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gascar included in their sample, which is sister to *Heeria argentea* (Thunb.) Meisn. and *Micronychia macrophylla* H. Perrier (the only representatives sampled of these genera of 1 and 10 species, respectively), and another in which *Protorhus longifolia* from Africa is sister to the tropical African species *Ozoroa insignis* Delile, the only sampled member of this genus of c. 40 species (Kokwaro, 1986).

While Engler (1881) did not indicate a type when he described *Protorhus*, 70 years later Phillips (1951) designated *P. longifolia* as the lectotype. In light of the results of the molecular phylogenetic work of Pell et al. (2008), *Protorhus*, as previously circumscribed, is polyphyletic and the name thus cannot be applied to the Malagasy species. As no other generic name is available for the members of the clade comprising species in Madagascar, it must therefore be recognized as a new genus. In the present study we formally describe *Abrahamia* Randrian. & Lowry to accommodate these species and provide a comprehensive taxonomic revision in which a total of 34 species are recognized, 19 of which are newly described. We also discuss additional morphological characters that, in combination, can be used to distinguish between the Malagasy taxa assigned to *Abrahamia* and *Protorhus*, which is henceforth restricted to a single African species.

Materials and methods

Herbarium studies and data management

The taxonomic revision of *Abrahamia* presented here is based on two phases of herbarium studies, conducted prior to and after field work. The first phase involved the examination of herbarium specimens available at the Missouri Botanical Garden herbarium (MO) and received on loan from other institutions with important holdings from Madagascar (in particular G, K, and P; acronyms according to Index Herbariorum, 2017). The goal of this phase was to identify and delimit those species for which adequate material was available and to identify gaps and/or problems that would require field work to generate additional specimens and make further observations. The second phase, which took place following field work (see below), was aimed at carrying out more detailed morphological analyses that incorporated newly collected material as well as observations made both in the field and through the consultation of herbarium specimens deposited at the two main herbaria in Madagascar, TAN and TEF. This work provided a robust basis for re-assessing species limits, including the delimitation of new species and the preparation of detailed descriptions and an identification key. The terminology used follows Hickey (1973), Radford et al. (1974), Weberling (1989), Harris & Harris (1994), and Ellis et al. (2009).

Data on all collections examined during this study were captured in Tropicos (2017) and are available on-line, along with distribution maps, photos of selected species, and other information, through the Madagascar Catalogue (2017). For collections lacking geo-coordinates, these were assigned, when possible, using the on-line gazetteer of Malagasy place names (Schatz & Lescot, 2003) and are indicated in square brackets in the specimens cited under each species. Distribution maps were generated from the data in Tropicos (2017) projected on a base map of the bioclimatic zones of Madagascar (after Cornet, 1974; see Schatz, 2000).

Field studies

Field work, conducted in Madagascar between 1996 and 2013, initially focused on collecting material needed to fill gaps identified during the first phase of herbarium studies, and was later aimed at sampling as many taxa as possible, including those that appeared to be new, in order to provide a robust understanding of morphological and geographic variation within the group. The collection of herbarium specimens followed standard MBG protocols [www.mobot.org/MOBOT/molib/fieldtechbook/pdf/handbook.pdf]. Whenever possible, a minimum of five duplicate specimens were prepared for each collection, two of which were deposited in Madagascar (at TAN and TEF) and the remaining were sent to MO, where the majority of herbarium studies were conducted (a single sheet was mounted at MO, and additional duplicates have been distributed). Fresh material (leaves, inflorescence, flower buds, flowers, and fruits) was also collected and preserved in FAA, and deposited in the spirit collection of the Missouri Botanical Garden. Leaf samples preserved in silica gel were prepared for as many species as possible for molecular studies (see Pell et al., 2008). Finally, mature seeds were collected and provided to the horticulture department of the Parc Botanique et Zoologique de Tsimbazaza in Antananarivo, Madagascar.

Risk of extinction assessments

The conservation status of each species was assessed using the IUCN Red List Categories and Criteria (IUCN, 2012). Data from the collection records in the Madagascar Catalogue (2017) were used to calculate geographic range parameters (area of occupancy AOO, extent of occurrence EOO, and number of localities), and the number of locations (sensu IUCN, 2012) was determined for each species with respect to the most serious threats.

Morphology and taxonomically informative characters

A number of morphological features have proven to be of value for recognizing and distinguishing species of *Abrahamia*. These characters are briefly presented below.

Habit

Two major growth forms can be discerned in *Abrahamia*. All wet forest species are canopy or midstory trees with straight trunks and conical crowns. By contrast, those occurring in dry areas (i.e., Madagascar's western slopes and in the far South) or in highly impacted or degraded habitats (in particular on the high plateau) are usually short and/or scrubby trees (e.g. *A. ibityensis* (H. Perrier) Randrian. & Lowry and *A. itremoensis* Randrian. & Lowry). Also, the color of exudate in the bark, observable when a slash is made on the trunk, varies from milky white or translucid/watery white to red.

Leaves

All species of *Abrahamia* have leaves that are entire and distinctly petiolate. Phyllotaxy, however, varies from alternate and subopposite to opposite or verticillate. Most species are evergreen, with the exception of *A. humbertii* (H. Perrier) Randrian. & Lowry, which is deciduous. Several additional foliar characters are also of taxonomic importance, as follows: