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An appraisal of the Mozambique types and endemic taxa in the Pires de Lima plant collection at the Porto Herbarium (PO, MHNC-UP)

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Putative type specimens of 18 taxa described from Mozambique collected by Américo Pires de Lima at the beginning of the 20th century are kept in the African collections of the Herbarium of Porto (PO) at the MHNC-UP. These specimens were not collected as part of a dedicated scientific mission, but they and the scientific studies carried out by Pires de Lima represent an important contribution to Portuguese colonial projects. During his scientific career, and despite the lack of support and specialised literature, Pires de Lima described 17 species new to science. In this work we analysed part of the material collected by Pires de Lima, kept in PO at MHNC-UP. Today, only two of the 17 taxa described by Pires de Lima remain as accepted taxa, viz. *Tephrosia reptans* var. *microfoliata* (Pires de Lima) Brummitt and *Crotalaria retusa* var. *tunguensis* (Pires de Lima) Polhill. In addition, information on *Polygala limae* Exell, named after Pires de Lima, has also been analysed as this is still accepted. Of over 300 specimens collected by Pires de Lima in the early 20th century, some 40% remain unidentified due to lack of expertise. Undoubtedly, this collection contains many other promising specimens in need of revision, taxonomic update, and other novelties that can be found even in the more ancient and inconspicuous materials.

Keywords: botanical collections, Natural History and Science Museum of University of Porto, Mozambique flora, Herbarium of the University of Porto, systematics.

Introduction

Mozambique is a botanical hotspot with five phytogeographic regions organised into communities of miombo, mopane, undifferentiated woodland and coastal mosaic (Burgess et al. 2004). In recent years, several centres of plant endemism have been recognised in Mozambique, with new taxa described at a significant rate. Mozambique includes four cross-border centres of botanical endemism, namely the Rovuma Centre, encompassing northeastern Mozambique and southeastern Tanzania (Darbyshire et al. 2019), where the province of Cabo Delgado is located, from which the botanical specimens discussed here originate.

Recent checklists of the flora of Mozambique, based on published literature, online databases and herbarium collections, recognise 5 957 species plus 605 subspecies and 537 varieties belonging to 226 families and 1 746 genera (Odorico et al. 2022). Initiatives such as the International Union for Conservation of Nature-Species Survival Commission (IUCN-SSC) Southern African Plant Specialist Group to update plant species assessments in the 2017–2020 period, and the 'Tropical Important Plant Areas: Mozambique' project, have been developed to raise awareness of the importance of Mozambique's flora (Darbyshire et al. 2019). A thorough assessment for Mozambique carried out

in 2021 included 1 667 of the recorded taxa on the IUCN Red List (Odorico et al. 2022).

At the beginning of the 20th century, scientific research in Portuguese colonies witnessed a change in attitude towards the Portuguese model of colonisation, largely due to international pressure that promoted a shift from the occupation of colonial territories by 'historical right' to 'effective occupation' (Neto 2013; Pires & Fogarty 2014). These changes, reinforced by the Berlin Conference of 1884/5, required a deeper scientific knowledge of the colonised territories. The scientific investigations carried out by Américo Pires de Lima in Mozambique between 1916/17 in the Cabo Delgado Province (Pires de Lima 1933), although not strictly a scientific mission, can be placed within this paradigm of the Portuguese colonial project.

The Herbarium of the University of Porto (PO) founded in 1892, is at present part of the Natural History and Science Museum of the University of Porto (MHNC-UP) (Folhadela et al. 1993; Vieira & Viegas 2019). With almost 130 000 specimens, it is one of the three largest herbaria in Portugal. In addition to the Portuguese flora, PO houses collections of the flora of former Portuguese colonies. These include a Mozambique collection, with specimens collected by various collectors some 50 to 100 years ago. As with other African collections, they remain as the institution's backlog due to lack of expertise for identification.

Among the specimens from the PO African herbarium is the collection of Américo Pires de Lima (1886–1966), a medical doctor, professor, botanist, bacteriologist and researcher. As an academic, he was a major figure at the University of Porto, where he held prominent positions including Director of the Faculty of Sciences and the Faculty of Pharmacy at the University of Porto and the Institute of Botany (Salema 1989). In 1916, still at the beginning of his academic career at the Faculty of Sciences, he was mobilised for World War I as a lieutenant doctor in an expedition to Mozambique, and also head of the Hygiene and Bacteriology Section (Pires de Lima 1933). Although this was a military mission, Pires de Lima was commissioned by two professors from the University of Porto, and reinforced by a ministerial decree, to take advantage of the trip to Mozambique to carry out studies on the flora, fauna and anthropology of the region where he was stationed, without disruption to his military service (Salema 1989).

Although Pires de Lima was not an expert in African botany, he endeavoured to collect in Mozambique, to analyse some of this material and to proceed with the identification of some of the specimens. He did this without an adequate specialised library and, according to his testimony, identified specimens by comparison (Pires de Lima 1950). The classification process was partly carried out with the help of Gonçalo Sampaio (1865–1937; University of Porto) and Júlio Henriques (1838–1928; University of Coimbra) (Pires de Lima 1921), the two best-trained botanists in Portugal at the time. It is also known that Pires de Lima intended to send the specimens to experts at Kew (Pires de Lima 1950). Some of the Pires de Lima specimens are type specimens of lichens or vascular plants from Mozambique referred to in the works of Vainio and Pires de Lima (Vainio 1930; Pires de Lima 1921, 1922, 1924; Paz-Bermúdez 2004), published in the Portuguese scientific journals available at the time, which contained much taxonomic content (Boletim da Sociedade Broteriana and Brotéria journals). Pires de Lima is known to have published at least 20 vascular plant names during the period between 1921 and 1924 (Figueiredo et al. 2018).

Initiatives such as Flora Zambesiaca and the work evaluating endemism in Mozambique and the checklist of Vascular Plants of Mozambique (Mendonça & Wild 1960, Darbyshire et al. 2019, Odorico et al. 2022), allowed us to verify that the locations of Pires de Lima's collections correspond to areas that were little-known to European botany, which highlights the value of these collections.

