Aloe Gautieri J.–P. Castillon & Nusb. (Xanthorrhoeaceae), a New Species from the Northeastern Coast of Madagascar

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Aloe gautieri J.-P. Castillon & Nusb. (Xanthorrhoeaceae), a new species from the northeastern coast of Madagascar

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Abstract

CASTILLON, J.-P. & L. NUSBAUMER (2014). Aloe gautieri J.-P. Castillon & Nusb. (Xanthorrhoeaceae), a new species from the northeastern coast of Madagascar. *Candollea* 69: 75-80. In English. English and French abstracts.

Aloe gautieri J.-P. Castillon & Nusb. *(Xanthorrhoeaceae, Asphodeloideae)*, a new species from the northeastern coast of Madagascar is described and illustrated. The new species is morphologically closely related to *Aloe fragilis* Lavranos & Röösli but differs in having paler flowers, more elongated racemes, ungrouped cauline leaves forming no compact rosette. The distribution, ecology and conservation status of the new species are presented along with a line drawing and colour pictures.

Key-words

XANTHORRHOEACEAE – *Aloe* – Northern Madagascar – Loky-Manambato – IUCN Red List – Conservation – Taxonomy

Résumé

CASTILLON, J.-P. & L. NUSBAUMER (2014). Aloe gautieri J.-P. Castillon & Nusb. (Xanthorrhoeaceae), une nouvelle espèce de la côte nord-est de Madagascar. *Candollea* 69: 75-80. En anglais, résumés anglais et français.

Aloe gautieri J.-P. Castillon & Nusb. *(Xanthorrhoeaceae, Asphodeloideae)*, une nouvelle espèce de la côte nord-est de Madagascar est décrite et illustrée. La nouvelle espèce est morphologiquement proche d'*Aloe fragilis* Lavranos & Röösli mais diffère par ses fleurs plus pâles, ses inflorescences plus allongées, par ses feuilles caulinaires espacées et sans rosette compacte. La distribution, l'écologie et le statut de conservation de la nouvelle espèce sont présentés ainsi qu'un dessin au trait et des photographies couleur.

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Aloe L. is a genus well-known by plant enthusiasts, and particularly succulent plant lovers. Aloes are perennial with leaves generally succulent and armed with thorns, and flowers with perianths including six segments, six stamens and with a superior ovary. *Aloe* is currently considered as part of the *Xanthorrhoeaceae* family (APG III, 2009), and the classification of the genus has undergone several changes during the past decades (Letsara & al., 2013). A recent proposal to conserve the family name *Asphodelaceae* will be evaluated during the next International Botanical Congress (Klopper & al., 2013). However, the precise delimitation of the genus is not as obvious as it may seem a priori. A recent publication divided the genus into four genera, and included the former African genus *Chortolirion* A. Berger (Grace & al., 2013). Fortunately, Malagasy *Aloe* do not seem to pose such generic level classification problems, the only major revision of their classification dates back to 1996 when the former genus *Lomatophyllum* Willd. (whose members are characterized by their berry-like indehiscent fruits) was included in the genus *Aloe*, inclusion justified by monophyly issues (Rowley, 1996).

All Malagasy *Aloe* are endemic to the "Red Island" with the exception of *A. massawana* subsp. *sakoankenke* (J.-B. Castillon) J.-B. Castillon that can be found in the wild in northern Madagascar, and which has probably been introduced from Africa. This makes Madagascar one of the three major hotspots for *Aloe* (the other two being South Africa and the Ethiopia-Yemen area). Since 2000, intensive collection effort in Madagascar led to the discovery of about 50 new species (not including the many other subspecies and varieties described), bringing to just over 120 the number of Madagascan species currently accepted. Many new species are still to be discovered and described, that will surely make Madagascar the richest country in the world for *Aloe*.

