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Monograph

Revision of *Asparagus* L. sect. *Myrsiphyllum* (Willd.) Baker ex H.Perrier (Asparagaceae) from Madagascar, with the description of five new species and two new varieties

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Abstract. *Asparagus* L. sect. *Myrsiphyllum* (Willd.) Baker ex H.Perrier, which includes the members of the genus with phylloclades, is defined and revised for Madagascar and the Comoro Islands based primarily on morphological evidence. This builds on earlier treatments of the group, taking into account the wealth of new material now available. In this study, nine species are recognised, including five species and two varieties that are new to science: *A. andriamihajarivoi* M.Pignal & Phillipson sp. nov., *A. bambusiformis* M.Pignal & Phillipson sp. nov., *A. laticladus* M.Pignal & Phillipson sp. nov., *A. messmerae* M.Pignal & Phillipson sp. nov., *A. simulans* Baker var. *falcicladus* M.Pignal & Phillipson var. nov., *A. simulans* var. *recticladus* M.Pignal & Phillipson var. nov., and *A. tsaratananensis* M.Pignal & Phillipson sp. nov. *Asparagus madagascariensis* Baker is also reinstated, having previously been treated as a synonym of *A. simulans* by Perrier de la Bâthie. An identification key is provided for the currently recognised species along with a key to the varieties of *A. simulans*. A provisional IUCN Red List assessment is proposed for each taxon.

Keywords. Madagascar, Grande Comore, new taxa, IUCN Red List status.

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Introduction

This study forms the first part of a revision of *Asparagus* L. from Madagascar and the Comoros Archipelago. It deals with an initial group comprising species with phylloclades (flattened cladodes), corresponding to

Asparagus sect. *Myrsiphyllum* (Willd.) Baker ex H.Perrier, the status of which is reviewed and discussed. This treatment will be followed by two more revisions dealing with the remaining species, which have filiform, unflattened cladodes.

Geography and floristic diversity of Madagascar

Madagascar is a large island located to the Southeast of Africa at a distance of ca 400 km to the nearest point on the continent in Mozambique. The island extends from ca 12°00′ S to 25°30′ S latitude and covers an area of ca 587 000 km². It exhibits remarkable topographical diversity, characterised by extensive highlands that exceed 1000 m in elevation, with 10 mountain peaks rising above 2000 m, the highest, Mt Maromokotro in the Tsaratanana massif, reaching just under 2900 m. Madagascar also has extensive coastal lowlands, especially along its western interior. Its geology is characterised by a rich diversity of substrates: metamorphic and igneous basement rock, quartzites and marbles, sedimentary basins, limestones, and volcanic soils, along with ultramafic and other localized substrates.

Madagascar's geographical separation from the African mainland, dating from approximately 165 million years ago, has resulted in prolonged biological isolation (Coffin & Rabinowitz 1987; Yoder & Novak 2006). The island exhibits diverse climatic conditions, which range from the sub-arid zone in the south-west to a humid and perhumid belt along the east, and cool, humid areas in the central highlands and mountains. Together, these factors have given rise to Madagascar's exceptionally high levels of biological diversification and endemism (Lowry *et al.* 2018; Antonelli *et al.* 2022). The island is home to 11 262 currently recognised native species of vascular plants belonging to 1698 genera, along with an estimated more than 3600 species that remain to be described, bringing the projected total of the flora to at least 14 900 species (Lowry *et al.* 2018; Catalogue of the Plants of Madagascar 2026). Considerable work on the description of new taxa therefore remains to be done. About 87% of the described species are endemic to the island (Humbert 1959; White 1983; Morat & Lowry 1997; Callmander *et al.* 2011; Phillipson *et al.* 2017; Lowry *et al.* 2018), and when the remaining undescribed taxa are added, nearly all of which are endemic, the level of endemism will approach 90% (Catalogue of the Plants of Madagascar 2026).

However, despite continuing advances in botanical exploration, our knowledge of the island's flora remains far from complete (Lowry *et al.* 2018). Moreover, many habitats and plant populations face significant threats from environmental degradation driven largely by recent anthropogenic pressures, as summarised by Antonelli *et al.* (2022).

A recent multi-authored study (Ralimanana *et al.* 2022) focused on the threats that confront Madagascar's biodiversity as well as the challenges that need to be addressed by its human population, and has taken a strong position with regard to the urgency for action and for adequate international support for this cause.

Taxonomic and nomenclatural history of *Asparagus* L.

Asparagus L. was established by Linnaeus (1753) with 12 species, only one of which, *A. declinatus* L., was treated as occurring on Madagascar and another, *A. falcatus* L., was recorded from the Comoro Islands. Schultes & Schultes (1829) expanded the genus to 45 species, including *A. falcatus*, *A. declinatus*, and the widely distributed *A. racemosus* Willd., which they indicated as also occurring on Madagascar.

Willdenow (1808) established *Myrsiphyllum* Willd. to accommodate the two species with flattened cladodes (phylloclades) known at the time, *M. asparagoides* (L.) Willd. and *M. angustifolium* (Mill.) Willd., the latter now regarded as a synonym of the former. He distinguished his new genus primarily on the basis of gynoecial characters, drawing a comparison with *Medeola* L. (Liliaceae Juss.).

Kunth (1842 [1844]) likewise observed that species of *Myrsiphyllum* bore distinctive flattened cladodes, which he described as foliose and solitary, in contrast to the filiform, fascicled cladodes typical of

Asparagus. He also noted that many species of *Asparagus* were hermaphroditic and bore multiple ovules per locule—traits uncommon in the rest of the (typically dioecious) group, which prompted him to describe a third genus, *Asparagopsis* Kunth, for species sharing these features. However, *Asparagopsis* Mont. (Montagne 1840) is a genus of Rhodophyta Wettst., and the name published by Kunth is therefore illegitimate since it is a later homonym. Obermeyer (1984) published a new genus, *Protasparagus* Oberm., to accommodate the species previously included in *Asparagopsis* Kunth and the infrageneric taxa based on it.

Kunth listed 37 species in *Asparagus* L. s. str. (including *A. falcatus*), 8 in *Myrsiphyllum* Willd., and 43 in *Asparagopsis* Kunth. Baker (1875) subsequently reduced *Myrsiphyllum* and *Asparagopsis* to infrageneric status within *Asparagus*, recognising 97 species, including 5 from Madagascar and 2 from the Comoros, although he did not explicitly indicate the rank of these infrageneric taxa.

Perrier de la Bâthie (1935, 1937 [1938]) and Jessop (1966) treated these groups as sections of *Asparagus*, i.e., *A*. sect. *Asparagopsis* (Kunth) Kunth and *A*. sect. *Myrsiphyllum* (Willd.) Baker; the former author also recognised *A*. sect. *Euasparagus* Baker (a superfluous name for the type section). *Asparagus falcatus* L. from the Comoros Archipelago was included by Perrier de la Bâthie in *A*. sect. *Myrsiphyllum*. This species was placed by various authors in other genera or infrageneric taxa due to the presence of pseudo-racemes: the *Falcati* group by Baker (1896), *A*. sect. *Racemosi* Jessop (Jessop 1966), *Protasparagus* Oberm. (Obermeyer 1983), and *A*. subg. *Asparagus* (Malcomber & Demissew 1993). However, we follow Perrier de la Bâthie (1935, 1937 [1938]), who placed it in *A*. sect. *Myrsiphyllum* on the basis of the shape of its cladodes.

Malcomber & Demissew (1993), adopting a monogeneric concept for the entire group and basing their work on morphological and cytological analyses of 90 species, did not recognise *Protasparagus* Oberm., preferring instead to divide *Asparagus* into two subgenera: *A*. subg. *Asparagus* and *A*. subg. *Myrsiphyllum* (Willd.) Baker, the latter characterised by the presence of connivent staminal filaments, a feature previously noted by Mathew (1989). Subsequently, Fellingham & Meyer (1995) found no consistent differences between *Myrsiphyllum* and *Protasparagus* with respect to filament connation and consequently returned all South African species to *Asparagus*, without recognising any subgeneric distinctions.

A summary of this taxonomic history of *Asparagus* is provided in Table 1.

Since the treatments of *Asparagus* by Baker (1875, 1896), who was the last to consider the genus in its entirety, numerous additional species have been described and several regional revisions have been published, including those mentioned above. Currently, more than 210 species are accepted worldwide, with a distribution spanning Africa, Madagascar, Europe, Asia, and Australia (POWO 2025). However, no comprehensive modern infrageneric classification or taxonomic framework currently exists for the genus.

Phylogenetic studies

A molecular study by Fukuda *et al.* (2005) based on the intron of *petB* and the intergenic region between *petD* and *rpoA* of the chloroplast genome suggested that *Asparagus* sect. *Myrsiphyllum* might be paraphyletic. However, the bootstrap values were insufficiently robust to draw definitive conclusions. Notably, the only Malagasy species included in their analysis was the widespread *A. racemosus*.

More recently, Bentz *et al.* (2024) conducted a phylogenomic study based on 1726 nuclear loci to investigate the evolution of dioecy in *Asparagus*. Their analysis recovered 12 major clades and two paraphyletic lineages. A distinct *Myrsiphyllum* clade (corresponding to *A*. sect. *Myrsiphyllum*) was identified, showing a strong affinity with the species in the '*Myrsiphyllum scandens* clade', as defined in the same work. However, no Malagasy taxa were included in the sampling.

Table 1. Summary of the taxonomic history of *Asparagus* sect. *Myrsiphyllum*.

Author(s) and publication dates	Higher taxa recognised	Morphological characters selected for *Myrsiphyllum* Willd. according to the authors
Willdenow (1808)	**2 genera:** *Asparagus* L. *Myrsiphyllum* Willd.	presence of phylloclades (= phyllodes sensu Willdenow)
Kunth (1842 [1844]) Baker (1875, 1896)	3 infrageneric groups of unspecified rank: *Asparagus* group *Asparagus* *Asparagus* group *Myrsiphyllum* (Willd.) Kunth *Asparagus* group *Asparagopsis* Kunth	distinctive flattened cladodes (= phylloclades sensu Baker), solitary, hermaphroditic flowers
Perrier de la Bâthie (1935, 1937 [1938]), Jessop (1966)	**3 sections:** *Asparagus* sect. *Euasparagus L.* (= *A.* sect. *Asparagus*) *A.* sect. *Myrsiphyllum* (Willd.) Kunth ex H.Perrier *A.* sect. *Asparagopsis* (Willd.) Kunth ex H.Perrier	hermaphroditic flowers, persistent stems, more or less enlarged cladodes (= phyllodes sensu Perrier de la Bâthie = phylloclades sensu Baker)
Huber 1969; Dahlgren & Clifford 1982; Obermeyer 1984	**3 distinct genera:** *Asparagus* L. *Myrsiphyllum* Willd. *Asparagopsis* Willd. nom. illeg. (= *Protasparagus* Oberm.)	perianth with the tepals coherent in lower half, forming a tube, spreading to recurved in the upper half; stamens coherent with filaments, forming a tube around gynoecium; flowers pendulous, solitary or rarely 2–3 placed next to one another at a node; spines absent; roots emerging radially from the cylindrical rhizome, rarely dorsiventral
Mathew (1989)	**3 distinct genera:** *Asparagus* L. *Myrsiphyllum* Willd. *Protasparagus* Oberm.	presence of connate perianth segments and staminal filaments forming a tube around the ovary—traits absent from all Madagascan species.
Malcomber & Demissew (1993)	**2 subgenera:** *A.* subg. *Asparagus* *A.* subg. *Myrsiphyllum* (Willd.) Baker	presence of connivent staminal filaments—traits absent from all Madagascan species.
Fellingham & Meyer (1995)	**No subgeneric taxa recognised**	no consistent differences between *Myrsiphyllum* and *Protasparagus* in terms of connivent filaments.

Given the lack of consensus and very limited sampling from Madagascar in the phylogenetic studies conducted to date, the circumscriptions of taxa at infrageneric ranks, such as subgenera and sections, remain uncertain and are likely artificial. The present study focuses on *Asparagus* sect. *Myrsiphyllum*, which we define based on the following characteristics: plants with hermaphroditic flowers; stems typically perennial and either erect or scandent; cladodes expanded into phylloclades (referred to as "phyllodes" by Perrier de la Bâthie), each bearing one or more veins.

Collection history

In his treatment of Liliaceae Juss. for the *Flore de Madagascar*, Perrier de la Bâthie (1937 [1938]) had access to only 131 collections of *Asparagus*, 22 of which he personally collected. Among these, 51 belonged to *Asparagus* subg. *Myrsiphyllum*, of which 11 were collected by him. Of more than 600

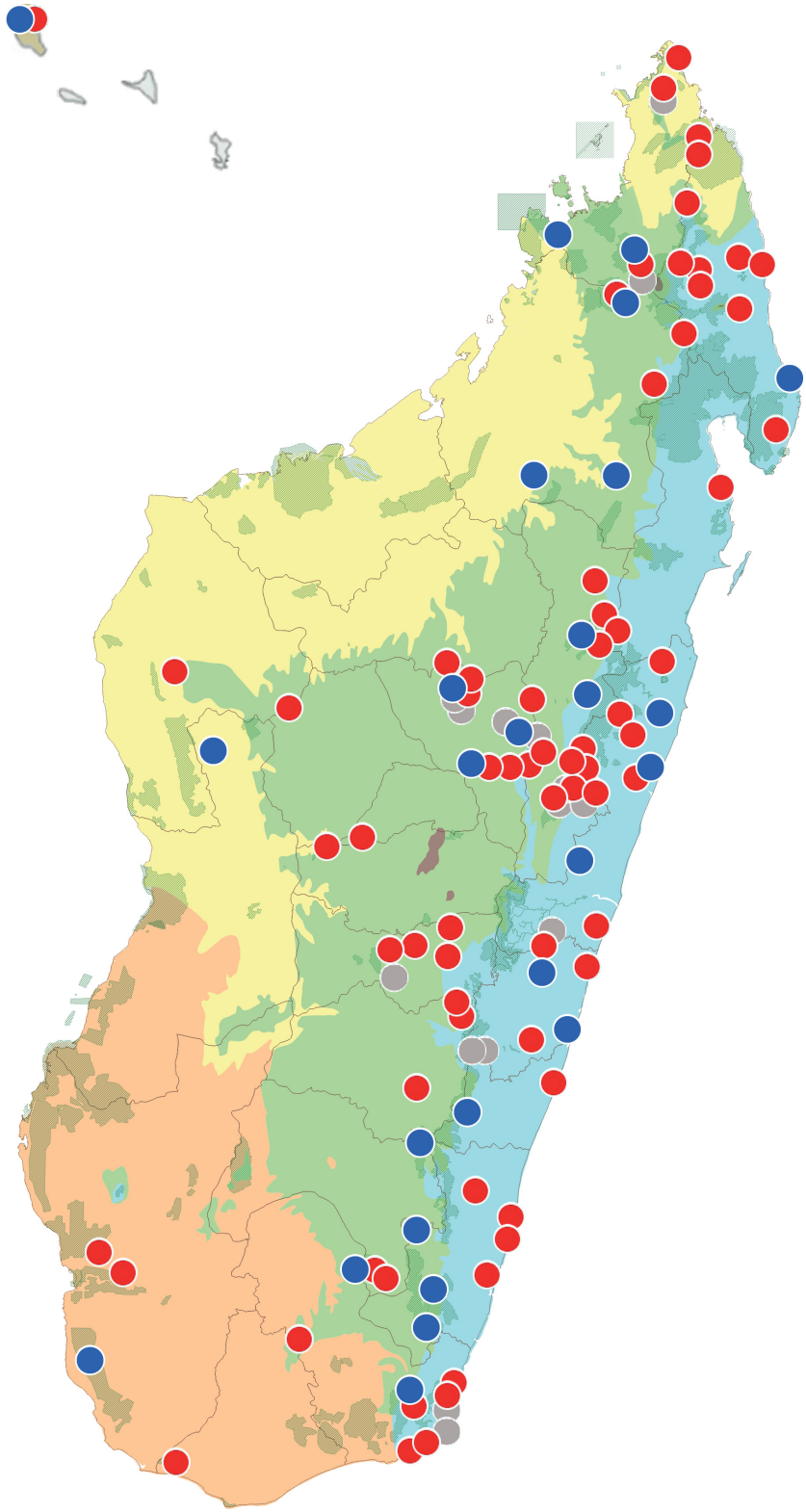

Fig. 1. Map of collections examined of *Asparagus* sect. *Myrsiphyllum* (Willd.) Baker ex H.Perrier: collections observed by Perrier de la Bâthie (1937 [1938]) (blue dots), additional material (red dots), and observations (grey dots).

Asparagus collections now at our disposal, more than four times as many as were available to Perrier de la Bâthie, we studied a total of 217 belonging to *A.* sect. *Myrsiphyllum* (see Fig. 1), a fourfold increase over what he was able to study.

Despite the limited material available to Perrier de la Bâthie for his treatment (1937 [1938]), he described two new species in *Asparagus* sect. *Myrsiphyllum*: *A. calcicolus* H.Perrier and *A. mahafalensis* H.Perrier, of which only the former is retained here. Furthermore, he studied 46 specimens that he assigned to *A. simulans* Baker, treating *A. madagascariensis* Baker as a synonym. He characterised this taxon (which can be referred to as the '*A. simulans* complex') by the absence of spines, angular stems with rough margins, univeined phylloclades, white berries, and a distinctive inflorescence morphology, acknowledging that it was highly variable. Based on the substantially larger number of specimens now available, we recognise seven species within this '*A. simulans* complex', each occupying a distinct phytogeographic zone, two already published (*A. madagascariensis* and *A. simulans*) and five new (*A. andriamihajarivoi* M.Pignal & Phillipson sp. nov., *A. bambusiformis* M.Pignal & Phillipson sp. nov., *A. laticladus* M.Pignal & Phillipson sp. nov., *A. messmerae* M.Pignal & Phillipson sp. nov., and *A. tsaratananensis* M.Pignal & Phillipson sp. nov.). These taxa can be distinguished from one another based on combinations of growth habit (erect vs climbing), shape and dimensions of the phylloclades, morphology of the ultimate branches, and fruit colour (white or red). Additionally, we recognise three varieties within *A. simulans* (*A. simulans* var. *simulans*, *A. simulans* var. *falcicladus* M.Pignal & Phillipson var. nov., and *A. simulans* var. *recticladus* M.Pignal & Phillipson var. nov.). *Asparagus falcatus* L. was known to Perrier de la Bâthie from a single collection from the Comoros Archipelago. We now have three at our disposal.

Material and methods

Plant material

Our study is based on the examination of 217 collections housed at MO, P and TAN, and a few high resolution scanned images of specimens held at BM and K (the herbarium acronyms follow the recommendations of Thiers (continuously updated)). In addition, we consulted several virtual collections, including the Global Plant Initiative (Global Plants 2025) as well as the RECOLNAT infrastructure, the French national network of naturalist collections (RECOLNAT infrastructure 2025). Furthermore, selected photos from the iNaturalist site (iNaturalist 2025) provided an additional source to complete species descriptions and to reveal additional localities. In all, 86 image-based observations from this source are cited under 'Material examined' for the corresponding species, which provides observers' names followed by iNaturalist pseudonyms in parentheses. They were also incorporated into the risk of extinction assessments performed using the IUCN Red List criteria (see below).

In this revision, all available herbarium specimens were examined in detail. Distribution maps accompany the account of each taxon, illustrating their known geographic ranges. The base map includes the limits of Madagascar's 23 administrative regions, and following Schatz (2001), the five major bioclimatic zones are indicated (shown as coloured polygons), along with the current network of protected areas (represented by green outlines and hatching).

Software tools

Herbarium images were measured using the Annotate-on tool (ver. 2.4.0) made available through the RECOLNAT infrastructure (RECOLNAT Infrastructure 2025) downloaded from https://recolnat.fr/fr/annotate (https://ecolplus.fr/annotation-ia/) (Pignal *et al.* 2024). All measurements were taken from mature structures, and the values presented use the following convention: (minimum value–)first quartile–third quartile(–maximum value).

For collections lacking geographic coordinates, we estimated post facto values (presented in square brackets) based on available locality information and in some cases on known itineraries of the corresponding collectors. Localities are cited verbatim from original collection labels to avoid ambiguity. The identification keys provided below were produced using XPER3 software online (Kerner *et al.* 2025) and formatted using DKey 2.0.0 software, downloaded from https://drawwing.org/dkey (Tofilski 2018).

Provisional IUCN risk of extinction assessment

Provisional risk of extinction assessments were made according to the IUCN's Red List categories and criteria (IUCN 2012) and the recommendations of the IUCN Standards and Petitions Committee (IUCN 2024).

Geographical tools

The distribution maps were produced with QGIS software ver. 3.22 (QGIS Development Team 2025) and the bioclimatic regions depicted in the base maps were derived from Schatz (2001).

Taxonomic approach

Our approach to the delimitation of taxonomic entities, i.e., species and infraspecific taxa, was based primarily on the careful examination of similarities and differences in the morphology of the plant specimens available. This was supplemented with observations made by collectors in the field and noted on the corresponding labels. We also took into account geographical and habitat data, including some that could be inferred on the basis of the collection locality, and which could be interpreted and contextualised.

Abbreviations

fl	=	flower
fr	=	fruit
ifr	=	immature fruit
nom. nud.	=	nomen nudum
n.v.	=	non videmus (not seen)
Prov.	=	Province
st	=	sterile

Results

Morphology

The taxonomic traits of South African species of *Asparagus* were carefully detailed by Jessop (1966), who considered that floral characters offer virtually no means of differentiation between species, prompting him to rely heavily on vegetative features. We consider this to be the case with the Malagasy species as well, and we therefore also rely almost entirely on vegetative traits to distinguish taxa, even though they can be highly responsive to environmental variation, which we treat in conjunction with eco-geographic parameters.

General habit

Asparagus andriamihajarivoi sp. nov. and *A. tsaratananensis* sp. nov. appear to be obligate climbers or have creeping growth where support is absent, whereas *A. laticladus* sp. nov., *A. madagascariensis*, *A. messmerae* sp. nov., *A. simulans* var. *simulans*, and *A. simulans* var. *recticladus* var. nov. are erect shrubs. In contrast, *A. bambusiformis* sp. nov. and *A. simulans* var. *falcicladus* var. nov. both have an erect habit, even though the ultimate branchlets show a slight tendency toward lianescence. The development of spines in many species helps to protect the plants from grazing animals and in many species reflexed spines serve as anchors, further facilitating the growth of branches into the canopy.

Underground parts

The root systems of Malagasy *Asparagus* have rarely been collected or observed, particularly in the case of the more robust, shrubby species. This is unfortunate, as the presence, shape, and abundance of tubers may be of significant diagnostic value. While the only known collection of *A. tsaratananensis* sp. nov. (*Perrier de la Bâthie 8402* [P00580844, P00580845]) does not have any root material, the collector indicated that it had numerous, narrow, fusiform tubers. *Asparagus laticladus* sp. nov. and *A. calcicolus* possess thickened roots that form fusiform tubers (approximately 3 mm in diameter) and are fibrous at the apex (Fig. 2A). In contrast, *A. madagascariensis* and *A. simulans* lack tubers entirely and instead have long, thick roots. The root systems of the other phyllocladous species of *Asparagus* from Madagascar are unknown.

Stems

Species of *Asparagus* all possess a short, robust, underground rhizome. The main stems and proximal portions of the upper branches are erect, but the distal portions of the latter sometimes develop into flexible, climbing stems. A good example of this growth variation is illustrated by the differences between *A. andriamihajarivoi* sp. nov. and *A. tsaratananensis* sp. nov. Although both species are lianas, the ultimate stems of the former are flexuous whereas those of the latter are straight.

In non-climbing, erect species, the main stems are unbranched along approximately one-half to two-thirds of their length and terminate in a compound, somewhat flat pseudo-frond that is triangular or elliptic in shape, somewhat reminiscent of a fern frond but highly dissected. Although the underground system and root crown have rarely been collected in Malagasy *Asparagus*, several species exhibit a woody base from which annual stems arise, either growing erect (e.g., *A. laticladus* sp. nov. and *A. simulans*, see Fig. 2A), or climbing (e.g., *A. calcicolus*, Fig. 2D, and *A. falcatus*).

The ultimate stems of most species are quadrangular in cross-section, but in *Asparagus andriamihajarivoi* sp. nov. and *A. laticladus* sp. nov. the ultimate internodes are distinctly winged and somewhat resemble a phylloclade, while in *A. bambusiformis* sp. nov. they are not flattened. The stem ridges are frequently adorned by minute, closely spaced papillae.

Photosynthetic organs in *Asparagus* sect. *Myrsiphyllum*

Historically, authors have proposed various hypotheses regarding the origin of photosynthetic organs in *Asparagus*. The term 'cladode' was first introduced by Kunth (1842 [1844]), referring to a sterile peduncle. However, subsequent authors more simply interpreted these structures as modified stems with determinate growth. Species of *A.* sect. *Myrsiphyllum* possess notably dorsoventrally flattened cladodes, and the term 'phyllode' has been employed by several authors, particularly Perrier de la Bâthie (1937 [1938]). Nevertheless, we regard the term 'phylloclade', as defined by Baker (1875), to be preferable, as anatomically it refers to a stem of determinate growth. In contrast, the term 'phyllode' should be reserved for taxa whose leaves have a winged petiole, such as many species of *Indigofera* L. (Fabaceae Lindl.) found in the dry regions of Madagascar (Pignal 2025).

In *Asparagus*, the phylloclades are often arranged in pseudo-whorls—technically lateral fascicles—consisting of 1 to 5 elements. They are variable in shape among the different species. *Asparagus calcicolus* (Fig. 2C–F) and *A. falcatus* possess spatulate to narrowly oblanceolate phylloclades, they are elliptical to falciform in *A. madagascariensis* and *A. laticladus* sp. nov. (Fig. 2B), and linear in *A. andriamihajarivoi* sp. nov., *A. bambusiformis* sp. nov., *A. messmerae* sp. nov., and *A. tsaratananensis* sp. nov., whereas in *A. simulans* the phylloclades are falciform and variably curved. The nature of these structures as modified stems is particularly evident in *A. andriamihajarivoi* and *A. tsaratananensis*, where the typical pseudo-whorls comprise three phylloclades, two of which are normally determinate while the third forms a lateral branch with indeterminate growth.

Fig. 2. A–B. *Asparagus laticladus* M.Pignal & Phillipson sp. nov. **A**. Habit with young fruits. **B**. Fruiting stem. — **C–F**. *Asparagus calcicolus* H.Perrier. **C**. Individual with fruit from La Table, showing short and wide phylloclades. **D**. Individual with fruit from Miary Carrière, showing long and narrow phylloclades. **E**. Individual from Mahabo Onilahy, with longer and narrower phylloclades. **F**. Buds. Photos: A by Gregory M. Plunkett; B by Patrice Antilahimena; C–F by Laurence Ramon.

The adaxial surfaces of the phylloclades are often glossy in texture. We note that this is often the case in species occurring in dry habitats.

Venation

Most species in *Asparagus* sect. *Myrsiphyllum* possess leaves with a single, well-defined, central pseudovein that is visible on both surfaces. However, in certain species, notably those with broad, thick phylloclades, 1 to 4 veins may be present. These are prominent on the adaxial surface but markedly raised on the abaxial side (e.g., in some individuals of *A. calcicolus*).

Leaves

The leaves of *Asparagus* species are highly reduced and dry rapidly to become no more than papery scales; they are often acuminate and also typically bear a basal extension resembling a spur. This spur-like structure is variably developed and may be absent; in some species, such as *A. calcicolus* and *A. falcatus*, on older stems it may become transformed into a spine. The size of the scale leaves and the presence of a spur depend on their position along the stem, with the scale leaves located on the ultimate branchlets tending to be much smaller and spurs usually lacking. In general, the main leaf (which may or may not form a spur) is flanked on the inner side by two smaller, lateral leaves that lack spurs.

Inflorescences

In all species of *Asparagus*, as far as we know, flowers are borne on an articulated axis, which may be interpreted as the axis of a single-flowered inflorescence, comprising a proximal peduncle and a distal pedicel. However, for the sake of clarity and consistency, we follow the definition of Jessop (1966), who preferred to describe this structure as a pedicel with an articulation, which is most often medial—distinguishing a proximal and distal portion on either side of it.

With the exception of *Asparagus falcatus*, a species that occurs on Grande Comore in the Comoros Archipelago, all of the other species included in our treatment produce flowers arranged in clusters, which are sometimes borne on a brachyblast, causing them to have the appearance of a pseudo-umbel. These clusters typically consist of 1, 2, or rarely 3 short brachyblasts bearing imbricate, papery bracteolar scales that closely resemble the scale leaves found on ultimate branchlets. The flowers, occurring in groups of 1 to 3, bloom successively; the proximal portions of the peduncles are often persistent, with up to ten on a single brachyblast.

Asparagus falcatus is unique in the section in that it has pseudo-racemes that combine both peduncular and pedicellate portions within the inflorescence, with the brachyblasts being replaced by a long, somewhat spike-like flowering rachis. We interpret these inflorescences as leafy shoots, with the leaves reduced to minute scales, lacking phylloclades. Furthermore, the floral axes are determinate in growth, a characteristic that is particularly conspicuous in certain specimens that were likely prepared from more well-developed individuals. In these cases, the floral axes themselves are borne on specialised shoots that terminate in flowers and thus develop a third level of branching.

Flowers

All species of *Asparagus* sect. *Myrsiphyllum* bear hermaphroditic flowers. The perianth consists of two whorls of three tepals each, those of the inner whorl (petals) generally being broader than those of the outer whorl (petaloid sepals). The tepals are ovate-lanceolate, keeled, and white in colour or rarely dull violet on the outer surface. The structural morphology of the flowers displays a striking uniformity among the various taxa.

Androecium

The stamens are arranged in two whorls of three. The filaments are flattened and basally adnate to each perianth segment and are consistently white in colour. The anthers are rectangular and medifixed, and may be white, yellow, or orange. No members of *Asparagus* sect. *Myrsiphyllum* are known to form a filamentous tube resulting from lateral fusion of the filaments, as has been reported for other groups in the genus and was adopted by Malcomber & Demissew (1993) to define the *Myrsiphyllum* group.

Gynoecium

Ovary

The ovary is ovoid-conical in shape, and in several species (*Asparagus bambusiformis* sp. nov., *A. falcatus*, *A. madagascariensis*, *A. simulans* and *A. tsaratananensis* sp. nov.) it is more or less distinctly stipitate, while in others it is sessile (*A. andriamihajarivoi* sp. nov. and *A. laticladus* sp. nov.). The ovary is topped by a white or off-white style that is generally rather short and terminates with three stigmas.

Ovules

Whereas unisexual-flowered *Asparagus* species appear consistently to possess two ovules per locule, those with bisexual flowers exhibit more variable conditions (Malcomber & Demissew 1993). While we were not able to determine the number of ovules in all the species treated in the present study, we counted four per locule in *A. simulans* and three per locule in *A. calcicolus* and *A. falcatus*, although Malcomber & Demissew (1993) reported four in the latter species.