Currently, the coastal region of the province of Cabo Delgado is identified as having high botanical value in the country and is recommended as a strategic conservation priority (Odorico et al. 2022). Added to this fact are the current scenarios of armed conflict, affecting the lives of populations and also resulting in the destruction of habitats. Pires de Lima's collection from a period of about 100 years ago, covers different types of habitats, and constitutes an important reference of the region's previous floristic cover, for habitat conservation and restoration projects.

This paper aims to document some of the types of the Mozambique vascular collection housed at PO, and to promote understanding and awareness of the importance of the permanent review of biological collections in systematics.

Materials and methods

The need for taxonomic and nomenclatural adjustments of the PO Mozambican types was identified in the context of an inventory following the project: IAPT REPORT Small Collections Grants – Grant Application (grant round 2019–20: African Backlog at PO Herbarium: uncovering 20th-century collectors and specimens from unofficial African botanical missions) and studied in the context of work placement (Faria 2021). These two processes made it possible to access PO and to search, organise, photograph or catalogue the African and, in particular, the Mozambican collections. In

time, it was possible to complete the recognition of the backlog of collections that had been unrecognised for several decades. We also found that the Pires de Lima collection is accompanied by documentation, such as notebooks with descriptions, inventories and publications and we were able to photograph specimens (Canon EOS 6D MARK II camera).

Results

Of the 324 vascular specimens collected by Pires de Lima, 59% were identified to at least family level, with the most represented families being Fabaceae, followed by Cyperaceae. A total of 175 of these specimens have been identified and published with collector numbers (Pires de Lima 1921, 1922, 1924), but 149 remain unidentified until today. Although there have been some evaluations of specimens in this vascular plant collection by Kew and British Museum staff or researchers (Arthur Wallis Exell, Richard Kenneth Brummitt, Jane Browning, Roger Marcus Polhill) or other sporadic studies by African flora specialists (Jorge Paiva, António Rocha da Torre, Simone Balle, Franciscus Jozef Breteler and Paul Goetghebeur), these types needed a taxonomic revision to support the global databases that still present Pires de Lima names as unresolved.

In total, 18 of the 324 specimens in the collection of Américo Pires de Lima (1921, 1922 and 1924) were identified as 'typus' by Pires de Lima or by other authors studying the collection. These type specimens were collected between 1916 and 1917, 16 by Américo Pires de Lima himself and two by his friend, Lieutenant Romualdo Tavares (Pires de Lima 1921, 1922, 1924), also in military service.

Types

The vascular plant specimens from the Pires de Lima collection that have been accessed and studied, and previously marked as types, are the following 18 taxa, listed in alphabetical order by family:

Acanthaceae

Hygrophila palmensis Pires de Lima in Boletim da Sociedade Broteriana, Sér. 2, 2: 149 (1924). TYPE: MOZAMBIQUE, Tungue, near Palma, 14 Aug. 1916, *Pires de Lima 26* (POV-69221) [1 specimen] = **Hygrophila auriculata** (Schumach.) Heine in Kew Bulletin 16 (2): 172 (1963).

Distribution: Mozambique

Notes: These specimens were initially designated by Pires de Lima as *Hygrophila palmensis* Pires de Lima (type specimen). According to Plants of the World Online (POWO), *Hygrophila palmensis* Pires de Lima co-exists with *Hygrophila auriculata* (Schumach.) Heine in Mozambique. Accordingly, in 2022, one of the authors of this manuscript (J. Paiva) reviewed the specimen as *Hygrophila auriculata* (Schumach.) Heine. (Figure 1).

Amaranthaceae

Achyranthes asperoides Pires de Lima in Brotéria, Série Botânica, 19, 3: 116 (1921). TYPE: MOZAMBIQUE, Cabo Delgado, surroundings of Palma, 8 Feb. 1917 and 4 Mar. 1917, *Pires de Lima 118* (POV-69282; POV-69283) [2 specimens] = **Achyranthes aspera** L., Species plantarum 1: 204 (1753a); Townsend: 101 (1985); Townsend: 106 (1988). *A. aspera* var. *sicula* L., Species plantarum 1: 204 (1753a); Townsend: 104 (1985); Townsend: 109 (1988).

Distribution: A. aspera var. *sicula* L. distribution includes Africa, Mediterranean to West Asia and Arabian Peninsula, India.

Notes: These specimens were initially designated by Pires de Lima as *Achyranthes asperoides* Pires de Lima (type specimen). According to the POWO, *Achyranthes asperoides* Pires de Lima is recognised as a synonym of *Achyranthes aspera* L. var. *aspera*. Until 2022, no other researcher examined this specimen, which one of the authors of this manuscript (J. Paiva) identified as *Achyranthes aspera* L. var. *sicula* L. (Figure 2).

Cleomaceae

Pedicellaria glandulosa Pires de Lima in Brotéria, Série Botânica, 19, 3: 117 (1921). TYPE: MOZAMBIQUE, Cabo Delgado, near Palma, 9 Aug. 1916, *Pires de Lima 9* (POV-68998, POV-69297) [2 specimens] = **Cleome gynandra** L., Species plantarum 2: 671 (1753b); Figueiredo & Smith: 55 (2008). *Gynandropsis gynandra* (L.) Briq. 17: 382 (1914); Wild: 205, tab. 31 (1960); Elffers et al.: 18, fig. 3 (1964).

Distribution: Cleome gynandra L. is native in tropical and subtropical Africa, Madagascar and tropical Asia; introduced to SW Europe, Central America and northern South America.

Notes: These specimens were initially labelled by Pires de Lima as *Pedicellaria glandulosa* Pires de Lima (type specimens). However, according to the POWO, *Pedicellaria glandulosa* Pires de Lima is currently considered an unplaced name that cannot be accepted or synonymised. In 2022, one of the authors of this manuscript (J. Paiva) argues that Pires de Lima misidentified it and identifies it as *Cleome gynandra* L. (Figure 3).