At the AETFAT congress in 2010 in Madagascar, JPC was searching for pictures of *A. capitata* var. *silvicola* H. Perrier; he and his father needed these photos for the book they were preparing on the Malagasy *Aloe* (Castillon & Castillon, 2010; Castillon & Castillon, 2011). Here, JPC heard about Laurent Gautier of the Conservatoire et Jardin botaniques de la Ville de Genève (CJB) who had made many botanical trips in several regions in North Madagascar (Manongarivo, Loky-Manambato, Ampasindava, Andavakoera, Montagne d'Ambre, etc.) with CJB's colleagues and their Malagasy partners from the Département de Biologie et Ecologie Végétale de l'Université d'Antananarivo (DBEV). After a first contact with him, LN provided JPC some photos of the *Aloe* found and collected during their trips: there were pictures of *A. capitata* var. *silvicola* that the first author was searching for, but, more interesting, there were also pictures of a small unknown *Aloe* from the Daraina area of Loky-Manambato region. The forest areas of this region present a complex topography and environmental gradients. These forests are at the meeting point of four important phytogeographical units entangled there and many new species were discovered in this underprospected region (for a review, see Nusbaumer & al., 2010). The following year, the first author decided to search for this new *Aloe* in the very interesting Loky-Manambato region. After several unsuccessful investigations, the plant was finally located in some forests of the region. Despite a clear relationship with *A. fragilis* Lavranos & Röösli (Lavranos & Röösli, 1994), it appears to be a new *Aloe* species described below:

Aloe gautieri J.-P. Castillon & Nusb., **spec. nova** (Fig. 1-2).

Typus: Madagascar. Prov. Antsiranana: sous-préfecture de Vohemar, commune rurale de Daraina, 8.III. 2003, fl., *Gautier, Wohlhauser & Nusbaumer 4272* (holo-: G [G00007131]!; iso-: P!, MO!, PRE, TAN, herbarium of Daraina).

Floribus, Aloe fragilis Lavranos & Roeoesli cognata est sed ab ista specie : habitu caulescente, caule 4 mm diam usque ad 35 cm longo, surculos emittente ad basim vel supra caulem; foliis alternis, raro rosulatis, brevioribus, tenuioribus (5 mm) et 5 mm crassis, basi planis postea canaliculatis, praecipue differt.

Plant perennial, herbaceous, caulescent growing in tuft, 8-15 stems per tuft; bulbils and roots on the lower leafless part of the stem; stem up to 35 cm long, 4 mm thick. *Leaves* up to 13 per stem, cauline, dispersed along the stem, spirally arranged, alternate, spreading, with sheath 1 cm long and with some reddish nerves; narrowly linear lanceolate, 5-14 cm long, 5 mm wide, ± 5 mm thick, apically ± obtuse with 2-4 white teeth; upper surface green, with many irregular white spots, generally flat at base and canaliculate higher up; lower surface convex with identical white spots; margin armed with small white teeth, 1 mm long, 1-5 mm apart; leaf exudate straw yellow on the fresh turning darker yellow when dry. *Inflorescences* simple, 1 per stem, 25-45 cm long, erect; peduncle slender and straight, green, 4 mm thick, the first half without sterile bracts, then 4-5 triangular acute bracts 6 × 4 mm, 3 cm apart, white, scarious, with a central brown nerve in the upper portion; raceme elongated 10-18 cm long, bearing 10-25 flowers loosely arranged and a tuft of sterile bracts at the top. *Floral bract* 5 × 3 mm, triangular, white, scarious, with a central greenish to maroon nerve, partly sheathing the pedicel. *Pedicel* 7-10 mm long, pink at base, becoming greenish white. *Flowers* slightly curved; perianth 25 × 4 mm, obconic at base to 3 mm, then nearly cylindrical, pink for the first 12 mm, then white with central green nerves at the apex. Outer *tepals* connate for half of the perianth length; filaments white, light yellow-green at the apex, curved above the ovary, then straight, included or as long as the perianth; style light yellow-green, included. *Ovary* 3 × 1.5 mm, olive-green. *Fruit*, a 6 × 5 mm globose and dehiscent green-grey capsule.

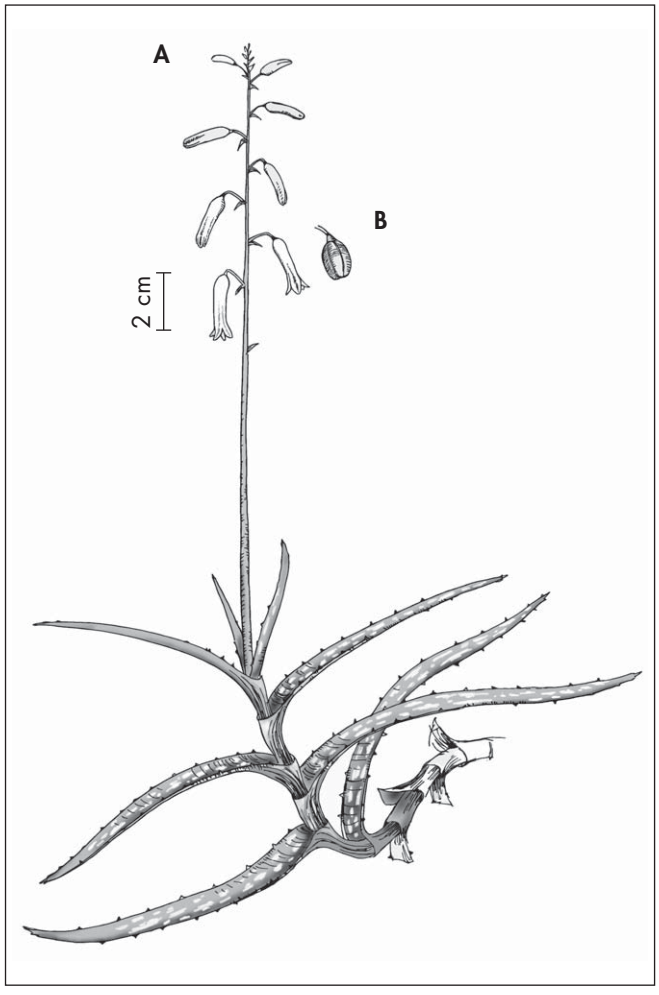

Fig. 1. – *Aloe gautieri* J.-P. Castillon & Nusb. **A.** Whole flowering plant; **B.** Fruit. [**A:** *Gautier & al. 4272,* G] [Drawing: C. Chatelain]

Phenology. – February to April.

Etymology. – This species is named in honour of Laurent Gautier who collected the type together with Sébastien Wohlhauser and LN. Laurent Gautier first gave some detailed information about the location of the type in the wild, and noticed the difficulty to relate this taxon to any known aloes. By his large knowledge of African and Malagasy tropical forests, taxonomy and ecological concepts, Laurent Gautier led and contributed largely to the success of the botanical research and conservation project of the Loky-Manambato region, the only place from where this new species is presently known.

Conservation status. – *Aloe gautieri* is assigned a preliminary status of Vulnerable (VU D2) following the IUCN Red List Categories and Criteria (IUCN 2012, calculation following Callmander & al., 2007 and performed with Moat, 2012). The new species has an "Extent of Occurrence" (EOO) of c. 100 km^2, an "Area of Occupancy" (AOO) of 27 km^2, and three subpopulations, only one of which is in the Loky-Manambato forests which holds a temporary protection status.

Notes. – The closest relative of this plant is undoubtedly *Aloe fragilis* (Fig. 3): the species has quite similar inflorescences but they are longer and more loosely arranged in *A. gautieri.* Many other differences between them can be related with ecological conditions: the colour of the leaves (green for *A. gautieri* vs. more reddish for *A. fragilis*) and of the flowers (paler, porcelain-coloured vs. more deeply pink coloured) might be the direct consequence of the habitat of both plants (undergrowth vs. in full sun), as well as their growth habit: elongated cauline spaced leaves vs. stemless compact rosette. Although *Aloe* species are known to be very sensitive to ecological conditions, and the same species can have very different morphologies under different conditions (Perrier de la Bâthie, 1926: 36), ex-situ cultivation plants of *A. fragilis* or *A. gautieri* keep their respective growth habit (compact for the first, stemmed for the second), even if they germinate in an unusual area (in a shady zone or in full sun).

Another morphologically closely related species, *Aloe guillaumetii* Cremers from Ambilobe, can be easily distinguished by its bigger size and its very succulent erect long leaves. These three species (or four if we include *A. capmanambatoensis* Rauh & Gerold, a bigger form of *A. fragilis*, which may be considered conspecific) have almost identical flowers and form a group of *Aloe* distinct from any other Malagasy *Aloe* species.

