glandulosis (vs totos eglandulosos), pilis aliquando luteis (vs totos albos), bractea inflorescentiae unica 3–5-nervosa (vs 1–3 bracteas 6–8 nervosas), pedicello scabro (vs glabrum), perianthio majore (5 mm vs 3.5–4.5 mm), tepalo tribus nervis centralibus clare manifestis anastomosibusque ad apicem (vs paulo manifestos), staminibus aequilongis (vs inaequalia), filamentis attenuatissimis ad basim (vs truncata), antheris luteis (vs virides), stylo fusiformi ad apicem (vs filiformem), sex ovulis per loculum (vs 1–2), praecipue differt.*

Etymology

We are pleased to dedicate this new species to Patrick Ranirison, botanist and 'Maître de conférences à la Mention Biologie et Ecologie Végétale de la Faculté de Science', University of Antananarivo, and director of the Famelona association.

Type material

MADAGASCAR – **SAVA Region [Antsiranana Prov.]** • Daraina, forêt de Binara; 13°15′44″ S, 49°36′02″ E; 360 m; 2 Dec. 2005; fl; *L. Nusbaumer & F. Ranirison 1715*; forêt dense sèche sur dalles rocheuses; sol peu profond; holotype: G [G0090100]!; isotypes: K!, MO!, P [P04186577]!, research herbarium of Daraina n.v., TEF n.v.

Description

Plant herbaceous, ca 20 cm tall, *underground parts* not collected, *roots* tuberculate, rigid (Nusbaumer, pers. com.); *leaves* 5–7, with a single smaller central leaf, 5–10 cm long, the others 8–17 × 1.5–2.0 cm, lanceolate, base clearly sheathing (surrounded by one or two leaf sheaths 2.2–3.7 cm long for the shortest and 4.0–4.5 cm long for the longest), forming a pseudopetiole on the most developed outer leaves, 3.5–4 cm long, margin scabrous over approximately 1/2 of its distal part, more prominent on the younger leaves, 16–21 veins, spaced, clearly visible, acuminate apex; *inflorescences* 1–3 per plant, erect, 16–21 cm in height, with 1(–2) long branches at their base; peduncle 10–15 cm long, *rachis* and branches entirely covered with short white or yellow hyaline hairs, with a triangular base, some glandular, bract triangular, tapering, 8–13 × 1.5–2.5 mm, located on the peduncle for a simple inflorescence or at the first branch at the base of the flowering rachis, if branched; veins 3–5, brown, flowering rachis 7.0–11.5 cm long; *flowers* 3–4 per node, pendant, flowering bract triangular tapering to the apex, transparent, longer than the pedicel, 5–7 × 1.2 mm, apex acuminate, veins 3, clearly visible, the latter 3–4 mm long, covered with hyaline hairs, articulation supramedial; *perianth* white, 5.5 mm long, *tepals* recurved at anthesis, oblanceolate, outer tepals somewhat spatulate, 5 × 0.8–1.1 mm; veins 3, green in vivo, anastomosing below the apex; *stamens* as long as the perianth, filaments 5 mm long, flexible, inclined, white, narrow-based, swollen and very papillose in the upper 2/3 (the papillae flattened, elongate and rounded, white), anthers bright yellow, 1 × 0.2 mm, dorsifixed, filament inserted in the lower 1/4; *gynoecium*: ovary 1 × 0.8 mm, green in vivo, ovules 6 per locule; style 6 mm long, filiform with rounded stigma; *fruit* not seen.

Phenology

At the only known locality, flowering was at its peak at the beginning of December, with many flowers in full bloom and buds, but the fruit had not yet formed.

Distribution and ecology

This species is known only from the Loky-Manambato Region in northeastern Madagascar, specifically from the Binara forest. The forest is characterised as dense, semi-deciduous, with many fallen trees and emergents. The collection was made at an altitude of 360 metres, at the base of the slope. The plant grows on a soil, sometimes very shallow, formed from the erosion of a granitic substrate, more or less fragmented, mixed with a layer of humus.

Provisional IUCN Red List assessment

Chlorophytum ranirisonii sp. nov. is endemic to Madagascar, where it is known from a single collection that was made in 2005 in Binara forest, within the Loky Manambato Harmonious Landscape in NE Madagascar, where it is considered to be a strict endemic with a single known occurrence. While little exploration of the forests of Loky Manambato had been undertaken prior to the expeditions carried out recently by staff of CJBG (Gautier *et al.* 2006; Nusbaumer *et al.* 2010), data from the site has shown the different forest patches to be rich in highly local endemic species. Within Loky Manambato, extensive habitat degradation of many of the forest patches has been observed and this is undoubtedly the major threat to this species at its single known location, and it is assessed therefore assessed as CR B2ab(i,ii,iii,v).

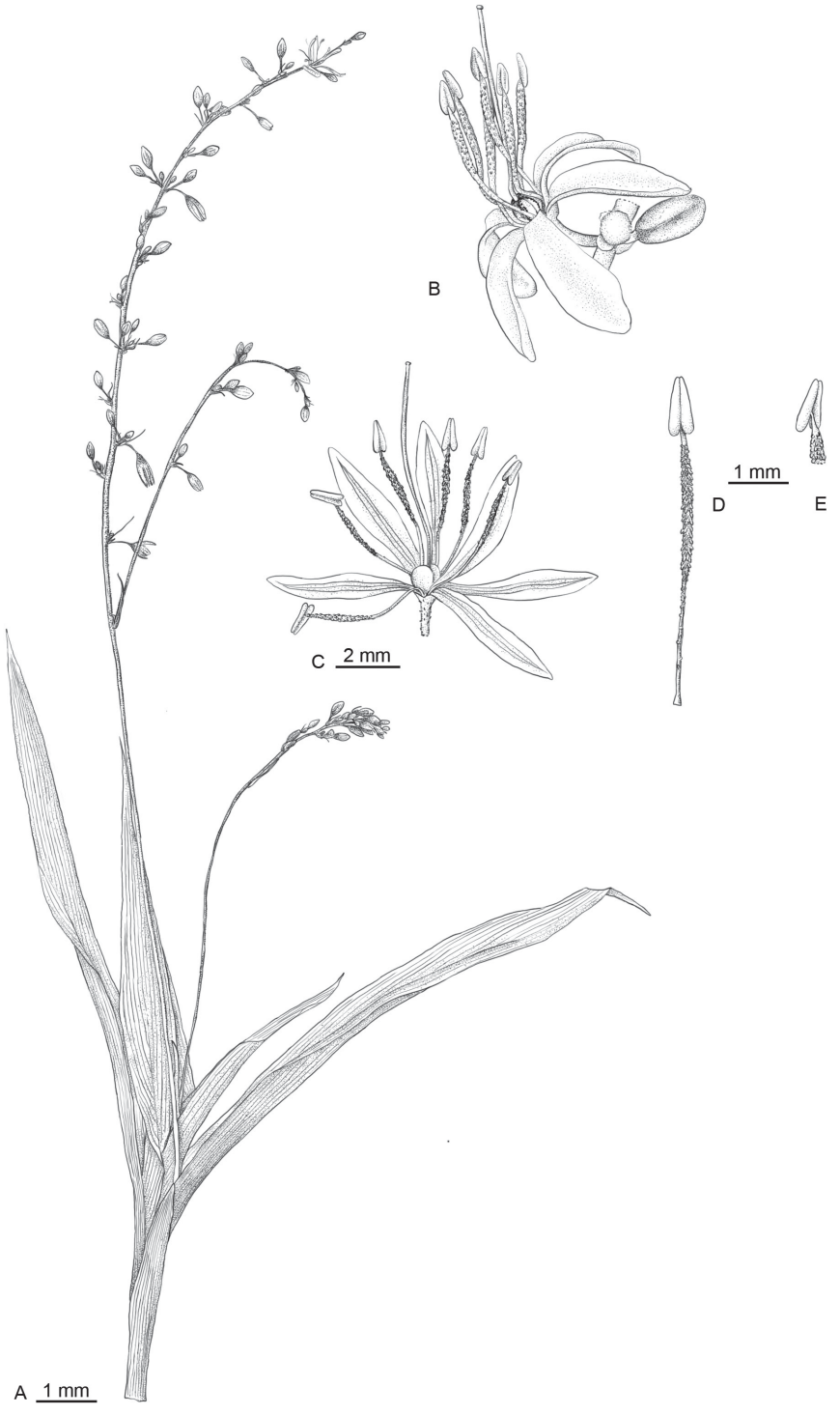


Fig. 39. *Chlorophytum ranirisonii* Bard.-Vauc. & M.Pignal sp. nov., holotype, *L. Nusbaumer & F. Ranirison 1715*, G [G0090100]. **A**. Habit. **B**. In situ flower after picture **C**. Flower. **D**–**E**. Stamens. Drawing by Laurence Ramon.

Geographical and morphological remarks

1) The collectors, having found only one location with a small population of this species, chose not to harvest the underground parts out of a concern for its conservation.

2) The collected leaves were still in the growing phase when they were collected, which explains differences in size and the fact that the pseudo-petiole is not yet clearly differentiated.

3) The reduced central leaf appears to be associated with the development of the floral scape.

For a map showing the known locality of *C. ranirisonii* sp. nov. see Fig. 19.

25. ***Chlorophytum ratovosonii*** Bard.-Vauc. et M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324055-1
Figs 5J, 36, 40

Diagnosis

Chlorophyto sylvestre Bard.-Vauc. *affinis, sed tuberculis brevioribus crassisque (0.6–1 × 0.25–0.3 cm vs 1–1.8 × 0.1–0.4 cm), foliis plus numerosis (7 vs 2–3), erectis (vs patentia), angustioribus (11.5–17.5 × 1.2–2.3 cm vs 7–13 × 1.8–5 cm), pseudo-petiolo manifesto (vs basim folii breviter attenuatam), rhachidi inflorencentiae glabro (vs rhachim parvis triangularibus squamis), pedicello fructifero gracili longioreque (8–10 mm vs 4–6 mm), seminibus plus numerosis per loculum (2–3 vs 0–1) praecipue differt.*

Etymology

This species is dedicated to Fidisoa 'Fidy' Ratovoson, the collector of the type specimen, Fidy has worked for Missouri Botanical Garden in Madagascar since the year 2000. He has conducted botanical inventory and conservation work in many parts of Madagascar, but has had a special interest in poorly known areas in the north, such as the Baie de Rigny, where he made the only known collection of *C. ratovosonii* sp. nov.

Type material

MADAGASCAR – **DIANA Region [Antsiranana Prov.] •** Antsiranana, Andrafiabe, Ambolobozakely, 3 km à l' Est, baie de Rigny; 12°26′55S, 49°32′04″ E; 1 Apr. 2006; fr; *F. Ratovoson 1134*; holotype: P [P06169905]!; isotypes: CNARP n.v., MO [MO-3020273] n.v., TAN n.v.