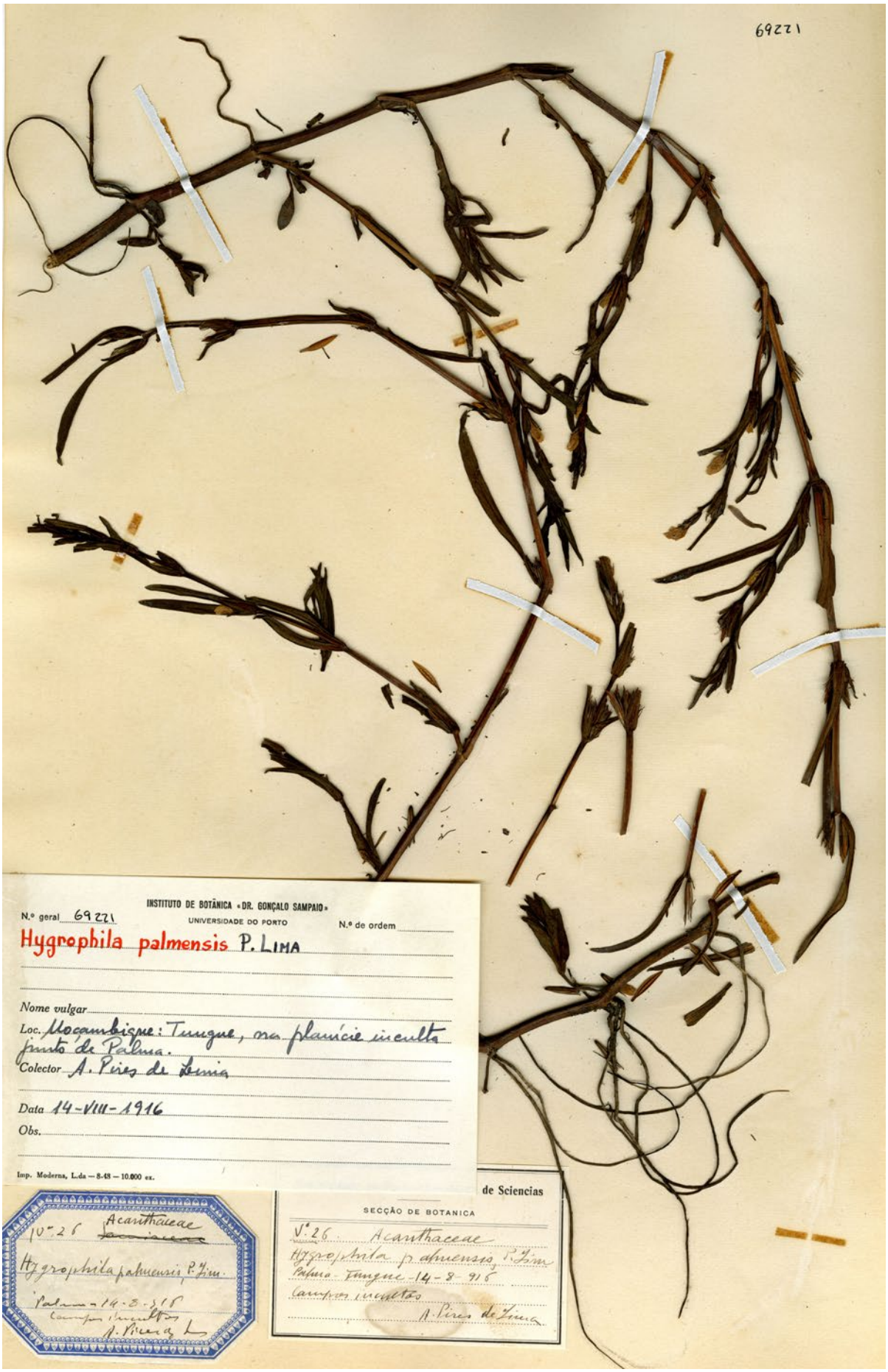

Figure 1. *Hygrophila palmensis* Pires de Lima. Specimen POV-69221.

