HAL
open science

Novelties in Erythroxylum P.Browne (Erythroxylaceae) from the Comoros Archipelago: two new, range-restricted and threatened species, and notes on the Mount Choungi biogeographical singularity

Ehoarn Bidault, Sébastien Traclet, Marc M. Pignal

To cite this version:

Ehoarn Bidault, Sébastien Traclet, Marc M. Pignal. Novelties in Erythroxylum P.Browne (Erythroxylaceae) from the Comoros Archipelago: two new, range-restricted and threatened species, and notes on the Mount Choungi biogeographical singularity. Adansonia, 2022, 44 (21), pp.215-228. 10.5252/adansonia2022v44a21 . hal-03795060

HAL Id: hal-03795060

https://hal.science/hal-03795060v1

Submitted on 3 Oct 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

ResearchGate

See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/363484807

Novelties in Erythroxylum P.Browne (Erythroxylaceae) from the Comoros Archipelago: two new, range-restricted and threatened species, and notes on the Mount Choungi biogeographical...

Article *in* Adansonia · September 2022

DOI: 10.5252/adansonia2022v44a21

CITATIONS
0

READS
21

3 authors:

Ehoarn Bidault
Missouri Botanical Garden
64 PUBLICATIONS **55** CITATIONS

SEE PROFILE

Sebastien Traclet
Terres autrales et antartiques françaises (TAAF)
14 PUBLICATIONS **22** CITATIONS

SEE PROFILE

Marc Pignal
Muséum National d'Histoire Naturelle
57 PUBLICATIONS **473** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Project GaboTREE - in situ conservation of threatened trees and forested habitats in Gabon View project

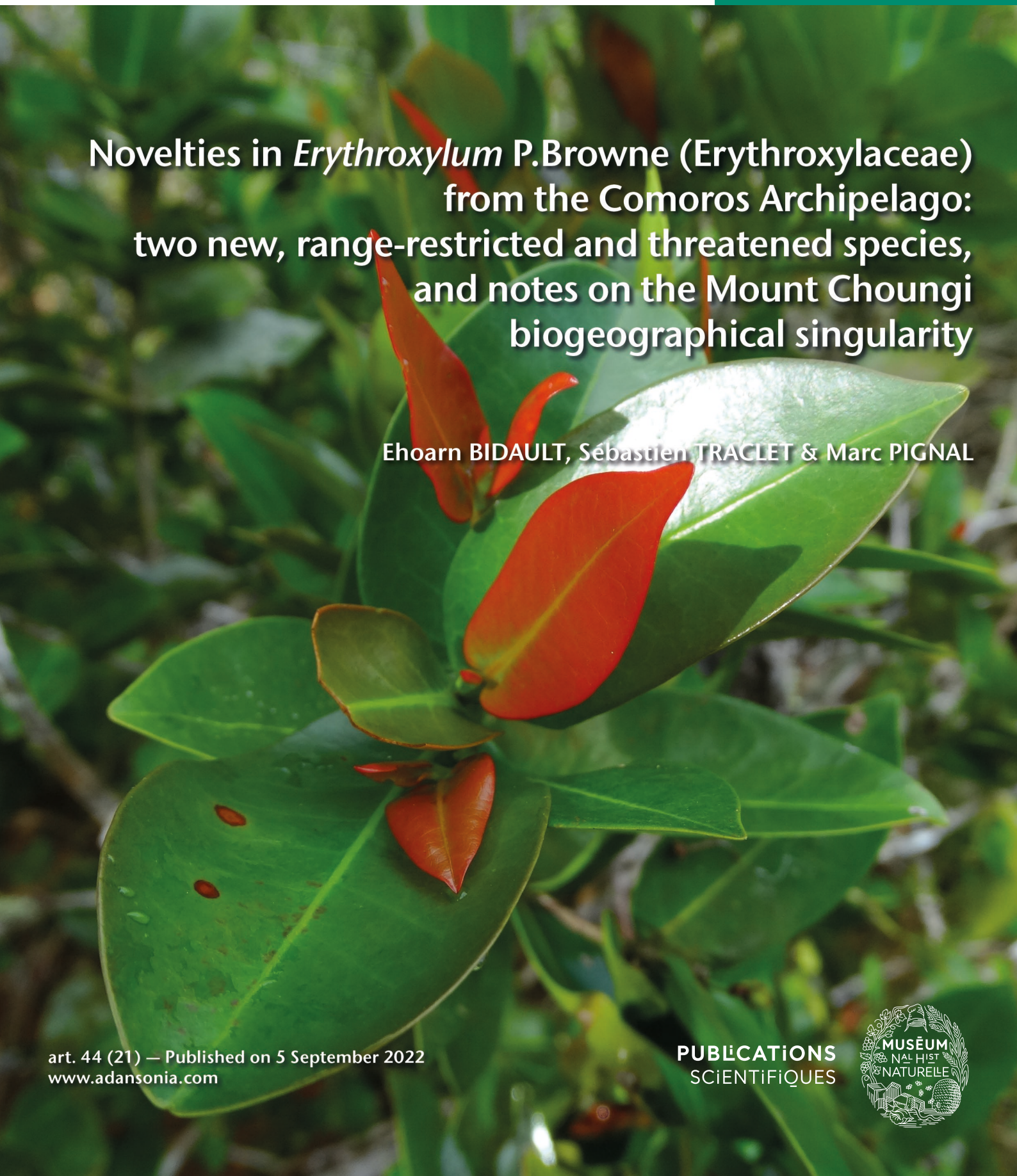
Project Systematics and Updated Classification of Commelinales View project

All content following this page was uploaded by Ehoarn Bidault on 13 September 2022.

The user has requested enhancement of the downloaded file.

adansonia

2022 • 44 • 21



Novelties in *Erythroxylum* P.Browne (Erythroxylaceae) from the Comoros Archipelago: two new, range-restricted and threatened species, and notes on the Mount Choungi biogeographical singularity

Ehoarn BIDAULT, Sébastien TRACLET & Marc PIGNAL

art. 44 (21) — Published on 5 September 2022
www.adansonia.com

PUBLICATIONS SCIENTIFIQUES

MUSÉUM NAL HIST NATURELLE

Directeur de la publication / *Publication director*: Bruno David
Président du Muséum national d'Histoire naturelle

Rédacteur en chef / *Editor-in-chief*: Thierry Deroin

Rédacteurs / *Editors*: Porter P. Lowry II; Zachary S. Rogers

Assistant de rédaction / *Assistant editor*: Emmanuel Côtez (adanson@mnhn.fr)

Mise en page / *Page layout*: Emmanuel Côtez

Comité scientifique / *Scientific board*:

P. Baas (Nationaal Herbarium Nederland, Wageningen)
F. Blasco (CNRS, Toulouse)
M. W. Callmander (Conservatoire et Jardin botaniques de la Ville de Genève)
J. A. Doyle (University of California, Davis)
P. K. Endress (Institute of Systematic Botany, Zürich)
P. Feldmann (Cirad, Montpellier)
L. Gautier (Conservatoire et Jardins botaniques de la Ville de Genève)
F. Ghahremaninejad (Kharazmi University, Téhéran)
K. Iwatsuki (Museum of Nature and Human Activities, Hyogo)
A. A. Khapugin (Tyumen State University, Russia)
K. Kubitzki (Institut für Allgemeine Botanik, Hamburg)
J.-Y. Lesouef (Conservatoire botanique de Brest)
P. Morat (Muséum national d'Histoire naturelle, Paris)
J. Munzinger (Institut de Recherche pour le Développement, Montpellier)
S. E. Rakotoarisoa (Millenium Seed Bank, Royal Botanic Gardens Kew, Madagascar Conservation Centre, Antananarivo)
P. H. Raven (Missouri Botanical Garden, St. Louis)
G. Tohmé (Conseil national de la Recherche scientifique Liban, Beyrouth)
J. G. West (Australian National Herbarium, Canberra)
J. R. Wood (Oxford)

Couverture / *Cover*:
Réalisée à partir des Figures de l'article/*Made from the Figures of the article*. Photo by S. Traclet.

Adansonia est indexé dans / Adansonia *is indexed in:*
– Science Citation Index Expanded (SciSearch®)
– ISI Alerting Services®
– Current Contents® / Agriculture, Biology, and Environmental Sciences®
– Scopus®

Adansonia est distribué en version électronique par / Adansonia *is distributed electronically by:*
– BioOne® (http://www.bioone.org)

Adansonia est une revue en flux continu publiée par les Publications scientifiques du Muséum, Paris
Adansonia *is a fast track journal published by the Museum Science Press, Paris*

Les Publications scientifiques du Muséum publient aussi / *The Museum Science Press also publish:* ***Geodiversitas***, ***Zoosystema***, ***Anthropozoologica***, ***European Journal of Taxonomy***, ***Naturae***, ***Cryptogamie*** **sous-sections** ***Algologie***, ***Bryologie***, ***Mycologie, Comptes Rendus Palevol***

Diffusion – Publications scientifiques Muséum national d'Histoire naturelle
CP 41 – 57 rue Cuvier F-75231 Paris cedex 05 (France)
Tél.: 33 (0)1 40 79 48 05 / Fax: 33 (0)1 40 79 38 40
diff.pub@mnhn.fr / http://sciencepress.mnhn.fr

© Publications scientifiques du Muséum national d'Histoire naturelle, Paris, 2022
ISSN (imprimé / *print*): 1280-8571/ ISSN (électronique / *electronic*): 1639-4798

Novelties in *Erythroxylum* P.Browne (Erythroxylaceae) from the Comoros Archipelago: two new, range-restricted and threatened species, and notes on the Mount Choungi biogeographical singularity

Ehoarn BIDAULT
Missouri Botanical Garden, Africa & Madagascar Department
4344 Shaw Blvd., Saint Louis, Missouri 63110 (United States)
and Institut de Systématique, Évolution et Biodiversité,
ISYEB – Muséum national d'Histoire naturelle,
Centre national de la Recherche scientifique, Sorbonne Université,
and École pratique des Hautes Études, Université des Antilles,
case postale 39, 57 rue Cuvier, F-75231 Paris cedex 05 (France)
ehoarn.bidault@mobot.org (corresponding author)

Sébastien TRACLET
Terres australes et antarctiques françaises, Direction de l'Environnement
rue Gabriel Dejean, F-97410 Saint-Pierre, île de La Réunion (France)
sebastien.traclet@outlook.fr

Marc PIGNAL
Institut de Systématique, Évolution et Biodiversité, ISYEB – Muséum national d'Histoire naturelle,
Centre national de la Recherche scientifique, Sorbonne Université,
École pratique des Hautes Études, Université des Antilles,
case postale 39, 57 rue Cuvier, F-75231 Paris cedex 05 (France)
marc.pignal@mnhn.fr

Submitted on 2 February 2022 | accepted on 28 April 2022 | published on 5 September 2022

Bidault E., Traclet S. & Pignal M. 2022. — Novelties in *Erythroxylum* P.Browne (Erythroxylaceae) from the Comoros Archipelago: two new, range-restricted and threatened species, and notes on the Mount Choungi biogeographical singularity. *Adansonia*, sér. 3, 44 (21): 215-228. https://doi.org/10.5252/adansonia2022v44a21. http://adansonia.com/44/21

ABSTRACT
A study of the genus *Erythroxylum* P.Browne from the Comoros archipelago reveals two new species, *E. choungiense* E.Bidault, Traclet & M.Pignal, sp. nov. from Mayotte and *E. labatii* E.Bidault & M.Pignal, sp. nov. from Mwali and Ngazidja, both of which are described and illustrated. The distribution of a third species, *E. elegans* Baill., is now only known with certainty to include Mayotte and Nzwani, and possibly Ngazidja, following the exclusion of material now assigned to the new species. A risk of extinction assessment using the IUCN Red List criteria is provided for the new taxa and the morphological features that distinguish them from their apparently close relative are summarized. A key to the species of *Erythroxylum* in the Comoros is provided in both English and French. *Erythroxylum choungiense* sp. nov. is endemic to Mount Choungi, and its conservation status is assessed as Critically Endangered. Mount Choungi harbors the unique patch of hygrophilous submontane shrubland in Mayotte, to which at least five species are now known to be strictly endemic: *Cassipourea ovata* Tul., *Eugenia choungiensis* Byng & N.Snow, *Psiadia pascalii* Labat & Beentje, *Syzygium labatii* Byng & N.Snow, and *Erythroxylum choungiense* sp. nov.. *Erythroxylum labatii* sp. nov. is only known from the submontane forests on ridges and steep slopes on Moheli and Ngazidja, at an elevation of 600 to 1300 m a.s.l., and is assessed as Endangered.