Description

Plant herbaceous, 15–40 cm high, *roots* numerous, fasciculate, short and fibrous, roots bearing fleshy fusiform tubers, 6–10 × 2.5–3.0 mm, mixed with fine, purely fibrous roots; *leaves* 7, ovate to lanceolate, 11.5–17.5 × 1.2–2.3 cm, the base sheathing, narrowed above into a pseudo-petiole 2.5–5.0 cm long, ca 1/3 of the total leaf length, leaf margin scabrous, veins, 20–24, clearly visible, apex pointed; *inflorescence* unknown; flowers in groups of 1 to 3 (observed from the pedicels of the infructescence), *flowers* (see Remarks below): floral bracts dark, with a broad triangular base, 2.3 × 1 mm, trinervate, shorter than the pedicel, the latter 8–10 mm long (in fruit), articulation supramedial, 6–7 mm from the base; *tepals*, 6 × 0.8 mm, with 3 dark veins close together; *stamens* equal, shorter than perianth, filament 4.2 mm long, papillose, fusiform in upper half, anther yellow, 0.7–1 × 0.2 mm, dorsifixed, attached to the lower third of the anther; *gynoecium*: ovary not seen, style filiform, 4.5 mm long, stigma a little thickened; *infructescence* 1, erect, ca 40 cm in height, with 6 lateral branches, peduncle 18 cm long, bearing two acute bracts, with a triangular base, dark in colour, 8–13 × 2.5–3 mm, 5-veined, *rachis* ca 22 cm long, fruits (and therefore flowers) in terminal units of up to three; *capsule* wider than tall, 3.5 × 5 mm, ornamented with 3–4 transverse veins; *seeds* 2–3 per locule, black, flattened, reniform, 2.2–2.3 × 1.5–1.8 mm, testa shiny, very finely granular, notch narrow but deep, radicle 1 mm thick, forming a protrusion in the notch.

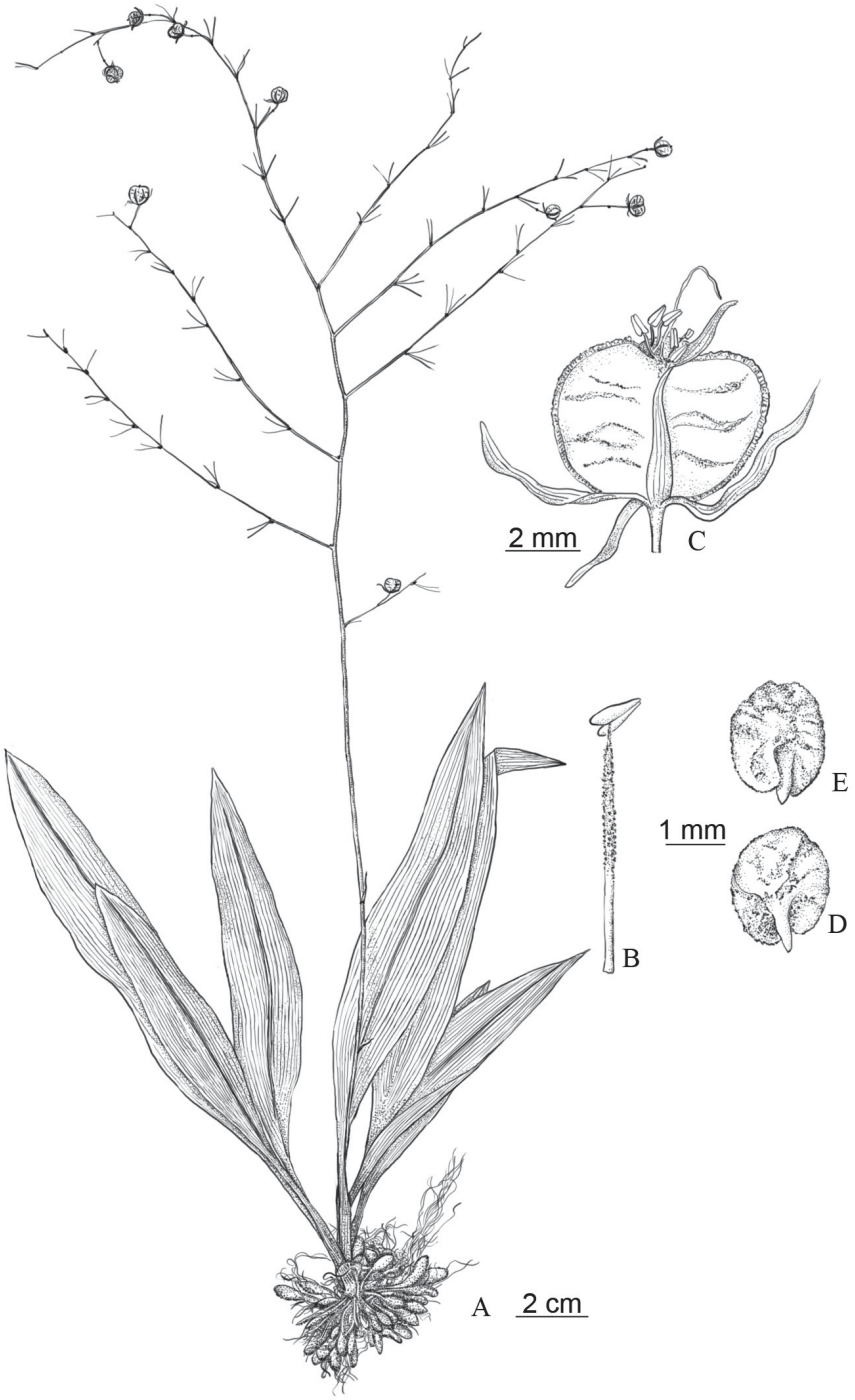


Fig. 40. *Chlorophytum ratovosonii* Bard.-Vauc. & M.Pignal sp. nov., holotype, *F. Ratovoson 1134*, P [P06169905]. **A**. Habit. **B**. Stamen. **C**. Fruit with flowering remains. **D–E**. Two faces of one seed. Drawing by Laurence Ramon.

Phenology

The only known material of this species was collected at the beginning of April, it has floral remains and immature fruits, so we assume that flowering took place in March and that fruits would mature in late April or May.

Distribution and ecology

The single known collection of this species was made in the northeast of Madagascar, at the edge of the Baie de Rigny, in a sparsely populated dry forest on loose, unconsolidated sands, at a very low altitude.

Provisional IUCN Red List assessment

Chlorophytum ratovosonii sp. nov. is known from a single recent collection, representing a single known occurrence. It was collected across the bay from the Ambodivahibe marine PA, which is reported as relatively intact and where there are no known threats to the species, however its known habitat is likely to be somewhat precarious and further exploration to gather information on its frequency and range, especially the possibility of it occurring at Ambodivahibe, as well as the state of its single known location, are needed in order to provide a meaningful Red List assessment. *Chlorophytum ratovosonii* is assessed as Data Deficient (DD).

Remarks

In the absence of flowers, floral data was collected from fruits bearing the remains of the perianth and stamens. The pedicels elongate after anthesis, so the measured length is not that of the pedicel at the floral stage, which would have been slightly shorter.

A map showing the only known occurrences of *Chlorophytum ratovosonii* sp. nov., *C. tolyanum* sp. nov., another poorly known species from northern Madagascar and *C. nigrogranulosum* sp. nov. is shown in Fig. 36.

26. ***Chlorophytum sofiense*** (H.Perrier) Marais & Reilly
Figs 2F, 5G, 41

Chlorophytum sofiense (H.Perrier) Marais & Reilly (Marais & Reilly 1978: 661) – *Anthericum sofiense* H.Perrier (Perrier de la Bâthie 1935: 37).

Etymology

The specific epithet refers to the Sofia River, specifically its middle basin, the type locality of the species.

Type material

MADAGASCAR – **Sofia Region [Mahajanga Prov.] •** Domaine occidental: sur des rocailles (gneiss), dans un bois humide, dans le bassin moyen de la Sofia; [15°29′18″ S, 48°35′34″ E]; Mar. 1907; fr; *H. Perrier de la Bâthie 10955*; lectotype: P [P01046122]!, **here designated**; isolectotype: P [P01046121]!.

Description

Plant herbaceous, 13–25 cm tall; *roots* fibrous, some terminating in an ovoid to fusiform tubercle, 0.8–1.5 × 0.3–0.5 cm; *rhizome* lacking; *leaves* 5–16, lanceolate, 9–27 × 1.2–2.5 cm, with a tapering, sheathing base and a tapered apex; pseudo-petiole 4.5–10 cm long (between 1/3 and 1/2 of the blade length), the margins smooth or scabrous, pseudo-midrib present, with 18–21 well-spaced, conspicuous veins; *inflorescences* 1(–2) per plant, 6–13 × 0.1–0.2 cm, erect, unbranched or sparsely branched, dense, shorter than the leaves, peduncle covered with transparent papillae; *flower* unknown; *capsule* slightly

wider than high, 3–3.3 × 4 mm, fruiting pedicel pendulous with a medial articulation; *seeds* semi-globular, with prominent transverse ridges, 1.9–2 mm diam. and 1–1.3 mm thick, black, shiny, surface granular, one face convex and the other flat and depressed, with a marked notch and a more or less prominent radicle.

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. VII 1–5.

Nomenclatural remark

Of the two known syntypes, the Paris herbarium sheet with the barcode P01046122 is designated as the lectotype of *A. sofiense* H.Perrier because of its more abundant material.

Key to the subspecies

1. Leaf surface glabrous ..... ***C. sofiense*** (H.Perrier) Marais & Reilly **subsp**. ***sofiense***
– Leaf surface scabrous ..... ***C. sofiense* subsp**. ***gautieri*** Bard.-Vauc. & M.Pignal subsp. nov.

26.1 ***Chlorophytum sofiense*** (H.Perrier) Marais & Reilly **subsp**. ***sofiense***

Fig. 41

Material examined

MADAGASCAR – **Sofia Region [Mahajanga Prov.] •** Domaine occidental: sur des rocailles (gneiss), dans un bois humide, dans le bassin moyen de la Sofia; [15°29′18″ S, 48°35′34″ E]; Mar. 1907; fr; *H. Perrier de la Bâthie 10955*; P [P01046121, P01046122]!.

Description

Plant herbaceous, 15–25 cm tall; *roots* fibrous, some ending in an ovoid to fusiform tubercle, 8–15 × 3–5 mm; stems grouped together, each stem bearing 5–6 leaves; *leaves* 17–27 × 1.8–2.5 cm, lanceolate, base and apex tapered, shortly sheathing, pseudo-petiole 6–10 cm long (between 1/3 and 1/2 the length of the blade), margins smooth, surfaces glabrous, veins 21, well-spaced and visible on both surfaces; *inflorescences* 1(–2) per plant, 11–13 × 0.1–0.2 cm, unbranched or sparsely branched, peduncle 8.5 to 10 cm long, with 1 or 2 inflorescence bracts, bracts triangular at the base, subulate, dark brownish when dry, 6 × 2 mm, *flowering rachis* short (2.0–3.5 cm long), very dense; *flowers* unknown, numerous, 2 to 5 per node (based on the number of remaining pedicels), floral bracts long and narrow, 4 × 1 mm, equal to or longer than the pedicel; *capsule* 3 × 4 mm, locules with 3 or 4 transverse ridges, fruiting pedicel short, 2–4 mm long, with medial articulation; *seeds* 2 mm diam. and 1 mm thick, the radicle not prominent.