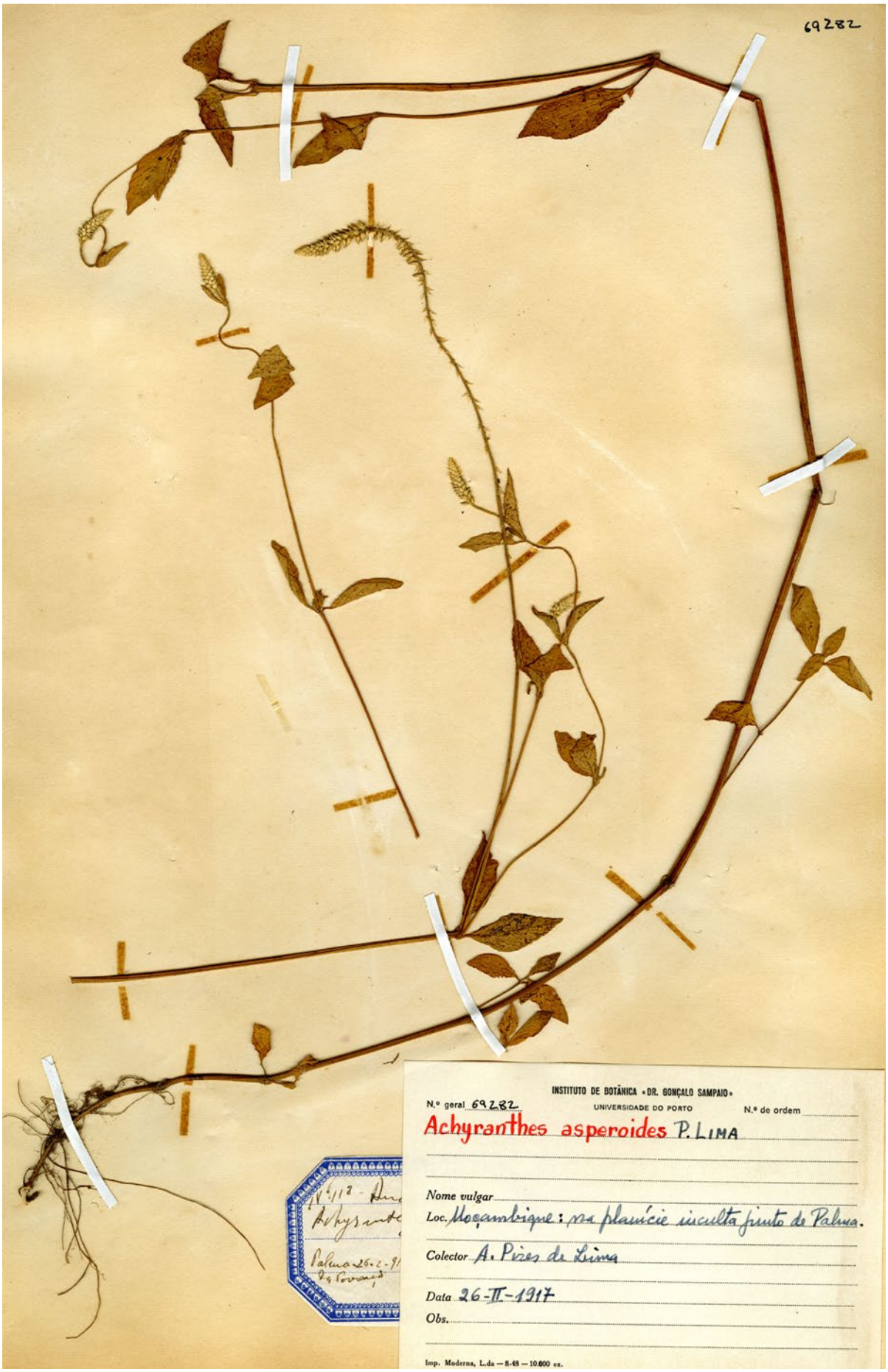

Figure 2. *Achyranthes asperoides* Pires de Lima. Specimen POV-69282.

Figure 3. *Pedicellaria glandulosa* Pires de Lima. Specimen POV-68998.

Colchicaceae

Gloriosa sampiana Pires de Lima in Brotéria, Série Botânica, 19, 3: 112 (1921). TYPE: MOZAMBIQUE, Madai, 3 Apr. 1917, *Pires de Lima 173* (POV-69286, POV-68979) [2 specimens] = *Gloriosa simplex* L., Mantissa plantarum: 62 (1767); Maroyi: 122, Fig. 6.13 (2012); Thiombiano et al.: 36 (2012).

Distribution: Gloriosa simplex L. is widespread in tropical and southern Africa.

Notes: These specimens were initially designated by Pires de Lima as *Gloriosa sampiana* Pires de Lima (type specimen). According to the POWO, **Gloriosa sampiana** Pires de Lima is recognised as a synonym of *Gloriosa simplex* L. Until 2022, no other researcher examined this specimen, which one of the authors of this manuscript (J. Paiva) identified as *Gloriosa simplex* L. (Figure 4).

Cyperaceae

Fimbristylis rhizomatosa Pires de Lima in Boletim da Sociedade Broteriana, Sér. 2, 2: 134 (1924). TYPE: MOZAMBIQUE, Palma, Quionga, 8 Nov. 1916, *Pires de Lima 52* (POV-62233, POV-62234) [2 specimens] = **Bulbostylis burchellii** (Ficalho & Hiern) C.B.Clarke: 612 (1894); Figueiredo & Smith: 178 (2008).

Distribution: Bulbostylis burchellii is native from Tanzania to South Africa.

Notes: These specimens were initially labelled by Pires de Lima as *Fimbristylis rhizomatosa* Pires de Lima (type specimens). In July 1991, Paul Goetghebeur reviewed the specimens as *Bulbostylis burchellii* (Ficalho & Hiern) C.B.Clarke. In 2022, one of the authors of this manuscript (J. Paiva) also agreed that Pires de Lima misidentified the specimens and agreed with P. Goetghebeur, naming them *Bulbostylis burchellii*. (Figure 5).

Fimbristylis elongata Pires de Lima in Boletim da Sociedade Broteriana, Sér. 2, 2: 133 (1924). TYPE: MOZAMBIQUE, Palma, Tungue, 21 Sept. 1917, *Pires de Lima 32* & *145* (POV-68955, POV-69316, POV-68954) [3 specimens] = **Bulbostylis contexta** (Nees) Bodard in Annales de la Faculté des sciences, Université de Dakar 9: 77 (1963); Figueiredo & Smith: 178 (2008).

Distribution: Bulbostylis contexta is native to Ethiopia, South Africa and Madagascar.

Notes: These specimens were initially labelled by Pires de Lima as *Fimbristylis elongata* Pires de Lima (type specimens). In July 1991, Paul Goetghebeur reviewed the specimens as *Bulbostylis contexta* (Nees) Bodard. In 2022, one of the authors of this manuscript (J. Paiva) also agreed that Pires de Lima misidentified the specimens and agreed with P. Goetghebeur, naming them *Bulbostylis contexta*. (Figure 6).

Fimbristylis longebracteata Pires de Lima in Boletim da Sociedade Broteriana, Sér. 2, 2: 134 (1924). TYPE: MOZAMBIQUE, surroundings of Palma, 10 Feb. 1917, *Pires de Lima 104* (POV-62232) [1 specimen] = **Bulbostylis hispidula** (Vahl) R.W.Haines, Sedges & Rushes E. Afr. 3: p.[1] (1983); Figueiredo & Smith: 178 (2008).

Distribution: Bulbostylis hispidula is native to the tropics and subtropics and the Caucasus.

Notes: These specimens were initially labelled by Pires de Lima as *Fimbristylis longebracteata* Pires de Lima (type specimens). In July 1991, Paul Goetghebeur reviewed the specimens as *Bulbostylis hispidula* (Vahl) R.W.Haines. In 2022, one of the authors of this manuscript (J. Paiva) also agreed that Pires de Lima misidentified the specimens and agreed with Goetghebeur, naming them *Bulbostylis hispidula*. (Figure 7).