Fruit

The fruits of members of *Asparagus* sect. *Myrsiphyllum* are globose or irregularly shaped berries, each containing 1, 2, or 3 seeds. Mature fruit colour has diagnostic value, with two main types observed: red (*A. calcicolus*, *A. falcatus*, and *A. laticladus* sp. nov.) and white (*A. madagascariensis* and *A. simulans*); fruit colour remains unknown for *A. andriamihajarivoi* sp. nov. and *A. tsaratananensis* sp. nov. In the case of *A. bambusiformis* sp. nov., the only fruiting record (*Perrier de la Bâthie 12653*) is unfortunately a mixture that also includes material of *A. laticladus*. The description "green" or "vert" on specimen labels is assumed to refer to immature fruits.

Seeds

Malcomber & Demissew (1993), who conducted a detailed study of the seeds of *Asparagus*, observed that the shape depends mainly on the number of seeds per fruit. They may be globose (when berries are 1-seeded) or more or less angular (when two- or several-seeded). All possess a black, glossy, granular seed coat (testa), which in some species is composed of two layers.

Chromosome number

The literature cited by Malcomber & Demissew (1993) reported diploid chromosome numbers of $2n = 40$ (Kar 1985) and $2n = 20$ (Kanno & Yokoyama 2011) for *Asparagus falcatus*; they also mentioned $2n = 20$ for *A. asparagoides* (Jessop 1966), whose type serves as the lectotype of *A.* sect. *Myrsiphyllum*.

Habitat and ecology

Two of the species treated here are known exclusively from low elevation sites: *Asparagus calcicolus* (0–200 m) and *A. falcatus* (ca 600 m), whereas *A. laticladus* sp. nov. and *A. simulans* occur across a much broader altitudinal range (0–1500 m) and *A. bambusiformis* sp. nov. occurs at mid to high elevations (700–1600 m). Four species are recorded from high elevations (from 1000 m upwards), *A. andriamihajarivoi* sp. nov., *A. madagascariensis*, *A. messmerae* sp. nov. and *A. tsaratananensis* sp. nov., although this should be interpreted with caution as they are known from only a few collections.

Two species occur in xerophytic formations: *Asparagus falcatus* is usually found in anthropogenic areas on volcanic soils, and *A. calcicolus* occurs in thickets on limestone outcrops and in *Euphorbia*-dominated bushland. The other species grow in the understorey of humid forests. *Asparagus laticladus* sp. nov. is also found on degraded gneissic substrates or on rocky outcrops, *A. andriamihajarivoi* sp. nov. has also been indicated to occur in areas affected by fire, and *A. madagascariensis* grows in clearings within rainforest on gneiss-derived laterite. While *A. tsaratananensis* sp. nov. occurs on ultramafic substrates, *A. simulans* (including all three varieties) occupies a range of substrates: humic soils, sandstone or white sands, coarse rocky blocks, clayey terrain, and ferrallitic soils, and has even been recorded in dry forest on latero-humic substrate, in subhumid forest, in mossy evergreen forest, in degraded formations, as well as in a remnant humid forest surrounded by *Eucalyptus* plantations.

Provisional IUCN risk of extinction assessment

Application of the IUCN Red List categories and criteria (IUCN 2012) reveals that one of the species in *Asparagus* sect. *Myrsiphyllum* is assessed as Vulnerable (*A. bambusiformis* sp. nov.), one as Endangered (*A. andriamihajarivoi* sp. nov.), and one as Critically Endangered (*A. messmerae* sp. nov.), whereas three are Near Threatened (*A. calcicolus*, *A. laticladus* sp. nov., and *A. madagascariensis*) and one is Data Deficient (*A. tsaratananensis* sp. nov.). All three of the varieties recognised within *A. simulans* are Least Concern and a regional assessment of *A. falcatus* var. *falcatus* for the Comoros Archipelago shows it to be Endangered.

Idntification key to the species of Asparagus sect. Myrsiphyllum in Madagascar

1. Liana 2
– Erect herb, not or only slightly lianescent 3

2. Ultimate internodes winged; phylloclades with tuberculate margins, to 2.3 mm wide; tepals 3 mm long ..... ***Asparagus andriamihajarivoi*** M.Pignal & Phillipson sp. nov.
– Ultimate internodes not winged; phylloclades with smooth margins, not exceeding 1.5 mm wide; tepals 4–6 mm long ..... ***Asparagus tsaratananensis*** M.Pignal & Phillipson sp. nov.

3. Phylloclades rigid; spines well developed on older stems 4
– Phylloclades flexible; older stems without spines 5

4. Inflorescences forming pseudo-racemes; phylloclades narrowly elliptic, with an acute apex .... ***Asparagus falcatus*** L.
– Inflorescences forming clusters; phylloclades spatulate to narrowly spatulate, with a predominantly rounded apex .....***Asparagus calcicolus*** H.Perrier

5. Phylloclades falciform 6
– Phylloclades elliptical to narrowly elliptical, straight or only slightly curved distally 7

6. Inflorescences forming clusters; phylloclades in fascicles of 3 to 9 ..... ***Asparagus simulans*** Baker
– Inflorescences forming pseudo-umbels; phylloclades in fascicles of (2 or)3 ....***Asparagus bambusiformis*** M.Pignal & Phillipson sp. nov.

7. Phylloclades at least 33 mm long, usually much longer [(33–)41–48(–59) mm] .... ***Asparagus messmerae*** M.Pignal & Phillipson sp. nov.
– Phylloclades less than 15 mm long, usually much shorter [(6–)8–11(–15) mm] 8

8. Berries white; plants more than 80 cm high .....***Asparagus madagascariensis*** Baker
– Berries red; plants less than 50 cm high ..... ***Asparagus laticladus*** M.Pignal & Phillipson sp. nov.

Taxonomic treatment

Class Angiospermae Lindl
Subclass Magnoliidae Takht.
Order Asparagales Bromhead
Family Asparagaceae Juss.
Genus *Asparagus* L.

Asparagus andriamihajarivoi M.Pignal & Phillipson sp. nov.
urn:lsid:ipni.org:names:77355479-1
Figs 3–5; Table 2

Diagnosis

Asparago simulanti Baker *var. simulanti similis, sed habitu scandenti (vs erectum), ramorum ultimorum internodio ultimo alato (vs teres vel quadrangula), phyllocladiis (1–)2–3(–4) coacervatis (vs 3–9), erectis linearibusque (vs curvata falciformiaque), longioribus, (13–)18–34(–49) mm vs (4.1–)9.2–13.6(–26.2) mm, latioribusque, (0.9–)1.1–1.6(–2.3) mm vs (0.3–)0.4–0.6(–1.1) mm), marginibus cladodorum manifeste papillosis (vs laevia), praecipue differt.*

Etymology

We are pleased to dedicate this species to our colleague Tefy H. Andriamihajarivo, botanist and site facilitator at the Missouri Botanical Garden's Analavelona conservation site in southwestern Madagascar, who made two of the five collections of *Asparagus andriamihajarivoi* sp. nov. Tefy has made nearly 2700 plant collections to date, which have been distributed to several herbaria.

Vernacular names and uses

Vernacular name and uses unknown.

Type material

Holotype and isotypes

MADAGASCAR – **Alaotra-Mangoro Region** [Toamasina Prov.] • Ambatondrazaka, Vohimena, Anony, environ 5 km du village d'Anony, vers Ankarefobe (vers le Nord); 17°12′26″ S, 48°33′13″ E; 1164 m; 22 Apr. 2005; fl, ifr, fr; *T. Andriamihajarivo, F. Ratovoson, J. Razanatsoa & A. Razakanirina 570*; holotype: P [P02275950]!; isotypes: MO [MO-3065721] image!, TAN n.v., TEF n.v.

Paratypes

MADAGASCAR – **Alaotra-Mangoro Region** [Toamasina Prov.] • Ambatondrazaka, Vohimena, Anony, environ 5 km du village d'Anony, vers Ankarefobe (vers le Nord); 17°12′26″ S, 48°33′13″ E; 1164 m; 22 Apr. 2005; fl, ifr, fr; *T. Andriamihajarivo, F. Ratovoson, J. Razanatsoa & A. Razakanirina 569*; MO [MO-3065722] image!, P [P02275949]!, TAN n.v., TEF n.v. • Entre le Lac Alaotra et Andilamena; [17°05′ S, 48°32′ E]; 1000 m; Nov. 1922; fl; *H. Perrier de la Bâthie 14987*; bois; P [P00581516]! • Forêt d'Ambatobe, Andilamena; [16°58′59″ S, 48°37′22″ E]; 19 Apr. 1953; st; *R. Portères s.n.*; P [P00581517]!. – **Without precise locality** • s.d.; *R. Baron 4238*; K [K002866185] n.v., P [P00581518]!.

Description

Climbing shrub; *root* system and main stems unknown; secondary *stems* spineless, well-branched, with branching to 2 or 3 levels, primary stems weakly climbing, angular, ultimate stems diverging, thin, (22–)42–65(–105) × 0.5 mm, internodes (9–)16–22(–39) mm long, weakly zigzag, forming somewhat triangular branches, ultimate internodes winged (0.7–0.8 mm wide), the margins with minute papillae; *phylloclades* divergent in fascicles grouped by 1 to 3(or 4), the nodes that bear only 2 phylloclades with

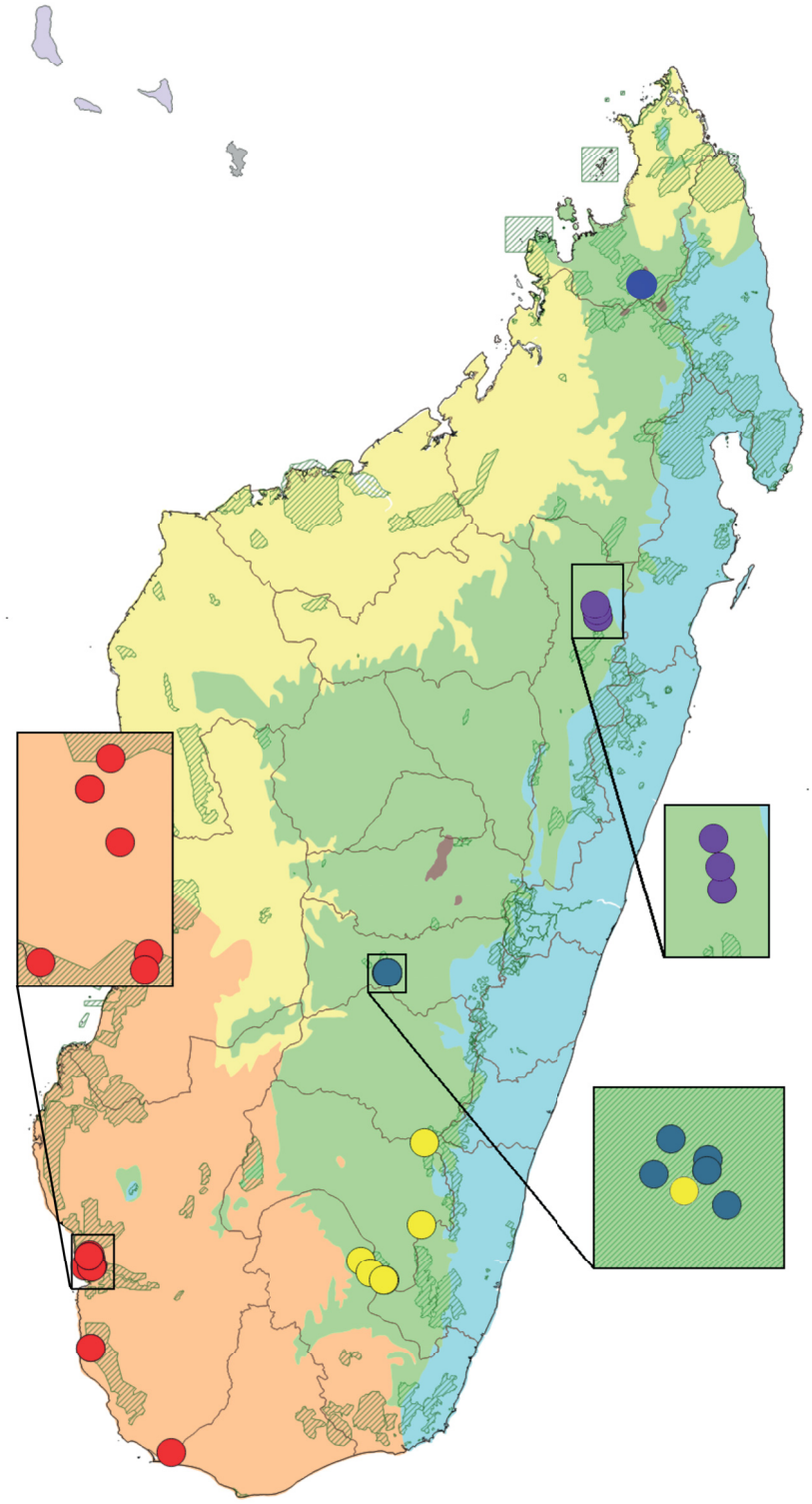

Fig. 3. Distribution of the five bambusiform species of *Asparagus* L. occurring on Madagascar: *A. andriamihajarivoi* M.Pignal & Phillipson sp. nov. (violet dots), *A. bambusiformis* M.Pignal & Phillipson sp. nov. (yellow dots), *A. calcicolus* H.Perrier (red dots), *A. messmerae* M.Pignal & Phillipson sp. nov. (grey-blue dots) and *A. tsaratananensis* M.Pignal & Phillipson sp. nov. (blue dot).

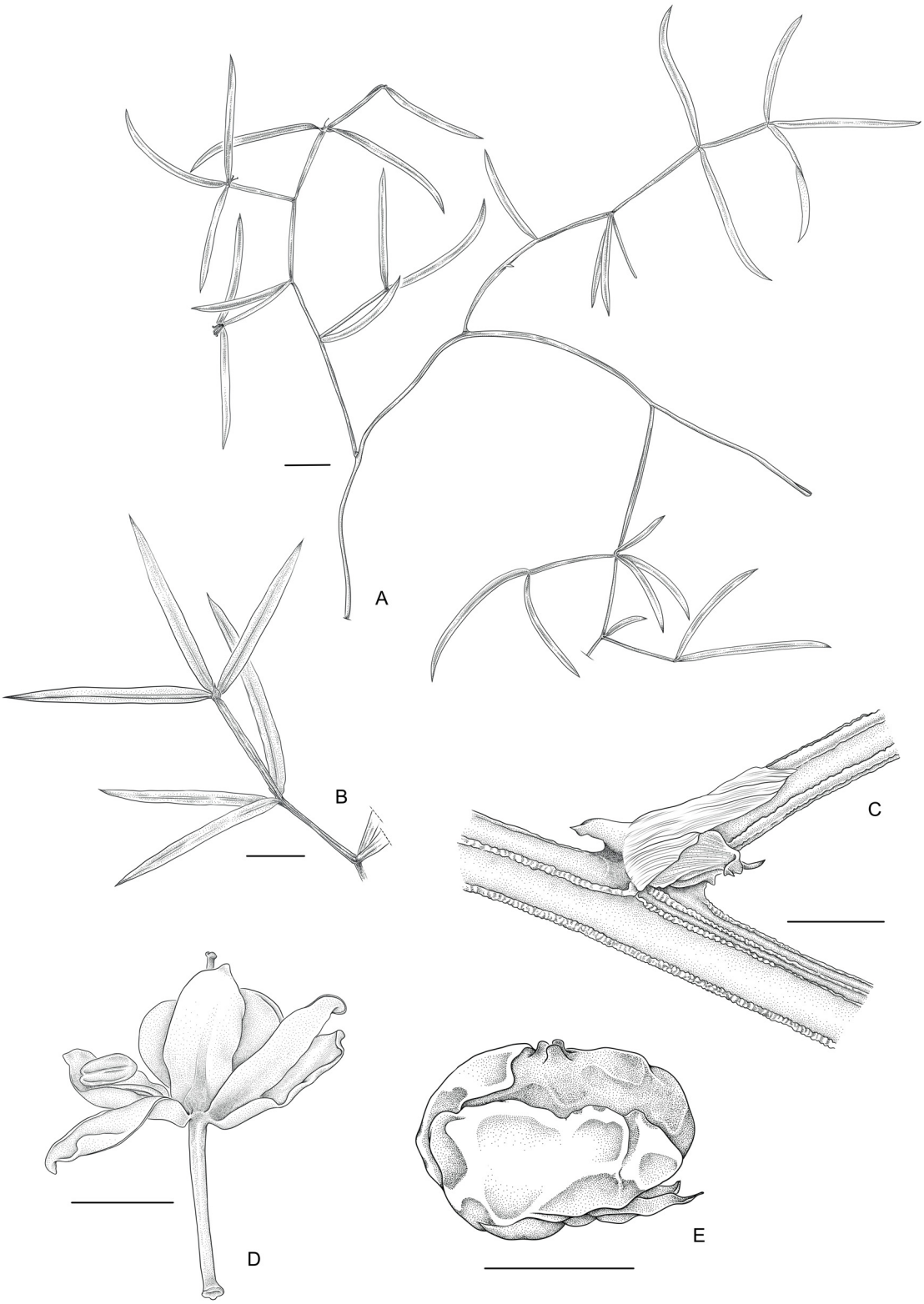

Fig. 4. Line drawing of *Asparagus andriamihajarivoi* M.Pignal & Phillipson sp. nov. **A**. Stem. **B**. Ultimate internode. **C**. Leaf-scale detail. **D**. Flower. **E**. Fruit, dry. A–E = *Andriamihajarivo et al. 569*, P02275949. Scale bars: A = 1 cm; B = 5 mm; C–D = 2 mm; E = 3 mm. Drawing by Ludivine Longou.

a branch (derived from the 3rd phylloclade, which is replaced by a stem), (13–)18–34(–49) × (0.9–)1.1–1.6(–2.3) mm, linear, green and shiny adaxially, base attenuate, margins thickened, finely papillose, apex attenuate, central pseudo-vein distinct on both surfaces, more pronounced on the abaxial surface, not narrowed toward the apex, 0.2 mm wide, long-attenuate; *scale leaves* papyraceous, long and narrow, 6 × 1 mm, with a flat, triangular, deflexed spur, 1.5 mm long on the intermediate stems, cordiform, 1.3 × 0.2 mm, with a spur 0.6 mm long on the ultimate stems; *flowers* solitary or in pairs, pedicel ca 6 mm long (distal part ca 3 mm long), *outer and inner whorls (tepals)* ovate-lanceolate, with a brown carina (in dry material) in the proximal two thirds, *outer whorl (sepals)* 3 × 1.2 mm, *inner whorl (petals)* 3 × 1.6 mm; *androecium*: filaments 1.5 × 0.2 mm, flattened, white, shortly adnate to the tepals at the base, anthers 1 × 0.6 mm, ellipsoid-ovoid, pale cream white (pale yellow in vivo), the pollen sacs separated and slightly divergent at the base, dorsifixed; *gynoecium*: ovary 0.6 mm diam., sessile, globose (yellow-green in living material), style 1.5 × 0.1 mm, truncate; *immature berries* 7 mm diam., globose (mature fruits not seen); *seeds* 6 (one per ovary lobe), globose, flattened, 3 mm diam., testa granular, black.

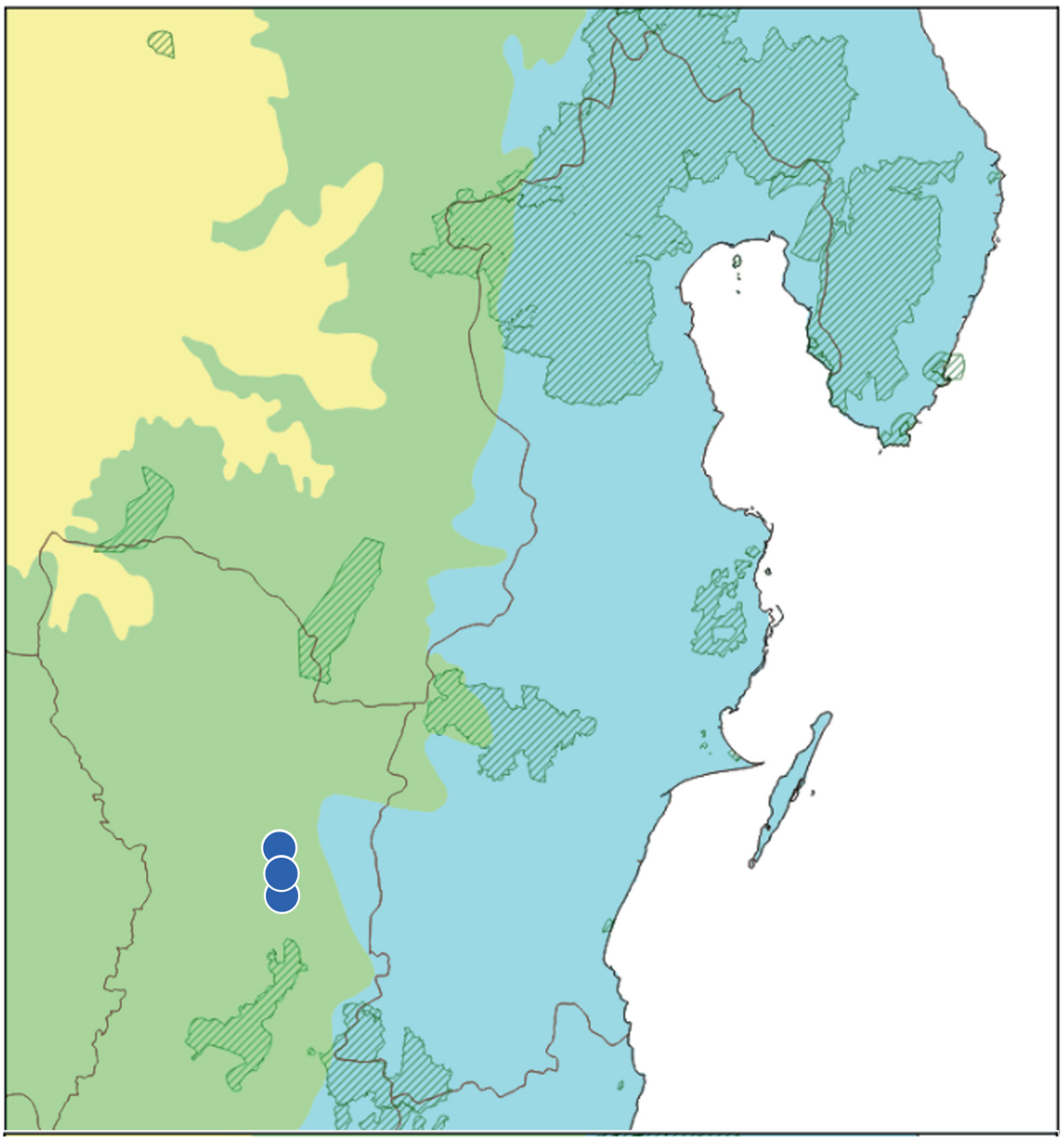

Fig. 5. Geographic distribution of *Asparagus andriamihajarivoi* M.Pignal & Phillipson sp. nov.

Table 2. Comparison of fruit colour among the species of *Asparagus* L. sect. *Myrsiphyllum* (Willd.) Baker ex H.Perrier.

Fruit color	Species
White	*Asparagus simulans* Baker var. *simulans* *Asparagus simulans* var. *recticladus* M.Pignal & Phillipson var. nov. *Asparagus simulans* var. *falcicladus* M.Pignal & Phillipson var. nov. *Asparagus madagascariensis* Baker
Red	*Asparagus laticladus* M.Pignal & Phillipson sp. nov. *Asparagus calcicolus* H.Perrier *Asparagus falcatus* L. (*fide* Jessop, 1966)
Colour unknown	*Asparagus andriamihajarivoi* M.Pignal & Phillipson sp. nov. *Asparagus bambusiformis* M.Pignal & Phillipson sp. nov. *Asparagus tsaratananensis* M.Pignal & Phillipson sp. nov. *Asparagus messmerae* M.Pignal & Phillipson sp. nov.

Phenology

The phenology of *Asparagus andriamihajarivoi* sp. nov. is poorly understood since it is known from just four collections, two of which were made at the same locality on the same day. It has been collected in flower and fruit only in April.

Distribution and ecology

Asparagus andriamihajarivoi sp. nov. is known only from a single recent georeferenced occurrence, where two collections were made (*Andriamihajarivo et al. 569* and *570*) on 22 April 2005 at the same locality. The species is also known from two older collections, *Perrier de la Bâthie 14987* and *R. Portères s.n.*, both of which can be adequately georeferenced post facto and were evidently collected close to the place where the more recent collections were made. The species has a very limited geographical range in East-Central Madagascar (see Fig. 3), recorded from very limited field observations at mid elevation sites (ca 1000–1164 m a.s.l.). Although poorly known, *A. andriamihajarivoi* appears to be a forest plant that has persisted outside Madagascar's protected area network in an area that is likely to have been subjected to significant habitat degradation.

Provisional risk of extinction assessment

Asparagus andriamihajarivoi sp. nov. has a geographic distribution in the form of an AOO of 12 km² (the value for its EOO of 4.2 km² cannot be used because it is smaller than the AOO). It is known from three occurrences documented by four gatherings, none of which occur within a protected area. The species is subjected to threats primarily resulting from forest clearing for agriculture, which are projected to result in a continuing decline of EOO, AOO, quality of habitat, number of locations and subpopulations, and number of mature individuals. With respect to the most serious plausible threat (forest clearance), *A. andriamihajarivoi* sp. nov. occurs at three locations and can therefore be provisionally accessed as Endangered [EN B2ab(i,ii,iii,iv,v)] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Remarks

Asparagus andriamihajarivoi sp. nov. is characterised by its lianescent habit, long phylloclades (which sometimes develop into short, divergent branches), and frequently winged ultimate branches. The two recent collections were made specifically to document its local variability with respect to bud and

perianth colour, observed as white in one collection (*Andriamihajarivo 569*) and as violet in the other (*Andriamihajarivo 570*).

Asparagus bambusiformis M.Pignal & Phillipson sp. nov.
urn:lsid:ipni.org:names:77355480-1
Figs 3, 6–7; Table 2

Diagnosis

Asparago simulanti Baker *var. simulanti similis, sed phyllocladiis (1–)2–3 coacervatis (vs 3–9), erectis anguste ellipticisque (vs curvata falciformiaque), margine tenuiter papillosa (vs laevem), longioribus, (13–)19–24(–33) mm vs (4.1–)9.2–13.6(–26.2) mm, latioribusque, (1.7–)2.1–2.8(–5.7) mm vs (0.3–)0.4–0.6(–1.1) mm), praecipue differt.*

Etymology

The epithet refers to the bambusoid habit of the species.

Vernacular names and uses

Vernacular name and uses unknown.

Type material

Holotype and isotype

MADAGASCAR – **Ihorombe Region** [Fianarantsoa Prov.] • Centre: Nord du massif d'Andringitra; [23°53′ S, 46°58′ E]; 1600 m; Mar. 1922; fl; *H. Perrier de la Bâthie 14445*; forêt à sous-bois herbacé; holotype: P [P00483592]!; isotype: P [P00483593]!.

Paratypes

MADAGASCAR – **Androy Region** [Toliara Prov.] • Toliara, Ampandrandava, Forêt d'Analakoky à l'Est d'Ampandrandava (entre Bekily et Tsivory); [24°05′ S, 45°42′ E]; 100–200 m; Aug. 1944; st; *A. Seyrig 833*; P [P00571173]!. – **Atsimo-Atsinanana Region** [Fianarantsoa Prov.] • Vallée de l'Itomampy; [23°53′ S, 46°58′ E]; 700 m; Jun. 1919; fr; *H. Perrier de la Bâthie 12653*; P [P00509259, P00509260]!. – **Ihorombe Region** [Fianarantsoa Prov.] • Kalambatritra, Betroka, Ivahona, Mont Kalambatritra, Analamaro Forest; 23°27′38″ S, 46°24′40″ E; 1540 m; 6 Nov. 2004; fl; *N.M. Andrianjafy, R.L. Andriamiarisoa, L.J. azafitsalama, J. Realy, N. Reaka & Resaviny 558*; MO [MO-3065649] image!, P [P00568776]!, TAN n.v. • Iakora, Begogo, Bekora, forêt de Sahalava au sud du village de Androizaha; 23°31′59″ S, 46°32′04″ E; 28 Jan. 2005; fr; *N.M. Andrianjafy, M. Ramanantsoa, P. Resabo, D. Razafindraibe & D.B. Kidamaoly 777*; forêt dense humide; MO [MO-3065651] image!, P [P00568775]!, TAN n.v. • Iakora, Begogo, Bekora, Sahalava forest, dense humid forest, south of Androizaha village; 23°32′21″ S, 46°32′15″ E; 1392 m; 2 Feb. 2005; fr; *N.M. Andrianjafy, M. Ramanantsoa, P. Resabo, D. Razafindraibe & Boba Kidamaoly 875*; MO [MO-3065650] image!, P [P00568777]!, TAN n.v. • Mont Kalambatritra et ses abords; [23°21′28″ S, 46°29′10″ E]; 1600 m; Nov. 1933; fl; *H. Humbert 11899*; P [P00483594]!.