Phenology

The taxon was collected in March, only in fruit.

Distribution and ecology

The typical subspecies was collected in the northwest of Madagascar, on an acidic substrate (gneissic rocks), in the mid basin of the Sofia river where it grew in humid undergrowth.

Provisional IUCN Red List assessment

Chlorophytum sofiense is endemic to Madagascar, where it has a highly disjunct known distribution that corresponds to the two distinct subspecies that are now recognized. The typical subspecies, *C. sofiense* subsp. *sofiense* is known from a single collection from the central zone of the Sofia River valley (Sofia Region) that was collected over 100 years ago. The site is poorly explored, but satellite imagery shows considerable degradation in that zone, and there are no protected areas in the vicinity. At the site, habitat

loss is inferred due to deforestation and this represents the primary threat to this subspecies. The typical subspecies is therefore considered as data deficient (DD), but possibly extinct (EX).

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. VII 1–5.

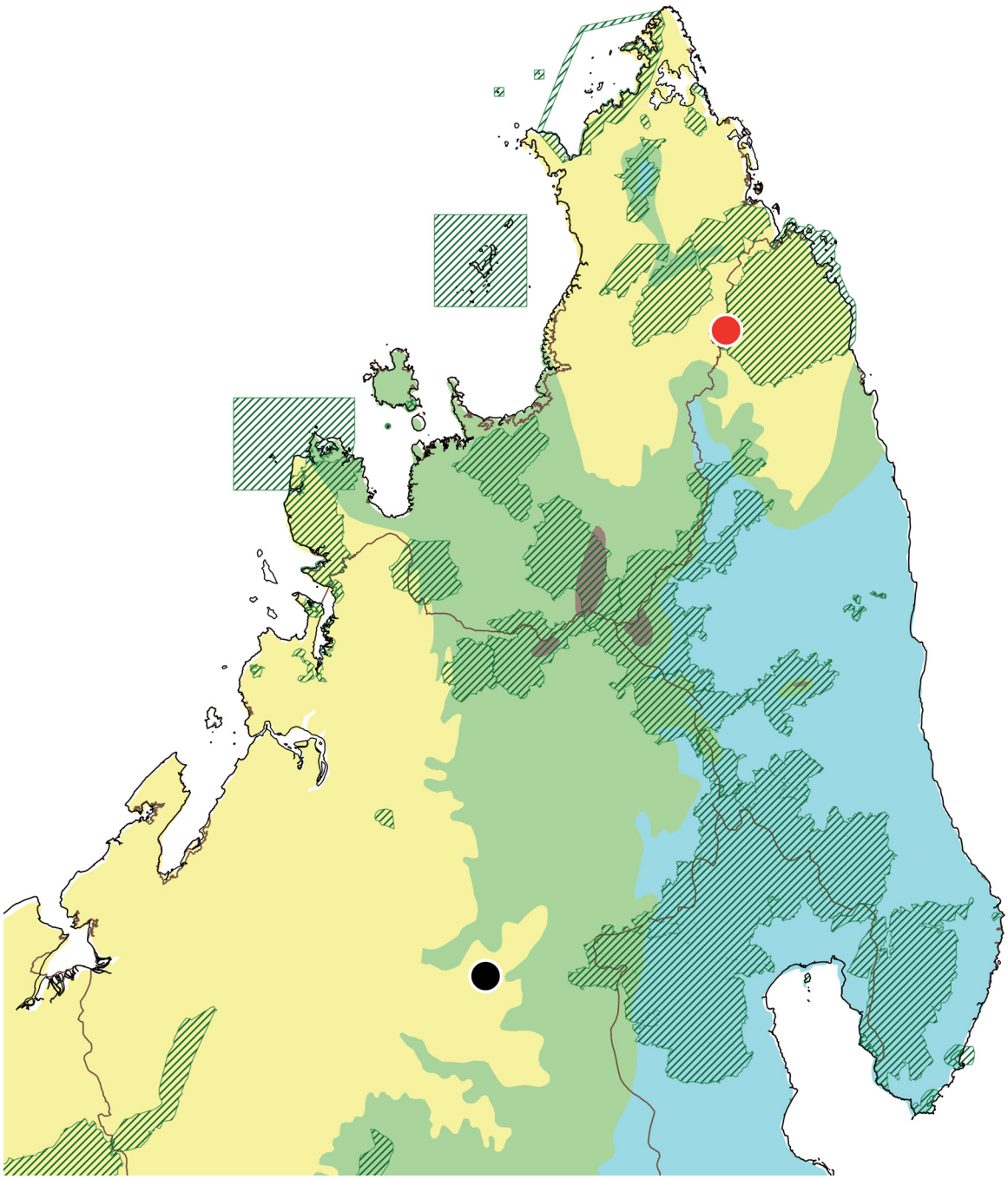


Fig. 41. Known distribution of *Chlorophytum sofiense* (H.Perrier) Marais & Reilly subsp. *sofiense* (black dot) and *C. sofiense* subsp. *gautieri* Bard.-Vauc. & M.Pignal subsp. nov. (red dot). See also Fig. 19. Map of all *Chlorophytum* taxa known from Daraina.

26.2 *Chlorophytum sofiense* subsp. *gautieri* Bard.-Vauc. & M.Pignal subsp. nov.
urn:lsid:ipni.org:names:77324053-1
Figs 2F, 5G, 41

Diagnosis

A tipo affinis, 1–4 bracteis foliaceis basilaribus inflorescentiae, 25–40 mm longis (vs tantum unicam basi triangulari atque apice acuminato, 6 mm), pedicello fructifero 10–11 mm (vs 2–4 mm), margine foliorum scaberula minutis regularibusque dentibus (vs laevem) praecipue differt.

Etymology

We are pleased to dedicate this subspecies to Laurent Gautier, Curator at the Conservatoire et Jardin botaniques de Genève, and lecturer in Plant Systematics and Biodiversity within the Department of Plant Sciences at the Université de Genève.

Type material

MADAGASCAR – **SAVA Region [Antsiranana Prov.]** • Daraina, forêt d'Ambohitsitondroina; 13°7′58′ S, 49°28′13″ E; 17 Mar. 2004; fr; *L. Gautier 4625*; holotype: G [G00030078]!; isotypes: K!, MO!, P [P04186579]!, TEF n.v.

Description

Herbaceous plant, 13–17 cm tall; *roots* long, slender, fibrous, some bearing a fusiform tuber of ca 1 × 0.3 cm; *leaves* numerous (9–16), with a broad sheathing base, lanceolate, 9.0–17.5 × 1.2–1.8 cm, pseudo-petiole 4.2–4.8 cm long, approximately one-third of the blade length, margin scabrous with small, regular teeth, lower surface glaucous green and covered with very fine protuberances, veins 18, well-marked and evenly spaced, apex with a tapering, pointed apex, 1.5 mm long; *inflorescence* solitary, terminal, short, dense and unbranched, 6.0–7.5 cm long, the peduncle ca 4–6 cm long (for the more robust specimens), bracts basal, 1–4, foliaceous, with a clasping base, pseudo-petiolate, subulate, 2.5–4.0 × 1.0–2.5 cm, margins scabrous, veins 5–9, *flowering rachis* contracted, 1–2.5 cm long with extremely reduced internodes; flowers 1–2 per node (based on the fruiting material), with a subulate floral bract, 4.0 × 0.5 mm, veins, 3–5; *flower* incompletely known (see Morphological remark below); *tepals* 3.5 × 0.8 mm, veins 3, well-spaced; *stamens* probably unequal, the longest equalling the tepals, filaments not seen, anthers rectangular, 0.7 × 0.2 mm, connective dark brown; *gynoecium*: ovary with 3 ovules per locule; *capsule* 3.3 × 4 mm, with rounded, short, thick, translucent sutural ridges visible on immature fruits; fruiting pedicel, 10–11 mm long, with medial articulation, *seeds* 1 or 2 per locule, 1.9 × 1.3 mm, with the radicle barely prominent.

Phenology

The subspecies was collected in March and only in fruit; the few remaining floral remains suggest that flowering finished in February.

Distribution and ecology

Chlorophytum sofiense subsp. *gautieri* subsp. nov. was collected in northern Madagascar near Daraina, at an altitude below 200 metres. Like the typical subspecies, it forms small groups, in humid forest, on granitic rocks. The collection was made at the edge of a stream.

Provisional IUCN Red List assessment

Chlorophytum sofiense subsp. *gautieri* subsp. nov. is also known only from a single recent collection and single occurence, made some 300 km to the NE of the typical subspecies, in the Loky-Manambato

protected area in NE Madagascar (SAVA Region) which is designated as a "harmonious protected landscape". Protection in the latter area is minimal, and only certain key sites are designated for active protection, and with its sole known location, *C. sofiense* subsp. *gautieri* is assessed as CR B2ab(i,ii,iii,iv,v).

Morphological remark

The data on floral morphology were obtained from the remains of flowers present on an immature fruit.

27. ***Chlorophytum subligulatum*** H.Perrier
Fig. 6H, 42

Chlorophytum subligulatum H.Perrier (Perrier de la Bâthie 1935: 53–54).

Etymology

The specific epithet refers to the grass-like growth habit and the resemblance of the leaf blade base to grass leaf ligules.

Type material

MADAGASCAR – **Sofia Region [Mahajanga Prov.] •** Masakoamena, bassin moyen du Bemarivo (Boina); [16°17′59.6″ S, 47°59′19.3″ E]; Dec. 1910; fl; *H. Perrier de la Bâthie 10976*; gneiss dénudés; lectotype: P [P01046107]!, **here designated**; isolectotype: P [P01046108]!.