Fabaceae

Abrus gracilis Pires de Lima in Brotéria, Série Botânica, 19, 3: 127 (1921). TYPE: MOZAMBIQUE, Cabo Delgado, surroundings of Palma, 8 May 1917, *Pires de Lima 257* (POV-69004; POV-69301; Kew photo negative 7527; 7526) [2 specimens] = **Abrus melanospermus** subsp. **tenuiflorus** (Benth.) D.K.Harder in Novon 10: 124 (2000); Timberlake et al.: 216 (2007).

Distribution: Abrus melanospermus subsp. *tenuiflorus* is native to tropical Africa and Madagascar.

Notes: These specimens were initially labelled by Pires de Lima as *Abrus gracilis* Pires de Lima (type specimens). In March 1960, F.J. Breteler reviewed the specimens as *Abrus fruticulosus* Wall. ex Wight & Arn. In October 1961, G. Nertcourt reviewed the specimens as *Abrus pulchellus* subsp. *tenuiflorus* (Spruce ex Benth.) Verdc. In 2022, one of the authors of this manuscript (J. Paiva) also agreed that Pires de Lima misidentified the specimens, and agreed with G. Nertcourt, naming them as *Abrus melanospermus* subsp. *tenuiflorus* (Spruce ex Benth.) D.K.Harder, the currently accepted name for the synonym of *Abrus pulchellus* subsp. *tenuiflorus* (Spruce ex Benth.) Verdc. (Figure 8).

Abrus tunguensis Pires de Lima in Brotéria, Série Botânica, 19, 3: 127 (1921). TYPE: MOZAMBIQUE, Cabo Delgado, surroundings of Palma, 8 Feb. 1917 and 4 Mar. 1917, *Pires de Lima 94* and *134* (POV-69285; POV-69284; Kew photo negative

Figure 4. *Gloriosa sampiana* Pires de Lima. Specimen POV-68979.

Figure 5. *Fimbristylis rhizomatosa* Pires de Lima. Specimen POV-62234.

Figure 6. *Fimbristylis elongata* Pires de Lima. Specimen POV-68954.

Figure 7. *Fimbristylis longebracteata* Pires de Lima. Specimen POV-62232.

Figure 8. *Abrus gracilis* Pires de Lima. Specimen POV-69301.

7524; 7525) [2 specimens] = **Abrus precatorius** subsp. **africanus** Verd. in Mitteilungen der Botanischen Staatssammlung München 7: 328 (1970a); Verdcourt: 241 (1970b); Verdcourt: 114 (1971); Harder: 211 (2007).

Distribution: Abrus precatorius subsp. *africanus* is native to tropical Africa; introduced and naturalised in many regions of tropical Africa, South Africa, Seychelles, Madagascar, Mauritius, into North, Central and South America, Australia and Asia (from China to SE Asia and the Philippines).

Notes: These specimens were initially labelled by Pires de Lima as *Abrus tunguensis* Pires de Lima (type specimens). In March 1960, F.J. Breteler reviewed the specimens as *Abrus precatorius* L. In October 1961, G. Nertcourt reviewed the specimens as *Abrus precatorius* subsp. *africanus* Verdc. In 2022, one of the authors of this manuscript (J. Paiva) also agreed that Pires de Lima misidentified the specimens, and agreed with G. Nertcourt, naming them as *Abrus precatorius* subsp. *africanus* Verdc. (Figure 9).

Baphia mocimboensis Pires de Lima in Brotéria, Série Botânica, 19, 3: 120 (1921). TYPE: MOZAMBIQUE, Cabo Delgado, Mocimboa da Praia, Ponta Vermelha, 7 Sept. 1917, *Pires de Lima 265* (POV-69302; POV-69005; Kew photo negative 6705; 6704) [2 specimens] = **Baphia macrocalyx** Harms in Botanische Jahrbücher für Systematik 40,1: 33, fig.3 (1907); Brummitt et al.: 43 (2007).

Distribution: Baphia macrocalyx is native to **s**outh of Tanzania and north of Mozambique.

Notes: These specimens were initially labelled by Pires de Lima as *Baphia mocimboensis* Pires de Lima (type specimens). In July 1964, R.K. Brummitt reviewed the specimens as *Baphia macrocalyx* Harms. In 2022, one of the authors of this manuscript (J. Paiva) also agreed that Pires de Lima misidentified the specimens, and agreed with R.K. Brummitt, naming them as *Baphia macrocalyx* Harms (Figure 10).

Crotalaria tunguensis Pires de Lima in Brotéria, Série Botânica, 19, 3: 120 (1921). TYPE: MOZAMBIQUE, Cabo Delgado, surroundings of Palma, 14 Apr. 1917, *Pires de Lima 204* (POV-69308; POV-69022; Kew photo negative 7674; 7675) [2 specimens] ≡ **Crotalaria retusa** var. **tunguensis** (Pires de Lima) Polhill in Kew Bulletin 21: 311 (1968); Polhill: 958 (1971).

Distribution: Crotalaria retusa var. *tunguensis* is native to Somalia, Kenya, Tanzania and Mozambique.

Notes: These specimens were initially labelled by Pires de Lima as *Crotalaria tunguensis* Pires de Lima (type specimens). In 1965, R.M. Polhill reviewed the specimens as *Crotalaria retusa* var. *tunguensis* (Pires de Lima) Polhill. In 2022, one of the authors of this manuscript (J. Paiva) also agreed with R.M. Polhill, and named them as *Crotalaria retusa* var. *tunguensis* (Pires de Lima) Polhill (Figure 11).

Cracca incana (Roxb.) Pires de Lima in Brotéria, Série Botânica, 19, 3: 124 (1921). TYPE: MOZAMBIQUE, surroundings of Palma, 4 May 1917 and 12 Apr. 1917, *Pires de Lima 237* and *197* (POV-69018; POV-69019) [2 specimens] ≡ **Tephrosia villosa** subsp. **ehrenbergiana** (Schweinf.) Brummitt in Flora Zambesiaca 3, 3: 136, Fig. 3.3.25 (2007).