Description

Shrub to (0.5–)1(–4) m high; *roots* system unknown; *stems* spineless, straight, terete, smooth, ca 50–100 cm long, with branching to 2 to 4 levels, producing up to 4 stems per node, forming an angle of ca 90° with the adjacent stem, ultimate stems (19–)46–91(–130) mm long, branched at the base, giving them a somewhat triangular form, sometimes slightly lianescent, green, strongly 4-ribbed, the ribs strongly papillate, the entire surface finely papillose, internodes regular, (5–)8–11(–16) mm long, the apex ending in 1 to 3 brachyblasts, 2–4 mm long, bearing flowers; *phylloclades* in opposite pairs in the leaf axils or

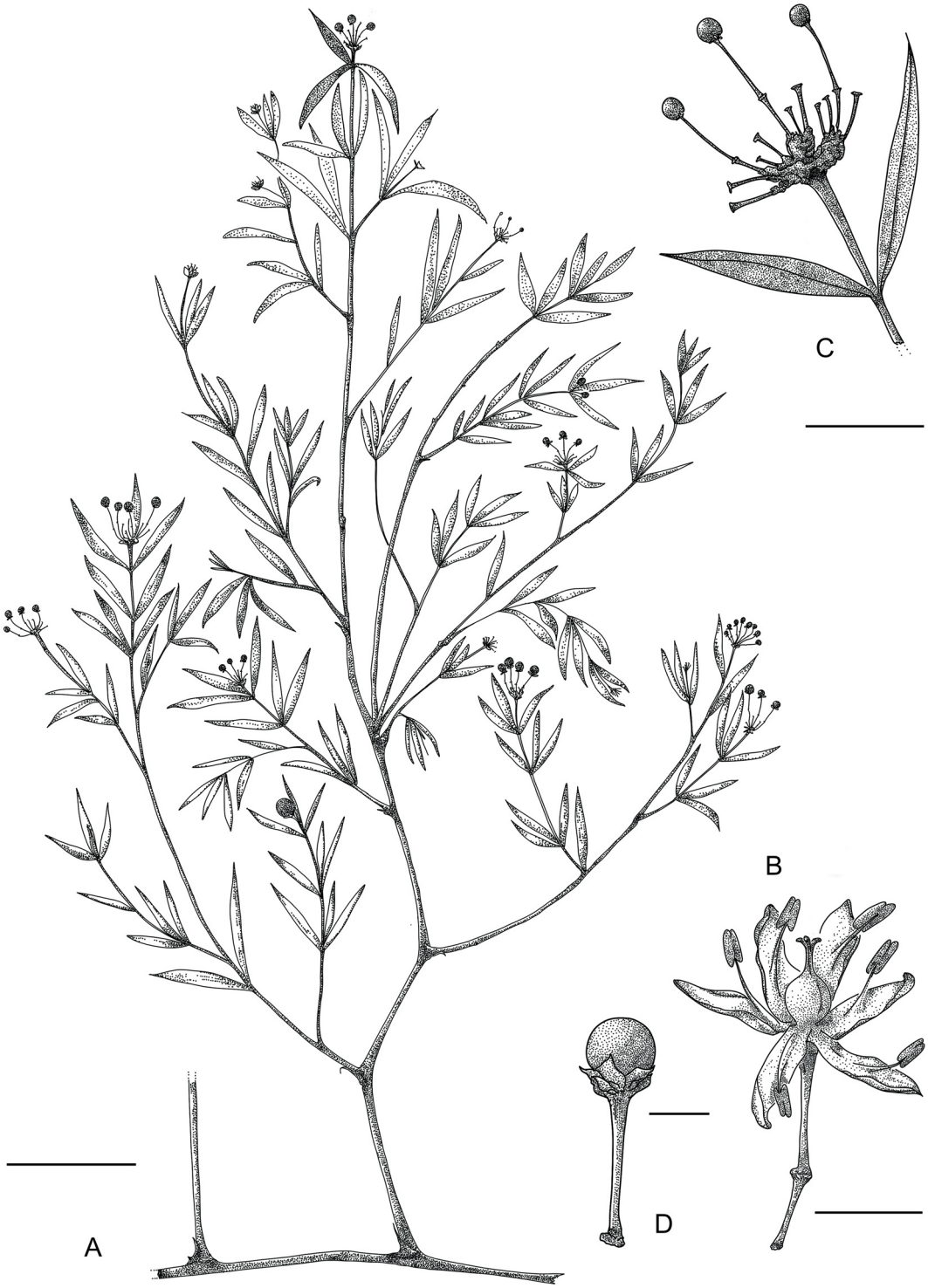

Fig. 6. Line drawing of *Asparagus bambusiformis* M.Pignal & Phillipson sp. nov. **A**. Stem. **B**. Flower. **C**. Young infructescence. **D**. Fruit. From *H. Perrier de la Bâthie 14445*, holotype (P00483592). Scale bars: A = 4 cm; B = 5 mm; C = 4 mm; D = 6 mm. Drawing by Giulia Iaconelli.

at the base of the stem, ternate at the apex, sometimes lacking on the ultimate node, sometimes replaced by a stem, (13–)19–24(–33) × (1.7–)2.1–2.8(–5.7) mm, flattened, lanceolate, green, shiny, base attenuate, margins thickened, finely papillose, nearly smooth on the surface, apex attenuate, mucronate, central pseudo-vein prominent on both sides, 0.2 mm wide; *scale leaves* on the stem unknown, precociously caducous, brachyblasts bearing flowers with imbricate, triangular scales up to 1 mm; *flowers* 3 to 8 in a dense, umbel-like, terminal fascicle born on a peduncle-like stem, apex ending in 1 to 3 brachyblasts, 2–4 mm long, 0.5 mm diam. at 3 mm from the base, pedicel ca 7 mm long (distal part ca 5 mm long), perianth white, *outer whorl (sepals)* 3.5 × 0.6 mm, narrowly ovate, *inner whorl (petals)* ca 3–3.5 × 1–1.5 mm at the base, triangular-oblong, the keel papillate; *androecium*: filaments 2 × 0.3 mm, flattened, shortly adnate to the tepals at the base, anthers 0.7–1 × 0.2–0.4 mm, rectangular in outline, yellow, dorsifixed; *gynoecium*: ovary 1 × 1 mm, stipitate, globose, style trifid, 1.2–1.5 mm long; *immature berries* 6–9 mm diam., globose, angular (mature fruits not seen), basal ring with the remains of the perianth; *seeds* 4 × 3.5 × 1.5 mm, globose, slightly flattened, testa granular, shiny black.

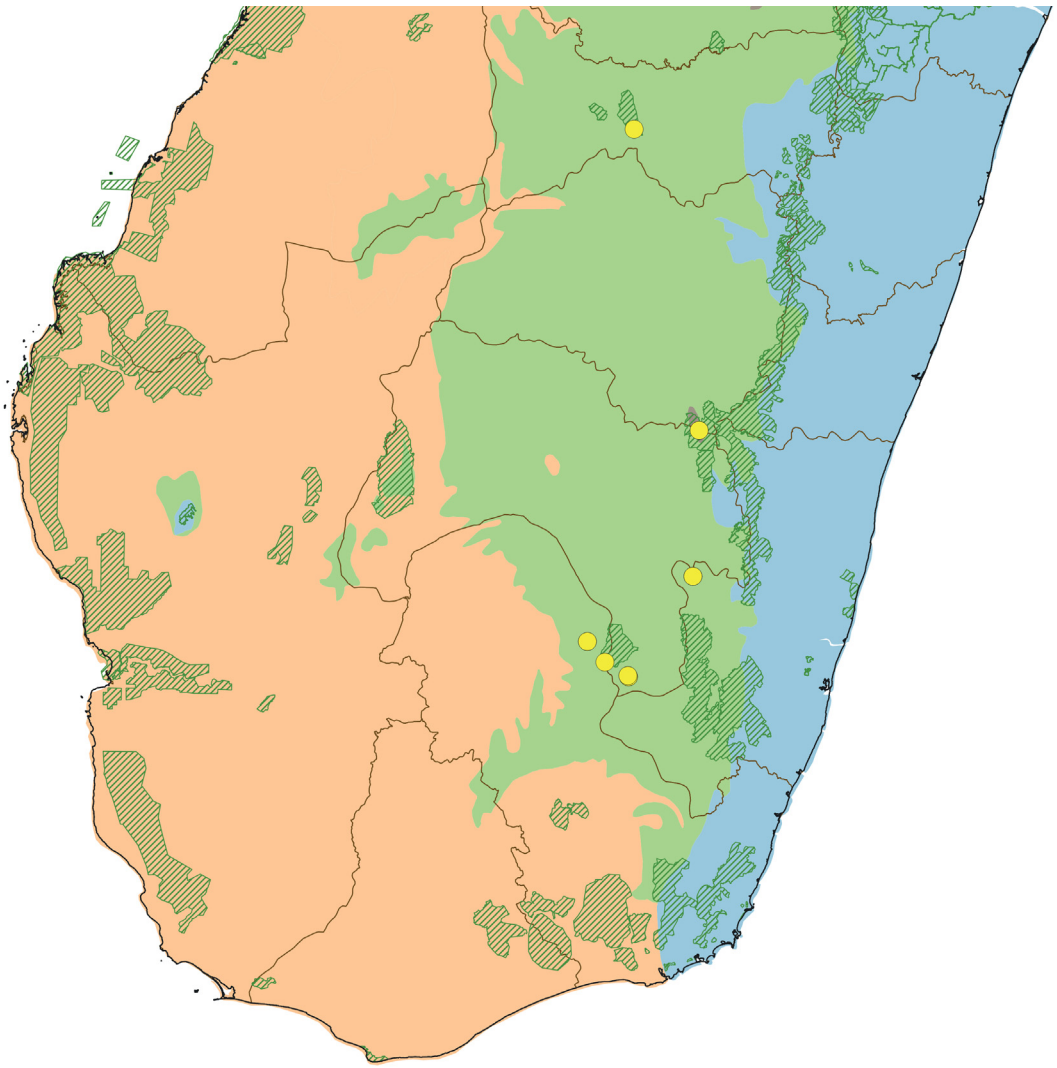

Fig. 7. Geographic distribution of *Asparagus bambusiformis* M.Pignal & Phillipson sp. nov. N.B. the northernmost locality is sympatric with the cluster of known occurrences of *A. messmerae* M.Pignal & Phillipson sp. nov., also described in this article.

Phenology

Asparagus bambusiformis sp. nov. has been recorded in flower in June and in November, and in fruit from January to June.

Distribution and ecology

Asparagus bambusiformis sp. nov. occurs in Southeast and Central Madagascar (Figs 3, 7), where it grows in dense, humid moss-forest at mid to high elevation sites (700–1600 m). It is found in areas with substrates that date to the Precambrian.

Provisional risk of extinction assessment

Asparagus bambusiformis sp. nov. has a geographic distribution in the form of an EOO of 7583.6 km² and an AOO of 24 km². It is known from seven occurrences documented by seven gatherings, two of which are from protected area (Andringitra and Kalambatritra), whereas the other occurrences are from unprotected sites where the species is subjected to threats primarily resulting from fire and forest clearing for agriculture, which are projected to result in a continuing decline of EOO, AOO, quality of habitat, number of locations and subpopulations, and number of mature individuals. With respect to the most serious plausible threat (forest clearing), *A. bambusiformis* sp. nov. occurs at six locations and can therefore be provisionally assessed as Vulnerable [VU B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v)] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Remarks

The notes accompanying *Perrier de la Bâthie 12653* indicate that the fruit is red, but this collection is heterogeneous, comprising a mixture of material of *Asparagus bambusiformis* sp. nov. mixed with *A. laticladus* sp. nov., making it unclear as to which species this information refers.

Asparagus calcicolus H.Perrier
urn:lsid:ipni.org:names:531035-1
Figs 2–3, 8–9; Table 2

Asparagus calcicolus H.Perrier (Perrier de la Bâthie 1935: 32–33) as '*calcicola*'.

Asparagus mahafalensis H.Perrier (Perrier de la Bâthie 1935: 29), **syn. nov.** – **Type**: MADAGASCAR – **Atsimo-Andrefana Region** [Toliara Prov.] • Domaine du S.-W.: sur les calcaires de la rive E du lac Manampetsa [Tsimanampetsotsa]; [24°11′ S, 43°46′ E]; Apr. 1933; fl, fr; *H. Perrier de la Bâthie 19178*; holotype: P [P00568785]!.

Etymology

The specific epithet refers to the taxon's preference for calcareous (limestone) habitats.

Vernacular names and uses

Vernacular name and use unknown.

Type material

Lectotype and isolectotype

MADAGASCAR – **Atsimo-Andrefana Region** [Toliara Prov.] • SW, rocailles calcaires, rive est du lac Manampetsa; [24°11′ S, 43°46′ E]; Apr. 1933; fr; *H. Perrier de la Bâthie 19312*; lectotype: P [P00509269]! (**here designated**); isolectotype: P [P00509268]!.

Material examined

MADAGASCAR – **Atsimo-Andrefana Region** [Toliara Prov.] • St Augustin; [23°20′ S, 43°46′ E]; 90 m; 20 Dec. 1912; fl; *K. Afzelius s.n.*; MO [MO-3065646] image!; P [P00509263]! • Vallée de l'Onilahy, à proximité du village d'Ankotrofotsy; 23°29′42″ S, 43°59′21″ E; 60 m; 7 May 2024; fr; *M. Bardot-Vaucoulon & Nadiah Manjato 2031*; milieu dégradé, coupes, quelques grands arbres, strate inférieure arbustive avec des lianes, strate herbacée réduite; P [P01172377]! • Mahaloetse, Madarano; 23°31′5.1″ S, 44°5′47.3″ E; st; *M. Bardot-Vaucoulon, L. Zazalahy, E. Ahmed Saïd & B. Randrianantenaina 2130*; forêt sèche; Zone de forêt dégradée, coupes et prospection pour le saphir, passage de bétail, quelques grands arbres, arbustes, sous arbrisseaux et couverture herbacée dans les zones de clairières; sol à nombreux blocs calcaires et autres, y compris conglomérats fluviatiles, poches d'argiles très chargée en oxydes de fer; MO n.v., P image!, TAN n.v. • Environs de Tuléar (SW); [23°24′19″ S, 43°43′11″ E]; Nov. 1956; fr; *J. Bosser 10497*; bush xérophile sur calcaire; MO!, PRE n.v., P [P00509267]!, TAN n.v. • Colline de la Table de Tuléar; [23°21′ S, 43°42′ E]; Nov. 1956; fr; *J. Bosser 10599*; bush xérophile sur calcaire; TAN image! • Falaise côtière vers l'embouchure de la Menarandra: Bevoalala-Ankazondranto; [25°10′ S, 44°31′ E]; 0–150 m; 12 Mar. 1955; fr; *H. Humbert & R. Capuron 29365*; bush xérophile sur calcaire; G!, P [P00509266]!, PRE! • Environs de Tuléar, La Table; [23°24′ S, 43°47′ E]; 0–200 m; 4 Nov. 1960; st; *J. Léandri & Ratoto 3662*; bush à Euphorbes; MO!, P [P00509264, P00509265]! • Route Nationale nº7 at 13 km east of Tuléar, on "La Table"; [23°24′34″ S, 43°46′52″ E]; 170 m; 13 Oct. 1978; st; *D.H. Lorence 1945*; climber in rocks on windy, exposed slope; dense xeric thorn scrub of *Euphorbia*, etc.; K [K002866145] image!, MO [MO-3065647] image! • Calcaires du Fiherenana; [23°17′00″ S, 43°45′40″ E]; 24 Jul. 1921; st; *H. Poisson 240*; P [P00509262]! • Miary, Miary-Carrière; 23°17′59″ S, 43°45′17″ E; 90 m; 20 Sep. 2021; fl; *L. Ramon 752*; calcaire; P [P00810761]!, TAN n.v. • Miary, Miary-Carrière; 23°20′ S, 43°46′ E; 28 Nov. 2019; fr; *L. Ramon 805*; P [P00810815]!.

iNaturalist observations

MADAGASCAR – **Atsimo-Andrefana Region** [Toliara Prov.] • 23°24′59.5″ S, 43°47′03.7″ E; 23 Mar. 2018; ifr, fr; *L. Ramon (laurence-clubbotatoliara)*; iNaturalist 109126271 • 23°17′59.7″ S, 43°45′17.4″ E; 28 Nov. 2018; fl, fr; *L. Ramon (laurence-clubbotatoliara)*; iNaturalist 97574474.

Description

Climbing shrub to 2 m high; *tubers* numerous, elongated, spreading widely (fide Perrier de la Bâthie); *stems* spinose, flexuous in the climbing portions, otherwise straight, with branching to 3 levels, the primary and major secondary stems grey, very finely papillose over the whole surface, minutely 4- or 5-ribbed, the surface between the ribs very finely longitudinally wrinkled (visible in dried material), the epidermis sometimes peeling off as a white membranous skin, the stem underneath then appearing dark grey, ultimate stems grey, (28–)67–92(–145) × 1 mm, very finely papillose over the entire surface, 4-ribbed, the ribs becoming more pronounced towards the apex, the surface between the ridges very finely, longitudinally wrinkled, at least in dried material, internodes (4–)9–14(–34) mm long, terminal nodes on ultimate stems tending to form subopposite pairs; *phylloclades* solitary in the leaf-scale axil or in fascicles of 1 to 5 on brachyblasts, (13–)23–42(–67) × (1–)2.1–3.2(–11) mm, flat, linear-oblanceolate to oblanceolate, (sometimes spatulate, long and thin, (39–) 43–48 (–55) × (1.1–)1.3–1.8(–12) mm), coriaceous, light green, dark green, or glaucous in fresh material, very finely papillose on the abaxial surface, nearly smooth on the adaxial surface, base gradually attenuate, margins thickened, apex acute to rounded, with thickened, simple or minutely 2- or 3-toothed tips, with 3 to 12 pseudo-veins; *scale leaves* with an erect triangular apiculate blade and a deflexed triangular smooth spur, blades and spurs on mature primary and major secondary stems grey, lignified, the blade appressed to the stem and somewhat spinescent, the spur forming a deflexed spine, *ultimate stems* with spreading, membranous blades (sometimes the brachyblast scales fimbriate) and reflexed, coriaceous spurs (the bases of the brachyblast scales not normally visible); *flowers* 1 to 4 per fascicle, pedicel ca 1.5–2 mm long (distal part ca 1 mm long), elongating to ca 2.5 mm

Fig. 8. Scans of herbarium material of *Asparagus calcicolus* H.Perrier. **A**. Habit. **B**. Linear-oblanceolate phylloclade. **C**. Medium phylloclades. **D**. Flowers. **E**. Fruit. A, C–D = *Afzelius s.n.* (P00509263); B = *H. Poisson 240* (P00509262); E = *H. Humbert & R. Capuron 29365* (P00509266). Scale bars: A = 10 cm; B–E = 1 cm. Scans prepared by Marc Pignal.

in fruit, articulation with a prominent flattened ring, perianth white or greenish-white, membranous, with scattered, appressed, minute white hairs, *tepals (outer and inner whorls)* 2.4–3 × 0.8–1 mm, elliptic-oblong, carinate in the proximal ⅔, apex rounded; *androecium*: filaments 1.8 × 0.2 mm, linear, flattened, white, shortly adnate to the tepal, anthers ca 0.5–0.8 × 0.25–0.3 mm, ovoid, pale yellow to almost white; *gynoecium*: ovary 1.0 × 0.8 mm, sessile, globose, style clavate, short, stigma 0.7 mm long, very shortly 3-lobed, ovules 3 per locule, white; *berries* (5.2–)5.7–9.3(–10.2) mm diam., globose, flattened, rugulose, red, 1- to 3-seeded, abscising at the summit of the pedicel and leaving a persistent stalk topped by the conspicuous remains of the perianth that forms a small disc; *seeds* 3 mm diam., sub-globose, testa granular, black.

Phenology

Flowering material has been collected in April and December; fruiting collections have been made in March, April, and November.

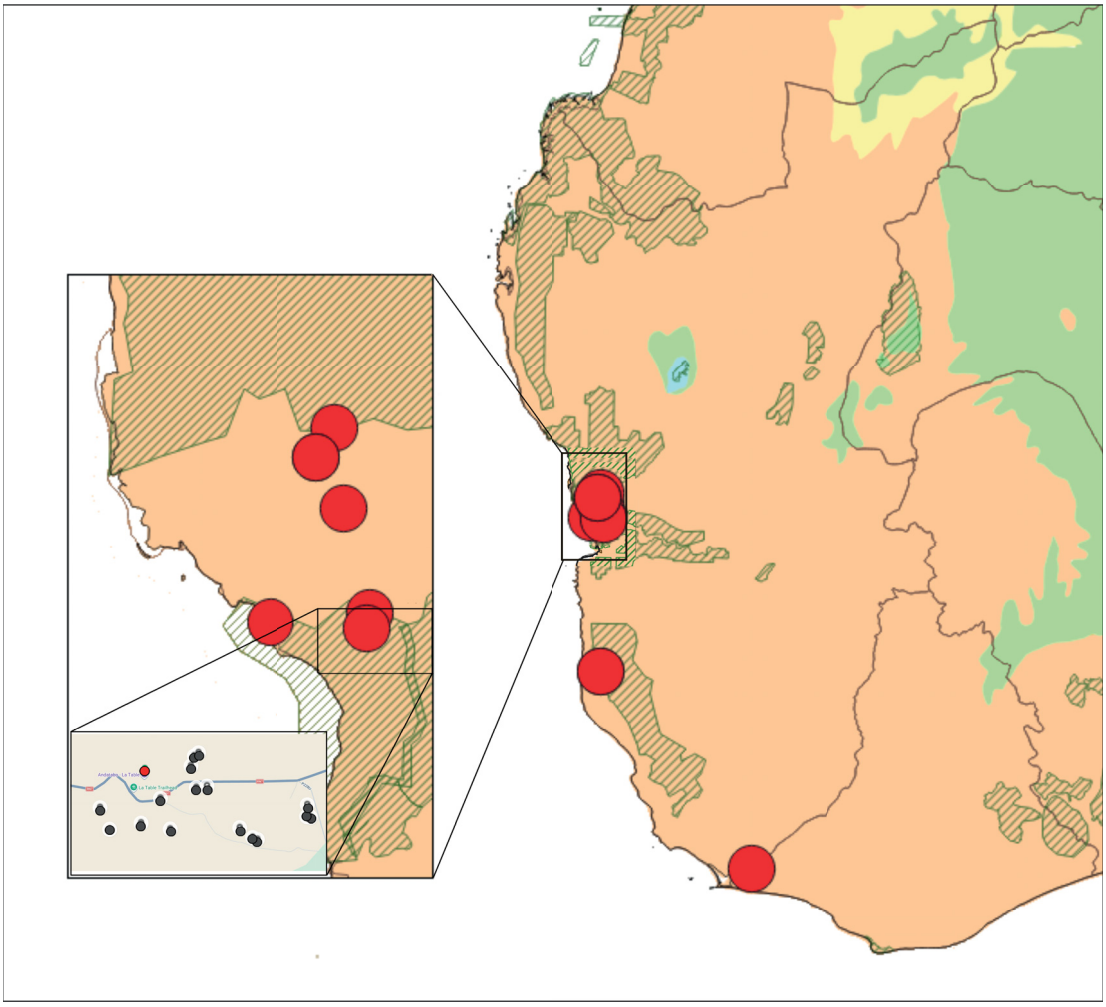

Fig. 9. Geographic distribution of *Asparagus calcicolus* H.Perrier in SW Madagascar, with enlarged portion of map on the left showing specimen records from the vicinity of Toliara (between the shaded areas to the north and to the south); the shaded area to the north is the Amoron'i Onilahy Protected Area (also known as PK32), and the shaded area to the south is the Littoral de Toliara Biosphere Reserve. The black dots represent data from observations carried out recently by Laurence Ramon and Denis Randrianandrasana in the Tulear region (unpublished data).

Distribution and ecology

Asparagus calcicolus is known only from the Atsimo-Andrefana Region, at elevations of 0–200 m, in the south-western coastal zone to the south of the city of Toliara. It occurs in thickets on calcareous outcrops from the Fiherenana valley in the north to the Menarandra valley in the south.

Provisional risk of extinction assessment

Asparagus calcicolus has a geographic distribution in the form of an EOO of 7 368.49 km² and an AOO of 64 km². It is known from 49 occurrences documented by 12 gatherings and 37 observations both from iNaturalist and personal observations from Laurence Ramon and Denis Randrianandrasana (unpublished data). Only one occurrence is from a protected area (Lac Tsimanampetsotsa) whereas the others are from unprotected sites where the species is subjected to threats primarily resulting from fire and forest clearing for agriculture and charcoal production, which are projected to result in a continuing decline of EOO, AOO, quality of habitat, number of locations and subpopulations, and number of mature individuals. With respect to the most serious plausible threat (forest clearing), *A. calcicolus* occurs at 12 locations and can therefore be provisionally assessed as Near Threatened [NT] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Remarks

In the protologue for *Asparagus calcicolus*, Perrier de la Bâthie (1935) followed the rule for second-declension feminine names for trees, using the ending 'a' for the specific epithet. In the *Flore de Madagascar* (Perrier de la Bâthie 1937 [1938]), he gave the species name in the masculine, with the ending 'us'. According to article 62.1 of the *Code of Nomenclature of Plants and Fungi* (International Botanical congress *et al.* 2025), nomenclatural tradition treats *Asparagus* as masculine, also following the grammatical gender used by Linnaeus (1753) when he published the generic name.

Two sheets of the type collection of *Asparagus calcicolus* are present at P, both of which carry similar original labels and annotations, including the note "type" in Perrier de la Bâthie's hand, one of which [P00509268] has an isotype label while the other one [P00509269] has a type label. We have designated the latter as the lectotype.

Perrier de la Bâthie (1935) described *Asparagus calcicolus* and *A. mahafalensis* as distinct species, citing a total of just three collections. According to him, the two species differ primarily by the distinctly flexuose stems of the former vs the straight or just slightly flexuous stems of the latter, as well as the presence of sharp vs blunt spines, scale leaves that are shredded vs entire, unifoliate vs unifoliate to fasciculate (up to 3 to 5) phylloclades, and the shorter, broader, more strongly striate stems of *A. calcicolus*. With a total of nine collections available to us now, we are able to re-assess the pertinence of these characters. We have observed firstly that true spines are found only on older stems, which are often not collected, and secondly that the scale leaves take on a shredded appearance as they age. Furthermore, the number of phylloclades varies from one collection to another, as do the striations on the young shoots. We do not regard this variability to be adequate for the recognition of two separate species. However, we consider the zigzag formation of the stems observed by Perrier de la Bâthie on the holotype of *A. mahafalensis* (his collection no. *19178*) to be of potential taxonomic importance and in need of further investigation as additional material becomes available.

Since both *Asparagus mahafalensis* and *A. calcicolus* were validated in the same publication, neither has priority over the other. We have chosen to retain *A. calcicolus* and place *A. mahafalensis* in synonymy since the type material of the former is more complete, especially with regard to its more typical phylloclades.

A geographic outlier of *Asparagus calcicolus* (*Humbert 29365*), collected ca 120 km to the south of the other known localities, has much wider phylloclades than the other material we include in the species,

measuring (5.1–)5.5–8.7(–11) mm vs (1.1–)2.0–3.1(–4.5), and has nearly straight stems. This collection may represent a distinct taxon, but based on the limited material currently available, we prefer to adopt a broad circumscription for this species. Further field investigations are needed to understand better the existing variability. The precise locality of this collection is not known, but it is likely to come from the north bank of the Menarandra River, perhaps within the Besanira or the Vohidefo protected areas.

Asparagus falcatus L.
urn:lsid:ipni.org:names:531097-1
Figs 10–11; Table 2

Asparagus falcatus L. (Linnaeus 1753: 313).

Etymology

The specific epithet refers to the falcate shape of the phylloclades.

Vernacular names and uses

Vernacular name and use unknown.

Type material

Lectotype and isolectotypes

SRI LANKA – lectotype: Herb. Hermann 1: 5, No. 123; BM [BM000621241] n.v., number 123 designated at the first step by Trimen (1887: 138), and at the second step by Turner (2026); isolectotypes: Herb. Hermann 1: 5, No. 123; BM [BM000621242] n.v. • Herb. Hermann 2: 76, No. 123; BM [BM000621767] n.v.

Material examined

COMOROS – **Grande Comore** (Ngasidja) • Centre nord entre Bahani et Itsounzou [Itsoundzou]; [11°37′ S, 43°18′ E]; 600 m; 11 Feb. 1975; fl; *J.-J. Floret 905*; forêt xérophile; P [P00196696]! • Forêt de Combani [Koimbani]; [11°37′ S, 43°22′ E]; 19 Sep. 1884; fl, fr; *L. Humblot 1234*; P [P00196705, P00196706, P00196707, P00725045]! • Bahani, 2 km au Nord-Est, RN4, bord de route, dans et aux alentours d'une vanilleraie; 11°37′59″ S, 43°18′5″ E; 27 Oct. 2008; fl; *M. Pignal, G. Rouhan & Y. Ibrahim 3411*; CNDRS!, K!, MO!, P [P00684810]!, PRE!, SP!.

Additional material examined

TANZANIA – Ambangulu montane forest patch between tea factory and New Ambangulu primary school; 5°4′48″ E, 38°26′16″ E; 1112 m; fr; *M.A. Mwangoka 312*; P [P02156073]! • Bagamoyo; [6°26′ S, 38°54′ E]; Feb. 1887; fl, fr; *Sacleux 675*; P [P02156069, P02156070]!.

Description

Robust *climbing shrub* to several metres high; *roots* bearing tubers (not observed in material from the Comoros); main *stems* woody, multibranched, leaf spines robust, straight, (3.7–)7.7–9.9(–13.9) × 3.4–4.5 mm at the base of old branches, deflexed on younger branches, (0.9–)1.4–3.3(–5) × 0.6–2 mm at the base, primary and major secondary stems terete, straight, with furrows and ridges in dry material, ultimate stems straight, with 4 nearly winged angles, (20–)46–99(–144) mm, internodes 7 to 10, (6–)19–31(–47) mm long; *phylloclades* ternate , borne along the stem or 3 to 14 at the apex, (31.3–)49.3–77.5(–92.3) × (1.9–)2.1–2.3(–2.7) mm, flattened, straight, green, upper surface glossy, base attenuate, margin slightly revolute, apex acute (6°), pseudo-vein central; *scale leaves* triangular, membranous, prolonged by a spine; *flowers* in a straight raceme (10–)24–38(–53) mm long, up to 9 in the apical cluster, 2 or 3 in the lateral clusters, pedicel ca 5–9 mm long (distal part 1.8 mm long), striate, perianth white green, *tepals (outer and inner whorls)* 1.5 × 0.6 mm, lanceolate, apex rounded; *androecium*: filaments 1.5 × 0.4 mm, flattened,

Fig. 10. Scans of herbarium material of *Asparagus falcatus* L. **A**. Stem. **B**. Phylloclade. **C**. Spine and leaf-scale. **D**. Raceme. **E**. Flower. **F**. Fruit. A–D = *J.-J. Floret 905* (P00196696); E–F = *L. Humblot 1234* (P00196707). Scale bars: A = 10 cm; B = 5 mm; C = 2 mm; D = 5 mm; E = 1 mm; F = 5 mm. Scans prepared by Marc Pignal.

shortly adnate at the base of the tepals, anthers 0.9 × 0.2 mm, ovate-rectangular, yellow; *gynoecium:* ovary 2–2.5 × 1.5–2 mm, shortly stipitate, style 0.6 × 0.2 mm, 3-lobed; *berry* 7–8 mm in diam., globose, yellow becoming red; *seeds* 1 or 2, ca 4 mm diam., testa granular, black.

Phenology

Flowering material of *Asparagus falcatus* has been collected in the Comoros Archipelago in February, September, and October; fruiting collections have been made in September.