Description

Herbaceous plant, 60 cm tall, somewhat caespitose; *roots* strongly thickened, 1–2 mm in diam., bearing a few fusiform tubers, 15–20 × 4 mm; *rhizome* present; *leaves* 7–10, linear, graminoid, 16.5–50 × 0.5–1 cm, leaf margin distinctly scabrous, base sheathing, 8–18 cm long, straw-yellow, transitioning to the green leafblade with a marked edge and an outward fold of the leaf, pseudo-midrib, veins 29–32, clearly visible, tip tapered; *inflorescence* solitary, erect, unbranched, up to 65 cm in height; peduncle 43 cm long, inflorescence bracts 1(–2), placed very high, just below the rachis, 2.5–5.4 × 0.35 cm, triangular, subulate, veins 20, margins smooth, *rachis* 7–12 cm long, flowers 1–3 per node; floral bracts basal, broadly triangular, 7 × 4 mm, the margins scabrous (in contrast to the inflorescence bracts), longer than the pedicel, the latter 1–5 mm long, with a sub-basale articulation; *perianth* white, 12–13 mm long, *tepals* subequal, oblong, 11–12 × 0.50–0.55 mm, veins 6, sometimes only 3 for the petals, all closely spaced at the centre; *stamens* as long as the tepals, filaments flattened, 4.5–5.0 × 1 mm at the base, distinct margin at the base of the connective, anthers yellow, 6.5 × 1.5 mm, oval, lanceolate, basifixed; *gynoecium*: ovary 0.2 × 0.12, ovules 16 per locule, style 12 mm long; *capsule* unknown.

Phenology

The only known collection was in flower in December.

Distribution and ecology

The only known collection of *C. subligulatum* comes from Boina, in the mid-Bemarivo basin. It was recorded growing on bare gneissic rocks, the post-facto georeference we have established is based on the recorded elevation.

Provisional IUCN Red List assessment

Chlorophytum subligulatum is known only from the type collection that was collected more than 100 years ago, representing a single known occurence. The area in which it was collected appears to be highly degraded on satellite images, and largely given over to agricultural activities. It is possible that the species

persists in the area, few plant collections have been made in the vicinity of the type and a targeted search for *C. subligulatum* in this area, which is poorly known, would be useful to assess its current status. Based on current information the species is assessed here as DD (Data Deficient).

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. IX 9–12.

Nomenclatural remarks

1) We designate the Paris herbarium sheet with the barcode P01046107 as the lectotype of *Chlorophytum subligulatum* H.Perrier because this specimen has more flowers than the only other known specimen, P01046108.

2) The type locality is uncertain. Perrier de la Bâthie places the plant in the "Bassin moyen du Bemarivo" [Middle Basin of the Bemarivo], specifying the locality: Masakoamena, which is a settlement located to the south of the river basin (we note that 'Masakoamena' means 'Place with many ripe *Sclerocarya caffra* fruits', which could be applied to many localities in western Madagascar). We have provided a post-facto approximate estimated georeference based on this information.

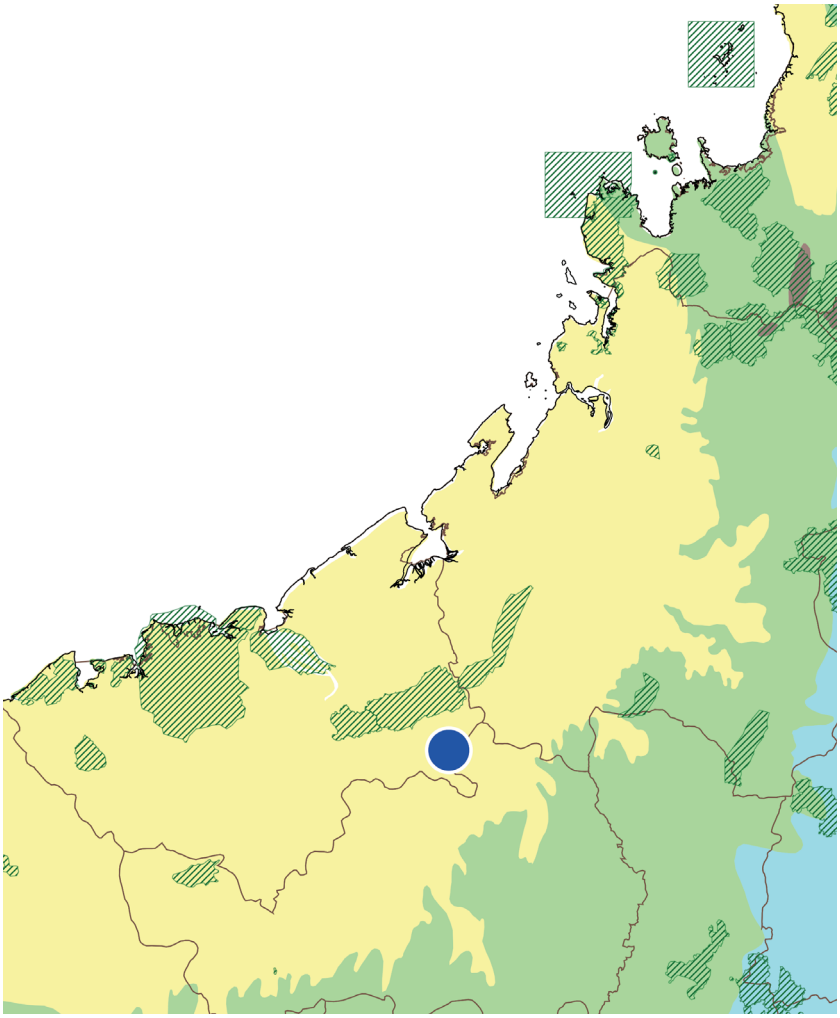


Fig. 42. Known distribution of *Chlorophytum subligulatum* H.Perrier (blue dot).

28. *Chlorophytum sylvestre* Bard.-Vauc.
Figs 2J–K, 4I, 43

Chlorophytum sylvestre Bard.-Vauc. (Bardot-Vaucoulon 1997: 152).

Etymology

The specific epiphet refers to the occurrence of the species in forest habitats.

Type material

Type

MADAGASCAR – **DIANA Region [Antsiranana Prov.]** • Plateau calcaire de l'Ankarana, zone du Lac Vert; [12°55′10.14″ S, 49°05′48.84″ E]; Jan. 1991; fl, fr; *M. Bardot-Vaucoulon 383*; holotype: P [P00078336]!; isotype: P [P00078337]!, TAN!.

Paratypes

MADAGASCAR – **DIANA Region [Antsiranana Prov.]** • collines et plateaux calcaires de l'Ankarana, E Ambondrofe; [12°53′37″ S, 49°14′ E]; Dec. 1937–Jan. 1938; fl; *H. Humbert 18980*; P [P00078338, P00078339, P00078340, P00078341]!.

Other material examined

MADAGASCAR – **DIANA Region [Antsiranana Prov.]** • Antsiranana, Ambilobe, Mahamasina Réserve Spéciale d'Ankarana, chemin d'Ambohimalaza, grotte d'Ambahibe; [12°58′ S, 49°07′ E]; 27 Jan. 2003; fr; *M. Bardot-Vaucoulon, O. Andrianantoanina, A. Toly, T. Manasy 1340*; MO [MO-3020305]!, P [P00455649]!, TAN!.

iNaturalist observations

MADAGASCAR – **DIANA Region [Antsiranana Prov.]** • 12°57′28.2″ S, 49°07′25.9″ E; 8 Jan. 2004; fl, fr; *Errol Vela (abounabat)*; iNaturalist 52799171 • 12°50′55.8″ S, 49°15′59.1″ E; May 2020; st.; *(feno)*; iNaturalist 61286825 • 12°52′06.3″ S, 49°13′33.9″ E; 10 Apr. 2022; st.; *A. Bour (botanarchiste)*; iNaturalist 140140162 • 12°56′47.8″ S, 49°07′30.0″ E; 11 Apr. 2022; fr; *A. Bour (botanarchiste)*; iNaturalist 140151596 • 12°56′58.5″ S, 49°07′39.4″ E; 11 Apr. 2022; st.; *D. Scherberich (dscherberich)*; iNaturalist 120482875.

Description

Plant herbaceous, 15–40 cm tall; *roots* numerous, fasciculate, fibrous, mostly with fleshy fusiform tubers below, 10–18 × 1–4 mm, but some roots branched and lacking tubers; *leaves* 2(–3), ovate to narrowly ovate, spreading on the ground, or occasionally erect, 7–13(–15) × 1.8–5.0(–5.8) cm, narrowed and sheathing at the base, 1.2–3.2 cm long, buried for 1–2 cm, emerging from a short foliar sheath, white, 1.8–3.5 cm with a pointed triangular tip, margin surrounded by a thin hyaline border, pseudo-midrib variably visible (differing between individual plants), veins 8–16, clearly visible, the apex pointed; *inflorescence* solitary, axis slender, often simple, but sometimes branched, 16.0–37.5 cm long, peduncle (5–)7–15(–22) cm long, bracts 1–2 or absent, triangular, acute, with a reddish-violet base, 3–5 × 1–2 mm, upper part of the peduncle and of the flowering *rachis*, covered with small triangular transparent protuberances, flowers, 1–5 per node, floral bract dark, with a broad triangular base, 2.3 × 1 mm, veins 3, shorter than the pedicel, the latter, 4.5 mm long, articulation inframedial; *flowers* pendant at anthesis, white; *perianth*, 4 mm long, with subequal 3-veined segments, greenish-white turning violet with age, outer tepals, 4 × 0.5 mm, inner tepals, 4 × 0.7 mm; *stamens* equal, shorter than the perianth, filament, 2.5 mm long, papillose and thickened from the lower 1/3, anthers, 0.6–0.8 mm long, yellow-green, dorsifixed to submedifixed; *gynoecium*: ovary 0.6–1 mm in diam., ovule 1 per locule, style filiform, 3.5 mm long, stigma slightly

thickened; *capsule* broader than long, 2.5 × 3.5 mm, often with one or two atrophied locules, sutures thick, ornamented with 3–4 transverse veins; *seeds* 3, black, flattened, reniform, 2.5–3.0 × 2 mm, testa shiny, surface very finely granular, notched in the middle of the inner edge, with the radicle forming a conical protrusion at the bottom of the notch.

Phenology

The species starts flowering as early as December, and the plants bear both flowers and fruits in January.

Distribution and ecology

This species is found exclusively in the north of Madagascar, in the Réserve Spéciale d'Ankarana [Ankarana Special Reserve] (including one record in the buffer zone) and at the edge of the adjacent Andrafiamena Special Reserve. It grows in the undergrowth of the dry deciduous forest on limestone plateaus, between the rock slabs, in shallow calcareous clay soils.

Provisional IUCN Red List assessment

Chlorophytum sylvestre is only known to occur within the Ankarana Special Reserve, where it has been collected recently three times and has been recorded by iNaturalists three times, and the available records are well distributed throughout the reserve, thus representing at least 5 occurrences. However, the species has a very restricted known range, with an EOO of 73 km^2 and an AOO of 28 km^2, but nevertheless the reserve is well established and not subject to major impacts. It is an important tourist site, and the reserve is largely inaccessible to livestock from surrounding areas, and of little use for shifting cultivation. It is assessed as Least Concern (LC).

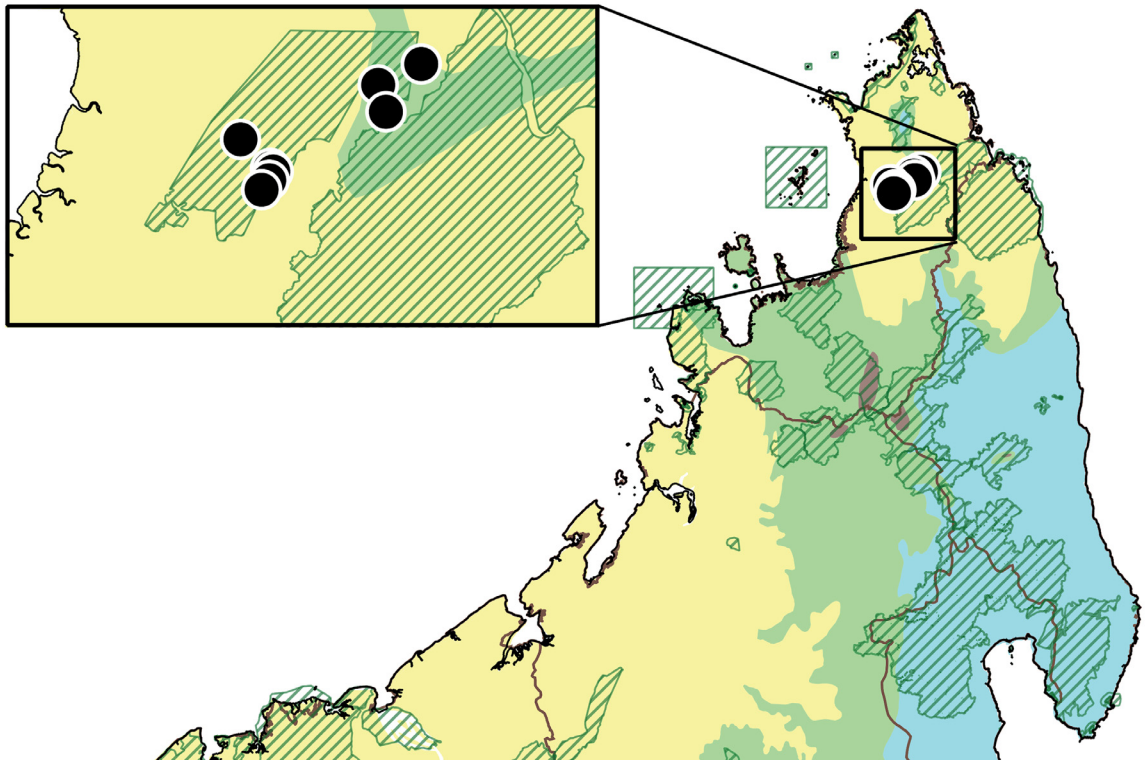


Fig. 43. Distribution of *Chlorophytum sylvestre* Bard.-Vauc. Known only from Ankarana Special Reserve, and from the edge of Andrafiamena Special Reserve, to the south-east of Ankarana.

29. ***Chlorophytum tolyanum*** Bard.-Vauc. & M.Pignal sp. nov.
urn:lsid:ipni.org:names:77324054-1
Figs 5B, 36, 44

Diagnosis

Planta herbacea 60 cm alta, radicibus fasciculatis, unum-tria fusiformia albaque tubercula, (10–15 mm × 2–3 mm), folia grandia (25.5–60 × 3.0–4.8 cm), duo externa minora, pseudopetiolus 12–17 cm, lamina attenuata ad basim et acuta ad apicem, inferna pagine triste viride (in vivo), margo scaberula, 32 nervis remotis manifestisque. Inflorescentia unica, erecta, ramosa, 42–52 cm alta, pedunculus 19–27 cm longus, bractea inflorescentiae triangularis, 12 × 4 mm, margine leviter scaberula nervisque paulo manifestis. Pedunculus ramificationesque inflorescentiae omnino obtecti pilis brevibus hyalinisque.

Flores (1–4). Pedicellus articulatus infra medium. Bractea floris triangularis, 3–4 × 2.5 mm, base vaginata acuto apice, 3 nervis paulo manifestis, omnino obtecta pilis brevibus hyalinisque. Perianthium, 5 mm altum. Tepala alba elliptica, subaequalia, 4.9–5.1 × 1 mm, trinervia apice acuminato.

Stamina 2 coacervati, 4 aequantia perianthum, 2 paulo breviora. Papilla 2/3 filamenti staminum obtegentia (longis staminibus 4.8 mm in longitudine, brevibus, 3.8 mm). Filamentum dorsifixum fere medifixum, antherae lutae, 0.7 × 0.2 mm. Ovarium globosum 0.8 × 0.8 mm. Ovulum 1 per loculum. Stylus filiformis, 6.3 mm.

Etymology

The species is dedicated to Aurélien Toly, ecotourist guide, who was, as ANGAP staff member (today MNP), one of the accompanying guides during the various missions carried out by MBV in the Special Reserve of Ankarana in 1997, 2003 and 2007. He is a co-collector of the material obtained in the field.

Type material

MADAGASCAR – **DIANA Region [Antsiranana Prov.] •** Ambilobe, RS Ankarana, chemin Amposately au Lac Vert; 12°55′ S, 49°05′ E; 14 Jan. 2003; fl; *M. Bardot-Vaucoulon, O. Andrianantoanina, A. Toly & T. Manesy 1193*; holotype: P [P00455486]!; isotypes: K!, MO!, TAN!.

Description

Plant herbaceous, up to 60 cm tall; *roots* fasciculate, rigid, bearing 1–3 white fusiform tubers, 10–15 × 2–3 mm; *leaves* 7, lanceolate, 25.5–60 × 3–4.8 cm, but the 2 outer ones smaller, leaf base attenuate, pseudo-petiole broad, 12–17 cm long, base sheathing, blade dull green below, the margins scabrous, with 28–32, clearly visible, evenly-spaced veins, apices long-tapered and aristate; *inflorescence* solitary, erect, branched, 42–52 cm in length, peduncle 19–27 cm long; axes entirely covered with short, white, hyaline hairs; subtended by a solitary, triangular bract, 12 × 4 mm, with slightly scabrous margins and barely visible veins; *rachis* 22–27.5 cm long; *flowers* 2–4 per node, floral bract 3.5 × 2 mm, triangular, embracing the base, margins scabrous, apex pointed, shorter than the pedicel, veins 3, only faintly visible; pedicel 4.5 mm long, covered with hyaline hairs, the articulation inframedial; *perianth* 5 mm long, *tepals* elliptical, white, sub-equal, 4.9–5.1 × ca 1 mm, veins 3, close together; *stamens* in two unequal groups, 4 long (equaling the perianth), 2 short (slightly smaller), filaments papillose for ca 2/3 of their length, 4.8 mm long for the long ones, 3.8 mm long for the short ones, anthers yellow, 0.7 × 0.2 mm, dorsifixed to submedifixed; *gynoecium*: ovary 0.8 × 0.8 mm, ovules 1 per locule, style filiform, 6.3 mm long; *fruit* unknown.

Phenology

The only known collection was in early flower in January, corresponding to the start of the rainy season.

Fig. 44. *Chlorophytum tolyanum* Bard.-Vauc. & M.Pignal sp. nov., holotype, *M. Bardot-Vaucoulon et al. 1193*, P [P00455486]. **A**. Habit. **B**. Flower. **C**. Stamen (long one). Drawing by Laurence Ramon.

Distribution and ecology

The only known collection of this species is from the Réserve spéciale d'Ankarana [Ankarana Special Reserve] in the North of Madagascar. It occurs in the understory of dry deciduous forest, specifically growing in limestone scree, containing conspicuous large blocks of limestone, with pockets of smaller pieces and humic soil.

Provisional IUCN Red List assessment

Chlorophytum tolyanum sp. nov. is known only from a single recent collection in what is regarded as a well-managed Special Reserve, and it is naturally well-protected by its habitat which is difficult to access. However, it is known from only a single occurrence, and it is therefore presumed to be rare. A targeted survey of its occurrence at the site is needed to be able to assess any threats to the species, and in orger to provide a meaningful conservation status, and at present it must be assessed as DD (data deficient).

A map showing the single occurrence of *Chlorophytum tolyanum* sp. nov. together with *C. ratovosonii* sp. nov., another poorly-known species from the north of Madagascar, is provided under the treatment of *D. nigrogranulosum* sp. nov. (Fig. 36).

Taxonomical remark

This species differs from other species by a mosaic of characters that makes it difficult to understand a differential diagnosis mentioning several other species. We prefer to present a descriptive diagnosis here.

30. ***Chlorophytum tripedale*** (Baker) H.Perrier
Figs 3G–H, 6J, 7B, 45

Chlorophytum tripedale (Baker) H.Perrier (Perrier de la Bâthie 1935: 51–52). – *Anthericum tripedale* Baker (Baker 1882: 269).

Etymology

The specific epithet refers to the height of the individuals, which is approximately 1 m (i.e., about three English feet).

Type material

MADAGASCAR – **Amoron'i mania [Fianarantsoa Prov.]** • Chiefly in Betsileo-land; s.d.; fr; *R. Baron 74*; holotype: K [K000432397] image!.

Other material examined

MADAGASCAR – **Amoron'i mania [Fianarantsoa Prov.]** • Ambatofinandrahana, Anjakely, route Itremo Amborompotsy, 23 km avant Amborompotsy; 20°35′19″ S, 46°26′07″ E; 1668 m; 20 Aug. 2010; fl; *B. Andrianaivoravelona, M. Rakotoarinivo, G. Ratovonirina & R. Rajaonarison 349*; K n.v., MO [MO-3187954] image!, TAN n.v. • Fianarantsoa, Ambatofinandrahana, Ampangabe, environ 3 km au sud ouest du village d'Itremo; 20°36′58″ S, 46°37′07″ E; 1371 m; 28 Apr. 2012; fl; *S. Andrianaivoravelona, M.J. Lazasoa & Andriamampionona 629*; G!, K n.v., MO [MO-3047189]!, P [P00967918]!, TAN n.v. • Ambatofinandrahana, Itremo, Andaobatofotsivava; 20°37′07″ S, 046°35′55″ E; 1371 m; 20 Dec. 2003; fl; *P. Antilahimena & Andriamihajarivo 2445*; G!, MO image!, P n.v., TAN n.v. • Itremo; [20°35′ S, 46°37′ E]; Jan. 1964; fl; *J. Bosser 19068*; P [P02071744]! • Entre Ambatofinandrahana et Itremo, 27 à 40 km à l'ouest d'Ambatofinandrahana; [20°33′ S, 46° 40′ E]; 26 Jan. 1975; fl; *T. Croat 29824*; MO [MO-2682023]!, P [P02071750]!, TAN! (2 parts), WAG [WAG.1151770] image! • Environs d'Ambatofinandrahana; [20°33′ S, 46°48′ E]; 1600–1800 m; 15 Feb. 1938; fr; *R. Decary 12904*; P [P02071746]! • same data