Distribution: Tephrosia villosa subsp. *ehrenbergiana* is native to Ethiopia to South Africa, Angola, Namibia and Madagascar.

Notes: These specimens were initially labelled by Pires de Lima *Cracca incana* (Roxb.) Pires de Lima (type specimens). In 1966, R.K. Brummitt reviewed the specimens as *Tephrosia villosa* subsp. *ehrenbergiana* (Schweinf.) Brummitt (homotypic synonym). In 2022, one of the authors of this manuscript (J. Paiva) agreed with R.K. Brummitt, and maintained the identification as *Tephrosia villosa* subsp. *ehrenbergiana* (Schweinf.) Brummitt (Figure 12).

Cracca bracteolata var. *microfoliata* Pires de Lima in Boletim da Sociedade Broteriana Sér. 2, 2: 137 (1924). TYPE: MOZAMBIQUE, near Palma, 24 Aug. 1916, *Pires de Lima 34* (POV-69017) [1 specimen] ≡ **Tephrosia reptans** var. **microfoliata** (Pires da Lima) Brummitt in Boletim da Sociedade Broteriana Sér. 2, 41: 287 (1968). [*Cracca bracteolata* sensu Pires de Lima in Brotéria, Série Botânica,19, 3: 123 (1921)].

Distribution: native range for *Tephrosia reptans* var. *microfoliata* is northern Mozambique.

Notes: These specimens were initially labelled by Pires de Lima as *Cracca bracteolata* var. *microfoliata* Pires de Lima (type specimens). In 1966, R.K. Brummitt renamed the specimens as *Tephrosia reptans* var. *microfoliata* (Pires da Lima) Brummitt (homotypic synonym). In 2022, one of the authors of this manuscript (J. Paiva) also agreed with R.K. Brummitt, and maintained the identification as *Tephrosia reptans* var. *microfoliata* (Pires da Lima) Brummitt (Figure 13).

Loranthaceae

Loranthus romualdensis Pires de Lima in Brotéria, Série Botânica, 19, 3: 114 (1921). TYPE: MOZAMBIQUE, Madai, 11 May 1917, *Pires de Lima 260* (POV-68985) [1 specimen] = **Agelanthus sansibarensis** (Engl.) Polhill & Wiens in Lebrun & Stork, Énumération des plantes à fleurs d›Afrique tropicale 2: 165 (1992); Polhill & Wiens: 166, photo 63,

Figure 9. *Abrus tunguensis* Pires de Lima. Specimen POV-69284.

Figure 10. *Baphia mocimboensis* Pires de Lima. Specimen POV-69005.

Figure 11. *Crotalaria tunguensis* Pires de Lima. Specimen POV-69022.