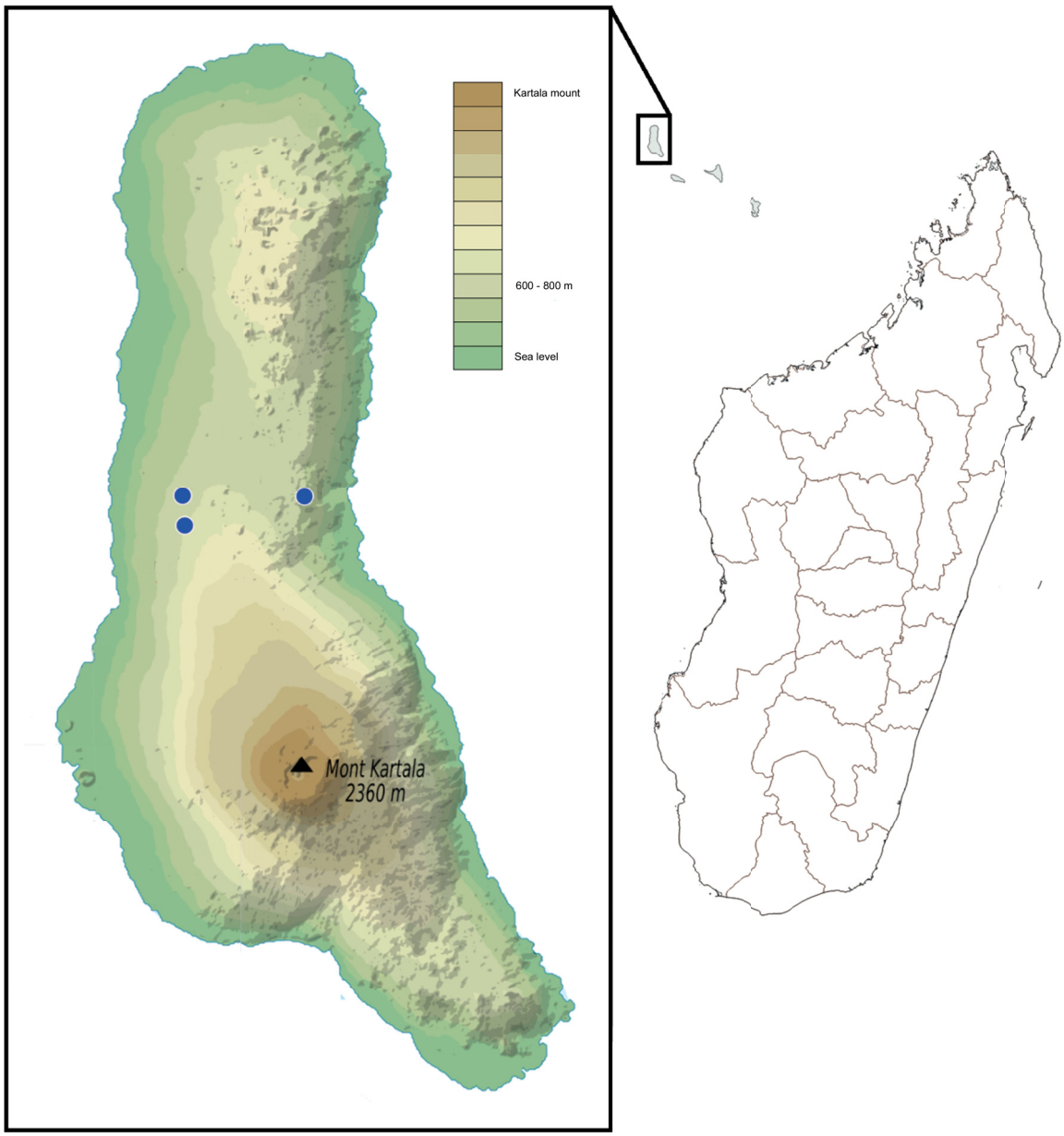

Fig. 11. Geographic distribution of *Asparagus falcatus* L. in Ngazidja (Grande Comore) (left), with base map adapted from Wikipedia, and map of the Comoros Archipelago and Madagascar to show relative scale.

Distribution and ecology

Asparagus falcatus occurs along the east coast of Africa and in the Comoros Archipelago, across the Arabian Peninsula. It has been collected only at low elevations on Ngazidja (Grande Comore) but has not been recorded from the other islands in the archipelago, nor from Madagascar. A reference to its presence on Mayotte on the labels of *L. Humblot 1234* results from the homonymy of the name 'Combani forest', a name that exists both on Mayotte and on Grande Comore. The species has been observed and collected on Ngazidja in anthropized areas and in xerophytic thickets, but it was not found during botanical surveys conducted on Mayotte in the 2000s.

Provisional risk of extinction assessment for the Comoros Archipelago

In order to conduct a regional assessment of *Asparagus falcatus* var. *falcatus* for the Comoros Archipelago that complies with the requirements of the IUCN Red List guidelines, a global assessment of the species would be required. The range of the species is very large, extending from the east coast of Africa, across the Arabian Peninsula and the Indian Ocean islands to India, and undertaking an assessment is beyond the scope of the present study. However, in order to provide information on the conservation status of this taxon in the archipelago, we propose the following provisional assessment.

In the Comoro Islands, *Asparagus falcatus* var. *falcatus* has a geographic range in the form of an AOO of 8 km², where it is known from two occurrences documented by three gatherings, *Floret 905*, which is more than 50 years old from an adequately defined locality, *Pignal et al. 3411*, collected in 2008 from a nearby site where the vegetation was reported to be degraded, and *Humblot 1234*, made more than 100 years ago and lacking precise locality information. The two occurrences are subjected to threats from human activities primarily related to land clearing for agriculture, which are projected to result in a continuing decline of EOO, AOO, quality of habitat, number of subpopulations, and number of mature individuals. With respect to the most serious plausible threat (habitat degradation at a local scale), *A. falcatus* var. *falcatus* occurs at two locations in the Comoro Islands and would therefore be provisionally assessed regionally as Endangered [EN B2ab(i,ii,iii,iv,v)] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Remarks

We include the populations present on Ngazidja (Grande Comore) within the typical variety, *Asparagus falcatus* var. *falcatus*, rather than in one of the varieties established by Jessop (1966), distinguished by their longer phylloclades, which exceed an average length of 35 mm, and by their simple inflorescences, as opposed to phylloclades less than 30 mm long and branched inflorescences.

The colour of the fruit is not mentioned for the Comoros collections, but label information for the African material assigned to the species specifies that the fruit is red (*Sacleux 675*) or pale yellow green (*Mwangoka 312*). Jessop (1966) also described the fruit of this species as red.

The original publication of *Asparagus falcatus* (Linnaeus 1753) made reference to two elements: i) Linnaeus' polynomial "*Asparagus aculeis solitariis, foliis ensiformibus falcatis*", with a reference to his earlier *Flora Zeylanica* (Linnaeus 1747), and ii) the polynomial "*Asparagus foliis falcatis, ex uno puncto numerosis*" accompanied by a reference to a description and a plate in Burman's *Thesaurus Zeylanicus* (Burman 1737). The only known specimens that comprise original material are those in Herman's collection from Sri Lanka, *Herman "1:5"* and *"2:27"* [BM000621242, BM000621241, BM000621767]. However, Burman's illustration also comprises original material of the species, although the specimen on which it was based is not known to exist (see discussion by Jessop 1966: 70). The Herman specimens would have provided better choices as lectotypes than Burman's illustration, but Jessop (1966) was unaware of Trimen's (1887) little-known work (which is open to interpretation) when he proposed the following lectotypification: lectotype: Burman 1737: 36, tab. 13 fig. 2. Jessop also confused the citation from the "*Flora Zeylanica*" with that from the "*Thesaurus Zeylanicus*". Turner's work (2026) helps to clarify the situation.

Asparagus laticladus M.Pignal & Phillipson sp. nov.
urn:lsid:ipni.org:names:77355481-1
Figs 2, 12–13; Table 2

Asparagus rusciformis Brongn. ex H.Perrier, nom. nud. (Perrier de la Bâthie 1935: 30).

Asparagus ternatus Brongn. ex H.Perrier, nom. nud. (Perrier de la Bâthie 1935: 30).

Diagnosis

Asparago simulanti Baker var. simulanti similis, sed phyllocladiis latioribus (2.6–)4.1–5.7(–7.7) mm (vs 0.4–0.5 mm) fructisque rubris (vs albos) praecipue differt.

Etymology

The specific epithet refers to the width of the phylloclades, which are broader than those of all other species of *Asparagus* from Madagascar.

Vernacular names and uses

'Diamaitso' (fide *Seyrig 833*), 'menavonga' (fide *R. Heim s.n.*, P00580873). *Asparagus laticladus* sp. nov. has been used for the preparation of herbal teas to treat colic in children (fide *Seyrig 833*).

Type material

Holotype

MADAGASCAR – **Anosy Region** [Toliara Prov.] • Bassin supérieur du Mandrare (Sud-Est): col et sommet de Marosoui; [24°28′ S, 46°49′ E]; 1000–1400 m; Nov. 1928; fl; *H. Humbert 6625*; forêt sur latérite de gneiss; holotype: P [P00580874]!.

Paratypes

MADAGASCAR – **Alaotra-Mangoro Region** [Toamasina] • Est: Antetezantany, près de Sevazy, au SW de Vatomandry; [19°40′ S, 48°29′ E]; Dec. 1921; fr; *H. Perrier de la Bâthie 14171*; forêt orientale; P [P00580875]!. – **Anosy Region** [Toliara Prov.] • Toliara, Ibakoko, Fokontany Antsontso, Ivohibe forest, Bemangidy; 24°34′13″ S, 47°12′01″ E; 286 m; 23 May 2006; fr; *P. Antilahimena et al. 4817*; MO [MO-3065712, MO-2650032] image!, P [P00568757] n.v., TAN n.v., TEF n.v. • Toliara, Anosy, forêt de transition d'Ambatorongorongo, Amboavola, Sarisambo, Taolagnaro; 25°4′4″ S, 46°46′53″ E; 287 m; 7–10 Jun. 1999; ifr; *J. Rabenantoandro, L. Randrihasipara & E. Ramisy 123*; MO [MO-3065607] image!, P [P00580513]!, TAN n.v. • Toliara, Intégrale Réserve #11, Andohahela, Parcelle 1, vicinity of Eminiminy; 24°40′ S, 46°48′ E; 200–700 m; 4–24 May 1993; fr; *B. Randriamampionona et al. 383*; MO [MO-3065538] image!, P [P00580512]! • Tolagnaro, Iabokoho, Antsotso, TGK 37. Forêt de Bemangidy; 24°34′10″ S, 47°12′01″ E; 651 m; 5 Apr. 2008; fr; *F. Randriatafika, J. Rabenantoandro, R. Razakamalala & R. Ramison 825*; MO [MO-3065682] image!, TEF n.v. • Toliara, Manantantely, forêt de Manantantely à 15 km au Nord-Ouest de Fort-Dauphin; [24°59′ S, 46°55′ E]; 50–100 m; 24 Jun. 1996; fr; *S.G. Razafimandimbison 226*; MO!, P [P00568756]! • Fort-Dauphin, Ifarantsa, Ivorona, forêt de Mamoareny; 24°49′ S, 46°56′ E; 706 m; 29 Nov. 2009; fr; *R. Razakamalala, R. Ramison, Miakamara, Damizandriana 4970*; MO [MO-3065676] image!, TAN n.v. • Fort-Dauphin, Ifarantsa, Ivorona, forêt de Mamoareny; 24°49′ S, 46°56′ E; 706 m; 30 Nov. 2009; fr; *R. Razakamalala, R. Ramison, Miakamara, Damizandriana 5008*; MO [MO-3065675] image!, P n.v. TAN n.v. – **Atsimo-Atsinanana Region** [Fianarantsoa Prov.] • Fianarantsoa, Tsararano, district Vondrozo; [22°47′ S, 47°23′ E]; Dec. 1963; fr; *J. Bosser 18699*; forêt ombrophile; MO!, P [P00571172]! • Haute vallée de la Manampanihy, col de Saindro; [24°43′ S, 46°45′ E]; 1200 m; Feb. 1934; fr; *H. Humbert 13990*; P [P00580871]! • Fort-Dauphin District, Iabakoko Commune, Ivohibe-Bemangidy Forest; 24°34′00″ S, 47°12′00″ E; 427 m; 26 Apr.

Fig. 12. Line drawing of *Asparagus laticladus* M.Pignal & Phillipson sp. nov. **A**. Habit. **B**. Root system. **C**. Flower. **D**. Rehydrated fruit. **E–F**. Dehydrated fruit. A = *F. Rasoavimbahoaka 717* (P00580510); B = *J. Rabenantoandro et al. 123* (P00580513); C = *H. Humbert 6625*, holotype (P00580874); D–F = *A. Pervillé s.n.* (P00580869). Scale bars: A–B = 1 cm; C = 2.5 mm; D–F = 5 mm. Drawing by Soraya Bengattat.

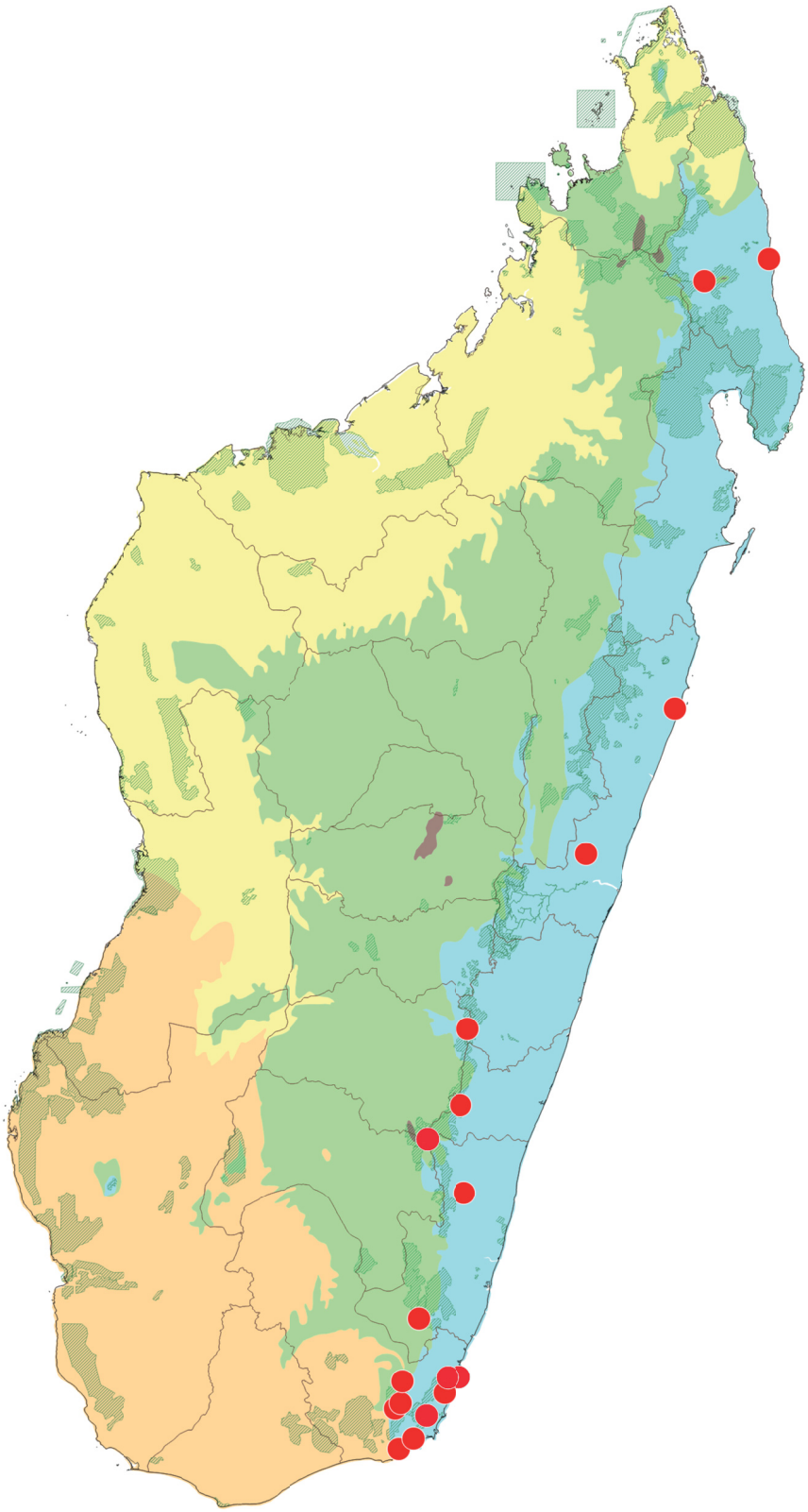

Fig. 13. Geographic distribution of *Asparagus laticladus* M.Pignal & Phillipson sp. nov.

2016; fr; *S. Razafimandimbison, V. Razafindrahaja & A. Atalahy 1544*; Evergreen forest on a steep slope of the eastern side; MO [MO-3047474] image!, TAN n.v., S n.v. • Fort-Dauphin, Taboko, Antsotso. Forêt Ivohibe; 24°33′52″ S, 47°14′25″ E; 112 m; 26 Nov. 2005; fr; *R. Razakamalala, F. Ramisa & B. Mara 2337*; MO [MO-3065678] image!. – **Atsinanana Region** [Toamasina Prov.] • Lac Nossi-Vé [south of Tamatave]; [18°21′ S, 49°18′ E]; 6 Apr. 1882; st; *L. Humblot 130*; P [P00580876]!. – **Haute Matsiatra Region** [Fianarantsoa Prov.] • Bassin de la Matitanana, forêt de Tsianovoha; [21°57′ S, 47°21′ E]; 24 Sep. 1934; fr; *R. Heim s.n.*; P [P00580873]! • Camp V (TL20), 9.0 km NE d'Ivohibe, 6.5 km ESE d'Angodongodona, dans le corridor entre Ivohibe RS et Andringitra PN; 22°25′36″ S, 46°56′18″ E; 900–975 m; 12 Nov. 1997; fl; *C. Rakotovao P.J. Rakotomalaza et N. Messmer 942*; MO [MO-3065606] image!, TAN n.v. – **Ihorombe Region** [Toliara Prov.] • Est: vallée de l'Itomampy; [23°53′31″ S, 46°58′2″ E]; Jun. 1919; fr; *H. Perrier de la Bâthie 12653 p.p.*; P [P00749876]!. – **SAVA Region** [Antsiranana Prov.] • Sambava; [14°15′ S, 50°9′ E]; Nov. 1967; fr; *P. Morat 2842*; forêt; P [P00580872]! • Marojejy RNI, Andapa, Doany, Betsomanga, environ à 11.2 km à vol d'oiseau au sud-est (14°) de Doany et à 7.5 km à vol d'oiseau au nord-est (14°) d'Ambalamanasy II, entre la rivière d'Ampandrana et Betsomanga, au nord de Marojejy; 15°27′ S, 49°34′ E; 920–1040 m; 15–29 May 1995; fr.; *F. Rasoavimbahoaka 717*; P [P00580510]!. – **No locality** • cultivated in Hortus parisiensis; Jul. 1844; bud, fr; *s.coll., s.n.*; (original data: e Madagascaria; Jul. 1842; *A. Pervillé s.n.*); P [P00580869]! • cultivated in Hortus parisiensis; Apr.; fl, fr; *s.coll., s.n.*; ex Herb. Houllet; (original data: e Madagascaria, *Pervillé s.n.*); P [P00580840] • cultivated in Hortus parisiensis; Aug. 1842; fl, fr; *s.coll., s.n.*; (original data: e Madagascaria, Jul. 1842; *A. Pervillé s.n.*); P [P00580870]!.

iNaturalist observation

MADAGASCAR – **Haute Matsiatra Region** [Fianarantsoa Prov.] • 21°15′23.2″ S, 47°24′44.3″ E; 23 Apr. 2019; fr; *D. Scherberich (dscherberich)*; iNaturalist 37987432.

Description

Erect shrub or herb 15–50 cm high; *roots* thickened into large spindle-shaped tubers (3 mm diam.), fibrous at the tip; *stems* thin, 2 mm diam., up to 50 cm long, erect, brownish green, striate, from a woody stump, mature primary and major secondary stems brownish green, striate, with 4 or 5 main ribs, unbranched, scaly bases 2–20 cm long, internodes ca 2 cm long, ultimate stems divergent, the base often branched, 10–20 cm long, winged, green, smooth, 4- or 5-pointed, internodes regular, (5–)8–12(–18) mm long; *phylloclades* 3 per lateral fascicle, opposite or ternate at the apex, articulated at the base, (12–)16–24(–34) × (2.6–)4.1–5.7(–7.7) mm, flattened, elliptic, dark green, shiny adaxially, base attenuate, margin revolute, apex asymmetric, apiculate, single-nerved; *scale leaves* 1–1.4 × 0.6 mm, triangular-cordiform, spurs reduced to small tubercles or a shredded blade 0.2 mm long; *flowers* 1 to 3 in a terminal fascicle, sometimes umbel-like (P00580875, approaching *A. bambusiformis* sp. nov.) borne on lateral brachyblasts at the apex of the ultimate stems, pedicel ca 3.3 mm long (distal part 1.4 mm long), elongating to ca 5 mm in fruit, articulation with a prominent, flattened ring, perianth white or green, membranous, with scattered, appressed, minute white hairs, *tepals (outer and inner whorls)* ca 3 × 0.8 mm, ovate-oblong, carinate in the proximal ⅔, apex rounded; *androecium*: filaments 1.3 mm long, linear, flattened, anther ca 0.6 × 0.25 mm, ovoid to triangular in outline, pale yellow; *gynoecium*: ovary 0.7 × 0.5 mm, stipitate, globose, style terete, 1 mm long, 3-lobed; *berries* 6 mm diam., globose, red or brownish, with 3 ribs, 1- to 3-seeded; *seeds* globose, flattened, 4–6 mm diam., testa granular, black.

Phenology

Specimens of *Asparagus laticladus* sp. nov. have been recorded in flower from September to December, and in fruit from April to December.

Distribution and ecology

Asparagus laticladus sp. nov. is widespread along the east coast and eastern escarpment of Madagascar, from Tolagnaro in the south-east to Sambava in the north-east, but it is known from only 14 collections. The majority of these come from the southern portion of the known range, and documented occurrences from the central and northern part are very few. *Asparagus laticladus* occurs in forest, especially in understorey environments, often as an epilithic element (i.e., growing on rocks). The species has also been observed in forest, on gneissic soils derived from laterite. It has been recorded across a broad altitudinal range, from 50 to 1500 m above sea level.

Provisional risk of extinction assessment

Asparagus laticladus sp. nov. has a geographic distribution in the form of an EOO of 103 708.0 km² and an AOO of 68 km². It is known from 18 occurrences documented by 17 gatherings and one verified iNaturalist observation. Three of the occurrences are from protected areas (Ambatotsirongorongo, Andohahela, and Marojejy) whereas the others are from unprotected sites where the species is subjected to threats primarily resulting from forest clearing for agriculture, which are projected to result in a continuing decline of EOO, AOO, quality of habitat, number of locations and subpopulations, and number of mature individuals. With respect to the most serious plausible threat (forest clearing), *A. laticladus* occurs at 16 locations and can therefore be provisionally assessed as Near Threatened [NT] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Remarks

Some of the specimens of *Asparagus laticladus* sp. nov. at P were derived from old successive cultivation of living plants at the Jardin des Plantes in Paris in the 19th century [P00580869, P00580840, P00580870]. They were labelled as originating from either Madagascar or from Île Bourbon (La Réunion), and were collected by J.M.C. Richard or A. Pervillé. As this Malagasy species has never been recorded on Réunion, the cultivated plants almost surely originated from Madagascar.

Asparagus madagascariensis Baker
urn:lsid:ipni.org:names:531184-1
Figs 14–15; Table 2

Asparagus madagascariensis Baker (Baker 1877: 206).

Etymology

The species is native to Madagascar, and is not to be mistaken for another Malagasy species, *A. madecassus* H.Perrier, whose etymology is similar and therefore easily confused.

Vernacular names and uses

Mantsoanala (fide *Anonym s.n.*, P00493486). Use unknown.

Type material

Holotype

MADAGASCAR – **Analamanga Region** [Antananarivo Prov.] • Antananarivo, Madagascar; [18°53′ S, 47°28′ E]; Mar. 1877; fr; *H. Gilpin s.n.*; holotype: K [K000190030] image!.

Material examined

MADAGASCAR – **Alaotra-Mangoro Region** [Toamasina Prov.] • Didy; [18°07′ S, 48°32′ E]; 14 Aug. 1889; fl; *L.D.M. Catat 1814*; P [P00493457]! • Centre Est, route de Moromanga Anosibe; Aug.1953; fr; *J. Bosser 6098*; Sous-bois de forêt ombrophile; MO [MO-3065583] image!, TAN n.v. • Zahamena (Réserve Naturelle n° 3); [17°30′ S, 48°39′ E]; 21 Mar. 1941; fr; *R. Decary 16526*; P [P00493452]! •

Fig. 14. Line drawing of *Asparagus madagascariensis* Baker. **A**. Stem. **B**. Root system. **C**. Flower. **D**. Rehydrated fruit. A = *Waterlot s.n.* (P00493487); B–D = *Académie Malgache 7362* (P00493481). Scale bars: A = 1 cm; B–D = 1 cm. Drawing by Lana Khong and Ludivine Longou.

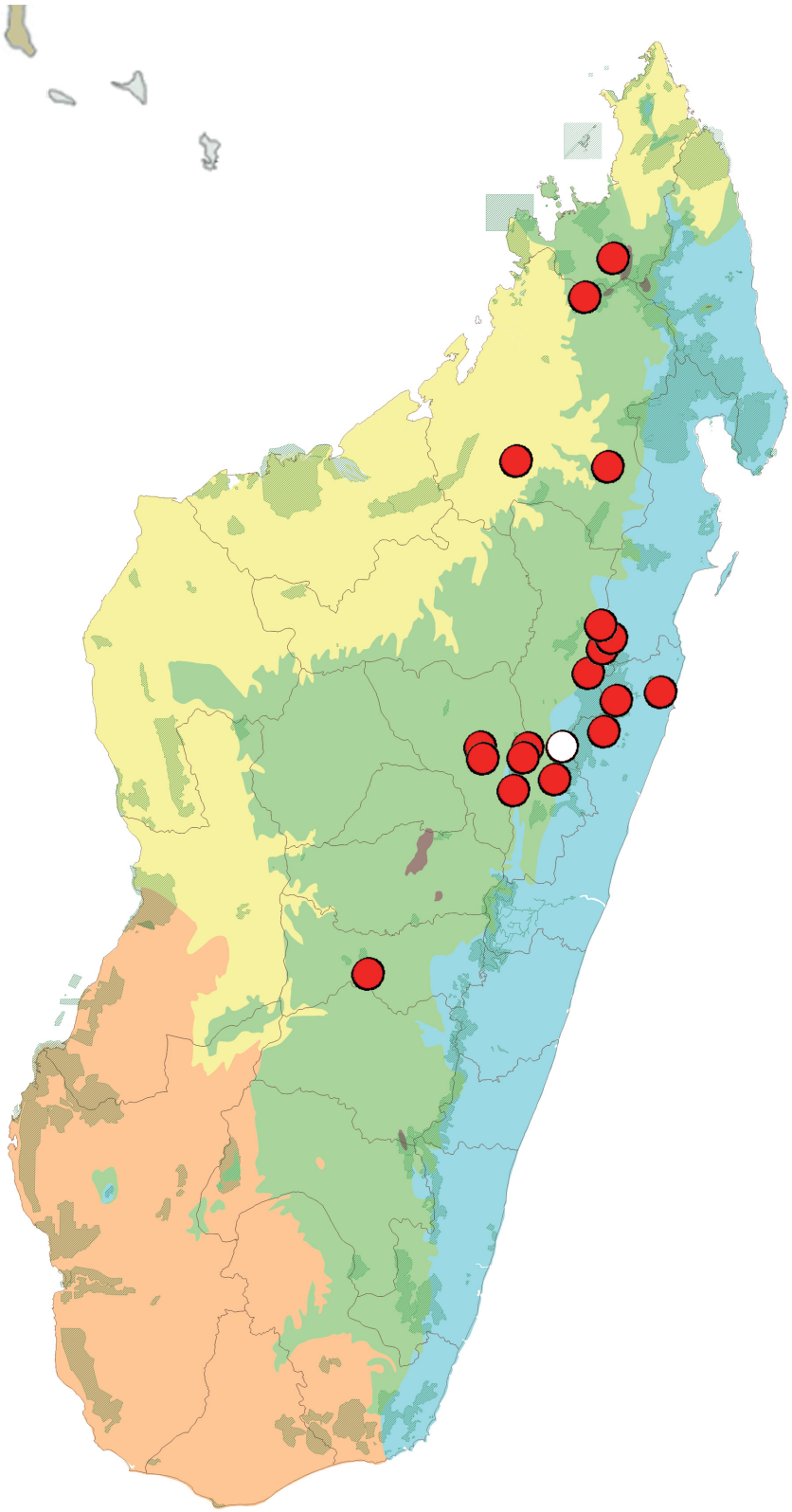

Fig. 15. Geographic distribution of *Asparagus madagascariensis* Baker. Herbarium collections (red dots), iNaturalist observation (white dot).

Massif d'Andrangovalo au Sud-Est du Lac Alaotra (Réserve Naturelle n°3 dite de Zahamena, Bassin de l'Onibe); [17°41′1 S, 48°46′ E]; 1000 m; 1937; st; *H. Humbert & G. Cours 17606*; P [P00493460]! • Moramanga, Ampitambe, Ambatovy, Zone de défrichement 27; 18°51′31″ S, 48°17′51″ E; 1084 m; 15 Dec. 2010; fl; *C. Miandrimanana, P. Antilahimena, R. Bernard, J. Ramahenina, S. Randrianasolo & F. Edmond 495*; MO [MO-3065696] image!, TAN n.v. • Alaotra Mangoro, Moramanga, Ambohibary, Ampitambe, Ambatovy, Andranovery, clearing zone 5; 18°51′50″ S, 48°18′47″ E; 995 m; 14 Feb. 2008; fr; *S. Randrianasolo, P. Antilahimena, M. Ratojomanana & S. Rabearivanona 685*; MO [MO-2653385, MO-3065681] image!, P [P00821355]!, TAN n.v. – **Analamanga Region** [Antananarivo Prov.] • Ambohidratrimo; [18°49′ S, 47°26′ E]; fl; *s.coll., s.n.*; P [P00493486]! • Ankeramadinika; [18°56′ S, 47°54′ E]; Nov. 1904; fl; *Académie Malgache 7362*; P [P00493481]! • Mandraka; [8°55′ S, 47°55′ E]; 1 Oct. 1905; *C. d' Alleizette 471*; P [P00493534]! • PK 64, entre Tananarive et Périnet; [18°55′48″ S, 47°55′48″ E]; 1200 m; 24 Nov. 1970; bud, fr; *M. Keraudren-Aymonin & G.G. Aymonin 25310*; P [P00493488]! • Forêt de la Mandraka; [18°57′ S, 47°53′ E]; 31 Mar. 1907; ifr; *L. Rotereau s.n.*; lieux frais; P [P00571165]! • La Mandraka; [18°55′ S, 47°55′ E]; Aug. 1918; fr; *G. Waterlot s.n.*; P [P00493487 individual on left]!. – **Atsinanana Region** [Toamasina Prov.] • Toamasina, Atsinanana, district Brickaville, Maroseranana, Fokontany Ambodilendemy, Andrangato River; 18°25′44″ S, 48°47′18″ E; 917 m; 21 Mar. 2011; ifr; *P. Antilahimena, J. Félix & A. Ravelomananjara 7684*; MO [MO-3065715] image!, P [P06774082]!, TAN n.v. • Nossy-Ve; [18°21′38″ S, 49°16′37″ E]; 16 May 1889; fr; *L. Catat s.n.*; P [P00493480]!. – **Haute Matsiatra Region** [Fianarantsoa Prov.] • Ankafina; [21°12′ S, 47°12′ E]; 1880; st; *W.D. Cowan s.n.*; BM [BM013822448] image!, P [P00493485]!. – **Sofia Region** [Majunga Prov.] • Entre Mandritsara et Andilamena; [16°09′ S, 48°49′ E]; 900–1200 m; Nov. 1937; fl; *H. Humbert 18033*; P [P00581519]! • Montagnes au nord de Mangindrano (haute Maevarano), jusqu'aux sommets d'Ambohimirahavavy (partage des eaux Mahavavy-Androranga: centre nord), clairières aux bords de la Bemafo, affluent de l'Androranga; [14°12′ S, 49°06′ E]; 1800 m; 1951; st; *H. Humbert & R. Capuron 25068*; P [P00493508]! • District Bealanana; [14°32′ S, 48°45′ E]; s.d.; fl, fr; *R. Dufournet s.n.*; MO n.v., P [P00493511]! • Centre: forêt d'Analamaitso; [16°07′ S, 48°02′ E]; Aug. 1907; *H. Perrier de la Bâthie 8393*; P [P00493489]!. – **Vakinankaratra Region** [Antananarivo Prov.] • Analamanga/Manjakandriana. Site de Biodiversite de Mandraka, adjacent to RN2; 18°55′03″ S, 47°55′00″ E; 1265 m; 1 Apr. 2009; fr; *M. Briggs, F. Rakotonasolo, A. Davis & T. Randriamboavonjy 309;* Humid evergreen forest, mid-montane; primary forest, very degraded to degraded; Laterite, mica-rich; K n.v., MO [MO-3065729] image!, TAN n.v. – **Without precise locality** • fl; *R. Baron 1081*; K [K000190026] image!, P [P00493482, P00493483]! • st; *R. Baron 3700*; K [K000190027] image!, P [P00493523]! • fl; *Expo. coloniale Marseille s.n.*; P [P00493490]! • Jardin Botanique; fl, ifr, fr; 2 Mar. 1938; *Jardin Botanique Tananarive 3217*; P [P00493484]!.

iNaturalist observation (cf. *madagascariensis*)

MADAGASCAR – **Alaotra-Mangoro Region** [Toamasina Prov.] • 18°47′23.9″ S, 48°26′07.7″ E; 5 Oct. 2018; st; *N. Helme (botaneek)*; iNaturalist 17403355.