Aloe gautieri is remarkable in the fact that it is the only known species of Malagasy *Aloe* that only lives in shady dense dry forests, but that does not belong to the section *Lomatophyllum* G. D. Rowley (a probably monophyletic group of *Aloe* thriving in forest undergrowth). Other species may be found in dry forests, but they always prefer exposed rocky places. Only two other species of *Aloe* s. str. (excl. *Lomatophyllum*) live exclusively in forest undergrowth: *A. leandrii* Bosser near Andasibe, and *A. analavelonensis* Letsara, Rakotoar. & Almeda in the Analavelona massif near Toliara, in both cases in dense humid montane forest.

In dense forests, the conventional sexual reproduction of *Aloe* is limited by the lack of pollinators (insects, birds) and by the difficulty to disperse seeds (no wind in dense forests). Whereas the species of the section *Lomatophyllum* have skirted those difficulties by autocompatibility and zoo- and hydrochory, the three above-mentionned forest aloes have chosen another way and have promoted vegetative propagation. *A. leandrii* produces bulbils and has hard, wingless seeds; *A. analavelonensis* has anthers almost without pollen and, even by cross pollination or by hybridization, is very hard to fertilize. It's stemless and has a star configuration: a mature plant in the middle, from where offsets grow in all directions. These offsets do not grow under the central mature plant, but at the

Fig. 2. – *Aloe gautieri* J.-P. Castillon & Nusb. **A.** Inflorescence; **B.** Stem and leaves; **C.** Whole flowering plant; **D.** Detail of one flower, stamen and ovary. [**A:** *Ranirison 607,* G] [Photos: **A:** P. Ranirison; **B-D:** J.-P. Castillon]

apex of creeping stems 4-10 cm long. To the knowledge of the first author, this is the only *Aloe* species in Madagascar with this adaptation. *Aloe gautieri* has a long creeping stem at ground level. Buds appear anywhere on this stem, and produce ramifications with leaves at the apex. The plant extends by forming a net of creeping and rooted stems, each one terminated by cauline leaves. Only a few other *Aloe* species present such a strategy for spreading via vegetative propagation.

Distribution and ecology. – "In corruptis silvis, supra humu operta saxa , orientale litore; Antsirananae provincia; Prope Darainam vicum, inter nominata flumina Loky Manambatoque". The species is only known from three forest areas in the Daraina region between the Loky and Manambato rivers in northeast Madagascar. Only 45-50 individuals were observed among all these localities during a vegetation study of the region which included more than 54,000 records of plant occurrences in the ten main forest areas of the region over three

consecutive years from 2003-2006. *Aloe gautieri* was observed between 350 and 550 m above sea level, in primary dry, sclerophyllous, mesophilous or even on the margin of ombrophilous forest, as well as in degraded dry vegetation or as a small shrub on ridges, but always near or on granitic rocks with little soil substrate, resulting in a water deficit during a part of the year. The canopies of the forests where it occurs reach up to 11 m, with a sparse shrub and treelet layer at 6 m high, and a very sparse suffrutescent layer reaching 1 m high. The most frequent species recorded together with *Aloe gautieri* in forest vegetation surveys are, in decreasing abundance: *Mimusops cf. capuronii* var. *retusa* Aubrév., *Strychnos decussata* (Pappe) Gilg, *Rinorea longipes* (Tul.) Baill. and *Cleistanthus suarezensis* Leandri. When observed in degraded dry vegetation, the species occurring with *Aloe gautieri* are *Mascarenhasia lanceolata* A. DC., *Plectaneia thouarsii* Roem. & Schult. and *Peponidium cuspidatum* Arènes.

Paratypus. – **Madagascar. Prov. Antsiranana:** sous-préfecture de Vohemar, commune rurale de Daraina, fl., 9.IV.2004, *Ranirison 607* (G [G00028420]!, PRE, TAN).

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Fig. 3. – Living plant of *Aloe fragilis* Lavranos & Röösli at the type locality of Cap Manambato, near Iharaña (Vohemar). **A.** Inflorescence; **B.** Leaves. [Photos: J.-P. Castillon]

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