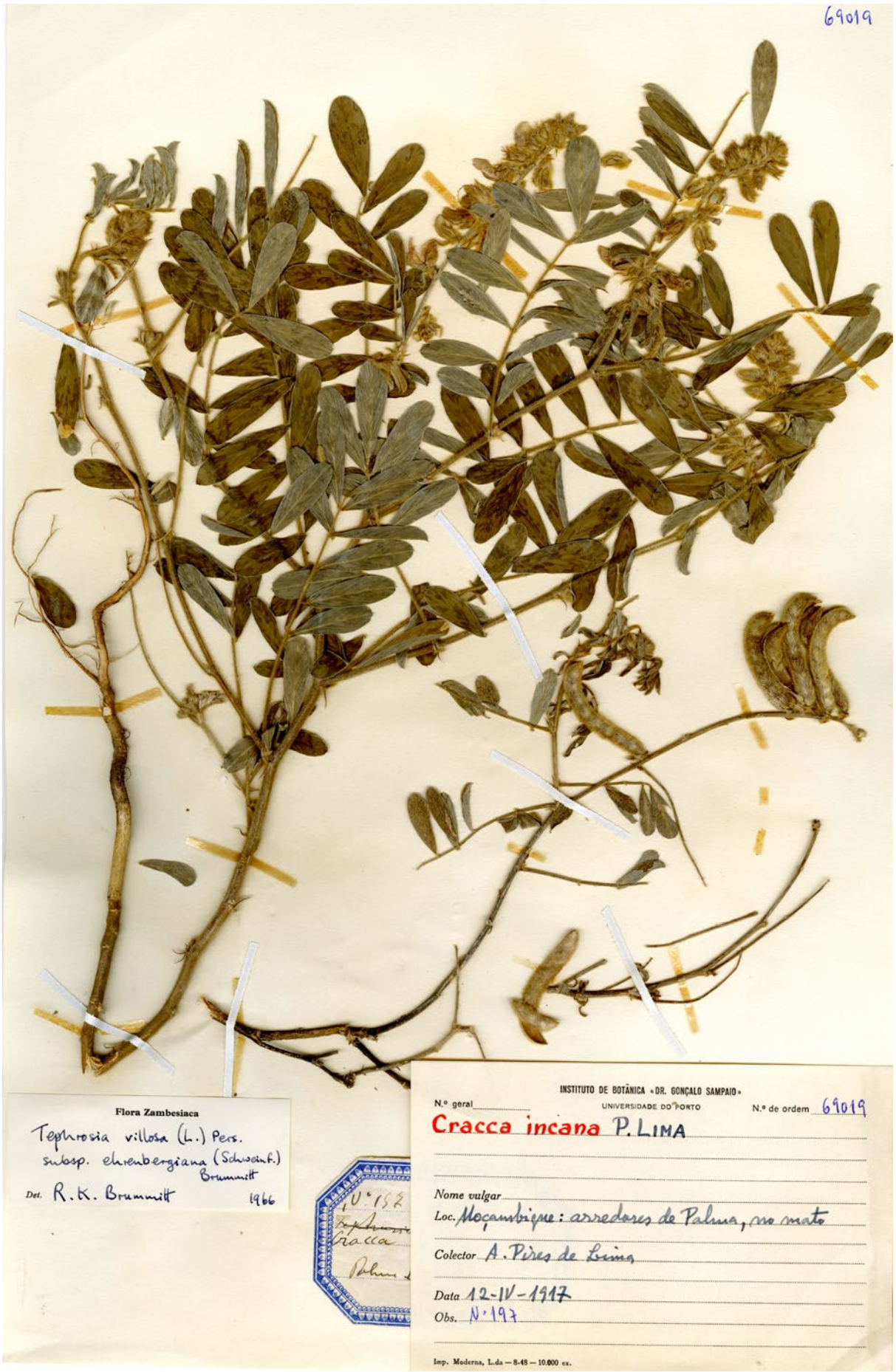

Figure 12. *Cracca incana* (Roxb.) Pires de Lima. Specimen POV-69019.

Figure 13. *Cracca bracteolata* var. *microfoliata* Pires de Lima. Specimen POV-69017.

fig. 14A (1998); Polhill & Wiens: 60 (1999); Polhill & Wiens: 153 (2006).

Distribution: Agelanthus sansibarensis is native to Somalia, Kenya, Tanzania and Mozambique.

Notes: These specimens were initially labelled by Pires de Lima as *Loranthus romualdensis* Pires de Lima. In 1962, S. Balle reviewed the specimens as *Englerina inaequilatera* (Engl.) S.Balle var. *swynnertonii* (Sprague) S.Balle. In 2022, one of the authors of this manuscript (J. Paiva) reviewed the specimen and named it as *Agelanthus sansibarensis* (Engl.) Polhill & Wiens (Figure 14).

Malvaceae

Hibiscus henriquesii Pires de Lima in Brotéria, Série Botânica, 19, 3: 138 (1921). TYPE: MOZAMBIQUE, Cabo Delgado, surroundings of Palma, 14 Aug. 1916, *Pires de Lima 24* (POV-69155, POV-69156) [2 specimens] = **Hibiscus cannabinus** L., Systema naturae 10, 2: 1149 (1759); Exell: 441 (1961); Verdcourt & Mwachala: 41 (2009).

Distribution: Hibiscus cannabinus L. is widespread in tropical and subtropical Africa and extending to India (as an introduced species).

Notes: These specimens were initially labelled by Pires de Lima as *Hibiscus henriquesii* Pires de Lima (type specimens). In 1958, A. Exell, Brummitt reviewed the specimens as *Hibiscus cannabinus* L. In 2022, one of the authors of this manuscript (J. Paiva) agreed with A. Exell, and maintained the identification as *Hibiscus cannabinus* L. (Figure 15).

Orobanchaceae

Striga diversifolia Pires de Lima in Brotéria, Série Botânica, 20,1: 6 (1922). TYPE: MOZAMBIQUE, near Palma, 9 Aug. 1916 & 14 Aug. 1916, *Pires de Lima 83* & *27* (POV-69211, POV-69212) [2 specimens] = **Striga asiatica** (L.) Kuntze, Revisio generum plantarum 2: 466 (1891); Philcox: 134 (1990).

Distribution: native range for *Striga asiatica* is Africa to the Arabian Peninsula.

Notes: These specimens were initially labelled by Pires de Lima as *Striga diversifolia* Pires de Lima. In 2022, one of the authors of this manuscript (J. Paiva) reviewed the specimen and named it as *Striga asiatica* (L.) Kuntze (Figure 16).

Polygalaceae

Polygala limae Exell in Boletim da Sociedade Broteriana, Sér. 2, 31: 5 (1957); Exell: 312 (1960); Paiva: 60 (1961); Paiva: 241, tab. 45, fig. g (1998). TYPE: MOZAMBIQUE, Mocimboa da Praia, Ponta Vermelha, 12 Sept. 1917, *Pires de Lima 276* (POV-69000, holo.; POV-69314, POV-69769, iso.).

Distribution: Polygala limae is endemic to north-eastern Mozambique.

Notes: Initially this specimen remained unlabelled by Pires de Lima, who only attributed the name of the family to the specimen (Polygalaceae). In 1956, A. Exell identified the specimen as *Polygala limae* Exell. In 2000, one of the authors of this manuscript (J. Paiva) reviewed the specimen and agreed with the status of this specimen as the holotype of the name *Polygala limae* Exell, an opinion he maintains until today. J. Paiva has revisited the region where the type material was collected, but was unable to relocate additional material of *P. limae*. *Polygala limae* Exell is very similar to *P. goetzei* Gürke but appears to be an annual, whereas *P. goetzei* is a perennial, and has smaller flowers and fruits than *P. goetzei*. As there is only the type material, more material is needed to assess whether they are two species (Figure 17).

Rubiaceae

Oldenlandia prostrata Pires de Lima in Boletim da Sociedade Broteriana, Sér. 2, 2: 151 (1924). TYPE: MOZAMBIQUE, Cabo Delgado, surroundings of Palma, 22 Apr. 1917, *Pires de Lima 219* (POV-69231, POV-69232) [2 specimens] = **Oldenlandia affinis** subsp. **fugax** (Vatke) Verdc. in Kew Bulletin 30,2: 293 (1975); Verdcourt: 292, Fig. 41, 15 (1976); Figueiredo & Smith: 145 (2008).

Distribution: Oldenlandia affinis subsp. *fugax* is native to tropical and South Africa, Comoros and Madagascar.

Notes: These specimens were initially labelled by Pires de Lima as *Oldenlandia prostrata* Pires de Lima. In 2022, one of the authors of this manuscript (J. Paiva) reviewed the specimen and synonymised to *O. affinis*, but to the subspecies *fugax* (Vatke) Verdc., the subspecies of *Oldenlandia* present in Mozambique (Figure 18).