KEY WORDS
Erythroxylaceae,
Mayotte,
Comoros,
IUCN status,
new species.

RÉSUMÉ
Nouveautés dans le genre Erythroxylum *P.Browne (Erythroxylaceae) de l'archipel des Comores : deux espèces nouvelles menacées à aire de répartition restreinte, et notes sur la singularité biogéographique du Mont Choungi.* Une étude du genre *Erythroxylum* P.Browne dans l'archipel des Comores révèle deux nouvelles espèces, *Erythroxylum choungiense* E.Bidault, Traclet & M.Pignal, sp. nov. de Mayotte et *E. labatii* E.Bidault & M.Pignal, sp. nov. de Mohéli et Grande Comore, qui sont décrites et illustrées. En conséquence, la distribution de *Erythroxylum elegans* Baill. est mise à jour, cette espèce étant désormais uniquement connue avec certitude de Mayotte et d'Anjouan, et possiblement de Grande Comore. Les caractères morphologiques permettant de distinguer les deux nouvelles espèces sont discutés, et des statuts de conservation selon les catégories et critères de la Liste Rouge de l'UICN sont proposés. Une clé de détermination des espèces du genre *Erythroxylum* à Mayotte et aux Comores est proposée, en français et en anglais. *Erythroxylum choungiense* sp. nov. est endémique du Mont Choungi, et est évaluée comme En Danger Critique. Le Mont Choungi présente un fourré hygrophile submontagnard, un type de végétation unique à Mayotte, dont au moins cinq espèces sont désormais connues pour y être endémiques : *Cassipourea ovata* Tul., *Eugenia choungiensis* Byng & N.Snow, *Psiadia pascalii* Labat & Beentje, *Syzygium labatii* Byng & N.Snow, et *Erythroxylum choungiense*, sp. nov. *Erythroxylum labatii* sp. nov. est uniquement connue des forêts submontagnardes de crêtes et de pentes fortes, entre 600 et 1300 m d'altitude, et est évaluée comme En Danger.

MOTS CLÉS
Erythroxylaceae, Mayotte, Comores, statut UICN, espèces nouvelles.

INTRODUCTION

Since 1995, multiple floristic inventories have been carried out on Mayotte, a French department located north-west of Madagascar, one of four islands comprising the Comoros archipelago. Intensive inventory was performed by the *Service de l'Environnement et de la Forêt de Mayotte* (SEF) in collaboration with the Herbarium of the *Muséum national d'Histoire naturelle* in Paris (MNHN), partly under the three-year multidisciplinary project "*Interactions entre espèces à Mayotte, variations de la biodiversité et des valeurs patrimoniales perçues*", funded by the French *Ministère de l'Écologie et du Développement durable* as part of its "*Programme Écosystèmes tropicaux*". In 2007, a permanent inventory program was developed and implemented by SEF, the *Direction de l'Agriculture et de la Forêt* (DAF), and the *Conservatoire botanique national de Mascarin* (CBNM), which generated important data to strengthen our knowledge of the island's flora, previously known almost entirely from material gathered in the XIXth century, and greatly increasing the number of herbarium collections available. Review of this newly available material in several institutions by taxonomists has revealed several novelties in numerous families, including Fabaceae (Du Puy & Labat 1996a, b; Labat & Pascal 1999), Sapotaceae (Labat *et al.* 1997), Oleaceae (Labat *et al.* 1999), Salicaceae and Achariaceae (as Flacourtiaceae, Hul *et al.* 1999), Araliaceae (Lowry *et al.* 1999), Putranjivaceae (as Euphorbiaceae, McPherson 2000), Malvaceae (as Sterculiaceae, Labat *et al.* 2001), Orchidaceae (Bosser & Morat 2001), Buxaceae (Schatz & Lowry 2002), Boraginaceae (Miller 2003), Asteraceae (Labat & Beentje 2003), Urticaceae (Wilmot-Dear & Friis 2004), Rutaceae (Labat *et al.* 2005; Rabarimanarivo *et al.* 2015), Melastomataceae (Stone 2006), Olacaceae (Rogers *et al.* 2006), Asphodelaceae (Ellert 2006), Icacinaceae (Labat *et al.* 2006), Dioscoreaceae (Wilkin *et al.* 2007), Vitaceae (Descoings 2007), Cyatheaceae (Janssen & Rakotondrainibe 2008), Rubiaceae (Mouly & De Block 2008; Mouly 2009), Iridaceae (Goldblatt & Manning 2010), Lecythidaceae (Labat *et al.* 2011), Passifloraceae (Pignal *et al.* 2013), Acanthaceae (Daniel 2014), Myrtaceae (Byng *et al.* 2016), Apocynaceae (Stevens *et al.* 2016), Annonaceae (Hoekstra *et al.* 2016), Euphorbiaceae (Kainulainen *et al.* 2017) and Burmanniaceae (Cheek & Traclet 2020). Since 1996, 43 taxonomic novelties have been described from Mayotte, including 28 that are considered to be endemic to the island. Taxonomical novelties and new records are still regularly discovered (Traclet *et al.* 2018, 2019) and are presumably yet to be discovered, which highlights the importance of conducting botanical inventories in Mayotte. Considering that less than 5% of the original vegetation cover is thought to remain on Mayotte (Pascal *et al.* 2001; Pascal 2002), these new species, along with other strict endemic taxa, are often considered as highly threatened.

Erythroxylaceae contain more than 270 species distributed throughout the tropics, belonging to four different genera: *Aneulophus* Benth., *Erythroxylum* P.Browne, *Nectaropetalum* Engl., and *Pinacopodium* Exell & Mendonça (The Plant List 2013), although most of species diversity is in *Erythroxylum*. This genus is highly diverse in the Neotropics, with about 190 species, and its center of diversification is found in Brazil and Venezuela (Plowman & Berry 1999; Daly 2004). Most recent publications on *Erythroxylum* focus on tropical America (Plowman 1983, 1984, 1986, 1987; Plowman & Hensold 2004; Emche *et al.* 2011; Jara-Muñoz 2011; Costa-Lima & Alves 2013; Costa-Lima *et al.* 2014a, b; Loiola *et al.* 2015), and only few studies have been carried on the genus in the Indian Ocean (Pailler *et al.* 1998). To date, 36 species are known to occur on the islands of Western Indian Ocean, including Madagascar (Humbert 1952; Friedmann 1987, 1998, 2011; Madagascar Catalogue 2021), and five are known from Mayotte (Barthelat 2019). Nevertheless, no recent revi-

Table 1. — Differences between *Erythroxylum nossibeense*, *E. labatii* sp. nov. and *E. elegans*. Diagnostic characters are in bold.

	***Erythroxylum nossibeense* Baill.**	***Erythroxylum labatii* sp. nov.**	***Erythroxylum elegans* Baill.**
Habit	Shrub to 4 m	Shrub or small tree to 5.5 m	**Small tree to 12 m**
Stipule	Caducous, visible on young portions of stem, 1-2 mm long	Caducous, visible on young portions of stem, 1-2 mm long	**Early caducous, only visible on the 1(-2) apical leaves, 3-4 mm long**
Leaf size (cm)	3-9 × 1.8-3.5	4-10 × 1.5-3.5	8-13 × 2.5-5
Upper surface of leaves	Waxy, dark grey when dry	**Not waxy, dark brown when dry**	Waxy, dark grey when dry
Inflorescence	1-2(-3)-flowered, borne individually or in pairs	3-6-flowered, borne individually or in pairs	**4-5-flowered, borne in groups of 3-4**
Bracteoles	Few, 0.5-0.8 mm long	Numerous, 0.8-1 mm long	**Numerous, 1.2-1.5 mm long**
Pedicel length (cm)	**0.35-0.5**	0.9-1.5	1.1-1.6
Petal length (mm)	**2-3**	3.5-5	5
Petal constriction	Inconspicuous	**Marked**	Inconspicuous
Cataphylls	**Apex papillo-villose, with few nectary glands**	Apex smooth, with abundant nectary glands	Apex smooth, with abundant nectary glands
Elevational range (m)	1-480(-605)	**600-1300**	200-660
Vegetation type	Low elevation humid forest	**Submontane forest on ridges**	Mesophilous to submontane forest
Distribution	Madagascar	Comoros (Ngazidja and Mwali)	Comoros (Nzwani and Mayotte)

sion is available for the genus in the Indian Ocean area, and the work of Humbert (1952) remains authoritative. The first known specimen of a possible new species of *Erythroxylum* on Mayotte was collected in November 1995 (*Pascal 209*) on Mlima (Mount) Choungi, and was never determined at the species level. Other collections made at the same place in the following years were referred to as *E.* cf. *lanceum*. Several herbarium collections have become available since then, including fruiting specimens, supplemented by photographs taken in the field. All of these are from the same population located close to the summit of Mount Choungi, and exhibit a high level of consistency in their morphological features as well as clear morphological differences with *E. lanceum* and the other members of the genus that occur on Mayotte. Several collectors and authors have since suggested that the taxon occurring at Mount Choungi could represent a new species, either on collection labels, but also in publications. Barthelat (2019) refers to this taxon as a new species. Close examination of the available material finally confirmed the existence of an undescribed species, which is hereby described as *Erythroxylum choungiense* E.Bidault, Traclet & M.Pignal, sp. nov.