Description

Erect shrub, spineless, 80–200 cm high; *roots* long and thick, 166 × 3–4 mm; *stems* upright, forming an acute angle with the axis of the plant (17°–50°), with branching to 3 levels, primary and major stems smooth and terete, unbranched in the proximal part and bearing appressed scales, ultimate stems forming a triangular pseudo-frond, internodes regular, (3–)4–5(–7) mm long, quadrangular in cross-section, with marked edges, strongly papillose; *phylloclades* in opposite pairs or ternate (in the upper parts), (6–)8–11(–15) × (1–)1.4–2(–3.4) mm, broadly elliptic to narrowly elliptic, straight or slightly falciform, shiny adaxially, base slightly attenuate, margin smooth (or sometimes papillose, with a central pseudo-vein, *Antilahimena et al. 7684*), apex attenuate; *scale leaves* triangular, 1 mm long, apex acuminate, spur absent or flattened, underdeveloped; *flowers* usually sessile, brachyblasts 2–3 mm long, bracteole scales

imbricate, flowering successively, pedicel ca 6 mm long (distal part 4 mm long), perianth white, *outer whorl (sepals)* 3.5 × 0.5 mm, oblong, *inner whorl (petals)* 3.5 × 1 mm, ovate-lanceolate; *androecium*: filaments 2 × 0.1 mm, subterete, slightly adnate to the tepals, anthers 0.8 × 0.5 mm, ovoid-triangular, with basally divergent lobes, yellow; *gynoecium*: ovary 1.2 mm diam., stipitate, subglobose, style somewhat conical, 1.5 × 0.2 mm; *berries* 5 mm diam., globose, red or brownish, 3-sided, 1- to 3-seeded; *seeds*, 4 mm diam., globose, flattened, testa granular, black.

Phenology

Flowering material of *Asparagus madagascariensis* has been recorded in January, March, August, and October–November, and collections with fruit have been made in November–April and August.

Distribution and ecology

Asparagus madagascariensis is known only from the northern half of Madagascar, including in the Analamanga, Alaotra-Mangoro, Atsinanana, Sofia and DIANA regions. It has a rather scattered distribution in areas with moderate to high rainfall, occurring mostly in the subhumid zone of the interior, where it has been collected in rainforest clearings, mostly at mid to high elevations (ca 900–1800 m) and generally on laterite. It has also been documented from a few sites within the humid zone at lower elevations on the eastern escarpment, such as at Mangerivola and Betampona.

Provisional risk of extinction assessment

Asparagus madagascariensis has a geographic distribution in the form of an EOO of 82 986.0 km² and an AOO of 76 km². It is known from 21 occurrences documented by 21 gatherings, two of which are from a single protected area (Zahamena) whereas the others are from unprotected sites where the species is subjected to threats primarily resulting from forest clearing for agriculture, which are projected to result in a continuing decline of EOO, AOO, quality of habitat, number of locations and subpopulations, and number of mature individuals. With respect to the most serious plausible threat (forest clearing), *A. madagascariensis* occurs at 16 locations and can therefore be provisionally assessed as Near Threatened [NT] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Remarks

Perrier de la Bâthie (1935, 1937 [1938]) erroneously cited *Baron 1081* as the type of *Asparagus simulans*. In his broader view of this taxon, he placed *A. madagascariensis* in synonymy, but it is considered to be distinct in the present work due to differences in the size and shape of its phylloclades, although some individuals of *A. madagascariensis* display narrowly elliptical phylloclades.

Asparagus messmerae M.Pignal & Phillipson sp. nov.
urn:lsid:ipni.org:names:77355482-1
Figs 3, 16–17; Table 2

Diagnosis

Asparago simulanti Baker var. simulanti similis, sed phyllocladiis (1–)2–3(–4) coacervatis (vs 3–9), erectis linearibusque (vs curvata falciformiaque), longioribus, (33–)41–48(–59) mm vs (4.1–)9.2–13.6(–26.2) mm latioribusque, (1.7–)1.8–2.1(–2.5) mm vs (0.3–)0.4–0.6(–1.1) mm, praecipue differt.

Etymology

The species epithet honours Nathalie Rasolofo (née Messmer), who made the type collection. Between 1994 and 2000, Nathalie produced over 2000 collections from across Madagascar and was engaged in a vegetation survey of the Andohahela Reserve at the time she collected the type. She is currently affiliated

with the Geneva Botanical Garden (Conservatoire et Jardin botaniques de Genève) (Callmander & Nusbaumer 2024).

Vernacular names and uses

Vernacular names and uses unknown.

Type material

Holotype and isotypes

MADAGASCAR – **Haute Matsiatra Region** [Fianarantsoa Prov.] • Ambatofinandrahana, Ianasana forest, à 7 km à l'ouest d'Itremo, le long de la rivière Atsirakamhaity; 20°36′06″ S, 46°34′18″ E; 1630 m; 3 Feb. 1999; fr; *N. Messmer & F. Andriatsiferana 770*; holotype: P [P00581547]!; isotypes: G [G00105238]!, K [K002866184] image! MO [MO-3065648] image!.

Paratypes

MADAGASCAR – **Haute Matsiatra Region** [Fianarantsoa Prov.] • Ambatofinandrahana, Itremo, Antsirakambiaty, ca 8 km west of Itremo village; [20°35′37″ S, 46°33′50″ E]; 1528 m; fl; *T. Randriamboavonjy, A. Frazer, N.A. Raharoson, K. Rasolofondramiandra & A.L. Rajonson 1206*; humid forest, on slope, orientation West, along stream (dry); K n.v., P [P02171773]!.

iNaturalist observations

MADAGASCAR – **Amoron'i Mania Region** [Fianarantsoa Prov.] • (Itremo); 20°35′51.7″ S, 46°33′57.7″ E; 6 Aug. 2017; ifr; *Ramaro (sederaramarom)*, iNaturalist 7531910 • [20°35′43.1″ S, 46°33′48.4″ E]; 28 May 2019; fr; *Andry.A.R (andryrakoto)*; iNaturalist 26545523 • 20°35′52.7″ S, 46°33′43.8″ E; 28 Oct. 2019;

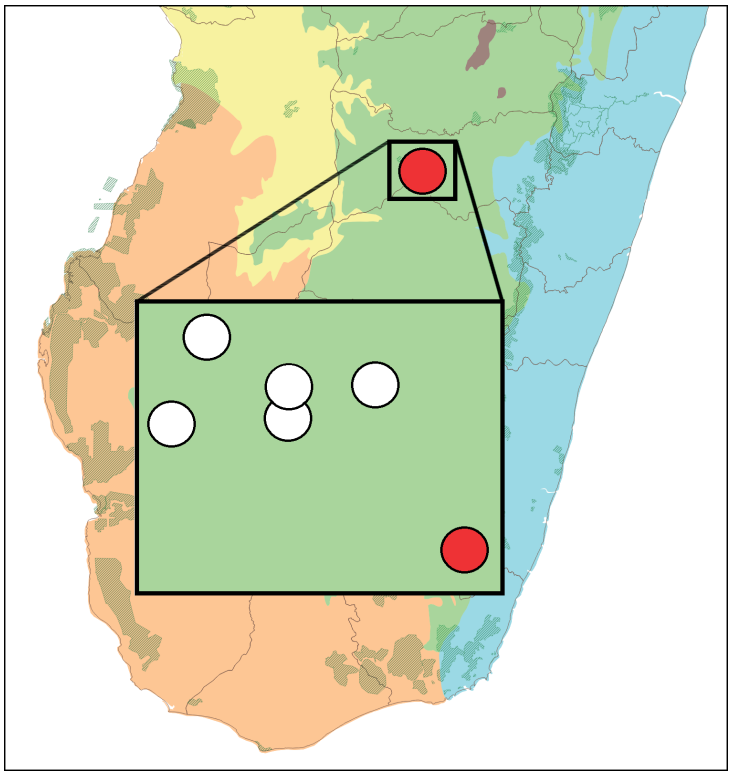

Fig. 16. Geographic distribution of *Asparagus messmerae* M.Pignal & Phillipson sp. nov. Herbarium collection (red dot), iNaturalist observations (white dots).

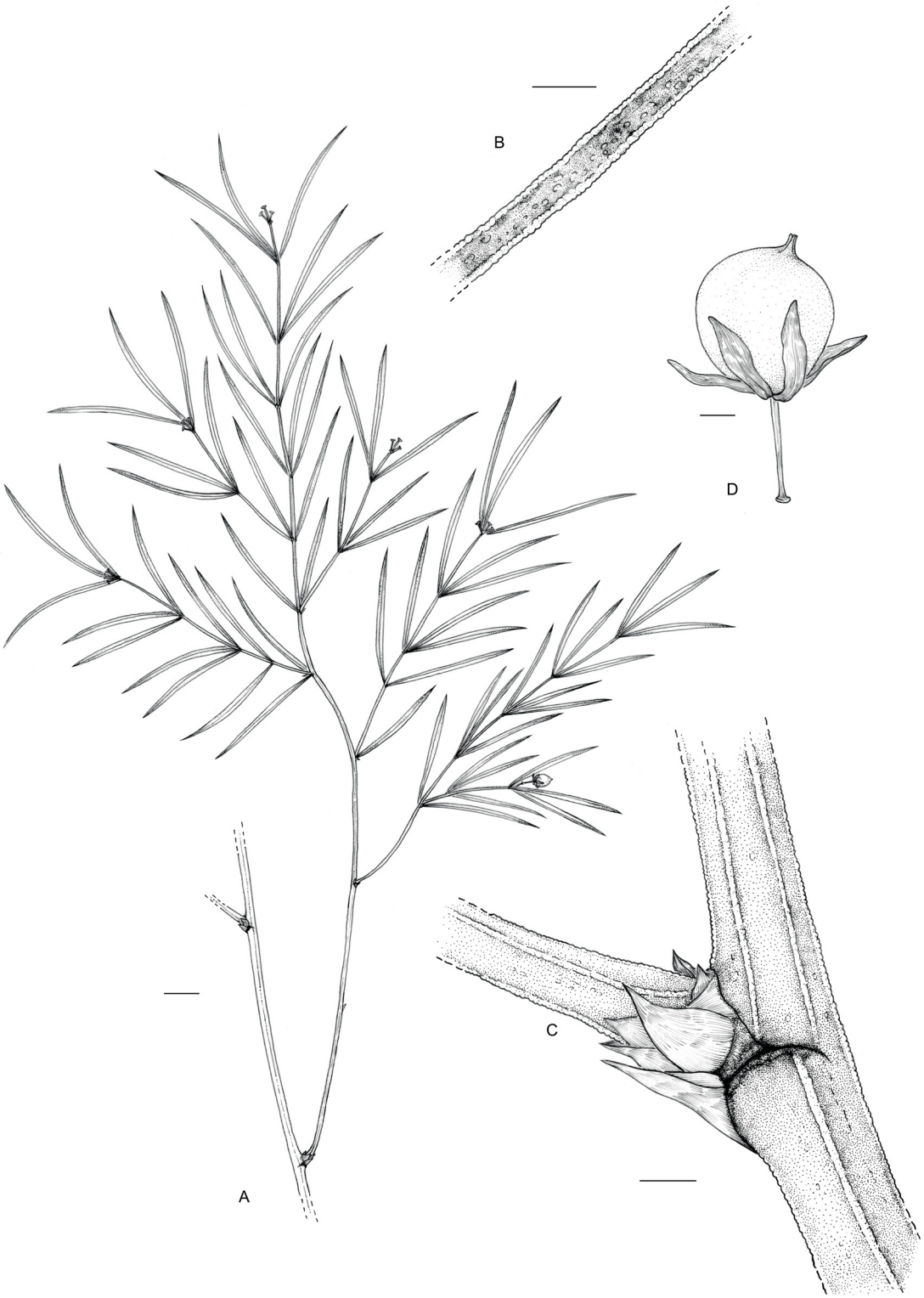

Fig. 17. Line drawing of *Asparagus messmerae* M.Pignal & Phillipson sp. nov. **A**. Stem. **B**. Ultimate stem detail. **C**. Leaf scales. **D**. Rehydrated young fruit. From *N. Messmer & F. Andriatsiferana 770*, holotype (P00581547). Scale bars: A = 1 cm; B–D = 1 mm. Drawing by Garance Coppens.

ifr, fr; *H. Ralimanana (helene001)*, iNaturalist 35048967 • 20°35′48.7″ S, 46°33′57.9″ E; 13 Jun. 2021; fr; *(nomentsoa)*; iNaturalist 85308228.

Description

Erect, spineless shrub ca 1 m high; *roots* unknown; *stems* erect, forming acute angles (23°–44°), with branching to 4 levels, primary and major secondary stems green, strongly 4-ribbed, very finely papillose on the ribs, epiderm very finely longitudinally wrinkled, ultimate stems divergent (ca 60°–70°), straight, quadrangular, green, (37–)77–98(–113) mm long, internodes 4 to 6, (15–)17–24(–26) mm long; *phylloclades* in fascicles of (2 or) 3, divergent, forming angles ca 60°–80° with the adjacent stem, nodes bearing only 2 phylloclades with a single axillary branch (the 3rd phylloclade replaced by a stem), (33–)41–48(–59) × (1.7–)1.8–2.1(–2.5) mm, linear, green, apex adaxially shiny, apex long-attenuate, margins smooth (but with very small papillae near the edge), apiculate, slightly deflexed, central pseudovein prominent; *scale leaves* ca 1.6 mm long, with a spur 1.6 mm long appressed to the stem; peduncle 5.5 mm long (proximal part 2.5 mm long); *flowers* (only withered flowers seen) 3 to 5 in a contracted raceme, flowering successively, borne at the tip of the final branches or on brachyblasts: *tepals (outer and inner whorls)* with thickened base, *outer whorl (sepals)* 3.8 × 0.8 mm, oblong, *inner whorl (petals)* 3.8 × 1.2 mm, lanceolate; *androecium* not seen; *gynoecium*: young ovary shortly stipitate; *berries* 4–5 mm diam., globose, bearing style remnants; *seeds* 4–5 mm diam., testa granular, black.

Phenology

Asparagus messmerae sp. nov. has been recorded in flower in August and October, and fruiting material has been collected in February, June, August, and October.

Distribution and ecology

All collections of *Asparagus messmerae* sp. nov. were made within the Itremo Massif Protected Area, in a forested area along a river, at elevations of 1528 and 1630 m. Four iNaturalist records provide additional localities from the same area.

Provisional risk of extinction assessment

Asparagus messmerae sp. nov. has a geographic range in the form of an AOO of 8 km². It is known from two occurrences documented by three gatherings and four verified iNaturalist observations. The occurrences are situated at the southwestern edge of the Itremo protected area, where the species is subjected to threats primarily resulting from wildfire, which are projected to result in a continuing decline of quality of habitat and number of mature individuals. With respect to the most serious plausible threat (wildfire), *A. messmerae* sp. nov. occurs at a single location and can therefore be provisionally assessed as Critically Endangered [CR B2ab(iii,v)] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Asparagus simulans Baker
urn:lsid:ipni.org:names:531317-1
Figs 18–20; Table 2

Asparagus simulans Baker (Baker 1875: 609).

Etymology

The species name is presumed to refer to the similarity of the phylloclades of the newly described species with those of *Asparagus racemosus*, which was at the time one of only two other known species of *Asparagus* from Madagascar.

Vernacular names and uses

Fankamata (*Réserves Naturelles (Rakotovao) 12040*, *Antilahimena et al. 5259*); Fankamantanahaidro (*Réserves Naturelles (Rakotoniaina) 5360* [P00493510]; Rouibec (*Bernier 341* [P00493573]). French notation; Takamatahandro (*Réserves Naturelles (Rakotovao) 10596*; *Réserves Naturelles (Rakotovao) 10650*); *Tsiota* (*Réserves Naturelles (Harizo) 1201*); *Service Forestier 26794*).

The species was reported by Boiteau (*Boiteau 1098*) to be used as a diuretic, and was also indicated to contain a potentially useful alkaloid.

Type material

Holotype

MADAGASCAR – **Atsinanana Region** [Toamasina Prov.] • "Madagascaria " (near Toamasina); 1865; *W.T. Gerrard 66*; holotype: K [K000190031] image!.

Description

Erect shrubs or vines (16–)33–60(–139) cm high; *rhizome* robust, horizontal, with elongated fusiform roots ca 100–200 cm long, axes robust, 2–5 mm wide, densely hairy when young, surrounded by fibrous secondary roots, lacking tubers; *stems*: primary stems green, 4- to 10-ribbed, each rib very finely papillose, gradually branched from a height of (5–)16–32(–99) cm, base smooth, apex slightly flexuose, not spinose, internodes ca 8, (1.2–)2–4(–12) cm long, the nodes bearing papery scales appressed to the stem, secondary and tertiary stems perpendicular, forming a pseudo-frond, triangular or elliptical, 4- or 5-angular, the ribs more or less papillose, green, the ribs becoming more pronounced towards the apex, nearly winged toward the apex, internodes (1.3–)3.3–5.4(–21) mm long, terminal nodes on ultimate stems tending to be opposite or ternate; *phylloclades* in alternate fascicles of (1–)3–4(–11), (0.6–)9.4–13.7(–26.2) × (0.3–)0.5–1.1(–2.4) mm, linear to linear-lanceolate, sometimes falciform, flattened, glossy, green, central pseudo-vein protruding on both sides, base slightly narrowed, margin entire, slightly thickened, apex acute, attenuate or apiculate; *scale leaves* triangular, papyraceous, those on the major branches 2–3 × 2 mm, with a deflexed, triangular, flattened, smooth extension 0.5–2 mm long, those on the ultimate branches 0.8 × 0.5 mm, sometimes with a deflexed rounded extension ca 0.1 mm long, the ultimate stem

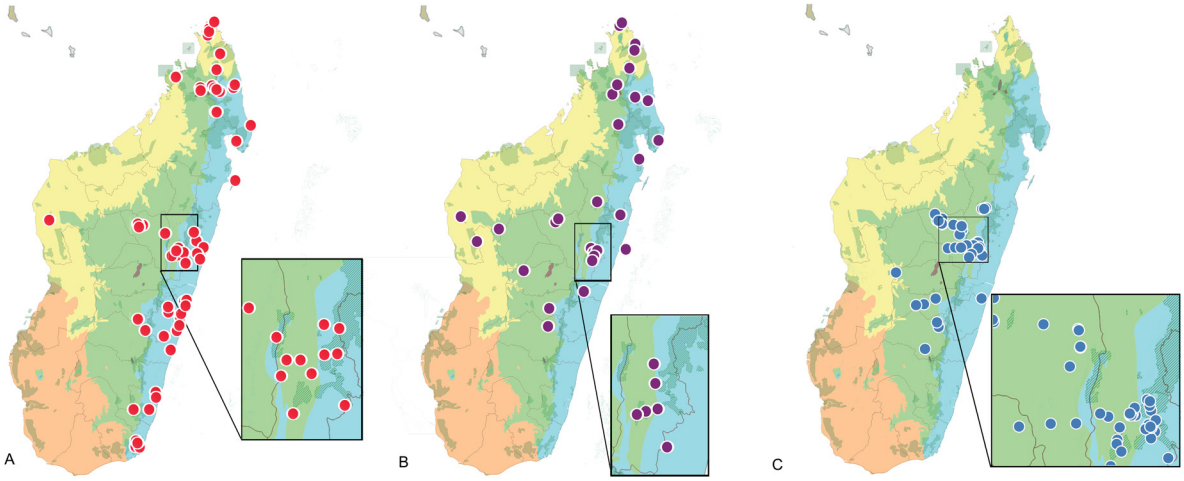

Fig. 18. Geographic distribution of varieties of *Asparagus simulans* Baker. **A**. *Asparagus simulans* var. *simulans* (red dots). **B**. *A. simulans* var. *falcicladus* M.Pignal & Phillipson var. nov. (violet dots). **C**. *A. simulans* var. *recticladus* M.Pignal & Phillipson var. nov. (blue dots).

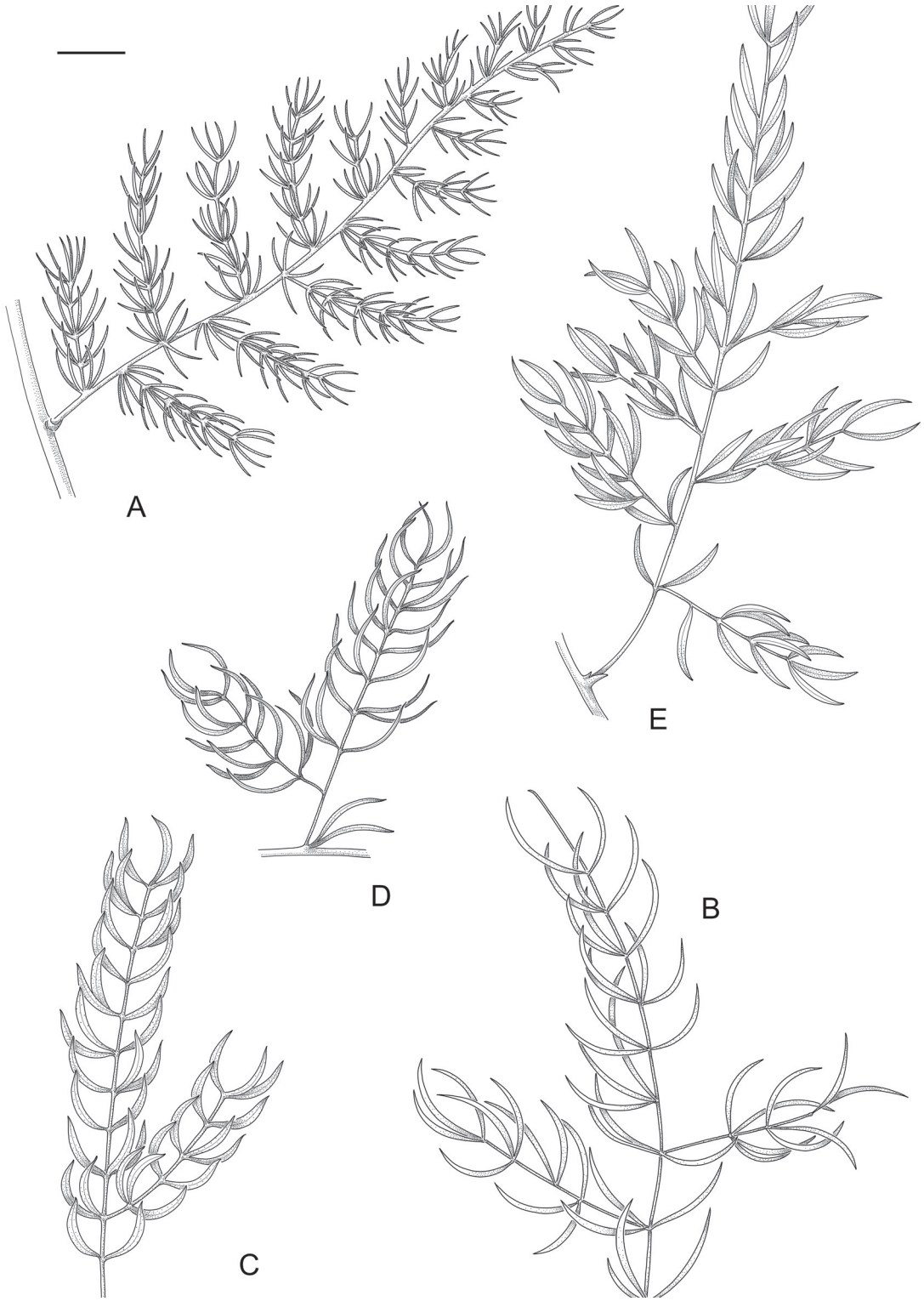

Fig. 19. Line drawings of terminal branches of the three recognised varieties of *Asparagus simulans* Baker. **A–B**. *Asparagus simulans* var. *simulans*. **A**. *P.B. Phillipson et al. 5772* (P00580504); individual from the west of Madagascar. **B**. *R. Letsara et al. 884* (P00722296). — **C–D**. *Asparagus simulans* var. *falcicladus* M.Pignal & Phillipson var. nov. **C**. *P. Antilahimena et al. 7658* (P06774053). **D**. *M.L. Zjhra et al. 360* (P00493477). — **E**. *Asparagus simulans* var. *rectícladus* M.Pignal & Phillipson var. nov.; *W. Deans Cowan s.n.* (P00493504). Scale bar = 1 cm. Drawings by Lola Lugand.

Table 3. Phylloclade sizes of the three varieties of *Asparagus simulans*. Values indicated: (minimum–) first quartile–third quartile(–maximum).

	A. simulans* var. *simulans	***A. simulans* var. *falcicladus* var. nov.**	***A. simulans* var. *recticladus* var. nov.**
Plant height (cm)	(16–)30–52(–104)	(25–)37–79(–139)	(22–)42–82(–105)
Phylloclade length (mm)	(4.1–)8.5–12.9(–26.2)	(7.9–)11.8–15.4(–26.2)	(5.8–)9.6–12.6(–18.8)
Phylloclade width (mm)	(0.3–)0.4–0.6(–1.1)	(0.7–)1.2–1.6(–2.4)	(0.5–)0.8–1.0(–1.5)
Internodes (mm)	(1.3–)2.7–4.5(–11)	(2.2–)4.2–6.1(–12.3)	(1.7–)4.1–5.9(–21)
No. of phylloclades per fascicle (excluding the terminal fascicle)	(1–)3–5(–11)	(2–)3–3(–7)	(1–)3–4(–8)
No. of measurements	2385	1050	1454

formed from a mass of scales (vegetative reactivation of a raceme?); *flowers* in a contracted raceme at the apex of the ultimate branches, 1(to 3) fully opened at a time, pedicel ca 6 mm long (distal part ca 1 mm long), perianth white, membranous, *tepals (outer and inner whorls)* carinate in the proximal ⅔, *outer whorl (sepals)* 2.9–3.5 × 0.8–1 mm, lanceolate, *inner whorl (petals)* 3–3.6 × 1–1.5 mm, ovate, apex rounded, carina more prominent than on the outer whorl; *androecium*: filaments 1.5–2 mm long, linear, flattened, long adnate to the tepal, white, anther ca 0.8–0.9 × 0.5 × 0.2 mm, ovate to cordiform, apiculate, pale yellow; *gynoecium*: ovary 1.8 × 1.1 mm, short-stipitate, style 1.5 mm long, 3-lobed; *berries* (4–)5–7(–12) mm diam. (in dry material), globose, irregular, often somewhat bilobed or asymmetrical, pale green when young, becoming white, 1- to 3-seeded (1 per locule); *seeds* 4 mm diam., globose, testa granular, black.

Phenology

Flowers and fruits of *Asparagus simulans* have been collected almost throughout the year.

Distribution and ecology

Asparagus simulans is endemic to Madagascar, where it has a widespread but somewhat fragmented distribution across much of the island, occurring in 17 of its 23 administrative regions, primarily in humid and subhumid areas. It is known to occur mostly at sites between 800 and 1800 meters in elevation, but in some areas it has been recorded at lower elevations, both in the west and in the east. However, this species is not known from the driest parts of the country (the subarid south-west and the far north-west) and it has only occasionally been recorded at sites in the centre-west. *Asparagus simulans* is found mainly in forested habitats, and despite its somewhat scattered distribution, it appears to adapt well to various forest conditions, ranging from understory habitats to more open areas at higher elevations. It is nevertheless a variable species, within which we recognise three varieties based on morphological features (see Fig. 18).

Provisional risk of extinction assessment

Asparagus simulans has a geographic distribution in the form of an EOO of 409 905.9 km² and an AOO of 516 km². It is known from more than 300 occurrences documented by nearly 284 gatherings and 66 verified iNaturalist observations, and can therefore be assessed as Least Concern [LC] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Remarks

Perrier de la Bâthie (1935, 1937 [1938]) noted that *Asparagus simulans* was a highly variable species within which he found it difficult to separate distinct entities. Since the publication of his work, the number

of available specimens has more than tripled, increasing from 47 to 142, and we have reconsidered the status of *A. simulans*. We agree with Perrier de la Bâthie's overall conclusion that it is highly variable, but we consider it useful to recognise three entities at the varietal level, whose geographical ranges overlap in part but are largely distinct. All three varieties are present and well represented in the centre-east of the country (Analamanga and Alaotra-Mangoro regions), but each of them also displays a distinct pattern of presence/absence in the other areas where the species occurs, as shown in Fig. 18. While these varieties form populations that are not completely isolated from one another, they differ in several characteristics such as the height and shape of individuals, the form of the branches, the number of phylloclades per whorl and their size and curvature (Table 3), which set each of them apart.

The identification of varieties, which is largely based on the shape and size of phylloclades, relies primarily on the average values of multiple phylloclades, as presented in Table 3. These same considerations also lead us to recognize *Asparagus madagascariensis* as a distinct taxon, contrary to Perrier de la Bâthie.

Perrier de la Bâthie (1935, 1937 [1938]) erroneously cited *Baron 220* as the type of *Asparagus simulans*.

Identification key of the varieties of *Asparagus simulans* H.Perrier

1. Phylloclades very narrow (0.5–0.6 mm wide), strongly curved (Figs 19A–B, 20C) ....***Asparagus simulans*** Baker var. ***simulans***
– Phylloclades broad (0.8–2.4 mm wide), weakly or strongly curved (Fig. 19C–E) 2

2. Phylloclades strongly curved, usually overlapping on young shoots (Fig.19C–D); outer (petaloid) whorl of sepals frequently white on abaxial surface, spreading, margins not revolute ....***Asparagus simulans*** Baker var. ***falcicladus*** M.Pignal & Phillipson var. nov.
– Phylloclades weakly curved (almost straight), generally not overlapping on young shoots (Fig. 19E); outer (petaloid) whorl of sepals frequently pale grey to violet on abaxial surface, margins revolute (Fig. 20E) .....***Asparagus simulans*** Baker var. ***recticladus*** M.Pignal & Phillipson var. nov.

Asparagus simulans Baker var. ***simulans***
Figs 18A, 19A–B, 20A–C; Table 3

Material examined

MADAGASCAR – **Alaotra-Mangoro Region** [Toamasina Prov.] • Toamasina, Brickaville, Ampitabe, Bifurcation a environ 5 km d'Antsampanana, (...) d'Analapetraka; 19°01′15″ S, 48°57′16″ E; 33 m; 18 Apr. 2010; fr; *B. Andrianaivoravelona, L. Rajaovelona, P. De Block, I. Groeninckx, J. Razanatsoa & Etienne 306*; Forêt humide de basse altitude; K n.v., MO [MO-3065580] image!, TEF n.v. • Fivondronana: Moramanga, Commune: Andasibe, Fokontany: Menalamba. Ambatovy forest. Up to Berano village; 18°48′29″ S, 48°18′49″ E; 25 Jan. 2005; fl; *P. Antilahimena & J. Andriambololona 3234*; MO[MO-3065716] image!, TAN n.v. • Andakana; [18°56′ S, 48°26′ E]; 15 May 1889; fl; *L.D.M. Catat 1288*; P [P00493557]! • Entre Sandrangato et Anosibe (Sud de Moramanga); [19°06′ S, 48°14′ E]; 800–1100 m; Nov. 1952; fl; *J. Léandri & R. Capuron 1556*; P [P00493555]! • Ambatovy; 18°52′10″ S, 48°19′09″ E; 1090 m; 14 Mar. 2005; fr; *P.B. Phillipson, S. Buerki & L. Andriamahefarivo 5772*; degraded forest; K [K002866125] image!, MO [MO-3065551]!, P [P00580504]!. – **Analamanga Region** [Antananrivo Prov.] • Ankazobe District, Ambohitantely Special Reserve; 18°11′47″ S, 47°17′12″ E; 1400 m; 12 Feb. 2018; fr; *U. Swenson, V. Razafindrahaja, A. Atalahy & S. Razafimandimbison 1912*; MO [MO-3120691] image!, S n.v., TAN n.v. – **Analanjirofo Region** [Toamasina Prov.] • Anjangoveratra, Antanandava; 14°10′15″ S, 49°57′18″ E; 400 m; fl; *C. Birkinshaw, S. Liede, C. M. Taylor & Ratsidy 1777*; Low elevation humid evergreen forest on basement rock (migmatites and granites), On humus covering rocks; K n.v., MO [MO-3065708] image!, P n.v. • Maroansetra, Antalavia; [15°47′ S, 50°01′ E]; 100 m; 20 Feb. 1988; fr; *M. Cheek 1332*;

Loosely rooted in leaf-litter under shade of undisturbed low evergreen forest; K n.v., MO [MO-3065581] image! • Sainte Marie, Lokintsy, Ambohidena. Forêt d'Ambohidena.; 16°50′27″ S, 49°57′01″ E; 34 m; 11–12 Oct. 2003; fr; *R. Razakamalala, D. Rabehevitra, S.N. Andrianarivelo & Poity 825*; MO [MO-3065672] image!, TEF n.v. – **Anosy Region** [Toliara Prov.] • Analamainty; [24°18′ S, 46°03′ E]; Dec. 1888; fl; *P. Campenon s.n.*; commun dans la forêt NE; P [P00493552]! • Vohimanana, dist. Brickaville, com. Maroseranana, fkt. Ambatolampy. Point 2 d'atterrissage d'helicoptère d'équipe qui avait fait le sondage: Héliport. Forêt d'Ankerana haut mi-versant Crête;18°24′07″ S, 48°48′13″ E; 1072 m; 25 Jan. 2012; fr; *D. Ravelonarivo, F. Edmond & Laindrirana 4192*; MO [MO-2697948, MO-3065534] image!, P n.v., TAN n.v. • Toliara, Taolanaro, près du village d'Amboahangy, Tsitongambarika, Androkabe. Commune Rurale Iaboakoho; 24°36′ S, 47°13′ E; 19 Oct. 2016; fl; *S.H.J.V. Rapanarivo, A. Ravoahangy, J.-M. Mara & B. Mara 971*; ASITY n.v., CAS n.v., P [P01031669]!, TAN n.v., TEF n.v. • Atsinanana, Vatomandry, Ambalabe, Ambinanindrano II. Forêt de Vohibe, limitrophe Ouest de la NAP, direction Andohan'Antsahabe; 19°08′32″ S, 48°32′15″ E; 894 m; 24 Apr. 2017; fr; *A. Razanatsima, C. Zafindrafeno, Tanjona, Mamy, Jean Rivo & Kôtsy 1673*; MO [MO-3066415] image!, TAN n.v. • District de Fort-Dauphin, Commune Rurale Manantenina, Fokontany Antanitsara, campement Melokondaty, près de la rivière Androkasarotra; 24°30′09″ S, 47°10′04″ E; 260 m; 27 Oct. 2017; fl; *A. Razanatsima, F. Rakotoarivony & T. Andriamihajarivo 1782*; forêt dense humide de basse altitude; MO!, P [P00972168] n.v., TAN n.v. – **Atsimo-Atsinanana Region** [Fianarantsoa Prov.] • Befotaka (Pce de Farafangana); [23°31′ S, 47°02′ E]; 11 Aug. 1926; fl; *R. Decary 4763*; P [P00493476]! • Mananjary; 20°57′01″ S, 48°26′02″ E; 0 m; 17 Feb. 2004; fr; *R. Ludovic 625*; MO [MO-3065697] image! • Farafangana, Mahabo Mananivo; 23°11′10″ S, 47°43′02″ E; 12 m; 6 Feb. 2011; fl; *R. Ludovic 1501*; forêt littorale sur sable blanc partiellement dégradée, présence d'*Erica* et de trace de collecte de gaulette; MO!, P [P00853056]!, TAN n.v. • S. of Farafangana, near village of Mahabo; 23°10′36″ S, 47°42′01″ E; 3 Nov. 2001; fl; *G. McPherson & J. Rabenantoandro 18313*; littoral forest on sand; K [K002866132] image!, MO [MO-3065552] image!, P [P06234402]! • Farafangana District, commune Ankarana, Réserve Spéciale de Manombo, parcelle I, circuit Reharatra; 23°00′39″ S, 47°44′07″ E; 16 m; 12 Sep. 2005; fr; *M. Rabarimanarivo, N. Rakotonirina, R. Razakamalala, J.J. Randrianasolo, Larizé & J. Mbita 25*; forêt dense humide de basse altitude sur sol ferralitique; MO [MO-3065549] image!, P [P00568800]!, TAN n.v. • Fivondronana: Farafangana, Firaisam-pokontany: Mahabo Mananivo, Fokontany: Nosy ala. Forêt d'Analazaha; [23°10′13″ S, 47°43′27″ E]; 22 m; 26 Aug. 2003; fr; *D. Rabehevitra, R. Razakamalala & Iaban'I Dely 519*; MO [MO-3065691] image!, P [P00568754]!, TEF n.v. • Farafangana, Ankarana, Antakohando village le plus proche, forêt littorale de la réserve spéciale de Manombo sur sable, parcelle 2, forêt d'Analazaha be; 23°05′58″ S, 47°45′16″ E; 11 m; 21 Sep. 2005; fr; *N. Rakotonirina, R. Razakamalala, F. Rambo, Bika & M. Randrianantoanina 411*; MO [MO-3065689] image!, P [P06172847]!, TAN n.v. • Farafangana District, Manombo National Park, Parcel II; 23°00′48″ S, 47°43′36″ E; 68 m; lowland evergreen rainforests; 19 Apr. 2016; fr; *S. Razafimandimbison, V. Razafindrahaja, A. Atalahy & U. Swenson 1436*; BR n.v., MEL n.v., MO [MO-3047471] image!, P [P00995793]!, S n.v., TAN n.v. • Vangaindrano, commune Vohipaho, vers 2 km au Nord Ouest du village Vohipaho; 23°31′43″ S, 47°30′1 E; 60 m; fl; *L.J. Razafitsalama, T. Andriamihajarivo, R.L. Andriamiarisoa & P. Ramanasaony 1418*; 22 Oct. 2010; G n.v., K [K001929697] image!, MO [MO-4380289] n.v., P [P02275947]!, TAN n.v. – **Atsinanana Region** [Toamasina Prov.] • Ambila (au sud de Tamatave); [18°49′ S, 49°08′ E]; 4 May 1928; fl; *R. Decary 6443*; dans le broussaille; P [P00493469]! • Fivondronana: Mahanoro, Firaisana: Mahanoro, Fokontany: Ambalavontaka, forêt littorale d'Ampanamara (Antaimby kely); 20°22′48″ S, 48°33′23″ E; 13 m; 12 Jun 2004; fr, *R. Ranaivojaona, R. Razakamalala & Velomahatratra 728*; MO [MO-3065686] image!, P [P00580502]!, TEF n.v. • Fivondronana: Mahanoro, Firaisana: Ambodibonara, Fokontany: Ambalavontaka. Forêt de Nankinana; 20°21′33″ S, 048°36′20″ E; 10 m; 19 Apr. 2004; fl; *R. Razakamalala, R. Ranaivojaona & Z. Rogers 1158*; MO [MO-3065670] image!, P [P00568774]!, TEF n.v. • Province d'Andovoranto, district d'Anivorano, forêt sur le pic de Vohilonjo, près Fetromby; [18°37′S, 48°55′ E]; 400 m; 6 Oct. 1912; st; *R. Viguier & H. Humbert 541*; P [P00493465, P00493466]!. – **DIANA Region** [Antsiranana Prov.] • Dans les bois des Montagnes Anbouitch [Ambohitra]

au SO de Diégo-Suarez; [12°30′ S, 49°12′ E]; *s.d.*; fr; *Bernier 341*; P [P00328197, P00493573]! • Diégo-Suarez; [12°17′ S, 49°21′ E]; *s.d.*; st; *L. Boivin 2839*; [P00493572]! • Montagne d'Ambre, versants est; 12°34′58″ S, 49°13′07″ E; 826 m; 29 Feb. 2012; fr; *S.D. Ramandimbimanana 397*; G n.v., P [P00783728]!, TEF n.v. • Montagne d'Ambre, partie centrale, à 350 m du point coté 1141, ou 154 ?; 12°37′15″ S, 49°10′25″ E; 1100 m; 14 Apr. 2008; fr; *M.H. Razanajatovo, S.D. Ramandimbimanana & S.M. Trigui 80*; forêt dense humide sempervirente de plateau; MO [MO-3065578] image!, P [P01848555]!, TEF n.v. – **Vatovavy Region** [Fianarantsoa Prov.] • Ambakoubé; [20°41′ S, 48°05′ E]; 900–1000 m; *s.d.*; fl, fr;

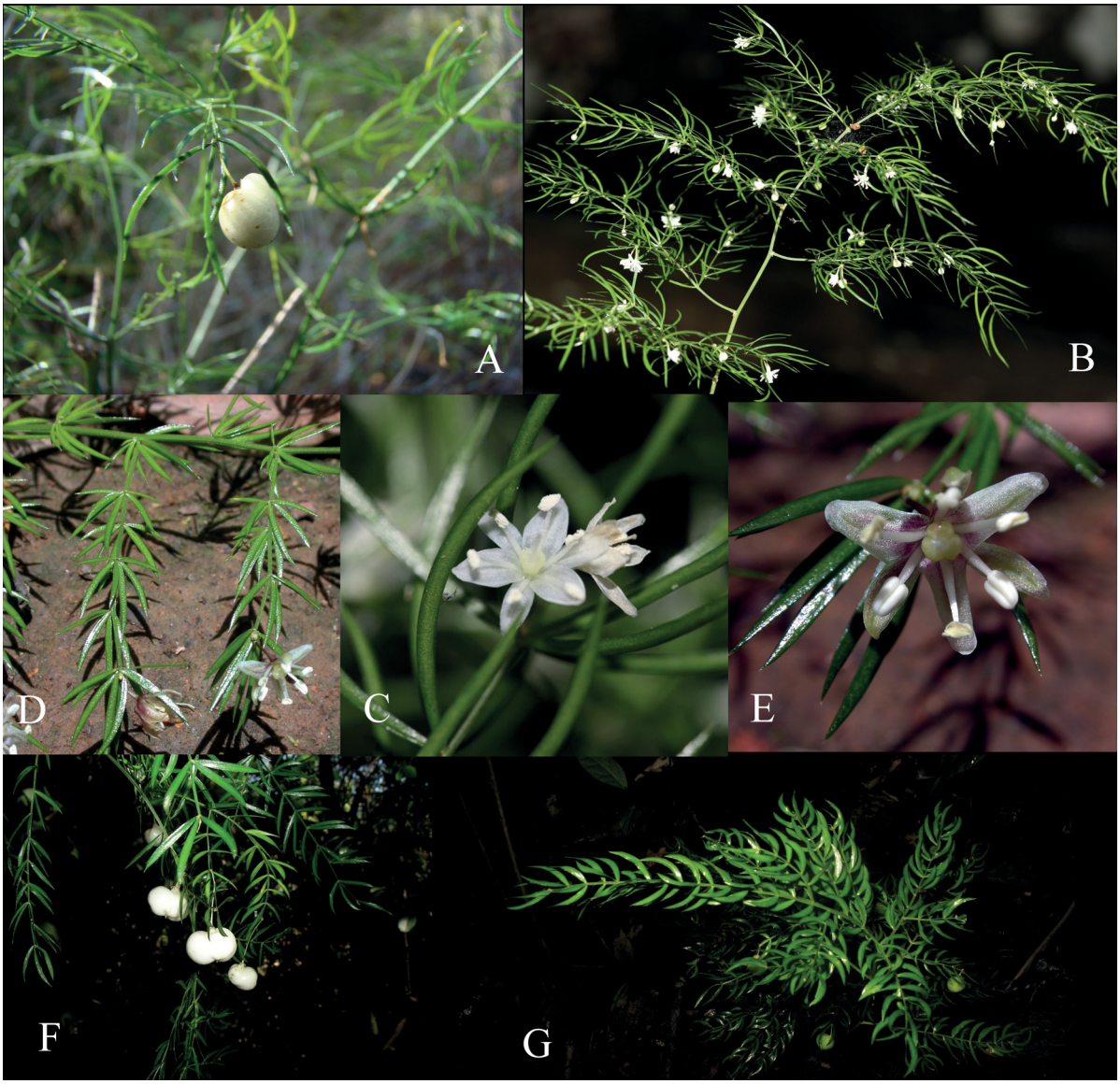

Fig. 20. Photos of *Asparagus simulans* Baker. **A–C**. *A. simulans* var. *simulans*. **A**. Fruit. **B**. Flowered stem. **C**. Flower. — **D–E**. *A. simulans* var. *recticladus* M.Pignal & Phillipson var. nov. **D**. Flowering stem. **E**. Flower. — **F–G**. *A. simulans* var. *falcicladus* M.Pignal & Phillipson var. nov. **F**. Fruit. **G**. Fruiting stem. A = *R. Letsara et al. 884* (image by R. Letsara); B–C = *A. Razanatsima et al. 1782* (image by F. Razanatsima); D–E = *P. Lowry et al. 6268* (image by P.B. Phillipson); F = *S. Buerki et al. 111* (image by S. Buerki); *P. Antilahimena et al. 7658* (image by P. Antilahimena).

W. Lantz s.n.; forêt; terr. argileuse; P [P00493468]! • Nosy Varika, Ambahy; 20°46′ S, 48°29′ E; 23 Mar. 2003; bud, fr; *R. Razakamalala, R. Rabevohitra, T. Rakotomamonjy & Gaspard 377*; forêt littorale de basse altitude; MO [MO-3065530] image!, P [P00995800]!. – **Melaki Region** [Majunga Prov.] • Province de Majunga / Mahajanga, région Melaki, Beanka, partie sud; 18°01′52″ S, 44°28′23″ E; 235 m; 9 Dec. 2012; *L. Gautier, P. Ranirison, R.M. Hanitrarivo & I. Luino 6001*; BR n.v., G n.v., K n.v., MO [MO-3065577] image!, P [P00821361]!, TEF n.v. • Mahajanga, Maintirano, Belitsaka, Ambinda; 18°01′03″ S, 44°28′08″ E; 218 m; 20 Oct. 2009; fr; *R. Letsara, F. Rakotonasolo, T. Andriamihajarivo & R. Razakamalala 884*; CAS n.v., MO [MO-3065555] image!, P [P00722296]!, TAN n.v. • Mahajanga: Melaki Region, Maintirano, Belitsaky, Antsakoabe, ouest du village Anbinda; [18°01′01″ S, 44°27′54″ E]; 291 m; 22 Nov. 2012; bud; *C. Rakotovao, I. Luino & J. Razafimandimby 6364*; P [P02090147]!, TAN n.v. • Province de Majunga / Mahajanga. Région Melaki. Beanka, Ambinda Est; 18°2′59″ S, 44°29′ 22″ E; 244 m; 6 Jun. 2013; st; *J. Ranaivoarisoa 66*; sable blanc; BR n.v., G n.v., K [K002866114, K002866115] image!, MO [MO-3065579] image!, P [P00821362]!, TEF n.v. – **SAVA Region** [Antsiranana Prov.] • Andapa, Anjialavabe, Ankiakabe. Tsaralanto; 14°13′59″ S, 49°23′17″ E; 1084 m; 28 Feb. 2006; ifr; *P. Antilahimena, Randriamandimby, Tianina & Patrio 4590*; MO [MO-3065568] image!, P [P00568782]!, TAN n.v. • Ruisseau d'Andasinanantsomanga Amparihy commune rurale de Matsoandakana; 14°54′29″ S, 49°24′16″ E; 1137 m; 27 Feb. 2008; fr; *R. Bernard, J. Ramiadana & J. Jocelyn 970*; MO [MO-3065726] image!, P n.v., TAN n.v. • Andranomena, Andapa; [14°18′ S, 49°33′ E]; 16 May 1956; fr; *Réserves Naturelles de Madagascar (Christophe) 8053 RN*; P [P00493509]! • Sous-préfecture de Vohemar, localité de Bokindro. forêt de Sorata; 13°39′43″ S, 49°25′48″ E; 1300 m; 15 Feb. 2022; fl, fr; *A.M. Havinga, Iharivolana & R.P. Klein AMH 305*; G n.v., P [P01139376]! • Sambava, Marogaona, Ambohibe, forêt d'Antsaleka Ambohibe, en mi versant; 14°11′03″ S, 49°56′52″ E; 548 m; 9 Dec. 2013; st; *Martial, C.Z. Rakotonirina, G. Be & D. Ravelonarivo 360*; forêt humide sur sol rocheux; MO!, P [P00821351]!, TAN n.v. • Daraina, forêt d'Antsahabe; 13°13′17″ S, 49°33′09″ E; 20 Jan. 2004; fl; *L. Nusbaumer 1060bis*; forêt dense humide sempervirente; blocs grossiers; bord de ruisseau; G n.v., K [K002866144] image!, MO [MO-3065576] image!, P [P00701639]! • Andapa, Ambodivohitra, forêt humide de moyenne altitude de Tsaralanto sur un versant, située à 12 km au sud-ouest de la commune rurale d'Anjialavabe et au Nord d'Anjialavahely; 14°14′12″ S, 49°23′05″ E; 1138 m; 27 Feb. 2006; fr; *C. Rakotovao, J. Ihasotra & J. Rabevazaha 2750*; K [K002866124] image!, MO [MO-3065544]!, P [P00580505]!, TAN n.v. • Andapa, Doany, Anjialavahely, forêt humide de moyenne altitude d'Ankarongameloka, sur une crête; 14°15′51″ S, 49°26′18″ E; 1170 m; Mar. 2006; fr; *C. Rakotovao, Jacky, Mobel & José 2878*; MO n.v., P [P00580506]!, TAN n.v. • Sambava, Bevontro, Tsaratanana, Morafeno, forêt dense humide de moyenne altitude d'Antsahandroboka, située à environ 10 Km au Sud-Ouest du village de Morafeno; 14°10′33″ S, 49°18′38″ E; 907 m; 7 Feb. 2007; fr; *C. Rakotovao, R. Razakamalala, D. Ravelonarivo & José (Ambalamanasy) 3550*; G n.v., MO [MO-3065543] image!, P [P00568752]!, TAN n.v. • Andapa, Doany, Anjialavahely, Antsahabalika situé à 10 Km vol d'oiseau au Nord d'Anjialava; 14°13′55″ S, 49°22′42″ E; 1293 m; 26 Feb. 2006; ifr; *D. Ravelonarivo, Patriode, Mobel & Germain 1655*; MO [MO-3065533] image!, P [P00580508]!, TAN n.v. • A Angotsi [Angotsy Antalaha?]; [15°16′ S, 50°29′ E]; *s.d.*; st; *J.M.C. Richard 19*; P [P00493470]! • Dans les terres humides à l'ombre à Angontsi; [15°16′S, 50°29′E]; before 1837; st; *J.M.C. Richard 47*; P [P00493467]!. – **Sofia Region** [Majunga Prov.] • Sambirano: Massif de Manongarivo; [13°54′ S, 48°15′ E]; 800 m; Apr. 1909; fl; *H. Perrier de la Bâthie 8396*; bois sur grès; P [P00493571]! • Andapa, Doany, forêt galerie sur le mi-versant du mont d'Antsahivo (le long de ruisseau d'Antsahivo), Ambohimirahavavy; 14°14′36″ S, 49°00′44″ E; 1328 m; 28 Nov. 2005; fr; *C. Randrianarivelo, Tsarajery & Torize 422*; K [K002866134] image!, MO [MO-3065537] image!, P [P00580507]!, TAN n.v. • Fokotany Tsaravilona Amparihy Androva, sur le sommet de Volamba et ses alentours; 14°53′30″ S, 49°25′01″ E; 1288 m; 29 Feb. 2008; fr; *D. Ravelonarivo, M. Gerard & N.S. Rasoanaivo 3070*; MO [MO-3065680] image!, P [P00910363]!, TAN n.v. – **Vakinankaratra Region** [Antananarivo Prov.] • Deep rocky gorge on steep grade with remnant native forest, on Route 7, 39 km N of Ambositra; [20°42′ S, 47°09′ E]; 1250–1350 m; 24 Jan. 1975; fr; *T. Croat 29476*; MO [MO-3065561] image!, TAN n.v. – **Vatovavy Region** [Fianarantsoa Prov.] • Mont Vatovavy (Manajary); [21°24′ S, 47°56′ E]; 22 Nov. 1938;

fl; *R. Decary 13695*; P [P00493462]! • Vallée du Sakaleona; [20°34′ S, 48°04′ E]; 13 Jun. 1939; fr; *R. Decary 14257*; P [P00493472]! • Province de Mananjary, zone côtière; [21°13′ S, 48°21′ E]; Mar.–Apr. 1909; fl, fr; *F. Geay 7458*; P [P00493471, P00493473]! • same collection data as for preceding; fl, *F. Geay 7635*; P [P00493464]! • same collection data as for preceding; fl; *F. Geay 7703*; P [P00493463]! • Fivondronana: Mahanoro, Firaisana: Ambodibonara, Fokontany: Ambalavontaka. Forêt d'Antaimby; 16 m; 20°22′21″ S, 48°33′15″ E; 12 Feb. 2004; *D. Rabehevitra, R. Ludovic & Edmond 820*; [MO-3065692] image! TEF n.v. • Fivondronana: Nosy Varika, Firaisana: Ambahy, Fokontany: Ampasimaneva, forêt littorale d'Ambolo; 20°48′59″ S, 48°27′09″ E; 13 m; 16 Jun 2004; bud, fr; *R. Ranaivojaona, R. Razakamalala & Clement 778*; MO [MO-3065539] image!, P [P00455377]!, TEF n.v. • S of Mananjary, area N. of Faraony River estuary; 21°46′53″ S, 48°08′51″ E; 10 m; 17 Dec. 1997; fr; *P. Wilkin, C.B. Foster & L.R. Caddick 943*; white sand; degraded fragment of littoral forest with *Aflezia* as dominant large tree and many climbers including *Flagellaria* and *Smilax*; in deep shade under *Aflezia*; K [K002866111]!, MO [MO-3065582] image!, P [P00493478]!, TAN n.v. – **Without precise locality** • s.d.; fl; *J. Goudot s.n.*; P [P00493474]! • 2 Mar. 1938; fl; *Jardin Botanique Tananarive 3216*; P [P00493550]! • s.d.; fr; *G.F. Scott-Elliot 3064*; BM [BM013822444] image!, P [P00493475]! • s.d.; st; *J.V. Thompson s.n.*; BM [BM013822445] image!.

iNaturalist observations

MADAGASCAR – **Alaotra-Mangoro Region** [Toamasina Prov.] • Analamazoatra; 18°56′31.2″ S, 48°25′16.8″ E; 1 Mar. 2023; st; *Ruairi Hafferty (ruairih)*; iNaturalist 150405936 • Analamazoatra; 18°56′30.4″ S, 48°25′20.9″ E; 1 Mar. 2023; st; *Ruairi Hafferty (ruairih)*; iNaturalist 150405381 • Analamazoatra; 18°56′30.6″ S, 48°25′20.7″ E; 1 Mar. 2023; st; *(callumswift)*; iNaturalist 150655797 • Moramanga; 18°56′25.8″ S, 48°25′01.3″ E; 2 Oct. 2022; st; *(avocat)*; iNaturalist 141134259 • Distrito de Moramanga; 18°56′21.6″ S, 48°25′16.2″ E; 4 Jun. 2022; st; *José Ignacio Márquez Corro (jimarcor)*; iNaturalist 126366546 • Moramanga; 18°56′06.8″ S, 48°24′42.6″ E; 9 Apr. 2024; fr; *Louis Aureglia (louisaureglia)*; iNaturalist 216621729 • Parc Mitsinjo Moramanga; 18°56′16.9″ S, 48°24′52.2″ E; 11 Feb. 2024; fr; *Christian Langner (christian langner)*; iNaturalist 254298856 • 18°48′03.3″ S, 48°25′43.9″ E; 16 Apr. 2016; fl; *(nk03kg)*; iNaturalist 3149410 • Mantadia; 18°49′47.8″ S, 48°25′57.6″ E; 24 Mar. 2025; st; *nomentsoa (nomentsoa)*; iNaturalist 266756299 • Moramanga district; 18°55′58.2″ S, 48°24′47.6″ E; 26 Apr. 2023; fr; *John Sullivan (sullivanribbit)*; iNaturalist 163556991 • Analamazoatra; 18°56′46.3″ S, 48°25′23.4″ E; 26 Feb. 2023; st; *(vononarbgkew)*; iNaturalist 150472609 • 18°55′31.9″ S, 48°25′11.4″ E; 28 Feb. 2015; fr; *Éric Mathieu (marojejy)*; iNaturalist 69853247 • Analamazoatra; 18°56′32.5″ S, 48°25′09.1″ E; 28 Feb. 2023; st; *Mack Laverick (wanderingbotanist)*; iNaturalist 150421919 • 18°56′15.3″ S, 48°24′40.7″ E; 28 Nov. 2016; st; *Michael A. Alcorn (airalcorn2)*; iNaturalist 9445001 • 18°56′48.9″ S, 48°25′07.0″ E; 1 Apr. 2024; fr; *Joe Zito (name_name_name)*; iNaturalist 204942256. – **Analamanga Region** [Antananarivo Prov.] • 18°24′35.2″ S, 47°56′30.7″ E; 1 Feb. 2018; fr; *linah (linah)*; iNaturalist 9738677 • 18°24′37.8″ S, 47°56′37.5″ E; 2 Nov. 2022; fl; *merveille (bmerveille)*; iNaturalist 142047291 • District d'Ankazobe; 18°10′54.0″ S, 47°17′21.7″ E; 24 Mar. 2024; fr; *Louis Aureglia (louisaureglia)*; iNaturalist 215574756 • 18°24′25.3″ S, 47°56′37.5″ E; 29 Apr. 2024; fr; *Len deBeer (lendebeer)*; iNaturalist 211778618 • 18°24′43.6″ S, 47°56′28.4″ E; 31 Jan. 2018; fr; *Steven Bachman (stevenkew)*; iNaturalist 9703028. – **Anosy Region** [Toliara Prov.] • 24°35′18.5″ S, 47°05′06.5″ E; 1 Jan. 2022; st; *Steven Wang (stevenw12339)*; iNaturalist 108688694 • 24°26′05.6″ S, 47°07′16.3″ E; 1 Jan. 2022; st; *Steven Wang (stevenw12339)*; iNaturalist 116588546 • 18°56′36.9″ S, 48°25′12.6″ E; 19 Jun. 2023; st; *Liah Continentino (liah_continentino)*; iNaturalist 169927825. – **Atsinanana Region** [Toamasina Prov.] • Toamasina; 18°56′37.7″ S, 48°25′02.6″ E; 28 Dec. 2023; st; *(molfoto)*; iNaturalist 195093985. – **Haute Matsiatra Region** [Fianarantsoa Prov.] • 21°13′46.5″ S, 47°22′18.4″ E; 6 May 2023; fr; *Mike Tidwell (carbonmike)*; iNaturalist 160048656. – **Sofia Region** [Majunga Prov.] • 14°12′31.5″ S, 48°58′12.4″ E; 14 May 2023; fr; *Fitiavana Rasaminirina (malagasysedges)*; iNaturalist 208242043.

Description

Erect, spineless, multicaule *shrub*, (16–)30–52(–104) cm high; *pseudo-fronds* triangular, phylloclades in alternate fascicles of (2–)3–5(–11), or rarely solitary, internodes (1–)3–4(–11) mm; *phylloclades* falciform, narrow, very curved to moderately curved, (4.1–)8.5–12.9(–26.2) × (0.3–)0.4–0.6(–1.1) mm, shiny; *berries* spherical, irregular, white, 8–10 mm in diam.

Phenology

Asparagus simulans var. *simulans* has been recorded in flower in January, February, June, July, and October to December; fruits have been documented almost throughout the year.

Distribution and ecology

Asparagus simulans var. *simulans* has a disjunct distribution, with one portion located along the eastern coast and another at the northern tip of Madagascar. It occurs in the understorey of humid forests, primarily at mid elevation sites (but not less than 800 m), but can be found up to 1300 m a.s.l. Two additional collections from the Melaki Region along the west coast have tentatively been assigned to this taxon. They display morphological differences compared to the eastern material, notably being more robust and with more sparsely arranged phylloclades, although they have narrow, curved phylloclades that resemble material from the East, albeit somewhat more laxly arranged than in specimens from other areas. These collections may warrant recognition at varietal rank, but further material is required.

Provisional risk of extinction assessment

Asparagus simulans var. *simulans* has a geographic distribution in the form of an EOO of 409 074.0 km² and an AOO of 224 km². It is known from ca 125 occurrences documented by nearly 100 gatherings and 28 verified iNaturalist observations, and can therefore be provisionally assessed as Least Concern [LC] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Asparagus simulans var. ***falcicladus*** M.Pignal & Phillipson var. nov.

urn:lsid:ipni.org:names:77364117-1

Figs 18B, 19C–D, 20F–G; Table 3

Diagnosis

Asparago simulanti Baker var. simulanti similis, sed fasciculis phyllocladiorum axilloribus densioribus (3–5 vs 2–3), phyllocladiis longioribus latioribusque (7.9–)11.8–15.4(–26.2) × (0.7–)1.2–1.6(–2.4) mm vs (4.1–)5.5–12.9(–26.2) × (0.3–)0.5–0.6(–1.1) mm, praecipue differt.