Discussion

In the Pires de Lima collection, we found specimens marked as types representing 18 taxa names. Among these, only three taxa are presently acknowledged, viz. *Crotalaria tunguensis* Pires de Lima = *C. retusa* var. *tunguensis* (Pires de Lima) Polhill, *Tephrosia reptans* var. *microfoliata* (Pires da Lima) Brummitt and *Polygala limae* Exell.

A recent study focusing on endemic species from Mozambique (Darbyshire et al. 2019) mentions three endemic taxa collected by Pires de Lima: *Polygala limae*

Figure 14. *Loranthus romualdensis* Pires de Lima. Specimen POV-68985.

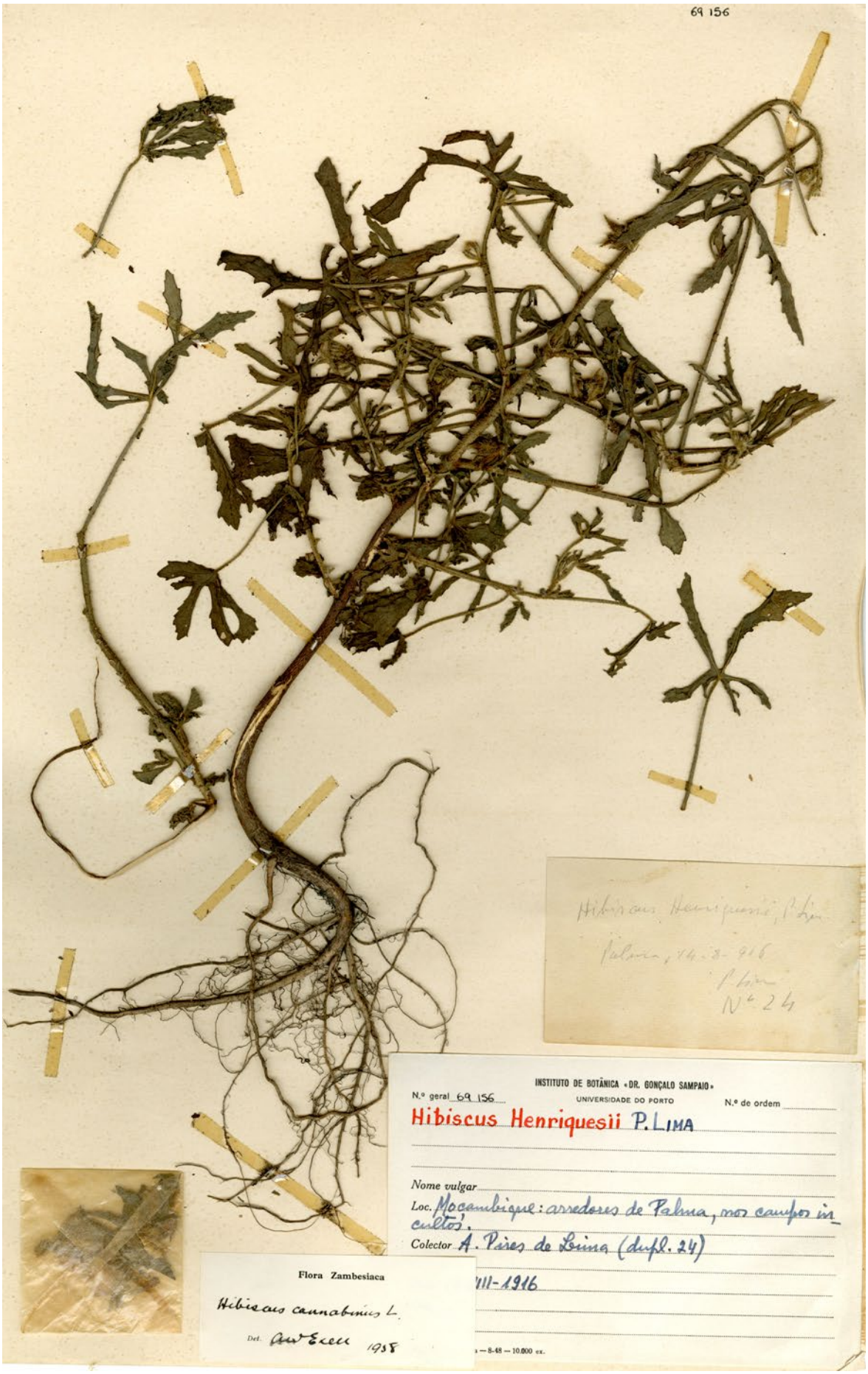

Figure 15. *Hibiscus henriquesii* Pires de Lima. Specimen POV-69156.

Figure 16. *Striga diversifolia* Pires de Lima. Specimen POV-69212.

Figure 17. *Polygala limae* Exell. Specimen POV-69000.

Figure 18. *Oldenlandia prostrata* Pires de Lima. Specimen POV-69232.

Exell, *Striga diversifolia* Pires de Lima, and *Tephrosia reptans* var. *microfoliata* (Pires da Lima) Brummitt. However, we found that the type specimen of *Striga diversifolia* Pires de Lima corresponds to the widely distributed *Striga asiatica* (L.) Kuntze.

In conjunction with other recent studies such as those by Darbyshire et al. (2019) and Odorico et al. (2022), this paper contributes significantly to the ongoing efforts to update and enhance the accessibility of data concerning the floristic diversity of Mozambique. We also hope this appraisal of the Mozambique types and endemic taxa in the Pires de Lima plant collection at the Porto Herbarium revives the interest in the African collections present at PO Herbarium.

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Authors' contributions

M.B.F (University of Porto) carried out the research, data collection and analysis. C.V. (University of Porto) was the project leader and, as curator of the Pires de Lima collection, supervised the types search and the database of the Pires de Lima collection, and participated in the planning of the work. S.B.V. (University of Lisbon) helped with the historical context of Américo Pires de Lima's mission to Mozambique, the endemism's search and the importance of historical collections for today's biodiversity conservation strategies. J.P. (University of Coimbra) proposed and designed the research, conducted the background research on the species surveys, and analysed and interpreted the data. All authors contributed to writing the paper, discussing the results and commenting on the final versions of the manuscript.

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