During the preparation of the description of *Erythroxylum chougiense* sp. nov., all available material of the genus collected in the Comoros archipelago was examined. Four collections from the island of Mwali (Mohéli) in the Union of the Comores were initially identified as belonging to a Malagasy species, *E. nossibeense*, by the late J.-N. Labat. However, these collections differed from the type material of *E. nossibeense* and all other collections of this species by their larger flowers with longer pedicels, as well as differences in their cataphylls, which are glabrous and almost always bear a nectary gland on the material from Mwali, whereas those of *E. nossibeense* are conspicuously papillo-villose on their apical portion and have a nectary gland on only few of cataphylls. These collections also differed from *E. nossibeense* by lacking the conspicuous dark grey colour of leaves when dry, due to the presence of a waxy layer that is absent from the material collected on Mwali. The four collections from Mwali otherwise shared similar morphological features with one additional collection (*Rouhan 899*) initially identified as *E. elegans*, and two previously unidentified collections (*Bidault 63* and *Loup 598*) that represent another new taxon described here as *E. labatii* sp. nov. Examination of *Erythroxylum* material from Ngazidja (Grande Comore) also revealed several specimens initially identified as *E. elegans*, but that are best regarded as belonging to *E. labatii* sp. nov., showing clearly smaller leaves than in *E. elegans* from Mayotte and Nzwani (Anjouan), being a shrub *c.* 4 m tall whereas *E. elegans* are small trees 10-12 m tall, having 3-6-flowered inflorescences that are borne individually or in pairs (vs always 4-5-flowered inflorescences in groups of 3 or 4), and by their smaller stipules 1-2 mm in length (vs 3-4 mm long) that are caducous but usually visible on at least the entire youngest portion of stems (vs. early caducous, only visible on the 1 or 2 most apical leaves). These and other differences between *E. labatii* sp. nov., *E. nossibeense*, and *E. elegans* are summarized in Table 1. The type collection of *E. elegans* (*Humblot 1266*) was collected in the "*Forêt de Combani*, *Comores*", a locality that exists on both Mayotte and Ngazidja, and it is yet unclear on which island Humblot collected the numerous specimens labeled as such, although it is probably Ngazidja. Consequently, the presence of *E. elegans* on Ngazidja remains ambiguous, and should Humblot's locality of Combani be proven to be from that island, the species would only be known from there by its type collection. The type material, although bearing rather small leaves compared to the more recently material from Nzwani and Mayotte, nevertheless differs from *E. labatii* sp. nov. by the profusion of flowers, and its early caducous stipules 3 mm in length. *Erythroxylum nossibeense* and *E. labatii* sp. nov. are also geographically and ecologically mutually exclusive: the Malagasy species *E. nossibeense* is known from 1 to 300 m in elevation in Lokobe on Nosy Be island, and mostly from 335 to 480 m on the Ampasindava peninsula (exceptionally as low elevation as 183 m and as high elevation as 605 m), in the last remnants of Sambirano lowland forest type. By contrast, *E. labatii* sp. nov. is restricted to the Comoros, where it is exclusively known from 600 to 700 m in elevation on Mwali and up to 1300 m in elevation on Ngazidja, in submontane

forest on ridges, a forest type not found at similar elevations on the Ampasindava peninsula.

Examination of *Erythroxylum* material from Comoros also revealed significant differences between the type specimens of *E. corymbosum* Boivin ex Baill. from Madagascar and the material from the Comoros subsequently identified as belonging to this species, especially in leaf size and shape. All collections labeled as *E. corymbosum* from the Comoros archipelago (including Mayotte) are very likely conspecific, and some collections from Madagascar likely also represent the same taxon. However, at least three morphotypes can be preliminarily distinguished among the material currently labeled as *E. corymbosum* (from both Madagascar and the Comoros archipelago), but it is unclear whether they represent distinct species or subspecies, or comprise a single morphologically variable species. Resolving this complex would require additional studies that are beyond the scope of the present study, which is primarily aimed at describing two new, endangered species from the Comoros archipelago mentioned above. A revision of the genus at the scale of the western Indian Ocean region is necessary to clarify species limits within *Erythroxylum*, which would require a significant effort considering the large amount of material available in various herbaria. For the time being, we have opted to apply the name *E. corymbosum* to the material from the Comoros archipelago that is already labeled as such, but we reiterate that future taxonomic work could result in the recognition of several entities.

Notes on Mount Choungi

This isolated basaltic cone located in the southern part of Mayotte, culminating at 584 m in elevation, is characterized by steep slopes, combined with the presence of rocky outcrops. It receives a high level of precipitation (above 2000 mm annually) and is frequently exposed to windy conditions, a unique combination on the island. Due to the singularity of this landscape, the summit area of Mount Choungi harbors a hygrophilous submontane shrubland, a unique vegetation type on Mayotte, to which at least five species are strictly endemic: *Cassipourea ovata* Tul., *Eugenia choungiensis* Byng & N.Snow, *Psiadia pascalii* Labat & Beentje, *Syzygium labatii* Byng & N.Snow, and *Erythroxylum choungiense* sp. nov. Moreover, this figure could increase or decrease in the future as additional species endemic to Mayotte are discovered and/or as new collections are made in Madagascar of species previously thought to be restricted to Mayotte. *Noronhia cordifolia* (Labat, M.Pignal & O.Pascal) Hong-Wa & Besnard, for instance, was long considered a strict endemic to the summit of Mount Choungi, but recent collections from Madagascar were determined to belong to this species. The presence in Madagascar of this species, as well as others known on Mayotte only from Mount Choungi (but not necessarily endemic to the island), is not surprising given that similar habitats occur on these neighboring islands. Moreover, it is estimated that 145 of the 663 native species currently known from Mayotte are restricted to the Comoros archipelago, the Seychelles, and/or Madagascar, confirming that there is a strong Malagasy component in the Mayotte flora (Barthelat 2019). Among these 145 shared species, 10 are known on Mayotte only from Mount Choungi: *Buxus madagascarica* Baill., *Cynorkis galeata* Rchb.f., *Habenaria incarnata* Rchb.f., *Ivodea choungiensis* Labat, M.Pignal & O.Pascal, *Jumellea arborescens* H.Perrier, *Malleastrum depauperatum* (Baill.) Leroy, *Monoporus bipinnatus* (Baker) Mez., *Peponidium humbertianum* (Cavaco) Razafim., Lantz & B.Bremer, *Securinega durissima* J.F.Gmel., *Sirochloa parvifolia* (Munro) S.Dransf. Several additional species present in the Seychelles and/or Madagascar recorded on Mayotte only from Mount Choungi are also present in mainland Africa, such as *Microcoelia aphylla* (Thouars) Summerh. and *Rapanea melanophloeos* (L.) Mez.

As an isolated cone in Mayotte's landscape, Mount Choungi is a popular destination for hikers and tourists, who regularly climb to its summit using the small path that traverses the forest at its base, which is publicly owned and is managed by the French *Office national des Forêts* (ONF), and is thus patrolled by the *Police de l'Environnement* (environmental police force). Access to the summit area is, however, not regulated and no protective measures have been implemented, such as demarcation of the path or of the area to accommodate the public at the summit. Pressure from touristic activities thus represents the main threat to the vegetation in summit area of Mount Choungi, which comprises a polygon of *c.* 1 ha, where slight erosion is induced by repetitive stamping of the ground, and where there is a decline in the general quality of habitat and a significant risk of human-induced fire. Projects are currently being undertaken to establish a clear path to the summit and perhaps also an accessible area for the public, as well as the installation of signs and the development of guided visits about the significant biodiversity of this singular landscape.

A protected area was created in May 2021 (as a "*Réserve naturelle nationale*"), which includes an large part of the remaining forests located on Mayotte's main ridges, including Mount Choungi. These measures contribute to the protection of this unique habitat and will help ensure the survival of the five strictly endemic plant species (Viscardi *et al.* 2013).

MATERIAL AND METHODS

Herbarium material was examined at MAO, MO, and P (Thiers, updated continuously), as well as images of types deposited at other institutions available through the JSTOR Global Plants website [http://plants.jstor.org]. Measurements of leaf sizes were made using the Annotate-on software version 1.7.37 (https://www.recolnat.org/fr/annotate), a powerful image annotation tool for the natural sciences that enables physical measurements from digitized images of herbarium specimens, zoological and paleontological samples, and other digitized objects. The format of the descriptions presented below follows those in other papers describing new species in *Erythroxylum* (e.g., Loiola & Sales 2008). All specimens cited have been seen. Information provided on distribu-

Key to the species of *Erythroxylum* P.Browne in the Comoros Islands

1. Leaves widely obovate, the apex usually emarginate and mucronulate ..... *E. platyclados* Bojer
— Leaves ovate to elliptic, rarely obovate, the apex usually apiculate or acute, never emarginate 2

2. Leaf base cordate ..... *E. choungiense* E.Bidault, Traclet & M.Pignal, sp. nov.
— Leaf base cuneate or attenuate, never cordate 3

3. Stipules very small (0.5-1 mm long); leaf apex sometimes obtuse, often broadly and shortly cuspidate, very rarely distinctly acuminate, always retuse; inflorescences borne on axillary stalks 3-7 mm long; usually occurring in dry, coastal areas ..... *E. lanceum* Bojer
— Stipules larger (1-3 mm long); leaf apex distinctly and narrowly acuminate, sometimes retuse; inflorescences sessile or subsessile; occurring in humid, forested areas 4

4. Trees to 10-12 m tall; stipules early caducous (usually only visible in the 1 or 2 apical leaves), *c.* 3 mm long; inflorescences in groups of 3 or 4, usually 4-5-flowered ..... *E. elegans* Baill.
— Shrubs 1-4 m tall; stipules caducous (visible at least on the youngest portions of the stem), shorter (1-2 mm); inflorescences usually solitary, sometimes in groups of 2, 1-6-flowered 5

5. Leaves 2-6 × 1-2.5 cm; acumen ¼ to ⅓ of the total leaf length, apex minutely retuse; inflorescences 1-2(-3)-flowered, cataphylls rarely with nectary glands ..... *E. corymbosum* Boivin ex Baill.
— Leaves 4-10 × 1.5-3.5 cm); acumen 1/6 to 1/5 of the total leaf length, apex rounded; inflorescences 3-6-flowered, cataphylls often bearing a nectary gland ..... *E. labatii* E.Bidault & M.Pignal, sp. nov.

Clé des espèces d'*Erythroxylum* P.Browne aux Comores

1. Feuilles largement obovées, généralement émarginées et mucronées à l'apex ..... *E. platyclados* Bojer
— Feuilles ovales à elliptiques, rarement obovées, généralement apiculées ou aiguës à l'apex, jamais émarginées 2

2. Base de la feuille cordée ..... *E. choungiense* E.Bidault, Traclet & M.Pignal, sp. nov.
— Base de la feuille cunée ou atténuée, jamais cordée 3

3. Stipules très petites (0,5-1 mm de long) ; apex des feuilles parfois obtus, souvent largement et brièvement cuspidé, très rarement nettement acuminé, toujours rétus ; inflorescences axillaires portées par des pédoncules de 3 - 7 mm de long ; généralement en zones côtières sèches ..... *E. lanceum* Bojer
— Stipules plus grandes (1-3 mm de long) ; feuilles distinctement et finement acuminées, rétuses ou non ; inflorescences sessiles ou subsessiles ; en zones humides et boisées 4

4. Arbre jusqu'à 10-12 m de haut ; stipules précocement caduques (souvent seulement visibles aux 1-2 feuilles apicales), env. 3 mm de long ; inflorescences en groupes de 3-4, généralement de 4-5 fleurs ..... *E. elegans* Baill.
— Arbuste de 1-4 m de haut ; stipules moins précocement caduques (visibles sur toute la portion jeune de la tige), plus courtes (1-2 mm de long) ; inflorescences généralement solitaires, parfois groupées par 2, portant 1-6 fleurs 5

5. Feuilles 2-6 × 1-2,5 cm ; acumen entre ¼ et ⅓ de la longueur du limbe, échancré au sommet ; inflorescences de 1-2(-3)-fleurs, cataphylles rarement à glande nectarifère ..... *E. corymbosum* Boivin ex Baill.
— Feuilles plus grandes (4-10 × 1,5-3,5 cm) ; acumen entre 1/6 et 1/5 de la longueur du limbe, non échancré au sommet ; inflorescences à 3-6 fleurs, cataphylles souvent à glande nectarifère .... *E. labatii* E.Bidault & M.Pignal, sp. nov.

tion and habitat is based on specimen label data and field observations made by the second author. Geo-coordinates calculated post-facto, when needed, are mentioned in square brackets. Maps based on georeferenced specimen data were generated using the ArcGis software.

A preliminary risk of extinction assessment was performed for each species using the IUCN Red List categories and criteria (IUCN 2012; IUCN Standards and Petitions Committee 2019). The geographical parameters of Area of Occupancy [AOO] and Extent of Occurrence [EOO], estimated using a 2 × 2 km grid, were calculated using GeoCAT (Bachman *et al.* 2011).

SYSTEMATICS

Family Erythroxylaceae Kunth
Genus *Erythroxylum* P.Browne

1. *Erythroxylum choungiense*
E.Bidault, Traclet & M.Pignal, sp. nov.
(Figs 1; 2)

Ab aliis speciecibus Erythroxylorum *Insulae Comorianae Madagascaraeque species nova facile differt conspicuis cordatis ad basem curvinervisque foliis (vs cuneata rectinervaque et angulos ad apicum).*

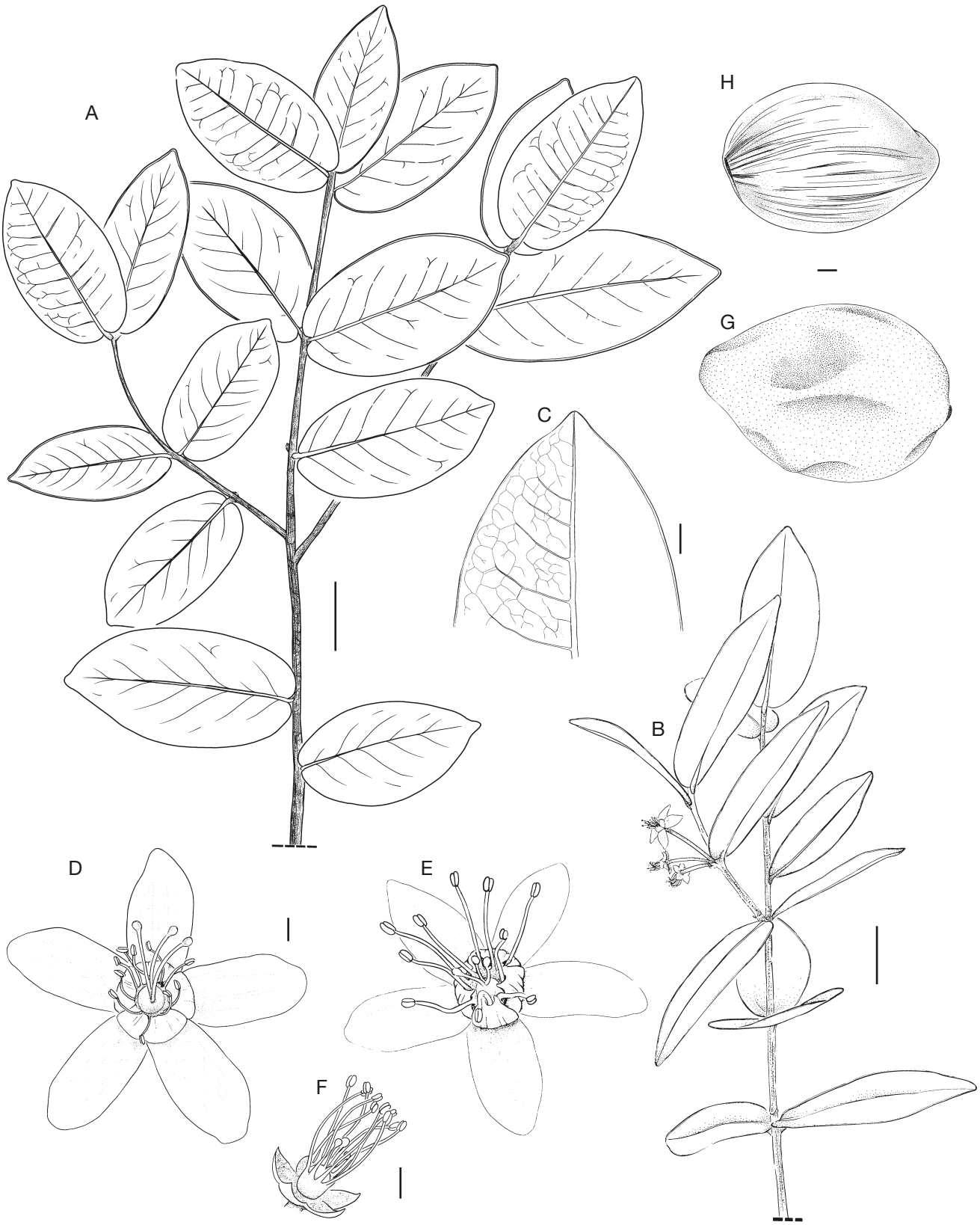


Fig. 1. — *Erythroxylum choungiense* E.Bidault, Traclet & M.Pignal, sp. nov.: **A**, habit (dry); **B**, habit (fresh); **C**, detail of leaf venation; **D**, long-styled flower; **E**, short-styled flower; **F**, short-style flower with corolla fallen; **G**, mature fruit; **H**, seed; **A**, **C**, **D**-**F**, *Guiot 03* (MAO), **B**, **G**, **H**, no voucher. Drawings by Ludivine Longou. Scale bars: A, B, 2 cm; C, 3 mm; D, E, 1 mm; F, 2 mm; G, H, 1 mm.

Fig. 2. — *Erythroxylum choungiense* E.Bidault, Traclet & M.Pignal, sp. nov.: **A**, habit; **B**, terminal leaves with red young leaves; **C**, long-styled flower; **D**, short-styled flowers; **E**, upper surface of leaves and immature fruits; **F**, mature fruit and seed; **G**, lower surface of leaves showing cordate base; **A**, **B**, **E**-**G**, photos by S. Traclet, **C**, **D**, photos by V. Guiot.

Typus. — **Mayotte**. Grande Terre, Kani-Kéli, Choungui, peu avant le sommet du Mont Choungui, 450 m, 12°57'25"S, 45°08'02"E, fl., fr., 30.XI.1997, *J.-N. Labat & O. Pascal 2920* (holo-, P[P00080562]!; iso-, G, K, MAO[MAO00616]!, MO, WAG).

Paratypi. — **Mayotte**. Grande Terre, Chirongui, Choungui, Mlima Choungui, fl., 16.XI.1995, *O. Pascal 209* (MAO[MAO01945]!; P[P00143108]!); fr., 29.XII.1995, *O. Pascal 286* (MAO[MAO01948]!; P[P00143107]!); 593 m, fl., 17.VI.1996, *O. Pascal 593* (MAO[MAO01944]!, P[P000780170]!); Réserve forestière de Choungui, fr., 28.XI.2002, *F. Barthelat, F. Melki & B. Ali Sifari 1100* (MAO[MAO00618]!; P[P00339177, P00339178]!; K; MO); 18.XI.2002, *F. Barthelat, P. Hoffman, H. Ralimanana. M. Mchangama & B. Ali Sifari 1084* (MAO[MAO00619]!; P[P00339195]!); 03.I.2004, *F. Barthelat, G. Viscardi & N. Parras 1260* (MAO[MAO00620]!; P[P00437926]!). — Grande Terre, Kani-Kéli, Choungui, sommet du Mlima Choungui, 500-640 m, 12°57'52"S, 45°7'55"E, fr., 30.XII.2000, *J.-N. Labat & F. Barthelat 3349* (MAO[MAO00617]!; P[P00209805]!); plateforme 2, fr., 09.IX.2014, *V. Guiot 3* (MAO[MAO00433]!); au-dessus du sentier avant le plateau dans le sous-bois, 537 m, 12°57'26.30"S, 45°08'02.18"E, st., 02.I.2019, *S. Traclet & A. Abdallah 591* (MAO[MAO02187]!; P[P000780169]!); plateforme (point de vue) du sentier qui monte au padza, 504 m, 12°57'27"S, 45°08'02"E, fr., 02.I.2019, *S. Traclet & A. Abdallah 593* (MAO[MAO02189]!; P[P000780168]!); 06.II.2019, *S. Traclet 651* (MAO[MAO02283]!; MO; P[P01069781]!); dans les pentes ouest avant de traverser le padza à fougères, 538 m, 12°57'25"S, 45°08'01"E, fr., 02.I.2019, *S. Traclet & A. Abdallah 598* (MAO[MAO02194]!; P[P000780167]!); pente à l'ouest du sentier montant au sommet, 533 m, 12°57'26"S, 45°08'02"E, fr., 06.II.2019, *S. Traclet 640* (MAO[MAO02272]; P[P000780166]!); 524 m, 12°57'26.20"S, 45°08'01.38"E, fr., 06.II.2019, *S. Traclet 645* (MAO[MAO02277]!; P[P000780165]!); 512 m, 12°57'27"S, 45°08'01"E, fr., 06.II.2019, *S. Traclet 652* (G; MAO[MAO02284]!; P[P01069782]!); 468 m, 12°57'28.87"S, 45°08'00.79"E, fr., 06.II.2019, *S. Traclet 653* (MAO[MAO02287]!; P[P01069783]).

Etymology. — The specific epithet refers to Mlima (Mount) Choungi, to which the species is endemic.

Habitat and distribution. — *Erythroxylum choungiense* sp. nov. is restricted to submontane nepheliphilous shrubland with *Buxus madagascarica* Baill. and *Olea capensis* subsp. *macrocarpa* (C.H.Wright) Verd. (Boullet 2005; Fadul 2011), where it occurs locally in a south-southwest oriented ravine, along with *Eugenia choungiensis* Byng & N.Snow, *Cynometra mayottensis* Labat & O.Pascal, *Cassipourea ovata* Tul., *Chionanthus cordifolius* Labat, Pignal & O.Pascal, et *Securinega durissima* J.F.Gmel. This species is only known from Mayotte island, at altitudes between 470 and 580 m. Only a single locality is known, near the top of Mount Choungi.

Phenology. — Flowering material has been collected in June (*Pascal 593*) and from November to December. Fructification starts at the end of November and extends through February, with a peak of fruit maturation at the end of January.

Conservation status. — *Erythroxylum choungiense* sp. nov. is endemic to Mayotte and known from 17 collections made between 1995 and 2019, only 10 of which provide precise geographical coordinates, although all of them came from the same area on Mount Choungi. These collections represent a single extant subpopulation, and while the total number of individuals has not been counted, the population size is estimated to exceed 50 individuals. Using a 2 × 2 km cell size, the AOO of this species is estimated to be 4 km², below the upper threshold for "Critically Endangered" status under Red List Criterion B2. Calculation of the EOO would yield a lower value than the AOO, so the EOO is therefore calculated to the AOO (4 km²), below the upper threshold for "Critically Endangered" status under Criterion B1. All occurrences are located within the recently created National Natural Reserve No. 328 (Réserve Naturelle Nationale des Forêts de Mayotte). The single subpopulation is nevertheless threatened by touristic activities, including uncontrolled hiking to the summit of Mount Choungi, which induces a decline in the quality of the habitat of this species. As a consequence, the 10 occurrences represent a single location (*sensu* IUCN 2012; IUCN Standards and Petitions Committee 2019) with respect to the most serious plausible threat (touristic activities). Based on this threat, we infer a past, current and a future continuing decline in the extent and the quality of its habitat. This species is thus assessed as Critically Endangered [CR B1ab(iii)+2ab(iii)].

Description

Shrub to 3 m tall, densely branched, with numerous short branches. Branches 2-5 mm in diameter, arranged alternately, silver-brown, finely striated; branches vinous when young, with numerous, elongated, yellowish lenticels 0.8-1.8 mm long; internodes 2-24 mm long on short branches. Cataphylls scarce, restricted to the youngest portion of stems, usually by 2(or 3) in the 1-2.5 cm portion of stem above each leaf, triangular, symmetrical, 1.8-2.2 × 2-2.4 mm, with two conspicuous longitudinal straight wings and a third wing between the two others, only visible in the apical half. Stipules caducous, often present on youngest leaves, 2-2.5 × 2-1.2 mm, triangular, asymmetrical, the longest margin to 2 mm, the shortest to 1.2 mm, apex joining the opposite stipule, base thickened, keel winged, straight, margins entire. Petiole 1.5-2.5 × 0.7-1 mm, subterete. Leaf blade (28-)45-60(-85) × (14-)22-29(-42) mm, chartaceous, usually ovate to elliptic, rarely obovate, base cordate, margins slightly revolute, apex acuminate, acumen rounded, 1-3 mm long, blade red when immature, discolorous when mature, medium-green (silver-green when dry) adaxially, light green (light brown to ochre when dry) abaxially, the midrib lighter green to yellow (prominent when dry) adaxially, prominent abaxially, 8-11 secondary veins per side, regularly arched, most evident on lower leaf surface. Inflorescences comprising 1- to 4-flowered fascicles borne in the axils of cataphylls; bracteoles 3-4, c. 1.2 mm long, triangular, concave. Flowers borne on a pedicel 10-13 mm long. Calyx: 2-3.5 mm high, 4-7 mm wide; lobes 5, 2-2.5 × 1.5-1.8 mm, triangular to rounded, apex acuminate, united for about one fourth of their length. Petals white, oblong, 4.5-5 × 2-2.5 mm, slightly recurved at anthesis, finely striated; ligule 1.5-2 mm, oriented towards the center of the flower, margin undulate, 2-lobed, the lobes triangular. Staminal cup smaller than calyx, margin entire. Short-styled flowers: stamens white subequal, 5.5-6 mm long; anthers 0.7 × 0.7 mm, suborbicular; styles 3, 3-3.2 mm long, free. Long-styled flowers: stamens white, unequal, antisepalous filaments 3.8-4 mm long; antipetalous filaments 3-3.5 mm long; anthers 0.7 × 0.7 mm, suborbicular; styles 3, 5.5-6 mm long, free. Fruit a drupe, green to orange with longitudinal red lines to red, 9-12 × 6-9 mm when mature, ovoid, pointed at apex, surface smooth; pedicel 11-16 mm long. Seed similar in shape, 7-10 × 5-6 mm when mature, finely striated longitudinally.

2. ***Erythroxylum labatii*** E.Bidault & M.Pignal, sp. nov. (Figs 3; 4)

E. nossibeensi *Baill. similis, sed folia eceracea et paullo revoluta, pedicelli longiores (0.8-1.3 vs 0.35-0.5 cm), et cataphylla glabra, plerumque cum glandula nectarifera (vs papillosa villosa et rare glandula nectarifera) praecipue differt.*

Typus. — **Union of the Comores**. Mohéli, Miringoni, Voundrouvou, Chalet Saint Antoine, 660 m, 12°17'17"S, 43°39'50"E, fl., fr., 24.XI.1999, *J.-N. Labat, I. Yahaya, E. Daroueche, M. Djoubieri & M. Mindhiri 3212* (holo-, P[P00184110]!; iso-, CNDRS, MO).

Paratypi. — **Union of the Comores**. Mohéli [Mwali], au-dessus de Drondroni, 688 m, 12°19'06"S, 43°42'39"E, fl., 27.III.2011, *E. Bidault, I. Yahaya, G. Viscardi & C. Loup 63* (HKM; P[P00852574]!]); 650 m, 12°19'17"S, 43°42'24"E, fl., 26.III.2011, *C. Loup, E. Bidault, I. Yahaya & G. Viscardi 598* (HKM; MAO; P[P00852657]!); centre, forêt du Mont Kimbouana, 700 m, [12°19'30"S, 43°42'45"E], fr., 27.II.1975, *J.-J. Floret 1214* (P[P00213746]!); ouest, ouest du chalet Saint Antoine, 600 m, [12°17'04"S, 43°39'33"E], fr., 28.II.1975, *J.-J. Floret 1239*, P[P00213747]!; Mohéli [Mwali], Miringoni, Mdawnyombe, Chalet Saint Antoine, 688 m, 12°17'18"S, 43°39'51"E, fl., 29.V.2006, *J.-N. Labat, I. Yahaya & A. Abdou 3734* (CNDRS; P[P00527372]!]); piste entre Miringoni et le chalet Saint Antoine, 610 m, 12°17'24"S, 43°39'43"E, fl., fr., 4.XI.2008, *G. Rouhan & M. Pignal 899* (G; MO; P[P00684874]!). — Grande Comore [Ngazidja], fl., V.1850, *L.H. Boivin s.n.* (P[P00213749]!); au-dessus d'Idjikunzi, 885 m, 11°43'56"S, 43°24'48"E, fl., fr., 5.IV.2011, *E. Bidault, I. Yahaya, Ramadouane & C. Loup 138* (HKM; MO; P[P00852628]!); Mawéni, massif de la Grille, versant ouest, 1 km est de Maouéni, 800 m, [11°27'52"S, 43°19'55"E], fl., 9.II.1975, *J.-J. Floret 814* (P[P00213728]!); 1016 m, 11°28'25"S, 43°20'43"E, fl., fr., 8.VI.2006, *J.-N. Labat, I. Yahaya & A. Abdou 3787* (CNDRS; K; MO; P[P00527415]!); versant Est du Karthala, Idjikoundzi, 1301 m, [11°44'12"S, 43°24'25"E], fl., fr., XII.2008, *M. Charahabil, M. Chaharmane & M. Younoussa 34* (CNDRS; P[P00577868]!); Gamambili, village Batu, [*c.* 11°30'00"S, 43°21'40"E], fl., 20.IX.1984, *C. Loup 48* (P[P00213729]!).

Etymology. — The specific epithet honours our friend and colleague Pr. Jean-Noël Labat (1959-2011), who served as Botany team leader at the *Muséum national d'Histoire naturelle* in Paris. Jean-Noël devoted particular attention to the exploration of the floristic diversity of the Comoros islands and made a very significant contribution to our taxonomic knowledge of several families in the archipelago. He also initiated the programme entitled "*Connaître pour conserver : le patrimoine naturel caché des Comores*" (2008-2011), which allowed him, as well as the first and last authors and numerous colleagues, to gather unique and invaluable data on several groups from the Comoros, and which ultimately led to the establishment of the Comoros National Herbarium, inaugurated in 2011. Finally, Jean-Noël was responsible for more than 4500 high quality collections deposited in the Paris herbarium, with duplicates distributed in collections in Europe and around the world, many associated with field photographs, including the types of this species as well as *Erythroxylum choungiense* sp. nov., all of which represent an invaluable heritage on which taxonomic work is still being conducted and will likely reveal additional novelties in the years to come.

Habitat and distribution. — This species occurs in submontane dense humid forest on ridges, along with *Cyathea* sp., palms, and *Cynometra* sp. on Mwali (fide *Labat 3212*) and degraded submontane forest with *Ocotea* sp., *Polyscias* sp., *Weinmannia* sp. and *Olea* sp. on Ngazidja (fide *Labat 3787*), where it is found at altitudes between 600 and 1300 m above sea level.

Phenology. — Material with flowers and fruits have been collected between February and June, as well as in November and December.

Conservation status. — *Erythroxylum labatii* sp. nov. occurs on the islands of Mwali and Ngazidja and is known from 13 collections made between 1850 and 2011. Of these 13 collections, only one could not be precisely located (*Boivin s.n.* from Ngazidja). The 12 remaining collections represent 12 occurrences and two or three extant subpopulations, having been sampled in 2011 (on both Ngazidja and Mwali). While the total number of individuals has not been counted, the population size is estimated to exceed 50 individuals as the label data associated with several collections indicate that the species is common. Using a 2 × 2 km cell size, the AOO of this species is estimated to be 28 km^2 and the EOO is calculated as 429 km^2, both below the upper threshold for "Endangered" status under Red List criteria B2 and B1, respectively. No occurrences are located within protected areas, and they are all threatened by small scale agriculture and deforestation for the production of firewood, largely occurring on both Ngazidja and Mwali. On Mwali, cultivation of crops such as bananas was observed at an elevation of *c.* 600 m a.s.l. in 2011 (EB pers. obs.) and is presumed to have persisted since then. On Ngazidja, the Massif de la Grille has largely been degraded due to wood harvesting, whereas the Karthala forest is experiencing less pressure from wood harvesting but its extent and quality are still declining due to the same reasons. Moreover, it is not clear whether the absence of collections of this species from below 600 m a.s.l. reflects an ecological preference for higher elevation sites or the fact that most of the forest below this elevation has been severely degraded on both Mwali and Ngazidja. Both of the main threats induce a decline in the quality of the habitat of this species. As a consequence, the 12 occurrences represent 4 locations (*sensu* IUCN 2012; IUCN Standards and Petitions Committee 2019), with respect to the most serious plausible threat (small-scale agriculture). Based on this threat, we infer a past, current and a future continuing decline in the extent and the quality of its habitat. *Erythroxylum labatii* sp. nov. is thus assessed as Endangered [EN B1ab(iii)+2ab(iii)].