as for preceding; 16 Feb. 1938; fr; *R. Decary 12978*; P [P02071743]! • Ouest d'Ambatofinandrahana; [20°33′ S, 46°48′ E]; 20 Nov. 1939; fl; *R. Decary 15150*; P [P02071751]! • Ambatofinandrahana; [20°33′ S, 46°48′ E]; 4 Feb. 1943; fl bud; *R. Decary 17393*; P [P02071745]! • same data as for preceding; 3 Feb. 1942; fl bud; *R. Decary 17413*; P [P02071749]! • WC, Fianarantsoa Province, W of Ambositra, Eastern margin of the Itremo Massif; 20°35′11″ S, 46°35′38″ E; 22 Nov. 1993; fl; *D. Du Puy, J.-N. Labat & J. Andriantiana M642*; K n.v., MO [MO-3020348] image!, P [P016763]! • Filiarivo à l'Ouest d'Ambositra. Bois des pentes occidentales sur gneiss; [20°35′ S, 47°10′ E]; ca 1600 m; 15 Jan. 1955; fl, fr; *H. Humbert & R. Capuron 28032*; P [P02071752]! • Environs d'Ambatofinandrahana (Betsileo); [20°33′ S, 46°48′ E]; 16 Jan. 1955; fl, fr; *H. Humbert & R. Capuron 28079 bis*; BR [BR0000021762284] n.v., G!, K n.v., P [P02158249]!, TEF n.v. • W d'Itremo, montagnes (ouest Betsileo); [20°35′ S, 46°37′ E]; 17–22 Jan. 1955, 18–22 Apr. 1955; fl; *H. Humbert 28381*; P [P02158251]!, TAN n.v. • same data as for preceding; fl; *H. Humbert 29997*; L n.v., P [P02158250]!, TAN! • same data as for preceding; fl, fr; *H. Humbert 29998*; MO n.v., P [P02158252]!, TEF n.v. • Entre Ivato et Ambatofinandrahana; [20°33′ S, 46°48′ E]; 1 Dec. 1970; fl; *M. Keraudren-Aymonin et G. Aymonin 25737*; MO!, P [P02071748]! • Ibity Massif, northern sector. Slopes above cement factory. Tapia (*Uapaca bojeri*) woodland; 20°03′47″ S, 47°00′02″ E; 16 Feb. 1997; fl; *P.P. Lowry 4819*; G!, MO [MO-3020290] image! • Itremo massif, W of Ambatofinandrahana, ca 2 km before (NE of) bridge over Ambalarangolana creek; 20°33′57.996″ S, 46°35′35.016″ E; 10 Nov. 2002; fl, fr; *P.P. Lowry II, G.E. Schatz, T. Andriamihajarivo, C. Hong-Wa, S. Rapanarivo, H. Rabarison 5911*; G!, MO [MO-3020303] image!, P [P06169839]! • Forêt d'Ianasana, à 7 km à l'ouest d'Itremo, le long de la rivière Atsirakamhaity; 20°36.1′ S, 46°34.3′ E; 1630 m; 1 Feb. 1999; fl, fr; *N. Messmer & F. Andriatsiferana 758*; G!, MO [MO-3020299] image!, P [P06169893]!, WAG [WAG.1924756] image!. – **Vakinankaratra [Antananarivo Prov.]** • Ibity Massif; 20°04′10″ S 047°00′16″ E; 1700 m; 15 Feb. 2003; fl; *G. Schatz, P.P. Lowry II, T. Andriamihajarivo, C. Hong-Wa, D. Rabehevitra, S. Lowry 4052*; BR [BR0000009374294] n.v.?, G!, P [P06169842]!, WAG [WAG.1924728] image! • Mt Ibity, about 27 km SW of Antsirabe; 20°04′10″ S, 47°00′16″ E; 1530 m; 15 Mar. 2004; fl; *F. Almeda, H. Ranarivelo & T. Randriambololona 8685*; CAS n.v., MO [MO-3241816] image!, TAN n.v. • S-W d'Antsirabé, montagnes; [19°55′ S, 46°59′ E]; 1600 m; Jan. 1914; fl; *H. Perrier de la Bâthie 10988*; P [P02071361, P02071362, P02071359]! • S du Mont Ibity; [20°9′ S, 47°1′ E]; 1200 m; Apr. 1928; fl, fr; *H. Perrier de la Bâthie 18508*; P [P02071363]! • Itremo, RN 35, 19 km w d'Ambatofinandrahana; 20°4′10.02″ S, 47°0′15.984″ E; 11 Mar. 1992; fl, fr; *P.B. Phillipson 3838*; MO [MO-3020300] image!, P [P02071360]! • Ibity, massif de Maintsoankarana, 3 km S mairie Ibity; 20°04′28″ S, 46°59′57″ E; 1400 m; 17 Mar. 2011; fl; *R. Randrianaivo, S. Rakotonandrasana, A. Rakotondrafara, Zafisoa, D.M. Dominique, J.C.O. Andrianiaina & B. Rakotonindriana 1816*; CNARP n.v., MO [MO-3020429] image!, TAN n.v. • Ibity, Antanifotsy, formation savanicole de Kiboy; 20°03′52″ S, 46°59′57″ E; 1650 m; 9 Dec. 2004; fl; *M.F. Randriatsivery M. H. Rasoafaranaivo & Bruno 1*; MO [MO-3047199] image!, P [P01138922]!, TAN n.v. • Antsirabe District, Ibity mountain. Above the Faliandro gallery forest; 20°04′28S, 47°00′27″ E; 1557 m; 18 Jan. 2017; fl; *S.G. Razafimandimbison, O. Thureborn, E. Larsén & V. Razafindrahaja 1715*; G!, MO [MO-3047190] image!, P [P02091352]!, S n.v. • Ibity massif west, Vohipisaka; 20°08′53″ S, 46°58′57″ E; 1482 m; 28 Feb. 2004; fl; *C.K. Skema & Chris Birkinshaw 11*; BH n.v., MO [MO-3020304] image!, TAN n.v. • Antsirabe district, commune Ibity, 25 km south Antsirabe, 1500 m, along the northern trail towards Mount Ibity; 20°04′01″ S, 47°0′04″ E; 9 Feb. 2018; fl; *U. Swenson, V. Razafindrahaja, A. Atalahy, S. Razafimandimbison 1901*; MELn.v., MO [MO-2682023] image!, P [P01182488]!, S n.v., TAN n.v.

iNaturalist observations

MADAGASCAR – **Amoron'i mania [Fianarantsoa Prov.]** • 20°35′44.7″ S, 46°37′58.7″ E; 7 Nov. 2013; fl; *F. Rakotonasolo (franck)*; iNaturalist 1873747 • 20°28′43.4″ S, 46°23′01.8″ E; 18 Dec. 2015; fl; *Fetra Randriatsara (fetra)*; iNaturalist 2559733 • 20°31′36.4″ S, 46°38′26.8″ E; Jun. 2017; fl; *F. Rakotonasolo (Franck)* • 20°28′50.1″ S, 46°27′45.3″ E; Dec. 2018; fl; *Ramaro (sederaramarom)*; iNaturalist 19061004 • 20°30′05.5″ S, 46°33′35.5″ E; 21 Feb. 2019; fl; *Landy Rita Rajaovelona (landyrita1)*; iNaturalist

21137874 • 20°32′45.6″ S, 46°34′24.8″ E; Dec. 2019. fl; *Ramaro (sederaramarom)*; iNaturalist 36521020 • 20°36′58.9″ S, 46°33′27.8″ E; 9 Dec. 2019; fl; *Andry.A.R (andryrakoto)*; iNaturalist 36793787 • 20°39′32.8″ S, 46°58′31.6″ E; 5 Jan. 2024; fl, fr; (*dennis-mada)*; iNaturalist 196826090 – **Vakinankaratra [Antananarivo Prov.]** • 20°13′42.4″ S, 46°21′42.5″ E; Nov. 2010; fl; *T. Randriamboavonjy (tiana123)*; iNaturalist 911218.

Description

Herbaceous plant, 60–110 cm tall, *roots* fleshy, thickened, 1.5–2.5 mm in diam.; developing from a short *rhizome*; *leaves* 5–8, linear, 32–80 × 0.3–0.7 cm, sheathing at the base; leaf margins and the veins on both surfaces scabrous, also with short hairs on the upper surface, and thick, dense indument forming a loose felt on the lower surface; midrib protruding on the adaxial surface, yellow in colour, long attenuate and tapered to the apex; veins 19–23, prominent, closed; *inflorescence* solitary, simple or occasionally with a rudimentary branching at the base of the flowering part (*Perrier de la Bâthie 10988* and *Schatz et al. 4052*), 73–125 cm tall, peduncle smooth (30–)40–76 cm long, bearing 2 or 3 bracts with a broad triangular base in the upper 2/3, the bracts sheathing, very variable in length, size and appearance, 1–13 × 0.4–0.8 cm, the largest bracts with scabrous margins; veins 18–20, tapered towards the apex, *rachis* 19–57 cm long, flowers 2–3 per node, floral bracts tinged red, ovate, 5 × 4 mm, cuspidate, shorter than the pedicel, the latter 10–12 mm long, articulation supra- or inframedial; *perianth* 1.5–2.5 cm long, with oblong segments,

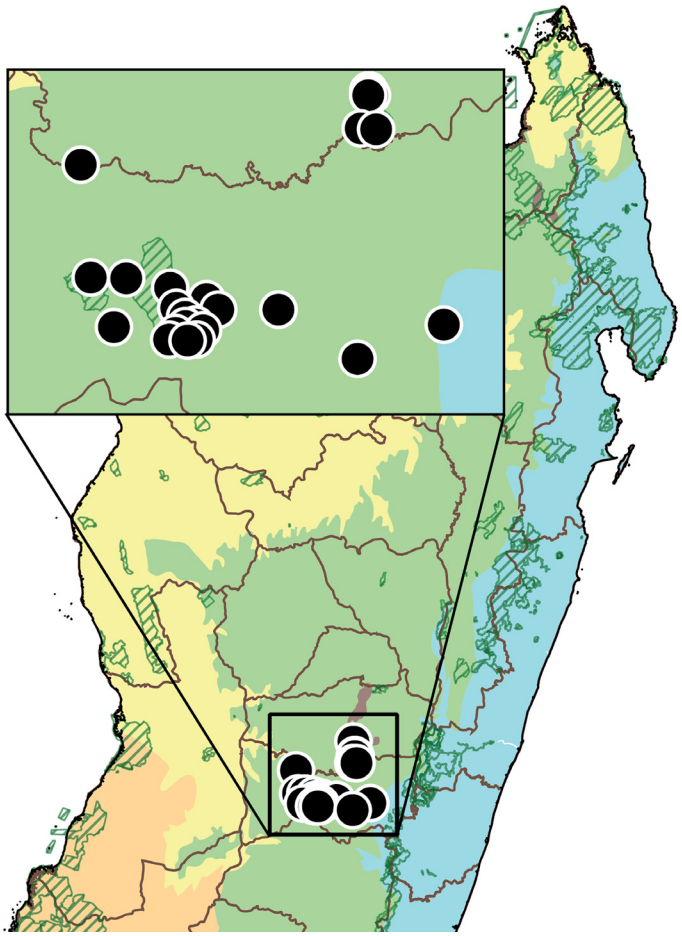


Fig. 45. Distribution of *Chlorophytum tripedale* (Baker) H.Perrier, including presence within the Itremo Massif Harmonious Protected Landscape (dark green hashed area visible in enlarged map).

white; apex subacute; outer tepals 0.5–0.8 cm wide; veins 5–7(–8–9), inner narrower, 0.3–0.7 cm wide, veins 3(–5), closely-spaced, conspicuous, anastomosing near the apex, green in vivo, becoming brown when dried; *stamens* equal, shorter than the tepals at anthesis, deflected to one side of the ovary, filament white, flattened, 3–5 mm long, tapered at the top, connective with no heel (except for *Humbert 28381* which has a short rounded heel) anthers yellow, oblong, 5–8 × 1–2 mm, basifixed; *gynoecium*: ovary inclined, opposite the stamens, 3 × 2 mm, ovules 14–20 per locule; style curved, 4–12 mm long, widely deflected, stigma rounded; *capsule* taller than wide, 1.2–1.7 × 0.7–0.8 cm, terminating in a beak formed from the indurated remains of the style, with marked transverse ribs; *seeds* black, flat, 3 × 2 mm, generally angular, densely packed and deformed due to compression; radicle ca 1 mm long, protruding.