Etymology

The name of the variety refers to the falcate shape of the phylloclades.

Vernacular names and uses

Vernacular names and uses unknown.

Type material

Holotype and isotype

MADAGASCAR – **Analanjirofo Region** [Toamasina Prov.] • Fiv.: Maroantsetra, Comm.: Ambanizana, Fok.: Ambanizana, between Bedinta and Bedinta summit; [15°40′14″ S, 49°58′40″ E]; 628 m; 26 Oct. 2004; fr; *P. Antilahimena 2982*; holotype: P [P00580501]!, isotype: MO [MO-3065714] image!.

Paratypes

MADAGASCAR – **Alaotra-Mangoro Region** [Toamasina Prov.] • Fivondronana: Moramanga, commune: Andasibe, Fokontany: Menalamba. Ambatovy forest; [18°51′08″ S, 48°19′07″ E]; 1099 m; 12 Jan. 2005; ifr, fr; *P. Antilahimena 3097*; MO [MO-3065572] image!, P [P00568795]!, TAN n.v. • Moramanga, Ambatovy, Andasibe, Menalamba, forest on the way Berano village; 18°50′11″ S, 48°19′17″ E; 1130 m; 20 Oct. 2005; fl; *P. Antilahimena, F. Herimandimby & F. Edmond 4039*; forest without crust; K [K002866116] image!, MO [MO-3065569]!, P [P00568793]!, TAN n.v. • Toamasina, département Atsinanana, district Brickaville, Maroseranana, Fokontany Ambodilendemy, Andrangato River; 18°25′58″ S, 48°47′17″ E; 772 m; 19 Mar. 2011; fr; *P. Antilahimena, J. Félix & T. André 7658*; MO [MO-3065564]!, P [P06774053]!, TAN n.v. • District Moramanga, commune Ambohibary, Fokontany Ampitambe, Ambatovy, Biocamp.; 18°52′03″ S, 48°17′47″ E; 1012 m; 24 Nov. 2011; fl, fr; *R. Bernard, B.A. Ratodimanana, R. Rakotondrajaona & F. Randrimitantsoa Jean 1830*, MO [MO-3065711] image!, P [P00821356]!, TAN n.v. • Fanovana; [18°55′ S, 48°32′ E]; 9 Jul. 1942; fl; *R. Decary 17997*; P [P00493529]! • Antsianaka; [17°35′ S, 48°30′ E]; 23 Dec. 1882; fl; *L. Humblot 545*; BM [BM013822446] image!, K [K002866110, K002866122] images!, P [P00493541, P00493542, P00493543, P00493544]! • Perinet, Analamazaotra; [18°57′ S, 48°24′ E]; 10 Nov. 1938; 1000 m; fl; *H.J. Lam & A.D.J. Meeuse 5354*; L n.v., P [P00493559]! • Périnet; [18°56′ S, 48°26′ E]; 3 Jul. 1961; fr; *M. Peltier, J. Peltier & R. Capuron 3234*; P [P00493556]! • Moramanga, Andasibe, Menalamba, 11 km E d'Ampitambe, Ambatovy; 18°50′45″ S, 48°19′22″ E; 960 m; 2005; fr; Forêt dense à dominance d'arbre atteignant 15 à 18 m de haut; *C. Rakotovao & F. Edmond 1867*; Sol sans croûte. MO [MO-3065545] image!, P!, TAN n.v. • Ambatovy; [18°49′ S, 48°18′ E]; 22 Feb. 1965; fl; *M. Peltier & J. Peltier 5170*; P [P00493535]! • Manaka-Androrangabe, Ambatondrazaka; [17°46′ S, 48°39′ E]; 20 Jan. 1960; st; *Réserves Naturelles de Madagascar (Rakotovao) 10596 RN*; P [P00493456]! – **Amoron'i Mania Region** [Fianarantsoa Prov.] • Environs d'Ambositra, à Faliarivo; [20°39′ S, 47°7′ E]; 1600 m; Mar. 1934; st; *H. Humbert 14490 bis*; P [P00493532]!. – **Analamanga Region** [Antananarivo Prov.] • Tampoketsa, au nord d'Ankazobe; [18°5′ S, 47°20′ E]; 900–1600 m; Jul. 1928; fr; *H. Humbert & C.F. Swingle 4479*; P [P00493495]! • La Mandraka; [18°55′ S, 47°55′ E]; Aug. 1918; fr; *G. Waterlot s.n.*; P [P00493487 individual on right]!. – **Analanjirofo Region** [Toamasina Prov.] • Befandriana Nord, Antsakabary, Andapanomby, près de la rivière Ampandisanana, Makira Nord-Ouest; 15°21′48″ S, 49°07′06″ E; 1040 m; 27 Apr. 2007; fr; *R. Bernard 471*; MO [MO-3065710] image!, P [P02056307]!, TAN n.v. • Province Diégo-Suarez/Antsiranana, sous-préfecture de Vohémar, commune rurale de Daraina, Daraina, forêt d'Antsahabe; 13°13′ S, 49°33′ E; 520 m; 15 Jan. 2004; fl; *L. Nusbaumer 973*; forêt dense humide sempervirente; G n.v., P [P00701637]! • Ibanda; [16°20′ S, 49°45′ E]; fr; 18 Feb. 1970; *F. Raharimalala 394*; sous-bois; P [P00493533]! • Andronobe, Masoala Peninsula, 0–3 km E from coast; 15°39′30″ S, 49°57′30″ E; 600 m; Jun.–Aug. 1993; fr; *M. Zjhra & J. Hutcheon 360*; K [K002866143] image!, MO [MO-798485] image!, P [P00493477]!, TAN n.v. – **Anosy Region** [Toliara Prov.] • District: Fort-Dauphin, commune : Iaboakoho, village le plus proche: Enakôny, rivière la plus proche: Andranomaizina, sommet d'Analamahavondraky, forêt de basse altitude de Tsitongambarika; 24°34′38″ S, 47°07′08″ E; 392 m; 14 Nov. 2018; fl; *T. Andriamihajarivo & F. Rakotoarivony 2263*; MO n.v., P [P01104276]!, TAN n.v. • Fort Dauphin, Manantenina, Tanitsara, forêt de Rianabo; 24°28′16″ S, 47°11′08″ E; 173 m; 6 Dec. 2017; fl; *T. Randrianarivony, T. Andriamihajarivo, N.H. Rakotoarivelo & F. Rakotoarivony 838*; forêt dense humide; K [K001939531] image!, MO n.v., P [P00944582]!, TAN n.v. – **Atsinanana Region** [Toamasina Prov.] • RNI, canton Ambodiriana, district Tamatave, sommet; [17°57′ S, 49°11′ E]; 24 Jun. 1953; fl, fr; *Réserves Naturelles (Rakotoniaina) 5360*; P [P00493510]! • Fivondronana: Brickaville, Firaisana: Andranonkoditra, Fokontany: Ankanin'ny nofy. Forêt de Vohibola; 18°33′56″ S, 49°15′24″ E; 8 m; 4 Aug. 2003; fr; D. *Rabehevitra, R. Razakamalala & Jean Paul 369*; MO [MO-3065548] image!, TEF n.v. – **Bongolava Region** [Antananarivo Prov.] • 15.4 km NW of Ambohitsaratelo-Bebao (NW of Tsiroanomandidy); [18°18′ S, 45°30′ E]; 1100–1200 m; 12 Jan. 1985; fr; *L.J. Dorr et al. 3497*; forest; MO [MO-3065556] image!, P [P00493536]!, TAN n.v. – **DIANA Region** [Antsiranana Prov.] • Montagne d'Ambre PN; 12°32′ S, 49°07′ E; 800–100 m; 19–27 Apr. 1993; fr; *O. Andrianantoanina & A. Solotiana 59*; K [K002866142]image!, MO [MO-798486]

image!, P [P00493512]!, TAN n.v. • ca 35 km SW of Antsiranana, Parc National Montagne d'Ambre, near Joffreville, North of Grand Cascade, Forêt d'Ambre; [12°29′ S, 49°10′ E]; 600–750 m; 17–22 Feb. 1992; fr; *S.T. Malcomber & S. Rapanarivo 1260*; MO [MO-3065559]!, P [P00493521]!, TAN n.v. – **Itasy Region** [Antananarivo Prov.] • Mandoto (Vakinankaratra); [19°34′ S, 46°17′ E]; 6 Dec. 1939; fl; *R. Decary 15244*; P [P00493527]!. – **Melaki Region** [Majunga Prov.] • Tsiandro, Tsingy de Bemaraha (9éme Réserve); [18°43′ S, 44°55′ E]; 400–600 m; Feb. 1933; st; *J. Léandri 854*; P [P00493538]! • Forêts de l'Antsingy, vers Bevary (E. d'Antsalova), restes de forêt vers Tsiandro; [18°43′ S, 44°55′ E]; 400–600 m; 1960; fr; *J. Léandri & P. Saboureau 2861*; P [P00493537]!. – **SAVA Region** [Antsiranana Prov.] • Parc National Masoala, à 21 km du village de Sahamalaza sur la route de Vakoanina. Vinanivao, Antalaha; 15°48′ S, 50°18′ E; 0–113 m; 15–16 Feb. 1996; fr; *J. Aridy & Moïse 143*; forêt dense humide sempervirente; MO [MO-3065563] image!, P [P00493522]!, TAN n.v. • Entre Vohémar et Ambilobe Phénologie; [13°03′30″ S, 49°33′30″ E]; 29 Jul. 1939; fl, fr; *R. Decary 14713*; P [P00493526]! • Province Diégo-Suarez/Antsiranana, sous-préfecture de Vohémar, commune rurale de Daraina, Daraina, forêt de Binara; 13°13′ S, 49°33′ E; 750 m; 22 Dec. 2003; fl; *L. Nusbaumer 890*; forêt dense humide sempervirente; blocs grossiers et forte pente; G n.v., P [P00701638]! • Province de Diego-Suarez/Antsiranana, sous-préfecture de Vohémar, localité de Amboriala, forêt de Sorata; 13°44′47″ S, 49°24′12″ E; 1220 m; 14 Dec. 2021; fl, fr; *L. Nusbaumer, P. Ranirison, A. Havinga & Iarivolana 5170*; G n.v., P [P01139375]! • Province de Diego-Suarez/Antsiranana, sous-préfecture de Vohémar, commune rurale de Daraina, Daraina, forêt d'Antsahabe, à 1270 m du point coté 938, au 303; [13°13′ S, 49°33′ E]; 685 m; 4 May 2004; fr; *P. Ranirison 810*; G n.v., P [P01809920]!. • Andapa, Doany, Betsomanga, environ à 11.2 km à vol d'oiseau au sud-est (14) de Doany et à 7.5 km à vol d'oiseau au nord-est (14) d'Ambalamanasy II, entre la rivière d'Ampandrana et Betsomanga, au nord de Marojejy; 14°27′ S, 49°34′ E; 920–1040 m; 15–29 May 1995; fr; *F. Rasoavimbahoaka 716*; MO [MO-3065535] image!, TAN n.v. – **Sofia Region** [Majanga Prov.] • Forêt de crête au Nord du campement Bemafo; 14°13′29″ S, 49°03′38″ E; 1765 m; 27 Oct. 2005; fr; *S. Buerki, C. Rakotovao & M. Callmander 111*; G n.v., K [K002866135] image!, MO [MO-3065562]!, P [P00580503]!, TAN n.v. • Ankaizinana; [14°30′ S, 48°55′ E]; 19 Apr. 1923; fr; *R. Decary 7872*; forêt; P [P00493507]!. – **Vakinankaratra Region** [Antananarivo Prov.] • 52 km E of Ambatofinandrahana on RN 35. Dense mixed forest with clearings, near waterfall; 20°39′40″ S, 47°07′40″ E; 1440 m; 15 Mar. 1992; fl, fr; *R.A. Clement, P.B. Phillipson & G. Rafamantanantsoa 2049*; in shady forest near clearing; E n.v., MO, TAN n.v. – **Without precise locality** • s.d.; st; *J.V. Thompson s.n.*; BM [BM013822449] image!.

iNaturalist observations

MADAGASCAR – **Alaotra-Mangoro Region** [Toamasina Prov.] • 18°51′11.2″ S 48°25′51.0″ E; 16 Apr. 2016; fr; *Eugenia Barnett (eugeniabarnett)*; iNaturalist 2963964 • Moramanga; 18°53′27.4″ S, 48°26′02.3″ E; 16 Apr. 2024; fr; *Louis Aureglia (louisaureglia)*; iNaturalist 218227084 • 18°56′39.2″ S, 48°25′00.3″ E; 17 Apr. 2016; st; *Eugenia Barnett (eugeniabarnett)*; iNaturalist 2963986 • 19°00′41.5″ S, 48°27′31.7″ E; 17 Jun. 2023; fr; *David Rabehevitra (davidrabehevitra)*; iNaturalist 167975648 • 19°00′40.4″ S, 48°27′33.0″ E; 18 Jun. 2023; fr; *(nomentsoa)*; iNaturalist 172638373. – **Analamanga Region** [Antananarivo Prov.] • Ambohitantely; 18°10′ S, 47°17′ E; 2 Mar. 2016; fr; *franck (Franck Rakotonasolo)*; iNaturalist 2768026. – **Atsimo-Atsinanana Region** [Fianarantsoa Prov.] • Marolambo; 20°09′54.9″ S, 48°09′18.4″ E; 18 Nov. 2023; fl; *Len deBeer (lendebeer)*; iNaturalist 191837920. – **DIANA Region** [Antsiranana Prov.] • Antsiranana II; 12°29′42.7″ S, 49°11′01.5″ E; 7 Jan. 2014; fr; *Rantotiana (rantotiana)*; iNaturalist 264115901.

Description

Erect shrub or slightly climbing *vines* (25–)37–79(–139) cm high, spineless; *pseudo-frond* triangular; *phylloclades* in alternate fascicles of (2–)3–3(–7), or rarely solitary, ultimate stems with internodes (2.2–)4.2–6.1(–12.3) mm long, *phylloclades* falciform, only slightly curved, with the exception of the

terminal ones, which are slightly curved, (7.9–)11.8–15.4(–26.2) × (0.7–)1.2–1.6(–2.4) mm; *berry* spherical, white, 5 mm diam. (on dry specimens); *seed* 1 per locule.

Phenology

Flowering material of *Asparagus simulans* var. *falcicladus* var. nov. has been documented from October to July, and fruits have been recorded from October to August.

Distribution and ecology

Asparagus simulans var. *falcicladus* var. nov. occurs in the far north-northeast of Madagascar and on the central high plateau. It occurs predominantly in forested habitats at mid to high elevations (800–1700 m).

Provisional risk of extinction assessment

Asparagus simulans var. *falcicladus* var. nov. has a geographic distribution in the form of an EOO of 284 338.2 km² and an AOO of 132 km². It is known from ca 60 occurrences documented by 54 gatherings and eight verified iNaturalist observations, and can therefore be provisionally assessed as Least Concern [LC] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Remarks

Many specimens show intermediate characteristics between *Asparagus simulans* var. *falcicladus* var. nov. and *A. simulans* var. *recticladus* var. nov. (described below). Typical material of the latter is rather taller, sometimes lianascent, and has straighter phylloclades, whereas *A. simulans* var. *falcicladus* is generally smaller, always takes the form of an upright herb or a shrub, and has curved, wider, overlapping phylloclades.

Asparagus simulans var. ***recticladus*** M.Pignal & Phillipson var. nov.
urn:lsid:ipni.org:names:77364118-1
Figs 18C, 19E, 20D–E; Table 3

Diagnosis

Asparago simulanti Baker var. simulanti similis, sed phyllocladiis fere rectis (vs fortiter arcuata), latioribusque, (0.5–)0.8–1.0(–1.5) mm vs (0.3–)0.4–0.6(–1.2) mm, praecipue differt.

Etymology

The name of the variety refers to the nearly straight shape of the phylloclades.

Vernacular names and uses

Vernacular names and uses unknown.

Type material

Holotype and isotypes

MADAGASCAR – **Analamanga Region** [Antananarivo Prov.] • Antananarivo: Analamanga, Ankazobe, Kiangara; [17°57′33″ S, 47°07′33″ E]; 1479 m; 14 Apr. 2007; fr; *R. Razakamalala, C. Randrianarivelo, N.H. Rakotoarivelo & C. Miadana 3349*; holotype: P [P01030845]!; isotypes: MO [MO-3065529] image!, TAN n.v.

Paratypes

MADAGASCAR – **Alaotra-Mangoro Region** [Toamasina Prov.] • Analamazaotra; [18°57′ S, 48°24′ E]; st; *C. d'Alleizette 682*; P [P00493566]! • Moramanga, Ambatovy, Andasibe, Menalamba, Analamay forest.

Without crust; 18°47′46″ S, 48°20′26″ E; 1058 m; 11 Oct. 2005; fr; *P. Antilahimena, J. Razanatsoa, F. Edmond & R. Razafindasy 3944*; MO [MO-3065570] image!, TAN n.v. • Moramanga, Andasibe, Berano. Ambatovy forest; [18°48′34″ S, 48°19′21″ E]; 1083 m; 17 Feb. 2005; fr; *P. Antilahimena, C. Rakotovao, Félix & Félix (guide) 3399*; MO [MO-3065571] image!, P [P00568797]!, TAN n.v. • Moramanga, commune Ambohibary, Fokontany Ampitambe. Vavanaomby forest, without crust; 18°51′08″ S, 48°17′25″ E; 1024 m; 11 Feb. 2007; fr; *P. Antalahimena, F. Edmond & Tojoniaina 5259*; MO [MO-3065567] image!, P [P06774057]!, TAN n.v. • Toamasina, Alaotra-Mangoro, Moramanga, commune Ambohibary, Fokontany Ampitambe. Vavanaomby forest; [18°51′31″ S, 48°17′03″ E]; 1015 m; 25 Feb. 2007; fr; *P. Antilahimena & F. Edmond 5441*; MO [MO-3065566] image!, P [P06774058]!, TAN n.v. • Ankaroka (ANK.-36). District d'Ambatondrazaka; [17°48′ S, 48°32′ E]; 14 Jan. 1938; fl, fr; *G. Cours 61*; P [P00493458]! • Faritra Alaotra Mangoro, Fivondronana Moramanga, firaisana Ambohibary, fokontany Ampitabe, Ambatovy, forêt d'Ambatovy (Base Camp) sur cuirasse, zone de défrichement 6; 18°51′01″ S, 48°18′30″ E; 1119 m; 6 May 2008; fr; *P. Antilahimena, S. Rakotonandrasana, S. Rabearivanona & M. Ratojoniaina 6146*; MO [MO-3065713]!, P [P00918445]!, TAN n.v. • Moramanga, Andasibe, Faliriana, Riana-Tsaravoniana, Corridor Forestier Analamay Mantadia; 18°45′54″ S, 48°25′40″ E; 954 m; 22 Apr. 2012; fl, fr; *P. Antilahimena & V. Razafindrahaja 8283*; forest along the river Ihofa; sandy soil; MO [MO-3065565] image!, P [P01069712]!, TAN n.v. • Environs de Perinet; [18°56′ S, 48°26′ E]; 13 Sep. 1966; fl; *P. Boiteau 156*; [P00493561]! • Forêt au nord de la route de Nickelville sur les bords de l'Ankotreana; [17°48′ S, 48°36′ E]; 850 m; 29 Dec. 1944; fr; *G. Cours 2108*; P [P00493459]! • Sud de Moramanga; [18°56′ S, 48°13′ E]; 8 Feb. 1930; fr; *R. Decary 6931*; P [P00493549]! • same collection data as for preceding; 9 Feb. 1930; fr; *R. Decary 7033*; BM [BM013822443] image!, P [P00493547]! • Forêt de Sandrangato, au Sud de Moramanga; [19°6′ S, 48°14′ E]; 3 Jun. 1942; fl, fr; *R. Decary 17747*; P [P00493548]! • Sandrangato; [19°06′ S, 48°14′ E]; 1000 m; Dec. 1954; fr; *B. Descoings 130*; MO [MO-3065741] image!, TAN n.v. • Forêt d'Analamazaotra (Perinet); [18°57′ S, 48°24′ E]; 5 Nov. 1970; fl, ifr, fr; *M. Keraudren-Aymonin et G.G. Aymonin 25393*; P [P00493567, P00493568]! • Analamazaotra; [18°57′ S, 48°24′ E]; Dec. 1932; fl; *J. Léandri 725*; P [P00493553, P00493554]! • Along road to Lakato, ca 13 km S of RN2; 19°01′29″ S, 48°21′34″ E; 1060 m; 12 Nov. 2003; fl, fr; *P.P. Lowry II, P.B. Phillipson, G.E. Schatz, C. Hong Wa & H.H. Schmidt 6268*; edge of partially disturbed forest along roadside; K [K002866133]!, MO [MO-2828350] image!, P [P00493539]!, TAN n.v. • Ambatovy, NE of Moramanga, azonal forest E of Dynatec offices; 18°51′33″ S, 48°19′21″ E; 1120 m; 12 Apr. 2006; fr; *P.P. Lowry II 6791*; ultramafic substrate; MO [MO-3065705]!, P [P06233537]!, TAN n.v. • Forêt d'Analamazaotra; [18°57′ S, 48°24′ E]; 800 m; s.d.; fl; *H. Perrier de la Bâthie 8386*; P [P00493564, P00493565]! • same collection data as for preceding; fl, fr; *H. Perrier de la Bâthie 8387*; P [P00493562, P00493563]! • Analamazaotra; [18°56′ S, 48°26′ E]; Feb. 1912; fr; *H. Perrier de la Bâthie 8388*; bois; P [P00493506]! • Andasibe (Perinet), forest N.E. of Graphite Mine; 18°53′ S, 48°28′ E; 1000 m; 23 Jul. 1987; fr; *P.B. Phillipson 2098*; K [K002866138]!, MO [MO-3065558]!, P [P00493558]!, TAN n.v. • Forêt d'Analamazaotra, Périnet; [18°57′ S, 48°24′ E]; 1 Oct. 1922; fr; *H. Poisson 588*; P [P00493551]! • District: Moramanga, commune: Ambohibary, Fokontany: Ampitambe. Ambatovy, NE de Moramanga, environ 22 km de Moramanga; 18°50′52″ S, 48°17′22″ E; 1041 m; 23 Feb. 2005; fr; *C. Rakotovao, F. Edmond, R. Razafindasy, P. Antilahimena & M. Razanatsoa 1328*; forêt sur sol non cuirasse; MO [MO-3065546] image!, [P00568794]!, TAN n.v. • Moramanga District, Andasibe, PK 12 from faliarana, 18 km N from Andasibe; 18°48′49″ S, 48°25′48″ E; 957 m; 12 Nov. 2004; fl; *H. Ranarivelo & R. Ranaivolaona 394*; Humid forest; CAS n.v., MO [MO-3065732] image! • Analamay, Ambatovy, Fokontany Ampitabe, Firaisana Ambohibary, Fivondronana Moramanga; 18°50′49″ S, 48°18′29″ E; 1130 m; 10 Feb. 2005; st; *H. Razafindraibe & P. Antilahimena 81*; forêt dense humide de moyenne altitude; MO [MO-3065532] image!, P [P00568772]!, TAN n.v. • Toamasina, Vohibe, Antsinanana, Vatomandry, Ambalabe, Ambinanindrano II, direction au bord de la rivière Zanaky Salampona; [19°08′19″ S, 48°33′19″ E]; 986 m; 12 Apr. 2008; ifr; *A. Razanatsima & Célestin 608*; MO [MO-3065528] image!, P [P00568748]!, TAN n.v. • Moramanga, Ambohibary, Ampahitra, forêt de Ranomena; 19°11′50″ S, 48°09′36″ E; 1011 m; 18 Sep. 2012; fl, fr; *R. Razakamalala & R. Randrianaivo 7175*; MO image!, P [P00821363]!, TAN n.v.

• Manaka-E. Mahitsihazo, district Ambatondrazaka; [17°46′ S, 48°39′ E]; 26 Jan. 1960; fl; *Réserves Naturelles (Rakotovao) 10650 RN*; P [P00493455]! • Manaka-Est [Manakambahiny-Est], district Ambatondrazaka; [17°46′ S, 48°39′ E]; 14 Apr. 1961; fr; *Réserves Naturelles (Rakotovao) 11824 RN*; P [P00493453]! • Manakambahiny-Est, district Ambatondrazaka; [17°46′ S, 48°39′ E]; 24 Mar. 1962; fl; *Réserves Naturelles (Rakotovao) 12040 RN*; P [P00493454]! • Andranomandry, canton et district de Moramanga; [19°3′ S, 48°12′ E]; 900 m; 18 Aug. 1968; fr; *Service Forestier 26794*; P [P00493569]! • Bords de la Sahampanjana, près Betrafo; [18°52′ S, 48°8′ E]; 3 Nov. 1915; fr; *H.L. Ungemach 49*; ravins humides; P [P00493560]! • Near Andasibe, forest of Mantadia, beyond the graphite mine; [18°55′ S, 48°25′ E]; 900 m; 5 Nov. 1994; fl; *H. van der Werff, G. McPherson & S. Rapanarivo 13676*; evergreen forest; MO [MO-3065525] image!, P [P00568753]!, TAN n.v. • Province d'Andovoranto, district de Moramanga, forêt d'Analamazaotra; [18°57′ S, 48°24′ E]; 19 Oct. 1912; fl, fr; *R. Viguier et H. Humbert 816*; K [K002866112] image!, P [P00493545, P00493546]! • Ambatovy, Vatovy; 18°50′55″ S, 48°18′33″ E ; 1126 m; 12 Oct. 20025; fr; *J. Razanatsoa & R. Razafindasy 55*; Forêt sur cuirasse.; MO [MO-3065531] image! • 6 km north of the bridge over the Mangoro River on National Route 2, 16.6 km west of Moramanga; 18°51′ S, 48°05′ E; 860–880 m; 12 Dec. 2006; fl, fr; *G.A. Wahlert & F. Rakotonasolo 59*; remnant humid forest surrounded by *Eucalyptus* plantations; MO [MO-3065738] image!, P [P00910368]!. – **Amoron'i Mania Region** [Fianarantsoa Prov.] • Ambatofinandrahana, Antsirakambiaty, forêt galerie à environ 4 km de la RN35 en allant vers le Nord sur la piste vers Antanimenaha; 20°34′38″ S, 46°33′33″ E; 1441 m; 25 Apr.; 2012; fr; *B. Andrianaivoravelona, S. Ravaoarisoa, M.J. Lazasoa & Andriamampionona 554*; forêt galerie; BR n.v., K [K000751595] image!, MO [MO-3047472] image!, P [P00995867]!, TAN n.v. • Environs d'Ambatofinandrahana; [20°33′ S, 46°48′ E]; 1600–1800 m; 21 Feb. 1938; fl; *R. Decary 13150*; P [P00493525]! • Fianarantsoa, Ambatofinandrahana, Itremo, Antsirakambiaty; 20°34′57″ S, 46°33′27″ E; 18 May 2005; old inflorescence, fr; *F. Rakotonasolo, M. Rakotoarinivo RNF 1018*; evergreen gallery forest; K n.v., P [P00995866]!, TAN n.v. • Ambositra, rivière de Fatihita; 20°23′20″ S, 47°09′24″ E; 1173 m; 25 Jan. 2015; fr; *N. Manjato, R. Razakamalala & J. Razafimandimby 635*; MO [MO-3065553] image!, P [P00821358]!, TAN n.v. – **Analamanga Region** [Antananarivo Prov.] • Mandraka; [18°55′ S, 47°55′ E]; Aug. 1906; st; *C. d'Alleizette 99*; [P00493570]! • Ambohitantely, ad occidentem Tananarive, NNE Ankazobe, nemora montana residua; [18°14′ S, 47°20′ E]; 1500–1550 m; 29 Oct. 1967; fl; *L. Bernardi 11116*; G n.v., K [K002866139] image!, P [P00493491]! • Station forestière d'Angavokely; [18°55′ S, 47°44′ E]; 1500–1550 m; 16 Sep. 1968; fl, ifr, fr; *P. Boiteau 1098*; en sous-bois dans la sylve à lichens; P [P00493492]! • Imerina; 1881; fl; *W.D. Cowan s.n.*; BM [BM013822459, BM001234485] image!, P [P00493479, P00493504]! • Forêt d'Ambohitantely, au nord d'Ankazobe; [18°14′ S, 47°20′ E]; 12 Mar. 1930; fl; *R. Decary 7465*; endroits secs; P [P00493500]! • Tampoketsa d'Ankazobe; [18°15′ S, 47°20′ E]; 12 Mar. 1930; fl, fr; *R. Decary 19354*; débris de forêt; P [P00493501]! • Tampoketsa, au nord d'Ankazobe; [18°5′ S, 47°20′ E]; 900–1600 m; Jun. 1928; fr; *H. Humbert & C.F. Swingle 4479*; P [P00493496]! • Tampoketsa, au nord d'Ankazobe (centre), forêt d'Ambohitantely et restes de forêts aux alentours; [18°5′ S, 47°20′ E]; 1600 m; Oct. 1933; fr; *H. Humbert 11122 bis*; P [P00493494]! • Ankazobe, Talata-Angavo, Ankafobe, fragment de forêt d'Ankafobe, forêt dense humide de moyenne altitude sur latérite, à PK 132 de la RN4, à 3 km sud d'Andranofeno sud; 18°08′11″ S, 47°11′12″ E; 1509 m; 23 Feb. 2005; st; *A. Lehavana, J.J. Rasolofonirina & C. Birkinshaw 259*; MO [MO-3065706] image!, P [P06836771]!, TAN n.v. • High Plateau, 16 km NNE Anjozorobe, montane forest on southern slopes of Mt. Tsimanahirivotra (local name for locality = Ankandrinosy); 18°17′29″ S, 47°55′34″ E; 1395 m; 24 Aug. 1993; fr; *B.A. Lewis, S.T. Malcomber & S. Rapanarivo 562*; MO [MO-3065557] image!, P [P00493505]!, TAN n.v. • Centre: Manakazo, au NE d'Ankazobe; [18°09′ S, 47°14′ E]; Nov. 1913; 1500 m; fl, ifr, fr; H. Perrier de la Bâthie 8390; P [P00493499]! • Manankazo, au NE d'Ankazobe; [18°09′ S, 47°14′ E]; 1500 m; Nov. 1913; fl; *H. Perrier de la Bâthie 8391*; P [P00493540]! • Analabe, au nord de Tananarive; [18°32′ S, 47°52′ E]; 1500 m; Feb. 1928; fl; *H. Perrier de la Bâthie 18435*; P [P00493493]! • Antananarivo, Ankazobe, Manerinerina, fragment forestier sur laterite, 5 km au Nord Est du village Manerinerina; 17°57′31″ S, 47°07′35″ E; 1470 m; 19 Nov. 2006; fl; *R. Ranaivojaona et al. 1635*; MO [MO-3065685] image!, P [P00995955]!, TAN n.v. • Manakazo, canton Maridaza, district: Ankazobe; [18°9′ S, 47°14′ E]; 23 Dec.