Description

Slender shrub or small tree to 5.5 m tall, densely branched, with plagiotropic branches. Branches 1.5-3.5 mm in diameter, arranged alternately, silver-brown, finely striated; branches darker when young, with lenticels numerous, elongated, yellowish, 0.5-1.2 mm long, denser and longer on old stems (to 3 mm); internodes 2.5-17 mm long on short branches. Very young portion of stem quadrangular with a rugose yellow face prior to the formation of lenticels. Cataphylls caducous, scarce on the youngest portion of stems, usually by 3-5(7) in the 1-2.5 cm portion of stem above each leaf, distichally arranged, triangular, thick, symmetrical, (1.2-)1.5 × 2-2.5 mm, with two conspicuous longitudinal straight wings forming a canalicule, an additional third wing, in between the two main wings, only visible on the apical half, often with a basal median extra-floral nectary, in between the two conspicuous longitudinal wings. Stipules caducous, often present at the base of youngest leaves, 1.5-1.8 × 0.8 mm, asymmetrically triangular, the longest margin to 2 mm, the shortest to 1.2 mm, apex joining the opposite stipule, base thickened, keel winged, straight, margins entire. Petiole 2-3 × 1-1.2 mm, straight, subterete to terete. Leaf blade (43-)58-74(-90) × (12-)22-28(-36) mm, papyraceous, usually ovate to elliptic, base rounded, margins very slightly revoluted, apex acuminate, acumen straight to curved, (3-)6-17 mm long, rounded, sometime slightly acute, blade red when immature, discolorous after, dark brown adaxially when

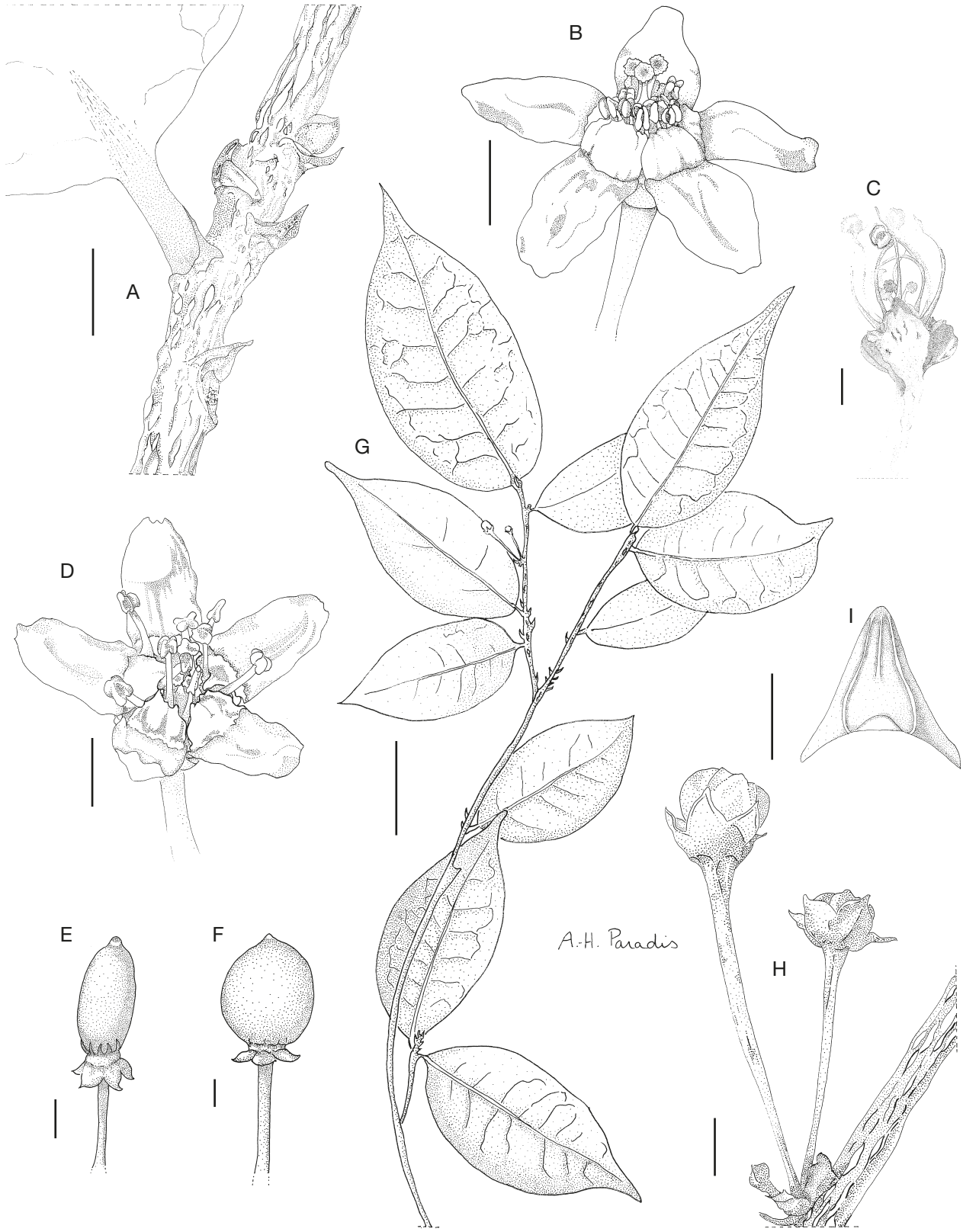


Fig. 3. — *Erythroxylum labatii* E.Bidault & M.Pignal, sp. nov.: **A**, detail of stem; **B**, long-styled flower; **C**, short-styled flower with corolla fallen; **D**, short-styled flower; **E**, immature fruit; **F**, mature fruit; **G**, habit, dry; **H**, detail of inflorescence with flower buds; **I**, detail of cataphyll, abaxial side; **A**, **C**, **G**-**I**, *Labat et al. 3212* (P); **B**, **D**, *Bidault et al. 63* (P); **E**, **F**, *Labat et al. 3787* (P). Drawings by Anne-Hélène Paradis. Scale bars: A, B, 2 mm; C, 1 mm; D, 2 mm; E, F, 3 mm; G, 2 cm; H, 2 mm; I, 1 mm.

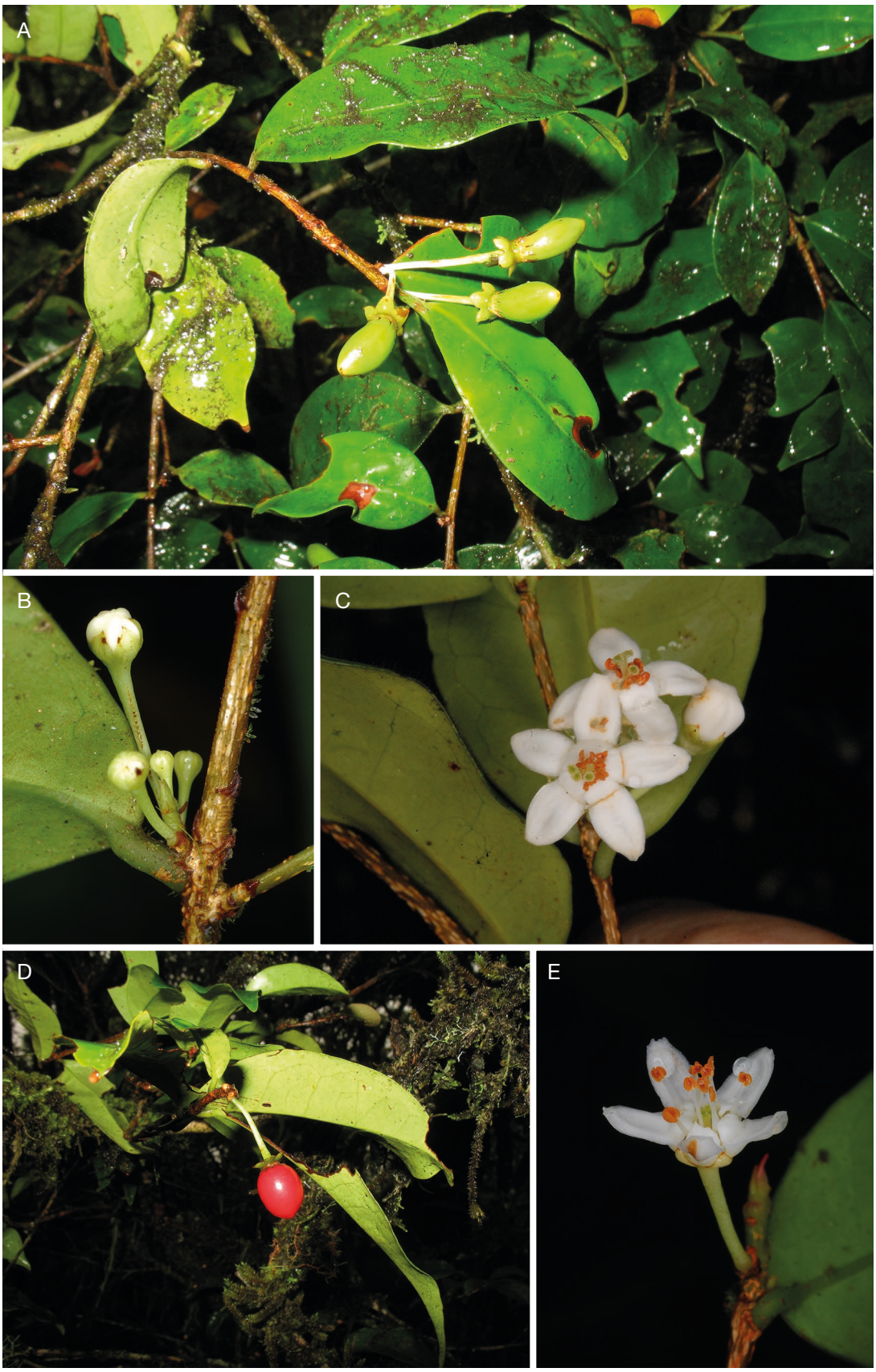


Fig. 4. — *Erythroxylum labatii* E.Bidault & M.Pignal, sp. nov.: **A**, stem and immature fruits; **B**, inflorescence with flower buds and stem portion with cataphylls; **C**, long-styled flower; **D**, mature fruit; **E**, short-styled flower; **A**, **D**, photos by J.-N. Labat, **B**, **E**, photos by E. Bidault, **C**, photo by G. Viscardi.