Phenology

The flowering has been recorded from November to April, with a peak in January and February. Flowering outside this period was observed in two collections, respectively in June and August. Fruiting begins as early as January.

Distribution and ecology

All the collections come from the central 'high plateau' of Madagascar, at altitudes ranging from 1200 m to 1600 m, mainly in the Itremo massif, on metamorphic rocks such as cipolins and quartzites. The distribution range appears to be closely linked to substrate, and with a preference, as reported several times, for moist areas.

Provisional IUCN Red List assessment

Chlorophytum tripedale is endemic to Madagascar, where it is limited to the Vakinkaratra and Amoron'i Mania Regions in the central highlands. It is known from a total of 40 collections, representing ca 14 occurences, of which the majority were collected in the past 20 years, within either the Itremo Massif (which comprises two separate zones) or the Ibity protected areas, both of which are classified as Harmonious Protected Landscapes. *Chlorophytum tripedale* has an Extent of Occurrence (EOO) of 4683 km^2 and an Area of Occupancy (AOO) of 96 km^2. Much of the potential habitat for the species is given over to agricultural activities which likely impacts the species significantly, especially outside the protected area. However, the species is known to be represented by an estimated 10 locations where the effect of these impacts may be significant, so an assessment of Vulnerable is appropriate. The species is assessed as VU B1B2ab(i,ii,iii,iv,v). Documenting and monitoring of the species outside of the protected areas should be undertaken.

Illustrations

Perrier de la Bâthie 1937 [1938]: fig. IX 4–8.

Geographical remark

The type, *R. Baron 74* was collected in "Betsileo country", which corresponds to a vast geographical area extending from the Mania River in the north to the Andringitra massif in the south. This distribution is consistent with the suggested range of other collections of this taxon.

31. ***Chlorophytum* sp. 1**

Figs 6A, 46–47

Material examined

MADAGASCAR – **Sofia Region [Mahajanga Prov.]** • Col d'Andavakaka, Befandriana (Nord); [15°21′ S, 47°40′ E]; 24 Dec. 1942; fl; *J. Botanique 5668*; P [P06169906]!.

Description

Underground parts and *leaves* unknown. *Inflorescence* unbranched, robust with a smooth, truncate peduncle, bearing two very long bracts up to 12.5 × 0.3 cm, that resemble leaves, terminating in a fine apex, with 18 prominent, closely-spaced veins, and with scabrous margins; *flowering rachis*, 12–13 cm long, floral bract 13.5 × 2.5 mm, similar to the inflorescence bract but shorter, longer than the pedicel, the latter, 5.5 mm long, articulation medial, flowers 1–2 per node, *flower* 16 mm long, *tepals* white, ovate, with 5 veins, the central 3 converging at the apex, unequal; outer tepals 14 × 3 mm; inner 15 × 4 mm; *stamens* almost equaling the perianth in length, the filaments flattened, 6.5 mm long, narrowed at the top, the anthers long conical, 8–9 mm long, the margins of the dehiscence slit denticulate, and the apex rounded, with a hastate base and a flat heel, 0.6–0.7 mm long at the base of the connective; *gynoecium*: ovary 2.2 × 2.0 mm, narrowed at the base, ovules 10 per locule; *immature capsule* taller than wide.

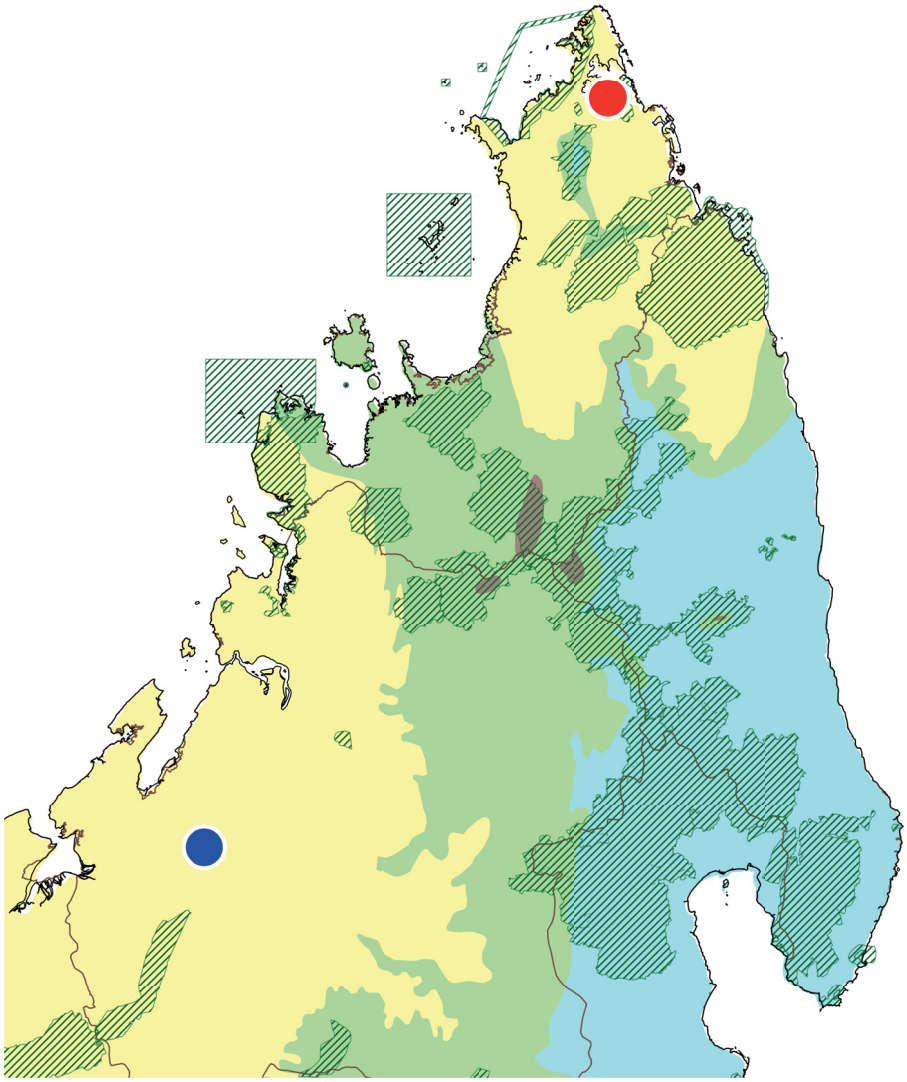


Fig. 46. Known locality for *Chlorophytum* sp. 1 (blue dot) at the Col d'Andavakaka, Befandriana, Sofia Region, *J. Botanique 5668*, and approximate locality of origin for *Chlorophytum* sp. 2 (red dot) from the vicinity of Antsiranana "Diego Suarez", DIANA Region.

Fig. 47. Herbarium specimen of *Chlorophytum* sp. 1, *J. Botanique 5668*; P [P06169906].

Phenology

The specimen flowered in December in cultivation at the Tsimbazaza Botanical Garden in Antananarivo (altitude of 1500 m). A young fruit was also formed.

Distribution and ecology

The plant was collected in northern Madagascar, in the region of Befandriana, on a rocky substrate consisting of granite and metamorphic rocks at an altitude of approximately 500 m. No further information was provided by the collector about its habitat.

Remark

The plant was collected in Befandriana Nord and subsequently cultivated in the gardens of Tsimbazaza, where it flowered and herbarium specimens were prepared. The herbarium specimen, composed of the dried floral parts, lacks underground organs and leaves. This collection appears clearly distinct from other species. However, its fragmentary condition provides only for an incomplete description, that we consider insufficient for formally establishing a new taxon. Nonetheless, the specimen clearly belongs to Perrier de la Bâthie's Group 2, and a targeted search for adequate material in the Befandriana Region is needed.

32. ***Chlorophytum*** **sp**. **2**
Fig. 5E, 46, 48

Material examined

MADAGASCAR – **DIANA Region [Antsiranana Prov**.**]** • Diego Suarez [Antsiranana]; [12°19′ S, 49°17′ E]; Sep. 1843; fl, fr; *L. Boivin 2338*; P [P06169866]!.

Description

Underground part and *leaves* unknown. Collection limited to an *inflorescence*, ca 35.5 cm long, with its base truncated, the peduncle and rachis of the flowering portion covered with translucent hairs whose abundance and size increase gradually towards the apex, at the base, there are short, 0.10–0.15 mm, triangular-based hirsute trichomes, longer, finer and flatter towards the apex, up to 0.35–0.40 mm long; peduncle 15.5 cm long, bearing two large, closely-spaced triangular bracts towards the middle, 9–11 × 2.5 mm, veins 7, margins smooth; *flowering rachis* 18.5 cm long, with short sub-terminal branching; flowers 2–3 per node, floral bract long and narrowly triangular, tapered, ca 5.0 × 0.8 mm, pedicel ca 5 mm long, slender, articulation medial, with a few short, triangular hairs present below the articulation; *perianth* 5 mm long, with elliptical segments and acute apices; outer tepals slightly shorter, but wider, than the inners, 4 × 0.5 mm; inner tepals 5 × 0.4 mm, with 3 converging veins at the apex; *stamens* shorter than the tepals, with short, flattened filaments, 1.8 mm long, anthers yellow, 2 × 0.2 mm, elongated, tapering at the top; *gynoecium*: ovary 0.9 × 0.6 mm, with at least 5 ovules per locule (based on the number of seeds in a fruit), style very long, 7 mm; *capsule* wider than high, 3.5 × 5 mm, with thin walls and transverse veins, containing approximately 5 seeds; *seeds* black, compressed bilaterally, attached toward the middle of the inner angle of the locule "5 graines environ noires, comprimées bilatéralement, attachées vers le milieu de l'angle interne de la loge" (fide Boivin, and dating back to 1848).