1947; fl; *Réserves Naturelles (Harizo) 1201 RN*; P [P00493497, P00493498]!. – **Atsinanana Region** [Toamasina Prov.] • Fivondronana: Mahanoro, Firaisana: Ambodibonara, Fokontany: Ambalavontaka, forêt littorale d'Antaimby; 20°22′22″ S, 48°33′16″ E; 10 m; 16 Apr. 2004; fl; *R. Razakamalala 1104*; MO [MO-3065671] image!, P [P00568751]!, TEF n.v. – **Haute Matsiatra Region** [Fianarantsoa Prov.] • Ialatsara, district d'Ambohimahasoa; [21°4′ S, 47°12′ E]; 7 Feb. 1942; fl; *R. Decary 17484*; P [P00493531]! • Ialatsara, district d'Ambohimahasoa; [21°4′ S, 47°12′ E]; 2 Jul. 1942; fl; *R. Decary 17497*; P [P00493530]! • Süd-Betsiléo, Wald von Ankafina; [21°12′ S, 47°15′ E]; Mar. 1881; st; *J.M. Hildebrandt 3974d*; BM [BM013822447] image! • Iarintsena, Tananomby, Inselberg Ambalalova; 21°50′09″ S, 46°50′14″ E; Formations au sommet de l'Inselberg; 1195 m; 15 Mar. 2010; st; *N.H. Rakotoarivelo, M. Rabarimanarivo, F.A. Rajaonary, N. Ravalimanarivo, J. Andriantiana & A. Raonizafitionimalaza 264*; MO [MO-3065602] image!, [P06836619]!, TAN n.v. – **Melaki Region** [Majunga Prov.] • Maintirano, Belitsaky, Antsakoabe, Ouest du village Ambinda, forêt dense sèche décidue sur sable blanc dans la région de Beanka; 18°01′01″ S, 44°27′54″ E; 291 m; 23 Nov. 2012; bud; *C. Rakotovao, I. Luino & J. Razafimandimby 6364*; P [P02090147]!, TAN n.v. – **Vakinankaratra Region** [Antananarivo Prov.] • Ramartina [Anjoma-Ramartina], district de Betafo; [19°38′ S, 45°57′ E]; 8 Nov. 1940; fl; *R. Decary 15479*; ravin humide; P [P00493528]!. – **Without precise locality** • s.d.; fl; *P. Campenon s.n.*; P [P00493502, P00493503]! • s.d.; *R. Baron 220*; K [K000190028] image!, P [P00493524]!

iNaturalist observations

MADAGASCAR – **Alaotra-Mangoro Region** [Toamasina Prov.] • Distrito de Moramanga; 18°56′12.1″ S, 48°25′09.2″ E; 1 Jul. 2022; st; *José Ignacio Márquez Corro (jimarcor)*; iNaturalist 125959512 • Analamazoatra; 18°56′25.8″ S, 48°25′02.2″ E; 7 Jul. 2022; fr; *(rafia01)*; iNaturalist 125160319 • 18°55′57.7″ S, 48°24′49.3″ E; 10 Sep. 2015; fr; *Guy Eric Onjalalaina (onjalalaina)*; iNaturalist 1932588 • Analamazoatra Reserve; 18°56′06.0″ S, 48°25′25.6″ E; 10 Sep. 2015; st; *(fidymbg)*; iNaturalist 1957351 • Parc Mitsinjo Moramanga; 18°56′16.9″ S, 48°24′52.2″ E; 11 Feb. 2024; fl; *Christian Langner (christianlangner)*; iNaturalist 254210985 • 18°56′04.8″ S, 48°25′01.2″ E; 17 Apr. 2016; fr; *rjhills (rjhills)*; iNaturalist 2990445 • Moramanga District; 18°45′16.4″ S, 48°24′31.4″ E; 17 Jun. 2021; fr; *Andrianiaina Angelo (angelomg)*; iNaturalist 100760249 • 19°00′37.2″ S, 48°26′18.0″ E; 20 Jan. 2016; fl; *Landy Rita (landyrita1)*; iNaturalist 2606549 • 19°01′19.3″ S, 48°12′16.4″ E; 21 Sep. 2023; fr; *Franck Rakotonasolo (Franck)*; iNaturalist 189445866 • 18°55′57.9″ S, 48°24′48.4″ E; 23 Feb. 2023; fl; *David Rabehevitra (davidrabehevitra)*; iNaturalist 149697474 • 18°56′09.6″ S, 48°24′48.8″ E; 25 Feb. 2018; fl; *Rahaingoson Fabien (fabienrahaingo)*; iNaturalist 10028603 • 18°56′09.5″ S, 48°24′47.1″ E; 25 feb. 2018; fl; *(kirst)*; iNaturalist 10053784 • Moramanga; 18°55′57.8″ S, 48°24′48.3″ E; 27 Jun. 2022; fr; *José Ignacio Márquez Corro (jimarcor)*; iNaturalist 125158727 • Distrito de Moramanga; 18°49′35.6″ S, 48°26′11.6″ E; 29 Jun. 2022; st; *José Ignacio Márquez Corro (jimarcor)*; iNaturalist 125793084 • Парк ВОИММА (Park VOIMMA), Andasibe; 18°55′34.0″ S, 48°25′00.5″ E; 30 Apr. 2024; fr; *Светлана Царахова (svetlanakhanty)*; iNaturalist 218601195 • Moramanga; 18°57′56.8″ S, 48°27′54.8″ E; 30 May 2024; fr; *Brendan O'Loughlin (brenainn)*; iNaturalist 234078480 • Moramanga; 18°55′56.9″ S, 48°24′46.7″ E; 6 Jul. 2024; fr; *David Rabehevitra (david rabehevitra)*; iNaturalist 228008016 • Moramanga; 18°55′58.5″ S, 48°24′47.9″ E; 6 Jul. 2024; fr; *David Rabehevitra (davidrabehevitra)*; iNaturalist 228008026 • Moramanga; 18°55′55.1″ S, 48°24′48.3″ E; 6 Jul. 2024; fr; *David Rabehevitra (davidrabehevitra)*; iNaturalist 228008046 • Andasibe; 18°47′40.9″ S, 48°25′36.3″ E; 9 Oct. 2023; st; *Daniel Austin (danielaustin)*; iNaturalist 186988612. – **Analamanga Region** [Antananarivo Prov.] • 18°24′50.4″ S, 47°56′31.1″ E; 2 Feb. 2018; fr; *Mamy Tiana Rajaonah (mamytiana)*; iNaturalist 9750923 • 18°24′42.8″ S, 47°56′29.0″ E; 2 Feb. 2018; fr; *Solofo Eric Rakotoarisoa (esrakotoarisoa)*; iNaturalist 9750966 • Anjozorobe; 18°24′29.6″ S, 47°56′29.4″ E; 1 Jun. 2024; fr; *Len deBeer (lendebeer)*; iNaturalist 220043416 • Andranofeno; 18°03′41.3″ S, 47°11′06.0″ E; 13 Jan. 2016; fl; *Fetra Randriatsara (Fetra)*; iNaturalist 2591449 • 18°24′50.7″ S, 47°56′30.8″ E; 15 Oct. 2011; fl; *Len deBeer (lendebeer)*; iNaturalist 107246115 • Mananara Lodge, Anjozorobe; 18°15′42.9″ S, 47°41′05.6″ E; 24 Nov. 2013; fl; *Pete Woodall (nyoni-pete)*; iNaturalist 12442051 • 18°24′39.7″ S, 47°56′28.2″ E; 27 Jan. 2018; fr; *Helene Ralimanana*

(helene001); iNaturalist 9748558 • Anjozorobe; 18°24′41.3″ S, 47°56′31.3″ E; 28 May 2024; fr; *Len deBeer (lendebeer)*; iNaturalist 218896562 • 18°24′48.3″ S, 47°56′25.7″ E; 31 Jan. 2018; fr; *Ando Andriamanohera (andoandria)*; iNaturalist 9738049 • Amboasarianala; 18°24′29.8″ S, 47°56′43.2″ E; 6 May 2024; fr; *(dennis-mada)*; iNaturalist 213941569.

Description

Erect shrub, sometimes climbing *vines*, (22–)42–82(–105) cm high, spineless, *pseudo-frond* obscurely elliptical, secondary and ultimate stems 4-angled, strongly papillose; *phylloclades* in alternate fascicles of (2–)3–4(–8), or rarely solitary, internodes (2–)4–6(–21) mm long; *phylloclades* falciform, almost straight, with the exception of the terminal ones, which are slightly curved, (5.8–)9.6–12.6(–18.8) × (0.5–)0.8–1.0(–1.5) mm; *berry* spherical, white, 4–5 mm diam. (on dry specimens), 1-seeded; *seed* spherical, black, 3.5 mm diam.

Remarks

While most of the material assigned to *Asparagus simulans* var. *recticladus* var. nov. has an upright growth habit, we have also included a number of collections with a lianescent habit, which may be associated with plant maturity or environmental conditions. One specimen (*N.H. Rakotoarivelo et al. 264*) exhibits more notable morphological differences: it is a liana with spiny stems, the primary ones being terete and the secondary ones angular, rather than ribbed, as is typical for this variety. The phylloclades are triangular in cross-section and have a slightly attenuate base and a non-attenuate apex.

Phenology

Flowering and fruiting material of *Asparagus simulans* var. *recticladus* var. nov. has been documented almost throughout the year.

Distribution and ecology

Asparagus simulans var. *recticladus* var. nov. is well represented in the northeastern parts of the island, but appears to have a rather scattered distribution in Central Madagascar at mid to high elevation sites (800–1800 m), with outliers recorded from the Tsingy de Bemaraha National Park and the Ambohijanahary Special Reserve in the West, at lower elevations. It appears to have a disjunct distribution, with one population located along the eastern coast and another at the northern tip of Madagascar, but has not been recorded from the southern part of the country. The variety grows mainly in the understorey of sub-humid forests.

Provisional risk of extinction assessment

Asparagus simulans var. *recticladus* var. nov. has a geographic distribution in the form of an EOO of 83 282.0 km² and an AOO of 216 km². It is known from ca 150 occurrences documented by 126 gatherings and 30 verified iNaturalist observations, and can therefore be provisionally assessed as Least Concern [LC] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Asparagus tsaratananensis M.Pignal & Phillipson sp. nov.
urn:lsid:ipni.org:names:77355483-1
Figs 3, 21–22 Table 2

Diagnosis

Asparago andriamihajarivensi M.Pignal & Phillipson *similis, sed phyllocladiis longioribus, (25–)29–47(–57) vs (13–)18–34(–49) mm, angustioribus, (0.9–)1.0–1.2(–1.5) mm vs (0.9–)1.1–1.6(–2.3) mm, internodiis terminalibus ramorum ultimorum teretibus vel quadrangularibus (vs alata), praecipue differt.*

Fig. 21. Line drawing of *Asparagus tsaratananensis* M.Pignal & Phillipson sp. nov. **A**. Stem, **B**. Scale leaf. **C**. Flower. **D**. Rehydrated young fruit. From *H. Perrier de la Bâthie 8402*, holotype (P00580844). Drawing by Ludivine Longou.

Etymology

The specific epithet refers to the Tsaratanana Massif in northern Madagascar.

Vernacular names and uses

Vernacular names and uses unknown.

Type material

Holotype and isotype

MADAGASCAR – **Diana Region** [Diego-Suarez Prov.] • Centre: Environs du Mt Tsaratanana; 1100 m; Nov. 1912; fl, fr; *H. Perrier de la Bâthie 8402*; holotype: P [P00580844]!; isotype: P [P00580845]!.

Description

Liana, slender and diffuse; *tubers* numerous, fusiform and narrow (fide *Perrier de la Bâthie 8402*); *stems* mostly branching to 3 levels, primary stems longitudinally striate (in dry material), ultimate stems flexuous, (31–)38–96(–162) mm long, with 2 to 5 nodes, internodes (13–)14–19(–29) mm long, very thin (0.6 mm diam.), angular, not winged, sparsely tuberculate or smooth; *phylloclades* divergent, forming angles of ca 70°–80° with the adjacent stem, in fascicles of (2 or) 3, the nodes bearing only 2 phylloclades with a single axillary branch (the 3rd phylloclade replaced by a stem), (25–)29–47(–57) × (0.9–)1.0–1.2(–1.5) mm, thin, linear, green, adaxially shiny, long-attenuate, central vein prominent, margins smooth (but with very small papillae near the edge), apex apiculate; *scale leaves* on major stems narrowly triangular, ca 3 mm long (with a 2 mm spur), those on minor stems with an attenuate apex, otherwise similar but smaller (2 mm long, with a 1.3 mm spur); *flowers* solitary or paired in fascicles, pedicel ca 6.6 mm long (distal part 3.6 mm long), articulation supramedial, perianth white, *tepals (outer and inner whorls)* ovate-lanceolate, *outer whorl (sepals)* 2.7–4.0 × 1.0–1.5 mm, *inner whorl (petals)* 2.1–5.0 × 1.6–2.3 mm;

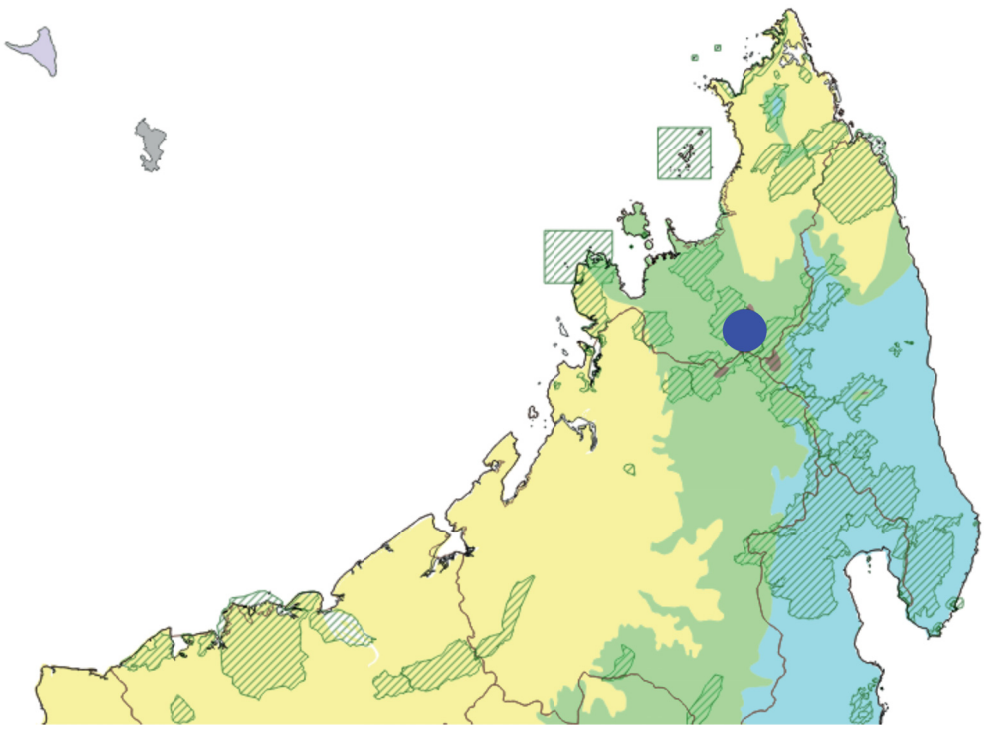

Fig. 22. Approximate location of *Asparagus tsaratananensis* M.Pignal & Phillipson sp. nov.

androecium: filaments 2 × 0.2 mm, white, flattened, anthers 0.8 × 0.5 mm, somewhat rectangular in outline at first, becoming triangular at maturity (due to the divergence of the lobe bases), pale orange; *gynoecium*: ovary ca 1.5 × 2 mm, globose, style conical, 1.2 × 0.5 mm at the base, trifid; *fruiting pedicel* ca 6 mm long (including the ca 4 mm long proximal section); *immature berries* ca 5 mm diam.; *seeds* unknown.

Phenology

The only known collection of *Asparagus tsaratananensis* sp. nov., which bears flowers and fruits, was made in November.

Distribution and ecology

Asparagus tsaratananensis sp. nov. is known only from the Tsaratanana massif in northern Madagascar, where it was recorded at 1100 m elevation, likely in forest habitat.

Provisional risk of extinction assessment

Asparagus tsaratananensis sp. nov. is known from a single collection made by Perrier de la Bâthie in 1912. The locality data indicate that it was collected near Mt Tsaratanana at an elevation of 1100 m, but no other information was provided, making it impossible to assign even approximate geo-coordinates. It is thus impossible to know whether the only documented occurrence occurs within the Tsaratanana protected area or to estimate whether it is still extant and if so, whether it is subjected to any threats. As a consequence, *A. tsaratanansis* sp. nov. can be provisionally assessed as Data Deficient [DD] based on the IUCN Red List Categories and Criteria (IUCN 2012).

Remarks

This taxon is characterised by a lianescent habit, with long, narrow long-attenuate phylloclades, the lateral stems sometimes develop into long, divergent, bifurcating branches.

Discussion

Asparagaceae are a plant family comprising no less than 126 genera (POWO 2025), including some well known members that can develop into large, single-stemmed arborescent plants bearing long, 'spear-like' leaves, notably *Agave* L., *Dracaena* Vand., and *Nolina* Michx., while others, such as *Hyacinthus* L., develop underground bulbs. In contrast, *Asparagus* has evolved entirely different growth models in which the terminal portions of the stems develop into clusters of small leaf-like phylloclades (modified, highly-reduced stems of determinate length that take on the role of photosynthesis) that characterise the genus, and the leaves are highly reduced and often transformed into sharply pointed spines.

Many intriguing aspects of *Asparagus* are still only poorly understood and deserve further study; this is certainly the case for the Malagasy species. In particular, the root systems are usually very poorly documented, with collections generally lacking these structures and herbarium labels only occasionally providing just a few sporadic annotations.

The available taxonomic treatments of *Asparagus* as a whole are old and outdated, including the monographic revision of Baker (1875), and do not reflect the currently known species diversity. A consistent treatment for the genus as a whole is sorely needed. Furthermore, phylogenetic relationships within the genus remain largely unresolved—including among the Malagasy taxa and also for the African and Asian species. More specifically, the diversification patterns observed among the Malagasy species suggest that the 'Grande Île' may have played a significant role in shaping the historical geography of the genus as a whole, although adequate testing of this hypothesis will require more comprehensive analysis that integrates a fully representative sampling of Malagasy taxa into a broader global study.

Author contribution

Data curation: MP, PBP. Project administration: MP. Software: MP. Supervision: MP. Validation: MP, PBP, PPL. Visualization: PBP, MP. Writing – original draft: MP, PBP. Writing – review & editing: MP, PPL.

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References

Antonelli A., Smith R.J., Perrigo A.L., Crottini A., Hackel J., Testo W., Farooq H., Torres Jiménez M.F., Andela N., Andermann T., Andriamanohera A.M., Andriambololonera S., Bachman S.P., Bacon C.D., Baker W.J., Belluardo F., Birkinshaw C., Borrell J.S., Cable S., ... & Ralimanana H. 2022. Madagascar's extraordinary biodiversity: Evolution, distribution, and use. *Science* 378 (6623): eabf0869. https://doi.org/10.1126/science.abf0869

Baker J.G. 1875. Revision of the genera and species of Asparagaceae. *Journal of the Linnean Society, Botany* 14 (79): 508–632. https://doi.org/10.1111/j.1095-8339.1875.tb00349.x

Baker J.G. 1877. On a collection of ferns made by Miss Helen Gilpin in the interior of Madagascar. *Journal of the Linnean Society, Botany* 16 (92): 197–206. https://doi.org/10.1111/j.1095-8339.1877.tb00173.x

Baker J.G. 1896. *Asparagus*. *In*: Thiselton-Dyer W.T. (ed.) *FIora Capensis: Being a Systematic Description of the Plants of the Cape Colony, Caffraria, & Port Natal (and Neighbouring Territories) Vol. 6, Part II.*: 256–274. L. Reeve&Co., London. https://doi.org/10.5962/bhl.title.821

Bentz P.C., Burrows J.E., Burrows S.M., Mizrachi E., Liu Z., Yang J., Mao Z., Popecki M., Seberg O., Petersen G. & Leebens-Mack J. 2024. Bursts of rapid diversification, dispersals out of Southern Africa, and two origins of dioecy punctuate the wvolution of *Asparagus*. *Genome Biology and Evolution* 16 (10): evae200. https://doi.org/10.1093/gbe/evae200

Burman J. 1737. *Thesaurus Zeylanicus: exhibens plantas in insula Zeylana nascentes, inter quas plurimae novae species & genera inveniuntur, omnia iconibus illustrata, ac descripta.* Apud Janssonio Waesbergio, & Salomonem Schouten, Amstelaedami [Amsterdam]. https://doi.org/10.5962/bhl.title.734

Callmander M.W. & Nusbaumer L. 2024. Descriptions of ten new species of *Turraea* L. (Meliaceae, Turraeeae) from Madagascar with notes on the species described by Buchenau. *Adansonia, sér. 3* 46 (11): 103–128. https://doi.org/10.5252/adansonia2024v46a11

Callmander M.W., Phillipson P.B., Schatz G.E., Andriambololonera S., Rabarimanarivo M., Rakotonirina N., Raharimampionona J., Chatelain C., Gautier L. & Lowry II P.P. 2011. The endemic and non-endemic vascular flora of Madagascar updated. *Plant Ecology and Evolution* 144 (2): 121–125. https://doi.org/10.5091/plecevo.2011.513

Catalogue of the Plants of Madagascar 2026. Missouri Botanical Garden, St. Louis, U.S.A. & Antananarivo, Madagascar. Available from https://www.tropicos.org/Project/Madagascar [accessed 1 Mar. 2026].

Coffin M.F. & Rabinowitz P.D. 1987. Reconstruction of Madagascar and Africa: evidence from the Davie fracture zone and western Somali basin. *Journal of Geophysical Research: Solid Earth* 92 (B9): 9385–9406. https://doi.org/10.1029/JB092iB09p09385

Dahlgren R.M. & Clifford H.T. 1982. *The Monocotyledons: a Comparative Study.* Academic Press, London.

Fellingham A.C. & Meyer N.L. 1995. New combinations and a complete list of *Asparagus* species in southern Africa (Asparagaceae). *Bothalia* 25 (2): 205–209. https://doi.org/10.4102/abc.v25i2.728

Fukuda T., Ashizawa H., Suzuki R., Ochiai T., Nakamura T., Kanno A., Kameya T. & Yokoyama J. 2005. Molecular phylogeny of the genus *Asparagus* (Asparagaceae) inferred from plastid *petB* intron and *petD–rpoA* intergenic spacer sequences. *Plant Species Biology* 20 (2): 121–132. https://doi.org/10.1111/j.1442-1984.2005.00131.x

Global Plants 2025. JSTOR. Available from https://plants.jstor.org/ [accessed 30 May 2025].

Huber H. 1969. Die Samenmerkmale and Verwantschaftsverhältnisse der Liliifloren. *Mitteilungen (aus) der botanischen Staatssammlung München.* 8: 219–538.

Humbert H. 1959. Origines présumées et affinités de la flore de Madagascar. *Mémoires de l'Institut Scientifique de Madagascar (série B, Biologie Végétale)* 9: 149–187.

iNaturalist 2025. Available from https://www.iNaturalist.org/ [accessed 30 May 2025].

International Botanical Congress, Turland N.J., Wiersema J.H., Barrie F.R., Gandhi K.N., Gravendyck J., Greuter W., Hawksworth D.L., Herendeen P.S., Klopper R.R., Knapp S., Kusber W.-H., Li D.-Z., May T.W., Monro A.M., Prado J., Price M.J., Smith G.F. & Señoret J.C.Z. 2025. *International Code of Nomenclature for Algae, Fungi, and Plants: 2025 Edition, Madrid Code*. University of Chicago Press. https://doi.org/10.7208/chicago/9780226839479.001.0001

IUCN 2012. *IUCN Red List Categories and Criteria, Version 3.1. Second edition.* IUCN, Gland, Switzerland. Available from https://portals.iucn.org/library/sites/library/files/documents/RL-2001-001-2nd.pdf [accessed 13 Aug. 2026].

IUCN Standards and Petitions Committee 2024. *The IUCN Red List of Threatened Species. Guidelines for Using the IUCN Red List Categories and Criteria Version 16*. Prepared by the Standards and Petitions Subcommittee. Available from https://www.iucnredlist.org/documents/RedListGuidelines.pdf [accessed 13 Aug. 2026].

Jessop J.P. 1966. The genus *Asparagus* in Southern Africa. *Bothalia* 9 (1): 31–96. https://doi.org/10.4102/abc.v9i1.1576

Kanno A. & Yokoyama J. 2011. Asparagus. *In*: Kole C. (ed.) *Wild Crop Relatives: Genomic and Breeding Resources*: 23–42. Springer Berlin Heidelberg, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-20450-0_3

Kerner A., Saliba E.M., Bouquin S., Portier R. & Vignes-Lebbe R. 2025. An Xper3 reference guide for taxonomists: a collaborative system for identification keys and descriptive data. *European Journal of Taxonomy* 987: 281–302. https://doi.org/10.5852/ejt.2025.987.2875

Kunth K.S. 1842 [published 1844]. Über die natürliche Gruppe der Liliaceen im weitesten Sinne des Worts. Seite 1. *Abhandlungen der Königlichen Akademie der Wissenschaften in Berlin.* : 1–56.

Linnaeus C. von 1747. *Flora Zeylanica*. Sumtu et Literis Laurentii Salvii, Holmiae [Stockholm].

Linnaeus C. von 1753. *Species Plantarum, Vol. 1*. Impensis Laurentii Salvii, Holmiae [Stockholm].

Lowry II P.P., Phillipson P.B., Andriamahefarivo L., Schatz G.E., Rajaonary F. & Andriambololonera F. 2018. Chap. 8. Flora: Introduction. *In*: Goodman S.M., Raherilalao M.J. & Wohlhauser S. (eds) *The Terrestrial Protected Areas of Madagascar: Their History, Description, and Biota*: 243–255. Association Vahatra.

Malcomber S.T. & Demissew S. 1993. The status of *Protasparagus* and *Myrsiphyllum* in the *Asparagaceae*. *Kew Bulletin* 48 (1): 63–78. https://doi.org/10.2307/4115749

Mathew B. 1989. Notes on tropical African *Asparagaceae*. *Kew Bulletin* 44 (1): 181–182. https://doi.org/10.2307/4114662

Montagne C. 1840. Plantae cellulares. Familis III. Phyceae Fries. *In*: Barker-Webb P. & Berthelot S. (eds) *Histoire naturelle des Iles Canaries. Tome troisième. Deuxième partie. Phytographia canariensis. Section Ultima*: 132–194. Béthune, Paris.

Morat P. & Lowry II. P.P. 1997. Floristic richness in the Africa-Madagascar region: a brief history and prospective. *Adansonia, sér. 3* 19 (1): 101–115.

Obermeyer A.A. 1983. *Protasparagus* Oberm., nom. nov.: new combinations. *South African Journal of Botany* 2 (3): 243–244. https://doi.org/10.1016/S0022-4618(16)30114-0

Obermeyer A.A. 1984. Revision of the genus *Myrsiphyllum* Willd. *Bothalia* 15 (1–2): 77–88. https://doi.org/10.4102/abc.v15i1/2.1106

Perrier de La Bâthie H. 1935. Notes sur les Liliacées de Madagascar. *Notulae Systematicae. Herbier du Muséum de Paris. Phanérogramie (Paris)* 5 (1): 17–72. Available from https://www.biodiversitylibrary.org/page/6463333 [accessed 22 Jul. 2026].

Perrier de La Bâthie H. 1937 [published 1938]. 40e famille. Liliacées (Liliaceae). *In*: Humbert H. (ed.) *Flore de Madagascar.* Imprimerie Officielle, Tananarive, Tananarive (Madagascar). https://doi.org/10.5962/bhl.title.6600

Phillipson P.B., Andriambololonera S., Lowry II P.P., Manjato N., Rabarimanarivo M., Rakotonirina N., Ravololomanana N. & Schatz G.E. 2017. The Madagascar Catalogue, progress to date and prospects for the future. *In*: *Abstracts, XXI AETFAT Congress, Nairobi, Kenya*: 241.

Pignal M. 2025. Deux nouvelles espèces d'*Indigofera* L.(Leguminosae) de Madagascar. *Adansonia* 47 (5): 31–40. https://doi.org/10.5252/adansonia2025v47a5

Pignal M., Bertin G., Chupin L., Pimparé E.P., Klasnja S., Lebbe R.V. & Dusoulier F. 2024. Récolnat Annotate-On: a tool to improve your experience with virtual collections. *Adansonia, sér. 3* 46 (13): 1–16. https://doi.org/10.5252/adansonia2024v46a13

POWO 2025. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Available from https://powo.science.kew.org/ [accessed 22 Jun. 2025].

QGIS Development Team 2025. QGIS Geographic Information System. Ver. 3.22. Open Source Geospatial Foundation. Available from https://qgis.org [accessed 30 May 2025].

Ralimanana H., Perrigo A.L., Smith R.J., Borrell J.S., Faurby S., Rajaonah M.T., Randriamboavonjy T., Vorontsova M.S., Cooke R.S.C., Phelps L.N., Sayol F., Andela N., Andermann T., Andriamanohera A.M., Andriambololonera S., Bachman S.P., Bacon C.D., Baker W.J., Belluardo F., ... & Antonelli A. 2022. Madagascar's extraordinary biodiversity: Threats and opportunities. *Science* 378 (0963): eabf0869. https://www.science.org/doi/10.1126/science.adf1466

RECOLNAT Infrastructure 2025. Available from https://recolnat.fr/fr/annotate [accessed 13 October 2026].

Schatz G.E. 2001. *Generic Tree Flora of Madagascar*. Kew & Missouri Botanical Garden St Louis.

Schultes J.J. & Schultes J.A. 1829. *C. Linné, Systema vegetabilium. Vol. 7, Pars 1. Ed. Nova*. J.G. Cotta, Stuttgart.

Thiers B. continuously updated. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available from https://sweetgum.nybg.org/science/ih/ [accessed 29 Jul. 2026].

Tofilski A. 2018. DKey software for editing and browsing dichotomous keys. *ZooKeys* 735: 131–140. https://doi.org/10.3897/zookeys.735.21412

Trimen H. 1887. Hermann's Ceylon Herbarium and Linnaeus's 'Flora Zeylanica.' *Linnean Society of London Zoology Transactions* 24 (160): 129–155. https://doi.org/10.1111/j.1095-8339.1887.tb01319.x

Turner I.M. 2016. Henry Trimen: Under-appreciated pioneer in the typification of Linnaean plant names? *Taxon* 75 (3): e70157 https://doi.org/10.1002/tax.70157

White F. 1983. *The Vegetation of Africa: a Descriptive Memoir to Accompany the Unesco/AETFAT/UNSO Vegetation Map of Africa*. Unesco, Paris.

Willdenow C.L. 1808. Nähere Bestimmung einiger Lilienwächse, besonders aber derjenigen, die zur sechsten Klasse und dritten Ordnung des Linnéschen Systems gehören. *Gesellschaft naturforschender Freunde zu Berlin, Magazin für die neuesten Entdeckungen in der Gesammten Naturkunde* 2: 14–30.

Yoder A.D. & Novak M.D. 2006. Has vicariance or dispersal been the predominant biogeographic force in Madagascar? Only time will tell. *Annual Review of Ecology, Evolution & Systematics* 37: 405–431. https://doi.org/10.1146/annurev.ecolsys.37.091305.110239

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