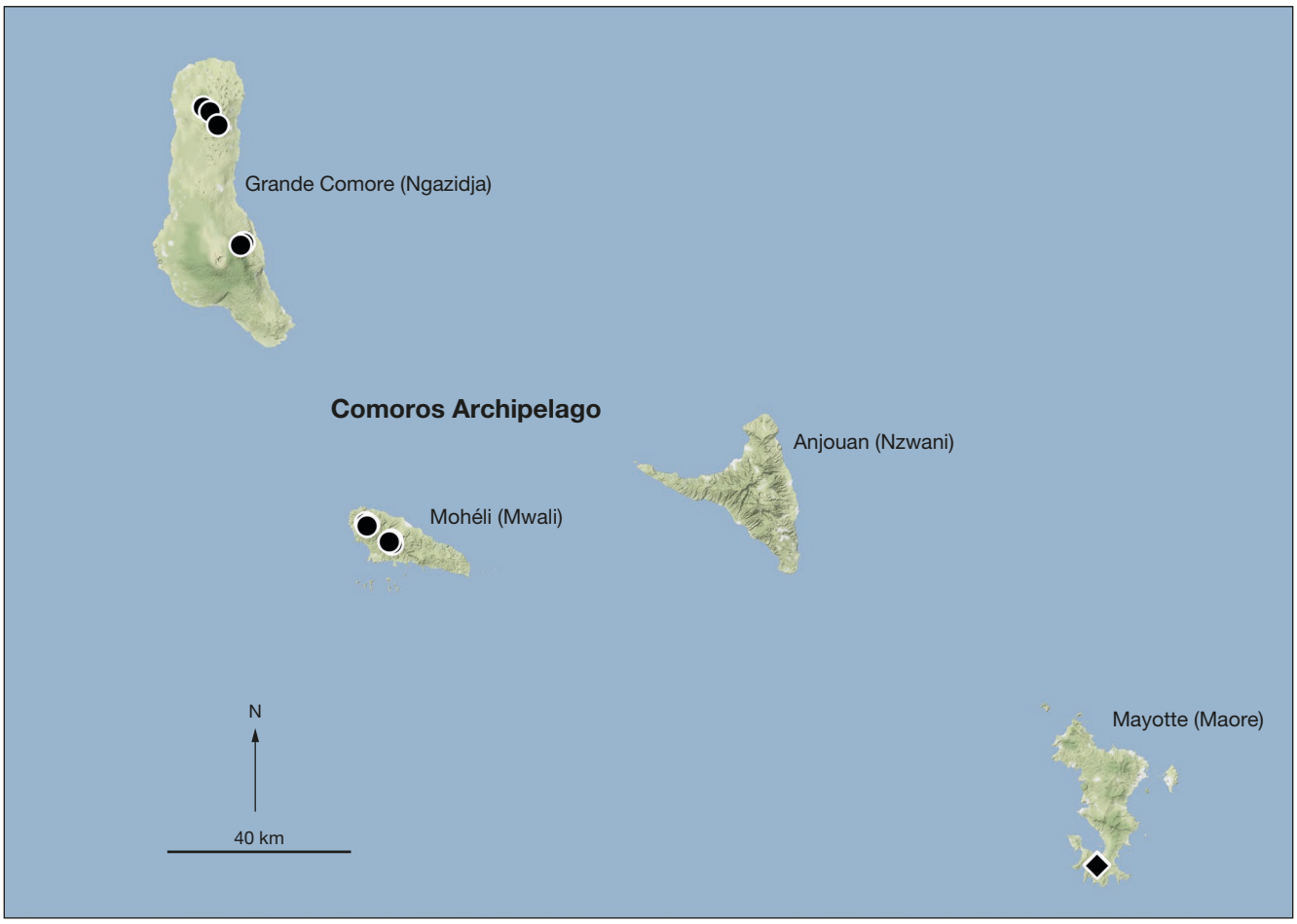


Fig. 5. — Distribution of *Erythroxylum choungiense* E.Bidault, Traclet & M.Pignal, sp. nov. (◆) and *E. labatii* E.Bidault & M.Pignal, sp. nov. (●) in the Comoros archipelago.

dry, light brown abaxially when dry, the midrib slightly prominent at base abaxially, 7-9 secondary veins on each side, most evident on lower leaf surface, forming an angle of (56°-)66°-74°(-86°) with the midrib. Inflorescences a sessile cyme, 1-3(-6)-flowered, borne in the axil of cataphylls in the distal part of the stem; bracteoles triangular, concave, 1 × 0.6-0.7 mm. Flowers: pedicel 9-15 mm. Calyx, 2.1 mm high and 3.8-4.2 mm wide; lobes, 5, 1.8 × 1.1 mm, triangular or rounded, united for about one third to half of their length. Petals white, narrowly obovate, 3.5-5 × 1.7-2 mm, not fully spread at anthesis, slightly constricted at its third, keeled at the upper half; ligule 1.5-2 mm, oriented towards the center of the flower, margin undulate, 2-lobed. Staminal cup smaller than calyx, margin entire. Stamen white, basifix. Short-styled flowers: stamens subequal, 4-4.5 mm long; anthers 0.8 × 0.8 mm, suborbicular, lobate at base ; styles 2 mm long, free. Long-styled flowers: stamens subequal, 2-2.2 mm long; anthers 0.5-0.7 × 0.9-1 mm, suborbicular; styles (2-)3, 3.7-4.2 mm, usually fused, sometimes 1 free and 2 attached up to the base of the stigmas. Fruit a drupe, green to bright red with longitudinal darker lines, 9-14 × 5-6 mm when mature and dry, ovoid, pointed at apex, surface smooth; pedicel 11-17 mm long. Seeds not seen.

Acknowledgements

This paper draws in part on the results of collaborative work conducted under the Memorandum of Understanding between the Missouri Botanical Garden (MBG) and the *Conservatoire botanique national de Mascarin* in Mayotte (CBNM). Financial support was provided by the BEST RUP program "*Promouvoir la conservation et l'utilisation durable de la Biodiversité et des Services écosystémiques dans les Régions ultra-périphériques* (RUP)" as part of the project entitled "BEST RUP 2483 : *Connaissance et conservation de la flore méconnue et menacée de Mayotte*" coordinated by CBNM (2018-2019). The authors wish to thank the collectors and co-collectors of the two species treated in the present paper, especially O. Pascal, F. Barthelat, C. Loup, V. Guiot, A. Dimassi, I. Yahaya, G. Rouhan, who tirelessly explored the flora of the Comoros and documented many taxonomic novelties. The first author thanks G. Viscardi, for welcoming him for six months in 2009 and providing training in the exploration and conservation of the flora of Mayotte. We also thank our colleagues from the MAO, MO and P herbaria for their help. MNHN (P) provides access to its collections through the RÉCOLNAT national Research Infrastructure (ANR-11-INBS-0004). Many thanks go to Ludivine Longou (MNHN-CNRS, Unité Mixte de Service 2700 2AD, atelier

iconographie scientifique) and Anne-Hélène Paradis (Africa and Madagascar Department, Missouri Botanical Garden) for their wonderful line drawings. Pete Lowry (MBG) and Fabien Barthelat are warmly thanked for helping to improve an earlier version of this manuscript, as well as Jacques Florence for correcting the Latin diagnoses.

REFERENCES

Bachman S., Moat J., Hill A. W., Torre J. de la & Scott B. 2011. — Supporting Red List threat assessments with GeoCAT: Geospatial conservation assessment tooL. *ZooKeys* 150: 117-126. https://doi.org/10.3897/zookeys.150.2109

Barthelat F. 2019. — *La flore illustrée de Mayotte*. Biotope ; Muséum national d'Histoire naturelle, Mèze; Paris, 688 p. (Inventaires et biodiversité; 15).

Bosser J. & Morat P. 2001. — Contribution à l'étude des Orchidaceae de Madagascar et des Mascareignes. XXXI. Espèces et combinaisons nouvelles dans les genres *Oeceoclades*, *Eulophia* et *Eulophiella*. *Adansonia*, sér. 3, 23 (1): 7-22.

Boullet V. 2005. — *Aperçu préliminaire de la végétation et des paysages végétaux de Mayotte, Mayotte biodiversité et évaluation patrimoniale. Mémoire Annexe 1. Contribution à la mise en œuvre de l'inventaire Z.N.I.E.F.F.* Collectivité Départementale de Mayotte, DAF Mayotte et Conservatoire botanique national de Mascarin, 160 p. + annexes et mémoires.

Byng J. W., Barthelat F., Snow N. & Bernardini B. 2016. — Revision of *Eugenia* and *Syzygium* (Myrtaceae) from the Comoros archipelago. *Phytotaxa* 252 (3): 163-184. https://doi.org/10.11646/phytotaxa.252.3.1

Cheek M. & Traclet S. 2020. — *Gymnosiphon mayottensis* Cheek, sp. nov. (Burmanniaceae) a new species from Mayotte, Comoro Islands. *Adansonia*, sér. 3, 42 (8): 179-188. https://doi.org/10.5252/adansonia2020v42a8. https://sciencepress.mnhn.fr/en/periodiques/adansonia/42/8

Costa-Lima J. L. da & Alves M. 2013. — A new species of *Erythroxylum* (Erythroxylaceae) from the Brazilian Atlantic Forest. *Phytotaxa* 141 (1): 55. https://doi.org/10.11646/phytotaxa.141.1.4

Costa-Lima J. L. da, Loiola M. I. B. & Alves M. 2014a. — A new species of *Erythroxylum* (Erythroxylaceae) from northeastern Brazil. *Brittonia* 66 (1): 60-64. https://doi.org/10.1007/s12228-013-9309-x

Costa-Lima J. L. da, Loiola M. I. B. & Jardim J. G. 2014b. — Erythroxylaceae no Rio Grande do Norte, Brasil. *Rodriguésia* 65 (3): 659-671. https://doi.org/10.1590/2175-7860201465306

Daly D. 2004. — Erythroxylaceae, *in* Smith N., Mori S. A., Henderson A., Stevenson D. W. & Heald S. V. (eds), *Flowering Plants of Neotropics*. The New York Botanical Garden; Princeton University Press, New York: 143-145.

Daniel T. F. 2014. — Taxonomy of *Anisotes* Nees (Acanthaceae: Justicieae) in the Comoros Archipelago and a preliminary List of Acanthaceae in the Islands. *Candollea* 69 (1): 45-54. https://doi.org/10.15553/c2014v691a5

Descoings G. 2007. — Vitacées nouvelles de Madagascar et des Comores. *Journal de Botanique* 39: 17-35.

Du Puy D. J. & Labat J.-N. 1996a. — New taxa and nomenclatural changes in *Rhynchosia* Lour. and *Eriosema* (DC.) Reichb. (Leguminosae-Papilionoideae-Phaseoleae) from Madagascar and the Comoro Islands. *Bulletin du Muséum national d'histoire naturelle. 4ème série, Section B, Adansonia* 18 (1-2): 85-96. https://www.biodiversitylibrary.org/page/13740253

Du Puy D. J. & Labat J.-N. 1996b. — New species of *Erythrina* and *Mucuna* (Leguminosae-Papilionoideae-Phaseoleae) from Madagascar and the Comoros. *Bulletin du Muséum national d'histoire naturelle. 4ème série, Section B, Adansonia* 18 (3-4): 225-234. https://www.biodiversitylibrary.org/page/13740397

Ellert A. 2006. — *Aloe alexandrei*. A surprisingly unknown new species from the island of Grande Comore. *Cactus and Succulent Journal* 78 (1): 10-14. https://doi.org/d25m8j

Emche S. D., Zhang D., Islam M. B., Bailey B. A. & Meinhardt L. W. 2011. — AFLP phylogeny of 36 *Erythroxylum* species: genetic relationships among *Erythroxylum* species inferred by AFLP analysis. *Tropical Plant Biology* 4 (2): 126-133. https://doi.org/10.1007/s12042-011-9070-9

Fadul R. 2011. — Typologie descriptive des habitats naturels de Mayotte – Outil de connaissance et de conservation du patrimoine naturel végétal. Rapport final pour le compte de la DEAL de Mayotte, CBNM, 87 p.

Friedmann F. 1987. — 57. Erythroxylaceae, 51 Malvacées à 62 Oxalidacées, *in* Robert A., Bosser J & Ferguson I. (eds), *Flore des Mascareignes : La Réunion, Maurice, Rodrigues*. MSIRI, IRD & KEW: 1-7.

Friedmann F. 1998. — *Flore des Seychelles : dicotylédones*. Muséum national d'Histoire naturelle, Paris ; IRD Marseille, 663 p.

Friedmann F. 2011. — *Flore des Seychelles: dicotylédones.* Muséum national d'Histoire naturelle, Paris ; IRD Marseille, 663 p. (Faune et Flore tropicales ; 44).