Remark

This specimen was already considered by Perrier de la Bâthie to be a new species (fide note in herb.), that unquestionably belongs in Group 1. While we agree with Perrier's conclusion, due to the unique combination of the indument of the peduncle, the rachis, and floral parts, we refrain from formally describing it as a new species due to the incomplete state of the available material. Extant populations

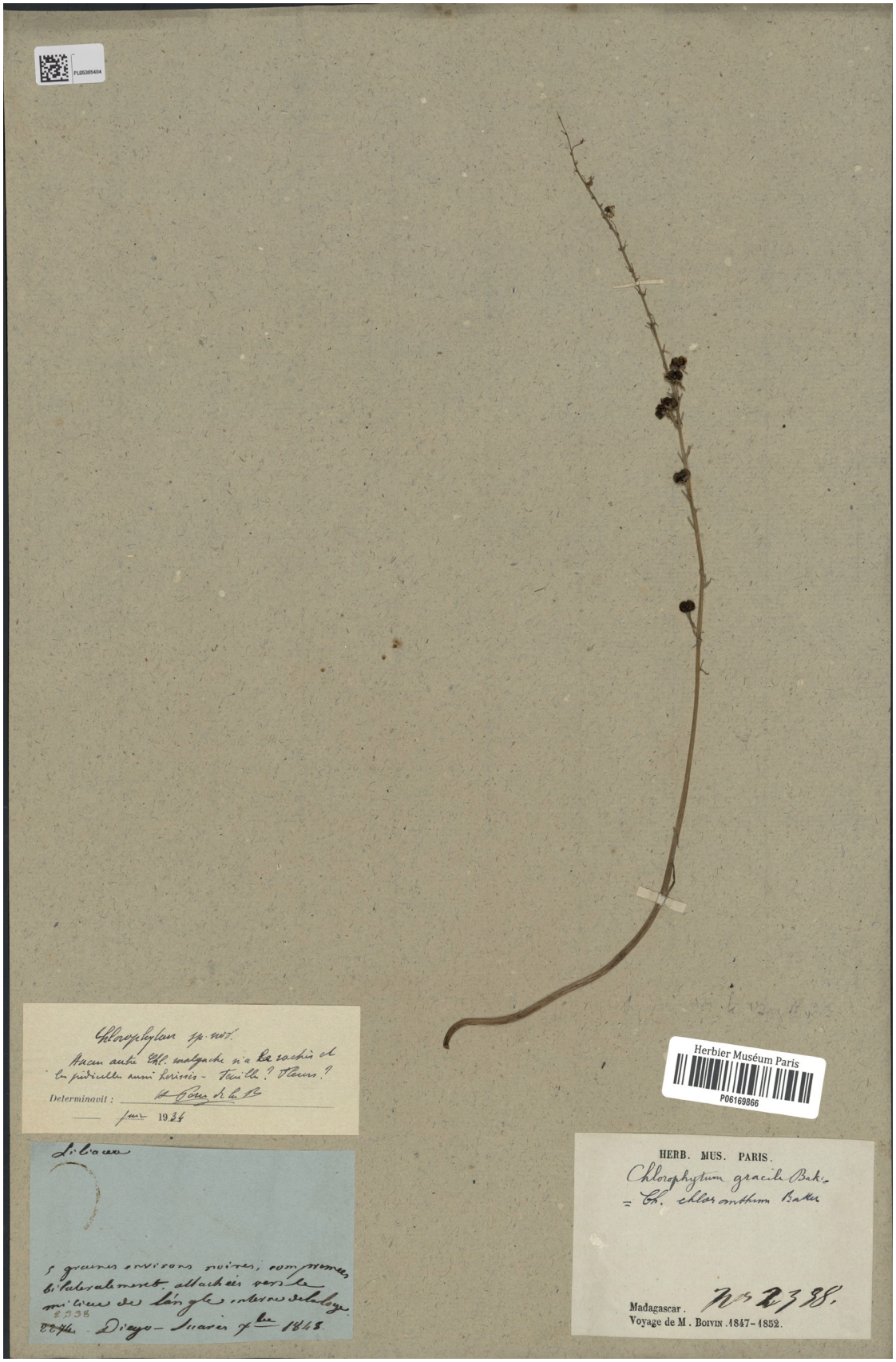


Fig. 48. Herbarium specimen of *Chlorophytum* sp. 2, *L. Boivin 2338*; P [P06169866].

should be sought near Antsiranana, but nevertheless, the chances of finding material of the species is probably low due to habitat degradation in this region.

33. ***Chlorophytum comosum*** (Thunb.) Jacques

Material examined

MADAGASCAR – **Analamanga [Antananarivo Prov.]** • Antananarivo, Jardin Tananarive; 1923; fl; *M. Waterlot 55bis*; P [P06169831]! • Antananarivo, Jardin botanique; ombrière; 21 Oct. 1935; *Jardin botanique JB 1190*; TAN!.

Remark

A plant native to southern Africa (Bjorå & Nordal 2014), but widely cultivated in gardens and as an indoor pot plant, including in Madagascar. Forms with variegated green and white foliage are most commonly cultivated.

Discussion

Our study, based on collections made since the publication of the *Flore de Madagascar* (Perrier de la Bâthie 1937 [1938]), provides an update on the knowledge of the genus *Chlorophytum* in Madagascar. Given the gaps in the collection for certain taxa, this work represents just an intermediate step. The characterisation of certain species (and their infraspecific taxa) in Madagascar remains incomplete (notably for *C. madagascariense* and its varieties). Similarly, knowledge of the distribution of many taxa is still incomplete, and this has hindered the clarification of several IUCN status assessments, which we can only assess as data deficient. To facilitate fieldwork, Table 6 lists the taxa to be searched for as a priority.

Finally, phylogenetic studies remain to be undertaken for the Malagasy *Chlorophytum* to elucidate the relationships between species. A broader phylogeny of the genus is needed to better understand the relationships between the Malagasy and African taxa, taking into account other related genera.

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Table 6 (continued on next page). Lesser-known species of *Chlorophytum* Ker Gawl., with observations to encourage future research.

Taxon	Type of environment	Region	Localities	Year of most recent collection	Remarks
***C. albociliatum* sp. nov.**	Gneiss, wooded area, 1400–1500 m	Amoroni'mania	Ambatofinandrahana	1955	One collection only. Mature fruit unknown.
C. ankarense	Sand or limestone, in dry areas	Boeny, Androy, Atsimo-Andrefana	5 subpopulations: Parc National d'Ankarafantsika, Parc National de Namoroka, Aire Protégée de Ranobe PK32, Causse d'Ankara, Ampandrandava	1955	5 collections, somewhat incomplete
***C. aspidistrifolium* sp. nov.**	Sclerophyllous forest undergrowth	SAVA	Paysage harmonieux de Loky Manambato	2006	Single collection; flowers unknown
***C. basivaginatum* sp. nov.**	Meadows and open areas, at 1600 m	Amoroni'mania	Ambatofinandrahana	2004	Single collection; mature fruit unknown
***C. candelabrum* sp. nov.**	Undergrowth of dense forest, at 200 m	SAVA	Near Loky Manambato	2005	Single collection; flowers unknown
***C. darainense* sp. nov.**	Dense secondary forest undergrowth	SAVA	Near Daraina	2006	Single specimen only; only detached leaves known, underground parts unknown, young fruit only known
C. distichum	Humid forest, at 100 m	Amoron'i Mania	Matitana Basin	1911	Single collection, mature fruit unknown
***C. graniticum* subsp. *ambrense* subsp. nov.**	Moist forest on basalt, at 1000 m	DIANA	Parc National de la Montagne d'Ambre	1988	Known from only 2 collections; additional representative material needed
***C. helvillae* sp. nov.**	Unknown	DIANA	Nosy Be	1905	A single collection; fruit and underground parts unknown
C. hypoxiforme	On a tampoketsa, in the rocks, at 900 m	Betsiboka	Tampoketsan'i Beveromay	1910	Mature fruit unknown
C. madagascariense	Open areas or forest undergrowth	Analamanga, Boeny, DIANA	Manongarivo, causse Ankara, Nosy Be, Lac Kinkony, Mahajanga	2013	Additional material needed for a better understand the infraspecific taxonomy and distribution
C. namorokense	Limestone rocks	Boeny	RN 8, Andranomavo	1904	Known from a single collection; fruit unknown
***C. nigrogranulosum* sp. nov.**	Limestone rock undergrowth dry forest	DIANA	Montagne des Français-Anosiravo	2007	Known from a single collection

Table 6 (continued). Lesser-known species of *Chlorophytum* Ker Gawl., with observations to encourage future research.

Taxon	Type of environment	Region	Localities	Year of most recent collection	Remarks
***C. nusbaumeri* sp. nov.**	Slope forest undergrowth, at 300–400 m	DIANA	Daraina, Ampandrabe	2005	Known from a single collection; only flower buds and fruits known
C. parkeri	Grasslands, wetlands	Analamanga, Boeny	Ambohimanga, Mahajanga, Beanka	2011	Known from diverse localities, altitudes and substrates (with populations in the west and also on the 'hauts plateaux' more collections from intermediate areas could confirm the taxonomy
C.* aff. *parkeri	Grasslands, wetlands, at 1000 m	Ihorombe	Ihosy	2010	Known from a single collection (far from true *C. parkeri*), very few flowers and a single fruit known
***C. ranirisoni* sp. nov.**	Dense dry forest undergrowth, at 350 m	SAVA	Daraina	2005	Known from a single collection; fruit unknown
***C. ratovosonii* sp. nov.**	Sparse, dry forests on sand	DIANA	Ambolobozokely	2006	Known from a single collection; flowers unknown
C. sofiense* subsp. *sofiense	Rocks, damp woods	Sofia	Sofia, central basin	1907	A single collection; flowers unknown
***C. sofiense* subsp. *gautieri* subsp. nov.**	Watersides in rainforest, 200 m	SAVA	Daraina	2004	A single collection; flowers unknown
C. subligulatum	Bare gneissic rocks	Sofia	Bemarivo, central basin	1910	A single collection known; fruits unknown
***C. tolyanum* sp. nov.**	Rocks under dry forest	DIANA	Spéciale Réserve Ankarana	2003	A single collection known; fruits unknown
***C.* sp. 1**	Habitat unknown	Sofia	Befandriana (Col d'Andavaka)	1942	Known from an inflorescence fragment obtained from a plant in culture; habit unknown, fruits unknown
***C.* sp.2**	Habitat unknown	DIANA	Antsiranana	1843	Very old material, collected near Antsiranana; likely extinct?

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