Goldblatt P. & Manning J. 2010. — *Geosiris albiflora* (Geosiridoideae), a new species from the Comoro Archipelago. *Bothalia* 40: 169-171. https://doi.org/10.4102/abc.v40i2.208

Hoekstra P. H., Wieringa J. J. & Chatrou L. W. 2016. — A nonet of novel species of *Monanthotaxis* (Annonaceae) from around Africa. *PhytoKeys* 69: 71-103. https://doi.org/10.3897/phytokeys.69.9292

Hul S., Labat J.-N. & Pascal O. 1999. — Deux nouvelles espèces de Flacourtiaceae de l'Île de Mayotte dans l'Archipel des Comores. *Adansonia*, sér. 3, 20 (2): 263-269.

Humbert H. 1952. — *102e Famille. Érythroxylacées*. Paris, Firmin Didot: 1-52. (Flore de Madagascar et des Comores). https://www.biodiversitylibrary.org/page/10078655

IUCN 2012. — *IUCN red list categories and criteria, Version 3.1. Second edition.* Gland, Switzerland and Cambridge, UK.

IUCN Standards and Petitions Committee 2019. — *Guidelines for Using the International Union for Conservation of Nature Red List Categories and Criteria*. Prepared by the Standards and Petitions Committee.

Janssen T. & Rakotondrainibe F. 2008. — A revision of the indusiate scaly tree ferns (Cyatheaceae, *Cyathea* subgen. *Alsophila* sect. *Alsophila*) in Madagascar, the Comoros, and the Seychelles. *Adansonia*, sér. 3, 30 (2): 221-376.

Jara-Muñoz O. A. 2011. — Two new species of *Erythroxylum* (Erythroxylaceae) from Ecuador and Peru. *Brittonia* 63: 227-232. https://doi.org/10.1007/s12228-010-9155-z

Kainulainen K., Van Ee B., Razafindraibe H., Berry P. E. 2017. — A revision of the *Adenophorus* Group and other glandular-leaved species of *Croton* (Euphorbiaceae) from northern Madagascar and Mayotte, including three new species. *Candollea* 72: 371-402. https://doi.org/10.15553/c2017v722a15

Labat J.-N. & Pascal O. 1999. — Two new species of *Cynometra* (Fabaceae: Caesalpinioideae) from Mayotte in the Comoro Archipelago. *Kew Bulletin* 54 (1): 163-169. https://doi.org/10.2307/4111033

Labat J.-N., Pignal M. & Pascal O. 1997. — Une nouvelle espèce de *Labramia* (Sapotaceae) de l'Ile de Mayotte dans l'Archipel des Comores. *Adansonia*, sér. 3, 19 (2): 213-216.

Labat J.-N., Pignal M. & Pascal O. 1999. — Trois espèces nouvelles d'*Oleaceae* et note sur la présence d'*Olea capensis* dans l'Archipel des Comores. *Novon* 9: 66-72. https://doi.org/10.2307/3392121

Labat J.-N., Munzinger J. & Pascal O. 2001. — Une nouvelle espèce de *Nesogordonia* Baillon (Sterculiaceae) de Mayotte, Archipel des Comores. *Candollea* 55 (2): 293-296.

Labat J.-N. & Beentje H. 2003. — A new species of *Psiadia* (Compositae) from Mayotte. *Kew Bulletin* 58 (4): 971-975. https://doi.org/10.2307/4111211

Labat J.-N., Pignal M. & Pascal O. 2005. — Deux espèces nouvelles et une combinaison nouvelle chez les Rutaceae de l'Archipel des Comores. *Monographs in Systematic Botany from the Missouri Botanical Garden* 104: 361-369.

Labat J. N., El-Achkar E., & Rabevohitra R. 2006. — Révision synoptique du genre *Pyrenacantha* (Icacinaceae) à Madagascar. *Adansonia*, sér. 3, 28 (2): 389-404.

Labat J.-N., Bidault E. & Viscardi G. 2011. — Une nouvelle espèce de *Foetidia* (Lecythidaceae, sous-famille Foetidioideae) en danger critique d'extinction récemment découverte à Mayotte, archipel des Comores. *Adansonia*, sér. 3, 33 (2): 263-269. https://doi.org/10.5252/a2011n2a11

Loiola M. I. B. & Sales M. F. de 2008. — Two new species of *Erythroxylum* sect. *Rhabdophyllum* (Erythroxylaceae) from north-eastern Brazil. *Kew Bulletin* 63: 655-659. https://doi.org/10.1007/s12225-008-9077-z

Loiola M. I. B., Costa-Lima J. L., Mayo S. J., & Sales M. F. de 2015. — Nomenclatural notes on *Erythroxylum* sect. *Rhabdophyllum* (Erythroxylaceae): new synonyms and lectotypifications. *Nordic Journal of Botany* 33 (4): 451-454. https://doi.org/10.1111/njb.00667

Lowry P. P., Pascal O. & Labat J.-N. 1999. — A new species of *Polyscias* (Araliaceae) from Mayotte, Comoro Islands. *Adansonia*, sér. 3, 21 (1): 67-73. http://www.biodiversitylibrary.org/page/56152618

Madagascar Catalogue 2021. — *Catalogue of the Vascular Plants of Madagascar.* Missouri Botanical Garden, St. Louis, U.S.A. & Antananarivo, Madagascar [http://www.efloras.org/madagascar. Accessed: September, 2021].

McPherson G. 2000. — *Drypetes* (Euphorbiaceae) in Madagascar and the Comoro Islands. *Adansonia* sér. 3, 22 (2): 205-209.

Miller J. S. 2003. — Classification of Boraginaceae subfam. Ehretioideae: resurrection of the genus *Hilsenbergia* Tausch ex Meisn. *Adansonia*, sér. 3, 25 (2): 151-189.

Mouly A. & De Block P. 2008. — A new species of *Coptosperma* (Rubiaceae) from the Comoro Islands and Madagascar. *Systematics and Geography of Plants* 78: 145-154. https://www.jstor.org/stable/20649760

Mouly A. 2009. — Les Rubiaceae émergentes de la canopée endémiques de l'archipel des Comores : affinités floristiques dans l'océan Indien et taxonomie. *Adansonia*, sér. 3, 31 (1): 197-206. https://doi.org/10.5252/a2009n1a14

Pailler T., Humeau L. & Thompson J. D. 1998. — Distyly and heteromorphic incompatibility in oceanic island species of *Erythroxylum* (Erythroxylaceae). *Plant Systematics and Evolution* 213: 187-198. https://doi.org/10.1007/BF00985199

Pascal O., Labat J.-N., Pignal M. & Soumille O. 2001. — Diversité, affinités phytogéographiques et origines présumées de la flore de Mayotte (Archipel des Comores). *Systematics and Geography of Plants* 71: 1101-1123. https://doi.org/10.2307/3668743

Pascal O. 2002. — *Plantes et forêts de Mayotte*. Muséum national d'Histoire naturelle, Paris, 116 p. (Patrimoines naturels ; 53).

Pignal M., Yockteng R., Hearn D. J., & Labat J. N. 2013. — *Adenia barthelatii* (Passifloraceae), a new endemic species of Mayotte and its phylogenetic status within the genus *Adenia*. *Phytotaxa* 99 (1): 40-48. https://doi.org/10.11646/phyto- taxa.99.1.3

Plowman T. C. 1983. — New species of *Erythroxylum* from Brazil and Venezuela. *Botanical Museum Leaflets* 29 (3): 273-290. https://www.jstor.org/stable/41762851

Plowman T. C. 1984. — New taxa of *Erythroxylum* (Erythroxylaceae) from the Amazon Basin. [Supl.] *Acta Amazonica* 14 (1/2): 117-143. https://doi.org/10.1590/1809-43921984145143

Plowman T. C. 1986. — Four new species of *Erythroxylum* (Erythroxylaceae) from northeastern Brazil. *Brittonia* 38: 189-200. https://doi.org/10.2307/2807336

Plowman T. C. 1987. — Ten new species of *Erythroxylum* (Erythroxylaceae) from Bahia, Brazil. *Fieldiana, Botany, new ser.,* 19: 1-41. https://doi.org/10.5962/bhl.title.2652

Plowman T. C. & Berry P. E. 1999. — Erythroxylaceae, *in* Steyermark J. A., Berry P. E., Holst B. & Yatskievych K. (eds), *Flora of the Venezuelan Guayana*. Missouri Botanical Garden Press, St. Louis: 59-71.

Plowman T. C. & Hensold N. 2004. — Names, types, and distribution of neotropical species of *Erythroxylum* (Erythroxylaceae). *Brittonia* 56: 1-53. https://doi.org/dndv4v

Rabarimanarivo M. N., Rakotonirina N. H., Phillipson P. B., Lowry P. P., Labat J. N. & Pignal M. 2015. — Révision du genre *Ivodea* Capuron (Rutaceae), endémique de Madagascar et de l'archipel des Comores. *Adansonia*, sér. 3, 37 (1): 63-102. https://doi.org/10.5252/a2015n1a6

Rogers Z. S., Malécot V. & Sikes K. G. 2006. — A synoptic revision of *Olax* L. (Olacaceae) in Madagascar and the Comoro Islands. *Adansonia*, sér. 3, 28 (1): 71-100.

Schatz G. E. & Lowry P. P. 2002. — A synoptic revision of the genus *Buxus* L. (Buxaceae) in Madagascar and the Comoro Islands. *Adansonia*, sér. 3, 24 (2): 7-19.

Stevens W. D., Labat J. N., & Barthelat F. 2016. — Two new species of Apocynaceae, Asclepiadoideae from Mayotte. *Candollea* 71 (1): 127-134. https://doi.org/10.15553/c2016v711a15

Stone R. D. 2006. — New species of *Memecylon* L. and *Warneckea* Gilg (Melastomataceae) from Madagascar and Mayotte. *Adansonia,* sér. 3, 28 (2): 337-358. http://www.biodiversitylibrary.org/page/11159906

The Plant List 2013. — Version 1.1. Published on Internet : http://www.theplantlist.org/ (access 19 September 2021).

Thiers B. M. (continuously updated). — *Index Herbariorum*. http://sweetgum.nybg.org/science/ih/

Traclet S., Dimassi A. & Valy N. 2018. — *Cartographie simplifiée de la végétation des presqu'îles de Saziley et Charifou*. CBNM, Rapport technique, version 2.2, 42 p.

Traclet S., Abdallah A., Mchindra A. & Dimassi A. 2019. — *BEST RUP 2483: Connaissance et conservation de la flore méconnue de Mayotte*. Version 2. Rapport bilan non publié, CBNM, 77 p. + annexes (29 p.).

Viscardi G., Guiot V., Mdere A., Duperron B., Picto F. & Gigord L. D. B. 2013. — *Identification des enjeux de conservation de la flore et des habitats du Mont Choungui*. Conservatoire Botanique de Mascarin & DEAL, 30 p. + annexes.

Wilkin P., Hladik A., Labat J. N. & Barthelat F. 2007. — A new edible yam (*Dioscorea* L.) species endemic to Mayotte, new data on *D. comorensis* R. Knuth and a key to the yams of the Comoro Archipelago. *Adansonia*, sér. 3, 29 (2): 215-228.

Wilmot-Dear C. M. & Friis I. 2004. — The Old World species of *Pouzolzia* (Urticaceae, tribus Boehmerieae). A taxonomic revision. *Nordic Journal of Botany* 24 (1): 62-64. https://doi.org/10.1111/j.1756-1051.2004.tb00825.x

Submitted on 2 February 2022;
accepted on 28 April 2022;
published on 5 September 2022.

View publication stats